The City of Longview Washington

STORMWATER MANUAL

JANUARY 2012

Table of Revisions

Date	*Description*
9/18/9	Manual becomes effective.
3/17/10	Many miscellaneous corrections and revisions associated with initial use and the City of Kelso's parallel development of their Development Ordinance and KEDM Revision. The private tree credit was de-coupled with the City's Urban Forestry Program (which is has yet to receive Council approval and no longer includes a tree preservation component). Updated the maintenance agreement example. Required projects to use LID to the MEP to benefit from its reduced flow control standard.
8/17/10	Revised the Maintenance Agreement example. Clarified language in 7.5(D) to require City approval of the Maintenance Plan approval and Recording with the County, per LMC 17.80.
12/14/11	Minor clarifications, typos, synchronized some wording with Kelso's KEDM. Notable clarifications include adding the "Done" box for the Local Requirements Flow Chart (Fig. 2.1.1) and re-directing an arrow to accurately screen for Redevelopment mitigation in the State Requirements Flow Chart (Fig 2.1.2), Private Drainage 6.4(A), Subsurface drainage and perforated pipe 6.5(B), and Curb Drains 6.6(B)(5). 7.3, 7.5(D), and 7.5(G) now clarify that As Built Plans and the Maintenance Agreement and Plan are only for *required* stormwater facilities. Long-term LID protection options were expanded in 7.5(G). Acknowledged past members. Revised (simplified) the submittal procedures. Added a glossary. Required the maintenance agreement and plan to receive preliminary approval prior to permit issuance. Added detention factor option for small projects. Added a 'failure to construct' clause to the example Maintenance Agreement and Plan, narrowed the ability for City to access Grantor's facility, 'referenced' §D(2) in §D(4) and D(6). Added provision to Excavation/Grading Permit granting permission for inspection and requiring compliance with LMC 17.80. Clarified that private trees must be within the project area, but allowed for Director discretion for use of new private trees. Abandoned curb drains shall be removed from the ROW. 2.2.5(B)(3) now allows the Director to waive the performance bond for deferred source controls.

Acknowledgements

In the spirit of cooperation and to provide consistent standards within the Longview-Kelso urbanized area, the Cities of Longview and Kelso and Cowlitz County developed and adopted the requirements of this manual and will continue to collaborate as updates are required. The individuals and groups listed below have contributed their time, expertise, and support to make this project a success.

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1 Introduction

This Section provides . . .

- Section 1.1: Purpose
- Section 1.2: Approach
- Section 1.3: Scope
- Section 1.4: Exemptions
- Section 1.5: Importance – An illustrated primer on stormwater

1.1 PURPOSE

The purpose of this manual is to provide policy and guidance for stormwater design and management in the City of Longview, consistent across the Longview-Kelso urbanized area, in order to:

- Protect the public health, safety, and welfare by minimizing risk from flood events,
- Protect property and habitat from increased runoff caused by development,
- Allow efficient operation, repair, and maintenance of the storm drain system, and
- Reduce discharge of pollutants to the storm drain system and protect water quality.

The requirements of this manual cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals.

1.2 APPROACH

A. These standards are written to comply with the Department of Ecology's (Ecology's) Western Washington Phase II Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) Permit. To comply with the permit, this manual:
   1. Supersedes and is no less protective than the 2004 Longview-Kelso Stormwater Runoff Control Guidelines, and
   2. Adopts the Stormwater Management Manual for Western Washington (SMMWW, which can be found at www.ecy.wa.gov/programs/wq/stormwater/index.html). This manual references (but does not typically repeat) the SMMWW.

B. Where portions of this manual and the SMMWW conflict, this manual shall apply. Where provisions of this manual conflict with other City of Longview Code, or state and federal requirements, the more stringent provisions apply.

C. Except as otherwise provided herein, all construction design detail, workmanship, and materials shall be in accordance with the following:
   1. Longview-Kelso Standard Plans & Specifications,

2. Washington State Department of Transportation's (WSDOT's) *Standard [Plans and] Specifications for Road, Bridge, and Municipal Construction*,
3. Ecology's SMMWW, and the
4. Puget Sound Partnership's *Low Impact Development Manual* (LID Manual).

D. This manual is intended to represent the minimum design standards for stormwater.

- Compliance with these Standards does not relieve the designer of the responsibility to apply sound professional judgment to protect the health, safety, and welfare of the general public.
- Special site conditions and environmental constraints may require a greater level of protection than would be required under these Standards.
- The project must be designed (and may require modification) to ensure compliance with the conditions of any permits, codes and regulations, and these Standards.
- Designs shall be consistent with the Lower Cowlitz River Flood Master Plan.

E. The City may temporarily suspend project work or require additional or modified protection measures if it appears to the Public Works Director or designee (Director), based upon observed conditions, that the approved plan is insufficient to prevent environmental harm and that such suspension or additional measures will prevent or minimize the harm.

1.3 SCOPE

All development activity as defined below including all construction and upgrading of public and private roads and drainage systems within the City of Longview is subject to the requirements of this manual.

- Development – Land disturbing activities, construction or installation of a building or other structure; creation of impervious surfaces; redevelopment; and subdivision, short plats, and binding site plans as defined in Chapter 58.17 of the Revised Code of Washington (RCW).
- Land disturbing activities are those activities which are commonly referred to as:
  a) Clearing (the act of vegetation removal from the land surface by mechanical or chemical means),
  b) Grubbing (the act of root vegetation removal from beneath the surface of the earth - usually in association with clearing),
  c) Excavation (the mechanical removal of earth material),
  d) Filling (deposition of earth and rubble material),
  e) Grading (excavation or filling or combination thereof),
  f) Compaction (densification of earth material),
  g) Stockpiling (temporary deposition of earth material placed by), and
  h) Stabilizing (counteracting the actions of gravity, wind, or water).

1.4 EXEMPTIONS AND VARIATIONS

A. The following activities are exempt from the requirements of this manual:

1. Commercial agriculture and forest practices regulated under Washington Administrative Code (WAC) Title 222 are exempt from all technical and administrative requirements established in this chapter. Class IV General Forest Practices that are conversions from timber land to other uses are not exempt.
2. Normal landscape maintenance activities and gardening must control erosion, but are otherwise exempt from the requirements of this manual.
3. The following road maintenance practices are exempt: pothole and square cut patching, overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage, shoulder grading, reshaping/regrading drainage systems, crack sealing, resurfacing with in-kind material without expanding the road prism, and vegetation maintenance.

B. The following are exempt or vary from <u>certain</u> requirements of this manual:

1. <u>State Flow Control</u>. Projects within the Consolidated Diking Improvement District #1 (CDID #1) boundary are exempt from Minimum Requirement (MR) #7 of the SMMWW Vol. I Chapter 2.5 (see Section 2.3 of this manual). Flow control is still required for any project that exceeds the thresholds described in Section 2.2 of this manual.
2. <u>Erosivity Waiver</u>. Projects disturbing less than five acres that meet the requirements delineated in Section 3.6 of this manual may apply for an "Erosivity Waiver" to be exempt from Minimum Requirement #2, the requirement to submit a Stormwater Pollution Prevention Plan (SWPPP).
3. <u>Utilities</u>. Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics are subject only to the erosion and sediment control requirements.
4. <u>Amenity</u>. The following are exempt from meeting the amenity goals, Section 2.2.6 (A), and are subject only to the Facility Requirements of Section 2.2.6 (B).
   a) Projects within the Manufacturing Districts, the Commercial Warehouse District, and the Redevelopment Project District; or
   b) Projects that have less than or equal to 20-parking spaces, less than 60 expected average daily vehicle traffic count (ADT).
5. <u>Small-lot Dispersion</u>. The Director may allow, on a case-by-case basis, lots smaller than 22,000 sq.ft. (as required in the SMMWW Vol. III §3.1 and Vol. IV §5.5) to receive credit for downspout dispersion. The Director may also allow local dispersion credits to apply if the vegetated flow path is less than the minimum specified in Table 5.3.
6. <u>Project Planning Area</u>. Any area within the same site having equivalent (or greater) flow and pollution characteristics can be used to meet the local requirements and Ecology's MRs. For public road projects of any size, the equivalent area can be outside the project limits, provided it drains to the same receiving water.
7. <u>Regional Facilities</u>. The requirements for on-site management and against the transfer of runoff from one basin to another may be waived by the Director of Public Works (Director) in areas served by a regional stormwater control facility. Such a waiver must be conditioned on the following provisions:

a) Basin Planning. The alternative or regional approach must comply with the Basin Planning provisions of Volume I, Section 2.5.9 of the SMMWW.

b) Services Contracted. The developer shall provide the City a copy of an executed contract with the regional facility demonstrating full compliance with the applicable standards.

c) Conveyance System Capacity. The conveyance system transporting the stormwater from the development to the facility shall be sized to handle the additional runoff. The developer shall be required to demonstrate the adequacy of the conveyance system by an engineer registered in the State of Washington.

8. Other Manuals Accepted. Relevant technical content (i.e. BMPs, methods, and technologies) from any Ecology-approved stormwater manual in western Washington may be used, subject to Director approval. For example, infiltration testing for projects exceeding the one acre threshold may use the 8-hour method described in the King County Stormwater Manual, instead of the 24-hour test described in the SMMWW.

9. Diking District Maintenance. Routine dike and channel maintenance activities covered by the CDID #1 Stormwater Manual are exempt from the administrative requirements of Section 3.2 (B).

10. Natural Drainage Features. Restoration of flow to natural drainage features as an alternative to traditional detention may be allowed by the Director to solve significant, existing (i.e. not otherwise caused by the project) flooding, stream stability, water quality or habitat problems. The project shall also satisfy all conditions of Volume I, Section 2.5.7 of the SMMWW, be documented by a qualified engineer or wetlands biologist, and receive approval from all relevant regulatory authorities.

11. Wetlands. New development and redevelopment are exempt from Minimum Requirement #8 (Wetlands Protection), provided that:

    a) The project does not change the rate, volume, duration, or location of discharges to and from the project site, or

    b) The project discharges to a slope wetland or riverine wetland where no depressional (impounding) characteristics exist, or

    c) The project meets the requirements for and intends to use full dispersion in accordance to the SMMWW or this manual for flow control, or

    d) The City determines, based on information in the preliminary stormwater plan or information submitted for wetland review per LMC 17.10 and 17.12, that the proposed project complies with the City's critical area requirements or constitutes either an adjustment or an exception/variance from them.

12. Local Thresholds. Low impact development credits (see Sections 5.3 & 5.4) may be applied to the threshold calculations for local stormwater requirements of Sections 2.2.4, and 2.2.5(A), and 2.2.6(A&B).

13. State Thresholds. The following are exempt from the threshold calculations for Ecology's MRs (see Section 2.3):

    - Impervious surfaces that are fully dispersed or infiltrated in compliance with the SMMWW; and
    - Open, uncovered retention/detention facilities; however, such facilities shall be considered impervious when modeling runoff.

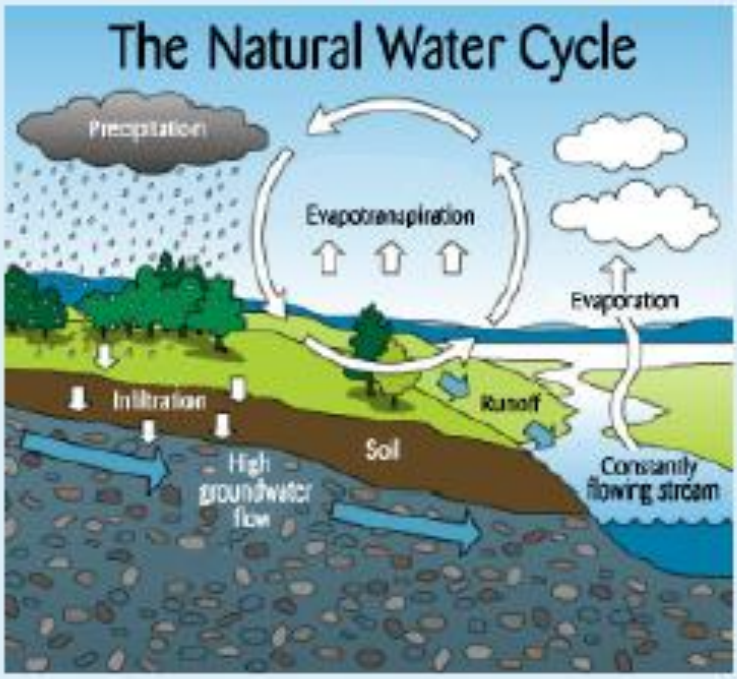
14. Road Maintenance:
    a) Removing and replacing a paved surface to base course or lower, or repairing the roadway base itself, if impervious surfaces are not expanded, are considered redevelopment exempt from MRs #6 - #9. However, in most cases, only MR #2, Construction Stormwater Pollution Prevention, will be germane.
    b) Public road projects are exempt from the local redevelopment requirements in Section 2.2.7, provided that low impact development techniques are preferentially used as practicable without causing flooding or erosion impacts.

INTRODUCTION

THE IMPORTANCE OF STORMWATER MANAGEMENT

The Water Cycle

The earth's water continuously circulates from the atmosphere to the land, from there into groundwater and surface water, and then back to the atmosphere. This is called the water cycle, or hydrologic cycle, and is key to understanding stormwater impacts.



In natural (undeveloped) conditions, rainfall infiltrates slowly into the ground. Natural biologic processes cleanse the water as it moves through vegetation and soil and into groundwater. Because most rainstorms are not large enough to fully saturate the soil, only a small percentage of rainwater flows over the surface as runoff. What does become runoff usually travels in a slow, meandering pace. Particles and sediments settle out along the way, ridding the water of impurities before it flows into rivers and streams.

The Effects of Development

Development drastically alters the natural water cycle. Impervious surfaces such as buildings, roads, parking lots, and sidewalks prevent rain from soaking into the ground. There is less vegetation to soak up, store, and evaporate water. The natural soil structure is lost as a result of grading and compaction during construction. As a result, stormwater runoff greatly increases, flowing over land surfaces or through conveyance systems (such as pipes and ditches) into rivers and streams.

This alteration of the water cycle can have significant negative effects on surface water and groundwater, causing harm to fish and wildlife, drinking water supplies, property, recreation, and other beneficial uses.

- Increased runoff volume and speed cause flooding and erosion and destroy natural habitat in rivers and streams.
- Because less water infiltrates into the ground, less groundwater recharge occurs. This reduces drinking water and irrigation supplies and also reduces base flows in streams, which is harmful to fish and aquatic organisms.
- Impervious surfaces retain heat, which increases runoff temperature during warm weather. This in turn raises the temperature of the receiving waters, with negative impacts on aquatic life.
- Stormwater runoff picks up oil, fertilizers and pesticides, metals, chemicals, sediments, bacteria, trash and debris, and other pollutants and carries them into rivers and streams.

Mitigation through Stormwater Management

Stormwater management reduces stormwater runoff volume, speed, and pollutants so new development and redevelopment maintain a better balance with the natural water cycle. This is achieved through the following basic approaches.

- **Source control** best management practices (BMPs) prevent stormwater from coming into contact with pollutants in the first place. Examples include sweeping (instead of hosing) water to clean an area, and covering oily parts and equipment with a tarp. Source control BMPs are a cost-effective way to reduce pollutants in stormwater and should therefore be a first consideration in all projects.

- **Treatment** BMPs reduce pollutant loads and concentrations in stormwater runoff through physical, biological, and chemical removal mechanisms. Examples include biofiltration, dispersion, constructed wetlands, and proprietary filter systems. These BMPs can accomplish significant levels of pollutant load reductions if properly designed and maintained.

- **Flow control** BMPs detain, retain, or infiltrate stormwater runoff to control the flow rate, frequency, duration, and volume of runoff leaving the site. Examples include detention ponds, infiltration systems, and constructed wetlands.

INTRODUCTION

Low impact stormwater approaches emphasize capturing, treating, and infiltrating stormwater at the source. Techniques are used that mimic natural processes by allowing stormwater to slowly soak into the ground or filter through vegetation—for example, porous pavement, rain gardens and infiltration planters, and green roofs. In addition, design and construction methods can be employed to preserve and take advantage of the site's natural features, such as open spaces, native vegetation, natural depressions, and wetlands. This approach—also known as low impact development—provides multiple environmental, aesthetic, and cost benefits in addition to stormwater management.

Conventional end-of-pipe storm water BMPs have been unable to adequately address negative impacts of development. Needed is a mix of public outreach, improved runoff controls, watershed planning, enforcement, & long-term maintenance…

2 Requirements for Development

This section provides . . .

- Section 2.1: Overview of the requirements for development (& redevelopment) including regional facilities and hydrologic analysis
  - 2.1.1 Local Requirements Flow Chart
  - 2.1.2 State Requirements Flow Chart

- Section 2.2: Description of Local Requirements
  - 2.2.1 General Requirements
    - A. LID Credits and Regional Facilities
    - B. Hydrologic and Hydraulic Analysis
    - C. Facility Design
  - 2.2.2 Erosion and Sediment Control
  - 2.2.3 Plans Submittal
  - 2.2.4 Flow Control including Design Storms
  - 2.2.5 Water Quality (Basic and Source Control)
  - 2.2.6 Amenity Criteria (plus Ugly Ponds and Fencing)
  - 2.2.7 Redevelopment

Basic Stormwater Control

- Section 2.3: Description of State Requirements
  - 2.3.1 Ecology's Minimum Requirements
  - 2.3.2 Construction Permit
  - 2.3.3 Underground Injection Control Program
  - 2.3.4 Other State (and Federal) Requirements

Information on adjustments, exceptions, and appeals is located in LMC 17.80.180

The City of Longview has additional requirements in subsequent sections for Easements Conveyance systems, LID Credits, Maintenance, Erosion Control, Bonding, etc.

2.1 OVERVIEW OF THE REQUIREMENTS

Stormwater is the nation's leading cause of water quality impairment. Longview's drainage and water quality challenges, as well its municipal stormwater permit necessitate that new development and redevelopment mitigate their stormwater impacts.

Phase I & II Municipal Stormwater NPDES Permits are issued by the WA State Department of Ecology (per the Federal Clean Water Act) to regulate the discharge of pollutants from public storm sewers.

Local Requirements. Projects that disturb ≥5,000 sq.ft. of land or create/replace ≥5,000 sq.ft. of impervious surfaces are subject to "Local" stormwater requirements described in Section 2.2 of this manual.

State Requirements. Projects that disturb one or more acres or that are part of a larger common plan of development or sale, are also subject to a set of state-mandated ("State") requirements. They have been adopted by the City of Longview and are detailed in Volume I, Section 2.5 of the SMMWW.

Consult the flow charts on the following two pages to determine which Local and State requirements apply. Where these requirements conflict, the stricter condition shall apply.

What is a big difference between the state and local requirements?

The state requirements only apply to projects disturbing one acre or more. They are more stringent because they require use of the SMMWW, or other Ecology-approved manual. The local requirements only require designs to be engineered to standards *comparable* to those in the SMMWW, or equivalent. This affords the designer more flexibility. For example, engineers may use commercially available software for hydrologic modeling, instead of Ecology's Western Washington Hydrology Model (WWHM).

FIGURE 2.1.1: **"LOCAL" REQUIREMENTS FLOWCHART (all projects)**

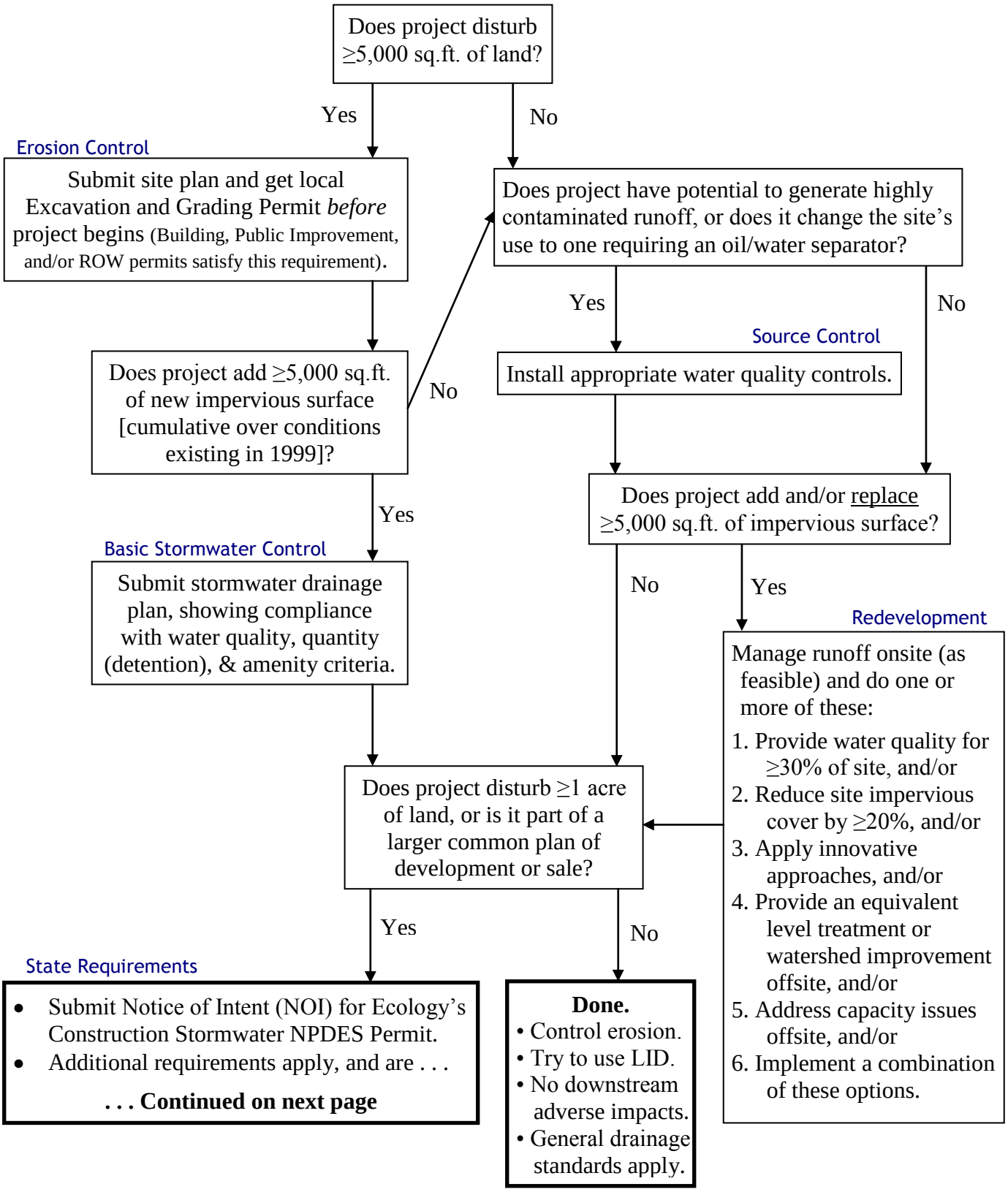
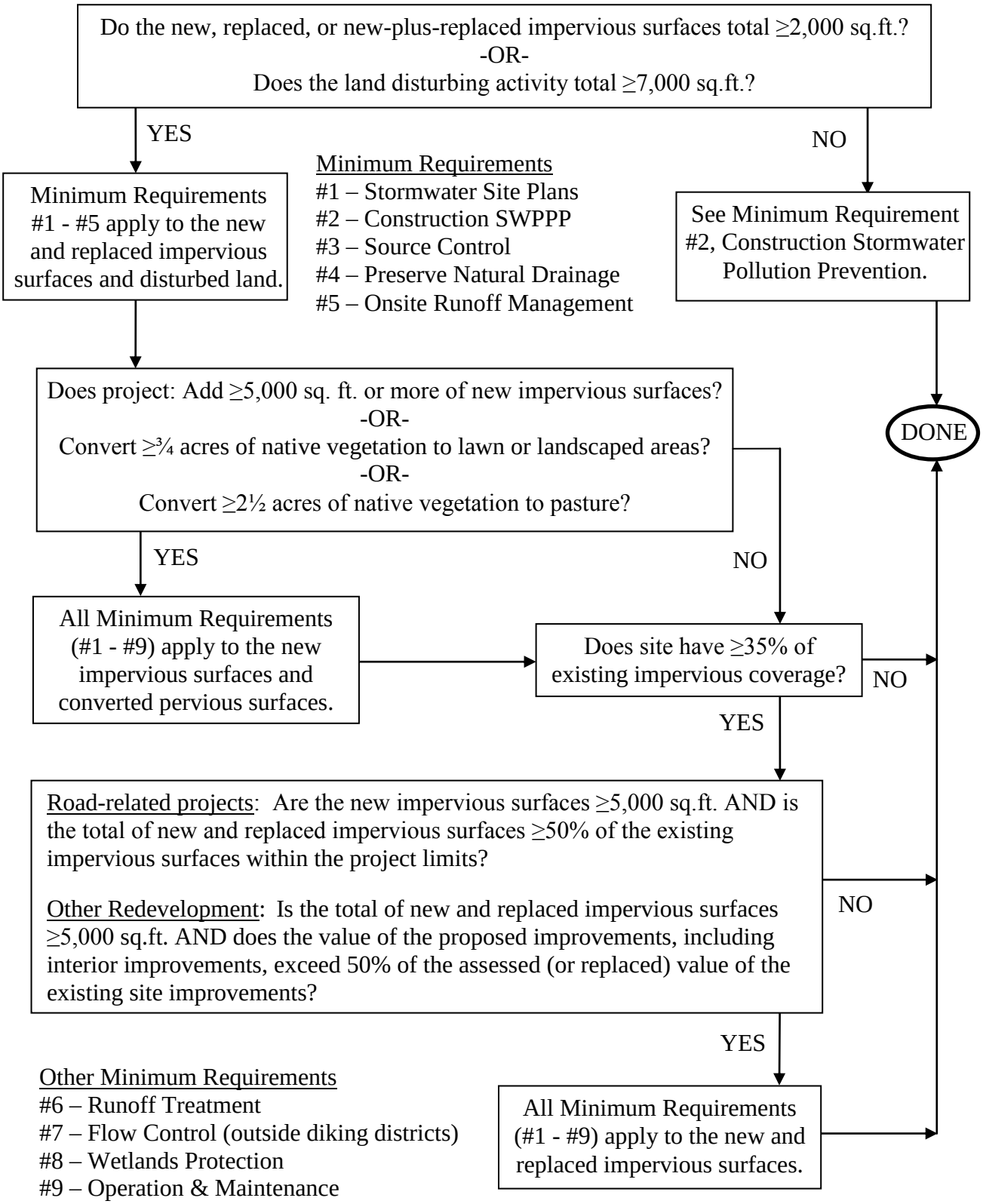


FIGURE 2.1.2: "STATE" REQUIREMENTS FLOWCHART (Projects ≥1-Acre)

[Applies to projects disturbing ≥1-acre, or less if part of a larger plan of development or sale. Local requirements will apply where more protective (see previous flowchart)].



2.2 LOCAL REQUIREMENTS FOR DEVELOPMENT AND REDEVELOPMENT

2.2.1 General Requirements

A. Facility Design

1) **On-site stormwater management BMPs that minimize, infiltrate, disperse, and retain runoff on-site shall be preferentially used as practicable without causing flooding or erosion impacts.**
2) A development or land disturbing activity may not change the surface or subsurface flow to or from an adjacent property without City approval and the applicable runoff controls described in this manual.
3) Flow and water quality control facilities are subject to the site planning and BMP selection, design, and maintenance criteria comparable to those in the SMMWW.
4) Creative engineering solutions are encouraged, but they must be pre-approved by the Director, in accordance with the variance criteria outlined in LMC 17.80.180.
5) If a site is proposed to be constructed in phases, the drainage report (including the preliminary design) shall accommodate all phases of the project.
6) A development is only required to mitigate the new plus replaced impervious surfaces and the converted pervious surfaces; however, stormwater facilities must be sized for the entire flow directed to them.

