2019

ENGINEERING DEVELOPMENT MANUAL

Public Works Department

City of Shoreline

17500 Midvale Avenue North

Shoreline, WA 98133

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FOREWORD

This Engineering Development Manual provides information to the development community to help with the processes, administration, engineering, and inspection that apply to private development within Shoreline. Land Use codes related to development can be found in Title 20 of the Shoreline Municipal Code (SMC).

This manual has four divisions:

- **Division 1: Administration** contains information related to permits.
- **Division 2: Right-of-way** presents standards and other information related to development within the right-of-way.
- **Division 3: Surface Water** contains surface water policies, as well as design standards.
- **Division 4: Construction and Inspection** provides the basics regarding construction and inspection in the City right-of-way.

The appendices contain information that supplements the four divisions.

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DIVISION 1 – ADMINISTRATION

Chapter 1. Introduction

1.1. General Authority

Shoreline Municipal Code (SMC) 12.10.015 authorizes the preparation, administration, interpretation, and amendment of the Engineering Development Manual (EDM).

The EDM addresses permitting and engineering requirements for site and right-of-way work related to development within the City of Shoreline. While the EDM is geared toward the applicant and the design/development engineer, it is intended to provide information to a wide group of users.

The EDM sets forth minimum engineering criteria and specifications and supplements the SMC; t does not replace the SMC. These standards do not substitute for engineering design, nor are these standards intended to limit innovative design where equal performance in value, safety, and maintenance can be demonstrated.

The Director of Public Works (Director) reserves the right to substitute more stringent design standards and specifications where special conditions warrant.

The City's website provides access to the EDM, the SMC, information handouts, permit applications, and other guidance documents. Title 20 of the SMC contains the Development Code.

- City's website: http://www.shorelinewa.gov
- Engineering Development Manual: http://www.shorelinewa.gov/government/departments/public-works/engineering-standards
- Shoreline Municipal Code: http://www.codepublishing.com/wa/shoreline/
- Shoreline Development Code: http://www.codepublishing.com/wa/shoreline/html/Shoreline20/Shoreline20.html
- Permit Application Checklists: http://www.shorelinewa.gov/government/departments/planning-community-development/forms-application-checklists-application-handouts/permit-checklists-application-packets
- Development Handouts: http://www.shorelinewa.gov/government/departments/planning-community-development/forms-application-checklists-application-handouts/development-handouts

1.2. Vesting

A project is vested under the zoning and land use control regulations in place on the date when the permit application is determined to be complete by the City. Refer to the appropriate submittal checklist for guidance on complete applications.

The City periodically reviews and revises the EDM. In the case that a zoning or land use regulation has been revised more recently than the update cycle for the EDM, the most current zoning or land use regulation supersedes the information provided in this manual.

A permit application or an approved permit that has been withdrawn, been revoked or expired is no longer vested. If the Applicant wishes to continue with the project, a new application shall be submitted and the project will be subject to the regulations in place at the time the new complete application is received by the City.

The EDM edition that applies to a particular project is the edition in effect when the proposed project is vested. If a newer version of the EDM is published after a project is vested, either the newer version of the EDM in its entirety or the older version in its entirety may be used.

1.3. Revising the EDM

The City always accepts public feedback to inform future revisions to the EDM. To share your comments, please use the Online EDM Feedback form on the Engineering Standards webpage: http://www.shorelinewa.gov/government/departments/public-works/engineering-standards

1.4. Copy of the EDM

The Engineering Development Manual is available online at: http://www.shorelinewa.gov/government/departments/public-works/engineering-standards

1.5. Contact Information

The contact information in Table 1 is provided as assistance during project planning and development and is not a comprehensive list of contacts.

Table 1. Contact Information

Planning and Community Development 17500 Midvale Avenue N Shoreline, WA 98133-4905 http://www.shorelinewa.gov/government/departments/planning-community-development (206) 801-2500	Public Works Department 17500 Midvale Avenue N Shoreline, WA 98133-4905 http://www.shorelinewa.gov/government/departments/public-works (206) 801-2400
Shoreline Fire Department 17525 Aurora Avenue N Shoreline, WA 98133 http://www.shorelinefire.com (206) 533-6500	Shoreline Police Department 17500 Midvale Ave N Shoreline, WA 98133 http://www.shorelinewa.gov/government/departments/police-department (206) 801-2710
Customer Response Team 17500 Midvale Avenue N Shoreline, WA 98133-4905 http://www.shorelinewa.gov/community/customer-response-team (206) 801-2700	
Sanitary Sewer Purveyor: Ronald Wastewater District (Permitted and operated by City of Shoreline) 17500 Midvale Avenue N Shoreline, WA 98133 http://www.ronaldwastewater.org (206) 801-2500	Solid Waste Purveyor: Recology CleanScapes, Inc. 117 S Main Street, Suite 300 Seattle, WA 98104 http://www.cleanscapes.com/shoreline.html Phone: (206) 763-4444
Water Purveyor: North City Water District 1519 NE 177th Street Shoreline, WA 98155 http://www.shorelinewater.org (206) 362-8100	Water Purveyor: Seattle Public Utilities 700 5th Avenue, Suite 4900 Seattle, WA 98104 http://www.seattle.gov/util/services/ Customer Service: (206) 684-3000 SPU Water Certificate: (206) 684-5795

Water and Sewer Purveyor: The Highlands (206) 362-2100	Natural Gas Purveyor: Puget Sound Energy 10885 NE 4th Street, P.O. Box 97034 Bellevue, WA 98009-9734 http://www.pse.com/Pages/default.aspx 1-888-225-5773
Electric Purveyor: Seattle City Light 700 5th Avenue, Suite 3200 Seattle, WA 98104 http://www.seattle.gov/light (206) 684-3000	Electrical Permits: State of Washington Department of Labor and Industries http://www.lni.wa.gov/TradesLicensing/Electrical/default.asp (425) 996-1496

Chapter 2. Permits

The information in this chapter summarizes the requirements in the Shoreline Municipal Code (SMC). If there are any conflicts between this EDM and the SMC, the SMC shall prevail. Prior to beginning a residential, commercial, or industrial development, or a project requiring construction of public infrastructure within the City, the proponent shall prepare and submit a complete application, including permit application, plans, and specifications to the Department of Planning and Community Development for review and approval.

2.1. Site Development Permit

A. Refer to SMC 20.30.315 for activities that require a site development permit.

B. Site development can be permitted under a Site Development Permit or as part of a Building Permit. Examples of work that can require a separate Site Development Permit include:

   1. Paving, grading, clearing, tree removal, on-site utility installation, stormwater facilities, walkways, striping, wheelstops or curbing for parking and circulation, landscaping, critical area and buffer mitigation, enhancement, remediation, or restoration (SMC 20.20.046); or
   2. The construction of two or more detached single-family dwelling units on a single parcel (SMC 20.30.315); or
   3. Site improvements associated with short and formal subdivisions (SMC 20.30.315); or
   4. The construction of two or more nonresidential or multifamily structures on a single parcel (SMC 20.30.315); or
   5. Land disturbing activities that require Minimum Requirements #1-9 as defined by the City's Stormwater Manual.

C. The following activities are usually exempt from Site Development Permit, unless located in a critical area or critical area buffer:

   1. Excavation for a structure approved by a building permit;
   2. Excavation for cemetery graves;
   3. Excavation at refuse disposal sites approved under other regulations;
   4. Excavation for wells or utility trenches; and

5. Excavation for exploration performed under the direction of a registered design professional.

2.2. Right-of-Way Permits

City right-of-way shall not be privately improved or used for access or other purposes unless a permit has been issued by the City for such improvement or use. Issued permits do not convey any vested right or ownership interest in any City right-of-way. Refer to SMC Chapter 12.15 for right-of-way use. Improvements in the right-of-way shall meet the technical requirements presented in Division 2 of this EDM.

A. Right-of-way Use Permit:
Right-of-way Use Permits are issued for short-term activities in the right-of-way and temporary alteration of the right-of-way. SMC 10.150.030(D) lists examples of activities that require a Right-of-way Use Permit which include, but are not limited to:

1. Temporary complete or partial closures of traffic lanes or sidewalks;
2. Boring, jacking, or pushing;
3. Construction or painting adjacent to the right-of-way that may physically impact the right-of-way;
4. Construction related to the installation of culverts, curb cuts, handicap ramps, sidewalks and driveway approaches;
5. Drainage facilities;
6. Installation of landscaping;
7. Paving;
8. Street trenching;
9. Temporary construction devices, such as scaffolding, barricades, walls, elevators, cranes, pedestrian walkways, etc.;
10. House moves, special usage of the street and/or public right-of-way to move houses or other oversize and overweight, materials and structures at specific times and locations;
11. Street runs, or races held on public streets and sidewalks on specific routes, parades and processions;

12. Assemblies, fairs, carnivals, shows, exhibitions, or large gatherings of people that may use or obstruct the right-of-way with people, vehicles, and signs that may produce noise;
13. Commercial filming or videotaping except that associated with news reporting;
14. Parking spaces temporarily dedicated for private use.

B. The following activities are usually exempt from a Right-of-way Use Permit:
    1. Utility facilities placed in the right-of-way under the authority of a franchised utility in good standing may be exempt from the requirement to obtain a use permit if the activity is exempted under SMC 12.15.170 or is a minor or blanket activity specified in SMC 12.15.180;
    2. City public works projects;
    3. Utilities in the right-of-way under the authority of a franchise agreement or site permit required to be relocated of converted because of City-initiated construction projects. This provision only applies to work that would not otherwise have been done by the utility; and
    4. The ordinary maintenance of landscaping in the right-of-way. Blockage of the right-of-way associated with ordinary maintenance of landscaping requires a use permit.

C. Right-of-way Site Permit:

A Right-of-way Site Permit allows private improvements or private long-term use of public right-of-way. A Right-of-way Site Permit is not required for use of right-of-way that is expressly allowed by the Development Code. A Right-of-way Use Permit may be required in conjunction with a Right-of-way Site Permit to construct or install structures and/or amenities associated with the use. For specific information on Right-of-way Site Permits, refer to SMC 12.15.030(C).

Site permits may be granted for a period of up to five (5) years. In addition to a permit fee, for some specific uses the Permittee may be assessed an annual fee for the length of the permit. The annual fee is calculated using the square feet of right-of-way proposed for leasing and multiplying it by 10 percent of the square foot dollar value of the abutting property.

Upon termination of a Right-of-way Site Permit, if the permit is not renewed, the Permittee shall remove any improvements constructed in the right-of-way and restore the area to its

original condition or better. Removal of improvements in the right-of-way could also require a Right-of-way Use Permit.

Right-of-way encroachments that compromise public safety shall not be allowed.

SMC 12.15.030(C) provides examples of activities requiring Right-of-way Site Permit which include but are not limited to:

1. Accessory uses permitted to the adjacent property such as parking, displays, and signage, provided the proposed use is not required to meet City development standards for any private property development;
2. Air rights;
3. Bus shelters/stops;
4. Fences, retaining walls, terracing, and similar structures;
5. Litter and recycles receptacles placed by private parties;
6. Special and unique structures such as benches, fountains, clocks, flagpoles, kiosks banners, street furniture, decorations, bicycles racks, private planters, or any other obstruction to be placed in the right-of-way by an entity other than the City.
7. Sales structures, including sidewalk cafes, telephone booths, or the usage of the right-of-way for the sales of flowers, beverages, newspaper, or other items;
8. Underground rights;
9. Utility facilities not exempt under a franchised agreement with the City.

D. The following activities are exempt from the Right-of-Way Site Permit:

1. Utility facilities placed in the right-of-way under the authority of a franchised utility.
2. If the adjacent zone expressly permits use of the right-of-way, that use may be approved for an indefinite duration and is exempt from compensation. For example: Awnings on buildings projecting into the right-of-way are expressly permitted in the zoning code for certain zoning designations and do not require a Right-of-way Site Permit.

2.3. Public Utilities

Depending on the type of work and the standing of the utility, a permit may be required for a utility to work in the right-of-way. Refer to SMC 12.15.150 and 12.15.180 for more information.

2.4. Non-City Agencies

It is the Applicant's responsibility to obtain permits from non-City agencies that may involve work within the right-of-way.

In order to ensure coordination between utilities, the, proposed locations of water, sewer, gas, and power in the right-of-way shall be approved by each provider as part of the permit review process.

The permit plans shall show the right-of-way installation locations as approved by each provider. Each utility only needs to approve the proposed locations. Approval shall consist of signature/initials with phone number and date from a representative of each provider on a civil plan showing the proposed utility location.

Prior to issuing City of Shoreline permit(s), verification that the Applicant has obtained other required permits may be required.

Permits from non-City agencies may include:

A. Electrical permits: Washington State Department of Labor and Industries, (425) 990-1430.
B. Electrical service permit: Seattle City Light, (206) 684-3000.
C. Propane tanks: Shoreline Fire Department, (206) 533-6500.
D. Sewer connection services and related information: Ronald Wastewater District, (206) 546-2494 or The Highlands, (206) 362-2100.
E. Water connection services and related information: Seattle Public Utilities (generally sites west of I-5), (206) 684-5800 or North City Water District (generally sites east of I-5), (206) 362-8100.
F. Washington Department of Fish and Wildlife:
    1. Any work below the Ordinary High Water Mark (OHWM) of surface waters including intermittent streams (work that uses, diverts, obstructs or changes natural flow or bed of State waters);

2. Any work that uses, diverts, obstructs, or changes the natural flow or bed of any of the salt or fresh waters of state requires a Hydraulic Project Approval (HPA) permit. Download the application for an individual permit, called a Joint Aquatic Resource Permit Application (JARPA), from the Department of Fish and Wildlife website.

G. Department of Ecology (DOE):

1. An NPDES (National Pollutant Discharge Elimination System) Construction Stormwater General Permit (CSWGP) Notice of Intent (NOI) is required from the Washington State Department of Ecology for all soil disturbing activities (including clearing, grading, and/or excavation) where one or more acres will be disturbed, and stormwater will be directly discharged to a receiving water (e.g., wetlands, creeks, unnamed creeks, rivers, marine waters, ditches, estuaries) or to storm drains that discharge to a receiving water. If all storm water is retained on-site and cannot enter surface waters of the state under any condition, the project may not require a permit. Refer to Ecology's website for information regarding applying for an NOI: https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

H. Army Corps of Engineers:

1. Coastal Zone Management Certification (CZM) is issued by the federal permitting agency or state DOE.
2. Water Quality Certification (401) ensures that limits placed in a permit on the quantity and concentration of pollutants discharged are not exceeded.
3. Activities that may affect endangered species shall be reviewed for permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The Army Corps of Engineers coordinates with the National Oceanic and Atmospheric Administration (NOAA) Fisheries and United States Department of Fish and Wildlife to ensure Endangered Species Act consistency.

I. United States Coast Guard and Washington State Department of Natural Resources are involved in certain projects (such as a bridge) involving impacts over or adjacent to navigable waters (Class 1 streams).

J. Federal Emergency Management Agency (FEMA) administers programs related to flood protection.

Chapter 3. Permit Process

This chapter describes how the Applicant and the City work together during the permit process. Each permit application submitted to Planning and Community Development is assigned a project manager. The project manager or Planning and Community Development Permit Services can provide process information related to a specific permit. Contact Planning and Community Development for more information.

3.1. Permit Process

Refer to Table 2 for a general outline of the application review process. The outline may be adjusted to meet particular project circumstances. Not all of the steps listed below are required for all permits. Contact the Planning and Community Development for an explanation of the steps applicable to a certain permit application. Description of various elements of the permit process is contained in the sections following Table 2.

Table 2. **Permit Process Outline**

Activity		Responsible Party
I.	Pre-Application Meeting: • Schedule a pre-application meeting when required by SMC 20.30.080 (or when desired)	Applicant
II.	Project Proposal: • Prepare studies and reports • Prepare Project Plans • Conduct Neighborhood Meeting when required by SMC 20.30.090, SMC 20.30.045, and SMC 20.80.224(G)(1)	Applicant
III.	Submit Application(s): • Only applications meeting the submittal requirements will be processed. Refer to the applicable permit submittal checklist for required submittal information and materials.	Applicant
IV.	Review: • Assign a project manager (PM) • Determine completeness	City

	• Coordinate reviews (for example Fire Department, Planning, Public Works, and Building and Inspection teams) • Approve permit or send a comment letter to designated contact • Redlined plans may accompany the comment letter	
V.	Revision and Re-submittal: • Revise plans per the City's comments • Submit revised plans and provide revised supporting documents • Submit redlined plans that were provided by the City	Applicant
VI.	Revision and Re-submittal Review • Coordinate plan review and verify that all comments have been satisfactorily addressed • Approve permit or send a comment letter to designated contact • Redlined plans may accompany the comment letter	City
VII.	Notification: • Notify Applicant's designated contact regarding outstanding items needed for issuance. • Before the permit is issued, all requirements for issuance shall be met. These may include proof of insurance, posting of financial guarantee(s), draft Declaration of Covenant, easements, permits from other agencies, payment of fees, and/or dedications. • When all conditions for issuance are met, and the permit(s) is ready to issue, a representative from Planning and Community Development will notify the designated contact person that the permit is ready. At this time, Planning and Community Development will notify the Applicant of fees owed.	City
VIII.	Obtain Permit • Provide outstanding items • Pay any remaining fees • Receive the permit	Applicant

IX.	Pre-Construction Meeting: • Schedule a pre-construction meeting. • Construction may not begin before having a pre-construction meeting.	Permittee
X.	Construction: • Complete all activities identified in the approved plans to City of Shoreline satisfaction • Notify the City Inspector assigned to the project when elements are ready for inspection	Permittee
XI.	Inspections: • Perform all required inspections including final inspection	City
XII.	Close-out: • Provide maintenance/monitoring financial guarantee • Provide as-constructed/record drawings when required	Permittee
XIII.	Release Performance Financial Guarantee (if applicable)	City
XIV.	Cancel expired permit applications when applicable. See Section 3.12, Permit Timing and Expiration	City

3.2. Pre-application Meeting

Refer to SMC 20.30.080.

Not all projects require a pre-application meeting, but many projects benefit from this service. A pre-application meeting allows the potential Applicant, City representatives, and some external agencies an opportunity to discuss a proposed project before a permit application is submitted. The pre-application meeting provides the project proponent information regarding permits, permit processes, codes, and standards that apply to the proposed project.

The meeting is scheduled at the time the Applicant submits an application for the meeting. Please refer to the Pre-Application Meeting handout that is available in the Permit Center or online at: http://www.shorelinewa.gov/government/departments/planning-community-development/forms-application-checklists-application-handouts/development-handouts.

3.3. Neighborhood Meeting

Certain types of permits require the Applicant to hold a neighborhood meeting. Refer to SMC 20.30.045, 20.30.090, and 20.80.224(G)(1). SMC 20.30.090 provides the requirements for neighborhood meetings, with a summary of the meeting and list of attendees submitted with the application materials..

3.4. Permit Review

The permit review process is a partnership between the Applicant and City representatives. Planning and Community Development will review permit submittals or coordinate review with other departments and/or external agencies for compliance with applicable standards following the general outline in Table 2.

The City reviews permits concurrently for projects having a building or site development permit and a Right-of-way permit. Generally, the City issues the right-of-way permit with its associated building permit or site development permit.

3.5. Plan Approval

Plan approval does not relieve the Applicant, the Applicant's engineer, or the contractor from the responsibility for ensuring that all facilities are safe and that calculations, plans, specifications, construction drawings and record drawings with as-constructed information are in compliance with accepted engineering practices, this manual, and applicable federal, state, and local laws and codes.

3.6. Plan Revisions

To help with plan review, any revisions shall be called out on the plans using "clouds" or some other indicator. The revised plan(s) shall include the revision number and date particular to that plan set.

The engineer of record shall stamp, sign, and date revisions to the design prepared under the engineer's authority.

3.7. Independent Review

Depending on the site conditions and design complexity, the City may determine that reports, such as geotechnical, stream or wetland reports submitted to the City may require independent (third party) review.

3.8. Permit Issuance

Before a permit is issued, all requirements for issuance shall be met. These may include proof of liability insurance, financial guarantees, draft Declaration of Covenant, easements or dedications, permits from other agencies, and/or payment of any outstanding fees. When all requirements for issuance are met, and the permit is ready to be issued, a representative from Planning and Community Development will notify the designated contact person that the permit is ready subject to any remaining requirements, such as payment of all fees.

3.9. Pre-construction Meeting

Many projects may require a pre-construction meeting. Depending on the project scope, more than one meeting may be required. Construction may begin only after the required pre-construction meeting(s). The Permittee is responsible for scheduling the pre-construction meeting(s). Directions for scheduling a pre-construction meeting(s) are found on the issued permit(s).

3.10. Permit Inspections

A. Inspections on-site are performed by Combination Inspectors from the Planning and Community Development. Work within the right-of-way is subject to inspection by a Construction Inspector from the Public Works Department.

B. Inspections are usually performed Monday through Friday, from 8:00 a.m. to 4:00 p.m.

C. Some projects may require special inspections performed by pre-approved third parties.

D. For more information on inspections, refer to Chapter 29, Inspection.

3.11. Final Project Approval

A. Fees:
   If, during construction, the number of estimated inspections is exceeded, or if revisions to approved plans have been submitted for review, additional fees may apply. All inspection, plan revision review, and other fees due the City shall be paid prior to final project approval.

B. Permanent Stabilization:
   All disturbed areas shall have permanent stabilization in place and functioning before final project approval.

C. Financial Guarantee:

Refer to Chapter 4, Permit Submittals for more information on Financial Guarantees.

D. Record Drawings:

Record drawings shall be provided for private infrastructure that connects to the City's infrastructure, for public facilities, and for right-of-way work. Refer to Appendix I – Record Drawings for more information.

E. Inspections:

All inspections shall be completed. Upon completion of all site or right-of-way work and associated conditions approved under a permit, the Permittee shall request a final inspection. Refer to Chapter 28, Inspections for more information on inspections.

F. Declaration of Covenant**:**

Refer to Chapter 4, Permit Submittals for more information on the Declaration of Covenant.

G. Easements:

Dedication of right-of-way easements shall be in place prior to permit issuance. Refer to Chapter 7, General Requirements for more information regarding dedication of right-of-way.

H. Work Completion:

The permit process is complete upon final inspection approval by the City.

3.12. Permit Timing and Expiration

The following provides general guidelines regarding application and permit expiration. For specific information contact the project manager or Planning and Community Development. Refer to SMC Chapter 20.30 Subchapter 3.

A. Issuance Notification:

Following plan approval, a representative of Planning and Community Development notifies the contact indicated on the permit application that the permit is ready to issue and of any fees owed. Following notification, the Applicant has 180 calendar days to obtain the permit. If a permit is pending issuance for more than 180 calendar days without issuance and the Applicant has not requested an extension, the permit is null and void.

B. Issued Permit:

Permits are valid for the periods specified by ordinance.

If the proposed work cannot be completed within the time covered by the permit, the City may grant an extension. The Applicant shall submit a written extension request to Planning and Community Development Permit Services **prior to the expiration date of the issued permit**. The City may assess additional fees for permit extension and inspection.

3.13. Notification (Right-of-way)

Notification is required for any project that has the potential to disturb encroachments into the right-of-way. Public Works will notify and work with abutting property owner(s) when there are encroachments that adversely affect installation of right-of-way improvements.

3.14. Franchises, Electric and Communication Facilities

In addition to a specific franchise agreement, requirements for the construction and usage of the right-of-way by utility providers are located in SMC Chapter 12.25 Right-of-Way Franchises, and SMC Chapter 13.20 Electric and Communication Facilities.

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Chapter 4. Permit Submittals

Checklists with the required submittal materials are available on the City's website at: http://www.shorelinewa.gov/government/departments/planning-community-development/forms-application-checklists-application-handouts/permit-checklists-application-packets.

The checklists provide a list of the typical submittal materials. Some items are not applicable to all projects, and the City may request additional submittal materials for some projects. Please contact Planning and Community Development with any questions regarding submittal materials.

4.1. Design Professionals

State law requires that certain work be performed by or under the direction of a professional licensed to practice in Washington State, including engineering and land surveying.

A. Activities requiring design by a licensed Professional Engineer include:
    1. Nearly all right-of-way design, except simple activities such as installation of a driveway apron;
    2. Design of treatment facilities, flow control facilities (detention ponds or infiltration basins), structural source control BMPs, or drainage conveyance systems; and
    3. Construction Stormwater Pollution Prevention Plans (SWPPPs) that involve engineering calculations.

B. Activities requiring a licensed Land Surveyor include:
    1. Nearly all right-of-way work. The survey work includes setting right-of-way lines, locating conveyance systems and setting elevations, locating curbs and setting curb elevations, locating drainage improvements and recording elevations, and providing as-constructed information on record drawings;
    2. Construction of treatment facilities or flow control facilities (detention ponds or infiltration basins), structural source control Best Management Practices (BMPs), or drainage conveyance systems to set locations and elevations;
    3. Cuts on slopes steeper than 15 percent require a professional surveyor to set the slope stakes to confirm top and toe of cuts;

4. Survey marks such as property corners, right-of-way lines, subgrade elevations, and slope stakes;
5. Placement, protection, and replacement of survey monuments;
6. When no profile has been established for the streets abutting and leading to a development site, the City may require a survey of the street area by a licensed surveyor for the purpose of establishing the proposed centerline profile and the transition between the right-of-way and on-site;
7. Flood Zone Elevation Certificates require surveyed finished floor elevations to confirm that structures meet the elevations set by the City; and
8. Record drawings with as-constructed (surveyed) information shall be provided for private infrastructure that connects to the City's infrastructure, for public facilities, and for right-of-way work.

4.2. Plans and Specifications

The plans shall clearly indicate the location, nature, and extent of the proposed work and shall provide sufficient detail to show that all provisions of the standards and codes are met. Specifications shall accompany the plans whenever the plans and notes do not adequately describe the proposed work and materials.

4.3. Survey

A. Surveys shall meet the following requirements:
    1. Horizontal Datum: All survey work, including but not limited to mapping, platting, planning, design, right-of-way surveys, and construction surveys, shall be in the Washington State Plane Coordinate System, North Zone, using NAD 83(2011) datum;
    2. The plans shall show the horizontal control used to establish ties to the datum, with type, size and location, date visited, and the State Plane coordinates for each monument used;
    3. Vertical Datum: All survey work, including but not limited to mapping, platting, planning, design, right-of-way surveys, and construction surveys, shall be in the North America Vertical Datum of 1988 (NAVD 1988);

4. The plans shall show the benchmarks used to establish ties to the datum, with reference number, description, location and elevation of each benchmark used, and any project site benchmarks; and
5. For Flood Elevation certificates, a conversion from 1988 NAVD to 1929 NAVD may be provided.

B. All real properties, including parcels, right-of-way, and easements shall be located or staked on the ground, starting from a monument.

C. Legal descriptions of the horizontal and vertical locations require the location of a monument as their beginning point of reference.

D. Refer to Appendix B – Survey Criteria.

4.4. Site Assessment

A site assessment for drainage design is required for medium impact and large impact projects. Refer to Division 3 – Surface Water and the Department of Ecology's Stormwater Management Manual for Western Washington (Stormwater Manual) for more information.

4.5. Surface Water Report

The scope of drainage review varies with the project complexity and potential surface water impacts. A drainage report may be required. Refer to Division 3 – Surface Water and Appendix C – Surface Water Report Guidelines for design and report requirements.

4.6. Geotechnical Report

A geotechnical report helps determine if the proposal for a site is appropriate. In addition to geotechnical reports required to support building designs, a geotechnical report is required for:

A. Land fill or excavation over 500 cubic yards;

B. Work on sites containing or adjacent to slopes that are 15 percent or steeper. Refer to SMC Chapter 20.80 for critical area regulations; and

C. Some storm drainage design.

For site development on a site with no steep slopes, erosion hazards, or critical areas, a report previously prepared for that site may be accepted if:

A. The report is less than five (5) years old and no significant changes to the site have occurred; or

B. The geotechnical engineer/engineering geologist who signed the report provides a letter stating the report is still applicable to the site and currently proposed project.

Refer to Appendix D – Geotechnical Report Guidelines for the approved report format.

4.7. Transportation Impact Analysis

A transportation impact analysis is required for each development or redevelopment that would generate 20 or more trips during the PM peak hour (SMC 20.60.140) consistent with the most current edition of the Trip Generation Manual, published by the Institute of Traffic Engineers (ITE).

Refer to Chapter 8, Transportation Impact Analysis and Appendix E – Transportation Impact Analysis Report Guidelines for guidance.

4.8. Traffic Control Plan

Prior to beginning any activity which might affect City right-of-way, the Applicant shall provide the City, for review and approval as part of a Right-of-way Use Permit, a traffic control plan that meets the most current Manual of Uniform Traffic Control Devices (MUTCD) standards. Refer to Chapter 27.3 and Appendix K – Traffic Control Plan Submittals.

The traffic control plan shall accurately reflect existing right-of-way conditions including accesses, channelization, sidewalks, bike/pedestrian paths, bus stops, hydrants, trees, poles, and pavement edge. The traffic control plan shall allow for continued emergency services. For pedestrian and business disruption, the plan shall contain adequate connections and clear signage.

