

Thurston County Drainage Design and Erosion Control Manual

Volume I Minimum Technical Requirements and Site Planning

Prepared by
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July 2009

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Additional Sources

Washington Department of Ecology Stormwater Management Manual for Western Washington, 2005

Pierce County Draft Stormwater Management and Site Development Manual, 2008

City of Tacoma Stormwater Management Manual, January 2009

City of Olympia Stormwater Management Manual, January 2005

Low Impact Development Technical Guidance Manual for Puget Sound, January 2005

Washington State Department of Transportation, Highway Runoff Manual (2009)

Chapter 1 - Introduction

The *Drainage Design and Erosion Control Manual* establishes requirements and provides guidance for managing the quantity and quality of stormwater runoff produced by development and redevelopment in Thurston County. This manual is a completely revised update to the 1994 Thurston County Drainage Design and Erosion Control Manual and is intended to comply with the National Pollutant Discharge Elimination System (NPDES) Phase II permit issued to Thurston County by the Department of Ecology and be equivalent to the *Stormwater Management Manual for Western Washington* (Ecology 2005).

The Thurston County Drainage Design and Erosion Control Manual applies to all unincorporated areas of Thurston County. Except that, within specific Urban Growth Areas (UGAs) associated with incorporated cities that have adopted a Drainage Manual equivalent to the *2005 Washington State Department of Ecology Stormwater Management Manual for Western Washington*, and for which an agreement between the City and Thurston County has been reached to use the City's Drainage Manual standards, the Drainage Manual of the incorporated city shall apply. The Manual establishes minimum requirements for projects of all sizes and types and the required submittals to demonstrate compliance with the minimum requirements.

The requirements of the manual also apply to cross-jurisdictional projects (e.g., utility, port, irrigation, drainage or flood control district, city, town, county, or other local, state, or federal government entity) located totally, or in part of, the County unless one of the following applies:

- Activity is exempted from submittal requirements (see Section 2.2)
- Development/redevelopment and stormwater activities are conducted in accordance with an approved stormwater management manual consistent with Thurston County's NPDES Phase II permit and the *2005 Washington State Department of Ecology Stormwater Management Manual for Western Washington*.

The Drainage Manual Administrator is authorized to request information or to impose controls beyond those specified in this Manual. In doing so, the Administrator shall act reasonably, exercising best professional judgment based on available information. Reasons that the Administrator may act include, but are not limited to, one of the following:

- To protect the health, safety, and welfare of the public
- To prevent water quality degradation and stream bank erosion

- To prevent flooding that may present a risk to life, safety, vital services, or property
- To implement regulatory mandates such as Total Maximum Daily Load (TMDL) requirements within a watershed
- Where the Administrator's direction is needed to correct errors and omissions, in order to clarify, augment or update Manual text. Where this is required, the Administrator will, in a timely and appropriate manner, revise the text and provide the revisions to Manual users. Users are advised to check the Thurston County website or contact the County for updated design and implementation guidelines.

The use of "onsite measures" (Low Impact Development) will be an integral part of the planning and design of all future development in Thurston County. The ultimate goal of stormwater management for new development and redevelopment will be to mimic the natural pre-development hydrologic conditions of the site as closely as possible with respect to infiltration, evapotranspiration, water quality, and quantity of surface water release from the site. To this end, the design for stormwater management systems for development shall be a sequential process described as follows:

- 1st Minimize disturbed areas and maximize open space and native vegetation retention.
- 2nd Limit impervious surface to the minimum necessary and implement source control measures to prevent contact of stormwater with pollutant generating sources.
- 3rd Use "onsite" measures such as dispersion, bio-retention (rain gardens), and small scale infiltration to the maximum extent practicable to reduce concentrated flows of stormwater.
- 4th Disconnect impervious surfaces to the maximum extent practicable to slow the runoff of stormwater from a site and increase the time of concentration. Examples include filter strips, porous paving, sheet flow of runoff to native vegetation, and bioretention.
- 5th For any remaining concentrated stormwater flows that exceed specific thresholds provide treatment and infiltrate to the maximum extent practicable and at least to the level of infiltration provided by the site in pre-development conditions.

- 6th Minimize release of surface water to protect stream channels and downstream properties by meeting design criteria established for peak flow rate and volume per drainage manual requirements.
- 7th Implement controls to manage stormwater runoff during construction to eliminate discharge of sediment-laden water offsite and maintain these controls until the site is stabilized.
- 8th Establish and implement a plan for the operations and maintenance of the stormwater facilities and provide ongoing maintenance, repair, and operations for those facilities to ensure continued protection of water quality and flow control.

The Best Management Practices (BMPs) described in this manual help meet the following water quality standards and protect beneficial uses of the receiving waters:

- **Chapter 173-200 WAC**, Water Quality Standards for Ground Waters of the State of Washington
- **Chapter 173-201A**, Water Quality Standards for Surface Waters of the State of Washington
- **Chapter 173-204**, Sediment Management Standards.

Stormwater management techniques applied in accordance with this manual are presumed to meet the technology-based treatment requirement of State law to provide all known available and reasonable methods of treatment, prevention and control (AKART; RCW 90.52.040 and RCW 90.48.010).

This technology-based treatment requirement does not excuse any discharge from the obligation to apply additional stormwater management practices as necessary to comply with the State water quality standards listed above.

The BMPs presented in this manual are approved by Thurston County and the Department of Ecology and are *presumed* to protect water quality and instream habitat – and meet the stated environmental objectives of the regulations described in this chapter. Project proponents always have the option of not following the stormwater management practices in this manual. However, if a project proponent chooses not to follow the practices in the manual then the project proponent will be required to individually *demonstrate* that the project will not adversely impact water quality by collecting and providing appropriate supporting data to show that the alternative approach is protective of water quality and satisfies state and federal water quality laws. Projects interested in pursuing the

demonstrative approach should contact Thurston County early in the process.

Where requirements in this document are also covered in any other law, ordinance, resolution, rule, regulation, or similar requirement, the more restrictive shall govern.

This manual has been adopted by the Thurston County Board of Commissioners and is part of Thurston County Code. Failure to comply may trigger administrative or enforcement action, and result in project delays, fines, civil, or criminal penalties.

1.1 How This Manual is Organized

The manual is organized into five volumes, each addressing a specific aspect of stormwater management in Thurston County:

- **Volume I** introduces the entire *Drainage Design and Erosion Control Manual*, summarizes minimum requirements, describes submittal requirements, and contains detailed guidance for the selection of Best Management Practices (BMPs) for onsite measures Low Impact Development (LID), water quality treatment, and flow control.
- **Volume II** describes BMPs and submittal requirements for temporary stormwater management (erosion and sediment control) at construction sites.
- **Volume III** explains hydrologic analysis, modeling, BMP sizing techniques and requirements for conveyance design. Volume III also provides guidance on field and analytical methods to determine infiltration rates and site suitability criteria, to ensure that infiltration facilities are sited in a manner that protects groundwater.
- **Volume IV** describes source control BMPs, used to minimize pollution generated by pollution sources on developed sites.
- **Volume V** describes and provides detailed design guidance for BMPs to control stormwater flows and treat runoff that contains sediment or other pollutants from developed sites.

1.2 Volume I Overview

Chapters in this volume will determine the applicable requirements for your project, your submittal requirements, and provide guidance on selection of BMPs. It will also direct you to other volumes of the manual for topics relevant to specific hydrologic design methods and infiltration

testing (Volume III), BMP design guidance (Volumes IV and V), and construction practices (Volume II).

- *Chapter 1: Introduction* describes the manual and where it applies, gives an overview of the stormwater management process, and lists related plans, permits, and manuals.
- *Chapter 2: Minimum Requirements for New Development and Redevelopment* describes minimum requirements for stormwater management for all new development and redevelopment projects. There are twelve minimum requirements, and their applicability to a project varies depending on the type and size of the proposed project.
- *Chapter 3: Stormwater Submittal Requirements* describes the submittal process required to meet Thurston County requirements. Submittal requirements vary depending on the project size and type and which minimum requirements apply to the project.
- *Chapter 4: Stormwater BMP Selection Process* explains how to select BMPs for long-term management of stormwater flows and quality. BMP selection for construction stormwater management and source control of pollution are not included in Volume I but can be found in Volume II and Volume IV respectively.

1.3 Related Plans, Permits, and Manuals

1.3.1 Phase II NPDES and State Waste Discharge Stormwater Permits for Municipalities

Depending on population, some cities, counties, and other agencies are subject to permitting under the U.S. Environmental Protection Agency (EPA) Phase II Stormwater Regulations (40 CFR Part 122). In western Washington, the Washington State Department of Ecology (“Ecology”) has issued joint National Pollutant Discharge Elimination System (NPDES) and state waste discharge permits to regulate stormwater discharges from municipal separate storm sewer systems (MS4) operated by small cities and counties, including the urban parts of Thurston County.

The Phase II NPDES Municipal Stormwater Permit was issued on January 17, 2007, and modified on June 9, 2009. It is available on Ecology’s website:

<http://www.ecy.wa.gov/programs/wq/stormwater/municipal/PermitsPermittees.html>.

Only those areas of unincorporated Thurston County that have population densities meeting the criteria of the NPDES Phase II program are covered by the permit. This is principally the area surrounding the incorporated

cities of Lacey, Olympia, and Tumwater and includes portions of areas designated as urban growth areas as well as areas outside of the urban growth areas. The applicant should check with Thurston County to determine the current NPDES permit boundary if this information is necessary for the project.

1.3.2 NPDES and State Waste Discharge Baseline General Permit for Stormwater Discharges Associated With Industrial Activities (Industrial Stormwater Permit)

Businesses subject to the *Baseline General Permit for Stormwater Discharges Associated with Industrial Activities* must prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the terms of that permit. The current permit was reissued on October 15, 2008, became effective on November 15, 2008, and expired April 30, 2009. A new permit is currently being developed by Ecology. See the following website for more information: <http://www.ecy.wa.gov/programs/wq/stormwater/industrial/index.html>.

1.3.3 WSDOT Highway Runoff Manual (HRM)

The HRM addresses stormwater runoff issues for typical WSDOT roadway construction and maintenance activities. It has been granted equivalent status by Ecology and can, therefore, be adopted by other jurisdictions. It was last updated in 2008 and can be found at the following website: <http://www.wsdot.wa.gov/Environment/WaterQuality/Runoff/HighwayRunoffManual.htm>.

1.3.4 2005 Low Impact Development Technical Guidance Manual for Puget Sound (LID Manual)

The LID Manual is published by the Puget Sound Partnership and provides current guidance on LID techniques and design procedures in Washington State. The Ecology Manual recognizes the LID Manual and references it in its *Stormwater Management Manual for Western Washington*. The LID Manual is currently being updated and can be found at the following website: <http://www.psp.wa.gov/documents.php>.

1.3.5 The Puget Sound Conservation and Recovery Plan

The *Puget Sound Conservation and Recovery Plan (PSCR)* directs every city and county in the Puget Sound Basin to develop and implement a comprehensive stormwater management program. It also emphasizes the use of Low Impact Development measures. (The PSCR has replaced the Puget Sound Water Quality Management Plan.) Publication of this *Drainage Design and Erosion Control Manual* partially fulfills that

requirement for Thurston County. For more information, see the Puget Sound Partnership website at: <<http://www.psp.wa.gov/>>.

1.3.6 Other State and Federal Permits

Your project may require additional permits, depending on location and type of development. These permits may include one or more of the following, which are described in detail in the Ecology *Stormwater Management Manual for Western Washington*:

- **Construction Stormwater Permit** (i.e., NPDES and State Waste Discharge General Permit for Stormwater Discharges Associated with Construction Activity): For construction sites with one or more acres of disturbed area with the potential to discharge stormwater to surface waters.
- **Endangered Species Act (ESA)**: Potentially restricts construction and development activities that affect ESA-listed species or their habitat.
- **Section 401 Water Quality Certifications**: Certification required for projects that require a fill or dredge permit under Section 404 of the Clean Water Act.
- **Hydraulic Project Approvals**: Permit issued by Washington State Department of Fish and Wildlife (WDFW), required when project-related stormwater discharges would change the natural flow or bed of state waters or work is required below the ordinary high water level of a lake or stream.
- **Aquatic Lands Use Authorizations**: The Washington State Department of Natural Resources (WDNR), as the steward of public aquatic lands, may require a stormwater outfall to have a valid use authorization and to avoid or mitigate resource impacts.
- **Underground injection control program**: An Ecology program (WAC 173-218) which may require registration or restrictions for certain infiltration systems (see Volume V for more information).

1.3.7 Local Government Permits

Your project will require some form of permit or land use review/acceptance from Thurston County depending on the location and type of project/development. Many of these permits also require a drainage review in accordance with the manual. These permits can include the following:

- Building Permit

- Construction Permit (Excavation, Grading, Clearing & Erosion Control)
- Short Plat Subdivision
- Large Lot Subdivision
- Long Subdivision
- Class IV Forest Practices Permit
- SEPA Approval
- Critical Areas Review
- Road Encroachment Permit
- Site Plan Review
- Binding Site Plan
- Design Review
- Contact Thurston County Permit Assistance Center for help in determining the permits that apply to your project:
<www.co.thurston.wa.us/permitting>.

1.3.8 Requirements Identified through Watershed and Basin Planning or Total Maximum Daily Loads (TMDLs)

Many requirements in this manual can be superseded by adopting ordinances and rules to implement watershed or basin plan recommendations. In accordance with the Watershed Management Act (Chapter 90.82 RCW) or the basin planning option (Chapter 400-12 WAC), Thurston County has initiated its own basin planning processes to identify alternative requirements for sensitive watersheds.

Basin plans are thorough investigations of water problems and potential solutions for a specific drainage basin. The term "drainage basin" refers to all the land that drains to a common body of water. Basin plans address issues such as flooding, poor water quality, erosion, and the degradation of aquatic habitat. They involve gathering data about the topography of the land and the way water moves through the soil, and also assesses how drainage projects and other activities in one area of a watershed might affect other areas.

Basin plans are reviewed and approved by the elected officials of each participating agency. Basin plans in Thurston County are usually written

jointly by the County and cities. The plan itself does not fund or authorize projects; however, Thurston County commissioners refer to the basin plans when deciding which stormwater construction projects to finance.

Information on Thurston County's basin planning process, including links to current County basin plans, can be found at the following website: http://www.co.thurston.wa.us/stormwater/Basin%20Plans/Basin_Plans_home.htm.

1.4 Definitions—Generally

For the purposes of interpreting this Manual, unless it is plainly evident from the context that a different meaning is intended, certain words and terms are defined in this section as follows:

- The words "shall," "will," and "must" are always mandatory, while the word "should" is situation-specific and not mandatory, and "may" is situation-specific and permissive. For any project, the Administrator or designee is authorized to determine if situation-specific requirements are applicable.
- Words in the present tense include the future, the singular includes the plural and the plural includes the singular.
- The word "and" indicates that all connected items or provisions apply.
- The word "or" indicates that the connected items or provisions may apply singularly or in any combination.
- The term "either or" indicates that the connected items or provisions shall apply singularly but not in combination.
- Where terms are not specifically defined (see Glossary in Appendix I-A) in this Manual, the following sources, in order of their use, shall be referred to for a definition of the term:
 - Washington State Department of Ecology Stormwater Management Manual for Western Washington (2005)
 - Thurston County Code
 - Other Ecology Approved Equivalent Stormwater Manuals for jurisdictions located in Western Washington
 - Current industry standard text books, guidance documents, or reports

- If not defined in the above sources then words shall have their ordinary accepted meanings within the context with which they are used. Webster's Third New International Dictionary of the English Language, Unabridged, 1986 Edition, shall be considered in determining ordinarily accepted meanings.

Illustrations found in this Manual are not intended to supersede or replace written definitions, restrictions, or standards.

Chapter 2 - Minimum Requirements for New Development and Redevelopment

2.1 Overview

This chapter describes minimum requirements for stormwater management applicable to new development and redevelopment sites, and provides guidance on how to apply those requirements. The first section provides a list of projects which are exempt from the minimum requirements. If you are unsure whether your project is exempt or not, check with the Drainage Manual Administrator. The next section identifies which minimum requirements apply to your project, and the final section describes each of the minimum requirements in more detail.

After determining that your project is not exempt from the minimum requirements, you can use this chapter to determine the minimum requirements that apply to your project. At that point, you will need to know the following for your overall project and for each threshold discharge area within the project:

- Area of existing and new impervious surface
- Area of replaced impervious surface
- Area of pervious surface converted to impervious (i.e., landscape converted to pavement)
- Total disturbed area (logged, cleared, graded or otherwise disturbed as part of the project)
- Area converted from native vegetation to landscape or impervious
- Area converted from native vegetation to pasture.

The glossary defines each of the terms used above and should be referred to in calculating the applicable areas.

2.1.1 Roadway Frontage Improvements

If your property abuts a public roadway, roadway frontage improvements are typically required for all improvement and development projects. This can include roadway widening, right-of-way dedication, and/or upgrade to urban features. The abutting property is responsible for the management of stormwater drainage from the public right-of-way. This may include construction of treatment and flow control facilities or allowance for dispersion areas in accordance with this manual.

Any land disturbing activity or addition of impervious surfaces associated with frontage improvements shall be included in the area calculations for determining the Minimum Requirements. Plans and reports prepared in accordance with this manual shall include management of runoff from the roadway frontage abutting the project site. See the Thurston County Road Standards for more information on frontage improvements and road drainage requirements.

2.1.2 Cumulative Impact Mitigation Requirement

The determination of thresholds for a project site shall be based on the total increase or replacement of impervious surfaces, conversion of native vegetation to landscape area or pasture that have occurred within the previous 5 years. The County will consider the cumulative impacts of all permits issued within the previous 5 years from the date of project submittal by the applicant.

The purpose of this Cumulative Impact Mitigation Requirement is to adequately mitigate the stormwater from improvements on a project site that are submitted under separate permits. The separate submittals could have project areas that do not meet thresholds, but would meet the thresholds if the projects were combined as one project.

2.2 Exemptions

The following projects are exempt from the minimum requirements:

2.2.1 Forest Practices

Forest practices regulated under Title 222 WAC, except for Class IV General Forest practices that are conversions from timber land to other uses, are exempt from the minimum requirements.

2.2.2 Commercial Agriculture

Commercial agriculture practices are generally exempt. However, conversion from timberland to agriculture and construction of impervious surfaces are NOT generally exempt.

2.2.3 Oil and Gas Field Activities or Operations

Construction of the following is exempt:

- Drilling sites
- Waste management pits
- Access roads

- Transportation and treatment infrastructure (e.g., pipelines, natural gas treatment plants)
- Natural gas pipeline compressor stations
- Crude oil pumping stations.

Operators are encouraged to use BMPs to minimize erosion and control sediment during and after construction to protect surface water quality during storm events.

2.2.4 Road and Parking Lot Practices

The following road and parking lot maintenance practices are exempt but should use appropriate BMPs to minimize erosion and sediment transport:

- Pothole and square cut patching
- Road projects completely within the right-of-way which do not add impervious surface, such as overlaying existing asphalt or concrete pavement without expanding the area of coverage
- Shoulder grading
- Reshaping or regrading drainage systems to restore as-built conditions.
- Crack sealing or resurfacing with in-kind material without expanding the road prism
- Vegetation maintenance

The following road or parking lot maintenance practices are considered redevelopment, and therefore are not categorically exempt:

- **Removing and replacing a paved surface to base course or lower, or repairing the roadway base.** If impervious surfaces are not expanded, Minimum Requirements #1 through #5 apply. Where appropriate, for privately maintained roads, project proponents are encouraged to use permeable and porous pavements.
- **Extending the pavement edge without increasing the size of the road prism, or paving graveled shoulders.** These are considered new impervious surfaces and are subject to the minimum requirements that apply when the redevelopment project reaches identified thresholds.

- **Resurfacing by upgrading from dirt to gravel, asphalt, or concrete; upgrading from gravel to asphalt, or concrete; or upgrading from a bituminous surface treatment (“chip seal”) to asphalt or concrete.** These are considered new impervious surfaces and are subject to the minimum requirements that apply when the redevelopment project meets or exceeds identified thresholds.

2.2.5 Underground Utility Projects

Underground utility projects that are linear in nature and replace the ground surface with in-kind material or materials with similar runoff characteristics are only subject to Minimum Requirement #2, Construction Stormwater Pollution Prevention.

All other development is subject to one or more of the Minimum Requirements.

2.2.6 Public Drainage Facilities

Drainage facilities conceived, designed, or constructed by or through an agent of the County shall be exempted from the submittal and permitting requirements of this Manual. The County shall meet the intent and specific requirements of this Manual on all projects relative to drainage or incorporating drainage components and shall maintain records adequate to reflect such compliance. These records shall be available upon request per the State Public Disclosure of Information Act, RCW 42.17.

The County shall incorporate the provisions of this Manual into the design calculations, drawings, and specifications of all projects released for public bid. These provisions shall also apply to projects constructed by County staff.

This exclusion from submittal and permitting requirements only applies to this Manual and does not relax any requirements of other applicable ordinances, regulations, or legislation except that superseded by this Manual.

2.3 Applying Minimum Requirements

If your project is not exempt, you must determine which Minimum Requirements apply to it. Use the flowcharts in [Figures 2.1 and 2.2](#) to help determine which minimum requirements apply to your project.

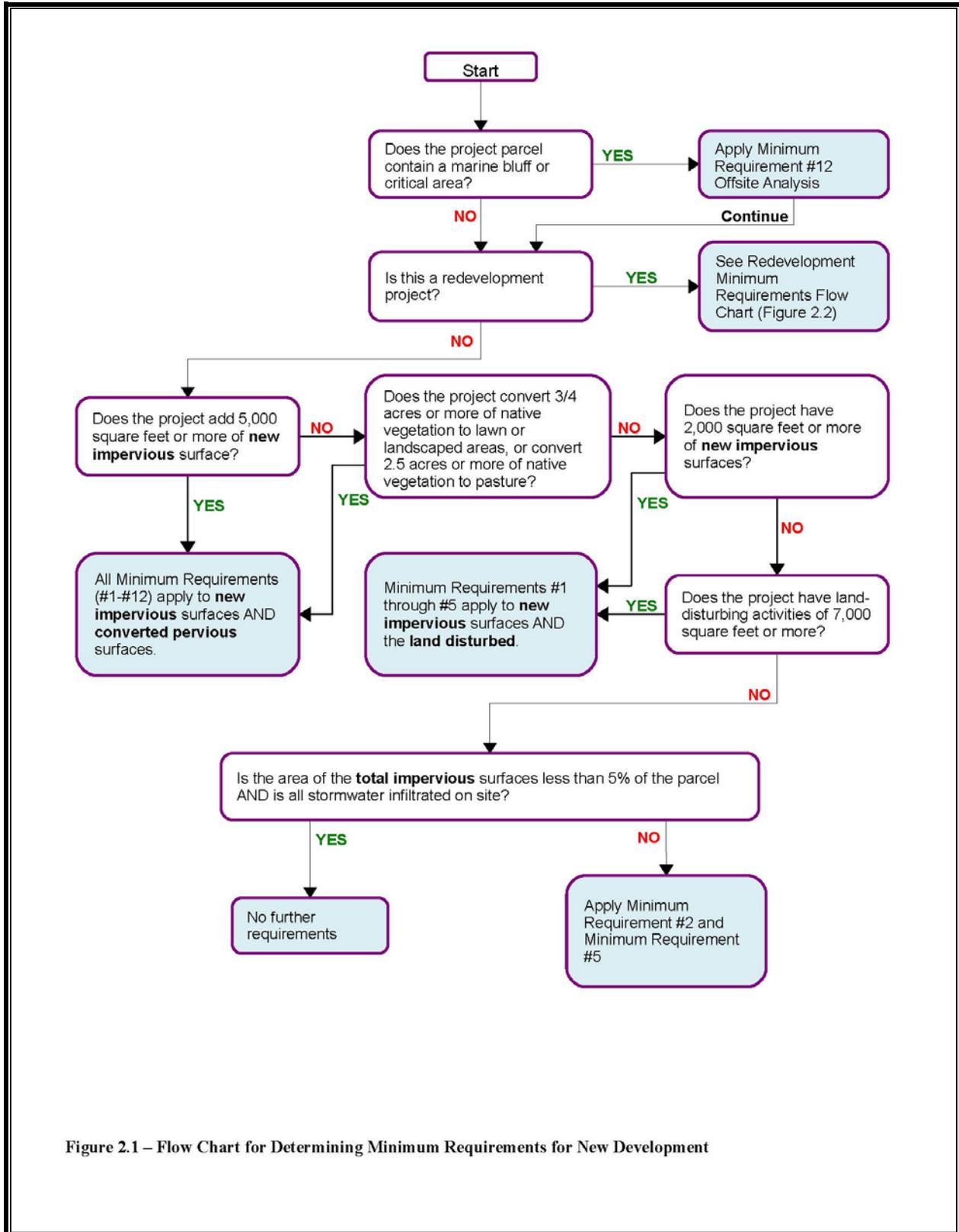


Figure 2.1 – Flow Chart for Determining Minimum Requirements for New Development

Figure 2.1. Flow Chart for Determining Requirements for New Development.

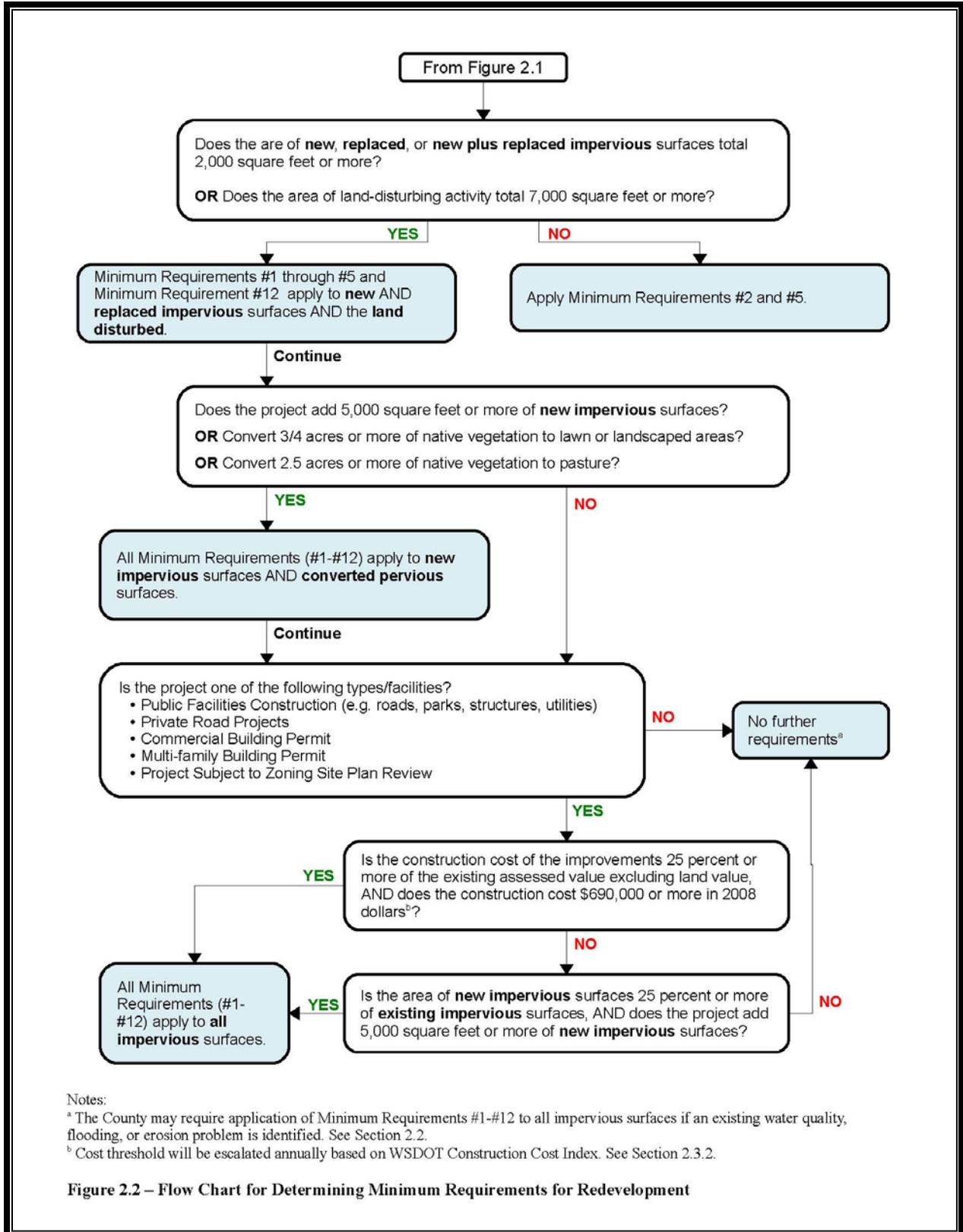


Figure 2.2. Flow Chart for Determining Requirements for Redevelopment.