B. Hydrologic and Hydraulic Analysis

1) Methods allowed. Acceptable hydrologic and hydraulic methods shall be:
   a) Single Event Hydrograph methods; typically, the Santa Barbara Urban Hydrograph Method (SBUH), and
   b) Continuous hydrologic simulation; specifically, the Western Washington Hydrology Model (WWHM), or Ecology-approved equivalent.
2) Rainfall data. Design storm data (detailed in Appendix C) is summarized below:

24-hour Design Storms for the
Longview-Kelso Urbanized Area

2-Year	2.54″	25-Year	4.37″
5-Year	3.10″	50-Year	5.17″
10-Year	3.60″	100-Year	6.17″

3) Existing conditions. Existing conditions shall be those in 1999, or as approved by the Director. Acceptable documentation may include, but not be limited to, aerial photographs taken in 2002.

What are impervious surfaces?

An impervious surface is a hard surface area that:

- Either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development; and/or
- Causes water to run off the surface in greater quantities or at an increased rate of flow as under natural conditions prior to development.

Common impervious surfaces include but are not limited to:

Rooftops Walkways Patios Driveways Macadam
Parking lots or storage areas Concrete or asphalt paving
Packed gravel surfaces Packed earthen materials
Other surfaces which similarly impede the natural infiltration of stormwater.

Does graveling over grass, or paving a gravel lot create an impervious surface?

New impervious surfaces include: 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.

Therefore, basic stormwater control is required where ≥5,000 sq.ft. of surfacing is made more impervious, whether grass is graveled, or if gravel is paved.

Grass to Gravel: Gravel curve numbers are similar to those for landscaping, so detention should be negligible, or easily managed with dispersion when grass is graveled. Uncompacted open rock over geotextile will be considered pervious.

2.2.2 Erosion and Sediment Control

All projects must provide erosion and sediment control. Projects disturbing ≥5,000 square feet are subject to local requirements discussed in Section 3 (B) of this manual.

Above: A construction entrance.
Below: No construction entrance.
Bottom right: A catch basin BMP settled-out silt in the gutter. Now it needs to be swept-up.

Basic Stormwater Control

BASIC STORMWATER CONTROL refers to the requirements for projects creating 5,000 square feet of new impervious surface to submit stormwater plans and provide flow and water quality control in a manner that satisfies the amenity criteria of this chapter. State requirements may also apply for larger projects.

- SOURCE CONTROL: Projects of any size may be subject to the water quality measures for pollution-generating sources described in Section 2.2.5 (B).

Does the 5,000 sq.ft. threshold reset each year?

No.

Does the 5,000 sq.ft. threshold reset after the project?

Yes, if the project fully mitigates its impact on stormwater.

Is stormwater mitigation required for my entire property, or just the project site?

Only the new and replaced impervious surfaces and the converted pervious surfaces require mitigation; however, stormwater facilities must be sized to handle the entire flow directed to them (typically under full build-out conditions). Any area within the same site having equivalent flow and pollution characteristics can mitigated. See Section 1.4 to learn more about project planning areas.

2.2.3 Plans Submittal

Projects creating ≥5,000 square feet of new or replaced impervious surfaces must submit a set of stormwater plans and supporting documents as outlined in Section 4 of this manual.

2.2.4 Water Quantity Control

A. Projects creating ≥5,000 square feet of new impervious surfaces must provide on-site stormwater flow control.

B. Low Impact Development. LID shall be preferentially used as practicable to minimize runoff (See LID Section 5).

C. Design Storms. Facilities shall be sized such that the peak release rate from the development shall not exceed the peak release rate from:
   - half of the pre-developed 2-year, 24-hour design storm,
   - the pre-developed 25-year, 24-hour design storm, and
   - the pre-developed 100-year, 24-hour design storm.

D. Tailwater. Consideration must be given to the backwater effect of high surface elevations in the downstream conveyance system. High tailwater elevations may affect performance of the upstream facility and reduce live storage volumes.

E. Emergency Overflow. If surface detention is used, an overflow shall be included to safely pass the 100-year, 24-hour design storm without overtopping any part of the pond embankment or inundating neighboring property. Sufficient armoring is required to prevent erosion.

F. Detention Factors. The Director may allow (typically minor) projects not subject to MRs #6 & #7 to calculate detention based on the factors and formula found in Appendix M. In no circumstance shall this method be allowed in areas with suspected or potential drainage problems.

What are pre-developed conditions?

The local and state requirements interpret "pre-developed conditions" differently.

- ❖ Local requirements consider pre-developed conditions to be those prior to a development, typically pasture, landscaping, and impervious surfaces like pavement and structures, cumulative over conditions existing in 1999. Acceptable documentation may include, but not be limited to, aerial photographs taken in 2002.
- ❖ State requirements consider pre-developed conditions to be those prior to all development, i.e. mature forest, unless evidence justifies existence of pasture.

2.2.5 Water Quality

A. Basic Treatment.
   1) Projects creating 5,000 square feet of new impervious surfaces must provide on-site water quality control.
   2) Low Impact Development shall be preferentially used as practicable to improve runoff quality (see Section 5 of this manual).
   3) Minimum capacity for water quality design:
      a. Single Event Methodology. The water quality design storm for the Longview-Kelso urban area is defined as two-thirds (⅔) of the two (2)-year, 24-hour storm, with an SCS 1A type rainfall distribution; therefore, the water quality design storm is 1.69 inches in 24-hours (2.54 x 0.667); or
      b. Continuous Methodology. Alternatively, the Western Washington Hydrology Model (WWHM) may be used to design stormwater quality facilities.

Does roof runoff need treatment?

Not if it can be separated from surfaces that require treatment. Only significant sources of pollutants, i.e. those subject to the uses below, require treatment:

- Erosion;
- Application of pesticides or fertilizers (e.g. all lawns, landscaped areas, golf courses, parks, cemeteries, and sports fields);
- Vehicular use [e.g. roads and shoulders (including bike lanes within or receiving runoff from a roadway), driveways, parking lots, unfenced fire lanes, equipment storage yards, and unpaved surfaces subject to regular vehicular use (i.e. infrequently accessed maintenance roads are exempt)];
- Industrial activities; or
- Storage of erodible or leachable materials which receive direct rainfall or the run-on or blow-in of rainfall (e.g. soil stockpiles, garbage dumpster leakage, etc).
  - Metal roofs must have an inert coating (e.g., baked-on enamel) to be exempt.
  - Roof downspouts should be disconnected from the storm drain system prior to chemical treatment (e.g. for moss control).

B. Source Control. Some new development or re-development projects, regardless of size, may be required to control runoff pollution at its source.

1) Highly Contaminated Runoff. Any project where a City construction permit is required, such as the Building, Fill and Grade, Right-of-Way and others, that is determined by the City to have the potential to generate highly contaminated runoff shall provide a level of treatment commensurate with the risk, according to Volume IV of the SMMWW.

Highly contaminated runoff contains toxicants which would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria. Examples include, but are not limited to:

a) Uncontrolled runoff from outdoor industrial, maintenance, and storage activities;

b) Process wastewater, including washwaters and leachate; and

c) Runoff from establishments subject to high-use traffic and/or parking. A high use site at a commercial or industrial site has one of the following characteristics:

- An expected average daily vehicle traffic (ADT) count ≥100 vehicles per 1,000 sq.ft. of gross building area (drive-through, big box); or
- Storage of a fleet of 25 or more diesel vehicles that are over 10-tons gross weight (trucks, buses, trains, heavy equipment, etc.)
- >1,500 gallons / year of petroleum storage and transfer (except heating oil)
- Intersections of roads carrying ≥25,000 and ≥15,000 vehicles.

2) Oil/Water Separation. Additionally, all projects requiring City approval that are changing the use of a parcel shall provide a level of oil/water separation commensurate with the risk, as follows:

a) API or CP-type oil/water separators are required for:

i. Industrial machinery and equipment, trucks and trailers, aircraft, parts and aerospace, railroad equipment;

ii. Log storage and sorting yards;

iii. Airfields and aircraft maintenance;

iv. Fleet vehicle yards;

v. Railroad yards;

vi. Gas stations;

vii. Retail/wholesale vehicle and equipment dealers;

viii. Vehicle maintenance and repair;

ix. Construction businesses such as paving, heavy equipment storage and maintenance, storage of petroleum products. (excluding construction sites);

x. Other activities that exhibit a significant risk of high oil loading in runoff;

b) Spill control (SC) type oil/water separators are required for:

i. Restaurants;

ii. Multi-family residential development activities creating parking spaces for twenty-five (25) or more vehicles;

iii. Other activities where the risk of oil spills or illegal dumping of oil or grease is significant;

iv. Where the risk of oil or grease spills or dumping is determined to be minimal by the City Engineer, oil/water separators shall not be required for those portions of a site.

3) Deferment. Projects subject to the local source control requirements, but which do not trigger other stormwater controls, may defer installation of the required treatment, provided:

a. A stormwater performance bond is furnished, if/as required in accordance with Section 7.2 of this Manual.

b. The controls must be installed within two years of receiving City approval.

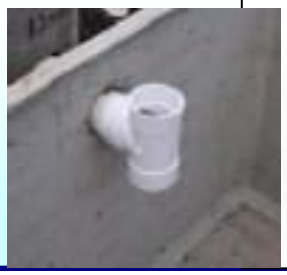
c. The source does not constitute an illicit discharge.

What is the difference between API, CP, and SC separators?

The American Petroleum Institute (API) oil/water separator is a vault with one baffle to spread flow, one to catch sludge, and a third to trap floatables and oil.

The coalescing plate (CP) design is more compact because it uses a series of parallel plates. These improve separation efficiency by reducing turbulence and offering more surface area on which oils impinge, collect, and coalesce into larger droplets – which according to Stoke's Law, rise faster.

A spill control (SC) separator (right) is a simple catch basin with a T-inlet for temporarily trapping oil. The "Snout" brand separator (far right) has a lower profile, more capacity, and a clean-out.

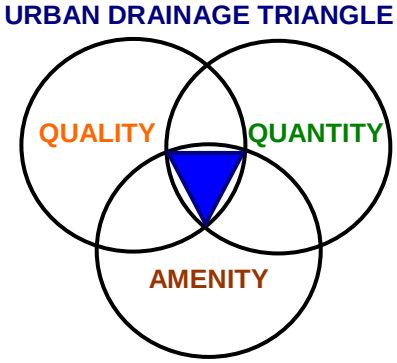


2.2.6 Amenity Criteria

Rain is essential for life. Properly managed, it is an asset. But stormwater has been managed as a problem to be guttered away, sight unseen. Stormwater facilities are typically hidden underground or behind the development, or fenced-off like dumpsters and HVAC equipment. Many, if not most, are eventually forgotten, overlooked, or are under-maintained.

Consequently, stormwater is responsible for large-scale water quality degradation, hydrologic pattern disruption, and downstream flooding. Despite years of engineering water quality and flow controls into site designs, the cumulative cost of these watershed challenges and maintaining/replacing the infrastructure that perpetuates them grows each year.

Increasingly, consensus calls for designs to either minimize the need for a traditional, discreet facility or to raise the profile of stormwater, so that citizens become aware of and begin to understand the impacts of their runoff.* To this end, the "Amenity" criteria have emerged as a third element of basic stormwater control. It completes a more holistic, long-term approach to stormwater site design called the Urban Drainage Triangle.



Overview of this Section:

A. Applicability, Narrative, and Appeals
B. Facility Design Goals,
C. Facility Design Requirements,
D. LID site design strategies, and
E. Examples of engaging stormwater designs.

A. Applicability, Narrative, and Appeals

All developments creating 5,000 square feet or more of new impervious surface shall satisfy at least one of the Facility Design Goals below and comply with the facility requirements of this section. A narrative of how the goals are (or are not) met shall be included with the stormwater report. In disputes over whether a design satisfies the terms and intent of this section, project proponents may present their case before the Longview Stormwater Advisory Committee (LSAC) to seek their opinion, prior to the Director's final determination and appeals per LMC 17.80.180.

B. Facility Design Goals

1. Retain resources and mimic natural processes [use LID] to the maximum extent practicable.
2. Use the stormwater design to enhance property value. *Suggestions* include:
   i. Create an aesthetic experience (beauty, art, etc.) focused on the stormwater.
   ii. Allow conditions for safe interaction with the stormwater system in a way that is relaxing, amusing, and/or refreshing.
3. Communicate the presence, function, or impact of the site's runoff.▪ *Examples* include:

* An ancillary benefit is expected to be improved long-term maintenance, see Section 5.4.
▪ Another option is to provide public access to nearby bodies of water, perhaps with an interpretive sign.

i. Provide statements or symbols communicating the value of the stormwater design in relation to hydrologic and ecological function.
ii. Create compelling conditions to learn about stormwater issues.

C. Facility Design Requirements

1. Aesthetics

a. Aboveground stormwater facilities shall appear as naturally occurring features or otherwise enhance or complement site aesthetics, i.e. no "ugly ponds;" or incorporate screening, location, landscaping, and/or artistic elements into the design so that the facility is a positive feature.

b. Fencing requirements are located in Section 2.2.6.1 of this manual.

2. Labeling and Signage

a. All inlets and manholes within shall be stamped "Dump no Pollutants – Outfall to Stream," or equivalent (See City of Longview Standard Plan SD-110). Similar-themed markers or stenciling in addition to this minimum requirement are encouraged.

b. Permanent markers or signs, such as those described in the SMMWW Vol. III §3.2.1, shall be installed for significant aboveground facilities such as ponds, bioswales, pervious streets, or developments that rely on numerous dispersed LID BMPs. Signs should identify the feature(s), state the purpose and/or function, provide contact information (for public facilities), and give any advisory message that is key to its proper and continued performance, such as "Dump no debris or pollutants. For more information or to report littering, vandalism, or other problems, call [insert telephone number]."

3. Sustainable Maintenance

a. Trees may be planted near biofiltration swales as long as they will not inhibit vegetative growth and water flow within the swale.

b. To maximize plant survival and performance, species selection shall conform to the following sections of the SMMWW:
- Detention ponds: Volume III, Section 3.2
- Basic Biofiltration Swale: Volume V, Tables 9.3 & 9.4, BMP T9.10
- Wet Biofiltration Swale: Volume V, Table 9.5, BMP T9.20
- Wetponds: Volume V, Table 10.1, BMP T10.10

c. Designs shall consider access for maintenance, and sun and water for vegetation.

d. Designs with complex or expensive long-term maintenance are discouraged.

D. LID Site Design Strategies

Preserving Natural Vegetation and Better Site Design are two LID strategies that are encouraged because they improve performance, long-term maintenance, and aesthetics. They are discussed in the SMMWW Volume V Chapter 5.3.2 as BMPs T5.20 & 21, and are summarized below (see Section 5 for credits).

1. Preserving Natural Vegetation. Existing vegetation can be a site's greatest (if not most interesting) stormwater management resource. Preserved areas:
   - Should be sited to minimize loss of or promote connectivity to existing forest, wetlands, and riparian areas;
   - Shall be placed in a separate tract or protected through recorded easements for individual lots; and
   - Shall be shown on all property maps and should be clearly marked on-site during clearing and construction.

   a. Where possible, preserve areas below the building sites, so that runoff can be dispersed through the duff, undisturbed soils, and native vegetation.

   b. Vegetation and trees shall not be removed from the preserved area, except to remove noxious or invasive species, dangerous or diseased trees, and for approved timber harvesting/thinning.

2. Better Site Design. Site designs that reinforce the hydrologic cycle and integrate infrastructure with natural topography are encouraged because they can be more cost effective and aesthetically pleasing.

   a. Development Envelope. A compact development envelope can reduce runoff and/or retain attractive landscape features, such as important trees, steep slopes, riparian areas, or wetlands.

   b. Disconnect Impervious Areas. Provide opportunities for impervious areas to infiltrate or disperse before collection (See Section 5 – LID Credits).

   c. Permeability. Developments can be made more permeable by clustering buildings, sharing driveways and parking, using pavers-on-sand or porous pavements, reducing the land coverage of buildings, and using engineered soil/landscape systems.

   d. Narrow Streets. Streets and other transportation-related structures typically can comprise between 60 and 70% of a residential development's hardscape; and, unlike rooftops, streets almost always connect directly to the drainage conveyance system. The City will consider alternate street designs.

   e. Choices for Mobility. Incorporating amenities for bikes, pedestrians, and/or public transit can help address a primary source of stormwater pollution.

   f. Drainage as a Design Element. Work with natural land forms and other land uses so that the drainage system helps to generate urban form and minimize earthwork and expensive drainage features.

E. Examples of Engaging Stormwater Design. Water features and stormwater control facilities are common design features. The former typically lacks function and the latter typically lacks form. Combining the two is logical, but still relatively uncommon. Therefore, Appendix G provides nearby examples of "Artful Rainwater Design," from the website www.artfulrainwaterdesign.org.

2.2.6.1 Fencing

Nothing devalues or isolates a landscaping feature like a chain-link fence; but until recently, most aboveground facilities appeared prison-like, . . . detention cells for a singular class of bad, unsafe, or otherwise unwanted surface water.

But the Longview-Kelso area is shaped by its waters. They provide fish, commerce, and miles of shoreline for schools, backyards, parks, and ports. None of these waters are fenced.

- Not the Coweeman, Cowlitz, or Columbia Rivers,
- Not the extensive network of open drains and ditches,
- Not the numerous creeks and ponds, and
- Not Longview's 55-acre crown jewel, Lake Sacajawea.

Volume III, Section 3.2.1 of the SMMWW references safety standards developed by the Department of Health (DOH) and the Superintendent for Public Instruction (SPI) for school sites, parks, and playgrounds. Those standards only specify a "non-climbable fence" where a fence is required. The SMMWW requires fencing only for slopes steeper than 3:1 and for impoundment walls taller than 24 inches.

Therefore, stormwater facilities shall be subject to the following:

A. Fencing shall be consistent with any hazard.
   1. Facilities shall be designed (or control structures protected) such that peak flows and velocities do not pose an unacceptable risk to children or vulnerable adults (i.e. they cannot sweep a child off his or her feet, pass them through the outlet structure, or otherwise pin them underwater).
   2. Designs needing a steep or vertical slope shall provide emergency egress points and fall deterrence as discussed below.
      a) Only the portions of the facility associated with a hazard shall be fenced.
      b) Guardrails or other barriers will be required for vertical drops greater than 30 inches. [This is per OSHA, in lieu of the SMMWW's requirement to fence impoundment walls greater than 24 inches.]

B. Fencing shall be allowed only for legitimate safety concerns or as part of the site's landscaping design.
   1. Designs steeper than 3:1 or with walls exceeding 30 inches are discouraged.
   2. Benched retaining walls or natural appearing rockeries are preferred in lieu of vertical walls.
   3. The owner, neighborhood association, or other vested party, such as an adjacent daycare or assisted-living facility, may make a written request for the City to allow a fence.
   4. Landscaping shall be installed as screening where fencing is required, unless not feasible.

UGLY PONDS

This pond is the main feature of what the subdivision plat called a "natural area."

Lexington, WA gateway (Sparks Ave – I5 exit). Mini-storage is next to runoff storage.

MORE UGLY PONDS

Imagine this Westside Hwy. pond redesigned as the neighborhood's centerpiece amenity.

West Kelso gateway (Allen St. Bridge). A water prison is next to the people prison.

2.2.7 Redevelopment

All major surface waters in the Longview-Kelso urbanized area are at risk of becoming impaired or have at least one water quality impairment already. Mitigating the impacts of runoff from new development only slows the rate of degradation. Mitigating the impacts of runoff from redevelopment is key to actually improving the watershed.

A. Therefore, projects that create and/or replace 5,000 square feet or more of impervious surface that are not otherwise required in Sections 2.2.4, 2.2.5(A), and 2.3 of this manual to provide stormwater controls shall, as part of the project, make at least one of the following improvements (existing controls will not satisfy this requirement unless they are expanded commensurately):
   1. Provide water quality treatment for at least 30% of the site's pollution generating surfaces, and/or
   2. Reduce total site runoff by at least 20% below existing conditions, and/or
   3. Apply innovative approaches to maximize on-site management of runoff (e.g. green roofs, pervious pavements, or retrofits to parking and landscaping), and/or
   4. Provide an equivalent level of treatment or watershed improvement offsite (e.g. street trees, open space dedication, etc.) and/or
   5. Address downstream channel, capacity, or flooding issues through improvements offsite, and/or
   6. Any combination of (1) through (5) above and/or source controls required in Sections 2.2.5 (B) above will be allowed, subject to approval by the Director.

B. Additionally, all projects must rectify any drainage problems upon replacement or refurbishment of the affected system. For example, projects that grind and resurface a parking lot which sheets over a sidewalk shall divert or intercept that runoff to a drainage system or to landscaping.

What is replacement?

For structures, replacement is the removal and replacement of any exterior impervious surfaces or foundation.

By way of example, re-roofing is routine maintenance; however, removal and replacement of the roof down to exposed trusses is replacement.

For other impervious surfaces, replacement is the removal down to bare soil or base course and replacement.

Is expanding a building over pavement sufficient mitigation?

Not unless the project is designed to satisfy a source control requirement, such as covering storage or transfer areas, installing a wash-rack, etc.

2.3 STATE REQUIREMENTS FOR DEVELOPMENT AND REDEVELOPMENT

2.3.1 Ecology's Minimum Requirements (MRs)

The City of Longview has adopted Ecology's MRs for projects that disturb one (1) acre or more of land or less if part of a larger common plan of development or sale. Where both local and state thresholds are triggered, the stricter requirement applies.

A. Use Figure 2.1.2 to determine which of the Minimum Requirements below apply.
B. The SMMWW Volume I Chapters 2.4 and 2.5 provide detailed applicability and technical resources needed for compliance. Exceptions and notes are provided below:

1. Preparation of Stormwater Site Plans
Consult Section 4 of this manual for additional requirements.

2. Construction Stormwater Pollution Prevention
Consult Section 3 of this manual in lieu of MR #2. Refer to SMMWW Vol. II for the Construction BMPs. A few local BMP options are in the Erosion Control section of the Longview-Kelso Standard plans.

3. Source Control of Pollution

4. Preservation of Natural Drainage Systems and Outfalls

5. On-site Stormwater Management,
Also consult Section 5 of this manual for LID.

6. Runoff Treatment

7. Flow Control
a. See Section 2.2.6.1 if the design is to include fencing.
b. Per Section 1.4.B.1, properties protected by CDID #1 are exempt from the state flow control requirements.

8. Wetlands Protection

9. Operation and Maintenance

NOTE: A tenth category discussed in the SMMWW, **Basin/Watershed Planning**, is not required by this manual (or the City's Phase II NPDES Stormwater Permit).

When are retrofits of existing stormwater facilities necessary?

Where flow and quality control requirements are to be met using an existing facility originally designed using a peak flow standard and single-event methodology, the original flow rates into the existing facility do not need to be revised using the WWHM. However, the facility must be modified or expanded as necessary to fully accommodate runoff from the new development or redevelopment.

2.3.2 Construction & Industrial Stormwater NPDES Permits

Obtain Ecology's Stormwater NPDES Permit(s) if/as required by Ecology. To learn more, visit: www.ecy.wa.gov/programs/wq/stormwater.

2.3.3 Underground Injection Control (UIC)

The UIC program was created by Congress, and is administered in Washington State by the Department of Ecology under Chapter 173-218 WAC to protect underground sources of drinking water from discharges of fluids to the ground, by:

- Registering UIC wells with Ecology. A copy of the registration form is provided at www.ecy.wa.gov/programs/wq/grndwtr/index.html, and
- Ensuring that current and future discharges to groundwater are not endangered by pollutants in the discharge (non-endangerment standard).

UIC wells are any manmade subsurface fluid distribution system designed to discharge fluids into the ground. They consist of an assemblage of perforated pipes, drain tiles, or other mechanisms, or a dug hole that is deeper than the largest surface dimension. Subsurface infiltration systems include drywells, pipe or French drains, drain fields, and other similar devices. A UIC well may be used to manage stormwater when pollutant concentrations that reach groundwater are not expected to exceed Washington state groundwater quality standards (Chapter 173-200 WAC). Infiltration for a single family home and receiving only residential roof runoff is exempt from registering.

Ecology's "Guidance for UIC Wells that Manage Stormwater" (Ecology 2006, see website referenced above), provides site, design, and installation information that must be followed. It also lists development activities that are prohibited from using UICs.

2.3.4 Other Programs Could Impact Stormwater

Other State and Federal requirements that could impact stormwater programs are summarized in Volume IV, Appendix IV-D of the SMMWW.

1. Stormwater Discharges to Public Sanitary Sewers, Septic Systems, Dead-End Sumps, and Industrial Waste Treatment Systems
2. Uniform Fire Code Requirements
3. Ecology Requirements for Generators of Dangerous Wastes
4. Minimum Functional Standards For Containers
5. Coast Guard Requirements For Marine Transfer of Petroleum Products
6. Washington State/Federal Emergency Spill Cleanup Requirements
7. WSDA Pesticide Regulations
8. Air Quality Regulations
9. Ecology Waste Reduction Program
10. Washington State Ground Water Quality Standards

3 Erosion Control

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3.1 PURPOSE & OBJECTIVE

This chapter is intended to represent the minimum erosion and sediment control standards for land disturbing projects of varying sizes and terrain in order to reduce water pollution, flooding, and habitat damage downstream. Generally, these standards address the following:

- Erosion controls limit the generation of sediment-laden runoff through best management practices (BMPs), such as limiting cleared areas (especially on steep terrain or where adjacent to other sensitive areas), seasonal work limits, prompt cover practices (i.e. mulching, hydroseeding, etc.), control of land use in sensitive areas, and establishment and maintenance of setbacks and buffer areas.
- Sediment controls limit the loss of sediment-laden runoff offsite through BMPs such as settling ponds, sediment traps, filter fencing, mulch berms, catch basin (inlet) protections, runoff diversions, etc.

3.2 APPLICABILITY

A. General requirements for all land disturbing activities, regardless of size:
   1. Protect the public right-of-way, receiving waters, and adjoining properties from the discharge of sediments and other pollutants, from material deposition, and/or from increased flow rates caused by the project; and
   2. Comply with applicable requirements of local, state, and federal regulations, permits, and agencies charged with construction standards, development, and/or environmental protection.

3. Projects disturbing <5,000 sq.ft. are also encouraged to use the best management practices (BMPs) described in this chapter and review the BMP summary table in Section 3.12 of this manual.

B. Projects disturbing 5,000 sq.ft. or more of land are required to:

1. Obtain a local Excavation and Grading permit for the project prior to the disturbance (this permit is waived by the Director if a Right-of-Way, Building, or Public Improvement permit has already been issued to the project and its erosion and sediment control plan is sufficient); and
2. Submit an erosion and sediment control plan showing:
   a) Clearing limits and sensitive areas (steep slopes, wetlands, waterways, etc.),
   b) Site entrances/exits,
   c) Location, type, and size of erosion and sediment controls (see SMMWW Vol. II, Ch 3.2), and provide supporting details of those BMPs including dimensions, materials, and construction information.
   d) Existing and proposed ground contours,
   e) Locations and sizes of existing and proposed drainage pipes and channels (labeled as such and with arrows indicating flow direction),
   f) The Standard Erosion Control Notes (given at the end of this section) and other applicable notes, including references to timing of placement and removal of erosion control measures.
3. Submit appropriate calculations and information to support sizing of any necessary sediment traps, ponds, or use of alternate methods and materials.
4. Deploy sediment and erosion control BMPs that are:
   - Comparable to those in the SMMWW Vol. II. Chapters 3 & 4, and/or
   - From the Longview/Kelso Standard Plans & Specifications.
5. Implement or otherwise comply with all requirements of this chapter, except as otherwise noted in §3.2(C) below, or where site conditions render it unnecessary.

C. Additionally, land disturbances of one (1) acre (43,560 sq.ft.) or more or that are part of a larger common plan of development or sale must also:

1. Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) as part of the stormwater site plan required above. The SWPPP shall have a narrative and drawings (including the site plan required above). All BMPs shall be clearly referenced in the narrative and marked on the drawings. Ecology's SWPPP template can be found at www.ecy.wa.gov/programs/wq/stormwater/construction. The SWPPP narrative shall include:
   a) Documentation to explain and justify the pollution prevention decisions made for the project.
   b) All requirements outlined in this chapter, unless site conditions render the element unnecessary and the exemption is clearly justified in the SWPPP.
   c) Sediment and erosion control BMPs consistent with the SMMWW Vol. II. Ch. 3 & 4 and the Kelso-Longview Standard Plans and Specifications.