4.9. Declaration of Covenant

The City requires a Declaration of Covenant for all permanent surface water Best Management Practices (BMPs) on all projects. The Declaration of Covenant is a legal document that grants the City permission to access the property to inspect BMPs. The covenant includes several exhibits, which detail the BMPs and address operation and maintenance requirements. The facility owner is responsible for operating and maintaining all BMPs.

A draft of the covenant is available online with the permit checklists. A completed draft covenant shall be submitted with the drainage design for review and approval. Upon verification of the constructed items and prior to final approval of the project, the Applicant shall proceed with recording the covenant with the King County Recorder's office. After recording, the Applicant shall provide the City with a copy of the recorded document.

For subdivision projects, the recorded covenant shall be stated on the face of the plat.

4.10. Easements

Easements shall be provided when facilities on private property will be used by more than one lot or will benefit the public (SMC 20.70.160).

A. Utilities:
   Each utility (water, sewer, power, surface water, etc.) determines the minimum width for an easement..

B. Pedestrian/Bicycle:
   For traffic safety or access to schools, playgrounds, urban trails, shopping facilities, or other community facilities, bikeways or walkways shall be a minimum of five (5) feet wide. Additional width may be required.

C. Nonmotorized:
   Nonmotorized easements facilitate pedestrian circulation between neighborhoods, schools, shopping centers, and other activity centers. A nonmotorized easement shall be wide enough to include the trail plus at least two (2) feet on each side.

D. Roadway:
   Either the street's functional classification or its particular design features may necessitate slope, sight distance, wall, or drainage easements beyond the right-of-way line. Such easements may be required in conjunction with dedication or acquisition of right-of-way pursuant to SMC Chapter 20.70.

4.11. Tracts

Tracts should be used for facilities used by a broader group of individuals than easements, may have some degree of access by the public, and typically require regular maintenance activities. Examples of facilities that may be located in tracts include private streets or drainage facilities serving more than

one lot. Tracts are not subject to minimum lot size standards for the zone, although they shall be large enough to accommodate the facilities and activities located within them.

A publicly maintained stormwater facility shall be located in the roadway right-of-way or in a tract dedicated to the City. At a minimum, the tract shall include the entire facility, site access area, and at least five (5) feet around the facility. In limited cases, an easement may be permitted. If an easement is permitted, dimensions shall be determined by the City.

4.12. Dewatering Plan

Dewatering is defined as the removal and appropriate discharge and release of surface water and subsurface water. Temporary dewatering that occurs during construction shall have a Temporary Dewatering Plan reviewed and approved by the City before dewatering begins.

4.13. Financial Guarantee

The City determines the performance and maintenance financial guarantee amounts. The performance guarantee shall be submitted before permit issuance. The maintenance guarantee shall be provided before final approval.

A. Performance Guarantee:

1. The City requires a performance guarantee to cover the construction costs of proposed right-of-way improvements pursuant to SMC 12.15.040.
2. A performance guarantee may be required for proposed on-site improvements such as landscaping, tree replacement, critical area restoration, storm water facilities installation, and for erosion prevention and sediment control on projects which clear more than 7,000 square feet or contain or abut critical areas such as steep slopes, wetlands, or streams pursuant to SMC 12.15.040.
3. Performance financial guarantees remain in full force and effect until:
    a. The obligations secured are fully performed as determined by the City's inspection program;
    b. A guarantee for maintenance and operation of all improvements for a guarantee period have been submitted to the City; and
    c. The City has released the guarantee in writing.

4. The guarantee may be released in increments as improvements are completed and have satisfactorily met all inspection requirements of the City.

B. Maintenance Guarantee:

1. A maintenance guarantee shall be required to guarantee maintenance and operation of right-of-way improvements for a period of at least two years.
2. A maintenance guarantee may be required to guarantee maintenance and operation of on-site improvements for a period of at least two (2) years.
3. For low impact development or for innovative technologies, the maintenance financial guarantee term may be up to three (3) years.
4. For street tree replacement, a maintenance guarantee is required for three (3) years.

4.14. Insurance

As a condition of the City permitting work within the public right-of-way, it is required that a certificate of liability insurance shall be provided indicating that the permittee and /or contractor are covered by a Commercial General Liability insurance policy pursuant to SMC 12.15.040.

Additionally, when the City determines that the nature of any work on public or private property is such that it may create a hazard to human life, endanger adjoining property, street, street improvement, or any other public property; the City may require the Permittee to provide a Certificate of Liability Insurance. In this case the City shall determine the amount of insurance based on the nature of the risks involved.

The minimum Commercial General Liability insurance limits are to be no less than $1,000,000 each occurrence, $2,000,000 general aggregate and $2,000,000 products completed operation aggregate limits.

The required liability insurance shall be maintained for the duration of construction activities.

The City shall be named as an insured under the Commercial General Liability insurance policy using ISO Additional Insured-State or Political Subdivisions-Permits CG 20 12 or a substitute that provides and equivalent endorsement.

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Chapter 5. Permit Fees

All fees are set forth in SMC Chapter 3.01 Fee Schedules. Planning and Community Development collects these fees.

Plan review and submittal fees are collected when the application is submitted. Additional fees may include independent review costs, additional inspection or review time, and/or transportation impact fees. Additional fees are due prior to permit issuance.

5.1. Fee-in-lieu of Frontage Improvements

The City does not accept Fee-in-lieu of Frontage Improvements. A waiver may be approved by the Director to not require frontage improvements pursuant to SMC 20.70.320.

In the instance where streets will be improved as a whole through a capital improvement project or local improvement district within five (5) years of permit issuance, a contribution may be made and calculated based on the improvements that would be requested on the development. (SMC 20.70.320)

5.2. Independent Review

Depending on the site conditions and design complexity, reports submitted to the City, such as geotechnical or wetland reports, may receive independent third-party review. The permit Applicant shall pay the additional independent review fee.

5.3. Revisions to Issued Permits

The cost to review revisions to an issued permit is charged at the currently adopted hourly review rates. These fees shall be paid when the revision is issued and before the permit receives final approval.

5.4. Transportation Impact Fees

The City collects impact fees for transportation improvement projects. Transportation impact fees are collected at the time of building permit issuance. Fees are calculated based on the type of development listed in the fee schedule in effect at the time of complete application. Fee amounts are

calculated during the permit review either by the City or through an approved independent fee calculation. See SMC Chapter 3.80 for more information.

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DIVISION 2 – RIGHT-OF-WAY

Division 2 – Right-of-Way sets forth minimum engineering design criteria to support public safety and welfare within the right-of-way. Every effort has been made to ensure that these standards are in line with AASHTO, FHWA, ITE, and WSDOT standards.

These standards do not substitute for engineering design, nor are these standards intended to limit innovative design where equal performance in value, safety, and maintenance can be demonstrated. More stringent design standards or specifications may be required where special conditions warrant.

All facilities in the right-of-way, unless specifically excluded, shall be designed by or under the direct supervision of a professional engineer licensed in Washington State. All right-of-way drawings, designs, sections, details, standard plans, and supporting data submitted to the City of Shoreline for approval, unless specifically excluded, shall be stamped, signed, and dated by the engineer of record.

Chapter 6. Standards

Design detail, construction workmanship, and materials shall be in accordance with these technical standards and the most current edition of the following companion documents. Design and construction shall meet the applicable standards and codes, and the recommendations in specific reports, such as the geotechnical report, the traffic impact study, and the surface water report.

The following publications provide the basis for design and construction requirements for public or private development within the City:

- City of Shoreline Comprehensive Plan
- City of Shoreline Transportation Master Plan (TMP)
- City of Shoreline Surface Water Master Plan (SWMP)
- City of Shoreline Streetlight Master Plan
- City of Shoreline Municipal Code (SMC)

6.1. Companion Documents

When standards or other design criteria are not specifically addressed in the EDM, then the most current editions of the following shall govern the design.

A. Transportation design standards:

1. *Design Manual*, WSDOT
2. *A Policy on Geometric Design of Highways and Streets*, AASHTO
3. *Guidelines for Urban Arterial Program*, WSDOT
4. *Urban Street Geometric Design Handbook*, Institute of Transportation Engineers
5. *Guide for the Development of Bicycle Facilities*, AASHTO
6. *Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG)*, United States Access Board
7. *ADA Standards for Accessible Design*
8. *Small Town and Rural Multimodal Networks (STAR) Guide*, FHWA
9. *Urban Bikeway Design Guide*, NACTO
10. *Urban Street Design Guide*, NACTO

B. Surface water design standards:

1. *Stormwater Management Manual for Western Washington* (Stormwater Manual), Department of Ecology as amended in Chapter 19 Stormwater Manual Modifications; available online at http://www.ecy.wa.gov/programs/wq/stormwater/manual.html
2. *King County Surface Water Design Manual*, Chapter 4 "Conveyance System Analysis and Design," as amended in Chapter 26 Conveyance System; available online at http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual.aspx
3. *Highway Runoff Manual,* (HRM) M31-16.04, WSDOT; Only publicly funded linear transportation projects may use the BMPs and minim design requirements, except LID Feasibility (HRM Section 405.2 and within individual BMP design criteria in Section 5-4) available online at http://www.wsdot.wa.gov/Publications/Manuals/M31-16.htm

C. Traffic control design standards: *Manual on Uniform Traffic Control Devices*, Federal Highway Administration; available online at http://mutcd.fhwa.dot.gov/

D. State highway guidelines: *Local Agency Guidelines*, WSDOT

E. Construction specifications: *Standard Specifications for Road, Bridge, and Municipal Construction* M 41-10, WSDOT; WSDOT Manuals are available online at http://www.wsdot.wa.gov/Publications/Manuals/

F. The following shall be applicable when pertinent, when specifically cited in these standards, or when required by state or federal funding authority:

1. *Highway Capacity Manual*, Transportation Research Board
2. *Standard Rock Wall Construction Guidelines*, Associated Rockery Contractors
3. *National Electrical Installation Standards* (NEIS)
4. American Society for Testing and Materials (ASTM)
5. Design criteria of federal agencies including the Federal Housing Administration, Department of Housing and Urban Development, and the Federal Highway Administration, Department of Transportation.

6.2. Deviation from Engineering Standards

A Deviation from Engineering Standards is a mechanism to allow the City to grant an adjustment in the application of engineering standards where there are unique circumstances relating to the proposal. (SMC 20.30.290)

An application shall be submitted to request a Deviation from Engineering Standards. The application shall include justification to the nine (9) decision criteria set forth in SMC 20.30.290. Refer to the Deviation from Engineering Standards Checklist for additional submittal information. It is recommended that an Applicant discuss a potential Deviation with a Development Review Engineer prior to submitting the application.

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Chapter 7. General Requirements

This chapter provides general requirements related to right-of-way improvements.

7.1. Americans with Disabilities Act

All designs shall meet the current Americans with Disabilities Act (ADA) requirements and standards. The City standard for ADA requirements is the 2011 Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG).

In the event field conditions prohibit meeting the ADA requirements, the Applicant's/Permittee's engineer shall submit documentation that the design meets ADA to the maximum extent feasible. The maximum extent feasible documentation shall include a description of the proposed project, description of the non-compliant elements of the design, justification to support the design, and figure(s) to illustrate the non-compliant elements.

7.2. Low Impact Development

Requirements for low impact development apply to both onsite improvements and improvements in the right-of-way. Refer to the Stormwater Manual as adopted and amended in Division 3 – Surface Water.

7.3. Maintenance

The City of Shoreline maintains and repairs public streets.

See SMC Chapter 12.05 for information regarding the construction and maintenance of sidewalk, landscaping, trees, and driveway approaches.

7.4. Street Tree Removal/Pruning

Street tree removal and pruning in the right-of-way is regulated by SMC 12.30.040.

7.5. Connectivity

In order to provide connectivity, street layouts shall continue streets in adjoining developments(s) or their anticipated locations where adjoining property is not yet developed.

7.6. Underground Utilities

The following applies to the connection from the distribution lines in the right-of-way to the property it serves (service connection).

If the existing service connections in an area are underground, new service connections shall be underground in accordance with SMC 20.70.430.

Existing overhead facilities including utility poles, will be allowed to remain above ground in accordance with SMC 13.20.050.

7.7. Frontage Improvements

A. Certain activities require the installation of frontage improvements. Refer to SMC 20.70.320.

B. Standard frontage improvements consist of dedication of right-of-way, curb, gutter, sidewalk, amenity zone and landscaping, drainage improvements, and pavement overlay up to one-half of each right-of-way abutting a property as defined in the Master Street Plan. Additional improvements may be required to ensure safe movement of traffic, pedestrians, bicycles, transit, and nonmotorized vehicles. The improvements can include transit bus shelters, bus pullouts, utility undergrounding, street lighting, signage, and channelization.

C. When a development proposal requires frontage improvements, existing frontage improvements shall be upgraded to current standards.

D. When frontage improvements are required, City staff will review the required improvements for consistency with SMC Chapter 12.50 regarding Complete Streets. The Complete Streets policy strives to provide an integrated multi-modal transportation system that provides for the safe accommodation of pedestrians, bicyclists, transit users, motorists and users of all ages and abilities. This review may require variations of improvements from those in Appendix F – Street Matrix.

E. Acknowledging that the City is a built environment, design and installation of new or replaced frontage improvements may be adjusted during design or installation, with approval from the

Director, to meet the existing conditions. Approval may require a formal Deviation from Engineering Standards, as determined by the Director.

F. Appendix F – The Street Matrix defines street widths, curb locations, sidewalk widths and other right-of-way requirements for all streets.

G. The frontage improvements run the full length of the property line/right-of-way line. Transitions to existing conditions occur outside the development frontage.

H. An amenity zone is required, except where an alternate street design has been approved, or where protection of critical areas requires special consideration.

I. Required frontage improvements shall be installed, inspected and approved by the City prior to final approval of the related building/site development permits and before a Certificate of Occupancy is issued or a permit receives final approval.

J. The installation of required frontage improvements shall not create flooding, ponding, or other drainage issues.

7.8. Dedication of Right-of-Way

A. Dedication shall occur at the time of recording for subdivisions or prior to permit issuance for construction projects.

B. The City may require right-of-way dedication to incorporate necessary transportation and frontage improvements. Refer to SMC Chapter 20.70 for more information.

C. The Director may grant some reduction in the minimum right-of-way requirement where it can be demonstrated that sufficient area has been provided for all frontage improvements, including utilities, within the right-of-way.

D. Dedications may be required in the following situations:

    1. Accommodation of motorized and nonmotorized transportation, landscaping, utility, street lighting, and traffic control devices, and buffer requirements;
    2. The development project abuts an existing substandard public street and the additional right-of-way is necessary to incorporate future frontage improvements for public safety;
    3. Right-of-way is needed for the extension of existing public street improvements necessary for public safety; and

4. Right-of-way is needed in order to incorporate improvements that are reasonably necessary to mitigate the direct impacts of development.

7.9. Illumination

A. Seattle City Light (SCL) maintains and establishes service connections for street lighting within the City of Shoreline. When new street lighting is required, the Applicant/Permittee works with the Public Works Department and SCL regarding design and installation. The Applicant/Permittee pays the costs associated with the design and installation of the light. These costs may include new electrical service and/or a new pole.

B. Where a half-street improvement is required in conjunction with a development, the roadway width to be used for illumination design purposes shall be the actual width of the roadway at the time of design and not half of the ultimate width. All existing luminaires shall be evaluated for upgrades to present standards. Lighting standards shall be approved by Seattle City Light, consistent with Seattle City Lights' Stock Catalog.

C. Development projects that underground utilities shall provide new street lighting consistent with the City's Street Light Master Plan. Development projects within mixed-use or business zoned areas that are located along an arterial street shall provide pedestrian scale lighting per Standard Plan 440.

1. Pedestrian scale luminaires shall be placed within the amenity zone at a 50-foot maximum spacing on center. Lighting calculations are not required for pedestrian scale luminaires.
2. If the 50 foot maximum spacing cannot be achieved, pedestrian lighting shall be designed to meet the following performance standards in Table 3:

Table 3. **Pedestrian Lighting Requirements**

Parameter	Performance Standard
Calculated "Illumination Path" Width	10'
Maintained Average Horizontal Measured at Pavement	1.0 fc
Average : Minimum Uniformity Ratio	6.0 : 1
Calculation Grid Size	5' on center
Applied Light Loss Factor	0.85
Color Temperature	3000k

D. All new and retrofitted lighting systems shall be Light Emitting Diode (LED).

E. All lighting shall conform to NEIS standards. Street lighting system designs shall be stamped by a Professional Engineer licensed in the State of Washington experienced with lighting design and shall include the following: luminary spacing, illumination level, uniformity ratio, line losses, power source, the electrical and physical layout, installation details, plans and specifications. All designs shall be approved by the City Engineer.

F. For City-owned illumination systems, lighting level requirements for roadways are defined in Appendix J – Street Lighting Levels Criteria. Other criteria are as follows:

1. Intersections shall have a minimum light level equal to 1.5 times the average light level requirement of the intersecting street with the highest classification. Intersection uniformity shall be less than or equal to the uniformity of the intersecting street with the highest classification.
2. All marked crossings shall be illuminated with at least one luminaire oriented parallel to the crossing. Average maintained light levels within pedestrian facilities shall be as shown in Table 4.

Table 4. **Pedestrian Facility Light Levels**

Pedestrian Facility Type	Minimum Maintained Avg. (fc)	Uniformity Ratio (Avg/Min)
Marked intersection or mid-block crossing	1.0	3:1
Unmarked crosswalk at intersection	Same as adjacent intersection	
Sidewalk	1.0 0.4	4:1 4:1

G. As-constructed street lighting plans for City-owned systems shall be provided to the City on CD-ROM in CAD prior to final occupancy or final plat approval.

H. Street lighting systems shall be designed to be accessible by a wheeled vehicle weighing 30,000 lbs.

I. Contractor cabinets equipped with electrical meters, time clocks, circuit breakers, and other required components are required on arterial installations of five (5) or more street lights or as required by the Director.

J. The exact location of the power source shall be indicated together with the remaining capacity of that circuit. System continuity and extension shall be provided.

K. Street lighting may be required along private streets. Street lighting systems for private streets shall be designed and constructed on a separate power source from the public street lighting system. All street light maintenance, installation, and power costs for private street systems shall be paid by the property owner, homeowner, or homeowners' association.

7.10. Curbing

A. Curb and gutter shall be Type A per Standard Plan 312 – Curbs on all street classifications; however, 24-inch wide vertical curb may be used for uniformity or replacement.

B. Rolled curb is not allowed, unless it replaces or matches existing, and/or it is approved by the Director.

C. Extruded curb is not allowed in public right-of-way, unless it is temporary, and/or it is approved by the Director.

7.11. Pavement Cut Moratorium

The following applies to a utility doing work, such as system repair or expansion, within the right-of-way. This moratorium does not apply to utility service installation required for new development or redevelopment.

A. Any street that has been constructed, reconstructed, resurfaced, overlaid or paved within the past five (5) years cannot be cut for five (5) years from the date of project completion unless:

    1. A Deviation from Engineering Standards is approved; or
    2. It is allowed through a valid franchise agreement.

B. Emergency situations are exempt from the five-year moratorium. A right-of-way permit shall be applied for within 48 hours after beginning emergency work in the right-of-way pursuant to SMC 12.15.060.

Chapter 8. Transportation Impact Analysis

A Transportation Impact Analysis (TIA) may be required to inform the City on the need for additional improvements to meet concurrency requirements pursuant to SMC 20.60.140.

A. Pursuant to SMC 20.60.140, a TIA is required if:
    1. A development or project proposal would generate 20 or more new vehicle trips during the PM peak hour; or
    2. The City Traffic Engineer assesses that the project will have significant impacts to the transportation system. This may be required at the discretion of the City Traffic Engineer even if the 20-trip threshold is not met; or
    3. The level of detail to be included in the TIA depends on the complexity of the proposed project.

B. A Regional Transportation Analysis (RTA) is required if
    1. A development or project would generate 100 peak hour trips or more; or
    2. The City Traffic Engineer assesses that the project may have significant impacts to the regional system. This may be required at the discretion of the City Traffic Engineer for projects that generate between 20 and 100 trips.

C. In addition to the general TIA criteria, an RTA shall have an expanded study area for impacted intersections and roadways and shall include a thorough assessment of impacts to nonmotorized, transit, neighborhood streets, and parking.

D. The TIA or RTA scope is developed with the City Traffic Engineer. Please contact the City Traffic Engineer for details including background traffic growth information, trip distribution and assignment assumptions, and intersections and/or roadways required for study.

If the proposed project is changed by type or size or the TIA or RTA is older than two (2) years, updates to the TIA or RTA shall be required.

See Appendix E for Transportation Impact Analysis guidelines.

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Chapter 9. Street Classification

Federal and State guidelines require that streets be classified based on function. The City mainly classifies streets as arterial or non-arterial (local). Other classifications include alley and private streets.

9.1. Arterial Streets

Arterials provide a high degree of vehicular mobility through effective street design and by limiting property access to the right-of-way. Most vehicle trips on arterials are through-traffic. Arterials are divided into three classes: Principal, Minor and Collector Arterials.

A. Principal Arterials have higher levels of local land access controls, with limited driveway access, and have regional significance as major vehicular travel routes that connect metropolitan areas. *(Examples: Aurora Avenue N, NE 175th Street, and 15th Avenue NE)*

B. Minor Arterials generally provide a high degree of intra-community connections and are less significant than Principal Arterials when considering regional mobility. *(Examples: Meridian Avenue N, N/NE 185th Street, and NW Richmond Beach Road)*

C. Collector Arterials assemble traffic from the interior of an area/community and deliver it to the closest Minor or Principal Arterial. Collector Arterials provide mobility, and access to property. *(Examples: Greenwood Avenue N, Fremont Avenue N, and NW Innis Arden Way)*

9.2. Non-Arterial Streets

Streets that are not designated as arterials are non-arterial streets. Shoreline divides non-arterial streets into Local Primary and Local Secondary classifications.

9.3. Alley

An alley is a public right-of-way that serves as a service roadway providing a primary or secondary means of automobile, service vehicle, or emergency vehicle access to abutting property. An alley is not intended for primary traffic or pedestrian circulation. The City does not maintain alleys.

9.4. Private Street

A private street is a privately owned and maintained street providing vehicular access within a property or properties. The City may approve a private street under certain conditions. (SMC 20.70.240) Refer to Chapter 12.8, Private Streets for more information.

Table 5. **Street Classification Characteristics (typical)**

	ARTERIAL STREETS			NONARTERIAL STREETS	
	Principal	Minor	Collector	Local Primary	Local Secondary
Function	Connect cities and urban centers with minimum delay. Channel traffic to Interstate system. Accommodate long and through trips.	Connect activity centers within the City. Connect traffic to Principal Arterials and Interstate. Accommodate some long trips	Access to community services and businesses. Connect non-arterial to Minor and Principal Arterial. Accommodate medium-length trips.	Connect Local Secondary to Arterials. Provide local access. Accommodate short trips to neighborhood destinations.	Provide local access.
Speed Limit (mph)	30-40	30-35	25-35	25	25
Daily Volumes (vpd)	>15,000	7,000-20,000	2,000-8,000	<3,000	<3,000
Lanes	Three or more	Two or more	Two or more	One or two	One or two
Striping	Travel lanes delineated	Travel lanes delineated	Travel lanes delineated	No centerline striping	No centerline striping
Buses/Transit Stops	Allowed	Allowed	Allowed	Allowed for short segments	Not allowed
Bicycle Facilities	Lanes, shared lanes, or signage	Lanes, shared lanes, or signage	Lanes, shared lanes, or signage	Shared lanes/signs	No specific bicycle facilities; may have signed route
Pedestrian Facilities	Sidewalks both sides Amenity strips	Sidewalks both sides Amenity strips	Sidewalks both sides Amenity strips	Pedestrian access through use of sidewalks, trails, or other	Pedestrian access through use of sidewalks, trails, or other

Source: 2012 Transportation Master Plan, Table 2.1

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Chapter 10. Access Management

A. Access management recognizes the need to balance the need for access to private properties with the maintenance of safety, capacity and Level of Service on the streets that provide access. Property owners abutting City right-of-way generally have a right to access, but the particular means of access shall be reviewed and approved by the City.

B. Safety and the function (both current and future) of each street are the foremost factors in determining the number, location, and design of street accesses. Roadway design elements such as auxiliary lanes, medians, channelization, and safe stopping and turning sight distances are also factors in access management, as are the elements of land development, such as internal site circulation and parking layout. Access management is implemented via the Right-of-Way Use Permit, Site Development Permit, and Subdivision review processes.

10.1. General

A. Authority:

1. City of Shoreline Rights of Way:
   The Director approves the design, number, and location of access points to City of Shoreline rights of way. When changes in land use result in changes to the type and operation of access, the access location and design will be reviewed with the development plans and shall be constructed or modified to meet current standards.

2. State Highways:
   Access to State highways is regulated by the Washington State Department of Transportation (WSDOT) pursuant to chapter 47.50 RCW and chapter 468-51 WAC and chapter 468-52 WAC. Two classifications of State highway exist within Shoreline *Limited Access* and *Managed Access*. Interstate 5 is the only Limited Access Highway within the City of Shoreline. SR 99 (Aurora Avenue N), SR 522 (Bothell Way NE), SR 523 (N/NE 145th Street) and SR 104 (Ballinger Way NE) are *Managed Access Highways* within or adjacent to the City of Shoreline. For information on access permitting through WSDOT, please visit the WSDOT Access Management website:
   http://www.wsdot.wa.gov/Northwest/DevelopmentServices/AccessServices.htm

3. Construction or improvement of an access, approach or driveway, or construction of any classification of street that will intersect a State highway shall be designed in

accordance with this Engineering Development Manual and WSDOT requirements. Where applicable state or federal standards exceed the requirements of the EDM, state or federal standards shall govern.

B. Consolidation of Access:
In the interest of safety and efficient traffic operations, access to individual and contiguous parcels should be consolidated to the extent practicable. Access will be reviewed and approved to minimize conflicts between vehicles, pedestrian and bicycle traffic, and traffic entering and exiting adjacent driveways.

C. Required Access. All new development shall be served by adequate vehicular access as follows:

1. Every parcel upon which one or more building(s) is proposed to be erected, or where a traffic generating use is proposed, shall establish direct access from the street right-of-way, access easement, or fire lane, as needed to provide public services such as fire protection, emergency medical service, mail delivery, or trash collection.
2. The circulation system of the proposed development shall intersect with existing and planned streets abutting the site at approved locations.
3. The circulation system within the proposed development shall provide direct connections to adjacent developments (inter-parcel) where appropriate and/or required.

D. Backing into the Right-of-Way. Driveways, parking, or loading areas that require backing maneuvers in a public street shall be approved only for single-family or duplex residential uses abutting a Local Secondary street.

E. Maintenance. Maintenance of driveway approaches shall be the responsibility of the owner whose property they serve.

F. Restriction of Turning Movements. Conflict reduction measures may be required to safely manage turning traffic to and from the development site. Median design and driveway channelization are appropriate to reduce conflicts. Traffic control devices controlling traffic from private property shall be installed and by the property owner at no cost to the City.

G. Abandoned Access. All abandoned accesses on the same frontage shall be removed within 30 days after abandonment and the curbing, sidewalk, and amenity zone, or shoulder and ditch section shall be restored to meet current standards.

H. Temporary Access. The City Engineer may grant temporary access to accommodate phased development of a site in accordance with an approved phasing plan. Temporary access shall be removed, relocated, redesigned, or reconstructed after permanent, approved access is constructed.

10.2. Access Provision

A. Consolidate accesses to adjacent or contiguous parcels to the extent practicable. Each parcel shall have access to a public right-of-way by:

1. Direct access to a right-of-way; or
2. By a recorded easement providing shared access; or
3. By a recorded tract providing shared access.

B. No more than one access shall be provided to an individual parcel, to contiguous parcels under the same ownership, or to parcels that are included in the same subdivision or project, unless approved by the Director. Additional access may be granted to contiguous parcels if the minimum spacing requirements are met or if a Traffic Engineering Study acceptable to the Director demonstrates that the additional access will not adversely affect safe operation of the street.

C. Minimum Spacing: The minimum distance between access connections is 50 feet on the same side of the street.

D. Multiple Frontages: Access for projects with multiple frontage shall be off the lower classified road except as required by code. Additional access may be allowed provided spacing requirements are met.

E. Circular Driveway: New circular driveways are not permitted. Revisions to existing circular driveways shall meet all of the following criteria:

1. The property frontage must be at least 100 feet;
2. The accesses are onto a Local Secondary street. Circular driveway access shall not be permitted onto Arterial Streets;
3. Safe stopping sight distance is available for both driveways, as demonstrated by a sight distance analysis prepared by a professional engineer licensed in Washington State and acceptable to the City Traffic Engineer;

4. Circular driveways serving residential parcels shall be separated by a minimum of 40 feet between their closest points. Circular driveways serving commercial or multi-family parcels shall be separated by a minimum of 30 feet;
5. Driveways shall be no closer than 10 feet to the side property line, measured from the point at which the prolongation of the driveway edge intersects the right-of-way line; and
6. Driveways shall not exceed 20 feet in width for residential parcels and shall not exceed 30 feet in width for commercial or multi-family parcels.