Depending on the project size, site, and location, different requirements may apply. Not all minimum requirements apply to every project. The minimum requirements are:

1. Stormwater site planning
2. Construction stormwater pollution prevention
3. Source control of pollution
4. Preservation of natural drainage systems and outfalls
5. Onsite stormwater management
6. Runoff treatment
7. Flow control
8. Wetlands protection
9. Basin and watershed planning
10. Operation and maintenance
11. Financial liability
12. Offsite analysis and mitigation.

Not all minimum requirements apply to every project. This section describes thresholds that determine which minimum requirements apply. Minimum requirements are described in Section 2.4.

2.3.1 New Development

Figure 2.1 illustrates the process for determining the applicable minimum requirements for new development. In calculating project areas to determine thresholds, any required public roadway frontage improvements shall be included in the total for determining the thresholds.

All new development shall comply with Minimum Requirement #2, Construction Stormwater Pollution Prevention Plan, except if the total of all impervious surfaces (including existing) is less than 5 percent of the parcel AND all stormwater is infiltrated on site.

New development that does either of the following shall comply with Minimum Requirements #1 through #5 and Minimum Requirement #12 (offsite analysis and mitigation) for new and replaced impervious surfaces and the land disturbed:

- Creates or adds 2,000 square feet or greater of new, replaced, or new plus replaced impervious surface area
- Has land-disturbing activity of 7,000 square feet or greater.

New development that does any of the following shall comply with Minimum Requirements #1 through #12 for new impervious surfaces and the converted pervious surfaces:

- Creates or adds 5,000 square feet or more of new impervious surface area
- Converts 3/4 of an acre or more of native vegetation to lawn or landscaped areas
- Converts 2.5 acres or more of native vegetation to pasture.

2.3.2 Redevelopment

Figure 2.2 illustrates the process for determining the applicable minimum requirements for redevelopment.

All redevelopment shall comply with Minimum Requirement #2. All redevelopment that exceeds impervious area or land disturbance thresholds shall comply with additional minimum requirements, as follows:

- Redevelopment that does the following shall comply with Minimum Requirements #1 through #5 and #12 for the new and replaced impervious surfaces and the land disturbed:
 - The new, replaced, or total of *new plus replaced* impervious surfaces is 2,000 square feet or more, or
 - 7,000 square feet or more of land disturbing activities.
- Redevelopment that does any of the following shall comply with Minimum Requirements #1 through #12 for the new impervious surfaces and converted pervious areas:
 - Adds 5,000 square feet or more of new impervious surfaces
 - Converts 3/4 of an acre or more of native vegetation to lawn or landscaped areas
 - Converts 2.5 acres or more of native vegetation to pasture.

If runoff from new impervious surfaces and converted pervious surfaces is not separated from other surface runoff on the project site, stormwater treatment facilities must be sized for the entire flow directed to them. The Thurston County Drainage Manual Administrator may allow the minimum requirements to be met for an equivalent area within the same site and the same threshold discharge area. For roadway projects, the equivalent area does not have to be within the project limits, but must drain to the same receiving water. (For public roadway projects, use the most recent version of WSDOT's Highway Runoff Manual, for redevelopment guidance.)

Additional Requirements for Redevelopment Project Sites

In addition to the redevelopment requirements above, for any redevelopment project a complete retrofit (application of Minimum Requirements #1 through #12 to all impervious and pollution generation pervious surfaces) will be required if any of the following conditions apply:

- The proposed project will result in the addition of new impervious surface totaling 25 percent or more of existing impervious surface, providing that the area of the new impervious surface is at least 5000 square feet.
- The construction cost of proposed improvements is 25 percent or more of the assessed value excluding land value, providing that the construction cost of the addition or remodel is at least \$690,000 in 2008 dollars (see note below).
- The County determines that an existing water quality, flooding, or erosion problem can be attributed to the developed site. The County shall base this determination on:
 - Results of basin planning for the basin where the project is located
 - Historic water quality data
 - Historic flooding, erosion, or habitat degradation in receiving waters.

Based on the information submitted to the County, the above determination of whether a complete retrofit will be required will be communicated to the applicant as early in the submittal process as feasible. If adequate information is presented, this could be at the time of the pre-submittal meeting, in the acceptance of the stormwater scoping report, or during preliminary review of the application.

NOTE: The \$690,000 threshold figure is based on 2008 construction costs. The applicant shall calculate the current applicable figure based on using the current Washington State Department of Transportation (WSDOT) Construction Cost Index (CCI). The WSDOT CCI was 254 in 2008, and is updated annually. The calculation shall use the following formula:

$$Cost_{current} = Cost_{2008} \left(\frac{CCI_{current}}{CCI_{2008}} \right)$$

For road-related projects, runoff from all impervious surfaces (including existing, replaced and new pavement, shoulders, curbs, and sidewalks) shall meet all the Minimum Requirements if any of the following are met:

- The new impervious surfaces total 5,000 square feet or more and total 25 percent or more of the existing impervious surfaces within the project limits, or
- If the road project results in previously dispersed flows becoming concentrated (for example, because curb and gutter are to be installed), or
- The new impervious surfaces total 5, 000 square feet AND the estimated cost of the road project, excluding engineering, contingency, right-of-way acquisition and stormwater storage/treatment costs exceed \$690,000 based on a 2008 Construction Cost Index (see adjustment method above).

The project limits for a roadway project shall be defined by the length of the project and the width of the right-of-way.

Financial Cap on Stormwater Mitigation

The total cost of stormwater improvements to mitigate existing impervious surfaces and pollution generating pervious surfaces shall be capped at a minimum expenditure of 30% of the total project costs excluding the cost of stormwater mitigation for existing surfaces.

For example, if the total project cost excluding stormwater mitigation costs is \$1.0 million, and the cost to fully mitigate the existing impervious and pollution generating impervious areas is \$500,000, then the applicant shall expend at least \$300,000 toward mitigating existing impervious & pollution generating pervious making the total project cost including stormwater mitigation at least \$1.3 million. The applicant shall consult with Thurston County regarding priorities for mitigation if the financial cap is in effect. The proposed stormwater mitigation improvements and cost data for stormwater mitigation and the total project cost shall be

submitted with the scoping report and included in the Drainage Report for the project.

2.3.3 Basin Planning

Thurston County basin plans may have additional requirements for projects located within the basin. If your project is located within a basin subject to an adopted basin plan additional runoff treatment (minimum requirement #6), flow control (minimum requirement #7), or wetlands protection (minimum requirement #8) restrictions may apply. See Minimum Requirement #9 for more information.

2.4 Minimum Requirements

This section describes minimum requirements for stormwater management. See Section 2.3 of this Volume to determine which requirements apply. Volumes II through V of this manual describe BMPs and sizing criteria for use in meeting minimum requirements.

2.4.1 About Threshold Discharge Areas

Minimum Requirements #6 and #7 refer to *threshold discharge areas*. A threshold discharge area is an onsite area draining to one or more natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath). For a detailed description and example of mapping threshold discharge areas, see Section 4-2.5 of the *Highway Runoff Manual* (WSDOT 2008).

2.4.2 Minimum Requirement #1: Stormwater Site Planning

The main stormwater planning components of Minimum Requirement #1 are: (1) Construction Stormwater Pollution Prevention Planning, and (2) Permanent Stormwater Control Planning. Numerous documents are used to fulfill the objective of this requirement depending on the nature and location of the project.

The following types of submittals, as applicable to the project, when prepared as described in Chapter 3, will satisfy Minimum Requirement #1:

- Abbreviated Drainage Plan
- Engineered Abbreviated Drainage Plan
- Short Form Construction Stormwater Pollution Prevention Plan
- Drainage and Erosion Control Plan (includes a drainage report, drawings and specifications and a maintenance plan)

- Construction Stormwater Pollution Prevention Plan (includes temporary erosion and sediment control drawings and a narrative).

All non-exempt projects are required to prepare one or more of the above submittals for County review. Projects that require public roadway frontage improvements will be required to demonstrate how the roadway runoff is accommodated.

The County may require a project to prepare a “scoping report” and the applicant or County may request a “scoping meeting” early in the project to discuss the development site’s conceptual stormwater approach. This process may also be used to identify potential problems and to outline submittal requirements, scope, and content.

2.4.3 Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan (SWPPP)

Projects in which the new, replaced, or new plus replaced impervious surfaces total 2,000 square feet or more, or disturb 7,000 square feet or more of land must prepare a Construction SWPPP (narrative and drawings) as part of the Drainage and Erosion Control Plan (see Section 2.4.1).

Each of the 12 elements must be considered and included in the Construction SWPPP, unless site conditions make an element unnecessary and exemption from that element is clearly justified in the SWPPP narrative.

Projects that add or replace less than 2,000 square feet of impervious surface or disturb less than 7,000 square feet of land are not required to prepare a Construction SWPPP, but must consider all of the 12 elements of a Construction SWPPP listed below, and develop controls for all elements that pertain to the project site. This can be demonstrated through the submittals required of all non-exempt projects as outlined in Chapter 3 (for example, an abbreviated or engineered abbreviated drainage plan).

These elements address general water quality protection strategies for limiting site impacts, preventing erosion and sedimentation, and managing activities and pollutant sources during construction.

The elements of a Construction SWPPP are:

1. Mark clearing limits/preserve vegetation
2. Establish construction access
3. Control flow rates

4. Install sediment controls
5. Stabilize soils
6. Protect slopes
7. Protect drain inlets
8. Stabilize channels and outlets
9. Control pollutants
10. Control dewatering
11. Maintain BMPs
12. Manage the project.

The SWPPP shall include a narrative and drawings, as described in Volume II. Volume II also has a template for a Short Form Construction SWPPP for projects that are eligible (see Chapter 3).

If the project is required to obtain coverage under Ecology's NPDES Stormwater Construction permit program for project sites greater than 1-acre the applicant shall provide a copy of the Notice of Intent and the SWPPP prepared for the NPDES Construction stormwater permit to Thurston County.

From October 1 through April 30, clearing, grading, and other soil disturbing activities will not be allowed unless it can be demonstrated that silt-laden runoff will be prevented from leaving the site through:

- Favorable site conditions such as vegetative coverage, no severe slopes, erosion-resistant soil types, and distance from receiving waters
- Limited activities and extent of disturbed areas
- Proposed erosion and sediment control measures.

The County may expand or restrict the seasonal limitation on site disturbance based on site inspections, local weather conditions, or other information. If, during the course of any construction activity or soil disturbance during the seasonal limitation period, silt-laden runoff leaving the construction site causes a violation of the surface water quality standard or if clearing and grading limits or erosion and sediment control measures shown in the approved plan are not maintained, the County may

take enforcement action, including but not limited to a notice of violation, administrative order, fine/penalty, stop-work order, or correction notice.

Activities and conditions exempt from seasonal controls are:

- Routine maintenance and repair of erosion and sediment control BMPs
- Routine public facility maintenance that doesn't expose bare soil
- Areas where there is 100 percent infiltration of stormwater within erosion and sediment control (ESC) facilities.

2.4.4 Minimum Requirement #3: Source Control of Pollution

All known, available and reasonable source control BMPs shall be applied to all projects. Source control BMPs shall be selected, designed, and maintained according to Volume IV, Chapter 3, of this manual.

Source control BMPs are used to prevent stormwater from contacting pollutants. They are a cost-effective means of reducing pollutants in stormwater and should be considered first in all projects, before applying treatment measures. Source control BMPs include operational and structural source control BMPs. See Volume IV for design details and the selection of source control BMPs. For construction sites, see Volume II.

Minimum Requirement #3 applies to all non-exempt projects that meet the thresholds described in Chapter 2. Source control of pollutants (sediment/erosion control and spill prevention) during construction applies to all projects per Minimum Requirement #2.

Depending on the project location, there may be an adopted basin plan (Minimum Requirement #9) or a TMDL plan (also known as a Water Cleanup Plan) with more stringent source control requirements for a specific basin. See Minimum Requirement #9 for more information.

Structural source control BMPs shall be shown on project drawings, and the design shall be documented in the Drainage Report. Any required maintenance or operations required for a structural source control BMP shall be included in the Maintenance Plan.

Operational source control BMPs shall be included in the Maintenance Plan for the project; or, if a Maintenance Plan is not required, the operational source control BMPs shall be included with other submittals and upon acceptance by the County shall be recorded with the County auditor for the subject property.

2.4.5 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable.

Minimum Requirement #4 applies to all non-exempt projects that meet the thresholds described in Chapter 2, to the maximum extent practicable.

Preserving natural drainage systems provides multiple stormwater benefits and minimizes erosion and sediment problems. Runoff discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties.

When downstream drainage courses are inadequate, systems are undersized, or when (in the opinion of the Administrator or designee) property may be adversely affected by existing or proposed stormwater release rates, additional stormwater flow control measures may be required. Such determination by the Administrator or designee may be based upon information submitted by the applicant, existing information indicating problem areas, information received from or statements from property owners or residents near the project site, or current or past drainage problem litigation near the project. Additional information, calculations, or studies may be required of the applicant to assist the Administrator in making this determination.

If downstream conveyance system capacity is determined to be inadequate or undersized based on an evaluation of the entire contributing area at full build-out based on the current zoning, the applicant has the following options:

- Provide additional flow control, LID, or infiltration measures as required by the County to reduce stormwater discharge rates and/or volumes to pre-development conditions, or
- Correct or improve downstream drainage conditions so that the capacity is adequate to convey drainage from all contributing properties, or
- At such time as the County establishes a program for payment in lieu of improvements, the applicant may contribute to a dedicated fund to provide the downstream improvements required per the provisions of the program.

Any offsite improvements proposed by the applicant will require the applicant to obtain easements from the owners of any property where work occurs.

If flows for a given outfall are not channeled in the pre-development condition, runoff concentrated by the proposed project must be discharged overland through a dispersal system or to surface water through an energy dissipation BMP before leaving the project outfall. Typical dispersal systems include rock pads, dispersal trenches, level spreaders, and diffuser pipes. Typical energy dissipaters include rock pads and drop structures. These systems are better described in Volume III, "Conveyance."

In some instances, a diversion of flow from the existing (pre-development) discharge location may be beneficial to the downstream properties or receiving water bodies. Examples include situations where existing downstream flooding or channel erosion is occurring. If it is determined that a flow diversion may be warranted, the applicant should consult with Thurston County to confirm this conclusion and its application for the project.

As part of the project submittals, the applicant shall identify the location of natural drainage, topography, historic drainage information and any potential impacts. The discharge of stormwater from the project to adjacent properties may be subject to additional requirements (see Volume III, Conveyance).

2.4.6 Minimum Requirement #5: Onsite Stormwater Management

Projects shall employ onsite stormwater management BMPs to infiltrate, disperse, and retain stormwater runoff onsite to the maximum extent feasible.
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Minimum Requirement #5 applies to all projects that meet the thresholds described in Chapter 2. All projects, including those not meeting the thresholds of Chapter 2, should use onsite measures to the maximum extent practicable for the control of stormwater.

All projects required to comply with Minimum Requirement #5 shall employ all of the following Low Impact Development BMPs as applicable:

- Restore native vegetation (BMP LID.01)
- Post-Construction Soil Quality and Depth (BMP LID.02) – All disturbed areas of the project to be landscaped shall implement BMP LID.02 to restore soil quality and depth

- Downspout infiltration systems (BMP LID.04)
- Dispersion of roof and driveway runoff (BMP LID.05; LID.06; LID.07)
- Bioretention (BMP LID.08).

Where roof downspout controls are planned, the following three types shall be considered in descending order of preference:

- Downspout infiltration systems including bioretention (rain gardens)
- Downspout dispersion systems, only if infiltration is not feasible
- Collect and convey to the County or private stormwater system if other alternatives are not feasible.

The use of Low Impact Development BMPs is more effective in reducing disruptions to the site's natural hydrologic characteristics and preferable to more traditional BMPs such as detention ponds. In some cases, the application of onsite measures can reduce the effective impervious surface and/or effective pollution generating impervious surface within a threshold discharge area to the extent that additional flow control or water quality treatment (Minimum Requirements #6 and #7) is not required. An applicant may also consider using full dispersion where the impervious surface, landscape areas, and native vegetation retention as a percentage of the site meets certain thresholds (see BMP LID.11).

Chapter 4 provides guidance on BMP selection, including onsite stormwater management BMPs required by this minimum requirement. Design guidelines and sizing tables for the BMPs listed above are provided in Volume V.

Onsite measures and Low Impact Development BMPs shall be shown on the project drawings and design calculations shall be included in the Drainage Report. Maintenance and operations requirements for these BMPs shall be included in the Maintenance Plan for the project. For projects in which a Maintenance Plan is not required, the operations and maintenance criteria for onsite measures shall be shown on and described in the other submittal documents required for the project.

2.4.7 Minimum Requirement #6: Runoff Treatment

Projects must provide runoff treatment to reduce the water quality impacts of stormwater runoff from pollution-generating surfaces.

Minimum Requirement #6 applies to all non-exempt projects that meet the thresholds described in Chapter 2. Stormwater treatment facilities shall be constructed if the following criteria are met within a threshold discharge area (see Table 2.1):

- Total effective pollution-generating impervious surface (PGIS) is 5,000 square feet or more in a threshold discharge area, or
- Total pollution-generating pervious surfaces (PGPS) are 3/4 of an acre or more in a threshold discharge area, and from which there is a surface water discharge to a natural or man-made conveyance system from the site.

Table 2.1. Treatment Requirements by Threshold Discharge Area

	<3/4 Acres of PGPS	≥3/4 Acres PGPS	<5,000 sf PGIS	≥5,000 sf PGIS
Treatment Facilities		✓		✓
Onsite Stormwater BMPs	✓	✓	✓	✓

PGPS = pollution-generating pervious surfaces
 PGIS = pollution-generating impervious surfaces
 sf = square feet

The above thresholds apply to both a project’s onsite and offsite improvements. Once the project triggers this minimum requirement, all new and replaced pollution generating impervious surfaces are required to receive water quality treatment.

With respect to the water quality treatment requirements, a “net” total of pollution generating impervious surfaces associated with a given project will not be considered when dealing with replaced impervious surfaces or impervious surfaces converted to pervious. For example, construction of new surfaces that do not generate pollution (i.e., replacing old surfaces that were pollution generating) does not balance the environmental impacts of newly created pollution generating surfaces. All new or replaced pollution generating surfaces that meet the thresholds for new development or redevelopment and create, add, and/or replace 5,000 square feet of pollution generating impervious surface shall provide water quality treatment.

If runoff from the total new PGIS and that portion of any replaced PGIS that requires treatment cannot be separated from the existing PGIS runoff, treatment facilities must be sized to treat all of the runoff.

Stormwater treatment facilities shall be selected using the process described in Chapter 4, designed in accordance with the design criteria in

Volume V, and maintained in accordance with the maintenance schedule in Appendix V-C and the requirements of Minimum Requirement #10.

Depending on the activities and likely pollutants at the project site, required BMPs may be basic, enhanced, phosphorus control, or oil control. Chapter 4, BMP Selection explains when each type is required.

- Volume III provides information on the water quality design storm and flow rate for treatment facility sizing.

Water quality treatment facilities shall be shown on the project drawings and include details and construction notes for their proper construction. Design calculations for each BMP shall be included in the Drainage Report along with any supporting documents (geotechnical reports, material specifications, soils testing, etc.). Maintenance and operations requirements for these BMPs shall be included in the Maintenance Plan for the project. If a justification for not providing treatment facilities for a threshold discharge area based on a reduction in effective impervious surfaces due to LID techniques, this justification shall be documented in the Drainage Report for acceptance by Thurston County.

2.4.8 Minimum Requirement #7: Flow Control

Projects must provide flow control to reduce the impacts of stormwater runoff from impervious surfaces and land cover conversions. This includes controlling the discharge and infiltration for a project site such that:

- Stormwater discharges from a threshold discharge area shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow and,
- For groundwater recharge, the average annual infiltration volume of stormwater from the project site after development shall match (or exceed) the pre-developed (forested condition, see below) average annual volume infiltrated
- The predevelopment condition to be matched shall be a forested land cover, unless reasonable historic information is available that indicates the site was prairie prior to settlement (modeled as “pasture” in the Western Washington Hydrology Model).

The above discharge requirement is waived for sites that will reliably infiltrate all runoff from impervious surfaces and converted pervious surfaces.

The requirement to match the average annual infiltration volume may be waived for the portion of a project site that can demonstrate that the average overall infiltration rate of the native soils at that portion of the site in the pre-developed condition have an infiltration rate of less than 0.5 inches per hour.

In calculating the average annual infiltration volume for purposes of meeting the minimum infiltration requirement, the applicant may include infiltration from dispersion areas, landscaped areas, biofiltration and bioretention facilities, drywells, and other infiltration facilities.

The Thurston County version of the Western Washington Hydrologic Model, Version 3, has been modified to include calculation of infiltration and whether the site meets the average annual infiltration criteria.

The following require construction of flow control facilities or use of land use management BMPs that will achieve the standard requirements (see Table 2.2):

- Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area.
- Projects that convert 3/4 of an acre or more of native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a conveyance system (natural or man-made) from the site.
- Projects that, through a combination of effective impervious surfaces and converted pervious surfaces, cause a 0.1 cubic feet per second increase in the 100-year recurrence interval flow frequency from a threshold discharge area, as estimated using the WWHM, MGSFlood, or other approved model.

That portion of any development project where the above thresholds are not exceeded in a threshold discharge area shall apply onsite stormwater management BMPs in accordance with Minimum Requirement #5.

Table 2.2. Flow Control Requirements by Threshold Discharge Area

	Flow Control Facilities	Onsite Stormwater Management BMPs
<3/4 acres conversion to lawn/landscape, or <2.5 acres to pasture		✓
≥3/4 acres conversion to lawn/landscape, or ≥2.5 acres to pasture	✓	✓
<10,000 square feet of effective impervious area		✓
≥10,000 square feet of effective impervious area	✓	✓
≥0.1 cubic feet per second increase in the 100-year flood frequency	✓	✓

If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both this flow control requirement and Minimum Requirement #8 apply.

Projects discharging directly to salt water bodies are exempt from flow control.

The requirements below apply to projects that discharge stormwater directly or indirectly through a conveyance system, into an exempt receiving water including a salt water body:

- The direct discharge must not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types “S”, “F”, or “Np” in the Permanent Water Typing System, or from any Category I, II, or III wetland; and
- Flow splitting devices or drainage BMPs shall be applied to route the natural runoff volumes from the project site to any downstream Type 5 stream or Category IV wetland:
 - Design of flow splitting devices or drainage BMPs will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50 percent of the 2-year to the 50-year peak flow.
 - Flow splitting devices or drainage BMPs that deliver flow to Category IV wetlands will also be designed using continuous simulation hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by Thurston County; and
- The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes,

ditches, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water; and

- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected; and
- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.

For discharges to a conveyance system discharging to salt water see Minimum Requirement #12 for additional requirements. Flow control may be required if the conveyance system capacity is limited.

2.4.9 Minimum Requirement #8: Wetlands Protection

Discharges to wetlands (directly or indirectly through conveyance systems) shall maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses.

Minimum Requirement #8 applies to all non-exempt projects that meet the thresholds of Chapter 2 and where stormwater discharges into a wetland, either directly or indirectly, through a conveyance system.

The thresholds identified in Minimum Requirement #6: Runoff Treatment and Minimum Requirement #7: Flow Control shall also apply for discharges to wetlands. In addition, a hydroperiod analysis must be performed and must show that the discharge will not adversely affect the wetland hydroperiod. The hydrologic analysis shall use the existing land cover condition to determine the existing hydrologic conditions, unless directed otherwise by the County or other regulatory agency.

The hydroperiod is the pattern of fluctuation of water depth and the frequency and duration of water levels on the site. This includes the duration and timing of drying in the summer. A hydrologic assessment is useful to measure or estimate elements of the hydroperiod under existing **preproject** and anticipated **postproject** conditions. This assessment involves reviewing and applying the best available science to assess potential impacts and deciding whether hydrological modeling is warranted. Wetland hydroperiod analysis is of concern when proposing to discharge stormwater into or detract stormwater from a natural wetland (not constructed). The purpose of the analysis is to determine whether the stormwater will change the natural hydroperiod beyond the limits allowed.

When this is an issue on a project, the applicant should retain the services of a wetlands professional to assist in the evaluation of the wetland impacts.

Refer to Ecology's *Stormwater Management Manual for Western Washington*, Appendix D of Volume I, for additional guidance on discharges to wetlands.

A wetland can be considered for hydrologic modification or stormwater treatment only in accordance with Thurston County Critical Areas Ordinance TCC 17.15.900.

Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer, except for:

- Where allowed by Thurston County Critical Areas Code, TCC 17.15.
- As allowed in wetlands approved for hydrologic modification or treatment as approved by Thurston County or other regulatory agency.

An adopted and implemented basin plan (Minimum Requirement #9), or a TMDL may be used to develop requirements for wetlands that are tailored to a specific basin.

2.4.10 Minimum Requirement #9: Basin and Watershed Planning

Projects may be subject to equivalent or more stringent minimum requirements for erosion control, source control, treatment, operations and maintenance (O&M), and alternative requirements for flow control and wetlands hydrologic control as identified in basin/watershed plans or Total Maximum Daily Load (TMDL, also known as a Water Clean-up Plan) implementation plans for specific receiving waters.

Basin Plans

Basin/watershed plans shall evaluate and include, as necessary, retrofitting of urban stormwater BMPs for existing development or redevelopment to achieve watershed pollutant reduction and flow control goals consistent with requirements of the Clean Water Act. Standards developed from basin plans shall not modify any minimum requirement until the basin plan is both formally adopted and implemented by the local governments within the basin, and approved or concurred with by Ecology. Refer to Appendix I-A of Ecology's *Stormwater Management Manual for Western Washington* for examples of how basin planning can alter the minimum requirements.

In order for a basin plan to modify the minimum requirements, the following conditions must be met:

- The plan must be formally adopted by all jurisdictions with responsibilities under the plan
- All ordinances or regulations called for by the plan must be in effect.

As of May 2009, the following basins in Thurston County have adopted basin plans:

- Green Cove Creek Basin (North of Olympia, Cooper Point)
- Salmon Creek Basin (South of Tumwater, Vicinity I-5 and 93rd)
- Chambers/Ward/Hewitt Creek Basin (South of Olympia, Vicinity Yelm Highway & Rich Road)
- Indian/Moxlie Creek Basin (East side of City of Olympia and along South Bay Road)
- McCallister/Eaton Creek Basin (East of Lacey paralleling the Nisqually River)
- Percival Creek Basin (Southwest of Olympia from Black Lake to Capitol Lake)
- Woodland/Woodard Creek Basin (City of Lacey / north, south and east of Lacey).

Information on Thurston County's basin planning process and links to current basin plans may be found on Thurston County's web site:

http://www.co.thurston.wa.us/stormwater/Basin%20Plans/Basin_Plans_home.htm.

2.4.11 Minimum Requirement #10: Operation and Maintenance

<p>A Maintenance Plan that is consistent with the provisions in this manual shall be provided for all proposed stormwater facilities and BMPs, and the party (or parties) responsible for maintenance and operation shall be identified.</p>
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For private facilities, a project-specific agreement to maintain stormwater facilities and implement a pollution source control plan consistent with the provisions in Appendix I-E, for a single family residence, residential

subdivision or commercial/industrial project, shall be executed by the party (or parties) responsible for maintenance of stormwater facilities and BMPs. The agreement shall normally be signed by the property owner and recorded with the Thurston County Auditor's Office prior to final project acceptance by Thurston County. A draft copy of the agreement shall be included with the submittal of the Maintenance Plan for County review and acceptance. The maintenance agreement shall run with the land and be transferred automatically to all subsequent owners. Publicly owned facilities are not required to execute an agreement.

If the project is a subdivision, the Proponent shall form a Property Owners' Association. The document creating the Property Owners' Association shall, at a minimum, make provision for the following:

- Members of the Property Owners' Association shall be responsible for maintenance of storm drainage facilities as described in the Maintenance Plan
- Inclusion by reference of the Maintenance Plan prepared by the Project Engineer in accordance with Chapter 4 of this volume
- Power to assess fees to maintain storm drainage facilities
- Sanctions in the event that Thurston County has to take action to maintain facilities. The following or substantially similar words shall appear in the document creating the Property Owner's Association:

In the event Project Proponent (or successors or the Property Owners' Association), in the judgment of Thurston County, fails to maintain drainage facilities within the plat, or if the Proponent or successors willfully or accidentally reduces the capacity of the drainage system or renders any part of the drainage system unusable, the Proponent or successors agree to the following remedy: After 30 days notice by registered mail to the Proponent or successors, Thurston County may correct the problem or maintain facilities as necessary to restore the full design capacity of the drainage system. Thurston County will bill the Proponent or successors for all costs associated with the engineering and construction of the remedial work. Thurston County may charge interest as allowed by law from the date of completion of construction. Thurston County will place a lien on the property and/or on lots in the Property Owners' Association for payments in arrears. Costs or fees incurred by Thurston County, should legal action be required to collect such payments, shall be borne by the Proponent or successors.