2. Have all inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL) who shall be identified in the SWPPP and local Permit. The CESCL shall be present on-site or on-call at all times.
3. Obtain the state Construction Stormwater NPDES Permit if/as required by the Washington Department of Ecology ("Ecology," for the application or to learn more, visit www.ecy.wa.gov/programs/wq/stormwater/contruction).

3.3 GENERAL REQUIREMENTS

A. When necessary to control erosion or minimize environmental harm, based upon site and weather conditions (e.g. the threat of heavy rain or high winds) or the observed insufficiency of the approved plan, the erosion and sediment control strategy (including scheduling) shall be modified and/or work shall be stopped (by the City if necessary) until erosion control facilities are determined to be operating satisfactorily and are adequate to support the resumption of activity.

B. Activities covered in this chapter shall be implemented prior to initial soil disturbance, and remain until final stabilization following project completion.

C. Clearing and grading activities shall be:
- Permitted for developments only if conducted pursuant to an approved site development plan (e.g., subdivision approval)
- Prohibited in critical or environmentally sensitive areas unless written variances are secured from all applicable agencies.

3.4 SEASONAL WORK LIMITATIONS

A. During the wet season (October 1 through April 30), clearing, grading, and other soil disturbing activities may only be authorized if silt-laden runoff will be prevented from leaving the site through a combination of the following mitigating factors:
1. Site conditions, including vegetative coverage, slope, soil type and proximity to receiving waters; and
2. Limitations on activities and the extent of disturbed areas
   - Note: Wet season cover requirements are summarized in Element #5; and
3. Redundant and robust erosion and sediment control measures.

B. Work on slopes >25% shall be prohibited during the wet season, unless specifically authorized by the Director of Public Works.

C. The following activities are exempt from the seasonal limitations:
1. Routine maintenance and necessary repair of erosion and sediment control BMPs,
2. Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil, and

3. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

3.5 TWELVE ELEMENTS OF CONSTRUCTION EROSION & SEDIMENT CONTROL

The twelve elements described below frame the basic strategies of erosion and sediment control for any project.

Per § 3.2, BMPs referenced by this Section must be:

- From the SMMWW (see Vol. II Chapters 3 and 4), or an equivalent Ecology-approved manual (western Washington), for projects exceeding Ecology's one-acre threshold; or alternatively,
- *Comparable* to those in the SMMWW or provided in the Longview/Kelso Standard Plans & Specifications, for projects disturbing between 5,000 square feet and one acre.

Element #1: Preserve Natural Vegetation & Mark Clearing Limits	Element #7: Protect Drain Inlets
Element #2: Establish Construction Access	Element #8: Stabilize Channels & Outlets
Element #3: Control Flow Rates	Element #9: Control Pollutants
Element #4: Install Sediment Controls	Element #10: Control Dewatering
Element #5: Stabilize Soils	Element #11: Maintain BMPs
Element #6: Protect Slopes	Element #12: Manage the Project

<u>Element #1: Preserve Vegetation/Mark Clearing Limits</u>

a. Prior to beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, critical or sensitive areas and their buffers, and trees that are to be preserved within the construction area.

b. Existing vegetation (including significant trees) and native top soil (including the duff layer) shall be retained in an undisturbed state to the maximum degree practicable (i.e. minimize and/or phase cut and fill and clearing activities).

c. Trees and shrubs shall be marked and protected during construction 10 feet outside of the drip line. In no case shall land disturbances or the stacking, staging, storing, or parking of vehicles, equipment, and materials encroach into the drip line, unless approved by the City.

d. Trees shall not be used as anchors to stabilize equipment.

Element #2 Establish Construction Access

a. Construction vehicle access and exit shall be limited to one route, if possible.

b. Access points shall be stabilized with quarry spalls over geotextile or other equivalent BMP to minimize the tracking of sediment onto public roads.

c. Wheel wash or tire baths shall be located on site, if the stabilized construction entrance is not effective in preventing sediment from being tracked onto public roads. Washwaters shall be fully dispersed or treated prior to discharge.

d. If sediment is tracked off site, roads shall be cleaned thoroughly at the end of each day, or more frequently during wet weather. Sediment shall be removed promptly from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area.

e. Street washing is allowed only after sediment is removed in accordance with Element #2(d), above. Street wash wastewater shall be controlled by pumping back on site or otherwise be prevented from discharging into systems tributary to waters of the state.

f. Tracking material from a work site may warrant a cessation of construction activities until corrections are made. Unnecessary vehicle traffic and parking shall be limited onsite when and where the potential to transport material offsite is high.

Element #3: Control Flow Rates

a. Properties and waterways downstream from development sites shall be protected from erosion due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site.

b. Where necessary to comply with Element #3(a), above, stormwater retention or detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to any construction activities, including clearing and grading.

c. If permanent infiltration ponds are used for flow control during construction, these facilities should be protected from siltation during the construction phase.

Element #4: Install Sediment Controls

a. Stormwater runoff from disturbed areas shall pass through a sediment pond, vegetative buffer strip, sediment barriers or filters, dikes, mulch-berm, or other appropriate sediment removal BMP, prior to leaving a construction site or prior to discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but shall meet the flow control performance standard of Element #3(a), above.

b. Sediment control BMPs (sediment ponds, traps, filters, etc.) shall be constructed as one of the first steps prior to clearing and grading. These BMPs shall be functional before other land disturbing activities take place.

c. BMPs intended to trap sediment on site shall not interfere with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.

d. Permanent infiltration systems shall be isolated and protected from sedimentation and from compaction by traffic, stockpiling, etc.

Element #5: Stabilize Soils

a. Exposed and unworked soils shall be stabilized by application of effective BMPs, including but not limited to sod, hydroseed, plastic cover (particularly for steep slopes and stockpiles), mulching, runoff diversion, or by application of ground base for areas to be paved.

b. No soils should remain exposed and unworked for more than the time periods set forth below:

- During the dry season (May 1 – September 30): 7 days
- During the wet season (October 1 – April 30): 2 days
- The City may modify cover periods for projects below the one-acre threshold based on conditions, the erosion control plan, and the project's proven capacity to stabilize soils and prevent sediment loss from erosive forces and traffic.

c. *Reserved.*

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

e. Soil stockpiles must be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways and drainage channels.

f. Dust shall be minimized to the extent practicable, utilizing all measures necessary, including but not limited to:

- Sprinkling haul and access roads and other exposed dust-producing areas with water. Obtaining water from a hydrant or ditch will require specific authorization from the applicable water jurisdiction.
- Applying Ecology-approved dust palliatives on access and haul roads.
- Establishing temporary vegetative cover.
- Placing wood chips or other effective mulches on vehicle and pedestrian use areas.
- Maintaining the proper moisture condition on all fill surfaces.
- Pre-wetting cut and borrow area surfaces.
- Use of covered haul equipment.

Element #6: Protect Slopes

a. Design and construct cut and fill slopes in a manner that will minimize erosion.

b. Off-site stormwater (run-on) or groundwater shall be diverted away from slopes and undisturbed areas with interceptor dikes, pipes and/or swales. Offsite stormwater should be managed separately from stormwater generated on the site.

c. At the top of steeper slopes, collect runoff and covey it in a controlled manner, such as in a drain line or protected channel to prevent erosion.

- Projects exceeding Ecology's "one acre-threshold," must design temporary pipe slope drains to handle the expected peak 10-minute flow velocity from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis shall use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis shall use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area."

d. Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.

e. Check dams shall be placed at regular intervals within constructed channels that are cut down a slope.

Element #7: Protect Drain Inlets

a. Storm drain inlets offsite which could be exposed to turbid runoff caused by the project or which are on-site and made operable during construction shall be protected so that stormwater runoff is filtered or treated to remove sediment before entering the conveyance system. BMPs may include but are not limited to a combination of straw wattles, inlet filters, and gravel filters.

b. Inlet protection devices shall be cleaned or removed and replaced when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

Element #8: Stabilize Channels and Outlets

a. All temporary on-site conveyance channels shall be designed, constructed, and stabilized to prevent erosion from peak flows. BMPs may include, but are not limited to check dams, channel lining (e.g. with erosion control blankets or geotextile), and armoring (rocking).

- Projects exceeding Ecology's "one acre-threshold," must design channels using the hydrologic analysis described in Element #6(c) above.

b. Stabilization, including, but not limited to, armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

Element #9: Control Pollutants

a. All pollutants, including waste materials and demolition debris, that occur on-site shall be handled and disposed of in a manner that does not risk contamination of runoff.

b. Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and other materials that have the potential to

pose a threat to human health or the environment. On-site fueling tanks shall include secondary containment.

c. Maintenance, fueling and repair of heavy equipment and vehicles shall be conducted using spill prevention and control measures. Contaminated surfaces shall be cleaned immediately following any spill incident.

d. Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system or to the sanitary sewer with local sewer district approval.

e. Application of fertilizers and pesticides shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' requirements for application rates and procedures shall be followed.

f. BMPs shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources (see the SMMWW Vol. II Chapter 4 for BMPs C151 and C152 and view BMPs C252 and C253 at Ecology's construction stormwater website: www.ecy.wa.gov/programs/wq/stormwater/contruction). The pH of stormwater shall be adjusted as necessary to prevent violations of water quality standards.* Unmitigated concrete-related storage, process, and wastewater runoff** shall not be discharged to the storm drainage system or waters of the state.

Element #10: Control De-Watering

a. Foundation, vault, and trench de-watering water, which have similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond.

b. Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to, or directly into surface waters of the state, as specified in Element #8, above, provided the de-watering flow does not cause erosion or flooding of receiving waters. Clean de-watering water should not be routed through stormwater sediment ponds.

c. Other de-watering disposal options may include:

(i) Infiltration or dispersion;

(ii) Transport offsite in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters;

(iii) On-site chemical treatment (provide a copy of formal written approval by Ecology prior to use, visit Ecology's construction stormwater website at www.ecy.wa.gov/programs/wq/stormwater/contruction for more information);

(iv) Sanitary sewer discharge with local sewer district approval, if there is no other option; or

* Written approval from Ecology is required prior to using chemical treatment other than CO_2 or dry ice to adjust pH.

** These include but are not limited to bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping, and any concrete-related washwater, including from trucks and tools.

(v) Use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized de-watering.

d. Highly turbid or contaminated dewatering water shall be handled separately from stormwater. Highly turbid water is considered to be sufficient to cause or exacerbate the deterioration of receiving water quality or in-stream habitat conditions.

Element #11: Maintain BMPs:

a. All temporary and permanent erosion and sediment control BMPs shall be inspected, maintained and repaired as needed to assure continued performance of their intended function in accordance with BMP specifications.

b. All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization and permanent landscaping is achieved or after the temporary BMPs are no longer needed.

Element #12: Manage the Project:

a. Development projects shall be phased to the maximum degree practicable (to minimize extent of disturbance at any one time) and shall take into account seasonal work limitations.

b. Construction site operators shall maintain, and repair as needed, all sediment and erosion control BMPs to assure continued performance of their intended function.

c. Construction site operators shall frequently inspect their sites (daily is recommended) and for significant rainfall events.

d. The Erosion Control Plan or SWPPP shall be fully implemented throughout the project and promptly updated as necessary.

3.6 EROSIVITY WAIVER

Construction site operators may qualify for a waiver from the requirement to submit a SWPPP provided that all the following conditions are met:

1. The site will result in the disturbance of less than 5 acres; and the site is not a portion of a common plan of development or sale that will disturb 5 acres or greater;
2. The project's rainfall erosivity factor ("R" Factor) is less than 5 during the period of construction activity, as calculated using the Texas A&M University online rainfall erosivity calculator at: http://ei.tamu.edu/. The period of construction activity begins at initial earth disturbance and ends with final stabilization;
3. The entire period of construction activity falls between June 15 and September 15;
4. The site or facility has not been declared a significant contributor of pollutants;
5. There are no planned construction activities at the site that will result in non-stormwater discharges;
6. *Reserved;*

7. Construction site operators notify the City of the intention to apply this waiver at least one week prior to commencing land disturbing activities. The notification must include a summary of the project information used in calculating the project's rainfall erosivity factor (see Section 3.6.2 above) and a certified statement that:
   - The operator will comply with applicable local stormwater requirements; and
   - The operator will implement appropriate erosion and sediment control BMPs to prevent violations of water quality standards.

3.7 UNDERGROUND UTILITY CONSTRUCTION

The construction of underground utility lines shall be subject to the following criteria:

a. Where feasible, no more than 500 feet of trench shall be opened at one time;

b. Excavated material shall be placed to minimize runoff into the trench and adjacent roadway consistent with safety and space considerations;

c. Trench dewatering devices shall be managed as described in Element #10 of §3.5;

d. BMPs shall be used to control erosion during and after construction.

3.8 HISTORICAL AND ARCHAEOLOGICAL AREAS

Upon excavation, when burial sites, buried camp areas, village sites, and other distinctive archaeological or historical items are uncovered, or other items suspected of being of historical or archaeological significance are encountered, the Contractor shall report the matter to the City and the state liaison officer. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work.

Under the National Historical Preservation Act (P.L. 89-665; 1966), state liaison officers shall be notified when historical or archaeological items are unearthed.

The Washington Criminal Code prohibits disinterment of a corpse without permission of the appropriate authorities.

3.9 OTHER REQUIREMENTS

Construction noise shall be minimized by the use of proper engine mufflers, protective sound reducing enclosures, and other sound barriers. Construction activities producing excessive noise that cannot be reduced by mechanical means shall be restricted to locations where their sound impact is reduced to a minimum at the edge of the work area. All construction noise shall be in accordance with LMC 19.55.040 (WAC 173-060).

The construction shall be done in a manner to minimize the adverse effects on fish, habitat, and wildlife resources.

3.10 STANDARD NOTES FOR EROSION CONTROL PLANS

The following shall be carried as Standard Notes on erosion and sediment control plans:

STANDARD NOTES FOR SEDIMENT AND EROSION CONTROL

1. All construction shall be in accordance with the standard plans, specifications, and ordinances of the City, permit conditions, and all other applicable codes, ordinances, standards, policies and the WSDOT Standard Specifications;
2. Prior to all other construction activities, the boundaries of the clearing limits shall be clearly marked in the field and the erosion and sediment controls shall be installed.
3. To the maximum extent possible, minimize the disturbance of natural vegetation and soils.
4. The erosion and sediment controls (BMPs) shown on this plan represent the minimum requirements anticipated for the site. As construction progresses and seasonal conditions dictate, more erosion and sediment controls may be required. Additional measures and daily (or more frequent) street sweeping may be required to ensure that sediment and sediment laden water do not enter the drainage system, roadways, or surface waters.
5. All erosion and sediment control measures and facilities (BMPs) shall be inspected frequently (daily is recommended and for significant rainfall events) and maintained in satisfactory condition until clearing and/or construction is completed, permanent drainage facilities are operational, and the potential for erosion has passed. It is recommended that the contractor maintain an inspection logbook. Sites that also have a Construction Stormwater NPDES permit are required to have this logbook and a Certified Erosion and Sediment Control Lead. The contractor shall maintain a 24-hour contact number for emergency maintenance and repair of site BMPs. Inactive sites shall have their BMPs inspected and maintained at least once a month and for significant storm events. At no time shall more than one foot of sediment be allowed to accumulate within a trapped catch basin.
6. All disturbed land areas unworked for seven (7) days or more (and two (2) days between October 1st and April 30th) shall be covered. If required due to weather, timing, or site conditions, the hydroseeding shall be supplemented by mulching with straw a minimum of one (1) inch thick and stapling jute or utility mesh over the mulch.
7. Approval of the erosion and sedimentation control plan does not constitute an approval of design, nor location of pipes, restrictors, or retention facilities, or an approval of plans required for a building permit; but is an approval of grading and sedimentation control plan only.
8. The applicant/contractor is responsible for the installation, maintenance, and upgrading of these erosion/sediment controls and for preventing water pollution due to construction materials, methods, or equipment until all construction is completed and approved and vegetation/landscaping is established.
9. For cement concrete and masonry jobs, the Contractor shall provide a means to rinse concrete trucks and tools, such as a separate area of at least 200 square feet in size. Such a means or area shall be sufficiently isolated as to prevent affected runoff from entering the storm drainage system or receiving waters. All exposed aggregate concrete shall be installed and constructed so that no wash water enters the storm drainage system or water body.
10. Prior to occupancy of the building, the permanent storm drainage system shall be cleaned by pumping (not into the storm drainage system) or other method as approved by the City. All temporary BMPs shall be removed within 30-days after final site stabilization or after these BMPs are no longer needed.

3.11 SIGNAGE

Erosion control signage approved by the City shall be installed at each point of entry for any subdivision or short plat prior to issuance of provisional acceptance. Approved signs can be purchased at City Hall and local retailers.

Removal of signage shall occur no sooner than the latter of: certificates of occupancy have been issued for seventy percent (70%) of the lots; or there being less than ten (10) unoccupied lots remaining within the development; or as determined by the City.

Figure 3.11.1: Example of Erosion Control Signage:

3.12 COMMON EROSION AND SEDIMENT CONTROLS

- Minimizing the area of land disturbance, retaining vegetation (including significant trees) and the native soil (including the duff layer), and phasing of construction will yield the greatest erosion control benefits.
- Erosion and sediment controls must be installed before work begins, inspected frequently (daily recommended), maintained or replaced as necessary, and upgraded or modified as conditions change.
- It is recommended that, in addition to the project's CESCL, it is recommended that all site workers and suppliers are trained in erosion control.
- Table 3.12 below summarizes common strategies for erosion control for various types of projects and terrain. It is not meant to supersede the SMMWW or the sound judgment of the project's engineer, geotech, or erosion control professional.

Table 3.12: Common Erosion Control Strategies

		Single Family / Duplex Residential		**Commercial, Subdivision, & Large Site Construction**			**Ditch Swale**	**Stockpiles**
	Base Measures / Slope	<2%	>2%	<2%	>2%	>50%		
1	Construction entrance	X	X	X	X	X		
2	Silt fence at toe of disturbed area or stockpile		X		X	X		X
3	Sidewalk / subgrade barrier		Alt to #2		Optional	Optional		
4	Filter strip (undisturbed buffer)		Alt to #2		Alt to #2	Alt to #2		
5	Fence, wattles, or mulch filter berm along contours *				X	X		
6	Temp interceptor dike/swale around work areas			Optional	Optional	Optional		
7	Check dams						X	
8	Inlet protection	X	X	X	X	X		
9	Street sweeping (daily)	X	X	X	X	X		
	Wet Weather Measures **							
10	Establish grass				X		X	
11	Plastic sheeting				Alt	X		X
12	2″ of mulch cover				Alt		Alt	Alt
13	Erosion blanket with anchors				Alt	Alt	Alt	
14	Sediment trap or pond				Alt			
	Post Construction							
15	Establish groundcover or landscaping prior to removing controls	X	X	X	X			

* (Slope, Spacing on Contours): (<10%, 300′), (<15%, 150′), (<20%, 100′), (<30%, 50′), (≥30%, 25′)
** Wet weather seasonal restrictions apply from October 1st – April 30th.

4 Plans Submittal

4.1 GENERAL

A. Approval of a complete set of stormwater plans and supporting documentation is required prior to authorization (permit issuance) for any work covered by this Manual.

B. The scope and contents of each submittal will vary with the type and size of the project, individual site characteristics, and the applicability of Ecology's Nine Minimum Requirements. However, every submittal package shall:

1. Contain all of the technical information and analysis necessary for the City to evaluate the project for compliance with the stormwater requirements.
2. Conform to the generally accepted engineering practices in the Southwest Washington region.
3. Be of sufficient detail and clarity to expedite the review process and facilitate the operation and maintenance of the proposed system for the life of the improvement.

C. Design plans and reports shall be prepared and stamped by a professional engineer licensed in the State of Washington.

D. The City's development review process is summarized in Kelso-Longview Standard Plan PN 011-L page 2 of 28. Submittals shall be made directly to each appropriate agency (e.g. CDID1, WSDOT, etc.).

4.2 CONSTRUCTION PLANS AND SUPPORTING DOCUMENTS

A. A complete submittal package shall generally include relevant construction (design) plans, the stormwater plan (drainage report), the maintenance agreement and plan, and other supporting documentation as determined by the Director

B. Construction plans shall contain the following minimum sheets: Title sheet, erosion and sediment control plan, plan and profile sheet(s), and detail sheet(s).

1. The *erosion and sediment control plan* is discussed in Section 3.2(B)(2) for projects disturbing 5,000 sq.ft. or more. Additional considerations for projects disturbing an acre or more are provided in the SMMWW Volume II, Chapter 3.3.
2. The *plan and/or profile sheets* typically include the site, grading, (stormwater) facility, utility, and/or existing and proposed drainage plans. Jurisdiction as-builts, when available, are only to be used as an aid. When a potential conflict may occur, the engineer shall field locate and verify the alignment, depth, and

inverts of facilities shown on the plans that will be crossed by the proposed facility.

3. The *detail sheets* shall show all relevant Kelso-Longview Standard Plans and Specification (full size, and modified as necessary), special details unique to the project, and those for BMPs from the SMMWW (or Ecology approved equivalent manual).
4. For additional insight, the Director's "Private Development Plans Review Checklist" is provided in Appendix B.

C. The stormwater plan (drainage report) typically includes the following sections: Table of Contents, Maps, Overview, Applicable requirements, Soils, Source Control, Onsite stormwater management, Treatment, Flow Control, Amenity, Conveyance, Wetlands, Other permits, and Technical appendices. Additional considerations for projects disturbing one acre or more are provided in the SMMWW Vol. I, Chapter 3.

D. The maintenance plan and agreement (see Section 7.5(D)) shall receive preliminary approval by the City prior to permit issuance, unless otherwise authorized by the Director. It must then be recorded with the County prior to project completion. Likewise, any LID deeds, covenants, and education measures (see Sections 7.5(G) & (H)) must be approved by the City prior to permit issuance, and recorded prior to project completion.

E. Where site-specific challenges (e.g. capacity and critical areas) present difficult drainage and design problems, the Director may require additional supporting documentation (including the preparation of special reports and studies) that further address the potential for impacts associated with the development and the measures that would be implemented to mitigate impacts. Special reports shall be prepared by professionals with expertise in the particular area of analysis, who shall date, sign, stamp, and otherwise certify the report. Subjects of special reports may include, but are not limited to: Offsite analysis, Geotechnical, Wetlands, Floodplains and floodways, Groundwater, Structural, and Fluvial geomorphology (erosion and deposition).

4.3 AS-BUILTS

For all public works facility improvements, the engineer shall submit archival quality as-built drawings for all plans. They should include final/actual location and depth from finish grade of utilities encountered during construction, and include a statement certifying that all work for which plans were approved has been completed in accordance with the City's Standards and Specifications. The words "As-Built Drawing" shall appear as the last entry in the revision block along with the month, day, and year the as-built drawing was prepared. Final approval of improvements shall be withheld until the as-built drawings are approved by the City.

5 Low Impact Development (LID)

This Section provides . . .

- Section 5.1: Overview
- Section 5.2: Standards for Dispersion and Infiltration
- Section 5.3: State Credits
- Section 5.4: Local Credits
- Section 5.5: Simplified Infiltration Field Test

5.1 OVERVIEW

Low Impact Development (LID) is a stormwater management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic functions.

LID approaches can provide a level of mitigation superior to traditional development strategies, often at a lower cost, as they need less infrastructure and land. Additionally, LID BMPs are thought to be more cost-effective to maintain long-term because they:

- Generate less runoff, and thus have less capital infrastructure to neglect; and/or
- Are maintained along with the landscaping, which is typically simpler and would be done anyway.

As a rule of thumb though, high-groundwater and poorly-drained soils in the Longview-Kelso area render some LID practices less effective than in other parts of Western Washington, such as the Puget Sound and Vancouver. Additionally, LID approaches can demand increased interaction among project proponents (compared to traditional civil designs, where an engineer can simply size and site a facility).

A. On-site Stormwater Management. The on-site stormwater management BMPs identified in the SMMWW to infiltrate, disperse, and retain runoff on-site shall be preferentially used as practicable without causing flooding or erosion impacts. These BMPs are summarized in Table 5.3 and are illustrated in the subsequent figure, "Common Onsite Runoff Management BMPs." They generally pertain to:

- Downspouts: Using trenches or splash-blocks to spread (or "disperse") runoff over vegetated areas, or using "French drains" to "partially" connect downspouts to the street's curb and gutter, or other storm drain system.
- Driveways: Building driveways and other larger ground-level impervious areas so that they slope, berm, or intercept runoff to a gravel pad then to a vegetated area.
- Quality Soils: Retaining or replicating a soil's important stormwater functions (runoff storage, infiltration, and treatment) and minimizing added loads from fertilizers and pesticides after development.

B. LID Credits.

Table 5.1 below lists the LID credits available to developers. Any project may use the "State" credits summarized in Section 5.3 (i.e. those from the SMMWW Vol. III, App. III-C). Additionally, projects not otherwise subject to MRs #6 or #7, may also use the "Local" credits described in Section 5.4.

Table 5.1: Credits Accepted Towards Stormwater Requirements

"State" Credits (Section 5.3) *(from SMMWW Vol. III, Appendix III-C.)*	*"Local" Credits (Section 5.4)*
Permeable Pavements	Infiltration
Dispersion	Innovative LID Designs
Vegetated Roofs	Permeable Pavements
Rainwater Harvesting	Rain Gardens and Planters
Reverse Slope Sidewalks	Alternate Flow Control Standard
Minimal Excavation Foundations	Soils
Bioretention areas (rain gardens)	Trees

What is an LID Credit?

An LID credit, or runoff model representation, allows an equivalent area of impervious surface to be modeled as a pervious surface (typically lawn) or be fully mitigated (as with infiltration). For example, if roof downspout waters are properly dispersed, then that portion of the roof can be modeled as landscape. The result is a smaller stormwater facility, or sometimes no facility at all.

5.2 STANDARDS FOR DISPERSION AND INFILTRATION

A. Standards for Infiltration

- Infiltration designs must account for local soil types, slopes, and groundwater conditions and provide any necessary water quality treatment prior to infiltration.
- A soils report by a qualified geotechnical engineer (or comparable licensed professional) using soil logs to estimate USDA soil texture classes is required to determine site suitability.
- The design infiltration rate shall be limited to one-half (½) the measured infiltration rate.* Infiltration rates shall be verified at all sites, unless approved by the Director.
- Additional site suitability requirements for infiltration facilities are located in Volume III, Section 3.3.7 and Volume V, Section 4.3 of the SMMWW.

B. Standards shared by Infiltration and Dispersion

- No erosion, flooding, or damage to downstream properties may result.
- Roof downspout systems must be downslope of primary and reserve septic drainfield areas, unless site specific conditions render this unnecessary (e.g. soil permeability, system separations, or site topography prohibits subsurface flows from intersecting the drainfield).
- Facilities must comply with Ecology's Underground Injection Control (UIC) wells program (Section 2.3.3), the Washington Department of Health's (DOH's) Wellhead Protection Program, 12/93, and other regulatory protections.
- Setbacks are summarized (from the SMMWW) in Table 5.2 below:

Table 5.2: Infiltration and Dispersion Setbacks for Small Systems[1]

From Volume III Section 3.1 and Volume V Section 5.3 of the SMMWW

Setbacks (from edge of trench/well)	*Infiltration*	*Dispersion*
Structure, property line, & sensitive area	10′ [2]	5′ [3]
[On, above, or near] Slopes (>15%)	50′ [4, 5]	50′ [5]
[Ditto] Slopes >20%		50′ [4, 5]
[Ditto] Slopes >25%	Not Allowed	
[Ditto] Landslide / erosion hazard areas	N/A [4]	N/A [4]
Height above seasonal high groundwater	3′ Trench 1′ Drywell	1′ Perforated stub-out

[1] "Onsite" LID systems typically serving residential downspouts and pavements (e.g. ≤700 sq.ft. per splashblock & concentrated pavement BMPs, ≤3,500 sqft for dispersion trenches, etc.)