F. Transition Areas: Properties deemed to be within a Transition Area shall follow requirements in the SMC 20.50.021(C). All vehicular access to proposed development in nonresidential zones shall be from arterial classified streets, unless determined by the City Engineer to be technically infeasible or in conflict with state law addressing access to state highways. Traffic-calming measures, as determined by the City Traffic Engineer, may be required for projects that create additional traffic on nonarterial streets.

Chapter 11. Access Design

All accesses shall be located, designed, and constructed to minimize traffic congestion and maximize public safety on the street system. This chapter provides location and design criteria for access at the right-of-way line, access approach in the right-of-way, and driveways internal to a property.

11.1. General

A. Access: Access to the right-of-way shall be designed as an access approach.

B. Design: Access design shall comply with required grade transitions while considering building setback, terrain, and existing and designed grades.

C. Emergency Vehicles: All accesses shall be located and designed to readily accommodate emergency vehicles that would ordinarily respond at the particular establishment. The International Fire Code (IFC), as adopted by SMC Chapter 15.05, shall also apply to driveways designated as fire lanes and/or fire apparatus access roads.

D. Traffic Control Devices: All on-site traffic control devices, including signs and pavement markings, shall meet the MUTCD standards.

11.2. Access Width

The access width is measured at the right-of-way/property line. Table 6 provides maximum/minimum access widths. The City Engineer may approve a wider access when the traffic study or the turning radius of the appropriate design vehicle turning radius warrants the wider access. Minimum tract/easement widths shall be maintained on to the property a minimum of 20 feet from the right-of-way line or to the nearest property line of the most distant lot sharing the access, whichever is further.

Table 6. **Access Widths**

	Non-arterial Streets		Arterial Streets	
Access Types	Width (FT)		Width (FT)	
	Min.	Max.	Min.	Max.
Residential	10	20	10	20
Shared	20	30	20	30
Multi-family	20	30	20	30
Commercial	20	30	20	36
Circular Drive	10	12	NA	NA
Private Street	20	30	20	30

11.3. Access Clearance from Intersection and Property Lines

A. Minimum Offset Distance from Side Property Lines: Driveways shall be offset a minimum of 10 feet from side property lines, measured at the prolongation of the driveway's intersection with the right-of-way line.

1. Exceptions: the minimum offset distance from side property lines shall be:
    a. Zero feet for cul-de-sacs, flag lots, lots with a width of 30 feet or less, shared driveways, and single-family attached developments;
    b. Three (3) feet for lot widths between 30 feet and 50 feet.

B. Minimum Clearance from Intersections:

1. Local Streets: Driveways accessing Local Primary or Local Secondary streets shall be located at least 50 feet from the right-of-way line of the nearest intersection street, or at the minimum offset distance from the parcel's side property line that is farthest from the intersection.
2. Minor & Collector Arterial Streets: Driveways accessing Minor Arterial or Collector Arterial streets shall be located at least 75 feet from the right-of-way line of the nearest intersecting street, or at the minimum offset distance from the parcel's side property line that is farthest from the intersection, whichever is greater.
3. Principal Arterial streets: Driveways accessing Principle Arterial streets shall be located at least 150 feet from the right-of-way line of the nearest signalized

intersection, or 100 feet from the nearest un-signalized intersection, or at the minimum offset distance from the parcel's side property line that is farthest from the intersection, whichever is greater. Left-turn restrictions may be imposed at driveways that do not meet the foregoing criteria.

C. Corner Parcels: Access to commercial or multi-family corner parcels shall be located on the lower-classification street at the property line most distant from the right-of-way line.

D. An access shall not be placed in a curb setback or bulb out.

11.4. Access Approach

A. A paved access approach shall be provided between the property line and the edge of pavement in the right-of-way. Approaches shall conform to Standard Plans 301-306 based on site conditions.

B. The maximum change in access approach profile grade, within the right-of-way, shall be 6 percent within any 10 feet of distance on a crest vertical curve and 12 percent within any 10 feet of distance in a sag vertical curve.

C. Culvert Requirements: A drainage culvert is required for access approach that crosses an open ditch section. Minimum culvert internal diameter shall be 12 inches, or larger if required to carry anticipated stormwater flows. Refer to Chapter 27 Conveyance System for additional information regarding required culvert size and materials.

11.5. Driveway

A. A driveway, including the landing, extends from the access at the property line/right-of-way line onto the property.

B. Driveways shall be graded to blend into possible future road section without encroachment into graded shoulder or sidewalk.

C. A shared driveway has one access to the right-of-way via a shared tract or easement on the private property. Minimum tract/easement length shall be 20 feet from the right-of-way line. Refer to Standard Plan 307 Shared Driveway.

D. Driveways shall be paved to the nearest property line of the most distant lot sharing the access or 20 feet, minimum, whichever is farther.

E. All driveways shall be 90 degrees to the street at the right-of-way access unless an Deviation from Engineering Standards is approved.

F. A landing on a driveway accessing an arterial shall not exceed a 1V:30H slope for a distance of 30 feet. For an access to a local street, the landing slope shall not exceed 1V:20H slope for a distance of 20 feet. Refer to Standard Plan 215 Intersection Landing.

G. The maximum driveway profile grade is 15 percent. Shoreline Fire Department may approve steeper grades for short distances.

H. The maximum change in driveway grade shall be 8 percent within any 10 feet of distance on a crest and 12 percent within any 10 feet of distance in a sag vertical curve.

I. Grade breaks, including the tie to the roadway, shall be constructed as smooth vertical curves.

11.6. Parking Lot Throat Lengths

A. Traffic signage in a parking lot shall meet Manual of Uniform Traffic Control Devices (MUTCD) requirements.

B. The required throat length at a parking lot access to public right-of-way is determined during the permit review process and is based on the Transportation Impact Analysis (TIA).

C. The throat length vehicle storage in parking lots is based on a typical vehicle spacing of 20 feet but may be increased where larger vehicles can be expected.

D. The City may adjust the on-site throat lengths for accesses with two (2) approach lanes, subject to the traffic analysis findings, roadway geometry, traffic volumes, and site layout.

E. On-site storage is measured from the right-of-way line to the first parking stall or drive aisle in a parking lot.

F. Outbound: The throat shall be of sufficient length to provide adequate storage of outbound vehicles without interference with on-site circulation. Outbound vehicle storage areas shall be provided to eliminate backup and delay of vehicles within the development.

G. Inbound: The throat shall be of sufficient length to prevent vehicles from spilling onto the street system, and from obstructing the adjacent street, sidewalk, or circulation within the facility.

Chapter 12. Street Design

This chapter sets the minimum standards for the geometric street section. For arterial street design, reference the WSDOT *Design Manual*.

12.1. Reconstruction

A. Reconstructed roadways shall be brought up to current standards.

B. Transitions or tapers necessary to connect with existing roadway of a different width shall meet AASHTO and MUTCD standards.

12.2. Widths

A. Maximum widths for specific streets are provided in Appendix F – Street Matrix.

B. Typical Lane widths are defined in Table 7.

Table 7. Typical Lane Widths

Lane Type	Width (ft)
Parking	8
Bus Only	12
Vehicle Lane	10-12
Bicycle	5
Bicycle/Vehicle	14
Bicycle Buffer	2-3

12.3. Vertical Alignment

A. Curve length and stopping sight distance shall be designed to ensure proper drainage, clear sight distance, and safety for vehicles and pedestrians.

B. The maximum profile grades in Table 8 may be exceeded for 300 feet or less, upon showing that no practical alternative exists. Exceptions exceeding 15 percent shall require approval by the Shoreline Fire Department's Fire Marshal.

C. Grade transitions shall be constructed as smooth vertical curves except, upon approval of the Director, in intersections where the difference in grade is one percent or less.

Table 8. **Maximum Profile Grade**

Local Secondary	Local Primary	Arterial – Collector	Arterial – Minor	Arterial – Principal
15%	10%	10%	10%	9%

12.4. Vertical Curve Criteria

A. The minimum vertical curve length for roadways is 75 feet.

B. The point of vertical curvature shall not encroach into a cross street any further than the center of pavement of the cross street.

C. Cross Slope: The typical cross slope is two percent crown to provide for adequate drainage to the pavement edge. The maximum cross slope on the tangent sections shall not exceed four percent. The minimum cross slope shall be one percent.

D. Stopping Sight Distance (SSD): SSD applies as shown on Table 9.

E. SSD is based on an eye height of 3.5 feet and the height of an object at 0.5 feet.

F. For downgrades exceeding three percent, the SSD shall be increased by the values shown in Table 9.

G. The Director may approve sag vertical curves on Local Primary and Local Secondary streets with stopping sight distance less than that in Table 9, if no practical design exists and if acceptable road lighting is provided throughout the curve.

Table 9. **Vertical Curve – Minimum Stopping Sight Distance**

	Flat		Downgrade	
Design Speed	0%	3%	6%	9%
25	165	165	175	185
30	200	210	220	230
35	250	265	280	305
40	325	345	365	400
45	400	425	455	505

12.5. Horizontal Curve Criteria

A. Superelevation is not required in the design of horizontal curves of Local Primary and Local Secondary streets but may be needed to meet terrain and right-of-way conditions.

B. Calculate superelevation according to AASHTO "Low Speed Urban Streets" design methodology.

C. See Table 10 for horizontal curve standards.

Table 10. **Horizontal Curve Design**

Min. Design Speed (mph)	20[1] Grades >10%	25[1]	30[1]	35	40
Minimum Center line Radius[2] (ft)	100	150	300	470	See note[3]
Minimum Horizontal Sight Distance (ft)	150	200	200	250	325
Minimum Reverse Curve Tangent (ft)	0	0	0	200	200
Minimum Approach Tangent at Intersections[3, 4] (ft)	50	75	100	200	300
Minimum Tangent between Curves (ft)		50	50		
Minimum Run-Off Length (ft)		80	90	100	115
Superelevation		Not Required	Not Required	8% Maximum Calculate run-off lengths	
6% Superelevation Horizontal Curvature Radius (ft)		185	275	380	510
8% Superelevation, Horizontal Curvature for Radius (ft)		170	250	350	465

Source: "Low Speed Urban Streets", AASHTO

1 Use these criteria without superelevation

2 Radii based on crown section with 2% slope on each side of crown

3 Where superelevation is used, calculate runoff lengths according the WSDOT Design Manual.

4 Where a curved road approaches an intersection, these tangent sections shall be provided on the approach to the intersection to provide for adequate sight distance for traffic control devices at the intersection. The distance shall be measured from the flow line of the through street. Where superelevation is used, calculate runoff lengths according the WSDOT Design Manual

intersection. The distance shall be measured from the flow line of the through street. Where superelevation is used, calculate runoff lengths according the WSDOT Design Manual.

12.6. Street End

Streets end in a cul-de-sac, an eyebrow, or a hammerhead – See Standard Plan 209 Street Ends.

A. Turnaround facilities shall be provided at street ends where the street length from the nearest intersection is more than 200 feet measured from the face of curb to end of dead-end street pavement, and shall be constructed as follows:
    1. Minimum right-of-way diameter across bulb section: 93 feet in a permanent cul-de-sac; 84 feet in a temporary cul-de-sac, with bulb area lying outside straight-street right-of-way provided as temporary easement pending forward extension of the street
    2. Right-of-way may be reduced, provided that utilities and necessary drainage are accommodated on permanent easements within the development.
    3. Minimum diameter of surfacing across bulb: 80 feet of paving in curb type road.
    4. Cul-de-sac Island (Optional). If provided, island shall have full-depth vertical curb. Minimum diameter shall be 20 feet and there shall be at least 30 feet of paved traveled way in a curb type section around the circumference. Island shall be landscaped. The adjoining property owners shall maintain the island through a maintenance agreement.
    5. Sidewalks shall be constructed on both sides of the stem and on the bulb
B. Dead-end Local Primary and Local Secondary streets shall not be longer than 600 feet, measured from the centerline of the intersecting street to center of cul-de-sac. The maximum length may be extended to 1,000 feet if 50 or fewer potential units are to be served and there is provision for emergency vehicle turnaround near mid-length
C. A public pedestrian connection or an emergency vehicle access to connect a street at its terminus with other streets, parks, schools, bus stops, or other pedestrian trip generators shall be required. Off-street sidewalks shall be contained in the right-of-way or a sidewalk easement.
D. If a street temporarily terminated at a property boundary during development serves more than three (3) lots or is longer than 200 feet, a temporary bulb shall be constructed near the subdivision boundary. The paved bulb shall be 80 feet in diameter with sidewalks terminated at the point where the bulb radius begins. Removal of the temporary cul-de-sac, restoration,

and extension of the sidewalk shall be the responsibility of the Applicant/Permittee who extends the road.

E. The maximum cross grade of a street at the street end shall be eight percent.

F. Partial bulbs or eyebrows shall have a minimum paved radius and an island configuration. Island shall be offset two (2) feet from edge of traveled way.

G. A hammerhead per Standard Plan 209 Street Ends may be used to fulfill the requirement to provide a turnaround facility where the street serves (or will serve) four or fewer single-family residential units.

12.7. Utility Locations

A. Utility structures shall be located in the amenity zone, at the back of sidewalk without encroaching onto private property, in the gutter line, or within the roadway as specified in Table 11.

B. New utility structures are not allowed in sidewalks, driveways, driveway approaches, or curb ramps.

C. Underground systems shall be located at least five (5) feet away from road centerline and where they will not otherwise disturb existing survey monuments.

Table 11. **Underground Utility Locations**

Utility	Location from Centerline	Cover	Notes
Water Main[1]	Five to ten feet north and east	Minimum 24-inch cover from finished grade, ditch bottom or natural ground.	
Water Service	N/A	Minimum 24-inch cover from finished grade, ditch bottom or natural ground.	For any one connection, not extend more than 60 feet along or through the right-of-way, or the minimum width of the existing right-of-way. Stub out perpendicular to water main preferred

Utility	Location from Centerline	Cover	Notes
Water Meter Box	In the right-of-way, at right-of-way line/property line in the one-foot setback between the back of sidewalk and right-of-way line. Not to be located within a driveway.		
Sanitary Main[1, 2]	Five feet south and west	Minimum 96-inch cover from finished grade, ditch bottom or natural ground.	Stub out perpendicular to water main preferred
Force Main Side Sewer	Within 10 degrees of perpendicular-to-road centerline, and extend to right-of-way line.	Minimum 36-inch cover from finished grade, ditch bottom or natural ground,	If nonmetallic, install wire or other acceptable proximity detection features; or place in a cast iron or other acceptable metal casing.
Gas Main	Five to ten feet south and west	Minimum 24-inch cover	
Power, telephone, fiber-optic cable, cable TV	Either side	Minimum 36-inch cover	

1 Sanitary sewer and water lines shall be separated by a minimum of 10 feet in accordance with the most current edition of the Criteria for Sewage Work Design, Washington Department of Ecology.

2 Gravity systems, whether sanitary or storm drainage, shall have precedence over other systems in planning and installation except where a non-gravity system has already been installed under previous approved permit and subject to applicable provisions of such permits or franchises.

D. Electric utilities, power, telephone, fiber-optic cable, cable TV:

1. Utility poles or other appurtenances shall be located as far from the travel lane or auxiliary lane as conditions allow. No pole or appurtenance shall be located so that it poses a hazard to the general public. Utilities shall place and replace poles with primary consideration given to public safety.
2. Locations of poles shall be compatible with driveways, intersections, and other road features. A pole shall not interfere with sight distances, road signing, traffic signals, culverts, trees, etc.

3. Utility poles or other appurtenances shall be located back of ditches, unless an alternate location is approved by the Director.
4. Utility poles shall not be placed in sidewalks, curb ramps, or landing areas. Utility poles shall not impede ADA access in any way.
5. On roadways having vertical curb, poles and obstacles shall be placed clear of sidewalks.
6. On arterials, poles and obstructions shall be placed at least eight and one-half (8.5) feet from face of curb.
7. On non-arterial streets, poles and obstructions shall be placed at least five and one-half (5.5) feet from curb face.
8. Deviations from the pole and obstacle clearance criteria may be requested by utilities when there are no other viable alternatives and shall identify adequate protection for motorized and nonmotorized users.

12.8. Private Streets

A. Private street design and installation shall meet ADA requirements.

B. See Section 12.9, Dead End Street and Standard Plan 209 Street End.

C. The private street shall be paved at least 20 feet onto the property.

D. Pedestrian access at least five (5) feet wide shall be provided on at least one side of the private street. The pedestrian access shall be separated by a curb or other acceptable delineation. Parking is not permitted in the pedestrian access.

E. Street lighting systems for private streets shall be designed and constructed on a separate power source from the public street systems and shall be the responsibility of the property owner, homeowner, or homeowner's association.

F. Private streets shall be designed to provide adequate access for trash collection and merchandise deliveries.

G. See Section 11.2, Access Width for access width requirements.

12.9.

12.9. Dead-End Street

A. Dead-end Local Primary and Local Secondary streets shall not be longer than 600 feet, measured from the centerline of intersecting street to center of cul-de-sac. The maximum length may be extended to 1,000 feet if 50 or fewer potential units are to be served and there is a provision for emergency vehicle turnaround near mid-length.

B. Pedestrian access shall be required to connect a cul-de-sac to adjacent streets, parks, schools, or other pedestrian facilities. The pedestrian access shall be in right-of-way or, if approved, may be placed in a sidewalk easement. A turnaround facility shall be provided for a public or private dead end street where the street length is more than 200 feet, measured from the face of curb to the end of the dead-end street pavement.

C. A dead end street requires a cul-de-sac as a turnaround. See Section 12.6, Street End.

12.10. Woonerf

A woonerf (also known as a home zone, living street, or shared street) is a street that facilitates pedestrian, bicycle, and vehicular traffic within a shared space. Woonerfs typically lack separate pavement and include a variety of surface treatments, bollards, street lighting, and landscaping to define a shared space.

Woonerfs can be private or public and are intended to be designed to meet the needs of the immediate community. The following standards are generalized and provide a starting point for woonerf design. Each woonerf is a unique shared space.

Woonerfs designs should achieve the following objectives:

A. Shared pedestrian, vehicular, and bicycle traffic;

B. Safe transitions for between woonerfs and standard facilities;

C. Traffic calming measures, such as sitting areas, planters, parking spaces, and bollards; and

D. ADA-compliant access.

Woonerf design requirements include the following:

A. Entrance/Exit:

    1. The international woonerf sign is required at all entrances and exits. Informational signs may be placed under the international woonerf sign.

2. Traffic calming measures may be required at entrances and exits.

B. Designated Spaces:

1. The design shall not give the impression of a roadway and sidewalk.
2. To designate pedestrian-only spaces, the use of bollards, landscaping, and other protection are encouraged. Curbs are not allowed.
3. Parking and/or loading spaces are acceptable. Parking spaces shall be distinguished by pavement markings, surface treatments, or other means.

C. Surface Treatments:

1. The use of a variety of surface treatments is encouraged.

D. Other Amenities:

1. All pedestrian furniture shall be protected by bollards.
2. Pedestrian-scale lighting is required consistent with Section 7.9, Illumination.

E. The Applicant shall coordinate with the Shoreline Fire Department to ensure adequate access is provided for emergency services.

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Chapter 13. Intersection Design

The design criteria in this chapter apply to street intersections. Intersections include driveway access as well as an approach to a street.

To the extent feasible, intersection design shall conform to the guidelines set forth in WSDOT *Design Manual*, AASHTO *Policy on Geometric Design*, the ITE *Urban Street Geometric Design Handbook*, and the MUTCD, including alignment, sight distance, and geometric elements.

13.1. Alignment

A. The angle of an intersection of two streets shall be 85 degrees to 95 degrees.

B. It desirable that entering through traffic is aligned with the exit lanes at an intersection. However, the entering and exit lanes may be offset up to six (6) feet as shown in Figure 1 when the following conditions are met:

   1. Illumination is provided;
   2. The intersection is not within a horizontal curve, nor is it within a crest vertical curve; and
   3. The taper rates provided in Table 12 are used.

Figure 1. Maximum Intersection Lane Alignment Offset

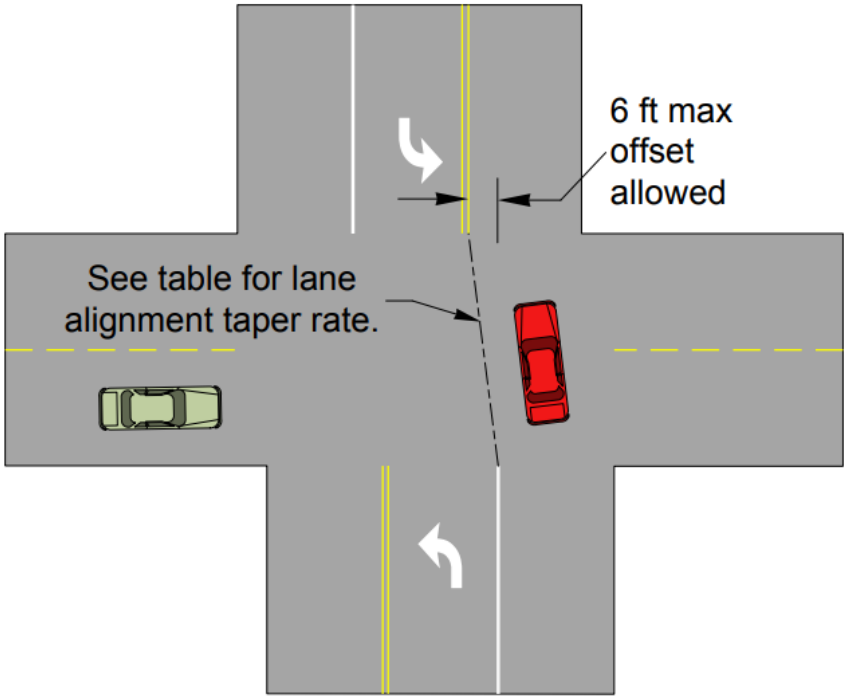


Table 12. Intersection Alignment Taper Rates

Posted Speed	Taper Rate
45 mph	45:1
40 mph	27:1
35 mph	21:1
30 mph	15:1
25 mph	11:1

C. Dotted extension lines may be required when the travel lanes are offset.

D. Special consideration shall be made when the exit lanes have been shifted to the right to ensure vehicles can safely traverse the intersection without conflicting with on-coming traffic.

13.2. Spacing

The minimum distance between adjacent parallel private or Local Primary and Local Secondary streets shall be 150 feet, measured from nearest curb edge to nearest curb edge. For all other intersections, the spacing shall be determined during preliminary design.

13.3. Design Vehicles

A. Where applicable, the intersection design shall accommodate the use of the roadway as a designated truck route, bus route, or school bus route.

B. The City's standard design vehicle is the AASHTO SU-30, although use of larger design vehicles may be required depending on roadway classification, transit routes, and adjacent land use.

C. All elements of the intersection shall be designed so the design vehicle will not encroach onto curbs, sidewalks, traffic control devices, medians, or the travel lanes of opposing travel flow, unless otherwise approved by the Director.

13.4. Curb Radii

A. Curb radii design shall balance vehicle turning movements with pedestrian safety. Typically, it is appropriate to use the smallest turn radii possible that still accommodates the Design Vehicle.

B. For design, round curb radii to the nearest five (5) foot increment.

C. Typical curb radii based on street classification are shown in Table 13. However, these values may be impacted by site conditions, including width of receiving lanes, on-street parking, and angle of intersecting roadways.

Table 13. **Typical Curb Radii Design Values**

Street Classification (for highest street classification at intersection)	Radius
Arterial to Arterial	25 feet
Arterial to Local Street	20 feet
Local Street to Local Street	20 feet
Where vehicular turn is prohibited	10 feet
Radii for curb setbacks and bulb-outs	15/15 feet

13.5. Drainage

A. An intersection shall be laid out and graded so that surface water drains and the intersection is safe and accessible for pedestrians and bicyclists.

B. Drainage structures shall not be placed in an ADA ramp or landing area.

C. Unless otherwise approved by the City, drainage structures shall be located outside the corner radii.

D. Drainage structures shall be placed at upstream side to reduce runoff or ponds in ADA ramp area.

E. When new curb and gutter is installed as part of frontage improvements, drainage shall be addressed to avoid ponding upstream and flooding downstream. This typically involves the installation of a catch basins at the extents of the frontage improvements.

13.6. Intersection Grades

A. Intersections shall be on grades as flat as practical.

B. At an unsignalized intersection, the maximum allowable grade in the intersection is four percent extending a minimum of 50 feet in each direction, measured from the outside edge of the travel lane of the intersecting street.

C. At signalized intersections, the maximum grade is two percent within the intersection and extends 200 feet in each direction. Grades above four percent shall be allowed only in areas with steep topography or other unusual circumstances that prevent a flatter grade.

D. On sloping approaches at an intersection, landings shall be provided with grade not to exceed one foot difference in elevation for a distance of 30 feet approaching an arterial or 20 feet approaching a Local Primary or Local Secondary street, measured from future right-of-way line (extended) of intersecting street. See Standard Plan 215 Intersection Landing.

E. The point of vertical curvature shall not encroach into a cross street any further than the center of pavement of the cross street.

13.7. Pedestrian Accommodations

A. In order to provide pedestrian safety, accommodations for pedestrians shall be designed into all intersections. Pedestrian accommodations include sidewalks, crosswalks, and pedestrian refuge islands. Pedestrian accommodations shall meet ADA guidelines. See Standard Plans 300 Series for curb ramp, driveway, crosswalk and sidewalk.

B. Vaults, covers, castings, or drainage grates shall not be placed within the crosswalk, or within crosswalk curb ramps or landing areas.

C. Two (2) compliant curb ramps with tactile warning strips shall be installed at each corner, where possible, and corresponding compliant companion ramps shall be retrofitted or constructed (RCW 35.68.075).

D. When street paving impacts an intersection or modification to a curb ramp occurs, the curb ramps shall be retrofitted to meet the current standard. Impact to an intersection is defined as:

1. Nine (9) square feet or more of disturbance to the sidewalk within the area bounded by the curb, the right-of-way or property lines, and the extensions of right-of-way/property lines (across the sidewalk); or
2. Three (3) lineal feet of disturbance to the curb; or
3. Development projects requiring installation of frontage improvements; or
4. Roadway resurfacing defined as an alteration by the 2013 *Department of Justice/ Department of Transportation Joint Technical Assistance on Title II of the Americans with Disabilities Act requirements to provide curb ramps when streets, roads, or highways are altered though resurfacing*. This includes asphalt overlays or addition of new asphalt/concrete roadway surface.

13.8. Clear Sight Triangle

A. General:

These guidelines establish clear sight triangles around all intersections and driveways, which shall be kept clear of sight obstructions. The clear sight triangle is determined by the type of intersection control and the speed limit on the major road or street entered upon.

In cases involving grades greater than three percent, number of lanes greater than two, skewed intersections, or for design vehicles other than passanger cars, the below sections shall be adjusted based on the sight distance procedures in the most current edition of *A Policy on Geometric Design*, AASHTO.

For sight triangle requirements as they relate to bicycle facilities, refer to the most current edition of *A Guide for the Development of Bicycle Facilities*, AASHTO.

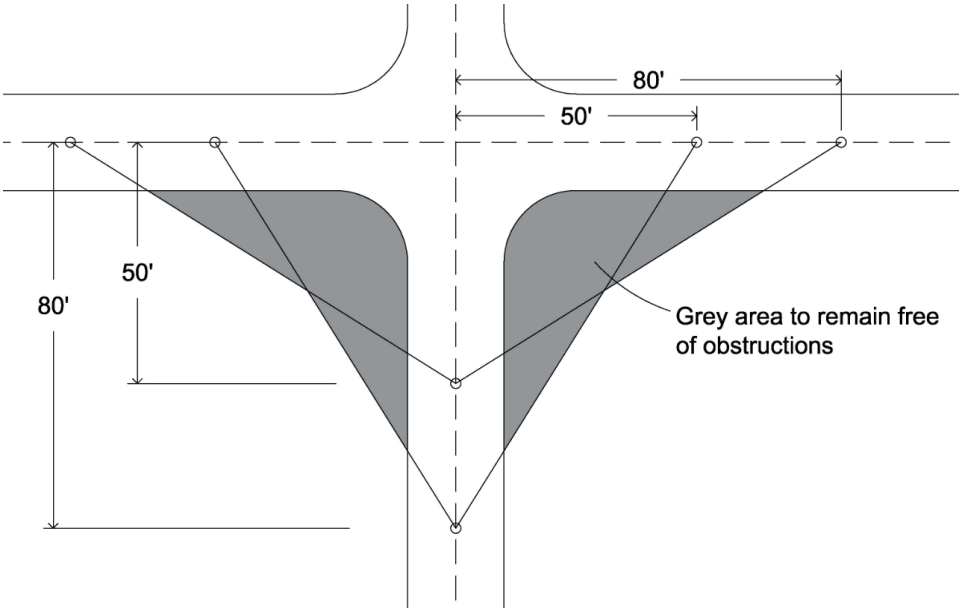
B. Obstructions:

Unless specifically approved by the Director, no structure, improvement, vegetation or other object between two and a half (2.5) feet and eight (8) feet above street grade may be within the clear sight triangle. The driver's eye height position shall be taken from a position three and a half (3.5) feet above pavement grade.