- A Maintenance Covenant stating the Property Owners' Association's specific maintenance responsibilities shall be recorded on the plat and recorded against each lot in the subdivision. The covenant shall include the following or substantially similar language:

MAINTENANCE COVENANT

Easements are hereby granted for the installation, inspection, and maintenance of utilities and drainage facilities as delineated on the plat for subdivision _____ including unrestricted access for Thurston County staff to any and all stormwater system features for the purpose of routine inspections and/or performing maintenance, repair and/or retrofit as may become necessary. No encroachment will be placed within the easements shown on the plat which may damage or interfere with the installation, inspection, and maintenance of utilities. Maintenance and expense thereof of the utilities and drainage facilities shall be the responsibility of the Property Owners' Association as established by covenant recorded under Auditor's file number _____.

Sanctions for Failure to Maintain

Inadequate maintenance is a common cause of failure for stormwater control facilities. Volume V, Appendix C, provides detailed maintenance guidelines and standards for each BMP presented in this manual. The applicable checklists from Volume V shall be included in the Maintenance Plan for the project.

At private facilities, a copy of the Maintenance Plan shall be retained onsite or be reasonably accessible from the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the Maintenance Plan shall be retained in the appropriate department. A log of maintenance activity shall be kept and be available for inspection by the County. An annual report on maintenance activities during the previous year is required to be submitted annually no later than August 31st. Chapter 3 describes Maintenance Plan submittal requirements, which are included as part of the Drainage and Erosion Control Plan for the project.

2.4.12 Minimum Requirement #11: Financial Liability

To ensure compliance with these standards, performance bonding or other appropriate financial instruments shall be required for all projects.

Financial Guarantees

In accordance with Thurston County Code Title 15.05.040, the project proponent/owner shall provide financial guarantees to insure that:

- The project will operate according to the design approved by the project engineer, and
- Operation of erosion control facilities will provide protection against siltation of surface water, erosion, and damage to adjacent properties.

The project proponent/owner shall provide a financial guarantee to the Administrator to ensure satisfactory maintenance of drainage facilities for a minimum of 2 years from final plat acceptance or acceptance of the project, whichever is later, in accordance with the Maintenance Plan submitted as part of the Drainage and Erosion Control Plan. The financial guarantee shall continue in effect until the drainage facilities are fully established, functioning per design and determined not to have substantial maintenance problems, or, if for a residential subdivision project, until no less than 80 percent of the lots have been developed and received certificates of occupancy (build-out). Upon acceptance of the project by Thurston County and after minimum time requirements and other conditions have been met, including minimum build-out for residential subdivisions, the project proponent shall request in writing that the financial guarantee be released. Said request shall document that the requirements for financial guarantee release have been met.

If the stormwater system is dependent on a property owners' association (POA) for maintenance, then the applicant shall present evidence of a POA being established and active before the financial guarantee is released. The holder of the financial guarantee shall establish a mechanism prior to sale of all or part of the project that ensures that the financial agreement holder has the legal right and ability to perform required stormwater system maintenance while the financial guarantee is in effect. Proof of same shall be provided to the Administrator prior to acceptance of the financial guarantee.

The mechanism may include a replacement of the financial guarantee by an identical guarantee from a third party (such as a POA) who takes responsibility for stormwater system maintenance. The original financial guarantee shall not be released until the replacement guarantee is accepted by the Administrator and legally recorded.

The amount of the guarantee shall be 25 percent of the construction cost of the drainage facilities. The applicant shall submit an itemized work sheet for the cost of facilities, acceptable to the Administrator before the

financial guarantee amount is fixed. The bond quantities worksheet provided in Appendix I-D shall be used to prepare the cost estimate.

With County acceptance, and to the extent allowed by law, all project guarantees may be replaced by a single guarantee, provided that the total amount guaranteed shall at no time be less than the sum of the separate guarantees replaced. Furthermore, such guarantees shall clearly delineate those separate guarantees which they are intended to replace.

Subject to County acceptance, financial guarantees may be any of the following:

- Cash deposit escrow account
- Assignment of interest in a bank account
- Irrevocable letter of credit from a financial institution
- A bond.

All financial guarantees shall run continuously until released by the County.

2.4.13 Minimum Requirement #12: Offsite Analysis and Mitigation

Minimum Requirement #12 applies to those projects meeting the thresholds outlined in Chapter 2. The Project Engineer or applicant (for abbreviated plans) shall submit an offsite analysis that assesses the potential offsite impacts of the project's stormwater discharges.

All projects shall perform a *qualitative analysis* downstream from the site to the receiving water even if 100 percent infiltration is proposed. The analysis shall meet the requirements in Chapter 3.

A *quantitative* analysis may be required for any project deemed to need additional downstream information or where the Project Engineer or the Administrator or designee determine that a quantitative analysis is necessary to evaluate the offsite impacts or the capacity of the conveyance system.

This quantitative analysis shall determine conveyance system performance for the appropriate design events (see Volume III), both with and without the proposed development and based on full development of the contributing basin based on land use zoning. The Administrator or designee shall have the discretion to specify the distance and level of detail to be provided by the Project Engineer. The Administrator or designee shall consider factors such as the relative size of the new

development, availability of other hydrologic work for the drainage area, and results of the qualitative analysis in making this determination.

The Administrator or designee may impose stricter discharge, infiltration or detention standards, or require offsite mitigation work to an existing conveyance system if the discharge from the Project is reasonably expected to result in any of the following:

- Flooding
- Loss of aquatic habitat due either to high or low flows
- Property damage
- Water quality problems
- Erosion
- An unacceptable interruption of vital services
- Exceeding the capacity of a downstream conveyance system based on full basin development.

If the Project Engineer (or Administrator or designee) determines that greater treatment, infiltration or storage volumes, lower release rates, or downstream improvements are needed, he or she shall specify project design criteria or other means to relieve the downstream problems, providing that such a solution will not violate minimum standards established in this Drainage Design and Erosion Control Manual. The Administrator or designee shall have the final decision as to the scope and depth of the analysis.

Other means might include increases in downstream flow capacity or offsite detention and infiltration facilities. Plans and financing for these alternatives will be subject to the acceptance of the Administrator or designee.

The Offsite Analysis shall also include how the runoff from any public roadway frontage abutting the property is managed (qualitative at minimum, quantitative if meets above conditions). The project shall incorporate any runoff from public roadway frontage into the drainage system for the project.

2.5 Deeds and Easements

The following deeds and easements shall be used to convey property or rights to Thurston County:

- Statutory warranty deed (individual, partnership, or corporate): conveys real property to Thurston County
- Storm sewer easement: conveys to Thurston County the right to have and maintain a storm sewer system across a specific parcel of property
- Stormwater Maintenance Agreement: delineates responsibilities of party responsible for stormwater system maintenance and grants to Thurston County the right to have access to stormwater facilities for purposes of inspection, maintenance, or repair if the party responsible for maintenance fails to take required actions in accordance with the maintenance agreement.
- Slope and utility easement: conveys the right to have fill material or a cut slope and utilities on private property
- Quitclaim deed: conveys maintained but undocumented right-of-way to Thurston County
- Drainage Easement: conveys to Thurston County the right to access, use, and maintain a specific area of a parcel of property for purposes of storm drainage. This may include stormwater facilities for water quality treatment or flow control, dispersion, conveyance, or other purposes.

Prior to final project acceptance by Thurston County, all easements, dedicated tracts, buffers, or similar features associated with the stormwater facilities of a development, including a subdivision, shall be shown on the face of the plat or project site plan. In addition, written legal documents shall be prepared and recorded against all parcels to which the easement or dedication applies. Easements or tracts providing access to stormwater facilities shall be delineated in the field with permanent markers to prevent encroachment.

2.6 Acceptance of New Stormwater Facilities

The developer of a stormwater facility is responsible for construction and maintenance of the facility, which must be in compliance with this manual.

2.6.1 Public Ownership

The County does not accept maintenance responsibility for private stormwater facilities constructed by private developers.

2.6.2 Private Ownership – Subdivision Projects

If the project is a subdivision or short subdivision, the project proponent/owner shall form a property owners' association. The document creating the association shall provide for the following, at a minimum:

- The Property Owners' Association shall be responsible for maintenance of storm drainage facilities
- Inclusion by reference of the Maintenance Plan prepared by the project engineer in accordance with this manual
- Power to assess fees to maintain storm drainage facilities
- Responsibility for payment of financial sanctions/repayments should the County have to conduct repairs due to hazardous conditions.

The maintenance covenant and statement of sanctions described under Minimum Requirement #10, Section 2.4.11 will be included in the document establishing the Property Owners' Association and shall be recorded with the Thurston County Auditor for the plat and recorded against each lot within the subdivision or short division.

2.6.3 Private Ownership – Other Projects

If the project is other than a subdivision, short subdivision, or large lot division, the applicant will describe the organization or persons that will own and maintain the facility and provide evidence that maintenance activities will be performed and are adequately financed.

2.7 Adjustments

Adjustments to the Minimum Requirements may be granted prior to permit acceptance and construction. The Administrator may grant an adjustment subject to a written finding of fact that documents the following:

- The adjustment provides substantially equivalent environmental protection
- The objectives of safety, function, environmental protection and facility maintenance, based upon sound engineering, are met.

2.8 Exceptions

Exceptions to the Minimum Requirements or the design standards, submittal requirements, or any other standards provided in the Manual may be allowed at the discretion of the Administrator provided that the applicant will substantially meet flow control and water quality goals established by or implicit in these standards. The Administrator may grant an exception subject to a written finding of fact that documents the following:

- There are special physical circumstances or conditions peculiar to the land, such as size, shape, topography, or location, such that the strict application of these provisions would deprive the property owner of rights commonly enjoyed by other properties similarly situated; OR
- The site is being redeveloped and certain site investigations or installed stormwater facilities would require that existing structures be removed or damaged; OR
- The site is being redeveloped and the changes are either very small or configured in such a way that in the Administrator's or designee's opinion some requirements of the manual cannot practically be met; OR
- The project is to be completed within an existing right-of-way which is of inadequate size to install required facilities and which cannot be expanded due to encroaching structures or setbacks;

AND

- That the granting of the exception will not be detrimental to the public health and welfare, nor injurious to other properties in the vicinity and/or downstream, and to the quality of waters of the state; AND
- The exception is the least possible exception that could be granted to comply with the intent of the Manual; AND
- A fee-in-lieu, based on the avoided cost or value of the exception, may be collected by the County subject to specific requirements regarding fee-in-lieu set by Thurston County at such time as a fee-in-lieu program is established.

2.9 Supplemental Guidelines

The adjustment and exception variance provisions are important elements of the plan review and enforcement programs. They are intended to maintain a necessary flexible working relationship between the applicant and the County. The Administrator will consider these requests judiciously, keeping in mind both the need of the applicant to maximize cost-effectiveness and the need to protect offsite properties and resources from damage.

2.10 Interpretations and Appeals

Any person who disagrees with any decision of the Administrator or Thurston County regarding application of this Manual may request an interpretation. The request for an interpretation shall be submitted in writing to the Administrator or designee as defined herein. The Administrator or designee shall respond to that person in a timely manner.

Appeals from an Administrative decision may be taken to the Hearings Examiner by any aggrieved person or by an officer, department, board, or commission of the jurisdiction affected by any order, requirement, permit, decision, or determination made by the Administrator or designee in the administration or enforcement of this manual or any subsequent amendment thereto. The appeals procedure shall be identical to the appeal procedures of the Thurston County zoning code which requires the appeal to be in writing and made within 14 days of the administrative decision being appealed. A fee is required to be paid for an appeal.

2.11 Severability

If any provisions of this Manual or their application to any person or property are amended or held to be invalid, the remainder of the provisions in this Manual in their application to other persons or circumstances shall not be affected.

Chapter 3 - Stormwater Submittal Requirements

3.1 Introduction

Completion of submittals described in this chapter documents compliance with Minimum Requirement #1 (Stormwater Site Planning) and Minimum Requirement #2 (Construction SWPPP), as described in Chapter 2. The following submittals, and their applicability to different types and sizes of projects, are described in this Chapter:

- Abbreviated Drainage Plan
- Engineered Abbreviated Drainage Plan
- Short Form Construction Stormwater Pollution Prevention Plan
- Drainage and Erosion Control Plan (includes a Drainage and Erosion Control Report, drawings and specifications and a Maintenance Plan)
- Construction Stormwater Pollution Prevention Plan (includes temporary erosion and sediment control drawings and a narrative).

All non-exempt projects are required to prepare one or more of the above submittals for County review and acceptance.

The County may require a project to prepare a “scoping report” and the applicant or County may request a “scoping meeting” early in the project to discuss the development site’s conceptual stormwater approach. This process may also be used to identify potential problems and to outline submittal requirements, scope, and content.

This chapter describes the submittal process for drainage review of projects submitted to Thurston County for permits. However, the site characterization and stormwater planning process should begin before submittal preparation.

3.1.1 Site Characterization

Site planning and design are integrated with stormwater management requirements. The manner in which a site is developed will impact the extent and cost of stormwater treatment and flow control. This section provides techniques that should be implemented to reduce both the impacts of projects on receiving waters and the overall cost of the stormwater management system.

Take an inventory of the site prior to design activities and identify the following:

Soils Analysis

Use of many of the BMPs described in this Manual requires a detailed understanding of site soils. A preliminary soils analysis of the overall site to identify the locations of different soil types, the layering of soils, existence of hardpan, etc. should be conducted prior to major site planning. The objective of site planning should be to locate new impervious surfaces over soils that are less permeable and locate proposed stormwater facilities over soils that are more permeable to promote infiltration.

A preliminary assessment of infiltration rates of soils throughout the site should be considered early in the process for establishing potential BMP locations. More detailed infiltration evaluation as described in Volume III can occur once preliminary locations of infiltration facilities are established. Establishing an estimated overall site infiltration rate will also determine whether the minimum infiltration volume requirement of Minimum Requirement #7 will apply to the project.

A few strategically located test pits or borings are generally adequate for this preliminary soils assessment.

Critical Areas (e.g., wetlands, streams, or stream buffers)

Sites that have streams, wetlands, high groundwater, steep slopes, geologic hazard areas, well head protection areas or a number of other features are considered critical areas. Many have been assigned buffer zones that restrict activities that can occur within them. These critical areas and associated buffers must be indicated on site plans and methods to protect them must be instituted from the start of development.

Natural Drainage Systems and Outfalls

Minimum Requirement #4 stipulates that natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable (see Chapter 2). By identifying natural drainage patterns at the start of the project, the designer can ensure that drainage routes are protected and that (where possible) the site is designed to minimize the conveyance facilities required to transport stormwater to natural drainage locations. Preserving natural drainage also decreases the likelihood of flooding or other problems downstream.

Significant Trees and Native Vegetation

By designing the site to protect significant trees and native vegetation, the designer will have more opportunities to use LID BMPs such as

infiltration and dispersion for stormwater management. Native vegetation areas suitable for dispersion and where trees can be retained without risk of toppling should be mapped and included in the site plan.

Steep Slopes

Unless preventive measures are taken, stormwater runoff from development will cause additional erosion problems or even landslides on steep slopes. Many stormwater BMPs do not work well in areas with steep slopes, and their use is limited in those locations. Identify through topographic mapping and site visits the location of slopes greater than 10 to 15 percent and show these on the site maps. Special studies may be required for facilities located within setback distances to steep slopes. Marine bluffs are a special case of steep slopes for properties located along the marine waterfront. Thurston County Code, Title 17, includes specific requirements related to properties along marine bluffs.

Existing Topography

How does the undeveloped site deal with stormwater? If most stormwater currently infiltrates rather than running off the site, the finished site should use infiltration as the main method of stormwater management. This lessens the need for constructing new drainage channels or installing pipe, lessens the likelihood of downstream flooding, and protects downstream water quality.

If the topography provides large areas of surface storage through many small dips and hollows, consider providing onsite storage. If the existing topography already drains to a natural channel, designing the drainage system to follow this means less grading and less likelihood of erosion, if existing channel vegetation is preserved.

Design practices that consider and adapt to a site's characteristics, like the features listed above, are sometimes referred to as Low Impact Development. LID techniques are intended to more closely mimic predevelopment watershed hydrologic functions than traditional development practices.

LID techniques are emphasized throughout this manual. These techniques include reducing impervious surfaces (described in BMP LID.03), preserving native vegetation (BMP LID.01), and protecting soils (BMP LID.02). They require advance planning, but will likely reduce costs associated with grading, stormwater treatment, flow control, stormwater conveyance, paving materials, curbs, and landscaping (if native vegetation is preserved). The County's NPDES Phase II permit also requires LID measures be given preferential consideration.

Preliminary sources of topographic information such as USGS maps and the Thurston County Geodata system can be used for preliminary evaluation of a site; however, topographic surveying by licensed surveyors and site visits to verify conditions by the project engineer or designer should be conducted to support design and before construction.

3.1.2 Site Design – Smart Design and Low Impact Development

As presented in Chapter 1, and as required by Minimum Requirement #5, to effectively protect critical areas and receiving waters while taking advantage of a site's overland and subsurface flow, infiltration, storage, and evapotranspiration characteristics, the applicant shall consider first the following Low Impact Development strategies:

- **Minimize effective impervious area (EIA):** By avoiding the use of curbs (where permitted), designing reverse slope sidewalks, and allowing impervious surfaces to drain overland to pervious areas, a site can be designed to avoid concentrating runoff allowing for a higher time of concentration and greater infiltration. Ecology allows a flow credit for reverse slope sidewalks that drain onto native soils (see BMP LID.03). When impervious surfaces drain onto lawn or gravel prior to being collected in the site stormwater system, peak flows and volumes of stormwater from the site are reduced, thereby reducing stormwater management costs.
- **Onsite stormwater management:** Many parts of Thurston County have soils with high infiltration rates. By designing your site so that small areas drain to localized facilities, such as bioretention facilities (BMP LID.08), you may be able to manage your runoff entirely onsite, using areas not much larger than those needed for traditional landscaping. This practice also assures compliance with Minimum Requirement #5.
- **Alternative paving surfaces:** For areas of private developments with low traffic volume and where allowed by Thurston County road standards for private roads, alternative paving surfaces (BMP LID.09) such as porous concrete or asphalt can be highly effective at reducing or eliminating stormwater runoff and associated stormwater treatment, flow control, and conveyance costs. Even with very low infiltration rates of underlying soils, alternative paving surfaces are highly effective at controlling stormwater runoff. Alternative paving surfaces are not allowed within the public right-of-way or for private roadways which may be dedicated to the County.

3.2 Submittal Review and Acceptance Process

This is a conceptual overview of a typical submittal review and acceptance process, shown in [Figure 3.1](#). For the latest information on submittal requirements and the acceptance process, contact the Permit Assistance Center or see Thurston County's permit website at: <http://www.co.thurston.wa.us/permitting/>.

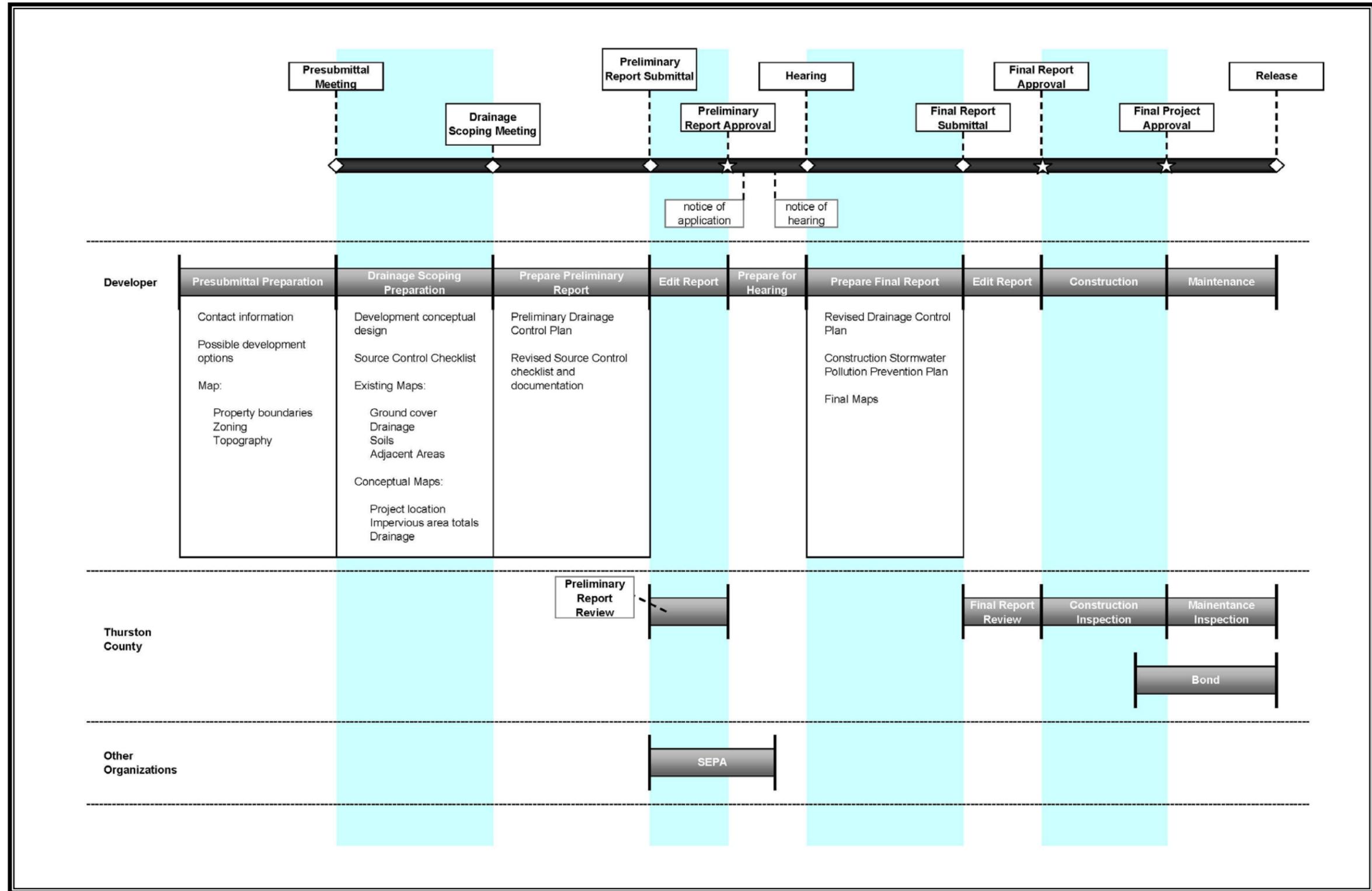


Figure 3.1. Submittal Review and Approval Process.

3.2.1 Presubmittal Meeting

A presubmittal meeting is an informal meeting between a project applicant and County and local government staff who will review the proposal. The applicant may have advisors present (e.g., realtor, surveyor, and engineer). Since this is an informal meeting and no decisions will be made, public comment is limited to the applicant and their advisors.

The project applicant must provide contact information, possible development options, and a map showing the property boundaries, topography, and zoning.

Sometimes, a presubmittal meeting is a required first step in a land use or subdivision process. The meeting is also a good way to obtain important information before beginning your project. For more information about the presubmittal meeting, see Thurston County's permit website at: <http://www.co.thurston.wa.us/permitting/>.

A presubmittal meeting is not required for single family residential projects, short plats, or large lot subdivision projects. However, it is still an option on these projects and may be appropriate on more complex projects to avoid delays in application review and acceptance.

3.2.2 Drainage Scoping Report/Meeting

For any project exceeding the thresholds of Chapter 2 for which Minimum Requirements #6 (Runoff Treatment) and/or #7 (Flow Control) apply, a Drainage Scoping Report shall be submitted. Based on the review of the Drainage Scoping Report, or at the request of the applicant, a drainage scoping meeting may be scheduled to assist the applicant in complying with stormwater requirements.

The Drainage Scoping Report shall include the following:

- A letter of transmittal requesting a Drainage Scoping Report review and including applicant, property owner, and parcel information required to identify the property and its location
- A written description of the project including overall stormwater management strategy proposed for the site
- Maps of the sites existing conditions showing ground cover, existing drainage, topography, soils, and adjacent areas
- A general vicinity map showing surrounding properties including topography, downstream, and upstream areas of the project

- Results of preliminary geotechnical investigations, test pits, etc. as well as Natural Resources Conservation Service (NRCS) soils mapping information
- A completed conceptual site plan, including a scale drawing with topography of the site and showing conceptual lot and building locations, impervious area totals, proposed drainage facilities, zoning information including any limits on impervious surfaces, tree retention requirements, landscape buffers, etc.
- If the project is a redevelopment project, a preliminary estimate of project construction costs should be submitted.
- The applicant shall also submit a completed source control checklist (see Volume IV, Source Control).

Upon review of the Drainage Scoping Report, Thurston County will prepare a response letter accepting the report and providing any additional information, studies, recommendations, suggestions, or additional requirements that might apply to the project that should be included in the submittal documents. If the County determines that a drainage scoping meeting is required, this will be included in the response letter.

3.2.3 Preliminary Report Submittal

Based on comments received from the Drainage Scoping Report review and drainage scoping meeting, the applicant then produces a preliminary Drainage and Erosion Control Plan including a preliminary drainage report, drainage plan, and a revised source control checklist for inclusion in the permit or land use application package.

3.2.4 Final Report Submittal

After receiving preliminary acceptance of the project (Preliminary Plat Approval, Site Plan Review Approval, etc.) the applicant shall submit a final Drainage and Erosion Control Plan including a complete, Drainage Report, Maintenance Plan, Construction SWPPP, and final construction drawings for the project for County review.

Drainage and Erosion Control Plans submitted to the County will be routed to the Administrator or designee for review concurrently with other project plans (e.g., vegetation removal and clearing, final grading, landscaping, water and sewer, community onsite sanitary waste disposal system, roads, utilities plans). Incomplete Drainage and Erosion Control Plans will be returned to the applicant without being reviewed.

Until the Administrator or designee accepts the submittal and confirms that erosion control devices are in place as per the plan, the County will not:

- Grant any development, building, or other related permit except as needed to install erosion and sediment control facilities
- Allow project clearing, earthwork, demolition, site work, or construction to begin
- Allow construction of footings for structures.

3.2.5 Final Report Acceptance

After the applicant completes changes to the final report required by the County, the County shall issue a Final Report Acceptance, allowing construction to begin.

3.2.6 Final Project Acceptance

The following must be completed before the County will accept plats, grant certificates of occupancy, release financial securities related to drainage and erosion control, or accept final construction.

For those filing Drainage and Erosion Control Plans:

- Drainage and Erosion Control Plan accepted by the County
- Stormwater Facilities Maintenance Plan accepted by County
- Construction Inspection Report and as-built drawings in electronic format (PDF or CAD)
- Special requirements on the cover sheet of a plat, such as BMP volumes or other design criteria, and a general easement for protection and maintenance
- Filing of covenants on lots, the Property Owners' Association articles of incorporation and CC&R's, maintenance agreements, easements, agreements with adjacent property owners, conservation easements, and similar documents as required in the Drainage and Erosion Control Plan and Thurston County Code.
- Conditions of acceptance fulfilled
- Site permanently stabilized and restored, and temporary erosion control measures removed.

For Abbreviated Drainage Plan or Engineered Abbreviated Drainage Plan projects:

- All conditions of the Abbreviated or Engineered Abbreviated +Drainage Plan must be met, except that replanting may be delayed with the concurrence of the County.
- An 8½ x 11” version of the Abbreviated or Engineered Abbreviated Drainage Plan showing the location of drainage structures, conveyances, drywells, and dispersion areas shall be created and recorded with the Thurston County Auditor for the subject property.

Abbreviated Drainage Plans must be submitted with the application for permit or preliminary project acceptance.

3.3 Submittal Format

Submittals shall be in accordance with submittal requirements of the Thurston County Code and Development Services appropriate for the project type. At least one copy of all submitted documents shall be in electronic (Adobe PDF) format. Where required, full size plans shall be 22” x 34” and all information and text shall be of sufficient size to be readable when reduced to 11” x 17” size. Where plot plans are required, such as for abbreviated plan submittals, they shall be 11” x 17”. Examples are available from the County.

3.4 Submittal Types

Submittals required for drainage review depend on the project’s type, size, location, and proposed treatment. [Figure 3.2](#) summarizes required submittals, depending on whether the project is 1) eligible for an Abbreviated Drainage Plan; 2) located within or near a critical area; and 3) subject to Minimum Requirement #2, Construction Stormwater Pollution Prevention Plan (SWPPP). Consult relevant sections of this manual to determine whether these categories apply to the proposed project.

In terms of submittals, there are four categories of Thurston County projects:

1. Projects exempt from submittal requirements
2. Projects eligible for an Abbreviated Drainage Plan
3. Projects requiring an Engineered Abbreviated Drainage Plan
4. Projects requiring a complete Drainage and Erosion Control Plan.