[2] For roof downspout systems from significant structures (e.g. house), the setback shall be 15.′ For infiltration facilities from building foundations, setbacks are 20′ upslope & 100′ downslope.

[3] Dispersion BMPs shall be setback 25′ from the Right of Way.

[4] Requires evaluation by a registered professional civil engineer with geotechnical expertise (geotechnical engineer) or a licensed geologist, hydrogeologist, or engineering geologist.

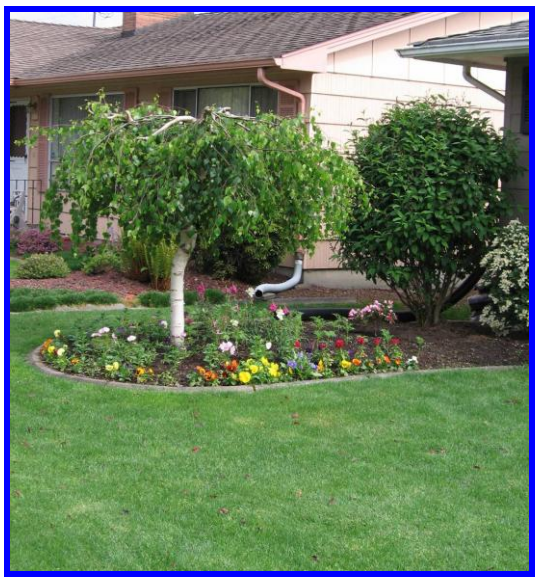
[5] May be reduced to 15′ based on geotech evaluation, but never less than the buffer width.

* The infiltration correction may be lower; for example, as required by the SMMWW or site conditions.

5.3 STATE CREDITS

The most common credit-eligible infiltration and dispersion BMPs from Volume III of the SMMWW, Appendix III-C are summarized in Table 5.3 and are illustrated in the "Common Onsite Management BMPs" figure that follows, with two exceptions:

- Full dispersion (total exemption) BMPs, which require longer vegetated paths.
- Roads, sidewalks, soils, and minimal excavation footings.



Rain garden shared by Terry-Taylor homes. Disconnected downspout at a Civic Center office.

What is the difference between infiltration and dispersion?

Dispersion BMPs spread runoff over vegetated pervious areas, providing some infiltration, some water quality benefits, and some peak flow attenuation into the conveyance system. Pre-engineered designs are typically used for dispersion BMPs; however, if the terrain is steep (i.e. >20%), near potentially or historically unstable areas, or above a septic drain field, they must be designed by a professional engineer.

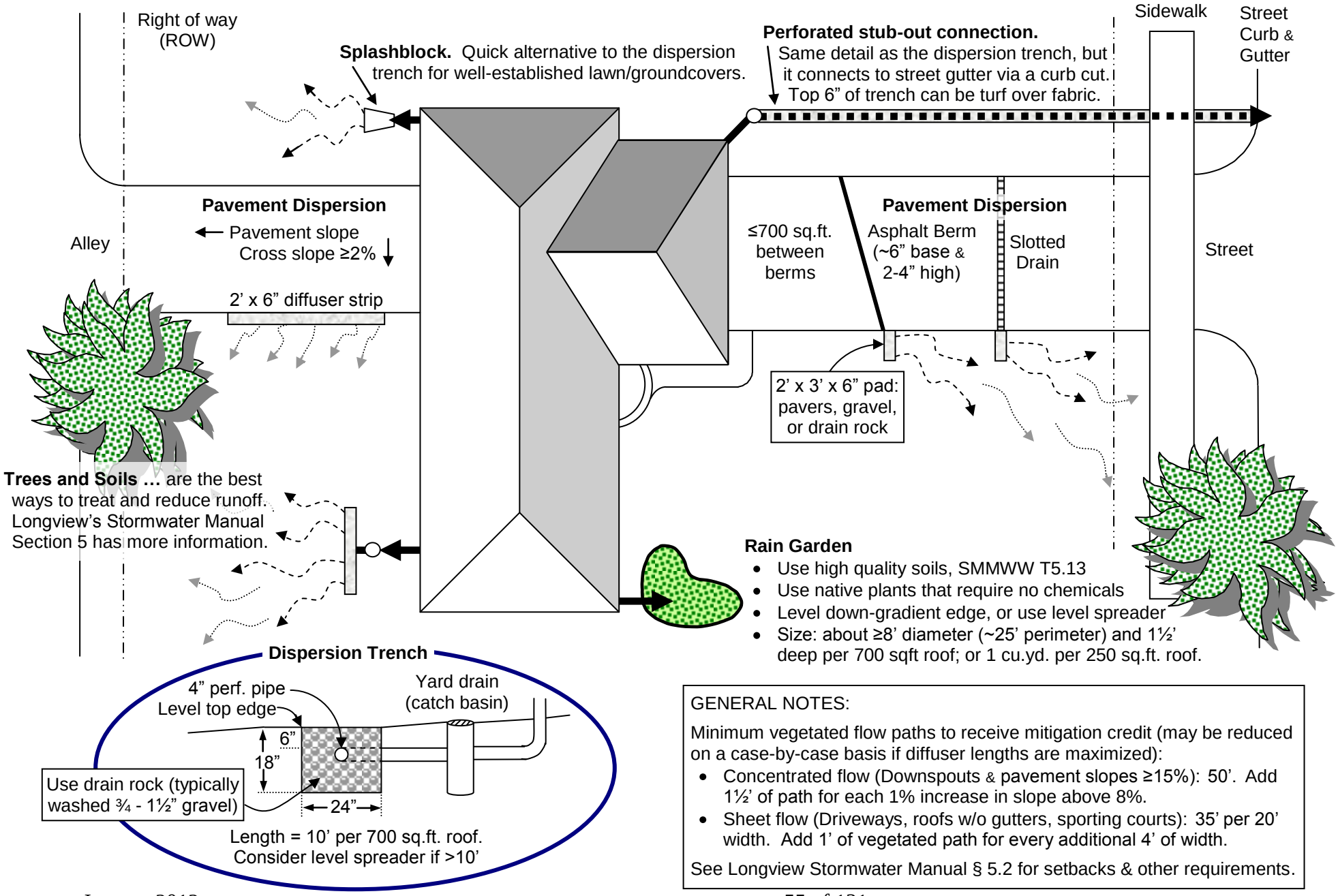
Infiltration is the use of the organic content and sorption capacity of loamy soils to remove pollutants and/or the use of coarser soils to provide flow control. Several soil types cannot serve both purposes, particularly if groundwater is a concern. Infiltration BMPs typically require a professional soils and engineering report.

Table 5.3: Summary of Most Common State Flow and Quality Control Credits in Ecology's SMMWW

Volume, Chapter	*BMP Name*	*ID*	*Application*	*Vegetated Flowpath* [1]	*Comment: (Credits allow impervious surfaces to be modeled as landscaping unless otherwise noted below)*
Vol. III, Ch. 3.1.1	Downspout Infiltration		Trench, Dry well	N/A	Total exemption from flow and quality control requirements – pretreatment may be required for non-residential.
Vol. III, Ch. 3.1.2 …and repeated in Vol. V Ch. 5.3.1	Downspout Dispersion *see pavement dispersion for roofs w/o downspouts*	T5.10	Trench, Splash block	≥50′ [2]	Each 10′ of 2′ wide x 1½′ deep gravel trench disperses 700 sq.ft. of rooftop (up to 50′ long). Designs have perf pipe to spread flow, catch basin to collect roof debris, & a level spreader for longer trenches. Splash blocks serve ≤700 sq.ft. each and require 50′ well-established groundcover. Consider downspout extensions for flat lawns or houses with basements / foundation drains.
Vol. III Ch.3.1.2; Vol. V Ch. 5.3.1	Downspout Dispersion	T5.10	Perforated Stub-out	N/A (No credit)	Perforated pipe in a gravel trench, instead of "tight-lining." It is a minimum requirement to be used per Sections 5.2 & 6.5(B).
Vol. V, Ch. 5.3.1	Pavement Dispersion *driveways, courtyards...*	T5.11	Concentrated Flow (slopes ≥15%)	≥50′ [2]	Use slotted (linear) drains or low diagonal asphalt berms to direct runoff to diffuser pads (pavers, gravel, or drain rock). Add 1½′ of vegetated flow path for each 1% increase in slope above 8%. Each berm serves ≤700 sq.ft.
Vol. V, Ch. 5.3.1 See also . . . Vol. III App. C § 7.5	Pavement Dispersion	T5.12	Sheet Flow (slopes <15%)	≥10′	Same as above. Option: slope driveway to narrow diffuser strip along the edge of the driveway. Add 1′ of vegetated path for every additional 4′ of driveway width beyond 20′.
Vol. V, Ch. 5.3.1	Soil Quality and Depth	T5.13	Soil Quality and Depth	N/A	— Visit www.soilsforsalmon.org to learn about this BMP — ▪ Retain the duff layer and native topsoil undisturbed (e.g. uncompacted), stockpile for later use if necessary, and ▪ Amend existing site soil, and/or import topsoil mix of sufficient organic content.
Vol. V, Ch. 5.3.2	Preserve Natural Vegetation	T5.20	Preserve Natural Vegetation	Preserve ≥65% of a ≥1-acre lot	Total exemption from flow and quality control requirements. Reference the Full Dispersion BMP T5.30 in Vol. V, Ch.5.3.3. Also see the discussion in Section 2.2.6 (C)(1) of this manual.
Vol. III App. C § 7.7 LID Manual § 6.1	Rain Garden (Bioretention)	Local Credit Only (soil quality is required)		N/A	Full mitigation ratio is 0.07. So, each cu.yd. of 1½′ deep garden or planter serves ~250 sq.ft. That's, a 4′ radius (25′ perimeter) garden or a 5′x10′ planter per 700 sq.ft. of roof/road.
Eugene's Manual	Planter				

Notes: [1] Vegetated Flowpath: A path through undisturbed native vegetation or lawn/landscape that meets soils quality BMP T5.13, as measured from the source down to the property line along contours. Downspouts need longer paths and bigger diffusers because they are most concentrated.
[2] Local credit may still apply on a case-by-case basis if the diffuser length is maximized.

COMMON ONSITE RUNOFF MANAGEMENT BMPs



GENERAL NOTES:

Minimum vegetated flow paths to receive mitigation credit (may be reduced on a case-by-case basis if diffuser lengths are maximized):

- Concentrated flow (Downspouts & pavement slopes ≥15%): 50'. Add 1½' of path for each 1% increase in slope above 8%.
- Sheet flow (Driveways, roofs w/o gutters, sporting courts): 35' per 20' width. Add 1' of vegetated path for every additional 4' of width.

See Longview Stormwater Manual § 5.2 for setbacks & other requirements.

5.4 LOCAL CREDITS

The following BMPs may be used in lieu of, or to reduce, the local development and redevelopment requirements. The credits and, to a lesser degree, technical notes for each BMP are provided below:

A. Infiltration. All infiltration shall be considered full treatment, to the degree allowed by federal and state water quality rules, and as approved by the Director.

B. Innovative LID Designs. Projects may receive a credit determined by the Director for innovative LID designs that are otherwise close to the meeting the local requirements. In the Longview-Kelso area, innovative designs are those that rely primarily on LID or apply particularly salient BMPs such as green roofs, pervious concrete, etc.

C. Permeable Pavements. **All pervious pavements may be modeled as landscaping (including systems with overflow drains) AND they may utilize any infiltration and storage within the rock base.** To maximize storage and infiltration, the pervious system may be connected to a control structure.

Example: An infill pocket subdivision uses pervious concrete as its primary paving material. The project is exempt from Ecology's flow control requirement, MR #7 because it is located inside the CDID #1 boundary. Local detention is not required for the streets and sidewalks because the pervious pavements are modeled as landscaping and the existing conditions happen to be landscaping. The lots are too small to fully disperse the roof gutters, so they are all connected to the street via perforated stub-outs. The road base is sufficiently open, deep, and its discharge controlled to satisfy the detention requirements for all the rooftops. Additionally, there is enough infiltration to satisfy the treatment requirement for the driveways, which are the project's only pollution generating impervious surfaces (PGIS). Finally, the project meets the Amenity criteria because it has used LID to the "full extent practicable."

Pervious pavements include pervious concrete, pervious asphalt, and pavers (porous pavers, specialty pavers patterned for extra void space, or regular pavers sufficiently separated with washed sand/aggregate as to allow the passage of water). More information can be found in the SMMWW Appendix III-C §7.1 and the LID Manual §6.3, visit www.psp.wa.gov/downloads/LID/LID_manual2005.pdf.

D. Rain Gardens and Planters. Properly designed rain gardens and planters are eligible for credit similar to the downspout dispersion trench. Table 5.3 provides a mitigation sizing factor of about 0.07, meaning that a 70 square foot facility can fully mitigate 1,000 square feet of surface. Facilities serving significant developments (i.e. as described in Section 1.4(B)(4)(b)) shall be professionally engineered and use quality soils as described in §5.4(F) below.

1. *Rain gardens* are shallow depressions that collect and filter rainwater, often with native plants. This helps the stormwater drainage system, replenishes

groundwater, and can provide habitat for birds, butterflies, and beneficial insects, like bees. They are equally suited for single family housing, streets, and parking lots. Information on rain gardens is widely available, beginning with:

- The SMMWW Appendix III-C §7.7 and the LID Manual §6.1.
- Portland's Bureau of Environmental Services' "How to Build a Residential Rain Garden," www.portlandonline.com/bes/index.cfm?c=46962&a=188636.
- City of Eugene, Oregon's Stormwater Management Manual. [Notes: 1) the amended soil should extend to 18″ deep (not 12″); 2) the impermeable membrane is only needed next to structures (e.g. finished basements)].

2. *Planters* are rain gardens that are confined within a hardscape. Designs are widely available [such as Eugene's Stormwater Management Manual and the Kitsap Home Builders Association. (visit www.kitsaphba.com/LID, Kitsap County, WA).

E. Alternate LID Flow Control Standard. Stormwater designs that manage runoff onsite (vs. traditional detention approaches) to the maximum extent practicable are allowed to match the full peak release rate of the pre-developed 2-year, 24-hour design storm instead of half that rate. Requirements for the other design storms are unchanged. Designs may include BMPs from the LID Manual or those summarized in the SMMWW Vol. III, Appendix III-C, also refer to Table 5.1.

The justification of this credit is fourfold. First, unlike traditional detention, these BMPs do more than just attenuate peak flow, they also reduce the total amount of runoff handled by the storm drainage system. Second, these facilities are typically dispersed throughout a site, so they serve runoff rates too small for orifice-based flow control. Third, by better mimicking natural conditions, they can potentially provide a higher degree of water quality control than end-of-pipe designs. Finally, incentives are deemed necessary to facilitate their introduction into the Longview-Kelso area.

F. Quality Soils. Pasture that is converted to landscaping may be considered fully mitigated if its soils achieve Ecology's T5.13 soil quality requirements, typically by augmenting with compost, visit www.soilsforsalmon.org/pdf/Soil_BMP_Manual.pdf.

G. Tree Credits. The tree credit allows areas using trees to be modeled as landscaping or forest. Tree cover is directly related to environmental quality. Yet, a broad multi-year statistical analysis of satellite imagery in numerous cities and land-use zones conducted by American Forests (formerly the American Forestry Association) concluded that 634 million urban trees are missing across the United States. Longview has about half the target 40% tree canopy they set for Pacific Northwest cities. The target tree canopy is sized for a community to fully realize the benefits of an urban forest, including the stormwater flow and quality controls, and:

- *Energy*. Many surface waters locally and across the nation are now too warm – largely due to pervasive and unmitigated suburban sprawl and riparian area loss. In fact, urban trees lower ambient temperatures by an average of 3 to 10°F, reducing what is known as the "urban heat island effect."

- *Air quality*. Urban trees and shrubs remove pollutants from the air—including nitrogen oxides, carbon monoxide, chlorine, fluorine halogens, ammonia, and ozone. They also sequester and reduce carbon dioxide and produce oxygen.
- *Stormwater*. A mature tree can intercept up to half of a storm's rainfall between its canopy and rich duff and soils. A mature forest can manage over 99% of rainwater on-site. Tree cover is one of the most cost-effective ways to improve certain water quality parameters, for example, nitrogen in streams.
- *Quality of life* and *wildlife habitat*. Washington State's 2008 Evergreen Communities Act states that "preservation and enhancement of city trees and urban and community forests is one of the most cost-effective ways to protect and improve water quality, air quality, human well-being, and our quality of life," Learn more at www.fs.fed.us/pnw/pubs/gtr490/gtr490.pdf, and www.americanforests.org/resources/urbanforests/analysis.php.

Therefore, to encourage the expansion of the urban tree canopy, two "tree credits" are extended to developers:

1. Existing Trees

   Preserved existing trees may allow impervious surfaces equal to half of the tree's canopy area measured at its drip-line (or the minimum credit for new trees below, whichever is greater) to be modeled as landscaping. The tree must:

   a) Be in the project area (i.e. onsite),
   b) Be within 25′ of an impervious surface or waterway,
   c) Be at least 4″ diameter at breast height (DBH),
   d) Be deemed by a City Forester certified by the International Society of Arboriculture (ISA) to be healthy, viable, and compliant with this section, and
   e) Not be in the right-of-way landscaping strip or otherwise managed by the City.

   If distinct portions of the site can be preserved, consider taking advantage of BMP T5.20, which is mentioned in Table 5.3 and discussed in the SMMWW Vol. V Ch. 5.3.2, or its full-dispersion twin BMP T5.30, found in Vol. V Ch.5.3.3.

2. New Trees

   New trees may allow impervious surfaces equal to 100 square feet for each deciduous tree planted and 200 square feet for each evergreen tree planted to be modeled as landscaping, subject to the following conditions:

   a) The tree must be planted in a public space and be maintained/replaced in perpetuity by a public entity (e.g. street trees). For public entities other than the City of Longview, copies of the tree preservation and maintenance agreement and policies germane to the perpetual maintenance and replacement of trees shall be provided. [The Director may allow, on a case-by-case basis, stormwater to be mitigated via new trees planted on private property and maintained privately. The Director retains sole discretion over the extent and manner of their use, which shall be at least as protective as described herein.]

b) The tree must be planted within 25′ of an impervious surface or surface water.

c) Because the time lag between planting and full efficacy of flow control benefits and a tree's decreased efficacy during major events, no more than 20% of a site's new impervious surfaces can be mitigated through the use of this credit. All of the replaced impervious surfaces are eligible for this credit.

d) Trees required by the City or other agency (such as street trees) are eligible for the credit, provided they meet all other requirements of this section.

e) The size, species, and location of trees must be consistent with applicable zoning codes [e.g. LMC 19.55.100(1)(e) & 19.80.130(4)(e)] and approved by the Parks Department. Pre-approved trees are listed in Appendix E.

f) The selection, location, and installation of the tree may be coordinated by the City. However, the tree shall <u>not</u> be planted in lieu of existing City programs; that is, the tree cannot be used to replace existing trees, satisfy Tree City USA requirements, close budget gaps for existing tree canopy strategies, etc.

g) The tree must be planted either before or as soon as feasible following the placement of the impervious surface receiving the credit and after activities which may harm the tree or its root zone.

h) The tree must be planted in the same drainage sub-basin as the project. The tree may be planted in neighboring basins provided the developer demonstrates the adequacy of the conveyance system. A map of sub-basins is provided in Appendix J.

3. General Requirements for Credit Trees

   a. Trees used for stormwater management credit shall be clearly labeled on the site plans and recorded as any other stormwater facility (see Section 7.1). Use of public trees offsite may be listed in the "Notes" section of the plans.

   b. Trees shall be maintained, protected, and replaced for the life of development or until any approved redevelopment for which a replacement facility is constructed, and are subject to the following conditions:

      i. Trees used for stormwater credit shall not be removed without prior inspection an ISA-certified City arborist and approval from the Parks Superintendent.

      ii. Trees that are removed or die shall be replaced within six (6) months.

      iii. Replacement size shall be consistent with the standards and procedures of this section, be within the same sub-basin, and be of a minimum size or number commensurate with the original credit tree. For example, a private tree documented as 1,000 square feet on the plans and drainage report, must be replaced with 10 deciduous or 5 evergreen trees.

   c. New or preserved trees shall be marked and protected from land disturbing activities as described in Section 3.5 Element #1(c) of this manual,

   d. Trees planted less than 18 feet from a perforated storm drain (or facility) require the installation of a tree root guard.

Can LID credits be applied to the local planning thresholds?

Yes! Assume a project converts 10,000 square feet of landscaping to impervious surfaces. If the project can successfully disperse just over half that area (say, through landscaping plus quality soils), then the project drops below the planning threshold. Erosion control will still be required, and plans must be submitted and recorded to document the dispersion BMPs.

(Units in Square Feet)	Pre-Developed	Post-Developed (Traditional)	Post-Developed (LID credit)
Forest	12,000	0	0
Pasture	8,000	0	0
Landscaping	0	10,000	10,000
Impervious	0	10,000	<5,000
Credit (model as lawn)		0	>5,000
Local threshold exceeded?		Yes	No
Area to mitigate		20,000	0

5.5 SIMPLIFIED INFILTRATION TEST*

The Director may allow this infiltration test for (typically minor) projects not subject to MRs #6 & #7. Because the test measures a combination of vertical and lateral infiltration, results may exceed the true infiltration rate, particularly for larger events.

Prepare Test Hole

1. Excavate an approximately 2-foot by 2-foot area at the bottom of the proposed facility.
2. A 2-inch layer of coarse sand or gravel should be placed in the hole to protect the bottom from scour and sloughing.

Soak

3. Fill the hole with a minimum of 1-foot of water. Presoak the soil by maintaining this water depth for at least 4 hours (or overnight if clay soils are present).
   - *Exception* (sandy-gravelly soils): Proceed to Step 6 if after filling the hole twice, the water completely drains in under 10-minutes.

Measure the Percolation Rate

4. To properly account for any soil swelling, percolation rate measurements must be made between 15 and 30 hours after the soaking period begins. Measure from a fixed point (e.g. with a yardstick against a sturdy beam across the top of the pit).
5. Begin measurements with the water level at 6-inches above the gravel. Measure the water level to the nearest ⅛ inch at 10-minute intervals for a total period of 1 hour (or 20-minute intervals for 2 hours in slower draining soils). Or until all of the water has drained. Any soil that sloughed into the hole during the soaking period must be removed and the water level adjusted to 6 inches above the added gravel (or 8 inches above the bottom of the hole).
6. Successive trials must be run until the measured infiltration rate between two successive trials does not vary by more than 25% (or 10% for well draining soils). At least three trials must be conducted. After each trial, the water level is readjusted to the 6-inch above gravel level.
   - *Option*: The first two trials may be run without measurement, measurements for the other(s) may be at 30-minute intervals, and the test may stop if the lowest two measurements of the third trial vary by not more than 25% (10% if well drained).
7. Upon completion of the testing, the excavation must be backfilled.

Calculation of the Infiltration Rate

8. The slowest percolation rate of the three trials is used for design. The design infiltration rate shall not exceed ½ of the tested percolation rate.

Note: 2″/hr is desirable, but many facilities are built with much lower infiltration rates.
Note: Notify the City 24 hours in advance to allow an inspector to witness the test.

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* It a simplified version of the Open Pit Falling Head Infiltration Test from the City Portland's (Oregon) *Stormwater Management Manual*, which in turn, was based on the Environmental Protection Agency (EPA) Falling Head Percolation Test Procedure (Onsite Wastewater Treatment and Disposal Systems Design Manual, EPA/625/1-80-012, 1980).

6 Conveyance

This Section provides . . .

- Section 6.1: General Notes and Standards
- Section 6.2: Closed Conduits
- Section 6.3: Open Conveyance
- Section 6.4: Private Drainage
- Section 6.5: Subsurface and Perforated Drainage
- Section 6.6: Curb Drains

6.1 GENERAL

A. Conveyance, collection, culvert, and bridge design shall accommodate the entire contributing drainage area projected under full build-out conditions and not adversely affect existing downstream conveyance elements and flow conditions.

B. Natural drainage flow routes to streams and wetlands shall be maintained, and discharges from the site shall occur at the natural location(s) and elevation(s), to the maximum extent practicable.

C. Since open channel conveyance systems can improve water quality treatment, long-term maintenance, and overland flood relief routes, they are preferred over closed conduits, if feasible (e.g. space, topography, etc.). Safety considerations must include public access and adjacent travel ways.

D. Outfalls shall enter existing creeks or drainage channels perpendicular to the channel or angled downstream and have protections to prevent erosion of the existing bank and/or channel bottom during the 100-year design storm.

E. Storm drain conveyance systems shall be installed in accordance with the Longview-Kelso Special Provisions & Standard Drawings and the current WSDOT Standard Plans and Specifications for Road, Bridge, and Municipal Construction, with the notations as provided in this Section.

F. Discharge to a diking district facility requires that diking district's approval.

6.2 CLOSED CONDUIT SYSTEMS

A. Design Requirements

1. The **25-year storm** shall show free-flowing conditions through the proposed and/or existing conveyance system

2. The **100-year storm** may overtop the conveyance system, provided:
   a. The additional flow shall not extend beyond one-half of the width of the outside lane of the traveled way and shall not exceed 4″ depth at the deepest point, and
   b. Waters do not rise to elevations more than 2′ below that of the lowest aboveground floor of buildings and no portions of a building will be flooded.

3. Backwater. At the discretion of the Director, or for the conditions listed below, a backwater analysis shall be conducted to determine the hydraulic grade line to ensure a minimum of 1.0′ freeboard between the water surface and the top of any manhole or catch basin for the 25-year storm:
   a. Pipes with slopes less than 0.5%,
   b. Pipes with velocities over 6.5 feet per second (fps) (for sub critical flow only),
   c. Inlet and outlet pipes forming a sharp angle (45 degrees or greater) at junctions, and
   d. Pipe inverts less than 3 feet deep when entering and leaving junctions.

   Detailed information on this procedure can be found in Section 6.6 of the WSDOT Hydraulics Manual (WSDOT 2007) or Section 7 of the Federal Highway Administration (FHWA) Hydraulic Engineering Circular (HEC) 22, "Urban Drainage Design Manual."

4. Pipe. All storm pipes shall be constructed of high-density polyethylene (HDPE) smooth interior corrugated pipe.
   a. Alternate Materials. Where required for strength, such as for shallow bury, Class 52 ductile iron pipe shall be used. Other pipe materials may be used if approved by the Director.
   b. Tracer Wire. Plastic pipe shall be laid with marking tape and tracer wire.

5. Size. The minimum pipe size within the public right-of-way (ROW) shall be 12″ unless otherwise approved by the City Engineer. Storm laterals from private drains to inlets may be 6″ and shall have a cleanout installed at the property line.

6. Velocity. All storm drains shall be on a grade which produces a mean velocity when flowing full of at least three feet per second (fps), unless prohibited by site conditions. The Director may waive this minimum where existing drainage systems make it impractical to meet the standard.

a. If velocities exceed 15 fps during the 25-year storm, anchors shall be provided at bends and junctions.
b. Velocities in pipes other than HDPE and iron are limited to 30 fps.

7. Slope.
   a. For slopes exceeding 25% and systems longer than 100,′ the HDPE pipe shall be anchored at the upstream end and the downstream end shall be placed in a minimum 4′ section of the next larger pipe size. This sliding sleeve connection allows for the high thermal expansion-contraction coefficient of the pipe material.
   b. For slopes steeper than 40%, the HDPE pipe shall be anchored at least every 100′ thereafter.
   c. Other materials have slope restrictions and different anchor requirements.

8. Minimum separations from storm drains to sewers and water lines shall be as required for sewers in the Longview-Kelso Standard Plans & Specifications, or as approved by the City Engineer: 10′ horizontal and 18″ below the crown of water lines, or less if as provided in Water Standard Details W-290, W-295, and W-300. Storm lines shall be laid higher than sanitary sewers where possible.

9. Pipes over 8″ in diameter that "daylight" to the surface shall have a protective grate installed that prohibits wildlife and children from entering the storm line. The grate shall be hinged or otherwise designed to allow for cleaning and to reduce accumulation of debris from behind the grate.