C. Clear Sight Triangle Dimensions – Intersections:

1. Uncontrolled Intersection. For intersections with no traffic control on any approach the clear sight triangle for vehicles shall be defined as shown in Figure 2.

Figure 2. Sight Triangles for Uncontrolled or Yield Controlled Intersections



2. Stop Control on Minor Street:

   For intersections with stop control on the minor street only, the clear sight triangle for vehicles shall be defined as shown in Figure 3 and Table 14. For stop control intersections the decision point shall be 10 feet back from the edge of the traveled way. The minimum required sight distance is the Stopping Sight Distance for the major roadway, shown in Table 14 below.

   The traveled way is the portion of the road intended for the movement of vehicles and bicycles exclusive of shoulders, turn lanes, and on street parking.

Figure 3. Departure Sight Triangles for Stop Control on Minor Street

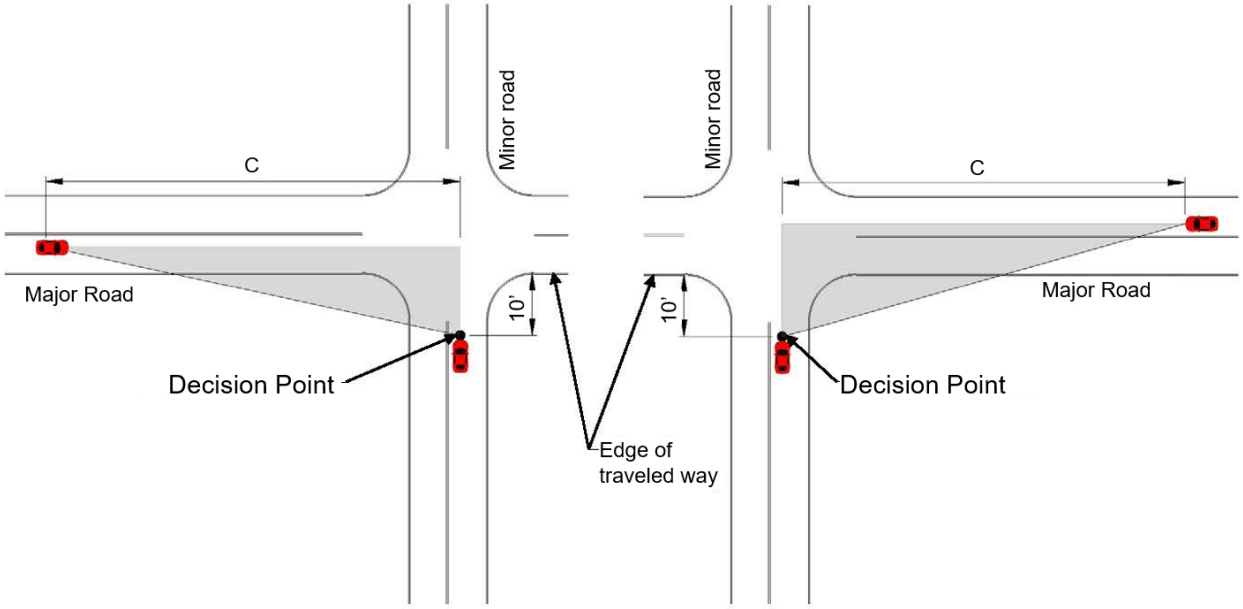


Table 14. Sight Distance for Stop Control on Minor Street

Posted Speed Limit (MPH) on Major Road	Recommended C (ft) *Desireable*	Required C (ft) *Minimum**
25	280	145
30	335	180
35	390	220
40	445	260

**Minimum shall only be used to evaluate existing conditions or when Desireable can not be obtained.*

3. Signalized Intersection:

   At signalized intersections, the first vehicle stopped on one approach shall be visible to the driver of the first vehicle or bicycle stopped on each of the other approaches. The first stopped vehicle on one approach shall also be able to see pedestrians within the legal crosswalk on all of the approaches. Left-turning vehicles shall have sufficient sight distance to select gaps in oncoming traffic and complete left turns. For sight lines to traffic signal displays, refer to WSDOT Design Manual Chapter 1330. For right turn on red movements, criteria for stop control on minor streets (Figure 3 and Table 14) shall apply.

4. All-Way Stop Intersection:

   At intersections with all-way stop control, the first stopped vehicle on one approach shall be visible to the drivers of the first stopped vehicles or bicycles on each of the other approaches. The first stopped vehicle on one approach shall also be able to see pedestrians within the legal crosswalk on all of the approaches.

D. Clear Sight Triangle Dimensions – Driveways

Driveways not controlled by traffic signals operate like intersections with stop control on the minor approach. The applicable sight distance triangles for vehicles and pedestrians are shown in Figure 4 and Table 15.

Figure 4. Driveway Sight Triangles

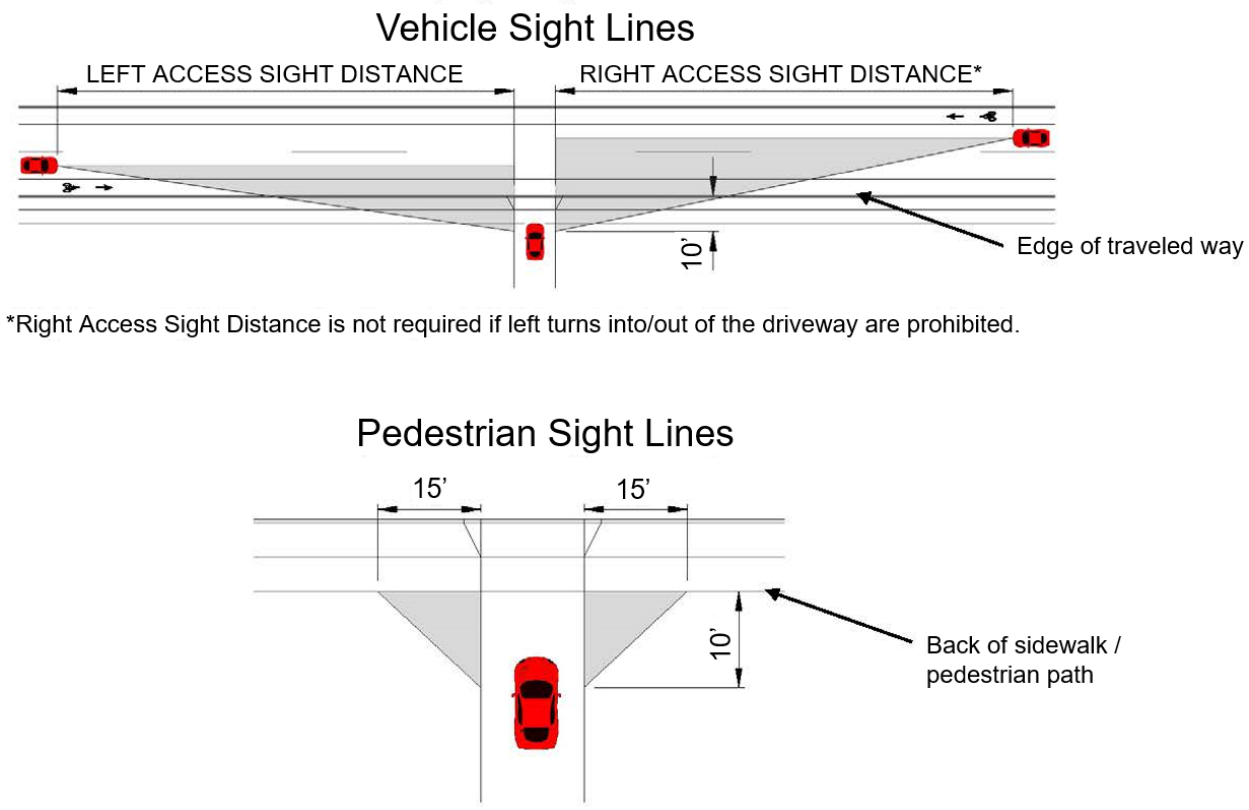


Table 15. Clear Sight Distance for Driveways

Major Road Volume (ADT)	Major Road Speed Limit (MPH)	Access Sight Distance (ft) *Desireable*	Access Sight Distance (ft) *Minimum**
<6000	25	155	155
	30	200	200
	35	250	250
>6000	25	280	155
	30	335	200
	35	390	250
	40	445	305

**Minimum shall only be used when Desireable can not be obtained.*

13.9. Pedestrian Sight Distance

A. The minimum sight distance for pedestrian safety shall be determined as follows: the driver of an existing vehicle shall be able to view a one-foot-high object 15 feet from either edge of the exit lane at the driveway throat when the driver's eye is 10 feet behind the back of the pedestrian walkway.

B. The minimum sight distance shall be maintained at all driveways, buildings, and garage entrances where structures, wing walls, etc., are located adjacent to or in close proximity to a pedestrian walkway.

Chapter 14. Nonmotorized Facilities

14.1. General

A. Consideration of nonmotorized facilities shall be included in any project in accordance with SMC Chapter 12.50.

B. Nonmotorized facilities may be required by the SMC, though transportation impact analysis, by Appendix F Master Street Plan, or other similar means.

C. Nonmotorized facilities may use developed or unopened right-of-way, or in some circumstances may be located across private property within an easement.

14.2. Sidewalks

A. All designs shall meet the current Americans with Disabilities Act (ADA) requirements and standards. Refer to Chapter 13 Intersection Design for curb ramp requirements.

B. Sidewalks are required on all public streets, except alleys. Sidewalks may be required on private streets and street ends. See Chapter 12, Street Design.

C. Sidewalks shall be located between the property/right-of-way line and the amenity zone unless otherwise approved by the Director.

D. Sidewalks abutting single-family residential uses shall be at least five (5) feet wide.

E. Sidewalks abutting uses other than single-family residential shall be at least eight (8) feet wide.

F. The required width of a sidewalk is defined for many streets in Appendix F - Street Matrix. Sidewalks may be greater than eight (8) feet when the City determines that greater widths are warranted due to expected pedestrian traffic volume.

G. Sidewalks installed immediately adjacent to curb shall have a minimum width of 8 feet to provide adequate space for signs, fire hydrants, utilities, tree grates, and door swing.

H. Sidewalks shall maintain their full width around obstructions that cannot be relocated.

I. When a sidewalk must transition to frontage that does not have a sidewalk, the transition shall meet ADA requirements. Unless the City requires a different transition, an asphalt transition is acceptable. Refer to Standard Plan 311 Temporary Asphalt Transition Ramp to Shoulder.

J. Parking stalls shall be designed and constructed so that no part of any parked vehicle obstructs the Pedestrian Access Route as defined by ADA or the sidewalk.

K. Sidewalks shall be constructed with concrete, unless otherwise approved by the Director.

14.3. Shared Use Paths

A. Paved paths can be designated for pedestrian use, bicycle use, or multiuse.

B. All designs shall meet the current ADA requirements and standards.

C. Widths for paved paths:

   1. Paths designated for pedestrian use shall be at least five feet wide and have one-foot wide shoulders on each side.

   2. Paths designated for two-way bicycle or multi-use shall be at least twelve (12) feet. A minimum two (2) foot graded shoulder is required on either side of a bicycle or multi-use path. A wider graded shoulder may be required when heavy pedestrian use is anticipated. If the shoulder is paved and adjacent to a bank slope greater than 6H:1V, a longitudinal pavement marking or surface treatment shall be used to differentiate between the path and the shoulder.

D. The maximum grade shall not exceed five percent. Depending on site conditions, stairs, and/or switchbacks may be required.

E. Acceptable surface materials are asphalt concrete (asphalt) and Portland cement concrete (concrete).

14.4. Bicycle Facilities

A. Bicycle facilities shall be provided in accordance with Appendix F – Master Street Plan and the AASHTO Guide for the Development of New Bicycle Facilities.

B. The direction of travel for bicycle facilities shall be in the same direction as motor vehicle traffic, unless the bicycle facilities are protected from vehicular traffic by a physical barrier .

C. Vaned grates or solid lids shall be used on all catch basins located within bicycle facilities.

Chapter 15. Roadside Features

15.1. Fixed Objects

A. Locate fixed objects so that vehicle and pedestrian sight distance meets the standards in Chapter 13 Intersection Design.

B. Standard clearances shall be met in accordance with Table 16 and Table 17 unless approved otherwise to accommodate existing site conditions.

Table 16. **Standard Lateral Clearances**

From	To	Standard Clearance
Curb face	Closest part of any fixed object (excluding traffic control signs and parking meter posts)	2 feet
Textured surface of wheel chair ramp	Closest part of any fixed object	1 foot
Edge of sidewalk	Stair riser	2 feet
Pole face, fire hydrant	Closest part of any fixed object (excluding traffic control signs and parking meter posts)	5 feet

Table 17. **Standard Vertical Clearances**

From	To	Standard Clearance
Roadway surfaces	Any horizontal projection over surface: measured from the crown of the street to the lowest portion of the structure.	16 feet
Sidewalk surfaces	Any horizontal projection over the surface	8 feet
Roadway surfaces	Tree limbs	14 feet
Alley surfaces	Any horizontal projection over paved surface	14 feet
Bicycle path surfaces	Any horizontal projection over surface	10 feet

C. Electrical Facilities. For projects that require installation of or adjustments to Seattle City Light (SCL) facilities, the Applicant shall coordinate this activity with SCL. Please visit the SCL website or SCL engineering for the most recent information on clearance requirements. SCL and City staff will work closely with applicants to accomplish appropriate clearances required for design, during construction, and at final build-out. Communication and resolution of required clearances are critical to final design and construction approval of the proposal.

15.2. Landscaping

The following criteria apply to landscaping improvements in the right-of-way. The landscaping design criteria in this section are based on transportation safety requirements and on minimum requirements for plants to achieve mature growth.

For landscaping requirements on private property, contact Planning and Community Development. This chapter applies to trees only where noted.

A. Any existing right-of-way landscaping disturbed by construction activity shall be replaced or restored to the same or better condition that was existing before construction started.

B. All landscaping shall meet the sight distance and sight triangle requirements in Chapter 13, Intersection Design.

Landscaping plans shall meet the following design requirements:

A. Plan:

1. The right-of-way landscaping plan shall be drawn to an engineering scale, and shall show property lines, plant and tree locations, right-of-way infrastructure, driveways, and intersections, as well as all specifications needed to install and inspect the installation.
2. Coordinate landscaping with transportation and utility plans. Adjust locations of trees and to accommodate utilities, pedestrians, and sight distance.
3. Preserve existing trees and landscaping where possible.

B. Plant Selection:

1. All plants shall conform to American Association of Nurserymen (AAN) grades and standards as published in the most current edition of the *American Standard for Nursery Stock* manual, provided that existing healthy vegetation used to augment new plantings shall not be required to meet these standards.
2. Plant selection shall consider adaptability to climatic, geology, and topographic conditions of the site.
3. Tree and shrub canopies, upon maturity, shall not reach an above ground utility such as street lights and power lines.

C. Soil:

1. The landscaping plan shall provide soil specifications, including soil depths. Refer to BMP T5.13 Post Construction Soil Quality and Depth (Stormwater Manual) for general soil specifications. Improvements that include biofiltration require specific specifications for the soils.

D. Street Trees:

1. New trees shall be at least two-inch caliper and selected from the City-approved street tree list in Appendix G – Right-of-way Street Tree List.
2. Street trees shall be spaced a minimum of 25 feet on center.
3. Street trees shall be centered within the amenity zone.
4. The standard five (5) foot clearance from underground utilities often is not enough space to minimize the effects of utility maintenance and repair and ensure longevity of the tree. When right-of-way width allows, additional clearance distance shall be provided.
5. When right-of-way width is limited and the five (5) foot clearance cannot be met, the City will evaluate site conditions and may permit one or both of the following:
    a. Tree installation less than five (5) feet from ductile iron or PVC pipe; or
    b. Tree installation less than five (5) feet from concrete pipe that has rubber gaskets.
6. Adjust placement to avoid conflict with driveways, utilities, and other functional needs. Trees shall be placed:
    a. Centered within the amenity zone between the curb and sidewalk;
    b. Eight (8) feet from underground utility lines (three (30 feet with root barriers);
    c. Ten (10) feet from power poles (15 feet recommended);
    d. Seven and one-half (7.5) feet from driveway edges (10 feet recommended);
    e. Twenty (20) feet from street lights or existing trees;
    f. Thirty (30) feet from curb or travel lane street intersections (when no curb);
    g. Ten (10) feet from roadway edge where no curb is present; and

h. Twenty (20) feet from marked or unmarked crosswalks.

15.3. Mailboxes

A. United States Postal Service (USPS) shall approve all mailbox locations.

B. Clustered mail boxes are preferred.

C. The approach to mailboxes shall be clear of obstruction(s).

D. Refer to Standard Plans 514 Mailbox Stand with Amenity Zone and 515 Mailbox Stand without Amenity Zone.

15.4. Steps

A. Steps and stairways, and associated landings from private property shall not extend into the right-of-way.

B. Stairways in public right-of-way shall be designed and constructed according to Standard Plans 325 Stairs and 326 Cement Concrete Stairway.

C. The first riser shall be at least two (2) feet clear of a public walk.

D. A minimum five (5) feet by five (5) feet landing shall be provided after each 20 risers.

E. Pedestrian lighting may be required for stairways.

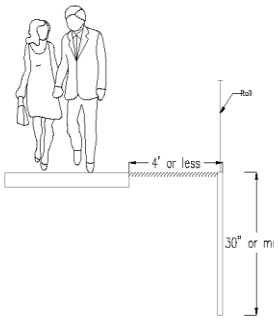
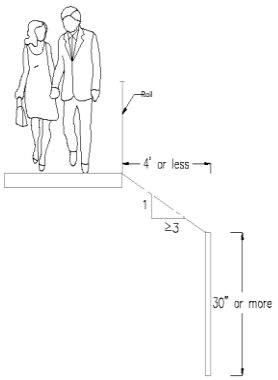
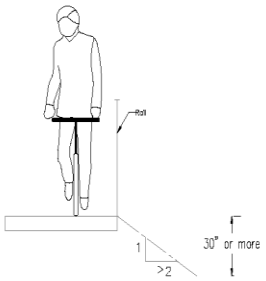
15.5. Railing

A. Railings on private property shall be consistent with guard requirements of the construction and building codes contained in SMC Chapter 15.05. Railings shall have a maximum spacing of four (4) inches for vertical elements of the railing.

B. Railings in the right-of-way shall be consistent with Standard Plans 324 Pedestrian Railing and the WSDOT Standard Specifications.

C. Railing in the right-of-way shall be installed along a nonmotorized transportation facility when there is a loss in elevation from the facility of 30 inches or more and:

1. The vertical wall face is less than four (4) feet in horizontal distance from the near side face of the facility. See Case A.
2. The vertical wall face is greater than four (4) feet horizontally to the near side face of the facility and the slope to the wall top is steeper than 1V:3H. See Case B.
3. The slope(s) adjacent to the facility average greater than 1V:2H. See Case C.

		
CASE A	CASE B	CASE C

15.6. Cut-and-fill Slopes

A. Side slopes shall be 2H:1V or flatter on both fill slopes and cut slopes.

B. Steeper slopes may be approved by the Director when supported by a geotechnical report and engineering recommendations.

C. Side slopes shall be stabilized by grass sod or seed, or by other approved plant or surface materials.

15.7. Guardrail

Guardrail shall be provided and installed by the Applicant/Permittee as directed by the Director. For purposes of warrants, design, and location, all guardrails along public and private roadways shall conform to the criteria of the WSDOT Standard Plans and Specifications.

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Chapter 16. Surface Treatment

This chapter provides criteria for paving and for restoring traveled ways within the City's right-of-way.

16.1. General

A. Hard surfacing such as asphalt concrete or Portland concrete cement (PCC) is required within the right-of-way.

B. Gravel surfacing may be allowed in right-of-way that the City does not maintain, such as alleys.

C. When approved by the City, grades steeper than 20 percent shall be paved with PCC.

D. Use of permeable pavements in the right-of-way may be utilized, subject to approval of the Director.

16.2. Asphalt Pavement Design

A. Arterial Streets:

1. Any pavement for arterial streets shall consider the load bearing capacity of the soils, based on actual field tests, and the traffic-carrying requirements of the roadway.
2. The analysis shall include the traffic volume and axle loading, the type and thickness of roadway materials and the recommended method of placement. Pavement sections shall not be less than those required for collector arterials.
3. Pavement design shall be prepared by a Professional Engineer licensed in the State of Washington who is proficient in pavement design. Soils tests are required to assess the California Bearing Ratio (CBR) for the subgrade.

B. Non-arterial Streets:

1. Minimum asphalt pavement sections are identified in Standard Plan 201 Typical Local Street as:
    a. Surfacing: Two (2) inches Class B Asphalt Concrete
    b. Base: Four (4) inches Asphalt Treated Base over two (2) inches Crushed Surfacing Top Course

2. Unless otherwise approved by the City, in areas of pavement restoration or adjacent to existing pavement, reconstruction shall, at a minimum, match existing roadway sections, provided it exceeds the minimum pavement section.

C. Poor Subgrade:

1. The minimum material thicknesses indicated are not acceptable if there is any evidence of instability in the subgrade. This includes, but is not limited to, free water, swamp conditions, fine-grained or organic soil, slides, or uneven settlement. If there are any of these characteristics, the soil shall be sampled and tested sufficiently to establish a pavement design that will support the proposed construction. Any deficiencies, including an R-value of less than 55 or a CBR of less than 20, shall be fully considered and compensated for in the design.

16.3. Pavement Widening

A. Any widening of an existing roadway, either to add traveled way or paved shoulder, shall have the same surfacing material as the existing roadway.

B. When an existing shoulder is to become part of a proposed traveled way, a pavement evaluation shall be performed. The shoulder area shall match the existing roadway section or pavement design is required to determine if the shoulder is acceptable or if any improvements are necessary. Designs based on these evaluations are subject to review and approval by the Director. The responsibility for any shoulder material thickness improvement shall be considered part of the requirement for roadway widening.

Chapter 17. Traffic Control Devices

A. All traffic control devices shall conform to the MUTCD and City of Shoreline standards.

B. All signs, such as street name, parking, stop, dead end, speed limit, and nonmotorized indicators shall be approved as part of the project plan. The channelization plan showing paving markings, permanent signing, and crosswalk locations shall be prepared by a Professional Engineer licensed in the State of Washington.

C. Temporary traffic control to ensure traffic safety during construction activities shall be provided by the Applicant/Permittee and installed per MUTCD standards, or as directed by the City's Inspector.

17.1. Traffic Signals

The following apply to new or modified traffic signals:

A. A signal warrant study prepared by a Professional Engineer licensed in the State of Washington shall be required for all new traffic signal installations. The City Traffic Engineer shall review and approve the study.

B. Signal design shall meet ADA, MUTCD, and WSDOT *Design Manual* 13.30 requirements.

C. Emergency vehicle preemptions systems are required for all new signal installations and may be required for signal modifications.

D. Signal structures consisting of poles and mast arms shall be required for all new installations.

E. Stop bar and advanced loop detection is required for all signalized approach lanes per Standard Plan 420. Camera detection may be installed by request subject to review and approval by the City Traffic Engineer.

F. Transit Signal Priority capability may be required at intersections which serve transit routes. Bicycle loop detection is required for all bicycle lane approaches to signalized intersections. If a predominant left turning movement for bicyclists is present, bicycle push buttons or channelized bike boxes may be required.

G. All new signals require backup battery systems. New signals shall provide communication to the City's Central Transportation System when feasible.

H. Traffic signal equipment, including cabinets, controllers and other components, shall be reviewed and approved by the City Traffic Engineer.

DIVISION 3 – SURFACE WATER

Chapter 18. Standards

Division 3 – Surface Water applies to public and private development within the City.

The City of Shoreline has adopted the *2014 Department of Ecology Stormwater Management Manual for Western Washington* (Stormwater Manual) and, for general guidance, refers to the *2012 Low Impact Technical Guidance Manual for Puget Sound* (LID Manual).

A. For surface water design:

   1. *2012 Stormwater Manual for Western Washington*, *as Amended in December 2014* (Stormwater Manual), Department of Ecology. Shoreline's modifications to the Stormwater Manual are itemized in Chapter 18 Stormwater Manual Modifications. The Stormwater Manual is available on the Department of Ecology website: http://www.ecy.wa.gov/programs/wq/stormwater/manual.html
   2. The 2012 *Low Impact Technical Guidance Manual for Puget Sound* (LID Manual) may be used for guidance on LID site design. The LID Manual is available on the Puget Sound Action Team website: http://www.psp.wa.gov/downloads/LID/20121221_LIDmanual_FINAL_secure.pdf

B. For conveyance system design in the City:

   1. King County *Surface Water Design Manual*, latest edition, Chapter 4 "Conveyance System Analysis and Design". Refer to EDM Table 22 for the City's amendment to Chapter 4. The manual is available online at: http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual

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Chapter 19. Stormwater Manual Modifications

The chapter lists the City's amendments to the Stormwater Manual. When using the Stormwater Manual, assume there is no amendment unless it is listed in this chapter. When the Stormwater Manual states something is "optional" or "up to the jurisdiction," it is a requirement in the City, unless otherwise noted herein.

Modifications to the Stormwater Manual are as follows:

A. Section 2.3 – Definitions Related to Minimum Requirements:
   City definitions shall be used where applicable. Refer to Appendix A – Acronyms and Definitions and applicable Shoreline Municipal Codes.

B. Section 2.4 – Applicability of Minimum Requirements:

   1. The paragraph below replaces the fourth paragraph, beginning with "The local government may allow the Minimum Requirements to be met for an equivalent (flow and pollution characteristics) area within the same site…" of Section 2.4.2.

      a. When in the same threshold discharge area, surface water control requirements for proposed impervious areas may be applied to equivalent existing developed areas of the site, provided those areas have equivalent flow and pollution characteristics and do not already have such controls.

   2. Supplemental Guidelines is revised. The second paragraph states, "Local governments can select from various bases for identifying projects that must retrofit the replaced hard surfaces on the project site."

      a. City of Shoreline elects to require retrofit for replaced hard surfaces not separated from other runoff when the value of the improvements (excluding land value) exceeds 50 percent of the assessed value of the existing improvements (excluding land value). The value of the proposed improvements shall include the valuation of all permitted projects from the last 5 years.

   3. Where the Stormwater Manual states that "Local governments are allowed to institute a stop-loss provision on the application of stormwater requirements to replaced hard surfaces", The City of Shoreline has determined that Stop Loss does not apply.

4. Where the Stormwater Manual states that “Local governments can also establish criteria for allowing redevelopment projects to pay a fee in lieu of constructing water quality or flow control facilities on a redeveloped site”, the City of Shoreline has determined that the fee-in-lieu does not apply.

C. Section 2.5.2 – Minimum Requirement #2, Construction Stormwater Pollution Prevention Plan (SWPPP) Elements. Refer to Chapter 24, Stormwater Pollution Prevention Plan for additional information. The following amendments also apply to Vol. II Construction Stormwater Pollution Prevention, Element #2.

1. Element 2 – Establish Construction Access:
    a. Street washing is not permitted, even after shoveling or sweeping.
    b. During construction, if material is being deposited on off-site streets, additional strategies may be required including:
        i. Regenerative-type vacuum sweepers and repeated or continuous sweeping.
        ii. Wheel wash (or an improved wheel wash if one already exists).
        iii. Special site procedures and provisions (such as transferring haul-outs to trucks that travel only on paved and maintained surfaces in the site).
        iv. Suspension of work until dry weather.
2. Element 4 – Install Sediment Controls:
    a. If the standards are not being met, additional BMPs (including site-specific designs) shall be implemented. If additional BMPs are not implemented or are not successful, work may be suspended until the City approves a new SWPPP (see Vol. II: 2.3).
3. Element 5 – Stabilize Soils:
    a. Rainy season requirements are required October 1 through April 30. A Seasonal Suspension Plan is required for some projects having 11,000 SF or more of disturbed land. Refer to Element 12, Manage the Project, for more information. All projects shall implement BMP T5.13 Post Construction Soil Quality and Depth.
4. Element 6 – Protect Slopes:

a. Clearing/grading work shall comply with the Stormwater Manual, geotechnical recommendations, SEPA (State Environmental Policy Act) conditions, and other applicable regulations and standards. These project-specific requirements are in addition to and take priority over general standards.

5. Element 7 – Protect Drain Inlets:
    a. The Contractor shall remove inlet protection at the end of the project without releasing captured sediment into the storm system.
6. Element 8 – Stabilize Channels and Outlets:
    a. Temporary conveyance channels shall be stabilized for the 10-year, 24-hour frequency storm, and assuming full build out of tributary area(s).
7. Element 12 – Manage the Project:
    a. For Certified Erosion and Sediment Control Lead (CESCL) requirements, and Rainy Season Requirements and Seasonal Suspension Plan, refer to Chapter 24, Stormwater Pollution Prevention Plan.
8. Element 13 – Protect LID BMPs:
    a. If the standards are not being met, additional BMPs (including site-specific designs) shall be implemented. If additional BMPs are not implemented or are not successful, work may be suspended until the City approves a new SWPPP.
9. Additional requirements for all projects:
    a. Dust is controlled and is in compliance with the Puget Sound Clean Air Agency; and
    b. Work in Critical Areas conforms to requirements of the City's Critical Areas Ordinance (CAO).