Projects that may submit an Abbreviated Drainage Plan or an Engineered Abbreviated Drainage Plan may have additional submittal requirements (e.g., a Short Form Construction SWPPP and Source Control Plan) if they are subject to Minimum Requirement #2 or #3. These submittals are briefly described below.

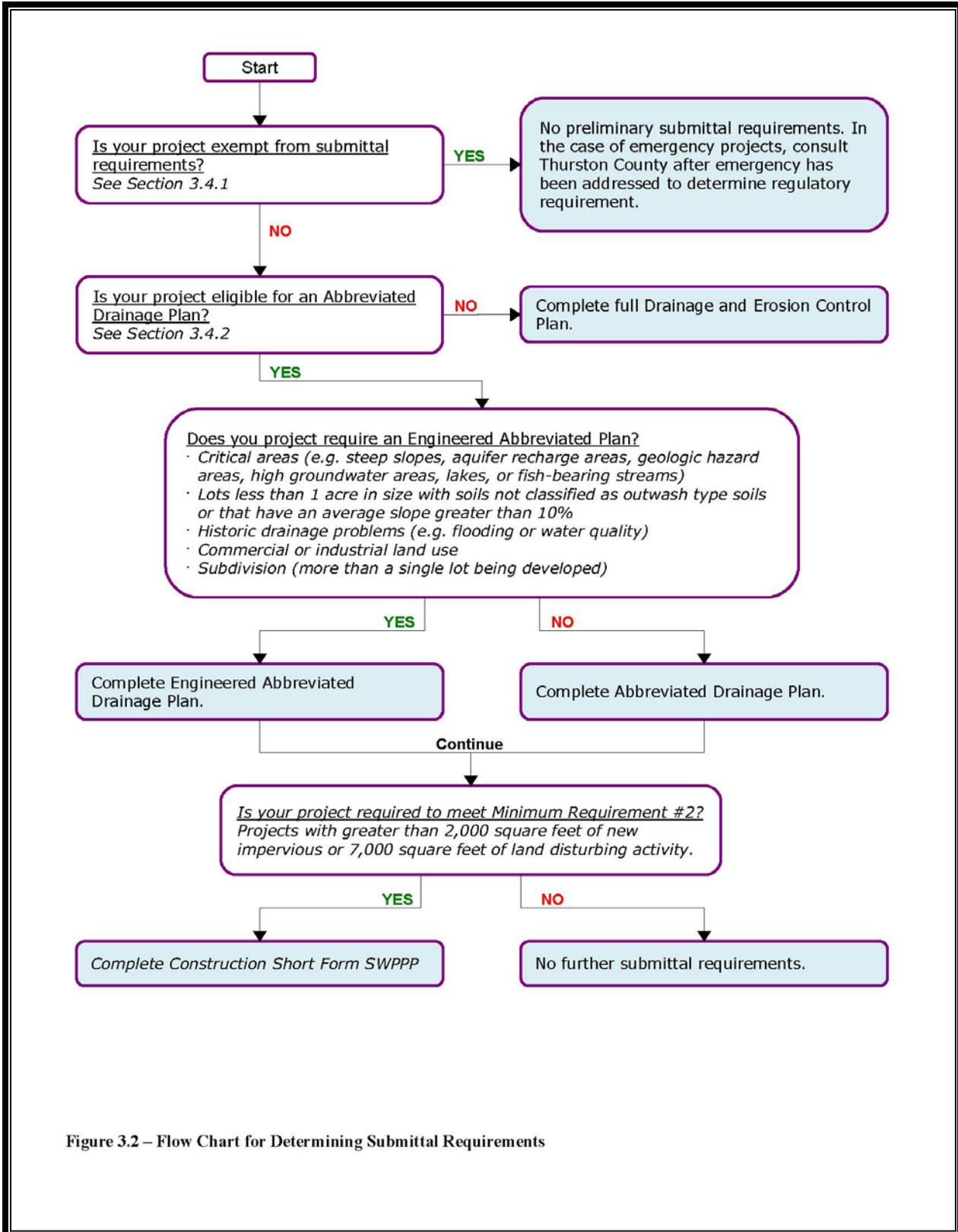


Figure 3.2 – Flow Chart for Determining Submittal Requirements

Figure 3.2. Flow Chart for Determining Submittal Requirements.

3.4.1 Projects Exempt from Submittal Requirements

In addition to those projects that are categorically exempt from the requirements of this manual (see Section 2.2) the following projects are exempt from the submittal requirements but shall be designed and constructed consistent with the requirements of this manual:

- Emergency projects which if not performed immediately would substantially endanger life or property are exempt from submittal requirements. Contact Thurston County to determine which regulatory requirements must still be met after the emergency situation has been addressed.
- Public works road projects completely within the right-of-way which do not add impervious surface and for which previously dispersed flows are not concentrated (i.e., adding curb and gutter).
- Public works road widening projects including minor right-of-way acquisitions and for which no change in the type of conveyance system (i.e., from open channel to piped system) is proposed and for which previously dispersed flows are not concentrated (i.e., adding curb and gutter).
- Projects for which impervious area to be added or modified results in total impervious surface of less than 5 percent of the parcel— providing that there is no increase in runoff or sediment discharge to adjoining property or to waters of the United States. If the property abuts a public roadway frontage, the area of the roadway frontage contributing drainage to the site shall be included in the impervious area computation and runoff from the roadway shall accounted for.

3.4.2 Abbreviated Drainage Plan

Abbreviated Drainage Plans are streamlined submittals allowed for projects on land zoned residential, agriculture, or forestry, where none of the special conditions requiring an Engineered Abbreviated Plan apply and the project meets one or a combination of the following criteria:

- Project on a single lot where less than 2,000 square feet of new impervious surface is created and less than 7,000 square feet of land is disturbed.
- Project on a single lot where greater than 85 percent of the lot area can be classified as Type A/B (outwash) soils and where less than 5,000 square feet of new impervious surface is created.

- Project subject to a building permit on a single lot of any size, *if* the lot is within a development that has a previously accepted and currently functioning stormwater system that includes the future development of that lot.
- Project converting less than 3/4 of an acre from native vegetation to lawn or landscaped areas
- Project converting less than 2.5 acres from native vegetation to pasture or timberland to commercial agriculture with no increase in impervious surface.
- Project on a parcel of greater than 1 acre outside the NPDES Phase II permit boundary where 85% of the parcel area can be classified as Type A/B (outwash) soils on which new, replaced, and existing impervious surfaces including any public roadway frontages are less than 10 percent of the site, *and* total non-native pervious plus impervious surfaces are less than 35 percent of the site, *and* no substantial (>0.1 cfs) increase in runoff or sediment discharges to adjoining property or to waters of the United States occurs as a result of the project.
- Project on a parcel of greater than 2.5 acres outside the NPDES Phase II permit boundary with any soil type on which new, replaced, and existing impervious surfaces are less than 10 percent of the site, *and* total non-native pervious plus impervious surfaces are less than 35 percent of the site, *and* no substantial (>0.1 cfs) increase in runoff or sediment discharges to adjoining property or to waters of the United States occurs as a result of the project
- Grading project requiring a permit, where total grading is less than 500 cubic yards with less than 2,000 square feet of impervious surface added and less than 7,000 square feet of land disturbing activity occurs and no change to existing drainage occurs.

In computing the area thresholds above, if the project site abuts a public roadway and roadway frontage improvements are required, the impervious and disturbed areas associated with the frontage improvements shall be included in the area calculations. In calculating existing impervious area the area to the centerline of the public road fronting the property shall be included.

Additional submittals (such as a Construction SWPPP or Source Control Plan) may be required to comply with Minimum Requirements #2 and #3 or for projects with critical areas as described below.

3.4.3 Engineered Abbreviated Drainage Plan

An Engineered Abbreviated Drainage Plan is a streamlined submittal similar to an Abbreviated Drainage Plan that must be prepared by a civil engineer licensed in the State of Washington and includes additional design, calculations and specifications beyond those required by an Abbreviated Drainage Plan (see Section 3.7). An Engineered Abbreviated Drainage Plan is allowed for the following project types:

- Project that meets the general requirements for an Abbreviated Drainage Plan, but has any of the following special conditions:
 - Any critical areas as defined by Thurston County Code, Title 17 (e.g., wetlands, aquifer recharge areas, geologic hazard areas, high groundwater areas, special management areas, flood hazard areas, shoreline protection areas, lakes, streams, etc.) exist within 200 feet of the boundaries of the disturbed area of the project site
 - Any project located within 200 feet of a Marine Bluff Hazard Area as defined by Thurston County Code, Title 17. (Note: Any project located within the Marine Bluff Hazard Area shall prepare a full Drainage and Erosion Control Report in accordance with Title 17, TCC)
 - For lots less than 1 acre in size with soils not classified as predominately Type A/B (outwash) soils, or where the average slope across the parcel is greater than 10 percent or any slope 15 percent or greater with 10 foot or greater height exists.
 - Project is located in an area that has historically had drainage problems including flooding and/or water quality problems
 - Proposed or existing land use is commercial, industrial, or multi-family residential.
 - Subdivision (more than a single lot being developed).
- Other Single Family Residential or Duplex projects on a single lot not meeting criteria for an Abbreviated Drainage Plan and not located within a Marine Bluff Hazard Area.
- Grading projects requiring a permit, where total grading is less than 5,000 cubic yards with less than 5,000 square feet of impervious surface added and less than $\frac{3}{4}$ of an acre of native

vegetation converted to lawn or landscape and no change to existing drainage occurs.

Engineered Abbreviated Drainage Plans shall be stamped by and prepared by, or under the direct supervision of, a civil engineer licensed in the State of Washington. All minimum requirements applicable to the project as described in Chapter 2 shall be addressed by the Engineered Abbreviated Drainage Plan.

3.4.4 Drainage and Erosion Control Plan

Applicants with projects not eligible for an Abbreviated Drainage Plan or Engineered Abbreviated Drainage Plan shall submit a Drainage and Erosion Control Plan. All such plans shall be stamped by and prepared by, or under the direct supervision of, a civil engineer licensed to practice in the State of Washington (hereinafter referred to as the "Project Engineer").

3.5 Abbreviated Drainage Plan

This section summarizes the minimum requirements of an Abbreviated Drainage Plan. The Administrator or designee may increase plan submission and runoff control requirements for projects expected to have a significant impact on sensitive natural resources, or projects that could exacerbate existing flooding or water quality problems.

An Abbreviated Drainage Plan consists of a written project summary, a plot plan, and any other requirements set by the Administrator or designee. Abbreviated Drainage Plans need not be stamped with the seal of a licensed Professional Engineer.

For projects which are required to address more than Minimum Requirement #2 (Construction SWPPP), the Abbreviated Drainage Plan shall address all Minimum Requirements applicable to the project.

3.5.1 Plot Plan

The plot plan submitted for the Abbreviated Drainage Plan shall be sufficiently clear to see the footprint of structures and other features described below. Drawings shall be 11 inches by 17 inches in size. Lines shall be drawn with a straight edge and features shall be to scale.

The plot plan shall contain the following information:

- Name, address, and telephone of the applicant, project proponent and property owner (may be the same person).
- Name, address, and telephone of the person preparing the plot plan

- Parcel number(s)
- Scale and north arrow
- Legend, if symbols are used
- Vicinity map of sufficient clarity to locate the property and the receiving water body
- Property boundaries, dimensions, and area
- Contour lines from the best available source (specify datum used)
- Adjoining street names
- Existing and proposed structures and other impervious surfaces such as driveways, patios, green houses, barns, etc. Include the area of each impervious surface.
- Location of waste treatment systems
- Utility easements
- Established buffers, significant trees, and natural vegetation easements
- Natural drainage channels, wetlands, canyons, gullies, water bodies, etc.
- Clearing limits and total area being cleared
- Areas to be graded, filled, excavated, or otherwise disturbed
- Location of known wells, underground storage tanks, septic tanks
- The location and type of erosion and sediment control measures.

The plan shall be kept on the project site during construction and made available to the County's inspectors on demand. Any changes to the plot plan shall be submitted to Thurston County for review and acceptance prior to performing the work in the field. All changes from the original plot plan shall be recorded and a record drawing (as-built) prepared showing the final constructed improvements. This as-built shall be submitted to Thurston County prior to final project acceptance.

3.5.2 Conditions

The Administrator or designee will attach conditions to the project as necessary to control erosion and runoff. These conditions shall include but not be limited to:

- An evaluation of the need for downspout infiltration systems (BMP LID.04), downspout dispersion systems (BMP LID.05), bioretention facilities (BMP LID.08), or other onsite facilities for disposal of runoff from roofs and other impervious surfaces. Size of facilities shall be determined through application of requirements specified in Volume V.
- Routing for storm drainage as necessary and appropriate for the size of project.
- Erosion control devices (e.g., construction entrances, filter fabric fences, stockpile protection, buffers for Critical Areas, and other measures).
- Easements and setbacks as required to ensure maintenance access, buffers, proper drainage, dispersion area protection, or other functions cited in this manual
- Management of tributary runoff from private or public roadway frontages abutting the project site.

3.6 Short Form Construction SWPPP

A Short Form Construction SWPPP is provided for projects with a disturbed area of less than 1 acre that are eligible for the Abbreviated Drainage Plan or Engineered Abbreviated Drainage Plan and are required to meet Minimum Requirement #2, i.e., projects with greater than 2,000 square feet of new impervious or 7,000 square feet of land disturbing activity.

The template for the short form Construction SWPPP, which includes an abbreviated erosion and sediment control plan, is provided in Volume II.

3.7 Engineered Abbreviated Drainage Plan

The Engineered Abbreviated Plan must consider the following in accordance with the hydrologic design criteria of Volume III for flow control, water quality treatment, and conveyance system design:

- Provision of adequate slope of surfaces toward drains

- Sizing of catch basins, drains, swales, ditches, pipes, and other conveyance facilities
- Bedding or anchoring of pipes
- Safe routing of runoff away from, over, or through critical areas including marine bluffs, geologic hazard areas, landslide hazard areas, wetlands, etc.
- Design of infiltration systems including drywells, bioretention areas, infiltration ponds, or trenches
- Design of flow control and runoff treatment facilities for stormwater released from the site, as required.
- Design of dispersion areas required to disperse concentrated or other runoff in accordance with the applicable BMP
- Other factors pertinent to safely convey runoff.

In addition to the requirements for submittal of an Abbreviated Drainage Plan, the Engineered Abbreviated Plan shall include narrative, calculations, drawings of facilities and specifications sufficient for construction.

The plan shall address all minimum requirements applicable to the project based on the criteria of Chapter 2.

For a project within a marine bluff hazard area or landslide hazard area Thurston County Code, Title 17, 17.15.630, has additional requirements that shall be addressed by the applicant.

3.8 Drainage and Erosion Control Plan

Drainage and Erosion Control Plans shall contain the following:

- A Drainage Report (described below)
- A Construction SWPPP (as described in Volume II)
- Drawings and Specifications
- A Maintenance Plan.

3.8.1 Drainage Report

The report shall be bound and 8-1/2 x 11 inches with map pockets for plan sheets (22" x 34" maximum size) and 11" x 17" drawings folded to

8-1/2 x 11 inch size unless the County approves another submittal format. The complete drainage report including appendices and drawings shall also be converted to PDF format and included in the submittal.

The report shall contain the following:

- **Cover Sheet:** Include the project name, applicant, owner and project proponent's name, address, and telephone number, project engineer's name, address and phone number, date of submittal, contact's name, address, and telephone number, and the name, address and phone number of the contractor, if known.
- **Table of Contents:** Show the page number for each section of the report and appendices.
- **Project Engineer's Certification:** The Drainage Report must be developed by a professional engineer licensed to practice in the State of Washington. For projects where a PE is required, all plans and specifications, calculations, certifications, "as-built" drawings, and all other submittals which will become part of the permanent record of the project must be dated and bear the project engineer's official seal and signature.

The Drainage Report shall contain a page with the project engineer's seal with the following statement:

"I hereby state that this Drainage and Erosion Control Plan/Construction SWPPP for (insert name of project) has been prepared by me or under my supervision and meets the requirements of the Thurston County Drainage Design and Erosion Control Manual and the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that Thurston County does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

- **Facility Summary Form** (see example in Appendix I-D)
- **Bond Quantities Worksheet** (use Thurston County's format, Appendix I-B)
- **Drainage Report Narrative** (10 sections, described below)
- **Construction SWPPP** (12 sections, summarized in Volume II, can be bound separately or together with the Drainage Report).

Drainage Report Section 1 – Proposed Project Description

The Drainage Report shall include the following information. Where appropriate, features should be shown on the drawings.

Permit

Describe the type of permit being applied for. Describe other permits required (e.g., hydraulic permits, 404 permit, marine bluff, etc.).

Project Location

Determine precise location of the construction site, adjacent roads and receiving waters:

- Indicate locations on Vicinity Map.
- Describe project including locations in Project Description.

Property Boundaries and Zoning

Determine the legal property boundaries and zoning requirements for the site:

- Indicate Legal Property Boundaries and Zoning on Site Map.
- Discuss zoning requirements in Existing Site Conditions.

Project Description

Provide a brief description of the development project, including the anticipated timing of the project.

Timing of the Project

An important consideration in selecting BMPs is the timing and duration of the project. Projects that will proceed during the wet season and projects that will last through several seasons must take all necessary precautions to remain in compliance with the water quality standards.

- Provide a timeline for the project based on applicant's best estimate of project start date.
- Describe and show design considerations based on project timing
- Include 12 elements of Construction SWPPP in timeline as applicable.

Drainage Report Section 2 – Existing Site Conditions

This section describes the existing conditions and what is required to be shown on the existing conditions scale drawing of the site to be included in a map pocket or an 11” x 17” drawing.

Topography

Prepare a topographic drawing of the site to show existing contour elevations at intervals of 1 to 5 feet, depending upon the slope of the terrain (see Section 3.8.3 for drawing protocols). Evaluate topography for erosion potential. The primary topographic considerations are slope steepness and slope length. The longer and steeper the slope, the greater the erosion potential. Erosion potential should be determined by a qualified engineer, soil professional, or certified erosion control specialist. Site topography shall be based on field survey by a licensed professional surveyor for any area of the project disturbed or where structures, roadways, or stormwater facilities will be located including dispersion areas.

- Show Topography on Site Map
- Discuss site topography in Existing Site Conditions.

Ground Cover

Label existing vegetation on the drawing. Show features such as tree clusters, grassy areas, and unique or sensitive vegetation. Indicate existing denuded or exposed soil areas. Where available, provide the most recent aerial photograph of the site.

Ground cover is the most important factor in erosion prevention. Existing vegetation that can be saved will prevent erosion better than constructed BMPs. Trees and other vegetation protect the soil structure. If the existing vegetation cannot be saved, consider practices like phasing construction, temporary seeding, and mulching. Phasing of construction involves stabilizing one part of the site before disturbing another. In this way, the entire site is not disturbed at once.

- Show vegetation on Site Map
- Include aerial photograph in Drainage Report
- Discuss vegetation in Existing Site Conditions.

Drainage

Locate and clearly mark existing drainage ditches, closed depressions, and storm drain systems on the site map. Identify the point(s) of exit of

drainage from the property. The drawings should distinguish between natural and constructed drainage. Identify offsite drainage contributing to the project site, and characterize the quantity and quality of offsite water. Document existing erosion or flooding problems. Identify closed depressions, areas where stormwater appears to infiltrate, and potential sites for temporary stormwater retention and detention.

- Show existing Drainage on Site Map
- Discuss Drainage in Existing Site Conditions.

Soils

Identify and label soil type(s) and erodibility (slight, moderate, severe, very severe or an index value from the NRCS manual) on the drawing. Soils information usually can be obtained from a county soil survey. If a soil survey is not available, a request can be made to a district Natural Resource Conservation Service Office. Show the location of any test pits or borings conducted for the project. Include description of the soils and the boring or test pit logs in the Drainage Report. Estimate the overall pre-development infiltration rate for the site based on preliminary soils data.

- Show soils information on Site Map and location of any borings or test pits
- Discuss in Soils section of drainage report
- Include boring or test pit logs in drainage report.

Critical Areas

Delineate critical areas adjacent to or within the site on the drawing. Show features such as steep slopes, streams, floodplains, lakes, wetlands, sole source aquifers, and geologic hazard areas. Delineate setbacks and buffer limits for these features on the drawings.

Other related jurisdictional boundaries such as Shorelines Management and the Federal Emergency Management Agency (FEMA) base floodplain should also be shown on the drawings. Critical areas per Thurston County Code 17.15.100 may include but not be limited to critical aquifer recharge areas, geologic hazard areas, important habitats, flood and channel migration hazard areas, and wetlands. Critical areas and their buffers shall be delineated on drawings and clearly flagged in the field. Fencing may be more useful than flagging to assure that equipment operators stay out of critical areas. Only unavoidable work should take place within critical areas and their buffers. Such unavoidable work will require special BMPs, permit restrictions, and mitigation plans.

- Show critical areas on Site Map
- Discuss critical areas in Critical Areas section.

Adjacent Areas

Identify existing buildings, roads, and facilities adjacent to and on the project site on the drawings. Identify existing utility locations on the drawings. An analysis of adjacent properties should focus on areas upslope and downslope from the construction project. Water bodies that will receive direct runoff from the site are a major concern. Evaluate the types, values, sensitivities of and risks to downstream resources, such as private property, stormwater facilities, public infrastructure, or aquatic systems.

- Show adjacent areas on Site Map
- Discuss adjacent areas in Adjacent Areas.

Precipitation Records

Refer to Volume III to determine the required rainfall records and the method of analysis for design of BMPs.

- Include rainfall data needed for sizing.

Reports and Studies

Include references to relevant reports such as basin plans, flood studies, groundwater studies, wetland designation, sensitive area designation, environmental impact statements, lake restoration plans, and water quality reports. When such reports impose additional conditions on the applicant, state these conditions.

Drainage Report Section 3 - Geotechnical Report

A geotechnical report may be required for grading or, where infiltration BMPs are proposed, a geotechnical report must be prepared in accordance with Section 3.3.2 of Volume III. Section 3 of the drainage report shall summarize soil types, geotechnical recommendations, infiltration testing methods and locations, and design infiltration rates. The entire report shall be included as an appendix.

If an infiltration or detention facility is near the top of a slope that is greater than 15 percent or otherwise regulated by Thurston County, then a geotechnical report addressing effects of seepage and the potential for slope failure during any precipitation event through the 100-year, 24-hour event may be required as part of the Drainage and Erosion Control Plan.

Any assessment of the infiltration receptor and/or mounding analysis shall be included in the geotechnical report or in another report and included in the Drainage Report.

This section should address all suitability criteria for infiltration facilities as described in Volume III.

Drainage Report Section 4 – Wells and Septic Systems

The Project Engineer shall make a diligent search to identify wells and septic systems "of record", on the site, and on adjacent property within the setback distance for stormwater retention/detention facilities identified in Volume V, Appendix E. The Project Engineer shall inquire with Thurston County Environmental Health and neighboring property owners as necessary to obtain the location of wells and septic systems that are not "of record." Wells and septic systems thus found, both active and abandoned, shall also be called out on the plans or as-builts (if found during construction).

The Project Engineer shall also identify whether the project site is located within the designated Well Head Protection Area (WHPA) of any public (Group A) water system. Thurston County Code, Title 17 and this Drainage Manual imposes additional requirements for projects within a designated WHPA.

The proper abandonment of wells is a matter regulated by state law (WAC 173-160). If a well on the site has not been properly sealed, the applicant shall be responsible for contacting Thurston County Environmental Health and Ecology. Ecology's procedure shall be followed for sealing the well. Proof of proper abandonment (e.g., copies of the well log and invoice from a firm qualified to perform such work) shall be supplied to the County at or prior to final project acceptance. Indicate if no wells or septic systems were found.

Drainage Report Section 5 – Fuel Tanks

The Project Engineer shall report after making a diligent search of records and project site the existence of fuel tanks, in-use or abandoned. Fuel tanks shall be shown on the plans or as-builts (if found during construction). If fuel tanks will be abandoned, contact Thurston County Environmental Health for specific instructions. If no fuel tanks were found, indicate so.

Drainage Report Section 6 – Analysis of the 100-Year Flood

If the project contains or abuts a stream, show the 100-year flood hazard zone on the plans. If the zone has not been established (or the Administrator or designee determines that it is in error), the County may

require the applicant to establish the 100-year flood plain for the proposed Project to be submitted with the Drainage and Erosion Control Plan. Analysis will be for the 100-year flood for build out at maximum density allowed by zoning (making reasonable assumptions regarding future stormwater management). The Project Engineer shall use the applicable program (HEC-HMS/RAS) for backwater analysis or another on acceptance of the Administrator or designee.

Drainage Report Section 7 – Aesthetic Considerations for Facilities

Describe the effort made to make the facilities aesthetically pleasing, how facilities will provide usable open space, and how the facilities will fit into the landscaping plan for the property.

Drainage facilities shall be made attractive features of the urban environment. Engineers are encouraged to be creative in shaping and landscaping facilities and to consider aesthetics when choosing design alternatives (e.g., parking lot paving, conveyance systems, detention facilities, weirs, check structures). See Volume V and Appendix V-E for aesthetic and landscaping criteria.

The applicant shall provide an informational sign for all aboveground stormwater facilities located within the development tract. Signs shall be constructed and worded as specified for each BMP and in Appendix V-E or as directed by the Administrator.

Drainage Report Section 8 – Facility Sizing and Offsite Analysis

Impervious and Pervious Area Tabulations

Include a tabulation of the pervious and impervious surfaces by threshold discharge area, including the following (see Appendix I-A Glossary for definitions):

- Existing impervious surfaces
- Converted pervious surfaces
- Replaced impervious surface
- New impervious surface
- Disturbed areas (area subject to “land disturbing activities”)
- Undisturbed pervious surfaces
- Existing significant trees and native vegetation.

Basins and sub-basins shall be labeled on the work map(s) and descriptors assigned that match the basin and sub-basin descriptors included in any hydrologic modeling. The work maps shall be included in the Drainage Report in a map pocket.

Proposed BMP Design

Describe which onsite and LID BMPs have been incorporated into the design and include design calculations where applicable. If LID design practices have not been used, explain why not.

If natural drainage patterns have not been preserved, explain why not and how hydrologic impacts to receiving waters will be mitigated.

Discuss vegetation establishment and soils management plans for all BMPs.

Provide calculations in an appendix documenting that conveyance facilities are sized in accordance with the standards in Volume III and runoff treatment and flow control facilities are designed to meet the design standards in Volumes III and V:

- All calculations shall be keyed to features shown on the work map.
- If hydrologic modeling is required, the Project Engineer shall state methods, assumptions, model parameters, data sources, and all other relevant information to the analysis. The input parameters to the model including basin characteristics, soil types, areas, etc. shall be tabulated within the drainage report and shall match the input parameters shown in any model output reports included as an appendix.
- If model parameters are used that are outside the recommended ranges discussed in Volume III or if parameters are different than those discussed in Volume III, justify parameters. Include an electronic copy of the computer model data file and the site plan in AutoCAD format.
- Include copies of all calculations for capacity of channels, culverts, drains, gutters, etc. If used, include nomographs and tables indicating how they were used. Show headwater and tailwater analysis for culverts when necessary. Provide details on references and sources of information used.
- Describe capacities, design flows, and velocities in each link.
- Describe required materials or specifications for the design (e.g., rock lining for channels when velocity is exceeded; high density

polyethylene pipe needed for steep slope). Regardless of whether the calculations are made using computer software or by hand, all relevant work shall be submitted for review. Complete calculations, including hydrologic modeling analyses where required, must be included with the report. It is recommended that these be placed in appendices and be referenced where appropriate. At Thurston County's request, submit electronic data for computer work including associated data files and settings.

Offsite Analysis

At a minimum, the qualitative analysis shall include the following:

- Site map showing project limits, existing and proposed storm drains (including pipe diameter, length, materials and slopes where available), existing and proposed ditches (including slope, width, bank slope, and bed materials), downstream drainage path to receiving water, and other contributing areas and up-stream and other offsite drainage entering or passing through the site.
- Review of available information, including but not limited to basin plans, record drawings, FEMA maps, drainage studies, critical areas maps, and Thurston County maintenance records.
- Field visit conducted by Project Engineer. The Project Engineer shall verify drainage basins, inspect onsite and offsite drainage systems, identify and document (with photographs and notations on site map) drainage problems (erosion, flooding, capacity problems, channel scour or incision).

If a quantitative analysis is required by the Administrator or designee (see Chapter 2, Minimum Requirement #12), the quantitative downstream analysis will include modeling the hydraulics of the proposed project and all other sources of runoff tributary to the receiving water body for the appropriate Design Event. The Project Engineer shall include an analysis of the impact of the 24-hour, 100-year event (in addition to "Design Event" analysis) for each component of the system including pond spillway.

Describe the proposed approach for managing run-on from upstream properties including whether run-on will be diverted around the project or incorporated into the site's stormwater system. The offsite analysis upstream of the property will include all properties located topographically uphill from the project that do, or may, contribute flow through the project site.