10. The letter 'D' shall be stamped into the curb directly above the point where storm pipes cross under it, curb cuts excepted.

B. Alignment and Cover

1. All changes in direction shall be made at a manhole, or other approved structure.
2. Storm drain lines shall not be curved between structures, unless approved by the Director
3. Unless otherwise approved, a minimum cover of 36″ of cover is required above the top of the pipe to the top of the ground surface. There shall be a minimum of one 1′ separation from the top of pipe to the bottom of the roadway section (e.g. laterals from catch basins).
4. In areas of relatively flat terrain, the design engineer must show that sufficient depth is provided at the boundary of the development to drain the upstream basins.
5. When necessary to locate drains in easements or tracts, the storm drain shall be centered in the easement. However, drains may be offset due to site conditions.
6. The crown of up stream pipes shall not be lower than the crown of downstream pipes, except as noted below:

a. Where a minimal fall is necessary between the inlet and outlet pipes in a structure, pipes shall be aligned vertically to (in order of preference): match crowns, match 80% diameters of pipes, match inverts.
b. Where pipes are downsized, as approved by the Director, and provided that:
   i. No hydraulic jump occurs
   ii. The downstream pipe slope is significantly greater than the upstream slope
   iii. Velocities remain in the 3 – 8 fps range.

C. Manholes

1. Manholes shall be located at all changes in slope, alignment, pipe size, and at all pipe junctions with present or future storm drains.
2. Manholes shall be spaced no greater than 300′ apart, and in no case shall the spacing be greater than 400′.
3. Standard manholes are required when rim to crown of pipe elevations exceed 4′, otherwise flat-top manholes shall be used.
4. The manhole cover shall be stamped "STORM."
5. Storm manholes shall have a sump at least 24″ below the lowest invert to collect sediment and debris. However, manholes having a mainline pipe entering or exiting at a slope of 15% or greater shall have no sump and be pre-channeled.

D. Collection

Stormwater collection systems shall be designed in accordance with the FHWA's HEC 22, "Urban Drainage Design Manual," with the following notes:

1. Curb inlets shall be located in streets at the curb-line to receive stormwater and convey it to the main storm drain.
2. Curb inlets shall be at the following locations, whichever is less, unless approved by the Director:
   a. Less than 300′ apart, and in no case shall the spacing be greater than 400′,
   b. In the tangent section immediately in advance of the curb returns on the upstream side of the intersection,
   c. At all street ends with a descending grade, and
   d. At intermediate locations such that gutter flow does not exceed 3′ in width or 3″ in depth.
3. Catch Basin grates shall be stamped "Dump no Pollutants – Outfall to Stream," "Dump no Pollutants – Infiltrates to Soil," or equivalent.
4. Catch basins shall have a sump at least 15″ below the lowest invert to collect sediment and debris.
5. Curb inlets shall be used with curb and gutter installations up to 8% in tangential grade. Combination curb inlets shall be used for steeper grades.

6.3 OPEN CONVEYANCE

A. The **25-year storm** shall show free-flowing conditions through the proposed and/or existing conveyance system. Culverts with contributing drainage areas greater than 200-acres shall be designed to pass the peak runoff from the 100-year design storm.

B. The **100-year** storm may flow at bank-full, provided:
   a. Runoff is contained within defined conveyance system elements,
   b. The hydraulic grade line does not exceed the elevation of the roadway subgrade, &
   c. Waters do not rise to elevations more than 2′ below that of the lowest aboveground floor of buildings and no portions of a building will be flooded.

C. Culverts. Culverts shall be designed in accordance with the current WSDOT Hydraulics Manual. Fish passage culverts shall meet the design criteria specified in the Washington Department of Fish and Wildlife (WDFW) *Design of Road Culverts for Fish Passage* http://wdfw.wa.gov/hab/engineer/cm/.

D. Backwater. A backwater analysis (see the King County Surface Water Design Manual for an example) shall be performed if a flow restriction (such as a bridge or culvert) causes flow to rise above normal depth within a channel reach.

E. Side Slopes. Channel side slopes shall not exceed 2:1. Depth, safety, and erosion concerns must be considered with slopes steeper than 3:1. All constructed channels shall be compacted to a minimum 95% compaction verified by a modified Proctor test (ASTM D1557/AASHTO T180).

F. Freeboard.
   1. Channels designed for 25-year storm flows of 10 cubic feet per second (cfs) shall have at least 0.5′ of freeboard, and 1.0′ for greater velocities.
   2. Vertical clearance between the 100-year water surface and the bottom of any part of the bridge shall be a minimum of two feet.
   3. Culverts at road crossings in natural perennial channels shall be designed to pass the peak discharge for the 25-year storm such that the headwater does not exceed one and one-half (1½) times the culvert diameter, or remains at least one (1) foot below subgrade, whichever is less.

G. Lining and Armor. Open channels shall be designed to withstand channel erosion and not degrade water quality.
   1. Channels with peak velocities less than 5 fps shall be vegetated.
   2. Channels with velocities above 5 fps, channels shall be sufficiently armored to the maximum water surface elevation.

6.4 PRIVATE DRAINAGE

A. Provide a recorded stormwater easement for the inspection and maintenance of the shared or offsite private stormwater system and for any crossing of private property to reach the approved point of discharge.

B. Stormwater easements shall match those for publicly owned systems [Section 7.1(4)], except those for pipes which have a 12″ or smaller inside diameter that are no greater than 5′ deep. These easements may be a minimum of 10′ wide or equal to any setback in which it is located.

C. Design and install the system to meet the Uniform Plumbing Code requirements.

D. Subdivision lots which drain to the rear should be avoided.

6.5 SUBSURFACE AND PERFORATED DRAINAGE

A. Underdrains shall be provided at the following locations:

1. For all existing springs and tile intercepted during construction.
2. Where high ground water exists or when it is necessary to reduce the piezometric surface to an acceptable level to prevent land slippage or under-floor flooding of buildings.
3. The drainage line installed shall begin at a clean-out and terminate at an approved point of discharge.

B. Where impervious surfaces and landscaping must be connected to the private or public storm sewer systems, perforated pipe in a fabric-wrapped open-rock trench (a.k.a. “French drain” or “perforated connection”) shall be preferentially used as practicable, unless as otherwise required by MR #5 (and as described in the SMMWW Vol. III Ch. 3.1.3) for all projects disturbing an acre or more. Such drainage provides some water quality, some peak flow attenuation, and some dewatering of the property during the wet season.

6.6 CURB DRAINS

A. Drainage from residential roofs and footings may drain directly to a street through the curb (a.k.a. "curb cut" or "curb drain") under the following circumstances:
   1. Perforated connections are first evaluated as per Section 6.5(B).
   2. It can be shown that gravity drainage is possible (for example, the building pad ground elevation is 2′ above the existing street curb or it slopes by 2% or more down to the high water mark of the street), and,
   3. The existing street is adequately crowned and its drainage system, including curb, gutter, and storm lines, is adequately sized to accept the additional flow.
   4. Pressurized outfalls, e.g. sump pumps, shall not be allowed to plume into the street or where they cause standing pools in the gutter, a slip, or a vector hazard.

B. Curb drains shall not be allowed for new commercial development. Commercial redevelopment may use curb drains, per approval of the City Engineer.

C. Should curb drains be abandoned, they shall be removed from the ROW, unless otherwise approved by the Director.

What are Perforated Connections?

They are French drains connected to a storm drainage system. They are sometimes referred to as a "partial" connections or disconnections.

The perforated stub-out connection consists of at least 10′ of perforated pipe in a trench typically at least 2′ trench backfilled with drain rock. The drain rock should cover the pipe and extend at least eight inches below the bottom of the pipe. The rock trench should be covered with filter fabric and 6″ of fill. Other recommendations include:

1. The use of clean-outs and traps at the base of the downspout to capture any debris from the roof gutter.
2. Properties with basements may want use traditional drain line for the first section.
3. Refer to Sections 5.2 and 5.3 for other considerations and detail.

7 Additional Requirements

This Section provides . . .

- Section 7.1: Requirements for Stormwater Tracts and Easements
- Section 7.2: Stormwater Performance Bond
- Section 7.3: As-Built Plans
- Section 7.4: Dedication of Facilities
- Section 7.5: Long-Term Maintenance, including the Maintenance Agreement/Plan, the Maintenance Escrow Account, Deeds, Covenants, and Education
- Section 7.6: Enforcement

7.1 TRACTS AND EASEMENTS

A. Storm drainage tract dedication and/or easements shall be required where the conveyance (including watercourses), storage, or treatment of stormwater is identified on the stormwater management design plan and where:
   a) Access is needed by the City for inspection and/or maintenance, or
   b) Access is needed to private drainage per Section 6.4 of this manual.

B. Stormwater tracts and easements shall be placed on all plats and property deeds and recorded with the Cowlitz County auditor, after approval by the City.

C. Easements shall not be used for any purpose which would interfere with the unrestricted use of the storm drain line. No structures or other obstructions that prevent access are permitted within tracts or easements. Fences crossing tracts shall provide gates of sufficient width to provide access for maintenance.

D. Minimum widths for public easements shall be as follows:
   a) Storm lines up to 24″ in diameter shall have a minimum easement width of 15′.
   b) Storm lines 24″ and greater in diameter shall have a minimum easement width of 20′ plus the pipe diameter.
   c) Depths greater than 7′ to the invert shall require wider easements. A slope of one horizontal to one vertical (1:1) from the storm drain invert to the ground surface shall be used in determining easement width.
   d) Channels: sufficient width to cover the 100-year floodplain line, fifteen 15′ from the waterway centerline, or 10′ from the top of the recognized bank, whichever is greater. A 15′ wide access easement shall be provided on both sides of the channel for channel widths greater than 14′ at the top of the recognized channel.
   e) Access: Where right-of-way (or an easement) is required for access, it shall be a

minimum of 15′ wide and the tract (or easement) shall extend to an acceptable access location.

7.2 STORMWATER PERFORMANCE BOND

At the discretion of the Director, the applicant may be required to furnish a stormwater performance bond. This is to ensure that action can be taken by the City, at the applicant's expense, should the applicant fail to initiate or maintain those measures identified in the approved stormwater management design plan. If the City takes such action upon such failure by the applicant, the City shall collect from the applicant the difference, should the amount of reasonable cost of such action exceed the amount of the security held.

A. Term of Performance Bond
The stormwater performance bond furnished pursuant to this section, or the unexpended or unobligated portion thereof, shall be released to the applicant within sixty days of issuance by Public Works of the final acceptance of the permanent stormwater BMP. A final inspection by Public Works is required before any performance bond will be released.

B. Term Extended for Initial Maintenance
At the discretion of Public Works, the stormwater performance bond may be extended beyond the time period specified above to cover a reasonable period of time for testing the BMPs during storm events and for initial maintenance activities. For the purposes of this section, the time shall not exceed two years beyond final acceptance of the construction of the BMP unless the Director determines that an extension is necessary to ensure that the facility satisfies the maintenance and performance requirements identified in the Manual and the approved stormwater maintenance plan.

C. Partial Release of Bond
The Director shall have the discretion to adopt provisions for a partial pro-rata release of the performance bond on the completion of various stages or phases of development.

D. Bond Estimation
The applicant shall be responsible for determining the estimated bond value and submitting the estimation to the Director for approval.

1. For public facilities, the bond value shall be 150% of the estimated cost, set or approved by the Director, for the City to construct the stormwater features and achieve final stabilization.
2. For private facilities, the Director may allow a cash escrow or other performance security in lieu of a bond. It shall cover 150% of the estimated cost, set or approved by the Director, for the City to fully mitigate the maximum impact that the disturbance and improvements could have on the public storm drainage system. Considerations may include, but are not limited to, project phasing, the erosion control plan, demolition or full disconnection of the new impervious surfaces, final

stabilization, and restoration of any hydrologically significant features, such as critical areas, drainage courses, natural detention areas, quality soils, and trees.

7.3 AS-BUILT PLANS

After final construction, but prior to project closure, applicants are required to submit as-built plans for permanent stormwater management facilities required by this manual. The plans must show the final design specifications for all stormwater management facilities, meet the criteria for as-built plans in Section 4 of this manual, and be signed and sealed by a registered professional engineer.

7.4 DEDICATION OF FACILITIES

The City may accept a dedication of a stormwater facility, together with necessary easements and appurtenances, upon a determination and acceptance, as provided herein, except that dedications made during the subdivision platting process shall not be subject to the following process:

A. Preliminary Determination by Public Works: Upon receipt by the City of an offer of dedication of a stormwater facility, Public Works will make a preliminary determination whether or not the dedication of the facility is appropriate to protect the public health, safety and general welfare, and furthers the goals of the City's stormwater management program and/or associated watershed plans. Budgetary implications will be a component of the determination. Public Works will inspect the facility to determine whether it has been properly maintained and is in good repair, and may condition the recommendation of acceptance on completion of any necessary maintenance items. The Director may reject the offer of dedication or forward the offer to the City Manager for acceptance.

B. Acceptance by the City: The City Manager may accept or reject the offer of dedication. Upon acceptance, the owner shall record the document dedicating the stormwater facility with the Cowlitz County Auditor at his or her sole expense.

C. Owner to Provide Documentation: The owner, at his or her sole expense, shall provide any document or information requested by the City in order for a decision to be reached on whether or not to accept the facility.

7.5 LONG-TERM OPERATION & MAINTENANCE

A. Operation and Maintenance Required

All erosion controls, watercourses, and stormwater facilities (including but not limited to structural and non-structural BMPs, catch basins and other protective devices, necessary access routes, and appurtenances) shall be operated and maintained in accordance with the manufacturer's specifications, the SMMWW, this manual, the approved stormwater management design plan, and the stormwater maintenance agreement and plan.

B. Responsible Party

The owner shall be responsible for the proper operation and maintenance of the site's stormwater facilities and shall pass such responsibility to any successor owner, unless such responsibility is transferred to the City or to another entity as per Section 7.4 of this manual.

C. Maintenance by the City

The City will maintain subdivision-scale residential facilities (such as detention ponds, bioswales, and non-structural LID BMPs shared by multiple residential lots). The City will not maintain the following:

1. Private single-family unit rain gardens, or the like.
2. Private facilities serving commercial, industrial, or managed residential properties (e.g. apartment complexes).

Who will maintain the stormwater facility?

As clarified above, the City will maintain residential detention and treatment facilities. The City will not maintain the following:

- Private single-family unit rain gardens, or the like.
- Private facilities serving commercial, industrial, or managed residential properties (e.g. apartment complexes).

Residential facilities not already maintained by the City (such as those constructed prior to September 2009), may have their facilities dedicated as described in Section 7.4 above.

Citizens and homeowner associations are encouraged to maintain their neighborhood facility, provided such maintenance is done in accordance with this manual and with the consent of the Director and in coordination with City crews.

D. Operation and Maintenance Agreement and Plan

The owner of a stormwater facility required by this Manual shall execute a Stormwater Operation & Maintenance (O&M) Agreement and Plan prior to final acceptance of the project (see Appendix D for an example). The agreement shall be approved by the City and recorded with the Cowlitz County auditor and shall run with the land. The agreement and plan shall, at a minimum:

1. Designate the responsible party permanently responsible for maintenance.
2. Pass the responsibility for such maintenance to successors in title.
3. Grant Public Works and its representatives the right of entry for the purposes of inspecting all stormwater BMPs at reasonable times and in a reasonable manner. This includes the right to enter a property when Public Works has a reasonable basis to believe that a violation of this manual is occurring or has occurred and to enter when necessary for abatement of a public nuisance or correction of a violation of this manual.
4. Establish an operation and maintenance plan to ensure the continued effectiveness of the BMPs. The plan shall, at a minimum, include site and facility plans, relevant detail sheets, technical description(s), a list and schedule of inspection and maintenance tasks, and actions to be taken when maintenance is required (e.g. standard procedures).
5. Include copies of any educational brochures required in Section 7.5(H) below.

E. Maintenance Escrow Requirement

At the discretion of the Director, the property owner may be required to post a cash escrow, letter of credit, or other acceptable form of performance security in an amount that would cover costs associated with maintenance and repair or replacement in the event of a stormwater facility failure, at least 10% of the project engineer's estimate to construct the facility. This instrument is required to be posted prior to completion of construction and release of the Stormwater Performance Bond and remain in place for a minimum of two years.

- At the discretion of the Director, the stormwater performance bond may be extended in lieu of the maintenance escrow account.

F. Maintenance Records

The responsible party shall keep records of the BMPs' installation and all subsequent maintenance and repairs, and shall retain the records for at least five years. These records shall be made available to the City within one week of inspection or request by the City.

G. Long-term Protective Mechanisms for LID

To ensure that the stormwater management applications continue to function as designed, private homeowner deed restrictions, homeowners/building covenants, and/or a recorded maintenance agreement and plan shall be required for all properties with on-site LID BMPs that were installed to satisfy the stormwater mitigation requirements of this Manual. The protective mechanism shall specifically address and/or append the requirements and responsibilities for long-term management and maintenance of any LID BMPs. Sample maintenance agreement language is provided in Appendix D.

H. Stormwater Education

The developer shall create education measures (e.g. fact sheet or brochure) for stormwater flow and treatment controls (including conservation areas and LID BMPs) that serve multi-unit residential developments. The literature shall provide the following:

1. A plan describing the facility (or BMPs), its locations, function, and purpose.

2. Technical information necessary to ensure long-term performance, including but not limited to, soil characteristics, tree and plant species, and maintenance instructions.
3. Information on any management agreement and plans.
4. Contacts for questions on maintenance needs and enforcement.

The developer shall provide copies of the educational materials first to the City for approval and filing prior to final acceptance of the project, and then to the initial property owners upon sale of the property. The City may provide a copy of the brochure or guide to successive owners or incorporate the material into its public education and outreach program.

7.6 ENFORCEMENT

Enforcement shall be consistent with LMC 17.80.130, 170, and 180 and LMC 1.33.

A. Protection of Watercourses and Facilities.
It shall be a civil or criminal violation to break, block, damage, destroy, uncover, deface or tamper with any watercourse, stormwater facility, or erosion control system.

B. Public Nuisance Declared.
In addition to other remedies, failure to install and/or maintain watercourses, stormwater facilities, or erosion controls as required in this manual and applicable permits is declared to be a public nuisance, subject to abatement as provided by LMC 1.33.

C. Suspension of Work or Access

1. Access to the municipal stormwater drainage system may be suspended if such termination is needed to abate or reduce an illicit discharge.
2. Work shall be suspended for un-permitted clearing and grading, or for projects that fail to provide required runoff controls for land disturbing activities. After the stop-work period, the Director may allow work on-site to recommence, provided that such work is necessary to ensure compliance with this manual, permits, or an approved stormwater drainage plan or SWPPP.
3. Resumption of work or reinstatement of connection to the municipal stormwater drainage system, without the prior approval of the City, shall be subject to the civil and/or criminal penalties delineated in LMC 1.33.

D. Financial Liability
The property owner and all persons engaged in development or land-disturbing activity shall be liable, jointly and severally, for all costs incurred by the City in any public nuisance action taken hereunder, or on account of damage or threatened damage to City property or facilities or water bodies, or associated with remedial actions necessitated by the damage or failure to install and/or maintain required stormwater facilities. The City may assess the responsible parties for these costs which shall be a lien on the property, or prorated against the beneficial users of the property, and may be placed on the tax bill and collected as ordinary taxes by the City**.**

8 References

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Washington State Department of Ecology, 2005. *Stormwater Management Manual for Western Washington*.

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APPENDIX A – Grading and Excavation Permit

PERMIT #: _____

ISSUED: _____

CITY OF LONGVIEW
STORMWATER DIVISION
P.O. BOX 128, LONGVIEW
(360) 442-5209

APPLICATION FOR EXCAVATION/GRADING OF 5000 SF OF AREA OR LARGER

APPLICATION

DATE PERMIT VOIDED: _____

THE UNDERSIGNED HEREBY MAKES APPLICATION TO:

_____
_____
_____
_____

LOCATION

_____
_____

SITE SIZE (ACRES): _____
DISPOSAL SITE (NOTE: PERMITS MAY BE REQUIRED): _____
SITE RUNOFF DRAINS TO – CIRCLE ONE: (CATCH BASIN, DITCH, PIPE, CREEK, OTHER) _____

NAME: _____

ADDRESS: _____
_____

PHONE NUMBER: _____

24-HOUR EMERGENCY CONTACT
NAME (IF OTHER THAN OWNER OR CONTRACTOR): _____

ADDRESS: _____
_____

PHONE NUMBER: _____

APPLICANT AGREES TO PERFORM THE WORK IN STRICT COMPLIANCE WITH THE PROVISIONS ENUMERATED BELOW AND STATES THAT HE/SHE HAS READ AND WILL ADHERE TO THE GENERAL PROVISIONS APPLICABLE TO PERMITS CONTAINED ON THE SECOND SHEET OF THE FORM. APPLICANT AGREES TO CONSTRUCT AND MAINTAIN EROSION AND SEDIMENT CONTROL (ESC) MEASURES IN ACCORDANCE WITH 17.80 LMC AND AS NECESSARY TO CONTAIN SEDIMENT ON THE CONSTRUCTION SITE.

PLAN FOR EROSION CONTROL PREPARED AND SUBMITTED IN ACCORDANCE WITH EROSION CONTROL GUIDELINES. EROSION CONTROL PLAN DRAWING, AS REQUIRED, HAS PLAN CONSTRUCTION NOTES COMPLETED, INCLUDING EMERGENCY PHONE NUMBER, SCHEDULES/STAGING FOR INSTALLATION AND REMOVAL OF EROSION CONTROL MEASURES, AND APPLICABLE STANDARD NOTES.

ECOLOGY'S NPDES CONSTRUCTION PERMIT REQUIRED? ☐ YES ☐ NO IF YES, COPY OF NOI SUBMITTED TO CITY? ☐ YES ☐ NO

EROSION CONTROL PLAN SUBMITTED? ☐ YES ☐ NO

_____
SIGNATURE, PERMITTEE

_____
SIGNATURE, CITY OF LONGVIEW

PROPOSED STARTING DATE OF INSTALLATION _____ INSTALLATION DURATION _____

PERMIT

PERMISSION IS HEREBY GRANTED TO PERFORM THE ABOVE DESCRIBED WORK SUBJECT TO THE GENERAL PROVISIONS ON THE REVERSE SIDE OF THIS FORM, AND THE FOLLOWING SPECIAL CONDITIONS.

SPECIAL CONDITIONS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION
SEDIMENTATION FACILITIES _____
STABILIZED CONSTRUCTION ENTRANCE _____
PERIMETER RUNOFF CONTROL _____
CLEARING AND GRADING RESTRICTIONS _____
COVER PRACTICES _____
CONSTRUCTION SEQUENCE _____
OTHER _____

MINIMUM ESC REQUIREMENTS FOLLOWING CONSTRUCTION
STABILIZE EXPOSED SURFACE _____
REMOVE AND RESTORE TEMPORARY ESC FACILITIES _____
CLEAN AND REMOVE ALL SILT AND DEBRIS _____
ENSURE OPERATION OF PERMANENT FACILITIES _____
OTHER _____

MORE SPECIAL CONDITIONS

General Provisions Applicable To This Permit

In accepting this permit, the petitioner, his successors and assigns, agree to protect the CITY OF LONGVIEW, WASHINGTON, and save it harmless from all claims, actions or damages of every kind and description which may accrue to or be suffered by any person, or person, corporation or property by reason of the performance of any such work, character of materials used or manner of installation, maintenance and operation or by the improper occupancy or rights of way or public structure and in case of any suit or action is brought against said City for damages arising out of or by reason of any commencement of such action, defend the same at his or their own sole cost and expense and will satisfy any judgment after the said suit or action shall have finally been determined if adverse to the said City.

The petitioner, his successors and assigns, agree to grant the City permission after due notice to enter and inspect the project area and/or monitor its discharges in accordance with the provisions and restrictions of 17.80 LMC for the purpose of verifying compliance with this permit. Access is limited to the project and shall not interfere with site operations.

If the work done under this permit interferes in any way with the drainage of the area, the grantee shall wholly and at his own expense make such provisions as the City may direct to take care of said drainage.

On completion of said work herein contemplated, all rubbish and debris shall be immediately removed and the roadway and roadside shall be left neat and presentable and satisfactory to the City.

The party or parties to whom this permit is issued shall maintain at his or their sole expense the structure or object for which this permit is granted in a condition satisfactory to the CITY OF LONGVIEW.

The CITY OF LONGVIEW may revoke, annul, change, amend, amplify, or terminate this permit or any of the conditions herein enumerated if grantee fails to comply with any or all of its provisions, requirements or regulations as herein set forth or through willful or unreasonable neglect, fails to heed or comply with notices given or if the utility herein granted is not installed or operated and maintained in conformity herewith or at all or for any cause of reason whatsoever.

The LONGVIEW POLICE DEPARTMENT, FIRE DEPARTMENT AND ENGINEER DEPARTMENT shall be notified before closing any street or alley to traffic.

All work areas shall be adequately barricaded according to MUTCD Standards. Barriers shall be properly lighted at night.

All trenches shall be backfilled with select materials only.

PAVEMENT REPLACEMENT: Cement concrete pavement shall be replaced to a depth of two (2) inches thicker than the original pavement. FULL PANEL replacement will be required unless otherwise specified by the Engineer. Asphalt pavement shall be replaced to a depth of two (2) inches thicker than original pavement and to the dimensions specified by the Engineer. In gravel alleys, the permittee shall replace base and surface rock.

All work shall be conducted using current WISHA/OSHA regulations. Particular attention shall be paid to the requirements as they pertain to work in trenches, electrical work, work in high places and to safety apparel such as hard hats and safety vests.

The CITY ENGINEER'S office (442-5209) must be contacted for inspection 24 hours before backfilling trenches or repairing pavement.

APPENDIX B – Submittal Checklist

CITY OF LONGVIEW
PUBLIC WORKS DEPARTMENT
PRIVATE DEVELOPMENT PLANS REVIEW CHECKLIST

Project Name: _____

Date: _____

This checklist is intended as a guide for use by City representatives to review development documentation for private developments and for developers to assure that their engineers include the required information during design. Plans, specifications, reports, calculations, etc. submitted for private developments should contain adequate information to address all applicable items listed in this checklist. This checklist includes items that are commonly encountered on private developments and is not intended to cover all items that may be required for every project.

Development documentation for private developments shall be submitted to the Community and Economic Development Department. Eleven copies accompanied by the plan submittal transmittal checklist shall be submitted. The eleven copies should include all of the submitted information. The Community Development Department will log the plans and submit the eleven sets to the public works department designated plans review coordinator. The assistant office engineer will route the submitted information to the appropriate departments/staff for review. Comments will be compiled and returned to the submitting party.