D. Section 2.5.5 – Minimum Requirement #5, On-site Stormwater Management.
1. Projects using List #1 shall consider Rain Gardens or Bioretention before considering Permeable Pavement for other hard surfaces.
2. Projects that use infiltration to meet Minimum Requirement #5 must refer to Chapter 21 of this Manual.

E. Section 2.5.6 – Minimum Requirement #6, Runoff Treatment

1. Treatment requirements shall not be less than that achieved by facilities in the Enhanced Treatment Menu (see Vol. V, Chapter 3).

F. Section 2.5.7 – Minimum Requirement #7, Flow Control

1. Refer to the Stormwater Manual Vol. I: 2.5.7 for the thresholds that trigger flow control requirements. If a project exceeds any one of the three thresholds, the project triggers the requirement for flow control facilities.
2. On projects that do not have set building footprints, for example a site development permit for a short plat, the flow control modeling shall use maximum hardscape allowed in the applicable zoning designation as the maximum impervious surface at full build out. Refer to SMC Chapter 20.50. For example, if a zoning designation allows maximum 50 percent of a lot as hardscape, then 50 percent is the maximum impervious surface to use for flow control modeling at full build-out.
3. Direct Discharge Exemption: the Director may approve an exemption to flow control for projects that discharge to Puget Sound or to Lake Washington, provided the proposal includes analysis showing that the existing or proposed conveyance system meets all the requirements in the Stormwater Manual for direct discharge, and: 1) the system conveys the 50-year frequency peak event for the entire basin without surcharging catch basins above the catch basin rim; and 2) the 50-year frequency event does not flood proposed buildings or any existing on-site or off-site buildings.
4. The analysis shall consider full build-out conditions, based on current zoning using the direct discharge option for flow control for those parcels that drain to the conveyance system. The analysis shall consider both conveyance impacts to the system down gradient of the proposed project and also the project's backwater impact to upstream and lateral flood stages in the conveyance system.
    a. Where the Standard Flow Control Requirement is applicable in Boeing and Thornton Creek watersheds, projects shall model the pre-developed condition as the "historic" land cover condition. The criterion allowing the use of existing land cover condition in basins that have been 40% total impervious area since 1985 is not permitted.

G. Section 2.5.9– Minimum Requirement #9, Operation and Maintenance

1. For public facilities built by private development:
    a. A copy of the draft operations and maintenance manual shall be submitted with the permit submittal. The final O&M Manual shall be submitted for review and approval prior to acceptance of the completed construction project. The final approved O&M Manual shall be submitted with one hard copy and one electronic copy on CD.
2. For private facilities:
    a. A declaration of covenant is required. Refer to Section 4.9.
3. At a minimum, the O&M Manual shall include:
    a. Party/parties responsible for facility maintenance, including phone numbers and addresses;
    b. For subdivision, list lots whose owners shall be responsible for maintenance;
    c. Maintenance cost distribution for shared stormwater best management practices and drainage facilities;
    d. Site map showing BMPs, critical area(s), buildings, affected lots, and dimensions;
    e. A list of BMPs and facilities installed on-site and purpose of each;
    f. For each BMP or facility, the required maintenance activities and schedule meeting the minimum requirements given in the Stormwater Manual Vol. V: Chapter 4;
    g. List of any proprietary components along with vendor's contact information and the vendor's maintenance schedule and costs;
    h. Inspection and maintenance schedules including recommended maintenance schedules per vendor specifications for proprietary components;
    i. Care and maintenance of any powered devices (e.g. pumps, aeration);
    j. Inspection procedures and how the maintenance schedule will be modified if inspections determine the facility is not operating properly;

4. The final O&M manual shall incorporate any comments made during the development review process and shall incorporate any field changes made to the facilities during construction.

H. Section 2.6.1 – Optional Guidance #1, Financial Liability

1. EDM Division 1 provides requirements for Financial Guarantee information for work performed within the right-of-way.

I. Section 2.6.2 – Optional Guidance #2, Off-Site Analysis and Mitigation

1. Preliminary analysis shall be qualitative. Refer to the Stormwater Manual Vol. I: 3.1.3. The City may require quantitative analysis and mitigation based on the results of the downstream analysis.

J. Refer to Appendix L for the approved plant list for surface water facilities in the City Right-of-way.

Chapter 20. General Requirements

20.1. Licensed Professionals

A. State law requires engineering work be performed by or under the direction of a professional engineer licensed to practice in Washington State. Plans involving construction of treatment facilities or flow control facilities, structural source control BMPs or drainage conveyance systems generally involve engineering principles and should be prepared by or under the direction of a licensed engineer.

B. Construction Stormwater Pollution Prevention Plans (SWPPPs) that involve engineering calculations shall also be prepared by or under the direction of a Professional Engineer licensed in the State of Washington.

C. Infiltration testing must be performed by a licensed professional. Refer to Chapter 21, Infiltration, or the Stormwater Manual Vol. III: Chapter 3.3.6.

D. Depending on project scope and location characteristics, the Director may require a licensed professional for any project. All credentials shall be current and issued by Washington State.

E. A Washington State licensed civil engineer with geotechnical expertise is required for site assessment for site work within or adjacent to slopes steeper than 15 percent and higher than 10 feet.

F. In addition to Department of Ecology NPDES Construction General Permit requirements, the Director may require a designated CESCL when disturbance is proposed on a site that contains or abuts a critical area. Refer to the Stormwater Manual Vol. II: Chapter 4, BMP C160: Certified Erosion and Sediment Control Lead.

G. Shoreline prefers planting plans and specifications to be prepared by a licensed Landscape Architect or a qualified professional working in the field of landscape design or horticulture.

20.2. Grading

Any grading activity, whether or not it requires a permit, shall prevent soils leaving the site or entering drainage facilities, streets and roads, water resources, or adjacent properties.

20.3. Water Quality Restrictions

A. The City does not have currently designated or known aquifers, or wellhead protection areas.

B. The Lake Ballinger Watershed, which includes the Echo Lake sub-basin, currently has a TMDL for phosphorous.

C. Enhanced treatment is the minimum water quality treatment standard when water quality treatment is triggered by the Stormwater Manual.

20.4. Separated Runoff

A. Sanitary sewer facilities shall be separate from storm water facilities.

B. Project design shall keep runoff from public right-of-way separate from on-site, private surface water runoff.

C. Surface water controls for one private property shall not be placed in public right-of-way or on other public property.

D. Runoff from replaced impervious surfaces that is not separated from other runoff may trigger a retrofit of the on-site storm drainage system in accordance with the Stormwater Manual Vol. I: 2.4.2, and Chapter 19, Stormwater Manual Modifications for retrofit triggers.

20.5. Backflow Prevention

The City may require backflow prevention on private stormwater connections to City-owned stormwater trunk lines or to undersized stormwater mains.

20.6. Sump Pumps

Uncontaminated discharge from sump pumps may connect to the City's surface water system when approved by a permit.

20.7. Footing Drains

For single-family residences, footing drains may connect to the downspouts, on the property, at a covered catch basin or yard drain that is located no closer than five feet to the foundation. Care shall be taken to ensure that slopes carry the water away from the building during high flows.

20.8. Catch Basin Medallions

Surface water education medallions shall be installed at all existing and new catch basins installed on-site or within the adjacent right-of-way. The City provides the medallions and installation instructions at no cost when requested.

20.9. Maintenance Access

A. All storm water facilities shall be accessible to maintenance vehicles, unless specifically waived by the City. If not located in or adjacent to an existing accessible access, an improved roadway surface shall be provided.

B. Access roads shall be designed with 40 foot inside radius on curves, grades flatter than 15 percent, and at least 10 feet wide. The access shall be designed to carry H20 loading. The approved surfaces include asphalt concrete, cement concrete, pervious concrete, pervious asphalt, structurally stabilized vegetated surface, or crushed surfacing.

C. The City may require the maintenance access be located in a separate tract.

D. A stormwater covenant or easement shall be required for all privately constructed storm facilities.

20.10. Offsite Drainage Improvements

With the City's approval, the Applicant may provide offsite improvements in the same drainage basin or threshold discharge area to mitigate water quality and flow control requirements associated with the project. These offsite improvements shall provide equivalent water quality and flow control.

20.11. Watercourses

A. Streams should be preserved in their existing channels.

B. Any alteration to a stream channel, piped watercourse or associated setbacks requires approval by the Washington Department of Ecology (DOE) and the Washington State Department of Fish and Wildlife (WDFW).

C. A copy of the WDFW approval shall be submitted prior to permit issuance.

D. Refer to SMC Chapter 20.80 for critical area regulations.

20.12. Stormwater Facility Operation

All Private Stormwater Facilities installed to meet Minimum Requirements #5, #6, and #7 (per the Stormwater Manual) are subject to inspection and shall be maintained to the standards set forth in SMC Chapter 20.70.

20.13. Subdivisions

A. The maximum hardscape in the Development Code (SMC Chapter 20.50) is used to determine impervious area for surface water design when the total hard surface area is not known.

B. Construction of the lot drainage connection systems shall be feasible and allow connection to the proposed formal and short subdivision improvements or to the documented infiltration areas.

C. When a subdivision surface water plan includes piped connections, provide a connection stub to each lot. A maximum of three lots may be connected to a common private collection pipe, six inches or more in diameter. For subdivisions, no more than three (3) roof drain stubs are allowed on a single roof drain collection pipe.

D. Roof and footing drain connection stubs shall be at least one foot below the lowest existing elevation of the building envelope on all newly created lots, unless a different elevation is approved or required by the City.

E. Easements for the specific drainage systems shown on the site development documents shall be provided as part of the formal or short subdivision.

F. Where the surface water plan and flow control calculations for a subdivision include assumptions about the size, location, or performance of permeable pavement, rain gardens, or bioretention facilities on individual lots, the surface water plan and site development plan shall identify the obligation of each lot. The Applicant shall record a deed restriction against each lot for the maintenance of those facilities by subsequent owners.

20.14. Phased Projects

A. For projects that are proposed to be built in phases, the Applicant shall provide plans that show the overall project as well as the project phases. The plan shall clearly delineate phase boundaries and provide estimates for construction dates for the phases.

B. The Applicant shall consider all phases when calculating thresholds for stormwater management. Phasing of projects shall not result in a reduction of drainage and erosion control requirements.

20.15. Protect Vegetation Post Construction

A. Mechanisms shall be put in place to assure long-term protection of vegetation retention areas. Mechanisms to protect conservation areas include setting aside conservation areas into separate tracts, permanent easements, homeowner covenants, maintenance agreements, and education.

B. Permanent signs shall be installed indicating that removal of trees or vegetation is prohibited within a native vegetation retention area.

C. Permanent fencing is required around the limits of any native vegetation retention area. The type, size, and location of the fencing shall be approved by City review staff and should be made of materials that blend in with the natural surroundings. For example, wood split-rail, pinned if necessary, and located in such a manner as to not impede the movement of wildlife within the vegetation retention areas.

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Chapter 21. Infiltration

Infiltration is a basic technique for many Low Impact Development practices to meet Minimum Requirement #5 and can be used to meet Minimum Requirement #7, Flow Control. Infiltration best management practices provide many benefits; therefore, the City of Shoreline requires infiltration facilities for sites where conditions are appropriate.

21.1. Soils and Subsurface Investigation

Use of infiltration is applicable on sites with appropriate site, soil, and subsurface conditions. Investigation of soil and subsurface characteristics of the site is required for all projects proposing to use infiltration.

Medium Impact Projects shall investigate and submit reports as described in section A, below. Large Impact Projects shall investigate and submit reports as described in the Stormwater Manual; Section B, below, provides a helpful roadmap to the location of requirements in the Stormwater Manual.

A. Medium Impact Projects:

A Medium Impact Project as defined in Chapter 22, Surface Water Project Classifications, shall provide the following reports and analyses for soils and subsurface investigations to meet Minimum Requirement #5.

1. Soils Report:

A Soils Report prepared by a professional soil scientist certified by the Soil Science Society of America (or an equivalent national program), a locally licensed on-site sewage designer, or by other suitably trained persons working under the supervision of a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington is required. The report shall identify:

a. For all sites, the Soils Report shall include a description of the soils on the site using soil surveys, soil test pits, soil borings, or soil grain analyses (see http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm for soil survey information).The report shall establish the type and limit of soils on the project site and include an inventory of topsoil depth.

b. For sites proposing to meet Minimum Requirement #5 solely with downspout full infiltration, the following additional site-specific information is required:

    i. Document the presence of outwash or loam soils at the location of the downspout infiltration drywell or trench using at least one soil log a minimum four feet deep from proposed grade and one foot below expected bottom elevation of trench. Identify the NRCS series of the soil and the USDA textural class of the soil horizon through the depth of the log and note any evidence of high groundwater level.

    ii. Document at least three feet of outwash or loam soils from the proposed final grade to the seasonal high groundwater table, at least one foot of clearance from expected bottom elevation of trench or drywell to seasonal high groundwater table.

c. For sites proposing to use Permeable Pavement for a pollution-generating surface (driveway, parking area, street), document the soil's physical and chemical suitability for treatment [Note: where soils do not meet the criteria, permeable pavement is infeasible.] Soils shall meet all three of the following criteria:

    i. Cation exchange capacity (CEC) is ≥5 milliequivalents CEC/100 g dry soil (USEPA Method 9081).

    ii. Organic content is ≥ 1% (ASTM D 2974).

    iii. One-foot depth of soil below base of permeable pavement has the above characteristics.

2. Infiltration Testing:

   Projects proposing to meet Minimum Requirement #5 with rain gardens, bioretention, or permeable pavement shall demonstrate adequate infiltration and separation from groundwater or hydraulic restriction layer.

   The Soils Report shall include infiltration testing conducted by a professional soil scientist certified by the Soil Science Society of America (or an equivalent national program), a locally licensed on-site sewage designer, or by other suitably trained persons working under the supervision of a professional engineer, geologist,

hydrogeologist, or engineering geologist registered in the State of Washington. At each location where a rain garden, bioretention, or permeable pavement is proposed, the following are required:

a. At each location, determine the initial (uncorrected) infiltration rate using one of the methods described in Appendix H – Infiltration Test Methods:
    i. On sites with outwash soils (unconsolidated by glacial advance), use grain size analysis; or
    ii. A small-scale Pilot Infiltration Tests (PIT) conducted between December 1 and April 1 (inclusive). (Fewer tests may be needed if the certified soils professional confirms that the site is unconsolidated outwash soils and at least one foot to groundwater exists under the proposed bottom of the facility.)
b. At each location, report the design infiltration rate using correction factors described in Appendix H – Infiltration Test Methods.
c. At each location, determine the depth to any hydraulic restriction layer (ground water, impermeable soil, bedrock, etc.). These tests shall be performed between December 21 and March 21 (inclusive):
    i. Excavating a pit at least one foot below the proposed bottom elevation of the rain garden/bioretention or below the subgrade surface of a permeable pavement; or
    ii. Testing with a monitoring well to a depth at least one foot below the estimated bottom elevation of a rain garden/bioretention excavation and at least one foot below the subgrade surface of a permeable pavement.

B. Large Impact Projects:

A Large Impact Project as defined in Chapter 22, Surface Water Project Classifications, shall conduct a detailed soils and subsurface evaluation. Requirements are given in the Stormwater Manual. Table 18 below provides cross-references to soils and subsurface investigation requirements for Large Impact Projects to meet Minimum Requirement #5 and when infiltration is proposed to meet Minimum Requirement #7. Infiltration is the preferred method for meeting Minimum Requirement #7.

Table 18. **Large Impact Projects Soil and Subsurface Investigation Requirements**

Requirement	Facility Type	Reference
Soils Report	All	Stormwater Manual, Volume I, Section 3.1.1 – the soils report is described under the requirement for a site analysis for projects required to meet Minimum Requirements # 1-9
Site and Subsurface Characterization	Downspout Full Infiltration	See Section A.1.ii, above.
	Bioretention and Permeable Pavement (MR #5 or #7)	Stormwater Manual, Volume III, Section 3.4
	Infiltration Basin/Pond, Trench, Vault, Tank (MR #7, also for MR #5 on sites that elect to meet LID Performance Standard)	Stormwater Manual, Volume III, Sections 3.3.5, 3.3.6, and 3.3.7

21.2. Prohibitions

Infiltration facilities are prohibited under the following conditions:

A. Infiltration rates lower than 0.3 inches per hour may be allowed to meet MR #5 and MR #7 if the design is modeled in WWHM and the geotechnical engineer has confirmed the design shall not have any adverse impacts to the subject property or adjacent properties.

B. Infiltration is not permitted within a Landslide Hazard Area as defined by SMC Chapter 20.80 Critical Areas or within a setback above a Landslide Hazard Area as described in SMC Chapter 20.80. **Note:** Other critical areas may have infiltration restrictions.

C. Infiltration in the right-of-way of arterial streets and/or areas of dense underground infrastructure is restricted. The infiltration facility shall be hydraulically separated from the street subgrade and physically separated from vehicular traffic.

21.3. Horizontal Setbacks

Setbacks do not replace infeasibility criteria for bioretention and permeable pavement. Applicants using the List Approach to meet Minimum Requirement #5 shall use the infeasibility criteria in the Stormwater Manual to determine if bioretention or permeable pavement may be considered infeasible on the site. If bioretention or permeable pavement are feasible, then setbacks shall be observed.

Setbacks are measured from the maximum pond elevation before overflow. Bioretention setbacks are measured from the bottom edge of the bioretention soil mix.

Unless otherwise noted, the following setbacks do not apply to permeable pavement surfaces that do not manage runoff from other areas.

A. Infiltration is not permitted within 5 feet of property lines (excluding the property line abutting the right-of-way) without agreement from neighboring property owners.
B. Infiltration is not permitted within the following setbacks from on-site and offsite structures:
    1. When runoff from <5,000 SF of impervious area is infiltrated in a single facility, the facility shall be located at least 5 feet from a structure without basement and 10 feet from a structure with basement.
    2. When runoff from ≥5,000 SF of impervious area is infiltrated in a single facility, a building structure shall not intersect with a 1H:1V slope from the bottom edge of an infiltration facility. The resulting setback shall be no less than 5 feet from a structure without basement and 10 feet from a structure with basement. For setbacks from structures on adjacent lots, future build-out conditions should be considered.
    3. No setback from the site structure is required if the structure has an open draining crawl space or the system is approved by the geotechnical engineer.
C. Infiltration is not permitted within 100 feet of drinking water supply wells or springs used for drinking water. This setback applies to permeable pavement, which is a pollution-generating surface.
D. Infiltration is not permitted within a groundwater protection area unless approved by the Director. If approved, water quality treatment may be required.
E. Infiltration is not permitted within 10 feet of underground storage tanks.
F. Septic systems or drain fields: Infiltration is restricted near septic systems or drain fields as described below.
    1. Bioretention and permeable pavement are not permitted within 10 feet of a proposed or existing small on-site sewage disposal drainfield, including reserve area, and grey water reuse systems.

2. Bioretention and permeable pavement shall be set back from a proposed or existing large on-site sewage disposal system in accordance with Chapter 246-272B Washington Administrative Code.
3. Other infiltration facilities are not permitted within 100 feet of proposed or existing septic systems or drain fields.

G. Contaminated soil or groundwater:

Infiltration has the potential to mobilize contaminants present in soil and groundwater. Unless a different setback is given in an approved cleanup plan, the following setbacks apply to areas with known soil or groundwater contamination (typically federal Superfund sites or state cleanup sites under the Model Toxics Control Act (MTCA):

1. Areas known to have deep soil contamination:
    a. Bioretention, permeable pavement, and other infiltration facilities serving less than 5,000 SF of impervious surface are not permitted within 100 feet of an area known to have deep soil contamination.
    b. Other infiltration facilities serving 5,000 SF or more of impervious surface are not permitted within 500 feet of an area known to have deep soil contamination.
2. Where groundwater modeling indicates infiltration will likely increase or change the direction of the migration of pollutants in the groundwater.
3. Within 10 feet (horizontal) of contaminated surface soils.

H. Landfills:

1. Bioretention, permeable pavement, and other infiltration facilities serving less than 5,000 SF of impervious surface are not permitted within 100 feet of a closed or active landfill.
2. Other infiltration facilities serving 5,000 SF or more of impervious surface are not permitted within 500 feet of a closed or active landfill unless a licensed hydrogeologist determines that stormwater can be safely infiltrated.

21.4. Vertical Separation

Infiltration facilities require a minimum vertical separation from the bottom of the facility to the underlying water table, bedrock, or other impermeable layer. Separation requirements depend upon the facility type and the facility's tributary area as described in the Stormwater Manual.

21.5. Verification Testing

The City may require verification testing for infiltration facilities where the City determines there may be a risk of infiltration system failure. Site conditions that justify infiltration facility verification testing include but are not limited to:

A. Low infiltration capacity soils;

B. History of infiltration failure in the project area;

C. High groundwater levels;

D. Risk of flooding in the event of system failure;

E. Indications of sediment loads to the facility during construction, indications of soil compaction during construction, or other new information gained during construction with regards to infiltration facility design; or

F. Performance information such as better soils data or groundwater data.

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Chapter 22. Surface Water Project Classifications

The City classifies stormwater impacts into three project classifications based on the Minimum Requirements: Small, Medium, and Large Impact Projects. The three types of impact projects are based on two thresholds: proposed hard surface and the amount of disturbed area. Table 19 below summarizes the thresholds that trigger each classification:

Table 19. **Surface Water Project Classifications**

Threshold	Small Impact Project	Medium Impact Project	Large Impact Project
New + Replaced Hard Surface	Less than 2,000 SF	2,000 SF to 5,000 SF	Greater than 5,000 SF
Total Area of Disturbance	Less than 7,000 SF	Greater than 7000 SF	Greater than 7000 SF

A project is classified based on the highest impact level of either threshold. Applicability of the Minimum Requirements shall be determined using the thresholds given in the Stormwater Manual Vol. I: 2.4 and the definitions given in the Stormwater Manual Appendix I-G. Table 20 below summarizes the requirements for each project classification:

Table 20. **Surface Water Submittal Requirements**

	Small Impact Project	Medium Impact Project	Large Impact Project
Minimum Requirements per the Stormwater Manual	#2	#1-5	#1-9
Soils Report	Not required	A soils analysis is required. Grain-size analysis or PIT are acceptable to calculate infiltration rates.	Geotechnical report is required. Grain-size analysis or PIT are acceptable to calculate infiltration rates. If grain-size analysis is performed, geotechnical engineer is required to review drainage design.
Surface Water Report	Not required	Required	Required
Is a licensed engineer required to prepare the site development plan?	Not required	Required if the site is within 100 feet of a critical area or its buffer	Required
Site Development Plan	Not required	Required	Required
Stormwater Pollution Prevention Plan (SWPPP)	SWPPP Short Form for Small and Medium Impact Projects	SWPPP Short Form for Small and Medium Impact Projects	Department of Ecology's SWPPP template
Declaration of Covenant	Not required	Required for any stormwater facilities	Required for any stormwater facilities
Copy of NPDES CSWGP Coverage Letter	Not required	Required, if coverage is necessary	Required, if coverage is necessary

Chapter 23. Site Development Plan

Refer to Stormwater Manual: Vol. I: Chapter 3 and BMP T5.41 Better Site Design.

Site planning and layout are critical in reducing the amount of stormwater runoff generated by a project site. Project layout shall address site planning and layout, shall consider the opportunities to reduce or minimize impervious surface, and shall utilize LID techniques for managing stormwater.

The following criteria shall be addressed in project layout and site design:

A. Locate development areas outside of conserved vegetation/habitat/wildlife areas and within designated buildable areas to minimize soil and vegetation disturbance and take advantage of a site's natural ability to store and infiltrate stormwater.

B. Orient residential lots to minimize site disturbance, maximize the benefits of minimal excavation foundation systems; facilitate sheet flow into natural resource protection areas and bioretention facilities; and promote community aesthetics, livability, and privacy.

C. Eliminate stream crossings with roads and conveyance systems whenever possible.

D. Minimize impervious surfaces by reducing building footprints, road length and width, parking areas, and driveways. Utilize shared parking, multi-storied parking, or parking facilities located under the structure. Any outdoor parking areas shall be designed with bioretention facilities that are interspersed throughout the parking lot area to receive stormwater runoff from the impervious surfaces.

E. Use dispersion or infiltration best management practices to diminish or eliminate effective impervious areas by directing stormwater from impervious areas.

F. Integrate small, dispersed bioretention areas to capture, store, and infiltrate stormwater on site.

G. Lay out roads, lots, and other proposed site features to follow topographic contours to minimize soil and vegetation disturbance and loss of topsoil or organic duff layer.

H. Utilize pervious paving surfaces such as porous pavement or pavers for roads, driveways, parking lots, or other driving or walking surfaces.

I. Direct rooftop runoff to infiltration areas, full dispersion systems, or to cisterns for non-potable reuse, or utilize vegetated roof systems to evaporate and transpire stormwater.

J. Minimize Clearing and Grading. Grading should be kept to a minimum by incorporating natural topographic depressions into the development and limiting the amount of cut-and-fill on

those portions of the site with permeable soils. At a minimum, the following standards shall be utilized:

1. Any portion of the site with permeable soils should be closely considered for preservation to promote infiltration of stormwater runoff;
2. Areas of rich topsoil should either be left in place or, if excavated in construction areas, utilized elsewhere on the site to amend areas with sparse or nutrient deficient topsoil;
3. Direct runoff to areas of permeable soils or natural depression areas to promote infiltration;
4. Distances for overland flow shall be kept short to promote sheet flow and minimize concentration of runoff;
5. Grading shall not increase steep, continuous slopes;
6. Limit clearing to road, utility, building pad, lawn areas, and the minimum amount of extra land necessary to maneuver machinery (e.g., a 10-foot perimeter around a building). All other land outside these areas shall be protected with construction fencing to prevent intrusion and compaction by construction equipment or other types of vehicles.

Chapter 24. Stormwater Pollution Prevention Plan (SWPPP)

24.1. SWPPP Requirements

Refer to the Stormwater Manual Vol. I: 2.5.2, Minimum Requirement #2, Construction Stormwater Pollution Prevention (SWPP).

A. All development, regardless of size, shall comply with Minimum Requirement #2 Construction Stormwater Pollution Prevention (SWPP), even when a permit is not required.

B. The SWPPP includes plans and a narrative:

   1. For Small and Medium Impact Projects, the applicant is required to complete the SWPPP Short Form for Small and Medium Impact Construction Projects. The form is available on the City's website: http://www.shorelinewa.gov/home/showdocument?id=42686
   2. For Large Impact Projects, the applicant is required to complete the Ecology's SWPPP template.

C. The following are minimum requirements need to be shown on the plans for all projects:

   1. Site areas which do not need to be disturbed shall remain undisturbed (clearing limits are defined and maintained);
   2. Runoff from areas not under construction does not flow over disturbed soils;
   3. Temporary cover on disturbed soils that are not being worked;
   4. Permanent cover installed without unnecessary delay on all areas at final grade;
   5. Off-site streets are kept free of dirt and mud originating from the construction site, using sweeping, not flushing, in the streets and, if appropriate, on-site wheel wash facilities;
   6. Dust is controlled and is in compliance with the Puget Sound Clean Air Agency; and
   7. Work in Critical Areas conforms to requirements of the City's Critical Areas Ordinance (CAO).
   8. Plans need to show construction BMP's to be used during construction.

D. If construction is being phased, the Director may require separate erosion and sediment control plans to address the specific needs for each phase of construction.

24.2. Rainy Season

A. The rainy season is defined as the months between October 1 and April 30 of any given year.

B. Slope stability and adequate protection of receiving waters are major concerns during the rainy season. For the following activities, clearing and grading is prohibited during the rainy season, unless the City has specifically given approval to continue or to initiate clearing and grading:

   1. Clearing and grading of 11,000 SF or more; or
   2. Disturbing more than 7,000 SF of soil and:
      a. Having area(s) that drain, by pipe, open ditch, sheet flow, or a combination of these to a tributary water, and the tributary water is one-quarter mile or less downstream; or
      b. Having slopes steeper than 15 percent adjacent or on-site; or
      c. Having highly erodible soils adjacent or on-site; or
      d. Located upstream of a critical area or critical area buffer; or
      e. Having high groundwater table or springs.
   3. Exemptions:
      a. Routine maintenance and necessary repair of erosion and sediment control BMPs;
      b. 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
      c. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

C. Seasonal Suspension Plan:

   1. When rainy season construction is prohibited, the Applicant shall provide a Seasonal Suspension Plan for review and approval. The plan shall be submitted to the City no later than September 1 and shall be implemented and inspected by September 30.
   2. The seasonal suspension plan shall include the following:

a. CESCL (with contact information) having the authority to direct implementation of additional measures or maintenance and repair of existing measures;
b. Inspections increased to weekly;
c. Erosion prevention and sediment control plan that protects all disturbed areas:
    i. Areas that are to be unworked during the wet season shall be seeded and mulched by September 30;
    ii. Cover measures shall be installed on all areas where seeding is not well established;
    iii. All soil stockpiles and steep cut-and-fill slopes shall have cover measures;
    iv. Construction road and parking lots shall be stabilized.