Describe how runoff from any public road frontage is managed. If runoff from the road is not collected in a roadway ditch or other public conveyance system then the project shall incorporate any roadway runoff into the drainage plans for the site.

Summarize measures that will be used to protect properties and waterways downstream from the development site from erosion due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site. Describe how flow from the project site will be discharged to adjacent properties per the requirements of Volume III (i.e., easement, dispersion, spreader, etc.).

Drainage Report Section 9 — Covenants, Dedications, Easements

Describe legal instruments needed to guarantee preservation of drainage system and access for maintenance purposes. (Attach copies.) Describe the organization which will be responsible for operation and maintenance of storm drainage facilities.

Drainage Report Section 10 – Property Owners Association Articles of Incorporation

Attach a copy of the Articles of Incorporation, if applicable.

3.8.2 Construction SWPPP Elements

The elements of a Construction SWPPP (below) are addressed in the Drainage and Erosion Control Report following the 10 Drainage Report Sections:

1. Mark clearing limits/preserve vegetation
2. Establish construction access
3. Control flow rates
4. Install sediment controls
5. Stabilize soils
6. Protect slopes
7. Protect drain inlets
8. Stabilize channels and outlets
9. Control pollutants
10. Control dewatering

11. Maintain BMPs
12. Manage the project.

SWPPP elements are described in detail in Volume II.

3.8.3 Drawings and Specifications

It is the responsibility of the Project Engineer to ensure that engineering plans supporting the Drainage and Erosion Control Plan shall be sufficiently clear to construct the Project in proper sequence, using specified methods and materials, with sufficient dimensions to fulfill intent of drainage laws and ordinances and these design guidelines.

Required Drawing Size

Required sheet size is 22 x 34 inches and text and details shall be of such size as to be legible at ½ size (11" x 17"). Submittals shall include full size drawings, half size (11" x 17") drawings, as well as PDF files, and if requested by the County AutoCAD drawing files.

Required Drawing Protocol

All drawings shall generally comply with the requirements of the Thurston County Road standards, Chapter 3, "Plan Format" and Thurston County CAD standards. These are available from Thurston County Department of Public Works. Where those standards conflict with the standards of this manual this manual shall govern.

Number of Sheets - Content

Plans will include sheets adequate to clearly display the following:

Vicinity Map

Show Project boundaries, sub-basin boundaries, and offsite area tributary to the project. Show contours, major drainage features (such as channels and detention facilities and floodways), and flow path to receiving waters. Identify existing buildings, roads, and facilities adjacent to or within the project site on the drawings. Identify existing and proposed utility locations, and construction clearing limits on the drawings.

Site Map

On a topographic map, show existing conditions and the proposed Project including (as applicable) but not limited to:

- Existing topography for the site and at least 50 feet beyond site boundaries

- Finished grades
- Existing structures within 100 feet of project boundaries
- Utilities
- Easements both existing and proposed
- Environmentally sensitive areas (e.g., gullies, ravines, swales, wetlands, steep slopes, estuaries, springs, wetlands, creeks, lakes, etc). For natural drainage features, show direction of flow.
- 100-year flood plain boundary (if applicable)
- Existing and proposed wells onsite and on adjacent properties (both "of record" and not "of record") within setbacks as specified in Appendix V-E
- Existing and proposed fuel tanks
- Existing and proposed onsite sanitary systems within setbacks as specified in Appendix V-E
- Proposed structures including roads, parking surfaces
- Lot dimensions and areas
- Proposed drainage facilities and sufficient cross sections and details to build
- Standard stormwater plan notes. Example notes are found in Appendix G of this volume (Volume I). Provide only those notes that apply.

Topography must be field verified for all areas where site improvements are to be constructed including drainage easements and conveyance systems. Contour intervals on site plan shall be as follows:

- 0 to 15 percent slope: 2 foot contour intervals
- 16 to 40 percent slope: 5 foot contour intervals
- Greater than 40 percent slope: 10 foot contour intervals.

Drainage Plan

Show the following information:

Plans or worksheets of open channel systems shall show water surface elevation for the design storm, invert elevations at breaks in grade, design discharge, design velocity, and any other data that facilitates plan review including:

- Schedule of catch basins with the following information:
 - Catch Basin/Manhole Identifier
 - Street Name
 - Cross Street
 - Stationing
 - Street side
 - Catch Basin diameter or size
 - Invert in/out
 - Pipe Diameter in/out.
- Detention/Infiltration/Wet Ponds to include:
 - Catch points for cuts and fills
 - Max design water level, water quality water level, overflow level
 - Clear path of overflow to downstream collection point
 - Outfalls and energy dissipation at outfalls
 - Inlet and outlet pipe invert elevations, slopes and pipe lengths.
- Drainage Details and Notes
 - Details of all BMPs
 - Construction notes and specifications for all BMPs
 - Cross-sections (ponds, swales, roadways, etc.).

Other Required Plans/Drawings

Include copies of other required plans such as:

- Soil Management Plan

- Landscape Plan
- Road profiles & roadway sections.
- Utility plans (sewer, water, septic).

Work Map (or maps) (bound into Drainage Report)

On a topographic map at the same scale and contour interval as the site map, show:

- Unit areas contributing to a reach of swale or to a catchbasin including offsite area. Identify areas contributing to retention/detention facilities. Show the following on the work map (or on a schedule) for unit areas: area, percent impervious, average slope, and estimated ultimate infiltration rate.
- Conveyance data, identifier (for reference to model output), length, slope, inverts up and down
- Overland flow paths and distances
- Soil types
- Locations of soil pits and infiltration tests
- Spot water surface elevations discharges and velocities for the Design Event.

The SWPPP drawing shall show:

- Construction entrance detail
- Silt fences and traps
- Mulching and vegetation plan
- Clearing and grubbing limits
- Existing and finished grade
- Standard erosion control plan notes. Example notes are found in the individual BMP design guidelines in Volume II.

Plans and Specifications

The most recent editions of Standard Specifications and Standard Plans (see Appendix I-A, Glossary) shall be the standards for all design and

construction of drainage facilities not explicitly described herein. In the event of a conflict between the Standard Specifications, Standard Plans, and this Drainage Design and Erosion Control Manual, this manual shall prevail.

3.8.4 Maintenance Plan

The Maintenance Plan will be prepared as a standalone document, including all necessary figures, maps and drawings. The Maintenance Plan should be bound separately and submitted for review and acceptance by Thurston County at the time of submittal of the Final Drainage and Erosion Control Plan for the project. Acceptance of the Maintenance Plan by Thurston County is required prior to final project acceptance.

Contents of Plan

The Project Engineer will prepare a Maintenance Plan including the following:

- A statement of where the Maintenance Plan will be kept and that it must be made available for inspection by Thurston County upon request
- A copy of the Maintenance Agreement (Commercial/Industrial or Residential) executed by the property owner and accepted as to form by Thurston County
- A maintenance activity log in a format that includes sufficient space to list maintenance activities completed as a result of inspections
- Facility Summary Forms prepared for each stormwater facility as part of final permitting
- A written description of each flow control and treatment facility and an over view of the stormwater system for the site explaining the principles of operations and general maintenance requirements and providing such information from the Drainage Report as might be necessary to the future maintenance of the stormwater facilities. This might include the design capacity of conveyance facilities, slope of pipes and swales, size and dimensions of infiltration and/or detention facilities and calculated release rates for various storm events.
- A drawing showing all stormwater facilities, drainage easements, access easements, etc., with a key referencing the applicable maintenance checklists required to be used in performing routine inspection and maintenance for the facility

- Engineering drawings of the stormwater facilities including details and specifications shall be included. Drawings may be 11" x 17" or 22" x 34" and included in a map pocket.
- All applicable maintenance checklists for facilities included in the project. The applicant shall only include those checklists that apply to the project.
- Vegetation Management Plan
- Identification of the responsible maintenance organization
- A description of the required maintenance frequency for each facility
- A description of required recordkeeping and reports and frequency of submittal of reports to Thurston County
- An estimate of the average annual cost of maintenance will be included. The annual cost shall include the annualized cost of major maintenance items such as sediment removal from ponds, etc.
- A pollution source control plan per Volume IV.

See Appendix V-C and Appendix I-E for additional guidance.

Identify Organization Responsible for Maintenance

It is Thurston County's policy that the property owner(s) shall maintain storm drainage facilities, or in the case of a subdivision, the Property Owners' Association shall maintain drainage facilities. The Maintenance Plan shall be prepared to Thurston County's specifications and held by the property owner or for a subdivision, included by reference in the articles of incorporation of the Property Owners Association.

Vegetation Management Plan

A vegetation management plan shall be included in the Stormwater Facilities Maintenance Plan for the project and shall include recommended plantings for each stormwater facility and specifications for maintenance and replacement plantings. The effectiveness of many stormwater facilities will depend on the species planted in them and their proper maintenance. Consult Appendix V-E regarding proper species for the design condition and for their requirements for maintenance.

Pollution Source Control

Pollution source control is the application of pollution prevention practices on a developed site to reduce contamination of stormwater runoff **at its source**. Best management practices (BMPs) and resource management systems are designed to reduce the amount of contaminants used or discharged to the environment.

The Maintenance Plan shall contain language regarding pollution source control that is specifically developed for the type of site covered by the plan. The pollution source control section of the plan shall incorporate the relevant information found in Volume IV of this manual, unless otherwise accepted by the Administrator or designee.

Annual Report Required

The owner shall submit an annual report to Thurston County by August 31st of each calendar year to include, at a minimum, the following:

- Name, address, and telephone number of the businesses, persons, or firms responsible for plan implementation, and the person completing the report
- Time period covered by the report
- A chronological summary of activities conducted to implement the programs required by the Maintenance Plan. A photocopy of the applicable section of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties, include a copy of the invoice for services.
- An outline of planned activities for the next year.

The annual report shall be submitted to the Water Resources Unit of the Thurston County Department of Resource Stewardship.

3.8.5 Project Completion Criteria

Inspection Report – Drainage and Erosion Control Plans

For Drainage and Erosion Control Plans, in addition to inspection performed by Thurston County, the applicant must retain a licensed Civil Engineer to inspect or oversee inspection of the project as directed by the Drainage and Erosion Control Plan and/or the Administrator or designee. (See inspection reporting requirements, Appendix I-C.) The Engineer must file with Thurston County a construction inspection report as shown in Appendix I-C before the project is made final. The report will consist of a completed form and sufficient additional text to describe all factors relating to the construction and operation of the system to meet treatment,

erosion control, detention/retention, flow control, and conveyance requirements.

The Engineer or his/her designee shall keep records of inspections of drainage and erosion control facilities. Records of inspection shall be submitted to the County upon request at any time during the course of the project.

As-Built Submittal – Drainage and Erosion Control Plans

For Drainage and Erosion Control Plans, the Project Engineer shall submit as-built drawings bearing the Project Engineer's seal showing all final locations and elevations, materials, and changes substantially different from the design. Final elevations, locations, slopes, grades, roadway alignments, etc. shall be based on a field survey conducted by a licensed professional surveyor and shall be stamped by the surveyor as a record of the final constructed location and elevation of facilities shown. The volume of any ponds, vaults, tanks, etc. included in the design shall be calculated based on the as-built survey and this information shall be noted on the as-built drawing. Changes from the approved plans shall be clearly identified using clouding, bold text or other methods to clearly identify those items that were changed during construction. Note that changes from the accepted plan will be reviewed by the County and may be subject to action by the Administrator or designee.

Phased Projects Submittals – Drainage and Erosion Control Plans

A plan showing the overall project, clearly delineating phase boundaries, and estimating dates of construction, shall be part of any initial submittal. Phased projects shall be completed in accordance with accepted plans and in accordance with standard phased development requirements for Thurston County. The thresholds of Chapter 2 shall apply to the entire development including all phases.

3.9 Additional Submittal Information

3.9.1 Qualifications of Project Engineers

The Project Engineer responsible for completion of Drainage and Erosion Control Plans and Engineered Abbreviated Drainage Plans shall be a Civil Engineer with a current State of Washington Professional Engineer's license. All plans and specifications, calculations, construction inspection reports, and all other submittals which will become part of the permanent record of the Project must bear the Project Engineer's official seal.

3.9.2 Review and Acceptance Does Not Confer Responsibility

Thurston County will review all drainage related submittals for general compliance with specific criteria. Acceptance by the County does not relieve the applicant or Project Engineer of responsibility for ensuring that all facilities are safe and that calculations, plans, specifications, construction, and as-built drawings comply with normal engineering standards, this manual, and applicable federal, state, and local laws and codes.

3.9.3 Time Limitations of Acceptance for Plans

Drainage and Erosion Control Plans and Abbreviated Drainage Plans shall expire when acceptance for the permitted activity (e.g., preliminary plat, clearing, grading, building permit) expires. After expiration, a new Drainage and Erosion Control Plan must be completed subject to conditions and requirements applicable at that time.

3.9.4 Aesthetic Considerations

Drainage facilities shall be made attractive features of the urban environment. Engineers are encouraged to be creative in shaping and landscaping facilities and to consider aesthetics when choosing design alternatives (e.g., parking lot paving, conveyance systems, detention facilities, weirs, check structures). See Volume V and Appendix V-E for aesthetic and landscaping criteria.

The applicant shall provide an informational sign for all aboveground stormwater facilities located within the development tract. The sign for storm ponds shall be constructed and worded as specified in Appendix V-E. Other stormwater facilities including swales, rain gardens, dispersion areas, etc. shall also include signage and fencing identifying the area as a stormwater facility and not to disturb. Individual BMPs also include requirements for signage and fencing.

3.9.5 Drainage Plans for Environmentally Sensitive Areas

Development in an Environmentally Sensitive Area

Where buffer zones have been established by the County to restrict development near an environmentally sensitive area or critical area, the applicant shall obtain and implement the requirements of those regulations in addition to any requirements of this manual.

Acceptance of Dedication of Buffers

Buffers for natural drainage features can provide water quality benefits. Consult the jurisdiction regarding their policy on acceptance of buffers.

3.9.6 Easements and Access

Easements for Natural Channels and Stormwater Facilities

All man-made drainage facilities, conveyances, and all natural channels (including swales, stream channels, lake shores, wetlands, potholes, estuaries, gullies, ravines, etc.) shall be located within easements. Easements shall contain the natural features and facilities and shall allow jurisdiction access to them for purposes of inspection, maintenance, flood control, water quality monitoring, and other activities permitted by law.

Easements for Access

Specific access requirements for ponds are included in Volume V, Appendix V-E. Generally a minimum 15-foot wide access easement shall be provided to drainage facilities from a public street or right-of-way and shall provide a 12-foot minimum width drivable path surfaced with lattice block pavement, crushed rock, or other acceptable surface to allow year-round equipment access to the facility. The easement shall include easement boundary markers which shall be fiberglass utility markers with a reflective easement tag, located at each corner of the easement, at angle points and at least every 100 feet along the length of the easement. Contact Thurston County Water Resources for additional information on easement marker requirements.

Easements for Conveyance Systems

Easement requirements for conveyance systems are described in Volume III, Section 3.6.2.

Chapter 4 - Stormwater BMP Selection Process

This chapter aids in the selection of appropriate LID, infiltration, flow control, and runoff treatment BMPs to meet Minimum Requirements #5 (Onsite measures), #6 (Runoff Treatment), and #7 (Flow Control). This chapter is organized as follows:

- **Section 4.1:** Types of BMPs and satisfying minimum requirements
- **Section 4.2:** Step-by-step process for determining the level of treatment and flow control and selecting BMPs
- **Section 4.3:** Supplemental information for selecting and applying oil control BMPs
- **Section 4.4:** Supplemental information for selecting and applying phosphorus treatment BMPs
- **Section 4.5:** Supplemental information for selecting and applying enhanced treatment BMPs
- **Section 4.6:** Supplemental information for selecting and applying basic treatment BMPs
- **Section 4.7:** Additional treatment facility selection factors, including pollutants of concern and BMPs for specific land uses.

4.1 Introduction

Stormwater BMPs described in this chapter focus on reducing or mitigating the hydrologic and water quality impacts of development. These BMPs address the following minimum requirements:

Minimum Requirement #5: Onsite Stormwater Management

- *Onsite* BMPs are measures to protect soils and control roof drainage and other runoff to prevent stormwater from leaving the site as much as possible.
- *LID* BMPs are site design and stormwater management techniques that seek to minimize the stormwater impacts of development by mimicking natural hydrologic processes.

Minimum Requirement #6: Runoff Treatment

- *Basic treatment* BMPs remove sediment from the water column to prevent sedimentation of receiving waters and the adverse effects

of sedimentation on fish and amphibians. Sediments can also carry other pollutants, and sediment removal reduces the level of these other pollutants in the runoff.

- *Enhanced treatment* BMPs provide a greater degree of removal of dissolved metals (that are toxic to salmon and other endangered species) than “basic” runoff treatment BMPs.
- *Phosphorus treatment* BMPs include larger wet pond facilities, media filtration BMPs, and treatment trains intended to reduce total phosphorus concentrations in nutrient-sensitive lakes.
- *Oil control* BMPs remove non-polar, hydrophobic substances (oil and grease) from stormwater by trapping the floating material with baffles or other physical barriers. They are required for high use sites.

Minimum Requirement #7: Flow Control

- *Flow control* BMPs are infiltration and/or detention BMPs that control the hydrologic impacts of stormwater by matching predevelopment peak flows, flow durations, and levels of infiltration.
- Applying LID and onsite BMPs within a threshold discharge area may also be used as part of flow control efforts.

Selection of construction-phase stormwater pollution prevention BMPs to meet Minimum Requirement #2 is described in Volume II. Selection of post-construction source control BMPs to meet Minimum Requirement #3 is described in Volume IV.

4.2 Step-by-Step BMP Selection Process

Selecting appropriate BMPs for a project site requires knowledge of:

- The receiving water(s) of the project site’s discharge
- Whether Thurston County, Ecology, or the EPA have identified the receiving water as subject to phosphorus control requirements
- Site conditions that may require oil control or enhanced runoff treatment.

Figure 4.1 illustrates the BMP selection process. The steps of this process are described in detail below.

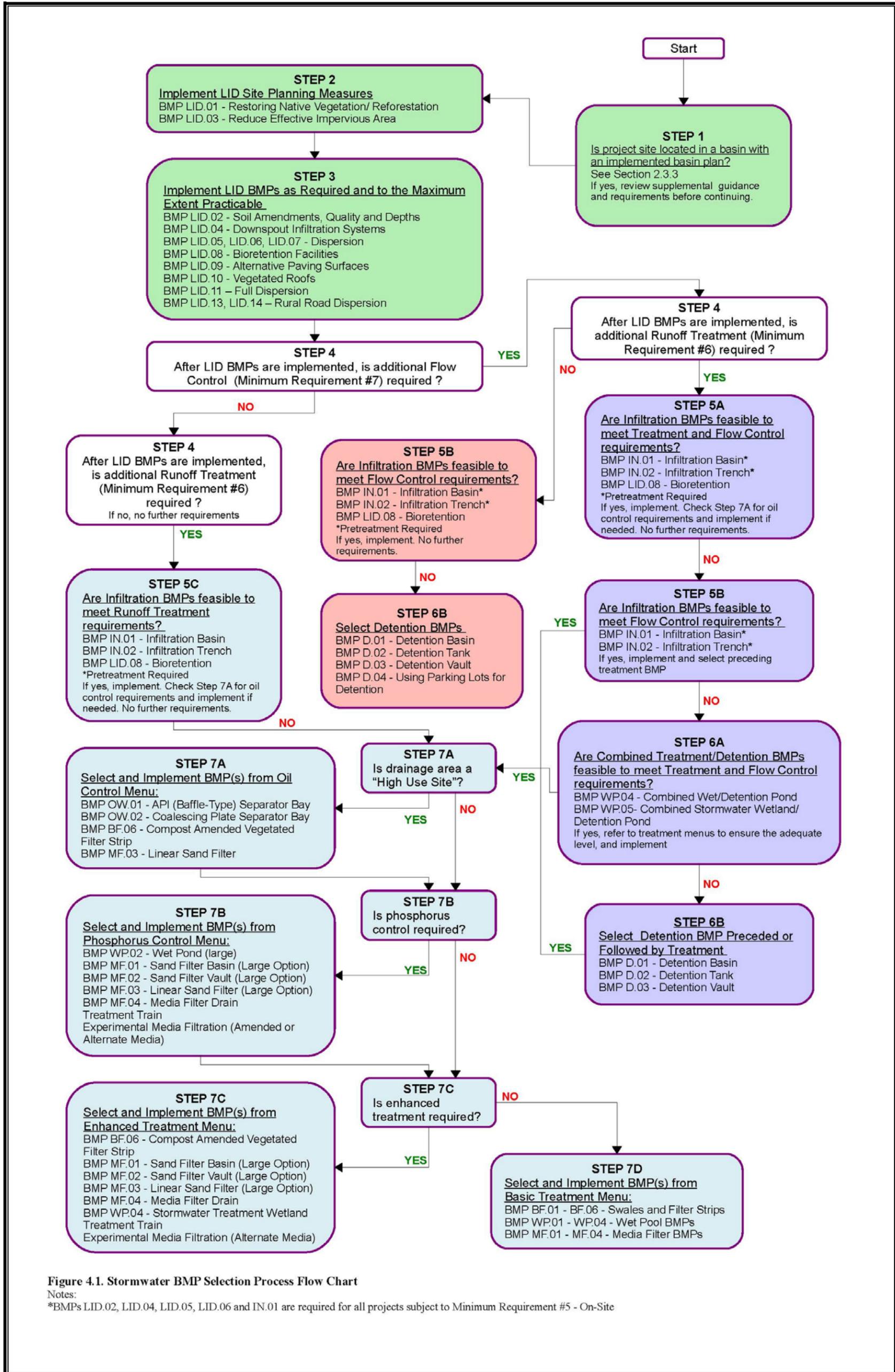


Figure 4.1. Stormwater BMP Selection Process Flow Chart

Notes:

*BMPs LID.02, LID.04, LID.05, LID.06 and IN.01 are required for all projects subject to Minimum Requirement #5 - On-Site

Figure 4.1. Stormwater BMP Selection Process Flow Chart.

4.2.1 Step 1: Determine if the Project Site is in a Basin with an Implemented Basin Plan

Does Your Project Drain to a Basin with an Implemented Basin Plan?

If so, see the applicable basin plan or the Thurston County basin planning website to determine if there are applicable requirements or restrictions for runoff treatment, flow control, and infiltration. You must meet the more stringent of either of the controls described in this section or those in the basin plan. See the Thurston County basin planning website for more information:

<http://www.co.thurston.wa.us/stormwater/BasinPlans/Basin_Plans_home.htm>.

4.2.2 Step 2: Implement LID Site Planning Measures

Thoughtful site design can significantly reduce both the cost and land area required for stormwater management and the hydrologic and water quality impacts of your project. Volume V provides ideas for smart design and LID measures to consider and, where feasible, implement at the earliest planning stages. Site planning LID BMPs include:

- **BMP LID.01:** Restore Native Vegetation
- **BMP LID.03:** Reduce Effective Impervious Areas Associated with Roads, Shared Accesses, Alleys, Sidewalks, Driveways, and Parking Areas.
- **BMP LID.11:** Full Dispersion

4.2.3 Step 3: Implement LID BMPs as Required and to the Maximum Extent Practicable

To meet Minimum Requirement #5: Onsite Stormwater Management, new and redevelopment projects must meet the requirements of the following onsite BMPs:

- **BMP LID.02:** Post-Construction Soil Quality and Depth.

Downspout controls, which includes:

- **BMP LID.04:** Downspout Infiltration Systems
- **BMP LID.05:** Downspout Dispersion Systems.

Alternately, rooftop runoff may be managed using one of the following BMPs:

- **BMP LID.08:** Bioretention Facilities
- **BMP LID.10:** Vegetated Roofs

Although some combination of the above BMPs is required to comply with Minimum Requirement #5, Thurston County encourages developers to incorporate LID BMPs to the maximum extent practicable. The following BMPs can be especially effective:

- **BMP LID.08:** Bioretention Facilities

Many parts of Thurston County have soils with high infiltration rates. By designing your site so that small areas drain to localized facilities (e.g., bioretention facilities), you may be able to manage most of your runoff onsite, using areas not much larger than those needed for traditional landscaping.

- **BMP LID.09:** Alternative Paving Surfaces

Where permissible by Thurston County or local jurisdiction road standards (or with approval), alternative paving surfaces such as porous concrete or asphalt can be used, and are highly effective at reducing or eliminating stormwater runoff and associated stormwater treatment, flow control, and conveyance costs. Even with nominal infiltration rates of underlying soils, alternative paving surfaces are highly effective at treating and controlling stormwater runoff, since there is effectively a 1:1 ratio of contributing area to storage/infiltration facility (run-on of stormwater to alternative paving surfaces is not allowed by Thurston County).

- **BMP LID.06:** Sheet Flow Dispersion

Sheet flow dispersion is an effective way to reduce the stormwater runoff from moderately sloping impervious surfaces such as driveways, sport courts, patios, or bare soil where concentration of flows can be avoided.

- **BMP LID.07:** Concentrated Flow Dispersion

Where sheet flow dispersion cannot be achieved, concentrated flow dispersion should be considered.

For roadway projects in the rural area of Thurston County (outside UGA and NPDES boundaries), additional BMPs that allow greater flexibility for dispersion include:

- **BMP LID.12:** Rural Roads Natural Dispersion

For rural roads where adequate native vegetation is available within the right-of-way or adjacent to the right-of-way, concentrated and sheet flows can be dispersed using this BMP.

- **BMP LID.13:** Rural Roads Engineered Dispersion

For rural roads where native vegetation is inadequate or not available within the right-of-way or adjacent to the right-of-way, but sufficient area is available to create an engineered dispersion area, concentrated and sheet flows can be dispersed to the engineered dispersion area using this BMP.

For projects on large parcels or where development can be concentrated in a small area of a parcel and limits on impervious surfaces, landscape areas and native vegetation retention can be met, the applicant may choose to apply the following BMP:

- **BMP LID.11:** Full Dispersion

Full dispersion is allowed for projects where a combination of limits on impervious surface and landscape area and minimum native vegetation retention is provided such that stormwater flows can be dispersed and infiltrated to an extent that flow control and water quality treatment facilities are not required or are greatly reduced in size. The dispersion techniques of this BMP provide greater flexibility than dispersion BMPs for sites not meeting the criteria for full dispersion.

4.2.4 Step 4: Determine Applicability of Minimum Requirements #6 and #7

After implementing LID BMPs, see the Minimum Requirements (Chapter 2 of this volume) to determine whether additional flow control (Minimum Requirement #7) or runoff treatment (Minimum Requirement #6) BMPs are required. The implementation of LID BMPs will help reduce the amount of flow control runoff treatment facilities required.

Are Both Flow Control and Runoff Treatment Required?

If YES, proceed to Step 5A.

If NO, proceed to next question.

Is Flow Control Required?

If YES, proceed to Step 5B.

If NO, proceed to next question.

Is Runoff Treatment Required?

If YES, proceed to Step 5C.

If NO, there are no further requirements.

4.2.5 Step 5: Select infiltration BMP

Step 5A: Determine Feasibility and Select Infiltration BMP for Both Flow Control and Runoff Treatment

Can an infiltration facility meet your project's flow control requirements, and do your site and soils meet the site suitability and runoff treatment criteria in Section 2.3 of Volume III?

If YES, select from the following BMPs to provide both flow control and runoff treatment. Also, check Step 7A to determine if oil control is needed prior to infiltration. If so, select an oil control BMP from the list and implement. However, do not continue to Step 7B. If after implementing one of the following BMPs the discharge to surface water exceeds flow control thresholds, proceed to Step 6B and implement detention BMP to meet flow control requirements:

- **BMP IN.01:** Infiltration Basins
- **BMP IN.02:** Infiltration Trenches
- **BMP LID.08:** Bioretention Facilities.

If NO, proceed to Step 5B.

Step 5B: Determine Feasibility and Select Infiltration BMP for Flow Control

Can an infiltration facility meet your project's flow control requirements and does your site meet the site suitability criteria in Section 2.3 of Volume III (pretreatment required)?

If YES, select from the following BMPs to provide flow control:

- **BMP IN.01:** Infiltration Basins
- **BMP IN.02:** Infiltration Trenches
- **BMP IN.04:** Bio-Infiltration Swale.

If after implementing one of the above BMPs there is a discharge to surface water that exceeds flow control requirements, proceed to Step 6B and implement detention BMP to meet flow control requirements.

Proceed to Step 7 if runoff treatment is still required to select runoff treatment BMP(s) located upstream of the infiltration BMP. If not, BMP selection is complete.

If *NO and runoff treatment is still required*, proceed to Step 6A.

If *NO and no runoff treatment is required*, proceed to Step 6B.

Step 5C: Determine Feasibility and Select Infiltration BMP for Runoff Treatment

Do your site and soils meet the site suitability and runoff treatment criteria in Section 2.3 of Volume III?