Please include the following information in your submitted packet (as applicable):

<u>General</u>

- ☐ Adequate geometric data is given such that the project can be staked by a surveyor
- ☐ Submit plans on Washington South State Plane coordinate system (or a minimum of a tie with course and distance to state plane monument) with vertical datum on NAVD 88 datum.
- ☐ Subdivision lots meet minimum size and dimensions
- ☐ North arrow shown correctly
- ☐ Vicinity map
- ☐ Scale
- ☐ Legend
- ☐ Contours
- ☐ Existing and proposed structures are clearly and accurately showing noting (proposed or existing)
- ☐ Demolitions (demolition permit required)
- ☐ Plans shall be stamped by a registered engineer

- ☐ Plans include a cover sheet showing all project information, a sheet for roadway improvements, illumination, channelization, storm drain improvements, water improvements, sewer improvements, erosion control, planting and irrigation etc. All underground facilities must be shown in plan and profile view.
- ☐ Name, address and phone number of owner, developer and engineer
- ☐ Legal description of property (lot, block, plat, etc. and/or metes and bounds)
- ☐ Property address
- ☐ Adjacent streets and driveways including opposite side of street
- ☐ Existing and proposed right of way and easements
- ☐ Existing and proposed utilities
- ☐ Landscaping shown with height and maintain site distance
- ☐ Horizontal and vertical control points with tie to development
- ☐ Property lines with adequate dimensions to locate driveways, building, utilities etc.
- ☐ Plans include note utilities locate number (1-800-424-5555) 48 hours in advance of any excavation
- ☐ All potential utility conflict (maintain 4′ horizontal separation and 1′ vertical separation)
- ☐ Include and use the latest edition of City of Longview standards specifications and WSDOT standards specifications (Note all work to be in accordance with the standards)
- ☐ Calculations included support design (hydrology, fire flow, structural, geotechnical etc)
- ☐ SEPA if required
- ☐ Boundary line adjustment if required
- ☐ Are the conditions of the preliminary plat met?
- ☐ WSDOT review if required
- ☐ CDID review if required
- ☐ Railroad review if required
- ☐ Parks department approval of plantings in the right of way
- ☐ Subdivision final plat reviewed by City and/or County Engineer (as applicable) (route to City GIS)
- ☐ Note on plans confined space requirements shall be adhered to
- ☐ Index of sheets
- ☐ Include City of Longview general note sheets, general permit conditions, submittal procedure and chlorination procedure if applicable
- ☐ Public works plan review fee paid on first submittal of plans
- ☐ Profiles required for all utilities (show crossings in profile)
- ☐ Show stationing uniform all sheets with match lines
- ☐ Where specific site characteristics, such as steep slopes, wetlands, and sites located in wellhead protection areas pose difficult drainage, roadway design and water quality design problems additional information or the preparation of special reports that address specific site characteristics, development impacts and mitigation requirements will be required
- ☐ Conditions of approval or SEPA mitigation requirements have been addressed (submit written explanation of how they are addressed)

Grading and Erosion Control

- ☐ Plan will minimize disturbance of existing cover. Where possible, phase the grading and clearing and protect natural features such as swales and tree root zones.
- ☐ Plan will minimize disturbance and compaction of soils not planned for pavement/structures. Where possible, mark these areas on the plans and in the field.
- ☐ Show and label existing and proposed contours and drainage
- ☐ Show existing and proposed ditches and swales (Note any existing or required easements)
- ☐ Finish grading will drain to stormwater features, catch basins, or natural drainage courses and will not cause standing water or offsite runoff
- ☐ Existing and proposed wetlands shown with appropriate buffer requirements maintained per the city critical areas ordinance.
- ☐ Provide erosion control measures that meet Longview Stormwater Manual
- ☐ Include standard notes for Erosion Control Plans, Longview Stormwater Manual
- ☐ Include other notes pertinent to erosion control for the site
- ☐ Remember to provide supporting detail sheets (see Longview-Kelso Standard Specs)
- ☐ Submit the Grading and Erosion Control Permit application
- ☐ Ecology's Construction Stormwater NPDES permit needed if ≥1 acre is disturbed.

Sanitary Sewer

- ☐ Adequate cover over pipes (36″ minimum from top of pipe to finish grade)
- ☐ Adequate horizontal and vertical separation between all utilities
- ☐ Slopes and invert elevations verified with minimum slope requirements and shown on plans
- ☐ Rim elevations to fit finish grade
- ☐ Manholes spaced at 300′ maximum.
- ☐ Manholes located at the end of dead end lines greater than 150′ in length
- ☐ Wash down areas flow through oil/water separator and into sanitary sewer system. Must be covered and calculations to support design required
- ☐ Existing and proposed services shown
- ☐ Unused services must be abandoned at main (show on plans)
- ☐ Note all fees must be paid and permits obtained prior to construction of services
- ☐ All proposed subdivision lots must have water and sewer services
- ☐ Services shall be shown on plans with a cleanout at property line
- ☐ Pipe types and sizes shall meet City of Longview minimum standards
- ☐ Tracer wire is required for all pipes
- ☐ All manholes must be provided all weather access by a 60,000 lb vehicle.
- ☐ System must be designed to meet Ecology requirements for loading, flow and slope.
- ☐ Minimum Pipe size is 8″
- ☐ Service laterals 8″ and larger must discharge to a manhole.
- ☐ No direct connections to Interceptor mains.
- ☐ All services must be perpendicular to the mainline, angled crossings not allowed.
- ☐ 6″ service laterals must discharge into mainline not into manholes.
- ☐ Service laterals shall be a minimum of 7.5′ from the nearest manhole or main line cleanout.

- No connection to the existing system or nearest downstream manhole without customers must be plugged until new system is tested and accepted.
- If outside city limits County review/permit required.
- Assure Ecology separations are maintained (18″ vertical & 10′ horizontal)
- Separate lateral for each lot
- Assure minimum slopes are obtained
- 0.10′ minimum drop through manholes
- Concrete anchors required (slopes greater than 15%)

Storm Drainage

- Plan should exploit opportunities for onsite stormwater management close to its source. Where possible, use landscaping and infiltration to slow, treat, and or reduce runoff.
- Provide calculations to support required detention and water quality in accordance with the Stormwater ordinance. The report should to accompany plan submittal and include the hydrology report, the geology/soils engineering reports, and any vendor design and application information.
- Provide engineered calculations to show that the affected storm sewer system and/or other downstream facility have capacity
- Provide the Maintenance Plan and Agreement (approve by permit, record later OK).
- Show catch basins and manholes with finish grade and inert elevations (should be numbered and stationed.
- Show pipe types, sizes, and slopes (meet City minimums)
- Verify that inverts and slopes meet minimum City requirements and match finish grades and provide adequate drainage for no ponding
- Pipe sizes meet stormwater ordinance (min 12″ in right of way)
- Public storm lines must be located in the right of way.
- Access easements from an existing public road to a drainage facility shall be ≥15′ and ≥20′ for lines ≥36″
- Adequate cover over pipes.
- Stormwater runoff drains internally (no sheet flow across sidewalks, curbs, driveways, adjacent parcels etc
- Stormwater flow control, treatment, and amenity is provided per Section 2 of the Longview Stormwater Manual.
- Provisions are made for overflow
- Manholes and catch basins are spaced no further than 300′ apart
- Place catch basins at curb returns at the upstream side of an intersection, at the ends of dead-end streets, at locations that limit and completely accept curb flow depths and widths of 3″ and 3,′ respectively.
- Provide a copy of the CDID #1 permit for discharges to their ditch, as applicable)
- Cleanout or manhole at right of way to separate ownership
- Show how roof downspout runoff are managed and or conveyed.
- Assure minimum slopes are obtained
- 15″ and 24″ for manholes and catch basin sumps, respectively
- Concrete anchors required (slopes greater than 15%)
- Industrial stormwater permit or UIC registration may be required.
- Double check Section 6 (Conveyance) of the Longview Stormwater Manual.

Water

- Adequate cover over pipes (36″ minimum)
- Adequate horizontal separation (water/sewer 10′ horz and 18″ vert) (all other utilities 4′ horz and 1′ vert)
- Existing and proposed fire hydrants are shown and approved by the City Fire Marshal
- Pipe type and size shown and meets City requirements for fire protection and service
- Existing and proposed services are shown (show if to abandon)
- All proposed lots have service
- Air release valves at high points
- Blow off assemblies at all dead end lines
- Adequate valves to minimize impacts of future outages
- Backflow devices required on all commercial, irrigation and fire service connections to the City system. City to determine level of hazard during review.
- Water Demand Requirements for meters larger than 1″. Need max Day and Average Day. Minimum Pipe size is 8″
- No size on size taps allowed, this requires a tee to be installed.
- For subdivisions only one connection to the existing system is allowed during construction.
- Each service location must have a minimum of 30 PSI at the point of connection.
- No service connection may exceed 120 PSI at the point of connection.
- All services must be perpendicular to the mainline, angled crossings not allowed.
- If outside city limits County review/permit required.
- Provide calculations and fixture counts to establish meter size

Streets and Sidewalks

- Proposed street width and right of way widths per City Standard
- Typical street section shown
- Sidewalks are installed along complete frontage of property (show existing and any repair of defects)
- Disabled access is provided per ADA requirements
- Full panel concrete replacement required for construction or repair
- Show streets proposed and existing
- Replace abandoned driveway approaches with full height curb
- Show monuments to be set at all PT and PC locations
- Show all curve data including radius

Traffic

- On-site traffic circulation is designed such that traffic will not stack into streets or across sidewalks
- Parking lots are designed such that vehicles will not back out of parking stalls into streets or sidewalks
- Parking lots are designed such that vehicles will not overhang onto streets or sidewalks
- Any street light installation or relocation shall be reviewed and approved by the City Traffic Engineer

- ☐ No poles, meter or hydrants within 7′ of any driveway
- ☐ If traffic (vehicular or pedestrian) will be disrupted/affected during construction a traffic control plan will be required either at plan approval or place note on plans to read "a traffic control plan is required to be prepared and submitted to the City of Longview for review and approval 10 days in advance of the proposed work"
- ☐ Traffic study (check with City of Longview Traffic Engineer to see if this is required)
- ☐ Illumination Plan In accordance with City of Longview street light standards
  Separate illumination plan.
  The illumination plan has to be stamped by a licensed civil engineer.

<u>Garbage Collection</u>

- ☐ Garbage disposal method and location
- ☐ Include in legend a symbol for the garbage enclosure (where applicable)
- ☐ Show location and note for garbage enclosure on site plan (where applicable)

APPENDIX C – Design Storm Data

Longview-Kelso Urban Area Rainfall Depth Relationships							
	Rainfall Depth, Inches						
Storm Duration	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**	**Storm Duration**
5-minute	**0.14**	**0.20**	**0.23**	**0.28**	**0.32**	**0.36**	**5-minute**
10-minute	**0.22**	**0.31**	**0.36**	**0.43**	**0.49**	**0.55**	**10-minute**
15-minute	**0.28**	**0.39**	**0.45**	**0.54**	**0.62**	**0.70**	**15-minute**
30-minute	**0.39**	**0.54**	**0.63**	**0.75**	**0.86**	**0.97**	**30-minute**
1-hour	**0.50**	**0.68**	**0.80**	**0.95**	**1.09**	**1.23**	**1-hour**
2-hour	**0.69**	**0.90**	**1.04**	**1.28**	**1.47**	**1.69**	**2-hour**
3-hour	**0.87**	**1.11**	**1.27**	**1.59**	**1.82**	**2.12**	**3-hour**
6-hour	**1.30**	**1.60**	**1.80**	**2.31**	**2.66**	**3.14**	**6-hour**
12-hour	**1.92**	**2.35**	**2.70**	**3.34**	**3.91**	**4.65**	**12-hour**
24-hour	**2.54**	**3.10**	**3.60**	**4.37**	**5.17**	**6.17**	**24-hour**

Longview-Kelso Urban Area Rainfall Depth, Inches						
Time Minutes	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
5	0.14	0.20	0.23	0.28	0.32	0.36
10	0.22	0.31	0.36	0.43	0.49	0.55
15	0.28	0.39	0.45	0.54	0.62	0.70
30	0.39	0.54	0.63	0.75	0.86	0.97
60	**0.50**	**0.68**	**0.80**	**0.95**	**1.09**	**1.23**
120	**0.69**	**0.90**	**1.04**	**1.28**	**1.47**	**1.69**
180	**0.87**	**1.11**	**1.27**	**1.59**	**1.82**	**2.12**
240	1.02	1.27	1.44	1.83	2.10	2.46
300	1.16	1.44	1.62	2.07	2.38	2.80
360	**1.30**	**1.60**	**1.80**	**2.31**	**2.66**	**3.14**
420	1.40	1.73	1.95	2.48	2.86	3.39
480	1.51	1.85	2.10	2.66	3.07	3.64
540	1.61	1.98	2.25	2.83	3.28	3.89
600	1.71	2.10	2.40	3.00	3.49	4.15
660	1.82	2.23	2.55	3.17	3.70	4.40
720	**1.92**	**2.35**	**2.70**	**3.34**	**3.91**	**4.65**
780	1.97	2.41	2.78	3.43	4.02	4.78
840	2.02	2.48	2.85	3.51	4.12	4.90
900	2.08	2.54	2.93	3.60	4.23	5.03
960	2.13	2.60	3.00	3.68	4.33	5.16
1020	2.18	2.66	3.08	3.77	4.44	5.28
1080	2.23	2.73	3.15	3.86	4.54	5.41
1140	2.28	2.79	3.23	3.94	4.65	5.54
1200	2.33	2.85	3.30	4.03	4.75	5.66
1260	2.39	2.91	3.38	4.11	4.86	5.79
1320	2.44	2.98	3.45	4.20	4.96	5.92
1380	2.49	3.04	3.53	4.28	5.07	6.04
1440	**2.54**	**3.10**	**3.60**	**4.37**	**5.17**	**6.17**

Longview-Kelso Urban Area Rainfall Intensity, Inches per Hour						
Time Minutes	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
5	1.73	2.37	2.78	3.31	3.80	4.27
10	1.35	1.84	2.15	2.56	2.94	3.31
15	1.14	1.55	1.82	2.17	2.49	2.80
30	0.79	1.07	1.26	1.50	1.72	1.94
60	**0.50**	**0.68**	**0.80**	**0.95**	**1.09**	**1.23**
120	**0.35**	**0.45**	**0.52**	**0.64**	**0.73**	**0.84**
180	**0.29**	**0.37**	**0.42**	**0.53**	**0.61**	**0.71**
240	0.25	0.32	0.36	0.46	0.53	0.61
300	0.23	0.29	0.32	0.41	0.48	0.56
360	**0.22**	**0.27**	**0.30**	**0.39**	**0.44**	**0.52**
420	0.20	0.25	0.28	0.35	0.41	0.48
480	0.19	0.23	0.26	0.33	0.38	0.46
540	0.18	0.22	0.25	0.31	0.36	0.43
600	0.17	0.21	0.24	0.30	0.35	0.41
660	0.17	0.20	0.23	0.29	0.34	0.40
720	**0.16**	**0.20**	**0.23**	**0.28**	**0.33**	**0.39**
780	0.15	0.19	0.21	0.26	0.31	0.37
840	0.14	0.18	0.20	0.25	0.29	0.35
900	0.14	0.17	0.20	0.24	0.28	0.34
960	0.13	0.16	0.19	0.23	0.27	0.32
1020	0.13	0.16	0.18	0.22	0.26	0.31
1080	0.12	0.15	0.18	0.21	0.25	0.30
1140	0.12	0.15	0.17	0.21	0.24	0.29
1200	0.12	0.14	0.17	0.20	0.24	0.28
1260	0.11	0.14	0.16	0.20	0.23	0.28
1320	0.11	0.14	0.16	0.19	0.23	0.27
1380	0.11	0.13	0.15	0.19	0.22	0.26
1440	**0.11**	**0.13**	**0.15**	**0.18**	**0.22**	**0.26**

APPENDIX D – Example Maintenance Agreement and Restrictive Covenant

After recording return to:

City of Longview
1525 Broadway
P.O. Box 128
Longview, WA 98632

CITY OF LONGVIEW
STORM DRAINAGE IMPROVEMENT
MAINTENANCE AGREEMENT AND RESTRICTIVE COVENANT

THIS STORM DRAINAGE IMPROVEMENT MAINTENANCE AGREEMENT AND RESTRICTIVE COVENANT (this "Agreement") is made this _____ day of _____, 20_____, by _____ ("Grantor") and the City of Longview, a Washington municipal corporation ("Grantee").

RECITALS

A. Grantee is the regulatory agency responsible for managing stormwater within the City of Longview.

B. Grantor is the owner of certain real Property in the City of Longview, Washington, described as [(set forth in Exhibit "_____") and/or (Parcel _____ in Auditor's file number _____, records of Cowlitz County, Washington)] and referred to in this Agreement as the "Property."

C. Grantor desires to construct a development on said Property, which development is known as _____. In conjunction with this development, Grantor is constructing a stormwater collection, conveyance, and control system ("System"), attached hereto and incorporated herein, that must meet the regulatory requests of Grantee.

D. Grantor and Grantee hereby covenant and agree as follows:

1.0 Construction

1.1 In connection with Grantor's proposed development of the Property, Grantee has required and Grantor has agreed to construct a System". The System is described and shown on a construction drawing prepared by the engineering firm of _____ approved by the City on _____, 20____, and as conditioned under Permit No. _____.

1.2 As a condition of project approval, Grantor agrees, pursuant to this Agreement to ensure that the System is constructed and, where herein indicated, maintain specified components of the System.

2.0 Maintenance of Specified Components

Grantor, its heirs, successors or assigns agree to maintain, at his or her sole cost, the System and its internal and external appurtenances, placed in the right-of-way or on private property, including designated common areas in their entirety, in perpetuity, and in accordance with this agreement, the approved construction plans, the approved maintenance plan (attached herein as Exhibit A), the manufacturer's recommendations, and the Stormwater Management Manual for Western Washington ("SMMWW") or comparable standards approved by the Grantee.

3.0 Records

The Grantor, its heirs, successors or assigns agree to provide to the City, by January 31st of each year, complete records of the maintenance performed on the System during the preceding year. These records shall document, at a minimum, the date and location of all cleaning, inspections, and any other measures taken as part of maintenance of the System.

4.0 No Removal

No part of the System shall be altered or removed except as necessary for maintenance, repair or replacement, as described above, except as may be agreed to in writing by the parties.

5.0 Access

Each drainage structure shall be designed and built in accordance with the approved plans to permit Grantor and Grantee access to the System at all times. Grantor hereby grants to Grantee the right to enter upon the property after receiving clearance from Grantor, which shall not be unreasonably delayed to inspect the System and/or provide necessary maintenance as set forth below. Notwithstanding anything to contrary in this Agreement, Grantee's right to access the System is limited to the System area only; Grantee acknowledges that Grantee has no right to access any portion of the Property that is outside of the System area; additionally, Grantee's access to the System area shall not interfere with Grantor's business operation on the Property.

6.0 Failure to Maintain or Construct

If Grantor fails to properly construct or, adequately maintain, or repair the specified components as described herein, Grantee shall provide Grantor with written notice of such failure and provide Grantor with a reasonable opportunity (no less than 60 days) to properly construct, adequately maintain, or repair the System; provided, however, that in the event of an emergency, Grantee has the right to enter upon the property to attempt to abate the threat to human life, property, or the environment upon making a reasonable attempt to notify the Grantor. Failure to install and/or maintain the stormwater facility may be subject to abatement provided by LMC 1.33.

7.0 Enforcement

This Agreement may be enforced by Grantee in law against the Grantor, its heirs, successors and assigns.

8.0 Successors and Assigns

These obligations shall run with the Property and be binding upon the Grantor, its heirs, successors and assigns.

9.0 Effective Date

This Agreement is effective on the date first written above.

10.0 Attachments [example only]

Exhibit A: Maintenance Plan

a) Site and Facility Plans
b) Detail sheets and technical descriptions of the stormwater facility (including the drainage system).
c) List and Schedule of inspection and maintenance tasks
d) Actions to be taken when maintenance required (standard operating procedures (SOPs))

Exhibit E: Educational Brochures (multi-unit residential developments only)

GRANTOR:

_____

By: _____

_____

Title _____

Title _____

GRANTEE:

CITY OF LONGVIEW

By: _____

_____

Title _____

Title _____

STATE OF WASHINGTON)
)ss
COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ (grantor) is the person who appeared before me, and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the _____(title) of _____, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED: _____

PRINT NAME: _____

NOTARY PUBLIC

My commission expires: _____

STATE OF WASHINGTON)
)ss
COUNTY OF COWLITZ)

I certify that I know or have satisfactory evidence that _____ (grantee) is the person who appeared before me, and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the _____(title) of CITY OF LONGVIEW, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED: _____

PRINT NAME: _____

NOTARY PUBLIC

My commission expires: _____

Approved as to form:

_____
City Attorney

[Reminder: Keep a 1″ margin on all sheets of the document.
Upper right ⅔ of first page should have 3″ top margin.
Number all pages.]

APPENDIX E – Permitted and Prohibited Trees

This information is from the City of Longview Forestry Management Plan. Contact the City Parks Department at 360 442-5400 to get a copy of the Plan and discuss design and construction requirements.

Permitted Trees. The following list constitutes the official street tree species for the City of Longview, Washington. No species other than those included in this list may be planted as street trees without written permission of the Parks Superintendent or designee.

COMMON NAME	BOTANICAL TAXONOMY
Alaskan Yellow Cedar	Chamaecyparis nootkatensis
Alpine Fir	Abies lasiocarpa
American Arborvitae	Thuja occidentalis
American Beauty Crabapple	Malus angustifolia
American Elm	Ulmus americana
Arizona Ash	Fraxinus velutina
Atlas Cedar	Cedrus atlantica
Autumn Cherry	Prunus serrulata Shirofugen
Bald Cypress	Taxodium distichum
Basswood	Tilia americana
Bechtel Crabapple	Malus ionensis Plena
Big Leaf Magnolia	Magnolia macrophylla
Bigleaf Maple	Acer macrophyllum
Black Locust	Robinia pseudoacacia
Blue China Fir	Cunninghamia lanceo. Glauca
Bolleana Poplar	Populus alba Pyramidalis
Bristlecone Pine	pinus aristata
Bunya-Bunya Tree	Araucaria bidwillii
Cape Chestnut	Calodrendrum capense
Cascara Sagrada	Rhamnus purshiana
Chinese Hackberry	Celtis sinensis
Cleveland Select Pear	Pyrus callerylana Cleveland
Coast Redwood	Sequoia sempervirens
Colorado Blue Spruce	Picea pungens
Columnar Hornbeam	Carpinus betulus Fastigiata
Common Hackberry	Celtis occidentalis

COMMON NAME	BOTANICAL TAXONOMY
Common Lilac	Syringa vulgaris
Common Snowball	Viburnum opulus Roseum
Corkscrew Willow	Salix matsudana Tortuosa
David's Maple	Acer davidii
Deodar Cedar	Cedrus deodara
Douglas Fir	Pseudotsuga menziesii
Elderberry	Sambucus neomexicana
Elm Species	Ulmus spp.
Empress Tree	Paulonia tomentosa
English Elm	Ulmus campestris
English Holly	Ilex aquifolium
English Laurel	Prunus laurocerasus
English Walnut	Juglans regia
Eucalyptus	
European Beech	Fagus sylvatica
European Larch	Larix decidua
Fairview Maple	Acer platanoides "Fairview"
Filbert	Corylus maxima
Fraser's Photinia	Photinia fraseri
Giant Sequoia	Sequoiadendron giganteum
Golden Chain Tree	Laburnum anagyroides
Goldenrain Tree	Koelreuteria paniculata
Grand Fir	Abies grandis
Green Ash	Fraxinus pensylvanica "Marsh"
Hemlock	Tsuga heterophylla
Hinoki Cypress	Chamaecyparis obtusa
Honey Locust	Gleditsia triacanthos
Horse Chestnut	Aesculus hippocastanum
Incense Cedar	Calocedrus decurrens
Irish Yew	Taxus baccata
Italian Stone Pine	Pinus pinea
Japanese Black Pine	Pinus thunbergiana
Japanese Maple	Acer palmatum
Japanese Red Pine	Pinus densiflora
Japanese Tree Lilac	Syringa reticulata
Juniper	Juniperus chinensis
Katsura	Cercidephyllum japonicum
Lace-Leaf Maple	Acer palmatum Dissectum
Littleleaf Linden	Tilia Cordata
Lodgepole Pine	Pinus contorta latifiolia
Lombardy Poplar	Populus nigra Italica
London Plane	Platanus acerifolia
Maidenhair Tree	Ginkgo biloba

COMMON NAME	BOTANICAL TAXONOMY
Maple Species	Acer spp.
Mimosa	Albizia julibrissin
Moraine Ash	Fraxinus holotricha Moraine
Morgan Maple	Acer rubrum “Morgan”
Mossy-Cup Oak	Quercus macrocarpa
Mountain Ash	Sorbus aucuparia
Mountain Hemlock	Tsuga mertensiana
Mt. Fuji Cherry	Prunus serrulata Shirotae
Mugho Pine	Pinus mugo
New Zealand Chaste Tree	Vitex lucens
Noble Fir	Abies procera
	Acer plattanoides Silver Variegated
Norway Maple	Acer platanoides
Norway Spruce	Picea abies
Nuttal Willow	Salix scouleriana
Oregon Ash	Fraxinus latifolia
Pacific Dogwood	Cornus nuttallii
Peachleaf Willow	Salix amygdaloides
Persian Parrotia	Parrotia persica
Pin Oak	Quercus palustris
Pink Dogwood	Cornus florida
Ponderosa Pine	Pinus ponderosa
Port Orford Cedar	Chamaecyparis lawsoniana
Purple Ash	Fraxinus americana
Purple Leaf Beech	Fagus sylvatica Atropunicea
Purple Robe Locust	Robinia psendoacacia
Quaking Aspen	Populus tremuloides “enermis”
Raywood Ash	Alnus oregona
Red Alder	Alnus oregona
Red Fir	Abies magnifica
Red Maple	Acer rubrum
Red Oak	Quercus rubrum
Redbud	Cercis canadensis
Saucer Magnolia	magnolia x. soulangiana
Sawara False Cyupress	Chamaecyparis pisifera
Scarlet Oak	Quercus coccinea
Schwedler Maple	Acer platanoides Schwedleri
Scotch Pine	Pinus sylvestris
Shore Pine	Pinus contorta
Siberian Elm	Ulmus pumila
Silver Maple	Acer saccharinum
Sitka Spruce	Picea sitchensis
Smooth Sumac	Rhus glabra

COMMON NAME	BOTANICAL TAXONOMY
Southern Magnolia	Magnolia grandiflora
Spanish Fir	Abies pinsapo
Staghorn Sumac	Rhus typhina
Sugar Maple	Acer saccharum
Sycamore Maple	Acer pseudoplatanus
Tree of Heaven	Ailanthus altissima
Trident Maple	Acer buergeranum
Tulip Tree	Liriodendron tulipifera
Umbrella Pine	Sciadopitys verticillata
Vine Maple	Acer circinatum
Weeping Cherry	Prunus subhirtella Pendula
Weeping Filbert	Corylus avellana Pendula
Weeping Larch	Larix decidua Pendula
Weeping Willow	Salix babylonica
Western Black Hawthorn	Crataegus douglasi
Western Catalpa	Catalpa speciosa
Western Red Cedar	Thuja plicata
Western Yew	Taxus brevifolia
White Ash	Fraxinus americana
White Basswood	Tilia heterophylla
White Cedar	Chamaecyparis thyoides
White Oak	Quercus alba
White poplar	Populus alba
White Sapote	Casimiroa edulis
White Spruce	Picea glauca
Wisteria	Wisteris sinensis

Prohibited Trees. It is unlawful to plant in any improved public right-of-way or any planting strip the following trees:

Poplar	Willow	Cottonwood	Conifers
Box elder	Catalpa	Mulberry	Sycamore
Birch	Mountain Ash	Ginkgo (female)	Hawthorn
Horse Chestnut	Kwanzan Cherry	Crabapple	
Prunus blireiana (Flowering plum)			

The Superintendent of Parks, with the approval of the Tree Board, shall have the authority to add or delete prohibited trees to or from this section. Any of the aforementioned trees currently existing in improved public rights-of-way or any planting strip will be placed on a schedule for removal and replacement.

APPENDIX F – Definitions
(from LMC 17.80.020)

1. **Amenity.** A pleasant and/or engaging feature that increases attractiveness, value, and/or understanding of stormwater. [A more refined definition from the KEDM is "…a holistic stormwater approach that incorporates sustainable maintenance and aesthetics into designs that retain or mimic natural processes, promote understanding of stormwater, and/or and increase a site's perceived value."]
2. **Best Management Practices (BMP).** The schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other structural 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 or the stormwater drainage system.
   (a) **Source control BMP.** A BMP that is intended to prevent pollution from entering stormwater.
   (b) **Treatment BMP.** A BMP that is intended to remove pollution from stormwater.
   (c) **Flow control BMP.** A BMP that is intended to mitigate the impacts of increased surface and stormwater runoff rates generated by development.
   (d) **Low Impact Development BMP.** A stormwater management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic functions.
   (e) **Experimental BMP.** Any treatment or methodology proposed for treatment or management of stormwater that is not in a current stormwater manual approved by Ecology.
3. **Bioretention.** An integrated stormwater management practice that uses the chemical, biological, and physical property of plants, microbes, and soils to remove or retain pollutants from stormwater runoff. Bioretention facilities are depressions that can be isolated detention cells, swales for conveyance as well as treatment, or a connected-cell hybrid of the two. Bioretention facilities include compost amended soils, landscape plantings selected for tolerance to a range of conditions and a mulch layer.
4. **City.** The City of Longview.
5. **Clearing.** The destruction and removal of vegetation by manual, mechanical, chemical or other such method.
6. **Common plan of development or sale.** A site where multiple separate and distinct construction activities may be taking place at different times on different schedules, but still under a single plan. Examples include: phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g. a development

where lots are sold to separate builders); a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; and projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility. If the project is part of a common plan of development or sale, the disturbed area of the entire plan shall be used in determining permit requirements.