3. Stockpile on-site cover materials sufficient to cover 50 percent of disturbed areas.
4. Stockpile on-site at least 50 linear feet of silt fence (and the necessary stakes) per acre of disturbance.
5. Additional requirements for projects one acre or greater:
    a. Designated CESCL with contact information;
    b. Contingency plans for controlling spills and other potential pollutants which have been developed and are ready to implement at the construction site;
    c. Designated point of contact that can call out and direct crews 24 hours a day and seven days a week (24/7), obtain materials, and authorize immediate expenditures for on-site temporary erosion prevention and sediment control work;
    d. Compliance with all project approval conditions and permits (including Hydraulics Project Approval from Washington State Department of Fish and Wildlife and the Washington State Department of Ecology NPDES CSWGP);
    e. Ensure that turbidity in runoff from the construction area does not exceed 25 NTU or 5 NTU above background.

A. When clearing and grading during the rainy season is prohibited, building construction can proceed as long as clearing and grading is halted and the seasonal suspension plan is in place and being maintained.

Chapter 25. Flood Control

The City of Shoreline has identified areas in Thornton Creek Basin and along the Puget Sound coastline as flood plain areas. Projects in these areas shall submit a Floodplain Development Permit application, including a Floodplain Development Worksheet. The City shall review the application for compliance with FEMA floodplain development requirements and SMC Chapter 13.12.

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Chapter 26. Conveyance System

26.1. Pipe Specifications

A. Acceptable pipe materials are given in Table 21.

Table 21. **Pipe Materials, Cover, and Bedding**

Pipe Material	Minimum Cover (in)	Pipe Bedding Requirements
Perforated Corrugated polyethylene pipe (CPEP) (smooth interior)	24	3/4" minus crushed rock, compacted in 8-inch lifts
Non-perforated CPEP (smooth interior)	24	5/8" minus crushed rock, compacted in 8-inch lifts.
Reinforced concrete (RCP) or Polyvinylchloride (PVC – ASTM 3034)	12	Same as non-perforated CPEP
Ductile iron pipe	6	Same as non-perforated CPEP
Yard drain lines – any material	18	5/8" minus crushed rock, compacted in 8-inch lifts.

B. The applicant is responsible for determining adequate pipe sizes. The City of Shoreline refers to the King County Surface Water Design Manual, Chapter 4, for the design of conveyance systems. Amendments to these requirements are given in Table 22. The Director may require the applicant to verify the adequacy of the pipe size and expand the conveyance system, such as adding pipe or catch basins.

Table 22. **Conveyance System Specifications**

Element	Amendment
Acceptable Pipe Sizes	1. For public stormwater pipe and storm pipe in the right-of-way, the minimum diameter shall be 12 inches. With Director approval, eight-inch diameter pipe may be permitted on cross street laterals less than 66 feet long to avoid utility conflict or meet shallow gradient. 2. For private stormwater pipe, the minimum size shall be six inches.

Element	Amendment
Pipe Connections	SWPE: 1. Solid wall polyethylene (SWPE) pipe with maximum SDR of 32.5, minimum cell Class ASTM D3350-06 and meeting WSDOT Specifications for ductile iron pipe with restrained mechanical joints may be used for outfalls on steep slopes. Above ground installation of SWPE does not require pipe bedding. 2. Thermoplastic pipe, (e.g., SWPE) shall be tested using the deflection test procedure described in Section 7-17.3 of the WSDOT Standard Specifications.
Changes In Pipe Size Pipe System Connections	Connections to pipe systems may be made without placing a catch basin or manhole on the mainline by meeting all of the following conditions: 1. The mainline pipe diameter is 48 inches or greater and at least two times the size of the connecting pipe; 2. Make connections in accordance with the manufacturer's recommendations. Standard shop fabricated tees, wyes and saddles shall be used, except for concrete pipe connections; 3. There shall be a catch basin or manhole on the connecting pipe within two to 10 feet of the external wall of the main line; 4. Offset angle of connecting pipe to mainline, horizontally and vertically, shall be less than 45 degrees; 5. Two-point survey control shall be used to set catch basin locations.
Pipe Design between Structures	In the right-of-way: 1. Catch basins shall be spaced no greater than 150 feet for grades less than one percent, 200 feet for grades between one percent and three percent and 300 feet for grades three percent and greater. 2. Catch basins rather than inlets shall be used to collect stormwater from road surfaces, unless approved by the Surface Water and Environmental Services (SWES) Manager.

Element	Amendment
Pipe System Installation	1. Install pipe in accordance with section 7-08 of the WSDOT Standard Specifications. 2. For nonmetallic pipe that does not contain wire or other acceptable proximity detection features, add detection wire or place in a cast iron or other acceptable metal casing. 3. Unstable soil conditions, such as peat, shall be removed from under pipes unless special measures are approved by the City. 4. For pipe crossings In the right-of-way: a. A pad is required for some installations to provide additional protection between adjacent utilities. The size of the pad shall be based on the outside diameter (O.D.) of the larger crossing pipe. The pad shall be O.D. by O.D. square by two and one-half inches thick minimum or as required to protect the pipes. The pad shall be a strong, resilient, medium-density, closed-cell, polyethylene foam plank (Dow Ethafoam 220, or accepted equivalent). b. A pipe sleeve is required for some installations to provide additional protection of stormwater from potential leakage from other utilities. A pipe sleeve shall be a single section of PVC pipe (no joints) with a minimum length of three feet to each side of pipe crossing. The pipe sleeve shall be placed around the stormwater pipe with the annular space between the pipe sleeve and the stormwater pipe filled with grout. Additional measures may be necessary to ensure system integrity and may be required on a case-by-case basis.
Pipe Testing	1. Thermoplastic pipe (e.g., SWPE) shall be tested using the deflection test procedure described in Section 7-17.3 of the WSDOT Standard Specifications.

C. The minimum vertical clearances for storm conveyance systems are given in Table 23. Utility providers may have additional clearance or crossing requirements. The applicant shall verify with the utility provider. If achieving the minimum clearance is not possible, use of pads or pipe sleeves may be allowed with approval from the Surface Water and Environmental Services (SWES) Manager.

Table 23. Conveyance System Vertical Clearances

Utility	Location (Above or below Storm Pipe)	Minimum Clearance	Special Requirement
Electrical	Above or below	12 inches	Standard
Communications	Above or below	12 inches	Standard
Water main or gas main	Above or below	12 inches	Standard
Water main or gas main	Above or below	6 inches	Ethafoam pad
Sanitary Sewer	Below	12 inches	Standard
Sanitary Sewer	Above	18 inches	Standard
Sanitary Sewer	Above or below	6 inches	Pipe sleeve and Ethafoam pad
Liquid petroleum	Above or below	18 inches	

D. The minimum horizontal spacing between closed storm drains and water mains, gas mains, other underground utility facilities and all structures shall be 5 feet horizontally.

1. The minimum horizontal distance between any open storm drainage facilities (swales, open channels, biofiltration swales, etc.) and water mains, gas mains, and other underground facilities shall be 10 feet.
2. For pipe crossings, the preferred horizontal angle is 90 degrees, but 20 degrees obtuse or acute of 90 degrees is acceptable.

26.2. Drop Structures

Drop structures shall only be allowed through a Deviation from Engineering Standards. Refer to Section 6.3. In general, drop structures shall not be approved if the drop is less than five feet.

26.3. Rockeries/Retaining Walls Crossing

Crossing of rockery/retaining wall and drain pipe should be perpendicular. Depending on conditions, the drain pipe may need a steel casing per engineer recommendation.

Rockeries and retaining walls may have foundation drains, when required by the design engineer. The foundation drain outlets must connect to an approved outfall.

26.4. Ditch Modifications

Ditches are an integral part of the stormwater conveyance system within the right-of-way and as such, modifications shall be reviewed and approved through the permit process.

A. Ditches having 10 percent or flatter longitudinal slopes shall remain open. The City may approve enhancement when either a "natural drainage system" swale design or a "bioretention ditch" design is proposed.

B. Ditch closure approvals are subject to the following criteria:

1. A Right-of-way Use Permit is required. The design must be prepared by a Washington State licensed professional engineer. The City shall review all applications to verify compliance with the City's critical areas requirements.
2. The property owner is responsible of the cost of permit, engineering, materials, labor, and equipment required for the installation.
3. The preferred pipe material is perforated corrugated polyethylene pipe (smooth interior). Types of pipe other than those listed in the Table 21 may be approved based on site constraints. Perforated pipe is not recommended when the bottom elevation of the ditch line is below the finished floor elevation of nearby structures.
4. Minimum pipe diameter (interior) is 12 inches. Larger pipes may be required by existing conditions or proposed changes.
5. Join dissimilar materials directly underground using a coupler specifically designed for the two types of material used. If the coupler does not exist for the two types of materials, then a structure is required to make the material transition.
6. Install a catch basin:
    a. At low points that drain to the ditch,
    b. At locations where roof downspouts, footing drains or other surface water piping connects to the ditch, and3
    c. For maintenance purposes, when the pipe run is 100 feet or greater.
7. Once the pipe is installed and covered, the disturbed areas must be graded such that any runoff from the road and private property is directed to a catch basin or open ditch. Cover the graded area using compacted 5/8" minus crushed rock.

8. Reasonable use of the adjacent property is not possible. This includes culvert installations that are necessary to provide driveway access.
9. Harm or threat of harm to public health, safety and welfare, the environment, or public and private property shall not exist or be a result of the work.

C. Modifications shall be designed by a Professional Engineer licensed in the State of Washington and shall meet the material and design requirements of this chapter.

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DIVISION 4 – CONSTRUCTION AND INSPECTION

Chapter 27. Construction

27.1. Standards

Construction, workmanship and materials shall be in accordance with the approved plans, permit conditions, and the standards referenced in this manual. Any change to these standards during construction in the right-of-way shall be approved by the Director.

A. Standard Specifications for Road, Bridge, and Municipal Construction M 41-10, WSDOT.

B. Surface Water Design Manual, Chapter 4 "Conveyance System Analysis and Design", King County, as amended in Division 3 – Surface Water.

C. Manual on Uniform Traffic Control Devices, Federal Highway Administration: http://mutcd.fhwa.dot.gov/

D. Surface Water Management Manual for Western Washington, Department of Ecology, as modified in Division 3 – Surface Water.

27.2. General

A. Work Hour Restrictions:

1. Work in arterials is restricted to the hours between 9:00 a.m. and 3:00 p.m., unless approved in the permit or by the City Traffic Engineer.
2. Sounds originating from construction sites, including but not limited to sounds from construction equipment, power tools and hammering between the hours of 10:00 p.m. and 7:00 a.m. on weekdays and 10:00 p.m. and 9:00 a.m. on weekends are considered public disturbance (SMC Chapter 9.05), except construction noise or other noise generated in response to emergency situations, in times when unexpected and uncontrollable events result in an imminent risk of physical harm or property damage.
3. Weekend or City-recognized holiday work may be allowed with five working days prior approval.
4. For night and/or weekend work, a noise variance permit is required pursuant to SMC 9.05.080.
5. In school zones, work may be restricted to alternative hours as approved in the permit and coordinated with the school district.

B. Survey Monuments:

1. Anyone performing construction, maintenance, or other work in Shoreline shall protect all survey monuments within the area of work.
2. The Permittee is responsible for all contractors working on the project. If it is necessary to disturb a survey monument, the Inspector shall be notified and a permit from the Department of Natural Resources shall be obtained before the disturbance occurs.
3. Failure to comply with Washington State requirements RCW 58.04.015 regarding monument removal or destruction is a gross misdemeanor and is punishable by a fine and/or imprisonment, and liability for the cost of reestablishment.

C. Vegetation:

1. Drainage areas shall be protected during construction. If an area has any type of channel/drainage swale that provides a hydrologic connection to vegetation protection area(s), the channel shall also be protected throughout the construction phase by fencing and use of erosion control measures to prevent untreated runoff from the construction site to flow into the channel.

D. During construction, the SWPPP shall be revised as necessary by the Certified Erosion and Sediment Control Lead (CESCL) or SWPPP supervisor to address changing site conditions, unexpected storm events, or non-compliance with the SWPPP performance criteria.

1. The City may stop site work if the SWPPP is not being monitored and maintained, or if the runoff leaving the site exceeds state standards.

E. Cleanup, incidental and collateral damage:

1. The street right-of-way, material storage sites, construction staging areas, and all other areas affected by the work shall be left neat and presentable and shall be fully restored as necessary to pre-existing or better condition.
2. Costs associated with site cleanup and restorations are integral to the project. If the City incurs additional cleanup costs, these costs may be billed to the Permittee or contractor. Moreover, except as provided in RCW 19.122.030, any damage or destruction to existing public or private facilities done during the course of work shall be restored at the Permittee's or contractor's expense. This includes restoration of all traffic devices and pavement markings. The Director shall determine the extent of

damage and order the extent and type of restoration, except as provided in RCW 19.122.030.

27.3. Temporary Traffic Control

A. Refer to Appendix K – Traffic Control Plan Submittals.

B. Pursuant to SMC Chapter 12.15, a traffic control plan shall be prepared to address disruptions to traffic and pedestrians.

C. A temporary traffic control (work zone) plan shall be submitted and approved before beginning any work requiring traffic control.

D. The Inspector may approve field adjustments to traffic control to meet actual conditions.

E. The traffic control plan shall be consistent with the standards defined in the MUTCD and Standard Plans 900 Series. The following basic principles and standards shall be observed by all those who perform work within a street right-of-way.

1. Work areas are safe, and congestion is minimized;
2. Motorized and nonmotorized traffic is warned, controlled, and protected;
3. Emergency access is maintained; and
4. All traffic is expedited through the work zone to the extent possible.

F. The traffic control plan shall allow for continued emergency services. For business disruption, the plan shall contain adequate connections and clear signage.

G. If steel plates are approved for use, the plates shall be pinned, and cold mix asphalt shall be added to provide suitable transition from the roadway to the top of the steel plates.

H. "MOTORCYCLES USE EXTREME CAUTION" signs and appropriate plaques shall be installed for each traffic directions when conditions stated in RCW 47.36.200 require them.

I. Coordination of disruptions to signal loops during construction shall occur at the project pre-construction meeting.

27.4. Staking

A. At a minimum, items that require staking include property corners, subgrade elevations, slope (grade) stakes, right-of-way location, drainage structures and other permanent structures.

B. Staking of property corners shall be maintained until final acceptance of the project.

C. In the right-of-way, all surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The Professional Engineer or Land Surveyor directing such work shall be licensed by the State of Washington.

D. A pre-construction meeting shall be held with the City prior to commencing staking. The minimum staking of streets shall be as follows:

1. Stake centerline alignment every 25 feet (50 feet in tangent sections) with cuts and/or fills to subgrade;
2. Stake top of ballast and top of crushed surfacing at centerline and edge of pavement every 25 feet;
3. Stake top back of curb at a consistent offset for vertical and horizontal alignment;
4. Staking shall be maintained throughout construction.

27.5. Trenches

A. General:

1. The Director may allow trenchless methods such as boring or jacking when it is demonstrated that trenching methods are not possible due to surface and subsurface conflicts or soil conditions or when the utility is installed after reconstruction or overlay of the road.
2. Open trench sides shall be kept as nearly vertical as possible and follow WISHA safety requirements.
3. When groundwater is anticipated or is encountered during trenching, a dewatering plan shall be provided for approval.

B. Backfill:

1. All subgrade shall be compacted to 95 percent maximum density as described in Section 2-03 of the latest version of the WSDOT Standard Specifications;
2. Crushed surfacing materials used for backfill shall conform to Section 4-04 of the latest version of the WSDOT Standard Specifications;
3. Granular material shall conform to Section 9-03.19 of the latest version of WSDOT Standard Specifications;

4. Native material may be used if deemed acceptable by the City. Soils test are required to determine if the material is acceptable and to test for adequate compaction. When existing material is used, the top 6" shall be Crushed Surfacing Top Course;
5. CDF shall meet the requirements of 2-09.3 of the latest version of the WSDOT Standard Specifications.

C. Temporary Trench Closure:

1. Trenches that will receive traffic or that will be left overnight before final restoration shall be covered by a temporary patch or by installation of steel plates. The temporary patch material can be hot mix or cold mix placed directly into the trench, bladed out, and compacted. The trench shall be filled flush to the surrounding surfaces to provide a smooth riding surface.
2. Use of steel plates requires approval from the Inspector. If approved shall follow section 28.4 of this chapter.
3. Steel plate(s) shall cover CDF for at least 48 hours prior to pavement placement.
4. Prior to predicted or possible snow events, the Inspector shall be notified of all the locations of steel plates.

27.6. Sidewalks

A. See Standard Plan 309 Curb and Sidewalk Joints.

B. During removal, panels should be removed to the nearest complete and competent panel.

C. Installation:

1. Install an 18-inch root barrier placed between trees and sidewalks/curbs/driveways;
2. Use Class 4000 concrete four-inches thick with a non-slip broom finish, except driveway approaches, where the concrete shall be six-inches thick;
3. Surfacing shall be Portland cement concrete. The concrete shall be placed and finished per WSDOT Standard Specifications 8-14.3 (3);
4. All concrete shall be free of postmarks, graffiti, footprints, and tire marks prior to acceptance;
5. Concrete sidewalks shall be cured for at least 72 hours. During curing time, sidewalk shall be protected from pedestrian and vehicle traffic;

6. Expansion joints shall consist of 3/8" wide full depth premolded material. Expansion joints shall be placed around fire hydrants, poles, posts, and utility castings;
7. Expansion joints in sidewalks shall be located so as to match the joints in the curb whether the sidewalk is adjacent to curb or separated by an amenity zone.

27.7. Landscaping

A. Soil:

1. All disturbed soils that do not have structures on them shall be remediated according to BMP T5.13 Post Construction Soil Quality and Depth (Stormwater Manual); except
2. Soils for improvements, such as biofiltration and raingardens, shall meet specified material and installation requirements.

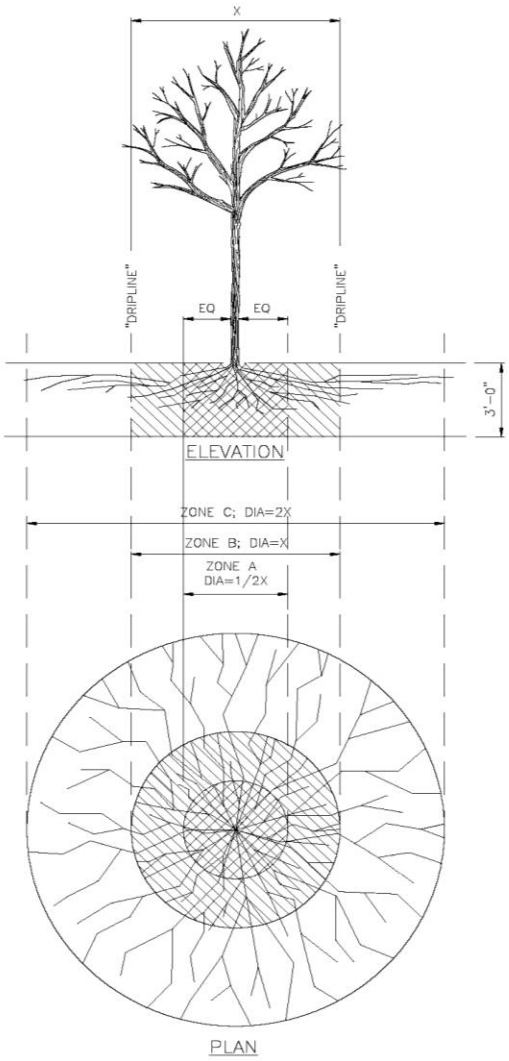
B. New Street Tree Installation:

1. Refer to Standard Plan 308 Street Tree.
2. Refer to Section 15.2 for street tree clearance requirements.
3. Mature tree and shrub root mats may overlap utility trenches, as long as approximately 80 percent of the root mat area is unaffected;
4. Trees shall be staked using five-foot staking and root barriers between the tree and the sidewalk and curb.
5. All new street trees are required to have a 10-foot long root barrier, centered on both sides of the tree.

C. Existing street trees and tree root systems shall be protected utilizing the following methods:

1. Reducing soil compaction during the construction phase by protecting critical tree root zones;
2. Prohibiting the stockpiling or disposal of excavated or construction materials in the vegetation retention areas to prevent contaminants from damaging vegetation and soils;
3. Avoiding excavation or changing the grade near trees that have been designated for protection. If the grade level around a tree is to be raised, a dry rock wall or rock well shall be constructed around the tree. The diameter of this wall or well should be at least equal to the diameter of the tree canopy plus five feet;

4. Restricting trenching and excavation in critical tree root zone areas; (See Figure 5 Tree Protection - Right-of-Way)
5. Preventing wounds to tree trunks and limbs during the construction phase. In the event that a tree is damaged during construction, a licensed arborist shall inspect and determine if replacement is needed.



A TREE, VEGETATION, AND SOIL PROTECTION PLAN (TVSPP) IS REQUIRED FOR ALL PROJECTS. APPROVAL OF PLAN REQUIRED PRIOR TO MOBILIZATION. SEE SECTION 8-01.

TRENCHING/EXCAVATION

ZONE A (CRITICAL ROOT ZONE)

1. NO DISTURBANCE ALLOWED WITHOUT SITE-SPECIFIC INSPECTION AND APPROVAL OF METHODS TO MINIMIZE ROOT DAMAGE.
2. SEVERANCE OF ROOTS LARGER THAN 2"DIA REQUIRES ENGINEER'S APPROVAL
3. TUNNELING REQUIRED TO INSTALL LINES 3'-0"BELOW GRADE OR DEEPER

ZONE B (DRIPLINE)

1. ZONE B FOR ASYMMETRICAL COLUMNAR AND NARROW CONICAL TREE FORMS. ZONE B = 1' RADIUS FOR EVERY 1" OF TRUNK DIAMETER.
2. TUNNELING MAY BE REQUIRED FOR TRENCHES DEEPER THAN 3'-0".

Figure 5. Tree Protection – Right-of-Way

D. Amenity zone: The final grade of soil surfaces in planting strips shall accommodate runoff from sidewalk surfaces cross-sloped to drain toward the street.

E. Tree pits shall be graded to provide a soil surface 4 inches below the adjacent sidewalk and curb elevation and shall then be top-dressed with 4 inches of bark or wood chips to surrounding grade.

F. Protect Vegetation During Construction. The following steps shall be taken to protect vegetation during construction:

1. Map natural resource protection areas on all plans and delineate these areas on the site with silt, construction, or other appropriate fencing to protect soils and vegetation from construction damage.
2. Before any groundwork begins, meet and walk property with equipment operators to clarify construction boundaries and limits of disturbance.
3. Protect drainage areas during construction. If an area has any type of channel/drainage swale that provides a hydrologic connection to vegetation protection area(s), then the channel shall also be protected throughout the construction phase by fencing and use of erosion control measures to prevent untreated runoff from the construction site flowing into the channel.
4. Install signs and fences to identify and protect natural resource protection areas.
5. Protect trees and tree root systems utilizing the following methods:
    a. Reduce soil compaction during the construction phase by protecting critical tree root zones that usually extend beyond the tree's canopy or drip line;
    b. Prohibit the stockpiling or disposal of excavated or construction materials in the vegetation retention areas to prevent contaminants from damaging vegetation and soils;
    c. Avoid excavation or changing the grade near trees that have been designated for protection. If the grade level around a tree is to be raised, a dry rock wall or rock well shall be constructed around the tree. The diameter of this wall or well should be at least equal to the diameter of the tree canopy pursuant to SMC 20.50.370;
    d. Restrict trenching in critical tree root zone areas or require use of air spade excavation and/or root pruning;
    e. Prevent wounds to tree trunks and limbs during the construction phase;

f. Prohibit the installation of any impervious surfaces in critical root zone areas. Where road or sidewalk surfaces are needed under a tree canopy, unmortared porous pavers or flagstone (rather than concrete or asphalt) or bridging techniques should be used;

g. Prepare tree conservation areas to better withstand the stresses of the construction phase by fertilizing, pruning, and mulching around them well in advance of construction activities.

27.8. Curb, Gutter, and Access Approach

A. Type A vertical curb and gutter shall be used on all street classifications. Refer to Standard Plan 312 Curbs.

B. All curb and gutter shall be constructed with Class 4000 concrete furnished and placed in accordance with WSDOT Standard Specifications, Sections 6-02, 8-04, and 8-14. Cold weather precautions as set forth in WSDOT Standard Specifications Sections 5-05.3(14) and 6-02.3(6) shall apply.

C. Subgrade compaction for curbs, gutters, access approaches, and sidewalks shall meet a minimum 95 percent of maximum density per ASTM D1557. Compaction shall be tested by an independent testing laboratory.

D. Extruded curb is not allowed in the public right-of-way, unless it is temporary and/or approved by the Director.

1. When used, extruded cement concrete curb shall be anchored to existing pavement by either steel tie bars or adhesive in conformance with WSDOT Standard Specification Section 8-04.
2. When used, extruded asphalt concrete curb shall be anchored by means of a tack coat of asphalt in accordance with WSDOT Standard Specification Section 8-04.

E. A concrete access approach shall have a construction joint at the right-of-way line.

27.9. Pavement Restoration

A. General:

1. Anyone creating an opening in the right-of-way is responsible for permanent restoration.

2. Temporary cold mix patches shall be maintained at all times by the Permittee.
3. Pavement restoration shall be completed within 30 days unless approved by the permit or by the Inspector.

B. Cement Concrete Pavement:

1. Refer to Standard Plan 801 Rigid Pavement Patching.
2. Cement concrete roadway shall be restored to the nearest half panel.
3. Cement concrete shall be replaced or patched with concrete.
4. Any cement concrete pavement traffic lane affected by the trenching shall have all affected panels replaced.
5. Cement concrete pavement shall be connected to existing concrete pavement with dowels and epoxy and restored with mix per WSDOT Standard Specification 9-01.2(1).
6. Concrete pavement shall be restored consistent with WSDOT Standard Plan A-60.10-03.

C. Asphalt Concrete Pavement:

1. Refer to Standard Plan 802 Flexible Pavement Patching.
2. Asphalt concrete pavement removal may be by full depth saw cut or drum grinder.
3. Asphalt concrete pavement cut widths, based on the final trench width, for pavement restoration/patching shall be according to Standard Plan 802 Flexible Pavement Patching; however, the Inspector may extend cut limits to competent roadway pavement.
4. The Inspector shall approve the restoration limits before restoration begins.
5. Cuts in asphalt shall be wide enough to accommodate compaction equipment.
6. Cuts shall be expanded to include joints, panel edges, existing patches or cracks within four feet of the opening.
7. Cuts shall be expanded to ensure that new longitudinal joints are not located in a wheel path.
8. The cut face shall be neat, straight and vertical. The corners shall be square.
9. When an existing asphalt paved street is to be widened, the edge of pavement shall be saw-cut to provide a clean, vertical edge for joining to the new asphalt at the time of

the placement of the new asphalt. After placement of the new asphalt section, the joint shall be sealed.

D. Overlay:

1. A public street shall be overlaid when any one of the following conditions applies:
    a. Utility installation parallel to the pavement centerline requires half street overlay from the centerline to the curb line for the entire length of the utility installation.
    b. If the utility trenching encroaches on both sides of the centerline, a full street overlay along the entire length of the utility installation shall be required;
    c. Utility installation consisting of three or more perpendicular (transverse) trenches within 150 feet, measured along the pavement centerline, requires overlay from the curb line to the centerline for the full length of the utility installation. If a trench extends beyond the centerline, the Director may require a full street overlay;
    d. Utility installed at an angle to the pavement centerline requires an overlay from the centerline to the curb line for the entire length of the utility installation. If the utility trenching encroaches on both sides of the centerline, the Director may require a full street overlay;
    e. When the permit conditions require street improvements and the existing pavement has alligator cracking, the existing pavement shall be removed and paved from the centerline to the new curb line.
2. Cold-plane both ends of the overlay perpendicular to the roadway for at least 15 feet to provide a flush transition. For half-street or full-street overlays, cold-planing (grinding) of the entire paving area is required (centerline to gutter or gutter to gutter). When curb and gutter does not exist, the new overlay surface may, at the Director's discretion, be tapered to meet the elevation of adjacent paved surfaces. All asphalt joints and tapered transitions shall be sealed with AR4000 or equivalent.
3. Where curb and gutter does not exist, the shoulder shall be restored with crushed rock.

E. Channelization:

1. All channelization and pavement markings such as raised pavement markers, paint, thermoplastics, etc., shall be pre-marked by a City-approved striping contractor, and the layout approved by the Inspector, prior to permanent installation by the contractor. Approval may require a three-working day notice for layout approval.