If YES, select from the following BMPs:

- **BMP IN.01:** Infiltration Basins
- **BMP IN.02:** Infiltration Trenches
- **BMP IN.04:** Bio-Infiltration Swale
- **BMP LID.08:** Bioretention Facilities.

Also, check Step 7A to determine if oil control is needed prior to infiltration. If so, select an oil control BMP from the list and implement. However, do not continue to Step 7B.

If NO, proceed to Step 7.

4.2.6 Step 6: Select Detention BMP

Step 6A: Determine Feasibility and Select Combined Treatment/Flow Control BMP

Is a combined treatment/flow control BMP feasible?

If YES, select from the following BMPs:

- **BMP WP.04:** Combined wet/detention pond
- **BMP WP.05:** Combined stormwater wetland/detention pond.

Proceed to Step 7 to evaluate the need for additional oil control BMPs, and to verify that the combined BMP selected above meets the necessary treatment level.

If NO, proceed to Step 6B.

Step 6B: Select Detention BMP

Select from the following BMPs:

- **BMP D.01:** Detention Ponds
- **BMP D.02:** Detention Tanks
- **BMP D.03:** Detention Vaults
- **BMP D.04:** Use of Parking Lots for Detention.

If *runoff treatment (Minimum Requirement #6)* is required for your project, proceed to Step 7.

If *no runoff treatment is required*, BMP selection is complete.

4.2.7 Step 7: Select Runoff Treatment BMP

Step 7A: Determine Feasibility and Select Oil Control BMP

Is your project a “high use site”?

”High use” sites include:

- An area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area (see Section 4.4 for guidance on estimating traffic counts)
- An area of a commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil
- An area of a commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.)
- A road intersection with a measured average daily traffic (ADT) count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

Section 4.4 has supplemental information on oil control, including land uses that are likely to have areas that fall within the definition of “high use sites”.

If YES, select one of the following BMPs and proceed to Step 7B:

- **BMP OW.01:** API (Baffle type) Separator Bay
- **BMP OW.02:** Coalescing Plate (CP) Separator Bay
- **BMP OW.03:** Oil Containment Booms. (not allowed for private development)

Alternately, the following BMPs can be used to meet oil control requirements and other treatment levels. If these BMPs are selected, steps 7B, 7C, and 7D must be completed to ensure that they meet the appropriate level of treatment:

- **BMP MF.03:** Linear Sand Filter (if amended to provide phosphorus treatment)
- **BMP WP.03:** Wet vaults (if designed to include a baffle)
- **BMP BF.06:** Compost-Amended Vegetated Filter Strip.

If NO, proceed to Step 7B.

Step 7B: Phosphorus Control BMP

The following Thurston County lakes are reported under Section 305(b) of the Clean Water Act and designated as not supporting beneficial uses due to phosphorus.

- Black Lake
- Capitol Lake
- Clear Lake
- Lawrence Lake
- Long Lake
- Pattison Lake (south arm).

Projects within any of these lakes' basins will be required to provide phosphorus treatment, unless a TMDL or County-approved lake management plan specifically identified phosphorus treatment as unnecessary.

If there is no lake management plan or TMDL for one of the above water bodies, and your project has the potential to contribute phosphorus to it

(e.g., landscaped areas that will be fertilized, bare soils that could be transported offsite), phosphorus treatment is required.

If phosphorus treatment is required, select and apply a phosphorous treatment facility from the list below:

- **BMP LID.08:** Bioretention Facility
- **BMP MF.04:** Media Filter Drain
- **BMP MF.01:** Sand Filter Basin (if amended to provide phosphorus treatment)
- **BMP MF.03:** Linear Sand Filter (if amended to provide phosphorus treatment)
- **BMP MF.02:** Sand Filter Vault (if amended to provide phosphorus treatment)
- **BMP WP.02:** Wet ponds (if designed to be a large wet pond)
- **BMP WP.03:** Wet vaults (if designed to be a large wet vault)
- **BMP WP.04:** Combined detention/wet pool facilities (if designed with a large wet pool).

Note: Project sites subject to the Phosphorus Treatment requirement could also be subject to the Enhanced Treatment requirement (see Step 11). In that event, apply a facility or a treatment train that is listed both above and under Step 7C. Infiltration treatment also provides phosphorous treatment.

Proceed to Step 7C.

Step 7C: Enhanced Treatment BMP

Does your project discharge to fish-bearing streams, lakes, or to waters or conveyance systems tributary to fish-bearing streams or lakes?

If NO, proceed to Step 7D.

If YES, proceed to next question.

Does your project drain directly (or, indirectly through a municipal storm sewer system) to a salt water body?

If YES, proceed to Step 7D.

If NO:

Does your project include any of the following?

- Infiltration facility within a designated Well Head Protection Area for a public water supply serving over 1,000 connections.
- Industrial project sites,
- Commercial project sites,
- Multi-family project sites, and
- High Annual Average Daily Traffic (AADT) roads as follows:
 - Within Urban Growth Management Areas:
 - Fully controlled and partially controlled limited access highways with AADT counts of 15,000 or more
 - All other roads with an AADT of 7,500 or greater
 - Outside of Urban Growth Management Areas:
 - Roads with an AADT of 15,000 or greater unless discharging to a 4th Strahler order stream or larger
 - Roads with an AADT of 30,000 or greater if discharging to a 4th Strahler order stream or larger (as determined using 1:24,000 scale maps to delineate stream order).

However, areas of the project sites listed above that are identified as subject to Basic Treatment requirements (see Section 4.6) are also not subject to Enhanced Treatment requirements. For developments with a mix of land use types, the Enhanced Treatment requirement shall apply when the runoff from the areas subject to the Enhanced Treatment requirement comprises 50 percent or more of the total runoff within a threshold discharge area.

If YES, select enhanced treatment BMPs for your site or for those areas subject to enhanced treatment BMPs.

- **BMP LID.08:** Bioretention Facilities
- **BMP BF.06:** Compost-Amended Vegetated Filter Strip
- **BMP WP.01:** Stormwater treatment wetland
- **BMP MF.04:** Media Filter Drain

- **BMP MF.01:** Sand Filter Basin (if amended to provide enhanced treatment)
- **BMP MF.03:** Linear Sand Filter (if amended to provide enhanced treatment)
- **BMP MF.02:** Sand Filter Vault (if amended to provide enhanced treatment).

Step 7D: Basic Treatment BMP

The following are options for basic treatment BMPs:

- **BMP BF.01:** Basic Biofiltration Swale
- **BMP BF.02:** Wet Biofiltration Swale
- **BMP BF.03:** Continuous Inflow Biofiltration Swale
- **BMP BF.04:** Basic Filter Strip
- **BMP BF.05:** Narrow area filter strip
- **BMP WP.01:** Stormwater treatment wetland
- **BMP WP.02:** Wet ponds
- **BMP WP.03:** Wet vaults
- **BMP WP.04:** Combined detention/wet pool facilities
- **Any BMP providing enhanced treatment.**

This completes the treatment facility selection process.

4.3 Oil Control BMPs: Supplemental Information

4.3.1 Applicability

The traffic count (to determine whether a site is considered “high use”) can be estimated using information from *Trip Generation*, published by the Institute of Transportation Engineers, or from a traffic study prepared by a professional engineer or transportation specialist with experience in traffic estimation.

The following urban land uses are likely to have areas that fall within the definition of “high use sites” or have sufficient quantities of free oil present that can be treated by an API or CP-type oil and water separator:

- Industrial Machinery and Equipment, and Railroad Equipment Maintenance
- Log Storage and Sorting Yards
- Aircraft Maintenance Areas
- Railroad Yards
- Fueling Stations
- Vehicle Maintenance and Repair
- Construction Businesses (paving, heavy equipment storage and maintenance, storage of petroleum products).

Oil control facilities should also be used on other sites that generate high concentrations of oil. All-day parking areas are not intended to be defined as high use sites and should not require the oil control options listed in this menu. Gasoline stations, with or without small food stores, will likely exceed the high use site threshold. The petroleum storage and transfer criterion is intended to address regular transfer operations such as gasoline service stations, not occasional filling of heating oil tanks.

4.3.2 Application on the Project Site

Oil control facilities are to be placed upstream of other facilities, as close to the source of oil generation as possible. 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 treatment facility must be sized to treat all water passing through it.

High use roadway intersections shall treat lanes where vehicles accumulate during the signal cycle, including left and right turn lanes and through lanes, from the beginning of the left turn pocket. If no left turn pocket exists, the treatable area shall begin at a distance equal to three car lengths 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.

4.3.3 Performance Goal

The facility choices in the Oil Control Menu are intended to achieve the goals of no ongoing or recurring visible sheen, and to have a 24-hour average Total Petroleum Hydrocarbon (TPH) concentration no greater

than 10 mg/l, and a maximum of 15 mg/l for a discrete sample (grab sample).

Note: Use the method for NWTPH-Dx in Ecology Publication No. ECY 97-602, Analytical Methods for Petroleum Hydrocarbons to determine oil concentrations. If the concentration of gasoline is of interest, the method for NWTPH-Gx should be used to analyze grab samples.

4.3.4 Oil Control Menu

Options

Oil control options include facilities that are small, treat runoff from a limited area, and require frequent maintenance. The options also include facilities that treat runoff from larger areas and generally have less frequent maintenance needs.

- **BMP OW.01:** API-Type Oil/Water Separator
- **BMP OW.02:** Coalescing Plate Oil/Water Separator
- **BMP MF.03:** Linear Sand Filter
- **BMP BF.06:** Compost-Amended Vegetated Filter Strip.
- **BMP WP.03:** Wet vaults (if designed to include a baffle).

Note: The linear sand filter is also used in the Basic, Enhanced, and Phosphorus Treatment menus. If used to satisfy one of those treatment requirements, the same facility shall not also be used to satisfy the oil control requirement, unless enhanced maintenance is assured. This is to prevent clogging of the filter by oil so that it will function for both suspended solids and phosphorus removal. Quarterly cleaning is required unless otherwise specified by the designer.

4.4 Phosphorus Treatment: Supplemental Information

4.4.1 Where Applied

The Phosphorus Treatment Menu (below) applies to projects within watersheds determined by local governments, the Department of Ecology, or the USEPA to be sensitive to phosphorus, and that are being managed to control phosphorus inputs from stormwater. This menu applies to stormwater conveyed to the lake by surface flow and to stormwater infiltrated within one-quarter mile of the lake in soils that do not meet soil suitability criteria described in Volume III, Chapter 3.

4.4.2 Performance Goal

The Phosphorus Menu facility choices are intended to achieve a goal of 50 percent total phosphorus removal for a range of influent concentrations of 0.1 – 0.5 mg/l total phosphorus. The choices are also intended to achieve the Basic Treatment performance goal. The performance goal applies to the water quality design storm volume or flow rate, whichever is applicable, and on an annual average basis. The incremental portion of runoff in excess of the water quality design flow rate or volume can be routed around the facility (offline treatment facilities), or can be passed through the facility (online treatment facilities) provided a net pollutant reduction is maintained. Ecology encourages the design and operation of treatment facilities that engage a bypass at flow rates higher than the water quality design flow rate. Note that wet pool facilities are always designed to be online.

4.4.3 Phosphorus Treatment Menu

Any one of the following options may be chosen to satisfy the phosphorus treatment requirement.

- Infiltration with appropriate pretreatment:
 - **Infiltration treatment:** If infiltration is through soils meeting the minimum site suitability criteria for infiltration treatment (see Chapter 3 of Volume III and Volume V), a presettling basin or a basic treatment facility can serve for pretreatment.
 - **Infiltration preceded by Basic Treatment:** If infiltration is through soils that do not meet the soil suitability criteria for infiltration treatment, treatment must be provided by a basic treatment facility unless the soil and site fit the description in the next option below.
 - **Infiltration preceded by Phosphorus Treatment:** If the soils do not meet the soil suitability criteria *and* the infiltration site is within 1/4 mile of a phosphorus-sensitive receiving water, or a tributary to that water, treatment must be provided by one of the other treatment facility options listed below.
- **BMP MF.01 or MF.02:** Large Sand Filter
- **BMP MF.01 or MF.02:** Amended Sand Filter

Note: Processed steel fiber and crushed calcitic limestone are the only sand filter amendments for which Ecology has data that documents increased dissolved metals removal. Though Ecology is interested in obtaining additional data on the effectiveness of

these amendments, Ecology is allowing local governments to exercise their judgment on the extent to which to allow their use. The use of processed steel fiber has been reported to cause a number of maintenance problems as it oxidizes over time and decreases the design filtration rate.

- **BMP WP.02:** Large Wet Pond
- Media Filter targeted for phosphorus removal (Drainage Manual Administrator acceptance required)
- Two-Facility Treatment Trains – see [Table 4.1](#).

Table 4.1. Treatment Trains for Phosphorus Removal

First Basic Treatment Facility	Second Treatment Facility
BMP BF.01 Biofiltration Swale	BMP MF.01 Sand Filter Basin or BMP MF.02 Sand Filter Vault
BMP BF.04 Filter Strip	BMP MF.03 Linear Sand Filter (no presettling needed)
BMP MF.03 Linear Sand Filter	BMP BF.04 Filter Strip
BMP WP.02 Basic Wet Pond	BMP MF.01 Sand Filter Basin or BMP MF.02 Sand Filter Vault
BMP WP.03 Wet Vault	BMP MF.01 Sand Filter Basin or BMP MF.02 Sand Filter Vault
BMP WP.01 Stormwater Treatment Wetland	BMP MF.01 Sand Filter Basin or BMP MF.02 Sand Filter Vault
BMP WP.04 Basic Combined Detention and Wet Pool	BMP MF.01 Sand Filter Basin or BMP MF.02 Sand Filter Vault

4.5 Enhanced Treatment: Supplemental Information

4.5.1 Performance Goal

The Enhanced Menu facility choices (below) are intended to provide a higher rate of removal of dissolved metals than Basic Treatment facilities. Due to the sparse data available on dissolved metals removal in stormwater treatment facilities, a specific numeric removal efficiency goal could not be established at the time of publication. Instead, Ecology relied on available nationwide and local data, and knowledge of the pollutant removal mechanisms of treatment facilities to develop the list of options below.

The choices are also intended to achieve the Basic Treatment performance goal. This performance goal assumes that the facility is treating stormwater with dissolved Copper typically ranging from 0.003 to 0.02 mg/l, and dissolved Zinc ranging from 0.02 to 0.3 mg/l.

The performance goal applies to the water quality design storm volume or flow rate, whichever is applicable, and on an annual average basis. The incremental portion of runoff in excess of the water quality design flow rate or volume can be routed around the facility (off-line treatment facilities), or can be passed through the facility (on-line treatment facilities) provided a net pollutant reduction is maintained. Ecology encourages the design and operation of treatment facilities that engage a bypass at flow rates higher than the water quality design flow rate as long as the reduction in dissolved metals loading exceeds that achieved with initiating bypass at the water quality design flow rate. Note that wet pool facilities are always designed to be on-line.

4.5.2 Enhanced Treatment Menu

Any one of the following options may be chosen to satisfy the enhanced treatment requirement:

Note: If phosphorous treatment is also required, select a facility or facility train that meets both Enhanced and Phosphorous treatment.

- Infiltration with appropriate pretreatment (see Volume III and Volume V)
 - *Infiltration treatment:* If infiltration is through soils meeting the minimum site suitability criteria for infiltration treatment (see Volume III and Volume V), a presettling basin or a basic treatment facility can serve for pretreatment.
 - *Infiltration preceded by Basic Treatment:* If infiltration is through soils that do not meet the soil suitability criteria for infiltration treatment, treatment must be provided by a basic treatment facility unless the soil and site fit the description in the next option below.
 - *Infiltration preceded by Enhanced Treatment:* If the soils do not meet the soil suitability criteria **and** the infiltration site is within a designated well head protection area or within 1/4 mile of a fish-bearing stream, a tributary to a fish-bearing stream, or a lake, treatment must be provided by one of the other treatment facility options listed below.
- **BMP MF.01 or BMP MF.02:** Large Sand Filter
- **BMP MF.01 or BMP MF.02:** Amended Sand Filter (sand filter amendment requires Drainage Manual Administrator acceptance from Thurston County)
- **BMP WP.01:** Stormwater Treatment Wetland

- **BMP BF.06:** Compost-amended Filter Strip
- Two Facility Treatment Trains – see [Table 4.2](#)

Table 4.2. Treatment Trains for Dissolved Metals Removal

First Basic Treatment Facility	Second Treatment Facility
Biofiltration Swale	Basic Sand Filter or Sand Filter Vault or Media Filter ¹
Filter Strip	Linear Sand Filter with no pre-settling cell needed
Linear Sand Filter	Filter Strip
Basic Wet Pond	Basic Sand Filter or Sand Filter Vault or Media Filter ¹
Wet Vault	Basic Sand Filter or Sand Filter Vault or Media Filter ¹
Basic Combined Detention/Wet Pool	Basic Sand Filter or Sand Filter Vault or Media Filter ¹
Basic Sand Filter or Sand Filter Vault with a presettling cell if the filter isn't preceded by a detention facility	Media Filter ¹

¹ The media must be of a nature that has the capability to remove dissolved metals effectively based on at least limited data. Ecology includes Stormfilter's™ leaf compost and zeolite media in this category.

- **BMP LID.08:** Bioretention Facility

Note: Any stormwater runoff that infiltrates through the imported soil mix will have received the equivalent of Enhanced Treatment. Where bioretention/rain gardens are intended to fully meet treatment requirements, they must be designed, using an approved continuous runoff model, to infiltrate 91 percent of the influent runoff file.

- **BMP MF.04:** Media Filter Drain

4.6 Basic Treatment: Supplemental Information

4.6.1 Applicability

The Basic Treatment Menu (below) is applied to:

- Project sites that discharge to the ground, *unless*:
 - The soil suitability criteria for infiltration treatment are met (see Chapter 3 of Volume III and Volume V), or

- The project uses infiltration strictly for flow control – not treatment – and the discharge is within 1/4 mile of a phosphorus sensitive lake (use the Phosphorus Treatment Menu), or within 1/4 mile of a fish-bearing stream, or a lake (use the Enhanced Treatment Menu).
- Facility is located within a designated Well Head Protection Area for a public water supply with 1,000 connections or greater (use the Enhanced Treatment Menu).
- Residential projects not otherwise needing phosphorus control as designated by the EPA, Ecology, or a local government.
- Project sites discharging directly to salt water or basic receiving waters
- Project sites that drain to streams that are not fish-bearing, or to waters not tributary to fish-bearing streams
- Landscaped areas of industrial, commercial, and multi-family project sites, and parking lots of industrial and commercial project sites, dedicated solely to parking of employees' private vehicles that do not involve any other pollution-generating sources (e.g., industrial activities, customer parking, storage of erodible or leachable material, wastes or chemicals). For developments with a mix of land use types, the Basic Treatment requirement shall apply when the runoff from the areas subject to the Basic Treatment requirement comprises 50 percent or more of the total runoff within a threshold discharge area.

4.6.2 Performance Goal

The Basic Treatment Menu facility choices (below) are intended to remove 80 percent of TSS for influent concentrations that are greater than 100 mg/l, but less than 200 mg/l. For influent concentrations greater than 200 mg/l, a higher treatment goal may be appropriate. For influent concentrations less than 100 mg/l, the facilities are intended to achieve an effluent goal of 20 mg/l TSS.

The performance goal applies to the water quality design storm volume or flow rate, whichever is applicable. The goal also applies on an average annual basis to the entire annual discharge volume (treated plus bypassed). The incremental portion of runoff in excess of the water quality design flow rate or volume can be routed around the facility (off-line treatment facilities), or can be passed through the facility (on-line treatment facilities) provided a net TSS reduction is maintained. Ecology encourages the design and operation of treatment facilities that engage a

bypass at flow rates higher than the water quality design flow rate as long as the reduction in TSS loading exceeds that achieved with initiating bypass at the water quality design flow rate. Wet pool facilities are always designed to be online. The performance goal assumes that the facility is treating stormwater with a typical particle size distribution. For a description of a typical particle size distribution, please refer to the stormwater monitoring protocol in “Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol - Ecology (TAPE)” on the Ecology website:
<<http://www.ecy.wa.gov/biblio/0210037.html>>.

4.6.3 Basic Treatment Menu

Any one of the following options may be chosen to satisfy the basic treatment requirement:

- Infiltration (with adequate soils)
- Sand filters
- Biofiltration swales
- Filter strips
- Basic wet pond
- Wet vault
- Stormwater treatment wetland
- Combined detention and wet pool facilities
- Bioretention facilities

Note: For bioretention facilities, any stormwater runoff that infiltrates through the imported soil mix will have received the equivalent of Enhanced Treatment. Where bioretention/rain gardens are intended to fully meet treatment requirements, they must be designed, using an approved continuous runoff model, to infiltrate 91 percent of the influent runoff file.

- Media Filter Drain
- Alternative Technologies when accepted at the “General Use Level” under Ecology’s TAPE program: (for example: CONTECH Stormwater Management StormFilter with ZPG™ media – A canister-type filter with zeolite/perlite/granular activated carbon).

Note: A wet vault may be used for commercial, industrial, or road projects if there are space limitations. Thurston County discourages the use of wet vaults for residential projects. Combined detention/wet vaults are allowed. Any use of a wet vault for basic treatment requires specific authorization and acceptance by Thurston County based on site circumstances.

4.7 Other Treatment Facility Selection Factors

Selection of a treatment facility should be based on physical site factors and pollutants of concern. Requirements for using Enhanced Treatment or Phosphorus Treatment represent facility selection based on pollutants of concern. Even if the site is not subject to those requirements, try to choose a facility that has been shown to remove the types of pollutants generated on the site. The types of physical site factors that influence facility selection are summarized below.

4.7.1 Soil Type

The permeability of soil under a treatment facility has a profound influence on the facility's effectiveness. This is particularly true for infiltration treatment facilities that are best sited in sandy to loamy sand soils, and not generally appropriate for sites that have final infiltration rates of less than 0.5 inches per hour. Wet pond facilities situated on coarser soils will need a synthetic liner or soil amendment to reduce the infiltration rate and provide treatment. Maintaining a permanent pool in the first cell is necessary to avoid resuspension of settled solids. Biofiltration swales in coarse soils can also be amended to reduce the infiltration rate.

4.7.2 High Sediment Input

High TSS loads can clog infiltration soil, sand filters and coalescing plate oil & water separators. Pretreatment with a presettling basin, wet vault, or another basic treatment facility would typically be necessary.

4.7.3 Other Physical Factors

Slope

Steep slopes restrict the use of several BMPs. For example, biofiltration swales are usually situated on sites with slopes of less than 6 percent, although greater slopes can be considered. Infiltration BMPs are not suitable when the slope exceeds 15 percent.

High Water Table

Unless there is sufficient horizontal hydraulic receptor capacity, the water table acts as an effective barrier to exfiltration and can sharply reduce the

efficiency of an infiltration system. If the seasonal high water table extends to within 5 feet of the bottom of an infiltration BMP, the site is seldom suitable.

Depth to Bedrock/Hardpan/Till

The downward exfiltration of stormwater is also impeded if a bedrock or till layer lies too close to the surface. If the impervious layer lies within 5 feet below the bottom of the infiltration BMP, the site is seldom suitable. Similarly, pond BMPs are often not feasible if bedrock lies within the area that must be excavated.

Proximity to Foundations and Wells

Since infiltration BMPs convey runoff back into the soil, some sites may experience problems with local seepage. This can be a real problem if the BMP is located too close to a building foundation. Another risk is ground water pollution; hence the requirement to site infiltration systems more than 100 feet away from drinking water wells.

Maximum Depth

Wet ponds are also subject to a maximum depth limit for the "permanent pool" volume. Deep ponds (greater than 8 feet) may stratify during summer and create low oxygen conditions near the bottom resulting in re-release of phosphorus and other pollutants back into the water.

Appendix I-A Glossary

303(d) waterbody	A list of lakes, rivers, and streams designated as impaired or threatened by a pollutant for which one or more TMDLs are needed. “Impaired” means the water is not meeting water quality standards.
319	The section of the federal Clean Water Act that addresses nonpoint pollution.
Applicant	The person who has applied for a development permit or approval.
Aquifer	A geologic strata containing water that can be withdrawn and used for human purposes.
Arterial	Road or street primarily for through traffic. A major arterial connects an Interstate Highway to cities and counties. A minor arterial connects major arterials to collectors. A collector connects an arterial to a neighborhood. A collector is not an arterial. A local access road connects individual homes to a collector.
As-built drawings	Engineering plans which have been revised to reflect all changes to the plans which occurred during construction.
Basin	Any area draining to a point of interest.
Basin plan	A plan that assesses, evaluates, and proposes solutions to existing and potential future impacts to the beneficial uses of, and the physical, chemical, and biological properties of waters of the state within a basin. Basins typically range in size from 1 to 50 square miles.
Best Management Practice (BMP)	The schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington State.
Bond	A surety bond, cash deposit or escrow account, assignment of savings, irrevocable letter of credit or other means acceptable to or required by the manager to guarantee that work is completed in compliance with the project's drainage plan and in compliance with all local government requirements.
Buffer	The zone contiguous with a sensitive area that is required for the continued maintenance, function, and structural stability of the sensitive area. The critical functions of a riparian buffer (those associated with an aquatic system) include shading, input of organic debris and coarse sediments, uptake of nutrients, stabilization of banks, interception of fine sediments, overflow during high water events, protection from disturbance by humans and domestic animals, maintenance of wildlife habitat, and room for variation of aquatic system boundaries over time due to hydrologic or climatic effects. The critical functions of terrestrial buffers include protection of slope stability, attenuation of surface water flows from stormwater runoff and precipitation, and erosion control.

Catch basin	A chamber or well, usually built at the curb line of a street, for the admission of surface water to a sewer or subdrain, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.
Cation Exchange Capacity (CEC)	The amount of exchangeable cations that a soil can adsorb at pH 7.0.
Channel	A feature that conveys surface water and is open to the air.
Channel, natural	Streams, creeks, or swales that convey surface/ground water and have existed long enough to establish a stable route and/or biological community.
Check dam	Small dam constructed in a gully or other small watercourse to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment.
Clearing	The destruction and removal of vegetation by manual, mechanical, or chemical methods.
Closed depression	An area which is low-lying and either has no, or such a limited, surface water outlet that during storm events the area acts as a retention basin.
Commercial agriculture	Those activities conducted on lands defined in RCW 84.34.020(2), and activities involved in the production of crops or livestock for wholesale trade. An activity ceases to be considered commercial agriculture when the area on which it is conducted is proposed for conversion to a nonagricultural use or has lain idle for more than five (5) years, unless the idle land is registered in a federal or state soils conservation program, or unless the activity is maintenance of irrigation ditches, laterals, canals, or drainage ditches related to an existing and ongoing agricultural activity.
Compost	Organic residue or a mixture of organic residues and soil, that has undergone biological decomposition until it has become relatively stable humus. Reference note: The Department of Ecology Interim Guidelines for Compost Quality (1994) defines compost as “the product of composting; it has undergone an initial, rapid stage of decomposition and is in the process of humification (curing).” Compost used should meet specifications for grade A or AA compost in Ecology publication 94-038.
Converted pervious surface	Areas of native vegetation that have been converted to lawn or landscape.
Conveyance system	The drainage facilities, both natural and man-made, which collect, contain, and provide for the flow of surface and stormwater from the highest points on the land down to a receiving water. The natural elements of the conveyance system include swales and small drainage courses, streams, rivers, lakes, and wetlands. The human-made elements of the conveyance system include gutters, ditches, pipes, channels, and most retention/detention facilities.

Critical areas	At a minimum, areas which include wetlands, areas with a critical recharging effect on aquifers used for potable water, fish and wildlife habitat conservation areas, frequently flooded areas, geologically hazardous areas, including unstable slopes, and associated areas and ecosystems. Critical areas are those areas as defined by Thurston County Code, Title 17.
Critical drainage area	An area with such severe flooding, drainage and/or erosion/sedimentation conditions that the area has been formally adopted as a Critical Drainage Area by rule under the procedures specified in an ordinance.
Culvert	Pipe or concrete box structure that drains open channels, swales or ditches under a roadway or embankment. Typically with no catchbasins or manholes along its length.
Curb and gutter barrier	An element of a roadway that prevents sheet flow of runoff from the roadway surface at the road edge and concentrates the flow for conveyance through a gutter to either a point of discharge or a catch basin structure and/or piping system. This includes rolled curbs, inverted crown roadway, asphalt wedge curbs and concrete curb and gutters.
Design storm	A prescribed hyetograph and total precipitation amount (for a specific duration recurrence frequency) used to estimate runoff for a hypothetical storm of interest or concern for the purposes of analyzing existing drainage, designing new drainage facilities or assessing other impacts of a proposed project on the flow of surface water. (A hyetograph is a graph of percentages of total precipitation for a series of time steps representing the total time during which the precipitation occurs.)
Detention facility	An above or below ground facility, such as a pond or tank, that temporarily stores stormwater runoff and subsequently releases it at a slower rate than it is collected by the drainage facility system. There is little or no infiltration of stored stormwater.
Discharge	Runoff leaving a new development or redevelopment via overland flow, built conveyance systems, or infiltration facilities. A hydraulic rate of flow, specifically fluid flow; a volume of fluid passing a point per unit of time, commonly expressed as cubic feet per second, cubic meters per second, gallons per minute, gallons per day, or millions of gallons per day.
Dispersion	Release of surface and stormwater runoff from a drainage facility system such that the flow spreads over a wide area and is located so as not to allow flow to concentrate anywhere upstream of a drainage channel with erodible underlying granular soils.
Drainage easement	A legal encumbrance that is placed against a property's title to reserve specified privileges for the users and beneficiaries of the drainage facilities contained within the boundaries of the easement.
Dry season	The season in which little rainfall occurs. In Western Washington, from May 1 through September 30.