7. **Clean Water Act (CWA).** The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.
8. **CDID#1.** Consolidated Diking Improvement District #1 (CDID #1). The Diking District that operates in and around the City of Longview.
9. **Critical areas.** Areas defined in Chapter 17.10 LMC, and any subsequent amendments thereto, 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.
10. **Detention.** The temporary storage of stormwater to facilitate the release of stormwater runoff from the site at a slower rate than it is collected by the stormwater facility system.
11. **Development.** The new development or redevelopment, including a combination thereof, or any work at a project site.
12. **Director.** The City of Longview Public Works Director or his/her designee.
13. **Ecology (DOE).** The Washington State Department of Ecology.
14. **Erosion.** The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.
15. **Excavation.** The mechanical removal of earthlike material.
16. **Fill.** A deposit of earthlike material including, but not limited to dirt, sand, concrete, rubble, etc., placed by artificial means.
17. **Forest practice.** Any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing timber, including but not limited to road and trail construction; harvesting, final and intermediate; pre-commercial thinning; reforestation; fertilization; prevention and suppression of diseases and insects; salvage of trees; brush control; or slash burning.
18. **Hazardous materials.** Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.
19. **Highly contaminated runoff.** Runoff that contributes a pollutant loading considered to be sufficient to cause or exacerbate the deterioration of receiving water quality or instream habitat conditions.
20. **Hyperchlorinated water.** The water that contains more than 10mg/Liter chlorine.
21. **Illicit connections.** An illicit connection is defined as either of the following:
    - Any drain or conveyance, whether surface or subsurface, which allows an

illicit discharge to enter the storm drain system, including but not limited to floor drains, sewer cross connections, process wastewater discharges, and wash-bay runoff, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,

- Any drain or conveyance connected from a commercial or industrial land use to the storm drain system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

22. **Illicit discharge.** Any direct or indirect discharge to waters of the state or the stormwater drainage system that is not composed entirely of stormwater except discharges expressly exempted in LMC 17.80.040 (C).
23. **Industrial activity.** The activities subject to NPDES Industrial Permits as defined in 40 CFR, Section 122.26 (b)(14).
24. **Impervious surface.** A hard surface area that 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, packed gravel surfaces, packed earthen materials, and 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 purposes of determining whether the thresholds for application of minimum requirements are exceeded. However, open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling. Impervious surfaces that meet the criteria for full dispersion or that are fully infiltrated in compliance with the SWMWW shall be excluded in the determination of thresholds for compliance with this Chapter 17.80 LMC.
25. **Land disturbing activity.** Any activity that results in movement of earth, or a change in the existing soil cover (both vegetative and non-vegetative) 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 or gardening are not generally considered land-disturbing activities.
26. **LID Guidance Manual.** The January 2005 Low Impact Development Technical Guidance Manual for Puget Sound, prepared by the Puget Sound Action Team and the Washington State University Pierce County Extension as now or hereafter amended or replaced.
27. **Longview Stormwater Manual (Manual).** The manual, as adopted by this Chapter 17.80.040(A) LMC or as hereafter modified or replaced, that sets forth certain standards of design and specifications for development and storm drainage.
28. **LMC.** The Longview Municipal Code.
29. **Low Impact Development (LID).** A stormwater management and land

development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic functions.

30. **Maintenance.** Maintenance and repair includes activities conducted on currently serviceable structures, facilities, and equipment that involve no expansion or use beyond that previously existing use. Maintenance includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems. Those usual activities may include removal and replacement of nonfunctional or poorly functioning 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. By way of example is the replacement of a collapsed, fish blocking, round culvert with a new box culvert under the same span, or width, of roadway.
31. **Maximum Extent Practicable (MEP).** Refers to paragraph 402(p)(3)(B)(iii) of the federal Clean Water Act which reads as follows: Permits for discharges from municipal storm sewers shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques, and system, design, and engineering methods, and other such provisions as the Administrator or the State determines appropriate for the control of such pollutants.
32. **"Minimum Requirements" (MRs).** The Ecology's Minimum Technical Requirement(s) for New Development and Redevelopment for land disturbances of one acre or more or smaller if part of a larger common plan of development or sale as more specifically set forth in LMC 17.80.050(G).
33. **Municipal Separate Storm Sewer System (MS4).** A conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):
    (a) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State Law) having jurisdiction over disposal of wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of the CWA that discharges to waters of the United States,
    (b) designed or used for collecting or conveying stormwater,
    (c) which is not a combined sewer, and
    (d) which is not part of a Publicly Owned Treatment Works as defined at 40 CFR 122.2.
34. **National Pollutant Discharge Elimination System (NPDES).** The national program for issuing, modifying, revoking, and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are

administered by Ecology under authority delegated pursuant to 33 USC § 1342(b).

35. **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.
36. **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.
37. **"One Acre Threshold."** The threshold for applicability of Ecology's nine minimum requirements and Ecology's Construction Stormwater NPDES permit. It is any land disturbance of one acre or more, or less if part of a larger common plan of development or sale.
38. **Owner.** The owner of a property (e.g. premises, stormwater facility, watercourse, or development project) or his or her designee or other person(s) having charge or control of the property or portions of the property**.**
39. **Person.** Any owner, individual, association, organization, partnership, firm, corporation or other entity recognized by law.
40. **Phase II Permit.** See the definition for Western Washington Phase II Municipal Stormwater Permit (Permit).
41. **Pollutant.** Anything which causes or contributes to water pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; yard wastes, refuse, garbage, litter, or other discarded or abandoned objects and accumulations; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform, animal waste, and pathogens; dissolved and particulate metals; and noxious or offensive matter of any kind.
42. **Pollution.** Contamination or other alteration of the physical, chemical, or biological properties of waterbodies, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waterbodies as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.
43. **Pollution Generating Surfaces.** Pollution-generating impervious surface (PGIS) and/or pollution generating pervious surfaces (PGPS), as defined in Volume I, Chapter 2 of the SMMWW. These are surfaces considered to be a significant

source of pollutants in Stormwater runoff. Such surfaces include those subject to vehicular use, industrial activities, storage of erodible or leachable materials, wastes, or chemicals, pesticides or fertilizers, or soil loss.

44. **Pre-developed condition.** For projects that are less than one acre and which are not part of a larger common plan of development or sale, pre-developed conditions are those prior to a development, typically pasture, landscaping, and impervious surfaces like pavement and structures, cumulative over conditions existing in 1999. Otherwise, consider pre-developed conditions to be the native vegetation and soils that existed at a site prior to the influence of Euro-American settlement; so the pre-developed 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.
45. **Premises.** Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.
46. **Project.** See the definition for Development.
47. **Project site.** That portion of a property, properties, or right of way subject to land disturbing activities, new impervious surfaces, or replaced impervious surfaces. The total projected area of new, replaced or new plus replaced impervious surfaces for subdivisions shall constitute a project site.
48. **Public Works.** The City of Longview Department of Public Works, their authorized representatives, or such other Department as may be designated by the city manager.
49. **RCW.** The Revised Code of Washington.
50. **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.
51. **Redevelopment.** a) For sites meeting Ecology's one-acre threshold, it shall be: *"On a site that is already substantially developed (which means 35% or more of existing impervious surface coverage), 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."* b) For projects that do not exceed the one acre threshold and which create less than 5,000 square feet of new impervious surface, redevelopment shall be projects where a City construction permit is required, such as the Building, Fill and Grade, Excavation and Grading permit, Right-of-Way, and Public Improvement permits.
52. **Regional facility.** A stormwater facility designed to address surface water runoff problems on a basin or sub-basin level. Regional approaches are conditionally sanctioned in LMC 17.80.050(G)(3)(c) and (4).
53. **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.
54. **Routine maintenance.** Preventative or cyclical (weekly, monthly, etc.) maintenance that is an essential part of the on-going care and upkeep of a system or facility against normal wear and tear.

55. **Site.** The area defined by the legal boundaries of one or more 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.
56. **Soil.** The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
57. **Stormwater**. Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation, including surface runoff and drainage.
58. **Stormwater drainage plan.** The comprehensive report containing all of the technical information and analysis necessary for a regulatory agency to evaluate a proposed project for compliance with stormwater requirements.
59. **Stormwater drainage system.** See the definition for "Municipal Separate Storm Sewer System (MS4)"
60. **Stormwater facility (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.
61. **Stormwater Management Manual for Western Washington (SMMWW).** This manual, as prepared by and updated by Ecology, contains BMPs to prevent, control or treat pollution in stormwater and reduce other stormwater-related impacts to waters of the state, and shall be interpreted to mean the current (most recent) edition. The Stormwater Manual is intended to serve as a reference and supplement to this Chapter 17.80 LMC to control the quantity and quality of stormwater runoff from new development and redevelopment.
62. **Stormwater master plan.** Documents illustrating the location, facility types and connections of the stormwater drainage system created and maintained for the comprehensive management of stormwater for urban areas and suburban fringe areas.
63. **Stormwater Pollution Prevention Plan (SWPPP).** A document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to stormwater, stormwater conveyance systems, and/or receiving waters to the maximum extent practicable.
64. **Underground Injection Control (UIC) Program.** A program created by Congress, and administered in Washington State by the Department of Ecology under Chapter 173-218 WAC to protect underground sources of drinking water from discharges of fluids to the ground, by:
    - Registering UIC wells with Ecology, and
    - Ensuring that current and future discharges to ground water are not endangered by pollutants in the discharge (non-endangerment standard). UIC wells are any manmade subsurface fluid distribution system designed to discharge fluids into the ground and consists of an assemblage of perforated pipes, drain tiles, or other mechanisms, or a dug hole that is deeper than the largest surface

dimension. Subsurface infiltration systems include drywells, pipe or french drains, drain fields, and other similar devices. A UIC well may be used to manage stormwater when pollutant concentrations that reach groundwater are not expected to exceed Washington state groundwater quality standards (Chapter 173-200 WAC).

65. **WAC.** The Washington Administrative Code.
66. **Waterbody.** Lakes, rivers, ponds, streams, inland waters, sloughs, ditches, and all other surface waters and watercourses within the jurisdiction of the state of Washington.
67. **Western Washington Phase II Municipal Stormwater NPDES Permit (Phase II Permit).** A permit issued by Ecology under Sections 307, 402, 318, and 405 of the Federal Clean Water Act that authorizes the discharge of pollutants to surface waters of the state from a "small" MS4 located either fully or partially within, an urbanized area as defined by the latest decennial census conducted by the U.S. Bureau of Census, or designated by the Department pursuant to 40 CFR 123.35(b) or 40 CFR 122.26(f).
68. **Wetlands.** Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands.
69. **Vegetation.** Organic plant life growing on the surface of the earth.

APPENDIX G – Examples of "Artful Rainwater Design"

All but one examples are from www.artfulrainwaterdesign.org by Dr. Stuart P. Echols
See also Portland's Bureau of Environmental Services "Landscapes for Rain: The Art of Stormwater" exhibit
For local examples, visit www.cleanstormwater.org and look at the presentation to Council.

Quantity ● Quality ● Amenity

Integrating stormwater controls "artfully" into site designs can result in greater user satisfaction and perceived value. When the stormwater facility is an amentiy, it is better understood and better maintained in perpetuity. Raising the profile of runoff can help improve awareness and understanding of non-point source pollution, which is vital to improving our surface waters.

The projects in this appendix are presented as examples only. All but one are in the Northwest, which is a world leader in the movement to aesthetically blend stormwater form and function. While most examples are in the Puget Sound and the greater Portland areas, several appealing and noteworthy low impact development projects are found right here in Longview and Kelso (follow the link at the top of this page).

Projects Featured:

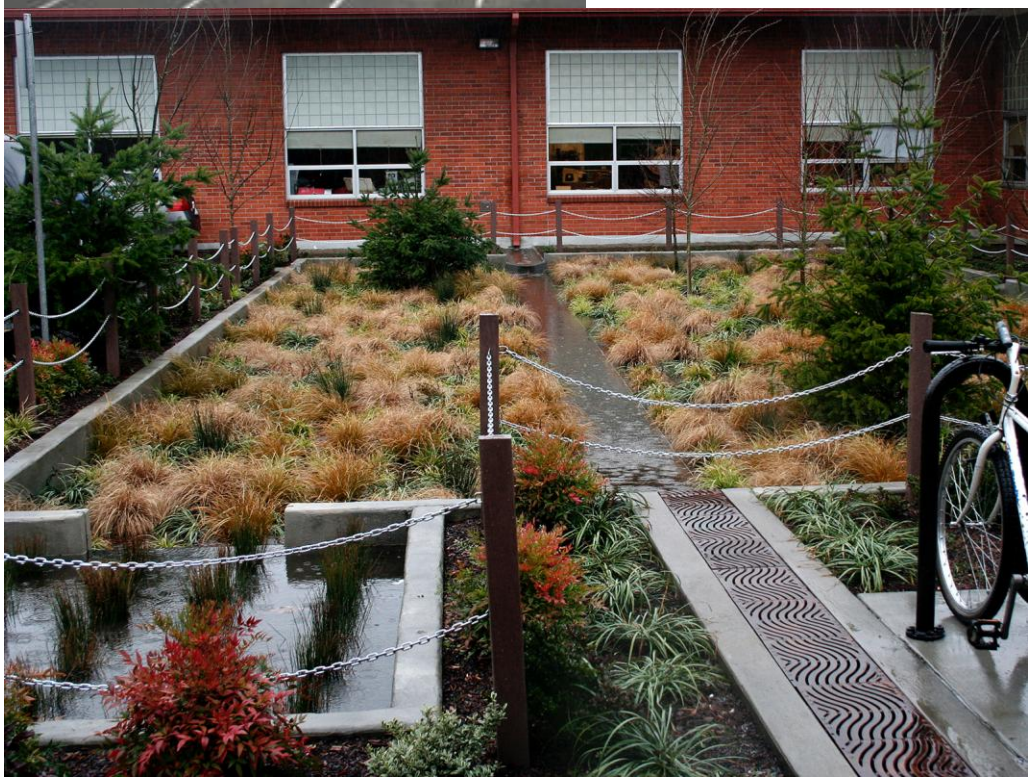
- Siskiyou Green Street
- Mount Tabor Middle School Rain Garden
- High Point
- Pierce County Environmental Services Building
- Growing Vine Street
- New Seasons, Seven Corners Market
- SEA Streets, Seattle, WA
- Stephen Epler Hall
- Cedar River Education Center
- 12th Avenue Green Street
- 10th @ Hoyt
- Buckman Heights
- Liberty Centre
- Tanner Springs Park
- Stata Center Outwash Basin

Siskiyou Green Street

NE Siskiyou Green Street Project between 35th Place and 36th Ave in a leafy residential neighborhood of Portland, Oregon. This "stormwater curb extension" as described by the Portland Bureau of Environmental Services is thickly planted with multi-textural sedges and ferns, and intersected by river rock dams and weirs, these right-of-way extensions catch street runoff and serve as biofilters. A simple sign standing in one of the landscaped extensions clearly shows, with brief text and images, how the system works and what it accomplishes. The extensions not only filter and slow runoff, but they also serve as traffic calming devices by narrowing the roadway while the lush plantings provide streetscape beautification that is compatible with residential plantings in the area. The project also stands as a virtual exemplar of transferability, as it's very easy to see how this strategy could be used in other neighborhoods. Indeed, according to Tom Liptan, Environmental Specialist for the City of Portland's Bureau of Environmental Services, residents of other Portland neighborhoods are now requesting the addition of this feature to their own streets, and are willing to open their own wallets to pay for this streetscape amenity. It won a 2007 ALSA General Design Category, Honor Award.

BEFORE

AFTER



Mount Tabor Middle School Rain Garden

The Mount Tabor Middle School Rain Garden is regarded as one of Portland's most successful examples of sustainable stormwater management. This project transformed an underutilized asphalt parking area into an innovative rain garden that melds the concepts of art, education, and ecological function. Built in the summer of 2006, the Mount Tabor Middle School Rain Garden has not only turned a "gray space" into a "green space", but it is also helping solve the local neighborhood's combined sewer infrastructure problems.
Visit this award winning project at 5800 SE Ash Street, Portland, Oregon, or read up on it at:

High Point

A natural drainage system cleans, cools, and filters stormwater runoff to Longfellow Creek (location of the highest Coho salmon counts for all Seattle creeks), while four miles of grassy and vegetated swales enhance the watershed, preserving water and ecosystem quality.

Seattle's High Point neighborhood was among five outstanding developments selected worldwide as winners of the Urban Land Institute's (ULI) Global Awards for Excellence. This award has become widely recognized as the land use industry's most prestigious recognition program.

The Institute's Awards for Excellence program, established in 1979, recognizes the full development process of a project, not just its architecture or design. The criteria for the awards include leadership, contribution to the community, innovations, public/private partnership, environmental protection and enhancement, response to societal needs, and financial success.

35th Ave S & SW and Raymond Street, Seattle, WA

Pierce County Environmental Services Building

The design uses a long water trail to exhibits a variety of water treatment approaches and design elements in sequence: the trail begins on a corner of the building at a dramatic scupper from which water falls into a concrete basin incised with a spiral runnel. In a rain event, water spirals from that basin into an adjacent wetland that visitors are invited to explore by walking across an elegantly meandering boardwalk. At the end of the wetland the water disappears briefly under a roadway to reemerge in a bioswale designed to clearly indicate its function: the bioswale is lined with river stone and plants interspersed with pieces of driftwood, to drive home the water theme. The bioswale forms a long axis, edged on one side by the parking lot and on the other by a walking trail—which ensures maximum visibility of the water treatment system. At the end of the bioswale the water system again disappears briefly under a roadway, to end in a particularly intriguing piece of the system: a "flow splitter plaza". Here effective signage and three visible valve heads indicate how the system diverts runoff into two different conveyance/infiltration swales: one grass-lined, and one rock-lined, while a third diverter awaits development of future treatment strategies.

9850 64th St W, Longview, WA (Chambers Creek)

http://www.svrdesign.com/growing_vine.html

Growing Vine Street

SvR was the civil engineer for Growing Vine, the first phase of a larger vision to create an 8-block green street on Vine in Seattle's Belltown neighborhood. In this first, two-block implementation, rooftop runoff was channeled the water through public art and a terraced watercourse along a sidewalk. The project features the Beckoning Cistern by Buster Simpson, a rock-hewn jade basin, and native plants. A major goal of this project was to end combined sewer overflows from the site by treating Vine like a watershed and purifying roof runoff along its length before releasing the cleansed water into Elliot Bay. Winner: Ahwannee Award at the Partners for Smart Growth Conference, 1999

New Seasons, Seven Corners Market

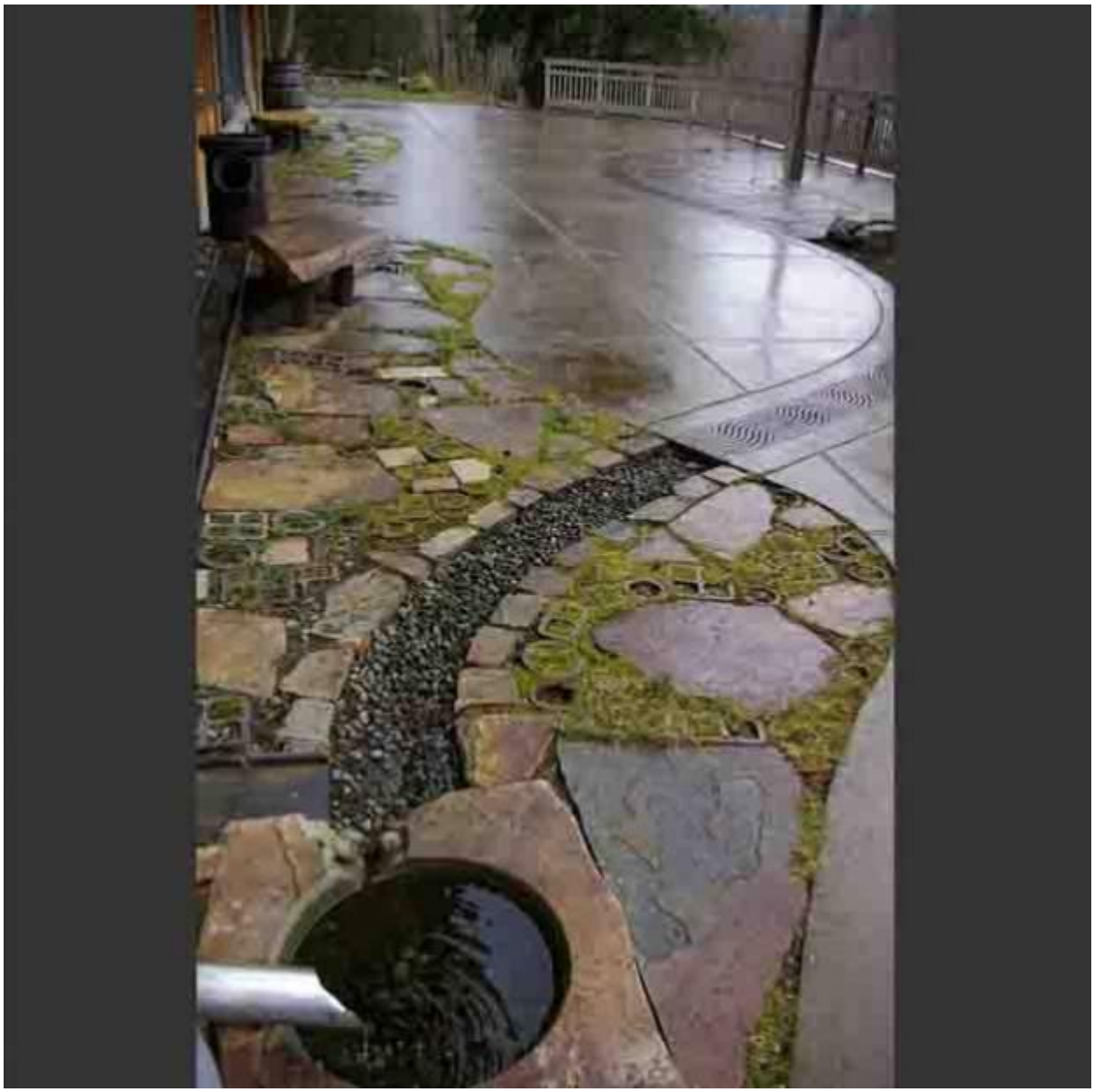
New Seasons Market sustainably integrates stormwater into building and site development. Disconnecting the flow from the storm sewer system and directing runoff to more natural systems reduces the amount of runoff by allowing water to soak into the ground, and filters pollutants before stormwater reaches our rivers and streams. New Seasons Market and the neighborhood association worked with Environmental Services to develop innovative sustainable stormwater solutions at New Seasons Market, 1954 SE Division St, Portland, OR 97202

SEA Streets, Seattle, WA

Seattle's pilot Street Edge Alternatives Project (SEA Streets) was completed in the spring of 2001. It is designed to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems. To accomplish this, Seattle Pubic Utilities (SPU) reduced impervious surfaces by over 10 percent (compared to a traditional street), provided surface detention in swales, and added over 100 evergreen trees and 1100 shrubs.
Two years of monitoring show that SEA Street has reduced the total volume of stormwater leaving the street by 99 percent. This award winning project is located on 2nd Ave NW, between NW 117th and 120th Streets.

Stephen Epler Hall

Stephen Epler Hall, a dormitory on the urban campus of Portland State University. In this design the stormwater action is particularly dramatic in rain events: water shoots down a 5-story downspout and out into a rock-filled basin, gushes out a small scupper into a runnel that directs water across the space, then falls into a "biopaddy" (a sunken plant-filled basin).To ensure that people stop and enjoy the stormwater show, two benches are strategically placed to face the stormwater action. To make the experience even more inviting, the benches sit under a freestanding roof (great for use during the rain), and are backed by a wall to create an effective sense of "prospect and refuge". This design clearly encourages people to experience the artful rainwater story at Epler Hall.



Cedar River Education Center

At the Cedar River Watershed Education Center runoff is conveyed from the roof via downspout into a sculpted basin; from that point the water traverses a stone terrace in a most elegant meander. That water trail is clarified, enhanced, and made safe by a cover of steel grating perforated with lilting curves that extend the "liquid" theme, alternating with river pebble fill. Whatever the compositional decision, manipulation of the line of the water trail is a great design opportunity in artful rainwater design. Mark Puddy from Department of Landscape Architecture at University of Idaho has provided a wonderful case study. Visit the facility at 19901 Cedar Falls Rd SE, North Bend, WA.

12th Avenue Green Street

The SW 12th Avenue Green Street Project between SW Montgomery and SW Mill in Portland, Oregon disconnects street stormwater runoff from a storm sewer that drains directly into the Willamette River and manages it on-site within the landscaping. Stormwater runoff flows downhill along the existing curb until it reaches the first of four stormwater planters via a 12-inch curb cut. Once inside the planter, the water is allowed to pool until it reaches a depth of six inches. The landscape system within each planter allows the water to infiltrate into the soil at a generous rate of four inches per hour. If a rain event is intense enough, water will exit through the planter's second curb cut, flow back out into the street and eventually enter the next downstream stormwater planter. The Green Street Project has received a national award of honor from the American Society of Landscape Architects (ASLA). It was designed by Portland Bureau of Environmental Services specialist Kevin Robert Perry.

10th @ Hoyt Apartments

10th@ Hoyt is the interior courtyard of a luxury apartment complex in Portland, Oregon's Pearl District. The design, by Koch Landscape Architecture is inspired by forms, textures, and colors of Persian gardens, presents an inward-oriented private oasis focused on a playful-yet-elegant illustration of stormwater collection, storage, and reuse. Stormwater from the roof travels down into the courtyard via copper downspouts in three locations; in each spot the water then travels via eye-catching chutes, runnels, and level spreaders of concrete, copper, and Cor-ten steel, eventually disappearing into raised basins filled with river stones. The water is then stored for up to 30 hours in a 4000 gallon cistern below grade. During the storage interval, the water is recirculated into elegant Cor-ten fountains in the courtyard. Detained runoff is then slowly released to the city stormwater system. Benjamin Rodes from Department of Landscape Architecture at University of Idaho has provided a Case Study of 10th@Hoyt.

Buckman Heights

Runoff from the building roof is piped under the lawn area and the sidewalk to the central courtyard planters. The planters act as infiltration basins allowing stormwater to soak into the ground. Water tolerant species including spiraea, iris and Oregon grape are planted in a Japanese holly border. The border hedge gives the planters a formal landscaped appearance not normally associated with stormwater facilities.

The required parking lot landscaping serves a dual purpose by also providing stormwater management. The parking lot is sloped toward the landscaping. Curb cuts allow water to flow into the infiltration strip where it soaks into the ground.