F. Testing:

1. Prior to placing any asphalt surface materials on the roadway, the Inspector shall review and approve density test reports, certified by a professional engineer, for the crushed surface base course and the crushed surface top course.
2. Testing shall be performed by a certified independent testing laboratory. The cost of testing is the responsibility of the franchise utility or contractor. The testing is not intended to relieve the contractor from any liability for the trench restoration.
3. Material testing may be required for trench backfill (native or imported), asphalt, and concrete.
4. All densities shall be determined by testing specified in WSDOT Standard Specifications.
5. Compaction of all lifts of asphalt shall be at an average of 91 percent of maximum density as determined by WSDOT Standard Specifications.
6. The compaction tests shall be performed in maximum increments of two feet. The number of tests required per square foot of material shall be as follows or as directed by the Inspector is included in Table 24:

Table 24. **Number of Compaction Tests**

Total Amount of Material	Number of Tests
Less than 50 SF	1
50 – 100 SF	2
100 – 300 SF	3
Greater than 300 SF	3, plus 1 for every additional 200 SF over 300 SF

27.10. Stop Work

If a permit is issued and the City subsequently issues three stop-work orders for insufficient erosion prevention and sedimentation control, the permit shall be suspended until the dry season, or, if violations occurred in the dry season, until weather conditions are favorable and effective erosion and sedimentation control is in place. The suspension shall be removed at the end of the rainy season or upon the City's determination that appropriate BMP's have been installed and are working and that the Permittee has adequate resources and abilities to manage BMPs effectively without further discharges that do not meet requirements.

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Chapter 28. Inspection

The City's inspectors inspect work performed under an approved permit. The Combination Inspectors in Planning and Community Development provide inspection services for the permitted on-site work; Public Works Construction Inspectors provide inspection services for permitted right-of-way development and for franchise permits for the right-of-way.

28.1. Authority and Duties of Inspectors

A. The Inspector functions as a resource for the Permittee and contractor. The duties of the Inspector include, but are not limited to:

   1. Conducts field investigations;
   2. Interprets and applies standards;
   3. Monitors compliance with permit conditions;
   4. Monitors utilities protection;
   5. Monitors traffic control and pedestrian access;
   6. Monitors excavation, shoring, backfill and restoration, and public safety;
   7. Enforces the Stormwater Pollution Prevention Plan during construction;
   8. Reviews as-constructed drawings (record drawings).

B. The Inspector has the authority to reject defective material and suspend work that is being done improperly. The Inspector may advise the Applicant or contractor of any faulty work or materials; however, failure of the Inspector to advise the Applicant or contractor does not constitute acceptance or approval. The Inspector has the authority to require revisions to approved engineering plans when necessary due to conflicting field conditions. The Permittee/Contractor is required to comply with all applicable codes and standards.

C. The Inspector is not authorized to revise, alter, or relax the provisions of these standards or the SMC. Such changes shall be approved by the Director.

28.2. Inspection Requirements

A. At all times during construction, the Permittee/contractor shall have the issued permits and approved plans and specifications on the job site.

B. Tree protection and erosion control measures shall be installed and inspected prior to any clearing or grading activities.

C. All construction or work for which a permit is required shall be subject to inspection by the City. The City may inspect any project at any stage of the work to determine that adequate control is being exercised.

D. It shall be the duty of the Permittee to cause the work to remain accessible and exposed for inspection purposes. Failure to notify the City of readiness for inspection in a timely manner may result in the requirement to remove and/or replace buried or hidden elements. The City shall not be liable for the expense entailed in the removal or replacement of any material required to allow for inspection.

E. Inspection of construction in the right-of-way may include the items listed below. Specific inspections are determined at the pre-construction meeting:

    1. Survey monuments;
    2. Survey stakes: Construction staking prior to construction. Could include contour lines of boundaries and depth of all existing floodplains, wetlands, channels, swales, streams, storm drainage systems, roads (low spots), bogs, depressions, springs, seeps, swales, ditches, pipes, groundwater, and seasonal standing water; property corners, subgrade elevations, slope (grade) stakes, right-of-way location; field verification of existing and proposed grading contours; work limits and clearing limits; or forms elevations (before concrete is poured);
    3. Stormwater Pollution Prevention Plan implementation, including installation and maintenance of BMPs;
    4. Staging and stockpile areas;
    5. Construction traffic routing; traffic control; signage and channelization;
    6. Drainage facilities – materials and installation;
    7. Retaining walls and rockeries;
    8. Utility installation, depth and location;
    9. Pavement cuts;
    10. Trench backfill/compaction;
    11. Roadway centerline elevations;

12. Elevations at curb radii PVC's, PVI's, and PVT's;
13. Right-of-way pavement restoration;
14. Landscaping installation and restoration, plants, root barriers, and irrigation;
15. Clean-up;
16. Record drawing with as-constructed information;
17. Punch list.

APPENDIX A - ACRONYMS AND DEFINITIONS

These acronyms and definitions are for use with this Engineering Development Manual. Unless specifically defined below, words or phrases used in this manual shall be interpreted to give them the meaning they have in common usage and to give this manual its most reasonable application.

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act
ADT	Average daily trips
AIA	American Institute of Architecture
APWA	American Public Works Association
ASTM	American Standards for Testing Materials
ATB	Asphalt treated base
AWWA	American Water Works Association
BMP	Best Management Practices
BVC	Begin of vertical curve – vertical curve
C	Long Chord Length (straight line between PC and PT) – horizontal curve
CDF	Controlled Density Fill
CESCL	Certified Erosion and Sediment Control Lead
CFR	Code of Federal Regulations
CSTC	Crushed Surfacing Top Course
DNR	Department of Natural Resources
DOE	Washington State Department of Ecology
DOH	Washington State Department of Health

e	Rate of Superelevation – horizontal curve
EDM	Engineering Development Manual
ESC	Erosion prevention and sediment control
EVT	End of vertical tangent – vertical curve
FBFM	Flood boundary/floodway map
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
HPA	Hydraulic Project Approval
JARPA	Joint Aquatic Resource Permit Application
KCSWDM	King County Surface Water Design Manual
L	Curve Length – horizontal curve
MUTCD	Manual on Uniform Traffic Control Devices
NAD	North American Datum, horizontal, of 1983/1991
NAVD	North American Vertical Datum
FIP	National Flood Insurance Program
NCHRP	National Cooperative Highway Research Program
NGVD	National Geodetic Vertical Datum of 1929
NICET	National Institute for Certification in Engineering Fundamentals
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units

OSHA	Occupational Safety and Health Administration
PC	Point of Curvature (point at which the curve begins) – horizontal curve
PCHB	Pollution Control Hearings Board
PI	Point of Intersection (point at which the two tangents intersect) – horizontal curve
PIT	Pilot Infiltration Test
PT	Point of Tangent (point at which the curve ends) – horizontal curve
PVI	Point of vertical interception (intersection of initial and final grades) – vertical curve
PW	Public Works Department
R	Radius – horizontal curve
SCL	Seattle City Light
SRD	Side Dimension Ratio
SWPE	Solid Wall Polyethylene
SWPPP	Storm Water Pollution Prevention Plan
T	Tangent Length – horizontal curve
TESC	Temporary erosion and sediment control
TSS	Total Suspended Solids
USACE	United States Army Corp of Engineers
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WISHA	Washington Industrial Safety and Health Administration

WSDOT Washington State Department of Transportation

Definitions

Access. The safe, adequate, and usable ingress/egress (entrance/exit) between private property and the public street system. Usually defined at the right-of-way.

Actual Elevation. The elevation in relationship to mean sea level.

Adverse Effect or Adverse Impact. Effect that is a direct or indirect result of a proposed action, or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. In the event that the overall effect of the proposed action is beneficial, but is also likely to cause some adverse effects, then the proposed action is considered to result in an adverse effect.

Alley. A service roadway, not designed for general travel, providing a primary or secondary means of automobile, service vehicle, or emergency vehicle access to abutting property and not intended for primary traffic or pedestrian circulation.

Alignment. The route of the road, defined as a series of horizontal tangents and curves.

Amenity Zone. That area, adjacent to the curb or paved roadway and within the right-of-way, which is commonly landscaped, but may include other features for the City's benefit such as utilities, traffic signs, bioretention facilities and mailboxes.

Applicant. Any person, governmental agency, or other entity that executes the necessary forms to procure official approval of a project or a permit to carry out construction of a project.

As-constructed. Actual surveyed locations of constructed elements. As-constructed information is included on Record Drawings.

Auxiliary Lane. The portion of the roadway adjoining the traveled way for parking, turning or other purposes supplementary to through-traffic movement.

Best Management Practices (BMPs). Schedules of activities, restrictions, maintenance procedures, and structural and/or managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to Waters of the State.

Bicycle Facilities. A general term denoting improvements and provisions to accommodate or encourage bicycling, including parking and storage facilities, and shared roadways specifically designated for bicycle use. (AASHTO)

Bicycle Lane or Bike Lane. A portion of a roadway which has been designated by pavement markings and, if used, signs, for the preferential or exclusive use of bicyclists. (AASHTO)

Bicycle Path or Bike Path. A pathway that is exclusively used by bicyclists, where a separate, parallel path is provided for pedestrians and other wheeled users. Most pathways are shared between bicyclists and other users: see Shared Use Path. (AASHTO)

Bicycle Route. A roadway or bikeway designated 1 by the jurisdiction having authority, either with a unique route designation or with BIKE ROUTE signs, along which bicycle guide signs may provide directional and distance information. Signs that provide directional, distance, and destination information for cyclists do not necessarily establish a bicycle route.

Bicycle Network. A system of bikeways designated by the jurisdiction having authority. This system may include bike lanes, bicycle routes, shared use paths, and other identifiable bicycle facilities. (AASHTO)

Bikeway. A generic term for any road, street, path or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. (AASHTO)

Bicycle Shared Lane. A lane of a traveled way that is open to bicycle travel and vehicular use.

Bicycle Shared Roadway. A roadway that is open to both bicycle 1 and motor vehicle travel. This may be an existing roadway, a street with wide curb lanes, or a road with paved shoulders. (AASHTO)

Bicycle Shared Use Path. A bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. (AASHTO)

Bicycle Shoulder. The portion of the roadway contiguous with the traveled way, for accommodation of stopped vehicles, emergency use and lateral support of sub-base, base and surface courses, often used by cyclists where paved. (AASHTO)

Bioretention Best Management Practices. Engineered facilities that store and treat stormwater by passing it through a specified soil profile. Refer to the DOE Stormwater Manual. Volume V, Chapter 7 for bioretention practices and design specifications.

Bulb. Area for vehicle turnaround typically located at the end of a cul-de-sac street.

Chlorinated. Water that contains more than 10 mg/Liter chlorine.

City. The City of Shoreline.

Clear sight triangle. An area of unobstructed vision at street intersections or street and driveway intersections defined by lines of sight between points at a given distance from the intersection of street and/or driveway lines.

Clearance. The minimum distance between elements in, under and above the street right-of-way.

Clearing. Removal of vegetation from a site by physical, mechanical, chemical, or other means which exposes the earth's surface or any actions which disturb the existing ground surface. This does not mean landscape maintenance or pruning consistent with accepted horticultural practices.

Comprehensive Plan. The plan and amendments as described in SMC Chapter 20.20.

Conveyance System. Natural and man-made drainage features that collect, contain, and convey surface water. Natural drainage features include swales, streams, rivers, lakes, and wetlands. Man-made features include swales, gutters, ditches, pipes, and detention/retention facilities.

Corner clearance. The distance between a driveway and the nearest intersecting street.

Critical areas. Critical areas as defined in SMC 20.20.014.

Cross section. Vertical section of a roadway showing the position and number of vehicle and bicycle lanes, curb and gutter, amenity zones, and sidewalks, along with their cross slope or banking. Cross

sections also show drainage features, pavement structure and other items outside the category of geometric design.

Cul-de-sac. The circular turnaround at the terminus of a street end.

Crosswalk. The portion of the roadway between the intersection area and a prolongation or connection of the farthest sidewalk line or in the event there are no sidewalks then between the intersection area and a line 10 feet there from, except as modified by a marked crosswalk. RCW 46.04.160

Daily Traffic – Annual Average (AADT). Daily traffic that is averaged over one calendar year.

Daily Traffic – Average (ADT). The average number of vehicles passing a specified point during a 24-hour period.

Dangerous Waste. Those solid wastes designated in the Washington Administrative Code (WAC) 173-303-070 through 173-303-100 as dangerous or extremely hazardous or mixed waste, as further defined under WAC 173-303-040.

Dead End. Street End. A road or street without an exit.

Declaration of Covenant. A legal document between the City and persons holding title to the property requiring the title holder to perform required maintenance and repairs on drainage facilities necessary to meet the City's specified standards within a reasonable time limit. The covenant also grants the City permission to access the property to inspect drainage features.

Design Speed. A selected speed used to determine the various geometric features of the roadway.

Detention Structure. A permanent structure designed to store runoff and discharge storage at controlled rates.

Developer. The person or entity that owns or holds purchase options or other development control over property for which development activity is proposed.

Development. The division of a parcel of land into two or more parcels; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any

mining, clearing, or grading; changes to surface or ground waters; or any use, change of use, or extension of the use of land. (SMC 20.20.016).

Deviation from Engineering Standards. Written permission from the City to depart from the requirements of the Engineering Development Manual.

Director. The Public Works Director or designee.

Discharge. Runoff leaving a new development or redevelopment via overland flow, built conveyance systems, or infiltration facilities.(Stormwater Manual)

Drainage Facility. A constructed or engineered feature that collects, conveys, stores, or treats stormwater runoff. "Drainage facility" includes, but is not limited to, a constructed or engineered stream, pipeline, channel, ditch, gutter, lake, wetland, closed depression, flow control or water quality treatment facility, erosion and sediment control facility and other structure and appurtenance that provides for drainage.

Drainage. Collection, conveyance, containment, and/or discharge of surface water and stormwater runoff. (Stormwater Manual)

Driveway. The on-site portion of an access to a property. Driveway is privately owned and maintained.

Driveway/Access – Approach. That area between the pavement edge of the intersecting street and the right-of-way/property line.

Driveway – Apron. See Driveway/Access – Approach.

Driveway – Shared. A jointly owned and maintained tract or easement serving two properties.

Easement. A grant by the property owner of the use of a strip of land by the public, corporation or persons for specific purposes.

Engineer – Geotechnical. A practicing, professional civil engineer licensed by the State of Washington, who has knowledge and practice of geotechnical engineering.

Engineer – Professional. An engineer, licensed to practice in the State of Washington as a Professional Engineer.

Engineer – Soils. Geotechnical Engineer.

Engineering – Geotechnical. The application of soil mechanics in the investigation, evaluation, and design of civil works involving the use of earth materials and the inspection or testing of the construction thereof.

Engineering Geologist. A geologist certified by the State as experienced and knowledgeable in engineering geology.

Engineering Geology. The application of geologic knowledge in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works.

Eyebrow. A partial bulb located adjacent to the serving road that provides access to lots and serves as a vehicle turnaround.

Financial Guarantee. A surety, bond, cash deposit, assignment of funds, or other means acceptable to the City to guarantee acceptable performance, execution, completion of the work and maintenance, in accordance with the project's approved plans and in accordance with all applicable governmental requirements. (SMC Chapter 12.15 and SMC Chapter 20.50)

Fire Apparatus Access Road. As defined in the International Fire Code.

Fire Lane. As defined in the International Fire Code.

Fixed Object. An object having properties greater than a four-inch by four-inch wooden post.

Flow Attenuation. Detaining or retaining runoff to reduce the peak discharge.

Frontage. Any lot line abutting street right-of-way.

Frontage Improvements. Motorized and nonmotorized facilities, transit facilities, utilities, landscaping, and other such features located within the public right-of-way.

Grading. See Land Disturbing Activity.

Ground Disturbance. See Land Disturbing Activity.

Half-Street. A street constructed utilizing at least half the regular width of the right-of-way and permitted as an interim facility pending construction of the other half.

Hard Surface. An impervious surface, a permeable pavement, or a vegetated roof. (Stormwater Manual)

Impervious Surface. A non-vegetated surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-vegetated area which causes water to run off the surface in greater quantities or at an increased rate of flow from those present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for the purposes of determining whether the thresholds for application of minimum requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling. (Stormwater Manual)

Improvements. Any improvement to public, real, or personal property, including but not limited to, installation of streets, roads, pedestrian/bike facilities, streetlights, landscape features, sewer and waterlines, bridge structures, storm drainage facilities, and traffic control devices.

Infiltration. The downward movement of water from the surface to the subsoil. (Stormwater Manual)

Inspector. Designee of the Director.

Internal Road. A road that is contained within the development.

Intersection. The area from the intersection of a roadway to the radius tangent point or stop bar on each approach, whichever is greater.

Land Disturbing Activity. For the purposes of this Engineering Development Manual and SMC Chapter 13.10. 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 are not considered land disturbing activity. Stormwater facility maintenance is not considered land disturbing activity if conducted according to established standards and procedures.

Land Surveying. Establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries and monuments of land after they have been established, the survey of land areas for the purpose of determining the topography thereof, the making of topographical delineations and the preparing of maps and accurate records thereof, when the proper performance of such services requires technical knowledge and skill.

Landing. A road or driveway approach area to any public or private road or intersection.

Loop. Road of limited length forming a loop, having no other intersecting road, and functioning mainly as direct access to abutting properties. A loop may be designated for one-way or two-way traffic.

Low Impact Development (LID). A stormwater and land use management strategy that strives to mimic predisturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design. (Stormwater Manual)

LID Best Management Practices (BMPs). Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs, and water re-use. (Stormwater Manual)

Low Impact Development (LID) Principles. Land use management strategies that emphasize conservation, use of on-site natural features, and site planning to minimize impervious surfaces, native vegetation loss, and stormwater runoff. (Stormwater Manual)

Maintenance. Repair and maintenance includes activities conducted on currently serviceable structures, facilities, and equipment that involves no expansion or use beyond that previously existing and results in no significant adverse hydrologic impact. It includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems. Those usual activities may include replacement of dysfunctional facilities, including cases where environmental permits require replacing an existing structure with a different type structure, as long as the functioning characteristics of the original structure are not changed. One example is the replacement of a collapsed, fish blocking, round culvert with a new box culvert under the same span, or width, of roadway. In regard to stormwater facilities, maintenance includes assessment to ensure ongoing proper operation, removal of built up pollutants (i.e. sediments), replacement of failed or failing treatment media, and other actions taken to correct defects as identified in the maintenance standards of Chapter 4, Volume V of the Stormwater Manual. See also Pavement Maintenance exemptions in Section 2.2, Volume I of the Stormwater Manual.

Municipal Separate Stormwater 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), owned or operated by the state, City, county, or special purpose district having jurisdiction over disposal of wastes, stormwater, or other wastes, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; designed or used for collecting or conveying stormwater; which is not a combined sewer; and which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

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 the Washington Department of Ecology.

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. (Stormwater Manual)

Nephelometric Turbidity Units (NTU). These units are a quantitative measure of water clarity based on the scattering of a standard beam of light directed into a standard sample of the water when the scattering is measured at right angle to the beam. See also the definition for "turbidity" included below.

Off-Street Parking Space. An area accessible to vehicles, exclusive of right-of-way, that is improved, maintained, and used for the purpose of parking a motor vehicle.

Operation and Maintenance Plan. A set of instructions and schedules to keep drainage facilities working to meet the design performance criteria.

Outfall. Point source as defined by 40 CFR 122.2 at the point where a discharge leaves the MS4 and discharges to waters of the State. Outfall does not include pipes, tunnels, or other conveyances which connect segments of the same stream or other surface waters and are used to convey primarily surface waters (i.e. culverts). (Stormwater Manual)

Pavement Width. Paved area on shoulder-type roads or paved surface between curb, thickened edge, or gutter flow line on all other roads.

Performance Guarantee. A financial guarantee in a form acceptable to the City, ensuring that all improvements, facilities, or work shall be completed in compliance with regulations, and approved plans and specifications.

Permeable pavement. Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir.

Permittee. Any person, governmental agency, or other entity that is performing, or plans to perform, permitted work within the City.

Plans. The plans, profiles, cross sections, elevations, details, and supplementary specifications showing the location, character, dimensions, and details of the work to be performed.

Pollution. Contamination or other alteration of the physical, chemical, or biological properties of waters of the state that will or is likely to create a nuisance or render waters harmful, detrimental, or injurious 1) to public health, safety, or welfare, or 2) to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or 3) to livestock, wild animals, birds, fish, or other aquatic life. Contamination includes discharge of any liquid, gas, or solid, radioactive, or other substance. Alteration includes temperature, taste, color, turbidity, or odor. (Stormwater Manual)

Project Manager. City of Shoreline staff member responsible for coordinating City review of a development project.

Project. Activity encompassing all phases of the work to be performed and is synonymous to the term "improvement" or "work."

Project site. That portion of a property, properties, or rights-of-way subject to land disturbing activities, new hard surfaces, or replaced hard surfaces. (Stormwater Manual)

Profile. When referring to roadway design: Vertical aspect of the road, including crest and sag curves, and the straight grades connecting them.

Rainy Season. The period starting on October 1 of each year and ending April 30 of each following year. These dates may be adjusted by the Director based on climatic conditions for a particular year.

Receiving waters. Naturally and/or reconstructed naturally occurring surface water bodies, such as creeks, streams, rivers, lakes, wetlands, estuaries, and marine waters, or groundwater, to which a municipal separate storm sewer discharges.

Record Drawings. Drawings that document as-constructed conditions of a permitted development or redevelopment project.

Redevelopment. For surface water purposes: on a site that is already substantially developed (i.e., has 35 percent 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. (Stormwater Manual)

Replaced hard surface. For structures, the removal and replacement of hard surfaces down to the foundation. For other hard surfaces, the removal down to bare soil or base course and replacement. (Stormwater Manual)

Replaced impervious surface. See "replaced hard surface."

Right-of-way. Property granted or reserved for, or dedicated to, public use for street purposes and utilities, together with property granted or reserved for, or dedicated to, public use for walkways, sidewalks, bikeways, and parking whether improved or unimproved, including the air rights, sub-surface rights and easements thereto.

Road. Interchangeable with "Street".

Runoff. Water that travels across the land surface and discharges to water bodies either directly or through a collection and conveyance system. See also "Stormwater."

Sediment. Soils or other materials transported or deposited by the action of wind, water, ice, or gravity.

Shoulder. The paved or unpaved portion of the roadway outside the traveled way that is available for parking or nonmotorized use.

Sidewalk. All hard-surface walkways within public right-of-way or a public easement in the area between the street margin and the roadway, including driveways. (SMC 20.20.046)

Sight Distance. The distance along a roadway throughout which an object of specified height is continually visible. This distance depends on the height of the driver's eye above the road surface, the height of the specified object above the road surface, and the height and lateral positions of obstructions within the driver's line of sight. (AASHTO A Policy on Geometric Design)

Site Plan. The development plan for one or more lots on which is shown the existing and proposed conditions of the lot, topography, vegetation, drainage, flood plains, walkways; means of ingress and egress; circulation; utility services; structures and buildings; signs and lighting; berms, buffers, and screening devices; surrounding development; or any other information that reasonably may be required in order that an informed decision can be made by the reviewing authority.

Sight Distance – Stopping. The distance needed for a driver to perceive and react to a discernible hazard and then brake to a stop before reaching the hazard. (Urban Street Geometric Design Handbook, ITE)

Sight Distance – Intersection. The distance needed to safely make a right turn or a left turn from an access or to a cross street, or for a driver to safely make a left turn from a street to an access. (Urban Street Geometric Design Handbook, ITE)

Sight Distance – Decision. The distance needed for a driver to ascertain and safely respond to an unexpected difficult or unfamiliar situation. Regarding access location, sight distance should give familiar and unfamiliar drivers enough distance to safely turn into the desired access. (Transportation Research Board, 2003. Urban Street Geometric Design Handbook, ITE)

Site. Any tract, lot, or parcel of land, or combination of tracts, lots, or parcels of land which are in one ownership, or are contiguous and in diverse ownership, where development is to be performed as a part of a unit, subdivision, or project.

Special Drainage Areas. An area which has been formally determined by the City to require more restrictive regulation than Citywide standards afford in order to mitigate severe flooding, drainage, erosion or sedimentation problems which result from the cumulative impacts of development.

Stabilization. The prevention of soil movement by any various vegetative and/or structural means.

Storm Drainage Plan. A set of drawings and documents submitted as a prerequisite to obtaining a development permit. The plan contains all of the information and specifications pertaining to surface water management on-site and offsite.

Stormwater. See “surface water.”

Stormwater Manual. The most recent version of the Stormwater Management Manual for Western Washington published by Washington Department of Ecology adopted in Chapter 18.

Street. A public or recorded private thoroughfare providing pedestrian and vehicular access through neighborhoods and communities and to abutting property.

Street – Arterial. Provides a high degree of vehicular mobility by limiting property access. The vehicles on arterials are predominantly for through traffic. Arterials are generally connected with interstate freeways or limited access expressways.

Street – Arterial – Collector. Connect traffic from the interior of an area/community to the closest Minor or Principal Arterials.

Street – Arterial – Minor. Provide intra-community connections and are less significant from a perspective of a regional mobility.

Street – Arterial – Principal. Provide major vehicular travel routes between cities within a metropolitan area.

Street – Local Primary. Connect local streets to Collector Arterials.

Street – Local Secondary. Provides local access connections to higher classification streets.

Street – Non-Arterial. Provide local access to residential areas. Shoreline classifies local streets as Neighborhood Collectors or Local Streets.

Street – Private. A privately-owned and maintained access provided for by a tract, easement or other legal means.

Surface Water. Water originating from rainfall and other precipitation that is found on ground surfaces and in drainage facilities, creeks, rivers, streams, springs, seeps, ponds, lakes, wetlands, as well as shallow ground water. (Stormwater Manual)

Surveyor. A person licensed by the State of Washington to engage in the practice of land surveying, as defined by RCW 18.43.020.

Threshold Discharge Area. An on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath.) The purpose of this definition is to clarify how the thresholds of the Stormwater Manual are applied to project sites with multiple discharge points. (Stormwater Manual)

Traveled Way. The part of the road made for vehicle travel excluding shoulders and auxiliary lanes.

Turbidity Meter. A portable, electric, hand-held measuring device designed to give a numerical value of the turbidity (cloudiness) of a sample of water. The numerical values are expressed in units known as Nephelometric Turbidity Units (NTUs).

Turbidity. The visual cloudiness of the runoff especially as caused by suspended solids and settle-able solids that are being carried by the runoff.

Utility. Private or municipal corporations owning, operating or proposing to own or operate facilities that comprise a system or systems for public service. Private utilities include gas, electric, telecommunications, or water companies that are subject to the jurisdiction of the State Utilities and Transportation Commission and that have not been classified as competitive by the commission. (SMC 20.20.050)

Waters of the State. Those waters as defined as "waters of the United States" in 40 CFR Subpart 122.2 within the geographic boundaries of Washington State and "waters of the state" as defined in chapter 90.48 RCW which includes lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and water courses within the jurisdiction of the State of Washington.

APPENDIX B - SURVEY CRITERIA

Survey Format and Content

The following requirements apply to surveys performed for development projects. Review of the survey shall be conducted as part of the plan review process. Contact Planning and Community Development for land use survey requirements. A survey acceptable to the City shall contain the elements listed below:

1. The surveyor's stamp, signature, contact information and the date signed (See Note 1)
2. North arrow, graphic scale, legend, and vicinity map
3. Legal Description, if needed (See Note 2)
4. NAVD 88 and NAD83/91 are required (See Note 3)
5. Monuments within the project area (See Note 4)
6. Site benchmarks (See Note 5)
7. Right-of-way with dimensions, source references, and methods used to determine (See Note 6)
8. Easements with type, dimensions, and source references (See Note 7)
9. Property lines with bearings and distances (See Note 8)
10. Buildings (See Note 9)
11. Streets and street improvements (See Note 11)
12. Utilities (See Note 11)
13. Contours (See Note 12)
14. Steep slopes (See Note 13)
15. Topography (See Note 14)
16. Significant Trees (See Note 15)
17. Water features (See Note 16)
18. Protected areas, if required, including wetland boundaries (See Note 17)
19. Setbacks (See Note 18)
20. Underground hazards (See Note 19)
21. Any monuments in the project area that may be disturbed, destroyed, or removed shall be noted on the plans as requiring replacement. An application for a permit to remove or destroy a survey monument shall be filed with the Washington State

Department of Natural Resources, pursuant to RCW 58.24.040(8). Under such conditions add Note 21 to General Notes on plan (See Note 20).

See below for the notes referenced above:

Note 1. Land Surveyor's Stamp – Work consisting of the Practice of Land Surveying shall be done by or under the direction of a Surveyor licensed to practice in the State of Washington (RCW 18.43.010), and shall conform to all RCWs and WACs pertaining to surveying and engineering. Plans, specifications, plats and reports prepared by the Surveyor shall be signed, dated and stamped with the Surveyors' seal. (RCW 18.43.070) Washington State law defines the "practice of land surveying" as "assuming responsible charge of the surveying of land for the establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries and monuments of land after they have been established, the survey of land areas for the purpose of determining the topography thereof, the making of topographical delineations and the preparing of maps and accurate records thereof, when the proper performance of such services requires technical knowledge and skill." (RCW 18.43.020(9)

Note 2. Legal Description – Legal Descriptions are needed for plats, short plats, easements containing City utilities, etc. Include the plat name or short plat number, block number if any, and lot number or parcel letter, or the meet's and bounds description of the parcel.