Earth material	Any rock, natural soil or fill and/or any combination thereof. Earth material shall not be considered topsoil used for landscape purposes. Topsoil used for landscaped purposes shall comply with ASTM D 5268 specifications. Engineered soil/landscape systems are also defined independently.
Ecology	Washington Department of Ecology. The agency responsible for implementing the stormwater control required by the Clean Water Act.
Embankment	A structure of earth, gravel, or similar material raised to form a pond bank or foundation for a road.
Erosion	The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Also, detachment and movement of soil or rock fragments by water, wind, ice, or gravity.
ESA	Endangered Species Act
Effective impervious surface	Those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system. Impervious surfaces on residential development sites are considered ineffective if the runoff is dispersed through at least one hundred feet of native vegetation in accordance with BMP LID.11 – “Full Dispersion,” as described in Volume V.
Energy dissipator	Any means by which the total energy of flowing water is reduced. In stormwater design, they are usually mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They include rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams.
Eutrophic	A condition in a waterbody where nutrient over-enrichment has led to excessive growth of aquatic plants, especially algae.
Excavation	The mechanical removal of earth material.
Fish bearing stream	A stream is generally considered fish-bearing in Western Washington if it is 2 feet or greater in width and has a gradient of 20 percent or less. Intermittent streams may also be fish-bearing for those times during which the stream is flowing. Includes lakes or ponds connected to a known fish-bearing water by a stream channel of similar dimensions as above.
Flow control facility	A drainage facility designed to mitigate the impacts of increased surface and stormwater runoff flow rates generated by development. Flow control facilities are designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground, or to hold runoff for a short period of time, releasing it to the conveyance system at a controlled rate.
Flow duration	The aggregate time that peak flows are at or above a particular flow rate of interest. For example, the amount of time that peak flows are at or above 50% of the 2-year peak flow rate for a period of record.
Flow frequency	The inverse of the probability that the flow will be equaled or exceeded in any given year (the exceedance probability). For example, if the exceedance probability is 0.01 or 1 in 100, that flow is referred to as the 100-year flow.

Frequency of storm (design storm frequency)	The anticipated period in years that will elapse, based on average probability of storms in the design region, before a storm of a given intensity and/or total volume will recur; thus a 10-year storm can be expected to occur on the average once every 10 years. Sewers designed to handle flows that occur under such storm conditions would be expected to be surcharged by any storms of greater amount or intensity.
Ground water	Water in a saturated zone or stratum beneath the land surface or a surface waterbody.
Groundwater table	The free surface of the ground water, that surface subject to atmospheric pressure under the ground, generally rising and falling with the season, the rate of withdrawal, the rate of restoration, and other conditions. It is seldom static.
Habitat	The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be protected from harmful biological, chemical, and physical alterations.
Hardpan	A cemented or compacted and often clay-like layer of soil that is impenetrable by roots. Also known as glacial till.
Highway	A main public road connecting towns and cities.
Hydrologic cycle	The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages or processes as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration.
Hydrologic soil groups	<p>A soil characteristic classification system defined by the U.S. Soil Conservation Service in which a soil may be categorized into one of four soil groups (A, B, C, or D) based upon infiltration rate and other properties.</p> <p>Type A: Low runoff potential. Soils having high infiltration rates, even when thoroughly wetted, and consisting chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.</p> <p>Type B: Moderately low runoff potential. Soils having moderate infiltration rates when thoroughly wetted, and consisting chiefly of moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.</p> <p>Type C: Moderately high runoff potential. Soils having slow infiltration rates when thoroughly wetted, and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures. These soils have a slow rate of water transmission.</p> <p>Type D: High runoff potential. Soils having very slow infiltration rates when thoroughly wetted, and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a hardpan, till, or clay layer at or near the surface, soils with a compacted subgrade at or near the surface, and shallow soils or nearly impervious material. These soils have a very slow rate of water transmission.</p>

Hydrology	The science of the behavior of water in the atmosphere, on the surface of the earth, and underground.
Hydroperiod	A seasonal occurrence of flooding and/or soil saturation; it encompasses depth, frequency, duration, and seasonal pattern of inundation.
Illicit discharge	All non-stormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality or ground water quality standards, including but not limited to sanitary sewer connections, industrial process water, interior floor drains, car washing, and greywater systems.
Impervious surface	A hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for the purposes of determining whether the thresholds for application of minimum requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.
Impoundment	A natural or man-made containment for surface water.
Industrial activities	Material handling, transportation, or storage; manufacturing; maintenance; treatment; or disposal. Areas with industrial activities include plant yards, access roads and rail lines used by carriers of raw materials, manufactured products, waste material, or by-products; material handling sites; refuse sites; sites used for the application or disposal of process waste waters; sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater.
Infiltration	The downward movement of water from the surface to the subsoil.
Infiltration rate	The rate, usually expressed in inches/hour, at which water moves downward (percolates) through the soil profile. Short-term infiltration rates may be inferred from soil analysis or texture or derived from field measurements. Long-term infiltration rates are affected by variability in soils and subsurface conditions at the site, the effectiveness of pretreatment or influent control, and the degree of long-term maintenance of the infiltration facility.

Interflow	That portion of rainfall that infiltrates into the soil and moves laterally through the upper soil horizons until intercepted by a stream channel or until it returns to the surface for example, in a roadside ditch, wetland, spring or seep. Interflow is a function of the soil system depth, permeability, and water-holding capacity.
Land disturbing activity	Any activity that results in movement of earth, or a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered a land disturbing activity. Vegetation maintenance practices are not considered land-disturbing activity.
Maximum extent practicable	The NPDES permit requires permittees to reduce the discharge of pollutants to the maximum extent practicable (MEP). Permittees who choose to use the site planning process, and BMP selection and design criteria in the 2005 Stormwater Management Manual for Western Washington, or an equivalent manual approved by Ecology, may cite this choice as their sole documentation to meet this requirement. When used in conjunction with application of BMPs such as LID it means those measures that are feasible taking into consideration all factors such as site conditions, soils, type of project, cost, maintenance, human health and the environment.
Maintenance	Repair and maintenance includes activities conducted on currently serviceable structures, facilities, and equipment that involves no expansion or use beyond that previously existing and results in no significant adverse hydrologic impact. It includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems. Those usual activities may include replacement of dysfunctioning facilities, including cases where environmental permits require replacing an existing structure with a different type structure, as long as the functioning characteristics of the original structure are not changed. One example is the replacement of a collapsed, fish blocking, round culvert with a new box culvert under the same span, or width, of roadway.
Municipal Separate Storm Sewer System (MS4)	A system where stormwater and wastewater flows are conveyed through separate systems of pipes. (As opposed to a combined sewer system.) MS4 systems exceeding certain population levels must obtain an NPDES permit for stormwater discharges.
Native vegetation	Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas Fir, western hemlock, western red cedar, alder, big-leaf maple, and vine maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.

Natural location	Means the location of those channels, swales, and other non-manmade conveyance systems as defined by the first documented topographic contours existing for the subject property, either from maps or photographs, or such other means as appropriate. In the case of outwash soils with relatively flat terrain, no natural location of surface discharge may exist.
New Development	Land disturbing activities, including Class IV -general forest practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of impervious surfaces; and subdivision, short subdivision and binding site plans, as defined and applied in Chapter 58.17 RCW. Projects meeting the definition of redevelopment shall not be considered new development.
Non-point source (NPS) pollutants	Pollution that comes from many different, hard-to-trace sources with no obvious point of discharge, unlike wastewater treatment plant discharges, for example. NPS pollutants come from roadways, fertilizers on lawns, rooftops, agricultural and forestry practices, and many other diffuse sources.
NPDES	The National Pollutant Discharge Elimination System as established by the Federal Clean Water Act. Under NPDES regulations, point source dischargers must obtain permits.
NPDES Phase II Boundary	The boundary of those areas of Thurston County which have sufficient population density based on the criteria established for the NPDES program managed by Ecology to be subject to the requirements of the NPDES Phase II permit. The boundary is subject to revision based on census data or regulatory changes. A map of the NPDES Phase II Boundary is available for review at the offices of the Thurston County Water Resources Unit of the Department of Resource Stewardship.
Off-line facilities	Water quality treatment facilities to which stormwater runoff is restricted to some maximum flow rate or volume by a flow-splitter.
Off-site	Any area lying upstream of the site that drains onto the site and any area lying downstream of the site to which the site drains.
On-line facilities	Water quality treatment facilities which receive all of the stormwater runoff from a drainage area. Flows above the water quality design flow rate or volume are passed through at a lower percent removal efficiency.
On-site	The entire property that includes the proposed development.
On-site Stormwater Management BMPs	Site development techniques that serve to infiltrate, disperse, and retain stormwater runoff on-site.
Outfall	Every point at which the stormwater conveyance system discharges from the project site into a receiving waterbody, such as a stream, river, wetland, salt water body or lake or a conveyance channel or ditch that eventually discharges to a surface water body such as a lake, stream or wetland.
Outwash soils	Soils formed from highly permeable sands and gravels.

Peak flow rate	The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event, such as a 25-year, 24-hour event.
Permeable soils	Soil materials with a sufficiently rapid infiltration rate so as to greatly reduce or eliminate surface and stormwater runoff. These soils are generally classified as SCS hydrologic soil types A and B.
Person	Any individual, partnership, corporation, association, organization, cooperative, public or municipal corporation, agency of the state, or local government unit, however designated.
Pervious surface	A surface which allows water to pass through it.
Phase 1 stormwater permit	The part of the NPDES program that deals with large cities, >100,000 population, or heavily urbanized areas.
Phase 2 stormwater permit	The part of the NPDES program that deals with small cities, generally between 10,000 and 100,000 in population.
Point discharge	The release of collected and/or concentrated surface and stormwater runoff from a pipe, culvert, or channel.
Pollution-generating impervious surface (PGIS)	<p>Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in this glossary); or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall. Erodeable or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage. Metal roofs are also considered to be PGIS unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating).</p> <p>A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following are considered regularly-used surfaces: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, vehicular equipment storage yards, and airport runways.</p> <p>The following are not considered regularly-used surfaces: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, fenced fire lanes, and infrequently used maintenance access roads.</p>
Pollution-generating pervious surface (PGPS)	Any non-impervious surface subject to use of pesticides and fertilizers or loss of soil. Typical PGPS include lawns, landscaped areas, golf courses, parks, cemeteries, and sports fields.

Pre-developed condition	The native vegetation and soils that existed at a site prior to the influence of Euro-American settlement. The predeveloped condition shall be assumed to be a forested land cover unless reasonable, historic information is provided that indicates the site was prairie prior to settlement.
Pretreatment	The removal of material such as solids, grit, grease, and scum from flows prior to physical, biological, or physical treatment processes to improve treatability. Pretreatment may include screening, grit removal, settling, oil/water separation, or application of a Basic Treatment BMP prior to infiltration.
Project engineer	The professional civil engineer licensed in the State of Washington who prepares the analysis, design, and engineering plans for an applicant's permit or approval submittal.
Project proponent	The person with overall responsibility for directing the project as a representative of the owner (may be the owner, architect, developer or project engineer).
Project site	That portion of a property, properties, or right of way subject to land disturbing activities, new impervious surfaces, or replaced impervious surfaces.
Property Owner's Association	A non-profit corporation established for the purposes of enforcing subdivision covenants, conditions and restrictions and for operating, maintaining and repairing private facilities associated with the subdivision such as roads, stormwater facilities, open space, water and sewer systems, as applicable. As used in this manual, it is synonymous with Home Owner's Association, Lot Owner's Association, Condominium Association, etc.
Receiving waters	Bodies of water or surface water systems to which surface runoff is discharged via a point source of stormwater or via sheet flow.
Redevelopment	On a site that is already developed, the creation or addition of impervious surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of impervious surface that is not part of a routine maintenance activity; and land disturbing activities.
Regional detention facility	A detention facility sited to detain stormwater runoff from a number of new developments or areas within a catchment, subbasin, or basin.
Replaced impervious surface	For structures, the removal and replacement of any exterior impervious surfaces or foundation. For other impervious surfaces, the removal down to bare soil or base course and replacement.
Retention	The process of collecting and holding surface and stormwater runoff with no surface outflow.
Runoff	Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes and wetlands as well as shallow ground water. As applied in this manual, it also means the portion of rainfall or other precipitation that becomes surface flow and interflow.

Salmonid	A member of the fish family Salmonidae. Chinook, coho, chum, sockeye and pink salmon; cutthroat, brook, brown, rainbow, and steelhead trout; Dolly Varden, kokanee, and char are examples of salmonid species.
Site	The area defined by the legal boundaries of a parcel or parcels of land that is (are) subject to new development or redevelopment. For road projects, the length of the project site and the right-of-way boundaries define the site.
Soil group, hydrologic	A classification of soils by the Soil Conservation Service into four runoff potential groups. The groups range from A soils, which are very permeable and produce little or no runoff, to D soils, which are not very permeable and produce much more runoff.
Source control	Control of pollution by preventing it from entering stormwater such as covering materials, rather than treating it after it enters stormwater.
Stormwater facility	A constructed component of a stormwater drainage system, designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales. An engineered or natural dispersion area that is dedicated to stormwater use is also considered a stormwater facility for purposes of this manual.
Surface and stormwater	Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow ground water.
SWPPP	Storm Water Pollution Prevention Plan
TESC	Temporary erosion and sediment control.
Threshold Discharge Area	An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath).
Tightline	A continuous length of pipe that conveys water from one point to another (typically down a steep slope) with no inlets or collection points in between.
Till	A layer of poorly sorted soil deposited by glacial action that generally has very low infiltration rates.
Time of concentration	The time period necessary for surface runoff to reach the outlet of a subbasin from the hydraulically most remote point in the tributary drainage area.
Topsoil	Topsoil shall be per ASTM D5268 standard specification, and water permeability shall be 0.6 inches per hour or greater. Organic matter shall have not more than 10 percent of nutrients in mineralized water soluble forms. Topsoil shall not have phytotoxic characteristics.

Total Maximum Daily Load (TMDL)	A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL (also known as a Water Cleanup Plan) is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for reasonable variation in water quality. Water quality standards are set by states, territories, and tribes. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.
Total Suspended Solids (TSS)	Suspended solids are organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles (and associated pollutants) as well as solids in stormwater. TSS refers to the solids that can be captured on a standard glass filter.
Tract	A legally created parcel of property designated for special nonresidential and noncommercial uses.
Water Resource Inventory Area (WRIA)	Ecology and other state natural resources agencies have divided the state into 62 Water Resource Inventory Areas or WRIsAs to delineate the state's major watersheds.
Water table	The upper surface or top of the saturated portion of the soil or bedrock layer indicates the uppermost extent of ground water.
Waters of the state	Surface waters of the state include lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands, and all other surface waters and water courses within the jurisdiction of the state of Washington.
Wet season	The season in which most of the rainfall occurs. In Western Washington, from October 1 through April 30.
WSDOT	Washington State Department of Transportation
WSDOT Standard Plans	The most current version of the Washington State Department of Transportation's Standard Plans.
WSDOT Standard Specifications	The most current version of the Standard Specifications for Road, Bridge and Municipal Construction prepared and promulgated by the Washington State Department of Transportation and any revisions thereof.

Appendix I-B

Bond Quantities Worksheet

BOND QUANTITIES WORKSHEET

Instructions

Financial assurance may be required for your project for one of several purposes including, but not limited to:

- **Bonding for Site Improvements:** As part of a land division to secure completion of required site improvements (Thurston County Code, Title 18, Section 18.24, "Agreement and Bond for Improvements").
- **Maintenance Bond:** To secure successful operation and maintenance of site stormwater facilities (Thurston County Code, Title 15, Section 15.05.040, "Financial Guarantee required").
- **Performance Bond:** To guarantee the performance of, or to correct permitted work in accordance with Thurston County Road Standards Section 2.16, "Securities". This can include roadway, stormwater, landscaping or other work that is part of the approved project.
- Other purposes as allowed by Thurston County Code and/or Washington State Law.

The attached Bond Quantities Worksheet is provided to the applicant for use in preparing cost estimates associated with establishment of a financial assurance for a project. For items not used in your project, leave the line blank or cross out the item. Unit prices should be based on actual construction costs and/or price quotes from providers. Unit prices inconsistent with current prices require the applicant to provide supporting data and/or justification. Unit prices and quantities are subject to the acceptance of the Administrator or designee.

The Bond Quantities Worksheet covers the following work items:

1. Erosion & Sediment Control
2. General Items (site work)
3. Road Improvements
4. Roadway Surfacing
5. Drainage

Additional project elements including sewer, water supply, franchise utility service (phone, power, cable, etc.) are not included in the worksheet; however, estimates for these items may be required depending on the type of financial assurance being provided or as required by the utility service providers.

Note: All unit prices shall include labor, equipment, materials, overhead and profit.

SITE IMPROVEMENT BOND QUANTITY WORKSHEET				
Item	Quantity	Unit	Unit Price	Amount
EROSION/SEDIMENT CONTROL				
Backfill & compaction-embankment		CY		
Check dams, 4" minus rock		Each		
Crushed surfacing 1-1/4" minus		CY		
Ditching		CY		
Excavation-bulk		CY		
Fence, silt		LF		
Fence, Temporary (Orange Construction)		LF		
Hydroseeding		SY		
Jute Mesh		SY		
Mulch, by hand, straw, 3" deep		SY		
Mulch, by machine, straw, 2" deep		SY		
Piping, temporary, CPP, 6"		LF		
Piping, temporary, CPP, 8"		LF		
Piping, temporary, CPP, 12"		LF		
Plastic covering, 6 mm, sandbagged		SY		
Rip Rap, machine placed; slopes		CY		
Rock Construction Entrance, 50'x15'x1'		Each		
Rock Construction Entrance, 100'x15'x1'		Each		
Sediment pond riser assembly		Each		
Sed. Trap, 5' high, riprapped spillway		Each		
Seeding, by hand		SY		
Sodding, 1" deep, level ground		SY		
Sodding, 1" deep, sloped ground		SY		
TESC Supervisor		HR		
Water truck, dust control		HR		
Wheel Wash		Each		
Street Sweeper		HR		
WRITE-IN-ITEMS				
EROSION & SEDIMENT CONTROL SUBTOTAL:				
CONTINGENCY & MOBILIZATION (30%):				
EROSION & SEDIMENT CONTROL TOTAL:				
Item	Quantity	Unit	Unit Price	Amount

SITE IMPROVEMENT BOND QUANTITY WORKSHEET				
GENERAL ITEMS				
Backfill & Compaction-embankment		CY		
Backfill & Compaction-trench		CY		
Clear/Remove Brush, by hand		SY		
Clearing/Grubbing/Tree Removal		Acre		
Excavation-bulk		CY		
Excavation-trench		CY		
Fencing, cedar, 6' high		LF		
Fencing, chain link, vinyl coated, 6' high		LF		
Fencing, chain link, gate, vinyl coated, 20'		Each		
Fencing, split rail, 3' high		LF		
Fill & compact – common borrow		CY		
Fill & compact – gravel base		CY		
Fill & compact – screened topsoil		CY		
Soil Amendment – scarification, placement		SY		
Gabion, 12" deep, stoned-filled mesh		SY		
Gabion, 18" deep, stone-filled mesh		SY		
Gabion, 36" deep, stone-filled mesh		SY		
Grading, fine, by hand		SY		
Grading, fine, with grader		SY		
Monuments, 3' long		Each		
Sensitive Areas Sign		Each		
Stormwater Facility Sign		Each		
Soil Amendment		SY		
Sodding, 1" deep		SY		
Surveying, line & grade		Day		
Surveying, lot location/lines		Acre		
Traffic control crew (2 flaggers)		HR		
Traffic control signs		Day		
Trail, 4" chipped wood		SY		
Trail, 4" crushed cinder		SY		
Trail, 4" top course		SY		
Wall, retaining, concrete		SF		
Wall, retaining, segmental block		SF		
Wall, rockery		SF		
Well, monitoring or piezometer		Each		

SITE IMPROVEMENT BOND QUANTITY WORKSHEET

Item	Quantity	Unit	Unit Price	Amount
<u>WRITE-IN-ITEMS</u>				
GENERAL ITEMS SUBTOTAL:				
CONTINGENCY & MOBILIZATION (30%):				
GENERAL ITEMS TOTAL:				
<u>ROAD IMPROVEMENT</u>				
AC grinding, removal & disposal		SY		
Barricade, type I		LF		
Barricade, type III (Permanent)		LF		
Curb and Gutter, rolled		LF		
Curb and Gutter, vertical		LF		
Curb and Gutter, demolition and disposal		LF		
Curb, extruded asphalt		LF		
Curb, extruded concrete		LF		
Sawcut, asphalt, 3" depth		LF		
Sawcut, concrete, per 1" depth		LF		
Sealant, asphalt		LF		
Shoulder, AC, (see AC road unit price)		SY		
Shoulder, gravel, 4" thick		SY		
Sidewalk, 4" thick		SY		
Sidewalk, 4" thick, demolition and disposal		SY		
Sidewalk, 5" thick		SY		
Sidewalk, 5" thick, demolition and disposal		SY		
Sign, handicap		Each		

SITE IMPROVEMENT BOND QUANTITY WORKSHEET

Item	Quantity	Unit	Unit Price	Amount
DRAINAGE (CPP=Corrugated Plastic Pipe, N12 or equivalent)				
Access Road, (Pond)		SY		
Bollards – fixed		Each		
Bollards – removable		Each		
*(CB's include frame & grate/lid)				
CB Type I		Each		
CB Type IL		Each		
CB Type II, 48" dia,		Each		
for additional depth over 4'		FT		
CB Type II, 54" dia		Each		
For additional depth over 4'		FT		
CB Type II, 60" dia		Each		
For additional depth over 4'		FT		
CB Type II, 72" dia		Each		
For additional depth over 4'		FT		
Through-curb inlet Framework		Each		
Cleanout, PVC, 4"		Each		
Cleanout, PVC, 6"		Each		
Cleanout, PVC, 8"		Each		
Storm Drain Pipe, PVC, 4"		LF		
Storm Drain Pipe, PVC, 6"		LF		
Storm Drain Pipe, PVC, 8"		LF		
Storm Drain Pipe, PVC, 12"		LF		
Storm Drain Pipe, CPP, 8"		LF		
Storm Drain Pipe, CPP, 12"		LF		
Storm Drain Pipe, CPP, 15"		LF		
Storm Drain Pipe, CPP, 18"		LF		
Storm Drain Pipe, CPP, 24"		LF		
Storm Drain Pipe, Concrete, 8"		LF		
Storm Drain Pipe, Concrete, 12"		LF		
Storm Drain Pipe, Concrete, 15"		LF		
Storm Drain Pipe, Concrete, 18"		LF		
Storm Drain Pipe, Concrete, 24"		LF		
Storm Drain Pipe, Concrete, 30"		LF		

SITE IMPROVEMENT BOND QUANTITY WORKSHEET				
Item	Quantity	Unit	Unit Price	Amount
Storm Drain Pipe, Concrete, 36"		LF		
Storm Drain Pipe, Concrete, 42"		LF		
Storm Drain Pipe, Concrete, 48"		LF		
Storm Drain Pipe, _____, ____"		LF		
Storm Drain Pipe, _____, ____"		LF		
Storm Drain Pipe, _____, ____"		LF		
Storm Drain Pipe, _____, ____"		LF		
Ditching		CY		
Flow Dispersal Trench		LF		
French Drains		LF		
Geotextile		SY		
Infiltration Pond Testing (post-construction)		LS		
Detention Tank System		LS		
Detention Vault System		LS		
Vault/Tank Access Riser		Each		
Pond Excavation & Embankment		CY		
Swale Excavation & Embankment		LF		
Pond Overflow Spillway		Each		
Restrictor/Oil Separator, 12"		Each		
Restrictor/Oil Separator, 15"		Each		
Restrictor/Oil Separator, 18"		Each		
Riprap, placed		CY		
Trash rack, 12"		Each		
Trash rack, 15"		Each		
Trash rack, 18"		Each		
Trash rack, 24"		Each		
Trash rack, _____"		Each		
Storm Facility Landscaping, Fencing & Signage		LS		
<u>WRITE-IN-ITEMS</u>				

Appendix I-C

Engineer's Construction Inspection Report Form

ENGINEER'S CONSTRUCTION INSPECTION REPORT FORM

Project Name: _____

Project Number: _____

Location (address, or other): _____

Stormwater Ponds (detention, infiltration, wetponds, etc.):

1. Type: _____

2(a). After pond construction, have infiltration tests and/or soil logs been completed? _____

2(b). Indicate test results and compare with design criteria (pre-construction soils information). Do the post-construction values indicate a need to modify system design? Explain. _____

3. Outlet Type _____

4. Field verify orifices, weirs, overflow at correct elevation: (Y/N) _____

Comments: _____

5. Field verify orifices, weirs, etc. of correct size per design plans: (Y/N) _____

Comments: _____

6. Emergency Spillway at correct elevation, slope, width, adequately armored, etc. (Y/N)

Comments: _____

7. As-built of pond volume verified based on field survey: (Y/N) _____

As-built volume at Max water elevation: _____ Cubic Feet

8. Pond side slopes per design: _____
9. Pond landscaping completed per design: _____

10. Pond inlet pipes and swales adequately armored: _____

11. Pond outlet pipe is adequately armored to prevent erosion: _____

12. Amended soils placed per design (if applicable): _____

Water Quality Treatment Facility:

1. Facility dimensions (width, length, depth, slope, etc.) per plans based on field survey:
Comments: _____

2. Level spreaders constructed per plan and field verified: (Y/N) _____
3. Amended soils meet specifications and placed per plans and specifications:
(Y/N) _____, Depth of amended soil: _____ inches. Comments: _____

4. Swale bottom sodded and sideslopes seeded per design seed mix: (Y/N): _____
Comments: _____

5. Plantings installed per planting plan (quantity, type and quality): (Y/N): _____

6. Grass established and growing (swale bottom & slopes) _____

Conveyances

1. Channels properly graded, sloped, planted, etc. _____

2. Storm sewers are at proper grade, inlets as designed, trenches as designed, pipe bedding properly prepared, backfilling procedures correct, materials as specified, etc. _____

Dispersion & Post-Construction Soil Quality/Depth:

1. Have all required disturbed areas had amended soils placed of the type and amount required: (explain)

2. Are areas designated for stormwater dispersion undisturbed and protected from encroachment by signage and fencing as required: _____

3. Have disturbed areas of native vegetation required to remain undisturbed been replanted and restored per Best Management Practices: _____

4. Are level spreaders and rock dispersion pads in place and functioning correctly: _____

5. Inspect dispersion areas and verify that no short circuiting, channeling, etc. is occurring to prevent sheet flow treatment of stormwater: _____

Roof Leaders:

1. Do roof leaders drain to infiltration trenches, drywells or rain gardens as shown on the plans (if applicable). _____

2. If roof drain dispersion is used, do splash blocks direct roof runoff to amended soils, do contributing areas of different roof drains meet convergence criteria and is there adequate dispersion length through native vegetation or amended soils as required by Best Management Practices? _____

Erosion Control:

1. Describe erosion temporary erosion and sediment control measures used during project construction: _____

2. Describe temporary erosion and sediment controls remaining in place pending full site stabilization: _____

3. What final site stabilization still needs to occur prior to removing final temporary erosion and sediment control facilities: _____

4. During construction were there any discharges of sediment laden waters to water bodies, wetlands or to adjacent properties? If so, what measures were taken to mitigate impacts: _____

5. Are permanent erosion control measures in place and as designed? _____

Signature and Seal:

I or someone under my direct supervision have adequately inspected the project during construction and to the best of my knowledge the project was built according to the approved plans and specifications except as noted above.

Signature/Date: _____

Appendix I-D

Facility Summary Form

**THURSTON COUNTY
FACILITY SUMMARY FORM**

Complete one (1) for each facility on the project site including flow control and water quality treatment facilities (BMPs) such as, but not limited to: detention ponds, vaults, or tanks; infiltration ponds, trenches, swales, or vaults; bioretention facilities (rain gardens, bioretention swales/slopes); biofiltration BMPs (filter strip, biofiltration swale); oil/water separators; wet ponds; constructed wetlands; dispersion areas & flow spreaders; StormFilters™ & other proprietary devices; sand filters; etc. Attach 8 1/2 x 11 sketch showing location of facility. Applicant may prepare one copy of pages 1 to 4 for the project and then attach multiple copies of pages 5 & 6 for each separate facility.