It is located at NE 16th and Sandy Blvd, Portland, OR, and has won many awards, including:

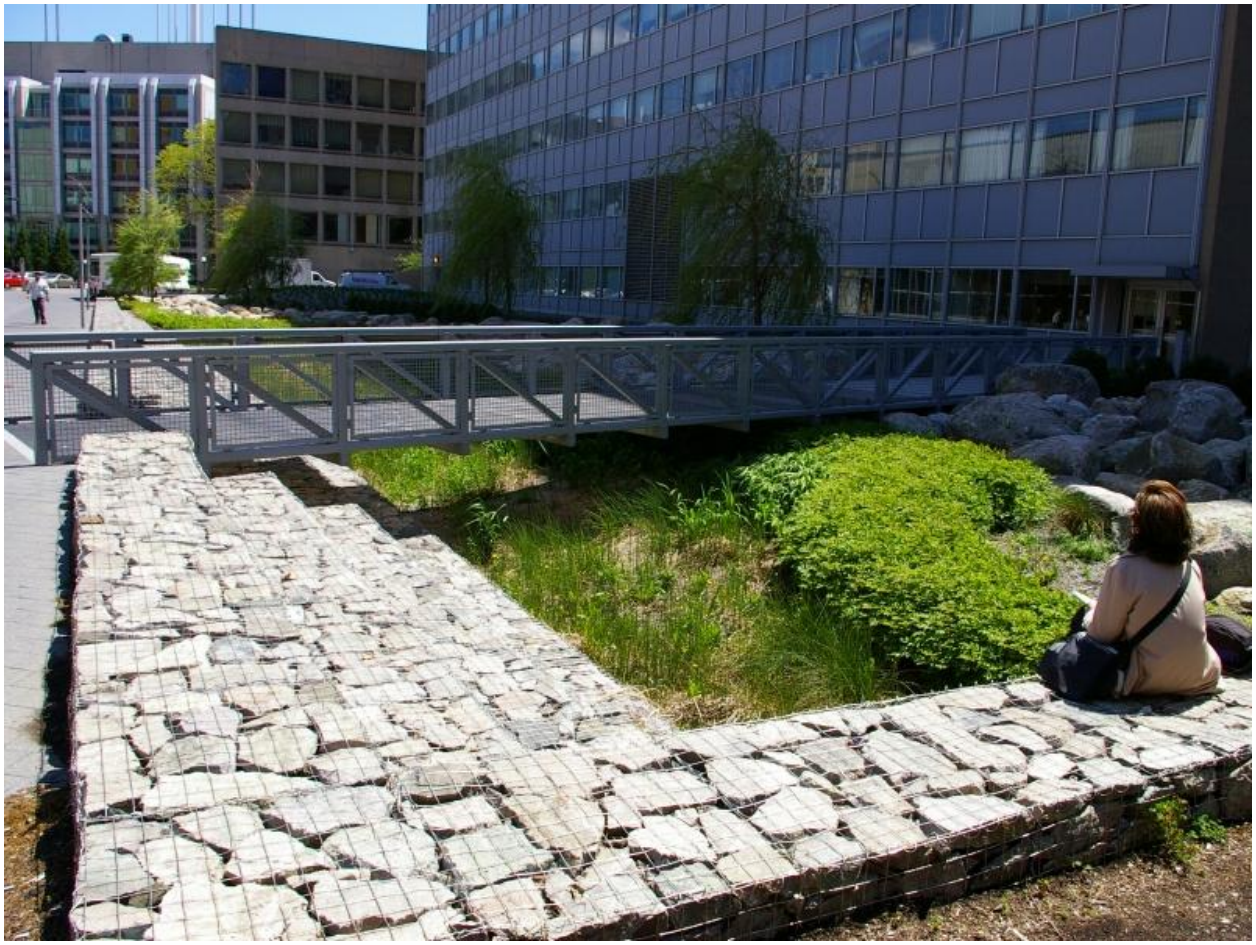
- 1998 Governor's Livability Award, Special Mention
- 1999 City of Portland, BEST Award (Businesses for an Environmentally Sustainable Tomorrow)

Liberty Centre

Stormwater planters are constructed in existing landscape areas next to the parking deck. Half of the runoff from the parking deck discharged to the eastern planter and half is discharged to the western planter. The planters slope to one end, where runoff ponds to a depth of 11 inches before overflowing into the combined sewer via a raised drop inlet. Colorful bioretention plantings include a variety of native trees and vegetation, improving the urban environment and aesthetic appeal of the property and surrounding commercial area. Case study at Portland Bureau of Environmental Sciences:
www.portlandonline.com/Bes/index.cfm?a=68710&c=36848
NE 6th and 7th at Oregon St., Portland, OR

Tanner Springs Park

GreenWorks collaborated with Atelier Dreiseitl of Germany to design an urban park in Portland's Pearl District. Envisioned as an urban park with a wetland focus, the park serves many residents in the newly developing Pearl District neighborhood. The design features innovative uses of water and stormwater, creating a refuge for people and wildlife in the midst of this bustling downtown neighborhood. The design process was highly interactive and involved the citizens of Portland through a series of interactive public workshops.
NW Marshall St & NW 10th Ave, Portland, OR.



Stata Center Outwash Basin

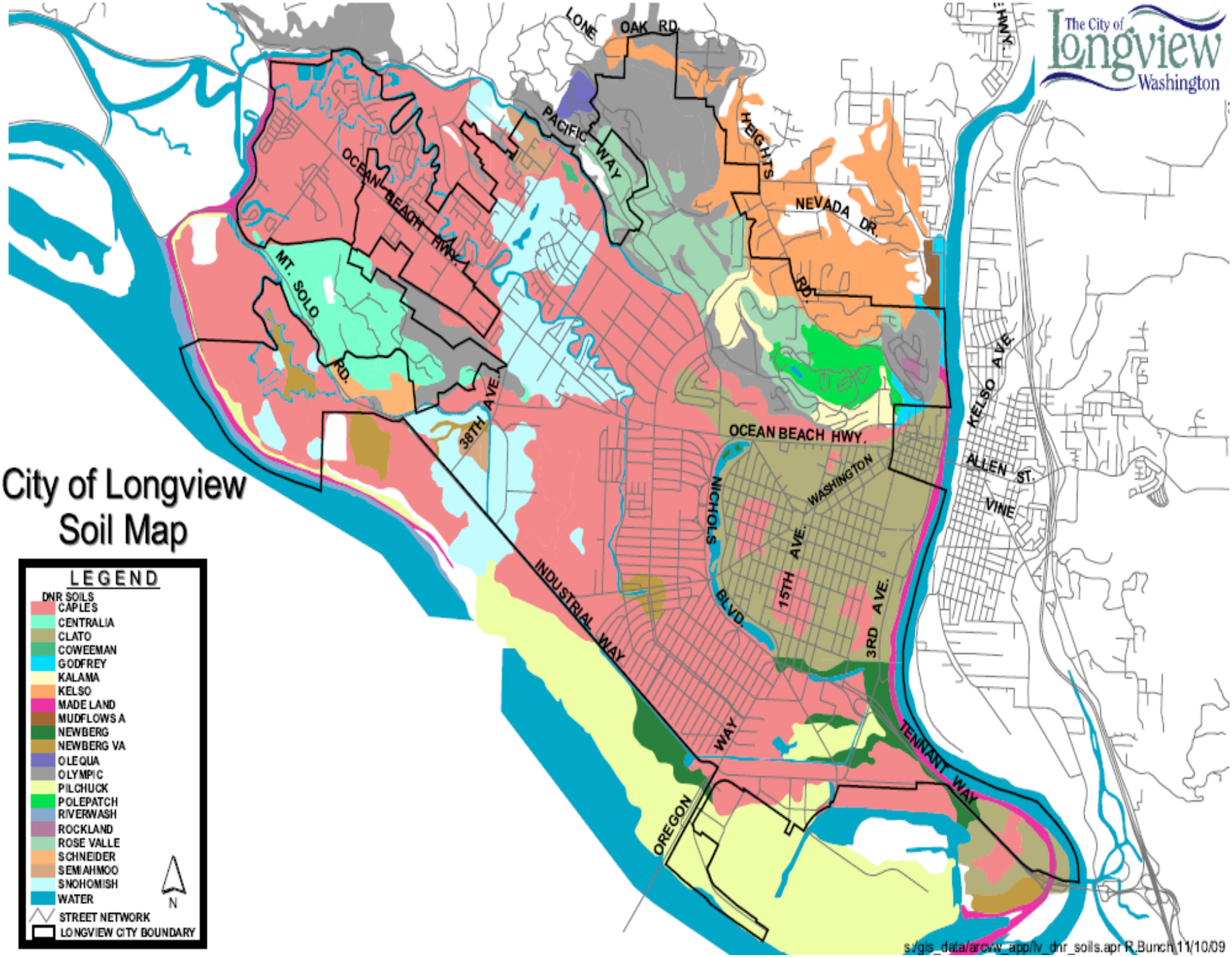
Frank Gehry building on the MIT campus. Nitsch Engineering designed the stormwater bioretention system. Wendy Goldsmith Bioengineering did the planting design. This system is multi functional: it is a constructed wetland that detains runoff to reduce peak downstream flow, the wetland's plants and planting medium cleanses the runoff, it allows some ground water infiltration, and a solar powered pump pushes the water back up to the wetland after its first pass through the water quality polishing cycle. This pumping not only cleanses the water a second time it also maintains the wetland moisture level required for plant health and vigor. The Olin concept was based of creating a "slice of new England," a piece of a riverine and wetland system.

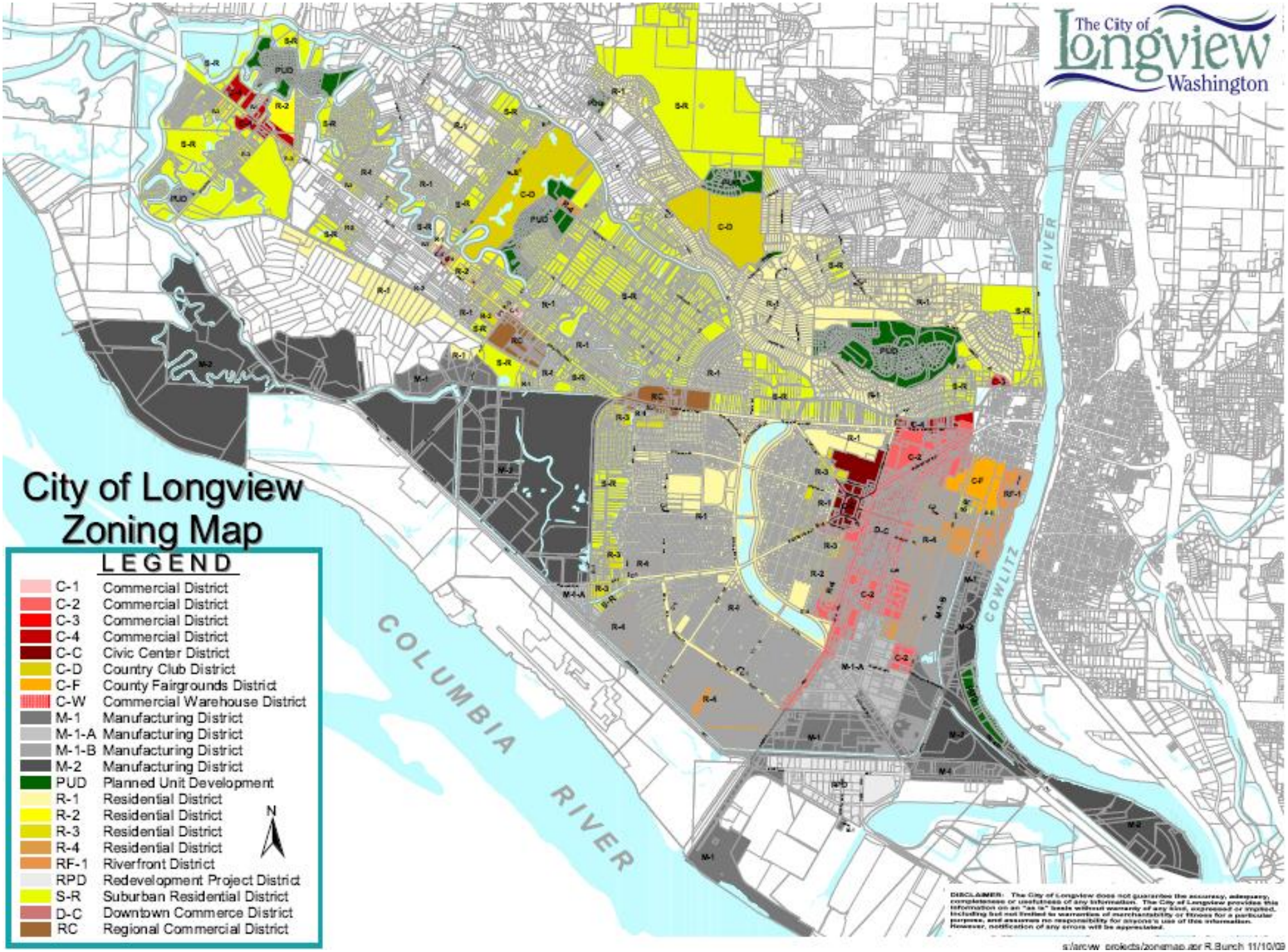
APPENDIX H – NRCS Soil Type Maps

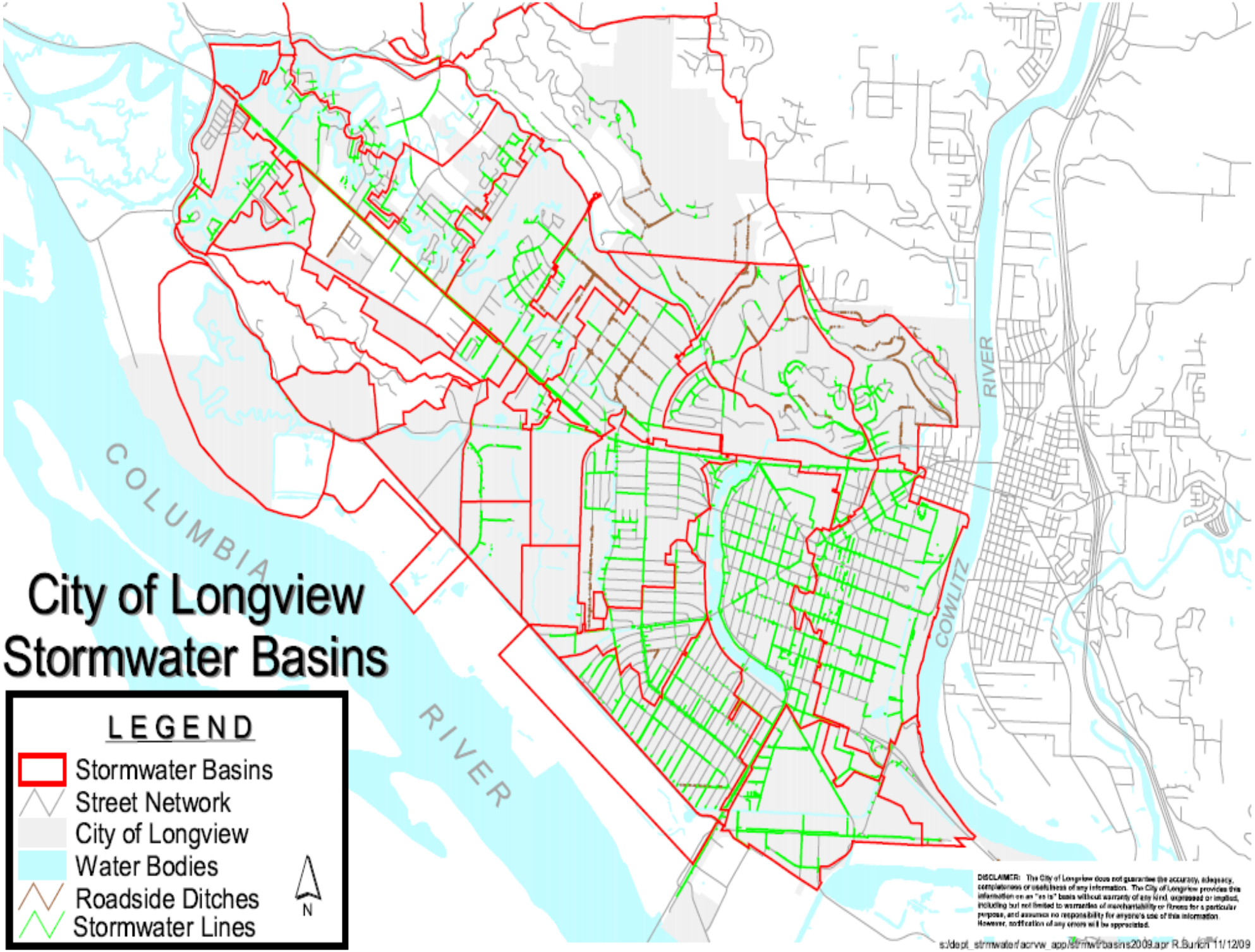
This data is provided as a courtesy only,
and should not be the sole basis for design
(see SMMWW Volume III, Section 3.3.6 and
http://websoilsurvey.nrcs.usda.gov/app/).

Summary of Longview Soils
(Map on next page)

Soil ID #	Soil Name & Description	Hydrologic Group	Permeability (Ksat) in/hr 0 - 3' depth	3 - 6' depth	Average
17	Caples, Silty Clay Loam, 0 - 3 % Slopes	C	0.4	0.1	0.3
21 - 23	Centralia, Silt Loam, 0 - 30% Slopes	B	1.3	1.3	1.3
32	Clato, Silt Loam, 0 - 30% Slopes	B	1.3	1.3	1.3
33 - 34	Coweeman, Silt Loam, 5 - 15% Slopes	D	0.1	0.0	0.1
93 - 95	Kalama, Gravelly Loam, 8 - 60% Slopes	C	0.9	0.4	0.7
100 -103	Kelso, Silt Loam, 0 - 50% Slopes	C	1.2	0.1	0.7
141	Newberg, Fine Sandy Loam, 0 - 3% Slopes	B	6.0	13.0	9.5
142 - 145	Olequa, Silt Loam, 0 - 65% Slopes	B	1.3	1.3	1.3
146 - 150	Olympic, Silt Loam, 2 - 65% Slopes	B	1.3	1.3	1.3
160	Pilchuck, Fine Loamy Sand, 0 - 8% Slopes	A	13.0	42.5	27.8
174 - 175	Rose Valley, Silt Loam, 0 - 15% Slopes	D	0.7	0.2	0.4
188 - 191	Schneider, Very Gravelly Loam (& Rock Outcrop Complex), 5 - 90% Slopes	B	1.3	1.3	1.3
195	Semiahmoo Muck, 0 - 1% Slopes	D	1.3	0.8	1.0
199	Snohomish, Silty Clay Loam, 0 - 1% Slopes	D	0.8	1.3	1.0
	Other Soils				
5	Arents, 0-5%	B	3.5	3.3	3.4
16	Camas, Cobbly Loam, 0 - 3%	A	18.8	21.1	19.9
65	Godfrey, Silt Loam, 0 - 30% Slopes	D	0.3	0.0	0.1
76 - 80	Hazeldell, Gravelly Silt Loam, 8 - 65%	B	1.3	1.3	1.3
127	Maytown, Silt Loam, 0 - 3%	C	1.3	0.4	0.9
162 - 165	Polepatch, Loamy Sand, (Overblown, Very Cobbly, & Extremely Bouldery), 0 - 90% Slopes	A	*11*	*13*	*12*
172	Riverwash	D	*13*	*13*	*13*
208 - 210	Stella, Silt Loam, 3 - 30%	C	1.0	0.3	0.7


The City of Longview Washington
City of Longview
Soil Map
LEGEND
DNR SOILS
CAPLES
CENTRALIA
CLATO
COWEEMAN
GODFREY
KALAMA
KELSO
MADE LAND
MUDFLOWS A
NEWBERG
NEWBERG VA
OLEQUA
OLYMPIC
PILCHUCK
POLEPATCH
RIVERWASH
ROCKLAND
ROSE VALLE
SCHNEIDER
SEMIAHMOO
SNOHOMISH
WATER
STREET NETWORK
LONGVIEW CITY BOUNDARY
N
LONE OAK RD.
PACIFIC WAY
HEIGHTS
NEVADA DR.
RD.
OCEAN BEACH HWY.
MT. SOLO RD.
38TH AVE.
OCEAN BEACH HWY.
WASHINGTON
NICHOLS BLVD.
15TH AVE.
3RD AVE.
INDUSTRIAL WAY
OREGON WAY
TENNANT WAY
KELSO AVE.
ALLEN ST.
VINE
s:/gis_data/arcvw_app/lv_dnr_soils.apr R.Bunch 11/10/09


The City of Longview Washington
City of Longview Zoning Map
LEGEND
C-1 Commercial District
C-2 Commercial District
C-3 Commercial District
C-4 Commercial District
C-C Civic Center District
C-D Country Club District
C-F County Fairgrounds District
C-W Commercial Warehouse District
M-1 Manufacturing District
M-1-A Manufacturing District
M-1-B Manufacturing District
M-2 Manufacturing District
PUD Planned Unit Development
R-1 Residential District
R-2 Residential District
R-3 Residential District
R-4 Residential District
RF-1 Riverfront District
RPD Redevelopment Project District
S-R Suburban Residential District
D-C Downtown Commerce District
RC Regional Commercial District
N
COLUMBIA RIVER
COWLITZ RIVER
DISCLAIMER: The City of Longview does not guarantee the accuracy, adequacy, completeness or usefulness of any information. The City of Longview provides this information on an "as is" basis without warranty of any kind, expressed or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, and assumes no responsibility for anyone's use of this information. However, notification of any errors will be appreciated.
s/arcvw projects/zonemap.apr R.Bunch 11/10/09


City of Longview
Stormwater Basins
LEGEND
Stormwater Basins
Street Network
City of Longview
Water Bodies
Roadside Ditches
Stormwater Lines
N
COLUMBIA
RIVER
COWLITZ
RIVER
DISCLAIMER: The City of Longview does not guarantee the accuracy, adequacy, completeness or usefulness of any information. The City of Longview provides this information on an "as is" basis without warranty of any kind, expressed or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, and assumes no responsibility for anyone's use of this information. However, notification of any errors will be appreciated.
s:\dept_stormwater\acrw_apps\stmwtrbasins2009.apr R.Burich 11/12/09

Simplified Open Pit Falling Head Percolation Test Data Form

Location:	Date:	Test Hole ID: Hole Depth:

Tester's Name:
Tester's Contact Number:
Testing Company (if applicable):
Signature (sign to validate test):

Depth (inches) Soil Description / Comments

Time	Time Interval (minutes)	Depth (inches)	Drop in Water Level (inches)	Perc. Rate (in/hour)	Remarks
			Presoak		Note presoak date & depth:
			First Trial		
			Second Trial		
					Lowest percolation rate =
					% Diff btwn the lowest two measurements =

Time	Time Interval (minutes)	Depth (inches)	Drop in Water Level (inches)	Perc. Rate (in/hour)	Remarks
					Lowest percolation rate =
					% Difference between the last two trials =

Time	Time Interval (minutes)	Depth (inches)	Drop in Water Level (inches)	Perc. Rate (in/hour)	Remarks
					Lowest percolation rate =
					% Difference between the last two trials =

Notes: Percolation rate is [Drop in Water Level (inches) / Time Interval (minutes)] * 60 (minutes/hour).
Percent difference is [(Larger percolation rate - Smaller percolation rate) / Larger percolation rate] * 100

Simplified Open Pit Falling Head Percolation Test Data Form

Location: *NW Corner of parking Lot, Center of landscape island, 123 Main Street, Oakville*	Date: *4/26/10*	Test Hole ID: *N/A* Hole Depth: *32"*

Tester's Name: *C.J. Tester*
Tester's Contact Number: *(210) 987-6543*
Testing Company (if applicable): *N/A*
Signature (required to validate test): *C. J. Tester*

Depth (inches)	Soil Description / Comments
0 - 6	Dk brwn topsoil
6 - 12	Brwn sandy loam
12 - 32	Brown loam with some clay, still no grndwater

Time	Time Interval (minutes)	Depth (inches)	Drop in Water Level (inches)	Perc. Rate (in/hour)	Remarks
6 PM			Presoak		Note presoak date & depth: 4/25 Filled to top
9 AM			First Trial		Filled 6" above gravel. Didn't take measurements
11 AM			Second Trial		Refilled to 6." Ditto
1 AM		23-1/8	1/2	1.00	Refilled to 6." Start of third trial.
1:30	30	22-5/8	1/2	1.00	
2:00	30	22-1/8	1/2	1.00	Got lucky, this was easy
2:30	30	21-5/8	1/2	1.00	
3:00	30	21-1/4	0.375	0.75	Infiltration rate is 0.75/2 ≤ 0.375" per hour
					Lowest percolation rate = 0.75" / hour
					% Diff btwn the lowest two measurements = 25%

Time	Time Interval (minutes)	Depth (inches)	Drop in Water Level (inches)	Perc. Rate (in/hour)	Remarks
					Lowest percolation rate =
					% Difference between the last two trials =

Time	Time Interval (minutes)	Depth (inches)	Drop in Water Level (inches)	Perc. Rate (in/hour)	Remarks
					Lowest percolation rate =
					% Difference between the last two trials =

Notes: Percolation rate is [Drop in Water Level (inches) / Time Interval (minutes)] * 60 (minutes/hour).
Percent difference is [(Larger percolation rate - Smaller percolation rate) / Larger percolation rate] * 100

APPENDIX L – Glossary

Glossary

API	American Petroleum Institute
BMP	Best Management Practices
CDID #1	Consolidated Diking Improvement District #1 (a.k.a. CDID1)
CESCL	Certified Erosion and Sediment Control Lead
CP	Coalescing Plate oil/water separator
CUFT	Cubic Feet
EPA	Environmental Protection Agency
FPS	Feet Per Second
KEDM	Kelso Engineering Design Manual
LID	Low Impact Development (see Section 5)
LMC	Longview Municipal Code
MEP	Maximum Extent Possible
MR	Minimum Requirement (Ecology, see section 2.3)
MS4	Municipal Separate Stormwater Sewer System
NPDES	National Pollution Discharge Elimination System
NPGIS	Non-Pollution Generating Impervious Surface (e.g. most roofs)
OSHA	Occupational Safety and Health Administration
PGIS	Pollution Generating Impervious Surface (e.g. parking lot)
PGPS	Pollution Generating Pervious Surface (e.g. lawn, landscaping)
ROW	Right of Way
SC	Spill Control oil/water separator
SCS	Society for Modeling and Simulation (International)
SMMWW	Stormwater Management Manual for Western Washington
SQFT	Square Feet
SWPPP	Stormwater Pollution Prevention Plan
UIC	Underground Injection Control (e.g. dry well, infiltration trench w/ pipe, or also Ecology's program to manage their impacts to groundwater)
USDA	U.S. Department of Agriculture
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

APPENDIX M – Optional Small Project Detention Factor Approach

The Director may allow (typically minor) projects not subject to MRs #6 & #7 to calculate detention based on the factors and formula below. At best, this approach will approximate single event hydrograph methodology using somewhat conservative assumptions for the most common situations in the Longview-Kelso area. In no circumstance shall this method be allowed in areas with suspected or potential drainage problems.

DETENTION FACTORS:

Development		CUFT of detention required per SQFT of land surface change				
		Conversion to Impervious from…			Conversion to landscaping from…	
SQFT	ACRES	Landscaping	Pasture	Sloped Woods	Pasture	Sloped Woods
5,000	0.11	0.09	0.21	0.23	0.09	0.12
10,000	0.23	0.10	0.21	0.23	0.10	0.13
15,000	0.34	0.11	0.22	0.23	0.10	0.13
20,000	0.46	0.12	0.22	0.24	0.11	0.13
30,000	0.69	0.13	0.22	0.24	0.11	0.13
40,000	0.92	0.14	0.23	0.24	0.12	0.13
<43,560	<1.00	0.15	0.24	0.25	0.13	0.14

FORMULA: DETENTION (CUFT) = (SQFT IMPERVIOUS * FACTOR) + (SQFT CONVERTED PERVIOUS * FACTOR)

EXAMPLE #1: 10,000 sqft of impervious built over landscaping

	ADDED	FACTOR	DETENTION
NEW IMPERVIOUS	10,000 sqft	0.1	1,000 cuft
CONVERTED PERVIOUS	0 sqft	N/A	N/A
TOTAL REQUIRED DETENTION (CUFT)			*1,000 cuft*

EXAMPLE #2: 15,000 sqft of impervious and 5,000 sqft of landscaping over pasture

	ADDED	FACTOR	DETENTION
NEW IMPERVIOUS	15,000 sqft	0.22	3,300 cuft
CONVERTED PERVIOUS	5,000 sqft	0.09	450 cuft
TOTAL REQUIRED DETENTION (CUFT)			*3,750 cuft*