Facility Name or Identifier (e.g., Pond A): _____

Total Number of Facilities Associated with Project: _____
(For which a Facility Summary Form is being prepared)

Name of Road or Street to Access Facility: _____

Name of Nearest Major Cross Street: _____

Hearings Examiner Case Number: _____

Thurston County Project No./Bldg Permit No.: _____

Parcel Number(s): _____

To be completed by Utility Staff:

Utility Facility Number _____

Project Number (num) _____

Parcel Number Status, (num, 1ch) _____
(0, Known; 1, Public; 2 Unknown; 3, Unassigned)

Basin and Subbasin: (num, 6ch) _____
(2ch for basin, 2ch for subbasin, 2ch future)

Part 1 - Project Name and Proponent

Project Name: _____

Project Owner: _____

Project Contact: _____

Address: _____

Phone: _____

Project Proponent: (if different) _____

Address: _____

Phone: _____

Project Engineer: _____

Firm: _____ Phone: _____

Part 2 - Project Location

Section _____

Township _____

Range _____

Names and Addresses of Adjacent Property Owners: (attach add'l sheet if required)

Part 3 - Type of Permit Application

Type of permit (e.g., Building, Plat, etc.): _____

Other Permits (circle)

WDFW HPA

COE 404

COE Wetlands

DOE Dam Safety

FEMA Floodplain

Shoreline Mgmt

Rockery/Retaining Wall

Encroachment

Grading

NPDES Construction Storm

NPDES Industrial

Forest Practices/Clearing

Other _____

Other Agencies (Federal, State, Local, etc.) that have had or will review this Drainage and Erosion Control Plan:

Part 4 - Proposed Project Description

What stream/lake/saltwater basin is this project in (e.g., Salmon, Green Cove, Woodland):

Project Area, acres (total area of all parcels) _____

Project Area Disturbed, acres (total of all areas disturbed by project) _____
(Include all area cleared, graded, etc. as part of this project)

Onsite Impervious Surfaces: *(excluding offsite public / private street frontage).*

Existing Impervious Surface, acres: _____

Replaced Impervious Surface, acres: _____

Existing Impervious Converted to Landscape, acres: _____

New Impervious Surface, acres: _____

Total Impervious, acres (existing, new, and replaced): _____

Zoning: _____

Onsite:

Residential Subdivision:

Number of Lots: _____

Lot size (average), acres: _____

Building Permit/Commercial Plat:

Building(s) Footprint, acres: _____

Concrete Paving, acres: _____

Gravel Surface, acres: _____

Lattice Block or Porous Paving, acres: _____

New Public Roads (including gravel shoulder), acres: _____

New Private Roads (including gravel shoulder), acres: _____

Frontage Improvements (including gravel shoulder), acres: _____

Existing road frontage to center of right-of-way, acres: _____

Part 5 - Pre-Developed Project Site Characteristics

Stream through site, y/n: _____

Name: _____

DNR Type: _____

Type of feature this facility discharges to (i.e., lake, stream, intermittent stream, pothole, roadside ditch, sheet flow to adjacent private property, etc):

Swales, Ravines, y/n: _____

Steep slopes, (steeper than 15%) y/n: _____

Erosion hazard, y/n: _____
(soil types classified "highly erodible" by NRCS soil survey)

100 yr. Floodplain, y/n: _____

Lakes or Wetlands, y/n: _____

Seeps/Springs, y/n: _____

High Groundwater Table, y/n: _____
(depth to seasonal high groundwater table less than 5-feet)

Wellhead Protection or Aquifer Sensitive Area, y/n: _____

Other: _____

Part 6 - Facility Description

Facility Type: _____

Facility Description: _____

Total Area Tributary to Facility Including Offsite (acres): _____

Total Onsite Area Tributary to Facility (acres): _____

Design Impervious Area Tributary to Facility (acres): _____

Design Landscaped Area Tributary to Facility (acres): _____

Design Native Vegetation Area Tributary to Facility (acres): _____

Design Total Tributary Area to Facility (acres): _____

Water Quality Design Volume: _____

Water Quality Design Flow: _____

100 Year return interval, 24-hr Design Flow: _____

Part 7 - Release to Groundwater (if applicable)

Design Infiltration Rate _____ in/hr

Average Annual Infiltration per WWHM _____

Designed for 100% Infiltration Y/N: _____

Designed for Infiltration Treatment Y/N: _____

Part 8 - Release to Surface Water (if applicable)

Discharge Structure: (check all that apply)

Single orifice _____ Elev. _____ Dia. _____

Multiple orifice _____ Elev. 1 _____ Dia. _____

Elev. 2 _____ Dia. _____

Elev. 3 _____ Dia. _____

Weir _____ Elev. _____ Type _____

Overflow Weir _____ Elev. _____ Dia/Width: _____

Spillway _____ Elev. _____ Max Elev. _____

Pump(s) _____ Model/Type: _____ Rating: _____

Other _____

Discharge to surface water:

<u>Return Period</u>	<u>Pre Developed:</u>	<u>Post Developed:</u>
2 year:	_____	_____
5 year:	_____	_____
10 year:	_____	_____
25 year:	_____	_____
50 year:	_____	_____
100 year:	_____	_____

Pond Information:

Design Max surface water elevation: _____ ft (msl)

Design Maximum pond depth: _____ ft

Pond Volume at Max design water level: _____ cubic feet

Overflow water elevation: _____ ft (msl)

Sediment storage volume: _____ ft (depth below outlet)

Appendix I-E

Maintenance Agreement Forms

COMMERCIAL/INDUSTRIAL MAINTENANCE AGREEMENT

After recording return to:

Thurston County
2000 Lakeridge Drive SW
Olympia, WA 98502

Thurston County Project No. _____

**“COMMERCIAL/INDUSTRIAL”
AGREEMENT TO MAINTAIN
STORMWATER FACILITIES AND TO IMPLEMENT A
POLLUTION SOURCE CONTROL PLAN**

For purposes of this agreement and for indexing by the Auditor as required by R.C.W. Ch. 65.04, the parties of this agreement are _____, **Grantor**, and Thurston County, **Grantee**.

LEGAL DESCRIPTION OF PROPERTY: (Abbreviated legal description if complete legal will not fit here and reference to where complete legal can be found.)

Assessor Parcel No.(s)

(COMMERCIAL/INDUSTRIAL VERSION)

**AGREEMENT TO MAINTAIN
STORMWATER FACILITIES AND TO IMPLEMENT A
POLLUTION SOURCE CONTROL PLAN
BY AND BETWEEN THURSTON COUNTY, AND

[INSERT LEGAL NAME OF OWNER] _____, AND
ITS HEIRS, SUCCESSORS, OR ASSIGNS
(HEREINAFTER "OWNER")**

The upkeep and maintenance of stormwater facilities and the implementation of pollution source control best management practices (BMPs) are essential to the protection of water resources in Thurston County. All property owners are expected to conduct business in a manner that promotes environmental protection. This Agreement contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs. The authority to require maintenance and pollution source control is provided by Thurston County Code.

LEGAL DESCRIPTION:

[INSERT LEGAL DESCRIPTION HERE OR REFERENCE ATTACHED EXHIBIT]

RECITALS

WHEREAS, OWNER is the owner of certain real property in Thurston County, Washington, described as set forth in the legal description contained herein and referred to in this agreement as the "Property".

and

WHEREAS, In connection with the OWNER'S proposed development of the Property, Thurston County has required and OWNER has agreed to construct stormwater facilities and to implement a pollution source control plan. The stormwater facilities and pollution source control plan were prepared by _____ for the OWNER'S property and is on file with Thurston County.

and

WHEREAS, OWNER has constructed improvements, including but not limited to, buildings, pavement, and stormwater facilities on the Property, in order to further the goals of Thurston County to ensure the protection and enhancement of Thurston County's water resources, THURSTON COUNTY and OWNER hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

OWNER SHALL:

- (1) Implement the stormwater facility maintenance program included herein as Attachment "A".
- (2) Implement the pollution source control program included herein as Attachment "B".

- (3) Maintain a record (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by THURSTON COUNTY at _____ during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items (“problems”) listed in Attachment “A” shall be inspected as specified in the attached instructions or more frequently if necessary. OWNER is encouraged to photocopy the individual checklists in Attachment “A” and use them to complete its monthly inspections. These completed checklists would then, in combination, comprise the log book.
- (4) Submit an annual report to THURSTON COUNTY regarding implementation of the programs referenced in (1) and (2) above. The report must be submitted on or before August 31 of each calendar year and shall contain, at a minimum, the following:
 - (a) Name, address, and telephone number of the business, the person, or the firm responsible for plan implementation, and the person completing the report.
 - (b) Time period covered by the report.
 - (c) A chronological summary of activities conducted to implement the programs referenced in (1) and (2) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with OWNER, include a copy of the invoice for services.
 - (d) An outline of planned activities for the next year.
- (5) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under item 4 above and shall be approved of by THURSTON COUNTY. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by THURSTON COUNTY and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements, and applications for permits.

THURSTON COUNTY WILL, AS RESOURCES ALLOW:

- (1) Provide technical assistance to OWNER in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request, as County time and resources permit and at no charge to OWNER.
- (2) Review the annual report and conduct occasional site visits to discuss performance and problems with OWNER.
- (3) Review this agreement with OWNER and modify it as necessary.

REMEDIES:

- (1) If THURSTON COUNTY determines that maintenance or repair work is required to be done to the stormwater facility existing on the OWNER’S property, THURSTON COUNTY shall give OWNER, and the person or agent in control of said property if different, notice of the specific maintenance and/or

On this day and year above personally appeared before me, _____
_____ known to be the _____ of _____
_____, the company that executed the forgoing instrument, and acknowledged
the said instrument to be the free and voluntary act and deed of said company, for the uses and purposes
therein mentioned, and on oath stated that he is authorized to execute the said instrument.

Given under my hand and official seal this _____ day of _____, _____.

Notary Public in and for the State of
Washington, residing in _____
My commission expires _____

Dated at _____, Washington, this _____ day of _____, _____

APPROVED as to form only:

ACCEPTED BY:

Thurston County Prosecuting Attorney

for THURSTON COUNTY

Date

Date

RESIDENTIAL SUBDIVISION MAINTENANCE AGREEMENT

After recording return to:

Thurston County
2000 Lakeridge Drive SW
Olympia, WA 98502

Thurston County Project No. _____

**RESIDENTIAL SUBDIVISION
AGREEMENT TO MAINTAIN
STORMWATER FACILITIES AND TO IMPLEMENT A
POLLUTION SOURCE CONTROL PLAN**

For purposes of this agreement and for indexing by the Auditor as required by R.C.W. Ch. 65.04, the parties of this agreement are _____, **Grantor**, and Thurston County, **Grantee**.

LEGAL DESCRIPTION OF PROPERTY: (Abbreviated legal description if complete legal will not fit here and reference to where complete legal can be found.)

Assessor Parcel No.(s)

- (2) Implement the pollution source control program included herein as Attachment "B".
- (3) Maintain a record (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by THURSTON COUNTY at _____ during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more frequently if necessary. OWNER is encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its monthly inspections. These completed checklists would then, in combination, comprise the log book.
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 - (e) An outline of planned activities for the next year.
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REMEDIES:

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On this day and year above personally appeared before me, _____
_____ known to be the _____ of _____
_____, the company that executed the forgoing instrument, and acknowledged
the said instrument to be the free and voluntary act and deed of said company, for the uses and purposes
therein mentioned, and on oath stated that he is authorized to execute the said instrument.

Given under my hand and official seal this _____ day of _____, _____.

Notary Public in and for the State of
Washington, residing in _____
My commission expires _____

Dated at _____, Washington, this _____ day of _____, _____

APPROVED as to form only:

ACCEPTED BY:

Thurston County Prosecuting Attorney

for THURSTON COUNTY

Date

Date

SINGLE FAMILY RESIDENTIAL MAINTENANCE AGREEMENT

After recording return to:

Thurston County
2000 Lakeridge Drive SW
Olympia, WA 98502

Thurston County Project No. _____

**“RESIDENTIAL”
AGREEMENT TO MAINTAIN
STORMWATER FACILITIES AND TO IMPLEMENT A
POLLUTION SOURCE CONTROL PLAN**

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LEGAL DESCRIPTION OF PROPERTY: (Abbreviated legal description if complete legal will not fit here and reference to where complete legal can be found.)

Assessor Parcel No.(s)

(RESIDENTIAL VERSION)

**AGREEMENT TO MAINTAIN
STORMWATER FACILITIES AND TO IMPLEMENT A
POLLUTION SOURCE CONTROL PLAN
BY AND BETWEEN THURSTON COUNTY, AND

[INSERT LEGAL NAME OF OWNER] _____, AND
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- (2) Review the annual report and conduct occasional site visits to discuss performance and problems with OWNER.
- (3) Review this agreement with OWNER and modify it as necessary.

REMEDIES:

- (1) If THURSTON COUNTY determines that maintenance or repair work is required to be done to the stormwater facility existing on the OWNER’S property, THURSTON COUNTY shall give OWNER, and the person or agent in control of said property if different, notice of the specific maintenance and/or

repair required. THURSTON COUNTY shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by THURSTON COUNTY, written notice will be sent to the persons who were given notice stating THURSTON COUNTY'S intention to perform such maintenance and bill the owner for all incurred expenses. THURSTON COUNTY may also adjust stormwater utility charges if required maintenance is not performed.

(2) If at any time THURSTON COUNTY determines that the existing system creates any imminent threat to public health, welfare or water quality THURSTON COUNTY may take immediate measures to remedy said threat. No notice to the persons listed in Remedies (1), above, shall be required under such circumstances. All other responsibilities shall remain in effect.

(3) OWNER grants unrestricted authority to THURSTON COUNTY for access to any and all stormwater system features for the purpose of routine inspections and/or performing maintenance, repair and/or retrofit as may become necessary under Remedies (1) and/or (2).

(4) OWNER shall assume all responsibility for the cost of any maintenance and for repairs to the stormwater facility. Such responsibility shall include reimbursement to THURSTON COUNTY within 30 days of the receipt of the invoice for any such work performed. Overdue payments will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by THURSTON COUNTY will be borne by the parties responsible for said reimbursements.

(5) OWNER hereby grants to the THURSTON COUNTY a lien against the above-described property in an amount equal to the cost incurred by THURSTON COUNTY to perform the maintenance or repair work described herein.

This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the County. It shall run with the land and be binding on all parties having or acquiring from OWNER or their successors any right, title, or interest in the property or any part thereof, as well as their title, or interest in the property or any part thereof, as well as their heirs, successors, and assigns. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of THURSTON COUNTY.

Dated at _____, Washington, this _____ day of _____, _____.

OWNER

By: _____ By: _____

Address: _____ Address: _____

Appendix I-F

Soils Report Forms

SOIL EVALUATION REPORT FORMS

INSTRUCTIONS

A geotechnical report and/or soils report is required for the majority of development projects. Specific requirements are described throughout the Drainage Design and Erosion Control Manual. Specific instances when a geotechnical report and/or soil report is required include:

- All projects for which a Drainage and Erosion Control Plan is required.
- To establish field-saturated percolation rates for stormwater facilities and the overall site.
- For characterizing the infiltration receptor when an infiltration facility is proposed for the project.
- For establishing parameters for the performance of a groundwater mounding analysis, if required.
- To support the design of structures, retaining walls and other site features associated with securing a building permit.
- To support the construction of roads, parking areas, etc. as part of the overall project design process.
- For sites with slopes greater than 15% to determine suitability for locating facilities and/or determining whether a landslide hazard exists and addressing the effects of seepage and potential for slope failure.
- As required for grading work per Thurston County Code Chapter 14.31, *International Building Code Appendix J, Grading*.

When completing a geotechnical/soils report, the forms in this Appendix shall be included in the report as follows:

- Form 1: General Site Information: One copy of this completed form will be included at the front of the report.
- Form 2: Soil Log Evaluation: One copy of Form 2 shall be completed and included for each soil location where testing has been done.

Where inadequate space is provided, reference attached supplemental documents or prepare separate report in format that includes each of the headings of Form 1

PREPARER: PLEASE
READ ALL
INSTRUCTIONS
FIRST.

STAFF USE ONLY

SOIL EVALUATION REPORT
FORM 1: GENERAL SITE INFORMATION

PROJECT TITLE: PROJECT NO.: PREPARED BY:	SHEET OF DATE:
1. SITE ADDRESS OR LEGAL DESCRIPTION:	
2. PROJECT DESCRIPTION:	
3. SITE DESCRIPTION:	
4. SUMMARY OF SOILS WORK PERFORMED:	
5. ADDITIONAL SOILS WORK RECOMMENDED:	
6. FINDINGS (Including pre-development site percolation rate):	
7. RECOMMENDATIONS:	
I hereby certify that I prepared this report and conducted or supervised the performance of related work. I certify that I am qualified to do this work. I represent my work to be complete and accurate within the bounds of uncertainty inherent to the practice of soil science and to be suitable for its intended use.	
SIGNED: _____	
DATE: _____	

SOIL EVALUATION REPORT INSTRUCTIONS FOR COMPLETING FORM 1

Form 1 is the “cover page” for all projects that require a soil evaluation report. One copy of Form 1 must accompany all soil evaluation reports. Certain information may be omitted for soil evaluations completed for small projects (e.g., single-family residences, duplexes). The following instructions should give you the guidance needed to complete the form:

1. Provide project name and address or legal description. Attach a legible map on 8 ½” by 11” paper showing site and major landmarks (e.g., roadways and surface waters) within approximately one-quarter mile radius around site.
2. Provide acreage, parcel dimensions, type of development proposed, and approximate proposed coverage of impervious surfaces.
3. Describe site topography, geomorphology, terrain, and natural cover. Distinguish among areas of the site with significantly different characteristics.
4. Provide description and purpose of soils work done. List methods used to expose, sample, and test soils. Give number of test holes logged. Describe field and lab tests performed. Attach a scaled map of good accuracy on 8 ½” by 11” paper showing locations of soil logs. Except small projects, using soil log results, divide map area into sub-areas according to hydrologic group (A through D).
5. Describe soils work still needed. For example, more work may be needed to obtain accurate percolation or infiltration rates for stormwater facilities not yet constructed.
6. Describe results of soil logs and tests and compare with expected soils from NRCS Soils maps. **As appropriate for the project, give your best estimate of the (a) overall predeveloped site infiltration rate, (b) the saturated infiltration rate for the above-ground stormwater facility, or (c) the saturated percolation rate for the below ground stormwater trench or drywell.** Discuss soils factors related to erosion control, infiltration, percolation, and placement of buildings, as these vary on the site.
7. Describe the recommended general approach for managing stormwater on the site. For example, if stormwater can be infiltrated or percolated, indicate where and at what depth. If erosion, soil stability, or high ground water are problems, can these problems be avoided or mitigated?

Sign the form and affix relevant professional seal (e.g., P.E. ARCPACS, R.G.). The form becomes the cover page to one or more copies of Form 2, which has soil logs for each test hole evaluated.

PREPARER: PLEASE
READ ALL
INSTRUCTIONS
FIRST.

STAFF USE ONLY

**SOIL EVALUATION REPORT
FORM 2: SOIL LOG INFORMATION**

PROJECT TITLE:	SHEET	OF
PROJECT NO.:	DATE:	
PREPARED BY:		

SOIL LOG:
LOCATION:

1. TYPE OF TEST DONE:	2. NRCS SOIL SERIES:	3. LAND FORM:
4. DEPOSITIOIN HISTORY:	5. HYDROLOGIC SOIL GROUP:	6. DEPTH TO SEASONAL HW:
7. CURRENT WATER DEPTH:	8. DEPTH TO IMPERV LAYER:	9. MISC:

POTENTIAL FOR:	EROSION	RUNOFF	PONDING

11. SOIL STRATA DESCRIPTION:

HORZ	DEPTH	COLOR	TEXTURE	%CL	%ORG	%CF	STR	MOT	IND	CEM	ROD	<X>	FSP

12. SITE PERCOLATION RATE:

13. FINDINGS & RECOMMENDATIONS:

SOIL EVALUATION REPORT INSTRUCTIONS FOR COMPLETING FORM 2

Form 2 is the detailed record of soil information obtained on the development site. One copy of Form 2 must be completed for each soil location where testing has been done. For tests other than soil logs for which the scientist wants to submit numerical results, please attach a separate sheet and briefly describe the results under “Findings and recommendations.” The summary information that heads the sheet should be self-explanatory. Regarding location, reference the location to features that are permanent and static, such as roads or property lines.

1. State briefly tests that were done. Indicate whether tests were field, laboratory, or other.
2. Determine the soil series from the maps provided in the NRCS *Soil Survey of Thurston County*. Then, indicate what soil series was mapped as a result of the testing done.
3. Indicate land form (e.g., till plain)
4. Indicate depositional history (e.g., alluvial plain).
5. Indicate NRCS hydrologic soil group (e.g., letter designation A through D).
6. Indicate seasonal high water table depth based upon the presence of mottling, gleying, or other evidence. Indicate how you determined this value under “Findings...” section. If information available is inadequate, state value to be “greater than” bottom of hole depth.
7. Indicate current water table depth based upon observation. If saturated conditions are not observed, state value to be “greater than” bottom of hole depth.
8. Indicate depth to impervious layer (e.g., basal till). If information is inadequate, state value to be “greater than” bottom of hole depth.
9. Space for other miscellaneous observations regarding setting of site (e.g., concave, convex, swale, hillslope).
10. Indicate susceptibility of area to erosion, runoff, and ponding problems. The susceptibility should be rated based upon relevant physical characteristics and development operations planned for the area, such as shape of the area (e.g., concave, convex, flat) removal or addition of fill, time of year, existing and planned vegetative cover, degree of soil compaction, etc. For erosion, the K-factor for the soils series in question might help in assessing erodibility.
11. The profile description provides the minimum information on the physical attributes of the soil. Additional factors may be assessed at the option of the scientist, but data on these factors should be tabulated separately and summarized briefly in the “Findings and recommendations” section.

FORM 2 INSTRUCTIONS (CONTINUED)

All information provided for the profile shall utilize standard NRCS nomenclature and abbreviations. The following are the factors to be addressed, with brief examples of acceptable responses. Further information on most of these is provided in the NRCS *Soil Survey of Thurston County*.

- a. Hor(izon): a layer of soil with distinct characteristics, labeled A, AB, B, C, Ccw, etc..
 - b. Depth: Starting at "0" (surface), depth and interval of horizon.
 - c. Color: Munsell code for hue, value, and chroma, such as 10 YR 3/4. Indicate whether color is wet or dry.
 - d. Textur(al class): Class that best describes relative percentages of sand, silt, and clay in horizon, such as sandy loam (SL).
 - e. %Cl(ay): Clay percentage is very useful as a guide to determining the drainage capability of a soil.
 - f. %Org(anic) M(atter): Organic matter percentage by volume is related to the infiltration as well as pollutant removal capability of soils.
 - g. %C(ourse)F(ragments): Coarse fragments percentage is relevant to drainage and other site management factors.
 - h. Str(ucture): Describes size and shape of soil "clods."
 - i. Mot(tling): Where present, describe using three-letter abbreviations to indicate abundance, size, and contrast, such as CFS (common, fine, distinct).
 - j. Ind(uration): Physical compaction of a layer such as a glacial till. Where present, describe as weak, mod(erate), or str(ong).
 - k. Cem(entation): Aggregation of soil particles due to chemical processes. Describe as in induration.
 - l. Roo(ts): Where present, describe using two-letter abbreviation to indicate abundance and size, such as CF (common, fine).
 - m. Generalized range of infiltration rates using NRCS Soil Survey <X>;
 - n. F(ield) S(aturated) P(ercolation rate): Using all available information, estimate field saturated percolation rate. This rate should be a single number, and may vary from that range (see previous column) published in the NRCS Soil Survey due to horizon-specific factors.
12. Provide overall site (location) field saturated percolation rate. Rate should reflect effects of the entire soil column. If soil test location is proposed for siting of an infiltration facility, use methods of Volume III and apply applicable correction factors to establish long-term, saturated infiltration rate for facility design.
 13. Discuss results of tests done on soil. Indicate features of soil that most affect stormwater management at this location. Provide recommendations to the Project Engineer on soil-related factors such as problems and controls, and for additional work needed (if necessary).

Appendix I-G

Standard Stormwater Notes

1. All workmanship and materials shall be in accordance with the Thurston County Drainage Design and Erosion Control Manual, other County standards and the most current copy of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA) in that order.
2. Temporary erosion/water pollution measures shall be required in accordance with the Standard Specifications and the Drainage Design and Erosion Control Manual.
3. Applicant shall comply with all other permits and other requirements of the governing authority or agency.
4. A preconstruction meeting shall be held prior to the start of construction or staking of the site.
5. All storm mains and retention/detention areas shall be staked for grade and alignment by an engineering or survey firm licensed to perform such work.
6. Storm drain pipe shall be as specified in the Drainage Design and Erosion Control Manual.
7. Special structures, oil/water separators, and outlet controls shall be installed per plans and manufacturer's recommendations.
8. Provide traffic control plan(s) as required in accordance with MUTCD.
9. Call underground locate line 1-800-424-5555 minimum 48 hours prior to any excavations.
10. All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.
11. The minimum staking of storm sewer systems shall be as follows:
 - A. Stake location of all catch basins/manholes and other fixtures for grade and alignment.
 - B. Stake location, size, and depth of retention/detention facility.

- C. Stake finished grade of all stormwater features, including but not limited to catch basin/manhole rim elevations, overflow structures, weirs, and invert elevations of all pipes in catch basins, manholes, and those pipes that daylight.
12. Pipe materials used for stormwater conveyance shall be as acceptable by Thurston County. Pipe size, slope, cover, etc., shall be as specified in Volume III of the Drainage Design and Erosion Control Manual.
 13. All driveway culverts shall be of sufficient length to provide a minimum 3:1 slope from the edge of the driveway to the bottom of the ditch. Culverts shall have beveled and sections to match the side slope.
 14. If drainage outlets (stub-outs) are to be provided for each individual lot, the stub-outs shall conform to the following:
 - A. Each outlet shall be suitably located at the lowest elevation on the lot, so as to service all future roof downspouts and footing drains, driveways, yard drains, and any other surface or subsurface drains necessary to render the lots suitable for their intended use. Each outlet shall have free-flowing, positive drainage to an acceptable storm water conveyance system or to an acceptable outfall location.
 - B. Outlets on each lot shall be located with a 5-foot-high, 2"x4" stake marked "storm" or "drain." The stub-out shall visibly extend above surface level and be secured to the stake.
 - C. Pipe material shall be as acceptable to Thurston County.
 - D. Drainage easements are required for drainage systems designed to convey flows through individual lots.
 - E. The developer and/or contractor is responsible for coordinating the locations of all stub-out conveyance lines with respect to the utilities (e.g., power, gas, telephone, television).
 - F. All individual stub-outs shall be privately owned and maintained by the lot home owner.
 13. The storm drainage system shall be constructed according to accepted plans on file with the County. Any material deviation

from the plans will require written acceptance from the Drainage Manual Administrator.

14. A copy of the accepted storm water plans must be on the job site whenever construction is in progress.
15. All disturbed areas shall be seeded and mulched or similarly stabilized to the satisfaction of Thurston County. For sites where grass has been planted through hydroseeding, the performance bond will not be released until the grass has been thoroughly established (90% establishment), unless otherwise approved by the County.
16. All building downspouts on commercial sites shall be connected to the storm drainage system, unless otherwise acceptable to the County.
17. All erosion control and stormwater facilities shall be regularly inspected and maintained by the contractor during the construction phase of the development project.
18. The contractor shall be responsible for providing adequate safeguards, safety devices, protective equipment, flaggers, and any other needed actions to protect the life, health, and safety of the public, and to protect property in connection with the performance of work covered by the contract. Any work within the traveled right-of-way that may interrupt normal traffic flow shall require at least one flagger for each lane of traffic affected. All sections of the current WSDOT Standard Specifications for Traffic Control shall apply.
19. It shall be the sole responsibility of the contractor to obtain street use and other related or required permits prior to any construction activity in the County right-of-way. It shall also be the responsibility of the contractor to obtain all required permits prior to any construction.
20. No final cut or fill slope shall exceed two (2) horizontal to one (1) vertical without stabilization by rockery or by a structural retaining wall.
21. The project engineer shall verify the locations, widths, thicknesses, and elevations of all existing pavements and structures, including utilities and other frontage improvements, that are to interface with new work, provide all trimming, cutting, saw cutting, grading, leveling, sloping, coating, and other work, including materials as necessary to cause the interface with existing works to be proper,

without conflict, acceptable to the engineer and Thurston County, complete in place, and ready to use.

22. Compaction of all fill areas shall be per current APWA specifications. Fill shall be provided in 6 inch maximum lifts and shall be compacted to 95 percent of its maximum relative density.