Note 3. Data – The Washington State Lambert Grid Coordinate System North Zone, using the NAD83 (1991) datum as established in accordance with Chapter 58.20 Revised Code of Washington. The unit of measurement shall be the U.S. Survey Foot. The plans shall show the horizontal control used to establish ties to the datum, with type, size, and location, date visited, and the State Plane coordinates for each monument used. Show at least two monuments on each street in the project.

Project control may be shown in the design drawings, or on its own sheet. The Vertical datum for all survey work (including but not limited to mapping, platting, planning design, right-of-way surveys, and construction surveys) shall be the North American Vertical Datum of 1988 (NAVD 1988). The plans shall show the benchmarks used to establish ties to the datum, with reference number, description, location and elevation of each benchmark used, and any project site benchmarks. Information on horizontal and vertical control monuments

can be found in the Washington Council of County Surveyors Data Warehouse at http://plso.wadnr.gov/surveycontrol/data.htm.

Other acceptable sources for benchmarks are WSDOT, King County, and NOAA. When another benchmark is used, establish one benchmark for each datum and show on the plans. Include a local conversion factor between the two data. The benchmark used to establish the conversion factor shall be the benchmark nearest to the project site.

Note 4. **Monuments –** The plans shall show all monuments, geometry and references used to establish the right-of-way, lines referencing the right-of-way, property lines, easements and any rights in real property shown. The plans shall show bearing and distance on monument lines, or radius, delta angle, and curve length on curving monument lines, and the station at each monument. If construction baselines other than the monument line are used, show the relation of each baseline to the monument line. Survey control and boundary information may be shown on the design drawings, the vicinity map, or on its own sheet.

Note 5. **Benchmarks –** Show site benchmarks. Project site benchmarks shall be established by measurement from two local benchmarks, meeting Third Order procedural requirements as specified in the Geospatial Positioning Accuracy Standards by the Federal Geographic Data Committee. Site benchmarks shall be set in a location that shall not be disturbed by the proposed construction.

Note 6. **Right-of-way –** Show the width on each side of the monument line, and the references used. If the right-of-way is of variable width, show the width at each end of the block.

Note 7. **Easements –** Show easements Native Growth Retention Areas, and critical area buffers within the project area, with type, dimensions, and source reference.

Note 8. **Property Lines –** Show bearings and distances for straight property lines, and radius, delta angle, and arc length for curves.

Note 9. **Buildings –** Show the location of all existing buildings, including projections, roof overhangs, and covered breezeways. Show the perpendicular distance to the property and right-of-way lines when significant to development. Show footprints of recently demolished buildings.

Note 10. **Streets –** Show the right-of way lines, monument lines, concrete surfaces, asphalt surfaces, gravel surfaces, and channelization, centerlines, pavement edges, pavement widths, shoulders, ditch lines, curbs, sidewalks, and access locations.

Show the curbs, curb cuts, wheelchair ramps, gutter and flow lines, sidewalks, landscape areas, pedestrian and bike paths.

Note 11. **Utilities –** Field locate and show all visible utilities, structure, and appurtenances. Show buried utilities and the source of the information used. Show the location, size, and description of all utilities including water, power, sewer, and storm drainage systems and appurtenances. Show elevations at rim and inverts of manholes, catch basins, and inlets. Locate and dimension all fire hydrants, vaults, utility poles, etc.

Note 12. **Contours –** Show existing and proposed contours at 2-foot intervals for portions of the site with slopes greater less than 40 percent, and for those areas exceeding 40 percent that will be graded. Show 5-foot intervals for portions of the site with slopes that exceed 40 percent but will not be disturbed.

Note 13. **Steep Slopes –** Identify slopes 15 percent and steeper. Show the top of slopes 40 percent or steeper.

Note 14. **Topography –** Show rockeries, retaining walls, fences, bridges, swales, culverts, etc. Show the location, length, and height above finished grade of all fences, rockeries, and retaining walls. Note heights at end and mid points.

Note 15. **Significant Trees –** Show evergreen trees that are eight inches or more in diameter and deciduous trees that are twelve inches or more in diameter. Diameter is measured four feet above existing grade. Label each tree with common name and diameter. Show drip lines.

Note 16. **Water Features –** Show lakes, rivers, streams, ditches, ponds, and other surface water features. Show the line of ordinary high water and the top of any well-defined banks. Show the 100-year floodplain, and show wetland boundaries. Show protected areas: top of bank of Type 1, 2, and 3 streams, and the centerline of Type 4 streams.

Note 17. **Environmentally Sensitive Areas –** Show areas defined in Shoreline's Critical Areas Ordinance (SMC Chapter 20.80). If the survey shows protected areas on or adjacent to the

site, contact the Department of Planning and Community Development for boundary verification prior to designing the project.

Note 18. **Setbacks –** Show the required primary setbacks from the protected areas.

Note 19. **Underground Hazards –** Show areaways, tunnels, mines and other underground hazards.

Note 20. **Survey Monuments –** Survey Monuments shall not be removed, disturbed, covered, or destroyed before a permit is obtained from the Washington State Department of Natural Resources. At least four working days before a monument is removed, disturbed, covered, or destroyed, provide a copy of the DNR permit to the City representative assigned to the project.

APPENDIX C - SURFACE WATER REPORT GUIDELINES

Surface Water Report Guidelines

The surface water report is a comprehensive report that documents the technical information and analysis related to the storm drainage/surface water design of a project. All medium and large impact projects require a surface water report that meets the criteria of this appendix.

The standard report format below is an outline of the required documentation to be included in the surface water report. The specific content in each section depends on the complexity of the project and site conditions.

The report shall address each section in the outline. If a section does not apply, the engineer may simply state that the section does not apply with a brief explanation. This standardized report format allows a quicker, more efficient review of the surface water design.

General report requirements are listed below:

- The report shall be prepared, stamped, signed and dated by a Professional Engineer licensed in the State of Washington.
- All revisions shall be submitted in a complete revised report.
- The report shall be bound.
- The report shall be 8.5" x 11". Figures may be on 11" x 17" sheets.
- Each page shall be numbered.

COVER SHEET

The cover sheet has the:

- Project name and address;
- Applicant's name, address, and telephone number;
- Engineering firm’s name, address, and contact information;
- Engineer's name and license number;
- Report date and revision dates.

TABLE OF CONTENTS

Show the page number for each section of the report, including appendices.

1.0 PROJECT OVERVIEW

Introduce the formal project name, address and parcel numbers.

The project overview shall provide a general description of the project, redeveloped and developed conditions of the site, site area and size of the improvements, and the pre- and post-developed stormwater runoff conditions.

The overview should summarize difficult site parameters, the natural drainage system, and drainage to and from adjacent properties, including bypass flows. Include drainage requirements and restrictions from other agencies.

2.0 MINIMUM REQUIREMENTS

Discuss minimum requirements that apply to the project, as well as additional requirements from basin plans, critical areas, plat/short plat approvals, conditional use permits, and SEPA mitigations. Discuss any engineering deviations and any specific site conditions that affect design requirements. Discuss any assumptions used in design.

Provide the Flow Chart for Determining Requirements for New Development (Figure 2.4.1) or the Flow Chart for Determining Requirements for Redevelopment (Figure 2.4.2) from the Stormwater Manual. Provide Flow Chart for Determining LID MR #5 Requirements (Figure 2.5.1). Highlight or otherwise denote the flow path on each figure.

3.0 SITE AND BASIN ASSESSMENT

The site assessment provides the baseline information necessary to preserve natural resources, preserve areas most appropriate to evaporate, transpire, and infiltrate stormwater, and help to achieve the goal of maintaining or restoring predevelopment natural hydrologic conditions on the site.

Describe existing conditions including relevant hydrologic conditions. The discussion should include hydrology, topography, soils, vegetation, water features, and drainage patterns. Include site visit dates, observations, and weather.

Describe the following:

A. Topography

B. Existing ground cover, including pervious, impervious, and pollution generating areas

C. Describe the natural features of the parcel (i.e., woods, pasture, and brush) and give the approximate area covered by those features

D. Offsite drainage to the property

E. Creeks, lakes, ponds, wetlands, ravines, gullies, steep slopes, springs, and other environmentally sensitive areas on or down gradient of the property

F. Drains, channels, and swales, within the project site and immediately adjacent

G. Points of exit for existing drainage from the property

H. Any known historical drainage problems such as flooding, erosion, etc.

I. Existing Structures/Improvements: List any existing buildings, driveways (dirt, gravel, etc.), sidewalks, etc. and their area size in square feet or acres

J. New structures or improvements: List new buildings and their sizes along with any size changes in existing driveways, parking areas, landscaped areas, etc.

K. Future Structures/Improvements Planned: If you wish to have drainage review waived for future structures/improvements on this parcel, you shall list them (with dimensions) in this section. Show their locations on the plot plan

L. Remaining Undisturbed Land: List and provide the size of the land (woods, pasture) not covered by buildings or improvements.

3.1 Phased Offsite Analysis

- Provide the results of phased offsite analysis performed according to the Stormwater Manual Volume I: 3.1.3 and Volume I: 2.6.2. Include the level of analysis, results for the upstream and downstream analyses. The analysis may include evaluation of impacts to fish habitat, groundwater levels, groundwater quality, or other environmental features expected to be significantly impacted by the proposed project due to its size or proximity to such features.

3.2 Sub-basin Description

- Describe offsite drainage tributary to the project. Describe any bypass drainage from the project which will not be controlled. Describe the drainage system between the site and the receiving surface waters. Include results for the upstream and downstream analyses.

3.3 Soils/Infiltration Rates

- Discuss soils. Provide results of PIT test, including observations made during the tests. Infiltration testing can be performed by a licensed geologist, licensed engineer, licensed hydrogeologist, licensed engineering geologist, or professional soil scientist certified by the Soil Science Society of America (or equivalent national program). Sites in the Medium Impact project classification may use a licensed on-site sewage designer for preparation of the soils analysis.
- Subdivision projects may need to evaluate the soils on each lot for infiltration BMP applicability.

3.4 Critical Areas and Flood Plain

Discuss all critical areas and buffers within and adjacent to the site. If the project is within the potential flood hazard area as defined in the Thornton Creek Watershed Plan, show the 100-year flood hazard area on the plans.

3.5 Assessment Summary

This section should define the study area, describe the drainage system (including conveyance), identify problems, and define mitigation. Figure 2 should represent the information contained in the site assessment and summary.

Summarize evaluation of impacts to fish habitat, groundwater levels, groundwater quality, or other environmental features expected to be significantly impacted by the proposed project due to its size or proximity to such features. Describe proposed mitigation for the impacts.

Provide all assumptions used.

Identify and discuss difficult site parameters and how the plan incorporates the following criteria:

A. Conserve existing habitat and vegetation.

B. Protect areas conducive to infiltration and preserve these areas during site design and construction.

C. Limit ground disturbance areas to road, utility, building pad, landscape areas, and the minimum additional area needed to maneuver equipment. (A 10-foot perimeter around the building site can provide adequate work space for most activities.)

D. Reduce impervious surfaces.

E. Place structures as close to the public access point as possible to minimize road/driveway length.

F. Limit vehicular and pedestrian infrastructure, such as roads, driveways, parking areas and sidewalks, to the minimum functional needs.

G. Utilize porous paving options wherever possible.

H. Slope paved areas to facilitate drainage to stormwater management areas.

I. Reduce building footprints whenever possible. Utilize basements or taller structures with lofts or second stories to achieve square footage goals.

J. Orient buildings on slopes with long-axis along topographic contours to reduce grading requirements.

K. Amending disturbed soils according to BMP T5.13 in the Stormwater Manual: Volume V.

3.6 Downstream Analysis

Describe the downstream surface water system and/or waterway. Include references to relevant reports such as basin plans, flood studies, groundwater studies, wetland designations, sensitive area designations, environmental impact statements, environmental checklists, lake restoration plans, water quality reports, etc. Where such reports impose additional conditions on the Applicant, state these conditions and describe any proposed mitigation measures.

4.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

An adequate constructions stormwater pollution prevention plan (SWPPP) includes both a narrative and drawings. Describe how each of the 13 Elements in a SWPPP are being met, where and when the various BMPs should be installed, expected performance of each BMP, and actions to be taken if the performance goals are not achieved.

State the name and contact information of the SWPPP Supervisor or Certified Erosion and Sediment Control Lead (CESCL) (See EDM Section 25.2).

The SWPPP should be a stand-alone document.

4.1 Rainy Season Requirements

Describe how the rainy season requirements for land disturbing work from October 1 to April 30 will be met.

4.2 Seasonal Suspension Plan

When rainy season construction is prohibited, describe the Seasonal Suspension Plan.

5.0 PERMANENT STORMWATER CONTROL

Describe how natural drainage systems and outfalls will be preserved.

Describe design measures taken to create facilities that are aesthetically pleasing, how facilities will provide useable open space, and how the facilities will fit into the landscaping plan for the property, and how the facilities are in keeping with any approved community plan.

Describe how utilities will be installed to ensure no conflicts with proposed stormwater quantity and quality control measures.

5.1 Low Impact Development and Flow Control

Describe the flow control system, including Low Impact Development techniques and BMPs, outlet works and spillways, flow path lengths, and the safety factors used.

List the method used to comply with Minimum Requirement #5 (List Approach or the Low Impact Development Performance Standard).

If flow control BMP credits are used, explain how the credits will be used and how the criteria for use of credits will be met. If the flow control system is an infiltration facility, provide the soils data, groundwater mounding analysis, or other calculations used to determine the design infiltration rate.

Provide a table that identifies the design facility stage expected for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence interval flows.

5.2 Water Quality

This section should list receiving waters and pollutants of concern, discuss oil control facilities, describe the selection process for treatment options, and discuss how the water quality plan meets required enhanced treatment.

5.3 Source Control

Pollution source control is the application of pollution prevention practices on a developed site to reduce contamination of stormwater runoff at its source. List the possible sources of pollution after construction. Provide supporting information (site conditions, calculations, etc.) for the selection and sizing of pollution prevention BMPs.

5.4 Conveyance System Analysis and Design

Describe capacities, design flows, and velocities. Specify materials for the design (e.g., rock lining for channels when velocity is exceeded; high density polyethylene pipe needed for steep slope). Present analysis in a clear, concise manner that can be easily followed, checked, and verified.

6.0 SPECIAL REPORTS AND STUDIES

Cite special reports and studies used as reference when preparing the Stormwater Site Plan(s), such as the following:

- Critical areas analysis and delineation
- Geotechnical/soils
- Structural design
- Structural fill

7.0 OTHER PERMITS

Include a list of other necessary permits and approvals as required by other regulatory agencies, if those permits or approvals include conditions that affect the surface water plan, or contain more restrictive drainage-related requirements.

8.0 PROJECT ENGINEER'S CERTIFICATION

The surface water report shall contain a page with the project engineer's seal, signature, and date signed, with the following statement:

"I hereby state that this surface water report for _____ (name of project) has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Shoreline does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

9.0 FIGURES

The following documents are required. Additional figures may be provided.

Figure 1. Vicinity Map

A vicinity map should clearly locate the property and any pertinent locations near the site.

Figure 2. Site Assessment and Summary

Figure 2 should represent the information contained in the site assessment and summary. Provide a map at a scale that clearly shows the contour intervals and other information. At a minimum the map shall show the following:

- Topography
- The direction of flow, for all drainage
- Boundaries of basins, sub basins, the site and the project site
- Acreage of sub basins and areas contributing runoff to the site
- Existing discharge points to and from the site
- Downstream drainage system for the distance of the downstream analysis
- Locations of existing utilities, existing improvements, and access
- Critical areas, natural streams and drainage features on and adjacent to the site
- Areas that cannot be developed due to conditions such as slopes or critical area buffers
- Areas to be preserved (infiltration, vegetation, soils).

Figure 3. Site Development

The drainage design on the construction drawings can substitute for this figure.

Figure 4. Planting Plan

Provide a planting plan and specifications for each vegetated facility.

APPENDICES

Appendix A – Infiltration Testing

Provide the results of the PIT testing. Include on-site observations of soils and groundwater. All test reports shall be signed and dated, with credentials and license number or certification number for person or persons responsible for performing the testing. Include a site plan showing locations of PIT test(s).

Appendix B – Geotechnical Report

Include a copy of the geotechnical report prepared for the project site.

Appendix C – Documentation

Provide the methods used for analysis, and information showing that facilities meet the performance standards. Include all supporting documentation such as assumptions, computer printouts, calculations, equations, references, storage/volume tables, duration analyses, graphs, and any other aides necessary to clearly show results used to design flow control and water quality facilities.

Appendix D – Maintenance Plan

The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. A substantial portion of failures (clogging of filters, re-suspension of sediments, loss of storage capacity, etc.) of such facilities is due to inadequate maintenance. In accordance with Minimum Requirement #9, a maintenance plan shall be developed for projects that LID, flow control, or water quality facilities.

At private facilities, a copy of the plan shall be retained on-site or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the plan

shall be retained in the appropriate department. If applicable, the Maintenance Plan shall be referenced in the articles of the home or property owner's association (HOA).

Note that, per Volume III, all detention and infiltration facilities (including detention vaults) are required to include a crest gauge that will record maximum pond water surface elevation after a storm event. In addition, project submittals shall include a table that identifies the design facility stage expected for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence interval flows.

The project engineer shall prepare the Maintenance Plan. The plan shall include the following elements:

- Description of the project
- Table of the stormwater facilities and the responsible party/parties for maintenance and operation
- Recording number of the private storm easement (for shared private facilities)
- Required maintenance activities and frequency of maintenance/inspection
- Pollution Source Control
- Sample Maintenance Log
- Statement that the Maintenance Log shall be maintained and made available for inspection by the City
- Vegetation Management Plan: The project engineer or qualified landscape professional shall prepare a listing of the proposed plants for all stormwater facilities and their requirements for maintenance. Incorporate specifications and requirements into the maintenance plan.

Appendix E – Covenants, Dedications, Easements

Include copies of legal instruments needed to guarantee construction of on-site stormwater management BMPs on individual lots, preservation of drainage systems, ongoing maintenance, and access for inspection and maintenance purposes (attach copies). The draft Declaration of Covenant for the stormwater maintenance shall be included in the surface water report. This document is not required to be recorded with King County until after the final as-built inspection.

Appendix F – Property Owners' Association Articles of Incorporation

Attach a copy of the Articles of Incorporation, when applicable and if available.

APPENDIX D - GEOTECHNICAL REPORT GUIDELINES

Geotechnical Report Guidelines

The City may require a geotechnical investigation and report based on the nature of the proposal. For site development for one single-family residence on a site with no steep slopes, erosion hazards, or critical areas, a report previously prepared for that site, may be accepted if:

The report is less than five years old and no significant changes have occurred;

The geotechnical engineer/engineering geologist who signed the report provides a letter stating the report is still applicable to the site and currently proposed project.

The report shall be stamped, signed and dated by a Professional Engineer licensed in the State of Washington, who meets the City's criteria for geotechnical engineer. The attached report outline describes the contents for the elements in a geotechnical report; the report submitted to the City address each element in the outline.

The content under each element shall depend on the complexity of the project and site conditions. For example, a single-family residence on a glacial till site without groundwater issues warrants a short, simple report; while a high-rise structure with a deep excavation on an alluvial site warrants a longer, more detailed report. The report should state "Not applicable" for each outline element that does not apply.

The Geotechnical Engineer determines the actual scope of investigation, analysis and reporting necessary to meet the Standard of Practice with respect to the project and its geotechnical requirements.

GEOTECHNICAL ENGINEER means a practicing geotechnical/civil engineer licensed as a professional civil engineer by the State of Washington who has at least four years of professional employment as a geotechnical engineer.

GEOTECHNICAL ENGINEERING means the application of soil mechanics in the investigation, evaluation, and design of civil works involving the use of earth materials and the inspection or testing of the construction thereof.

Please use double-sided printing for the report.

Number each page.

COVER SHEET

The cover sheet has the:

- Project name and address;
- Applicant's name, address, and telephone number;
- Engineering firm's name, address, and contact information;
- Engineer's name and license number;
- Report date and revision dates.

1.0 SUMMARY

The summary presents the major conclusions of the investigation and their bases. This section should be included in all lengthy or complex reports.

2.0 INTRODUCTION

The introduction sets the stage for the entire report and contains the following sections:

2.1 Overview

- Introduce the formal project name, address and parcel numbers.
- Describe slope classification(s) according to SMC Chapter 20.80 Subchapter 2 Geologic Hazards.
- Describe briefly the current or previous work used to form the basis for the conclusions and recommendations contained in the report.

2.2 Background

- Describe the project's history when relevant to the reason for the investigation.
- List other reports completed for the site or adjacent sites and note whether any environmental site assessments or other environmental work has been completed.
- Describe the scope of work, including grading, retaining walls, structures, construction materials and utilities. Include dimensions, quantities, proposed finish floor elevations, maximum depth of cut or fill, foundation and floor loads, etc.

- Describe all assumptions that were relied upon to develop the conclusions and recommendations contained in the report.

2.3 Purpose And Scope Of Services

- State succinctly the primary purpose for the geotechnical engineering services.
- Summarize the scope of geotechnical engineering services that form the basis for the conclusions and recommendations contained in the report.
- Indicate any limitations to the scope of geotechnical engineering services provided, particularly if the scope represents a departure from service typically provided on similar projects.

2.4 Investigations Summary

- Provide the dates, general nature and extent of the geotechnical investigation. This section should include data research, borings, test pits, geophysics, physical laboratory testing, chemical testing, field instrumentation or testing, etc.
- If the investigation was complex, present a complete and detailed explanation and results in the form of an appendix.

2.5 Report Overview

- Introduce and describe other sections of the report, directing the reader to critical sections, if appropriate.
- Identify and describe all attachments and appendices.

3.0 SITE CONDITIONS

Describe all site features relevant to the study and the geotechnical engineering conclusions and recommendations. Terminology should be clear and consistent through the entire Report.

3.1 Location And Surface Conditions

- Provide the cross streets, addresses and parcel numbers in order to locate the site.
- Describe the site and adjoining properties, including surface elevation, topography and drainage.

- Provide current uses of the site and adjacent properties.
- Identify all current structures, subsurface utilities, wells, manmade fills and other surface features.
- Describe vegetation, topsoil, paving and other surface coverings.
- Describe any indications of historic geological processes or hazards on or near the site (e.g., slope instability, landslides, liquefaction, flooding, etc.)
- Describe any indications of surface releases or other contamination or potential contamination sources.
- Describe any planned changes to the surface conditions described above which will take place after the investigation.

3.2 Geological Setting

- Provide an overview of regional geology, local stratigraphy, groundwater occurrence, etc.

3.3 Subsurface Soil Conditions

- Describe each soil or geologic unit encountered by their classifications and group units with respect to the properties that are most relevant to the conclusions and recommendations. Give each unit group a unique, clear, common title and consistently refer to this unit by its given title throughout the report.
- Provide important results of the laboratory physical property testing and its indications of soil behavior.
- Provide design infiltration rate per the Stormwater Manual.
- Avoid detailed descriptions of the sequence of units found in individual borings; rather, focus on variations in the units across the site, if appropriate. Refer the reader to the exploration logs for details.
- Describe any expected changes in subsurface conditions that may occur with time after the investigation.

3.4 Groundwater Conditions

- Describe the nature and occurrence of groundwater.

- Provide an opinion on likely seasonal variations in groundwater levels or flows, and the possibility for changes from those encountered at the time of exploration.
- Show groundwater levels on soil logs.

3.5 Subsurface Contamination

- Describe the nature and extent of soil and/or groundwater contamination as revealed by the explorations. Reference any applicable Environmental Assessments if performed.
- Provide important results of the analytical laboratory testing and indications about contamination distribution and concentration.
- Indicate limitations of knowledge on the nature and extent of contamination.
- Discuss possible changes that may occur in these conditions over time.

4.0 DISCUSSION AND CONCLUSIONS

The Discussion and Conclusions should set out major geotechnical issues and alternatives for the project, along with the Geotechnical Engineer's conclusions, in a succinct and clear manner. This section shall clearly describe the logic and reasoning supporting the recommended approach, or alternative approaches. Specific recommendations should be presented in the Recommendations section.

Discussions and Conclusions should:

- Build on information described in the previous sections;
- Describe project features, soils and construction materials using consistent terminology;
- Explain any apparent inconsistencies in the data or investigations;
- Describe clearly any limitations or restrictions to the conclusions and recommendations.

4.1 Slope Stability

- Summarize data and analysis used to evaluate slope stability.

- Provide an opinion regarding the risk of instability on the site or adjacent properties currently, during construction, and after the project is completed.
- Describe how design and construction recommendations will reduce or eliminate the risk of stability.
- Discuss any construction or post-construction measures necessary to verify slope stability.

4.2 Seismic Considerations

- Provide an opinion on the expected level of ground motion during a major earthquake.
- Describe any seismic risks associated with an earthquake such as liquefaction, lateral spreading, landslides, or flooding.
- Describe how design and construction recommendations will reduce or eliminate the impact of seismic risks.

4.3 Site Work

- Describe proposed site grading and earthwork and provide an opinion on the proper sequence and approach to accomplish the site work.
- Describe key issues which will impact earthwork, including short-term slope stability, on-site and import fill materials, groundwater and drainage, rainfall and moisture sensitive soils, and erosion.
- Describe how these key issues should be addressed during construction, including dewatering, temporary retaining structures and erosion control.
- Include specific recommendations for on-site erosion control based on soil erodability and the presence of groundwater, surface water and slopes.
- Include statements regarding the importance of construction monitoring by a geotechnical engineering firm.

4.4 Retaining Structures

- Recommend appropriate temporary retaining systems.

- Recommend the most appropriate permanent retaining system or systems and describe their expected performance with respect to stability and deflection.
- Summarize the data and analysis used to evaluate permanent retaining systems.
- Clearly define all limitations on backfill materials, reinforcement, and drainage for reinforced soil slopes and reinforced soil backfill.
- Describe the limitations on such systems.
- Emphasize any aspects of site work, particularly with respect to the native soil materials, backfill and drainage, which could impact performance of the retaining structures.
- Include statements regarding the importance of construction monitoring by a geotechnical engineering firm.

4.5 Rockeries

- Emphasize that rockeries usually protect a slope face from erosion. Indicate which rockeries will protect the slope face by preventing soil erosion and sloughing.
- Include the design criteria for rockeries that serve as retaining structures. Indicate which rockeries will function as retaining structures.
- Recommend locations for rockeries such that a contractor can reach them for maintenance and repair.
- Discuss what type of inspection and testing may be required during rock wall construction.

4.6 Foundation Support

- Summarize the data and analysis used to evaluate foundation systems.
- Provide an opinion on the most appropriate foundation system and possible alternatives, along with the expected level of performance with respect to load capacity and settlement.
- Emphasize any aspects of site work that could impact the performance of foundations.
- Include statements regarding the importance of construction monitoring by a geotechnical engineering firm.

5.0 RECOMMENDATIONS

The Recommendations should present all detailed geotechnical engineering recommendations for design and construction in a clear and logical sequence.

For each item covered in the recommendations sections, present the following:

- Specific design recommendations along with their limitations, factors of safety, minimum dimensions and effect of expected variations in actual conditions.
- Specific construction recommendations including definitions, materials, execution, monitoring testing, or other quality control measures and any other construction requirements to support the design recommendations
- Responsibility for seeing that each recommendation is met, such as owner, geotechnical engineer or other design consultant or contractor.

5.1 Site Grading And Earthwork

- Provide specific design recommendations for: 1) depth of stripping, 2) soil excavation limits and slopes, 3) depth and lateral limits of over-excavation to remove unsuitable materials, 4) preload fills, 5) location and thickness of particular fill material or compaction requirements, 6) maximum temporary and permanent slopes, 7) permanent surface and subsurface drainage systems, and 8) permanent erosion controls.
- Provide specific construction recommendations for: 1) clearing, 2) on-site and/or import fill materials, 3) excavation and compaction equipment, 4) fill material moisture conditioning, placement, and compaction, 5) proof-rolling, in-place density testing and other quality control measures, 6) temporary seepage and drainage control measures, 7) permanent surface of subsurface drainage system installation (as appropriate), and 8) temporary slope protection and erosion control measures.
- All design and construction methodologies should be specific and identifiable; generalized or vague statements are NOT acceptable.

5.2 Temporary Shoring And Retaining Walls

- Provide specific design recommendations for: 1) active and passive earth pressures, 2) surcharge pressures, 3) bearing capacity, 4) minimum or maximum dimensions and depth of penetration, 5) lateral support, 6) wall or backfill drainage systems, and 7) any other appropriate structured details.
- If appropriate, provide specific design recommendations for tie-back anchors including: 1) anchor inclination, 2) no load zones, 3) minimum anchor length, 4) anchor bond zone, 5) anchor adhesions, and 6) corrosion protection.
- Provide specific construction recommendations for: 1) installation, 2) on-site and/or import backfill materials, 3) backfill material moisture conditioning, placement, and compaction, 4) in-place density testing or other control measures, and 5) seepage and drainage control.
- If appropriate, provide construction recommendations for tie-back anchors including: 1) anchor installation methods, 2) anchor testing, and 3) monitoring.

5.3 Rockeries

- Provide recommendations as outlined in the Associated Rockery Contractors (ARC) Standard Rock Wall Construction Guidelines (December 1992).
- The geotechnical engineer shall provide direct input to the design of the rockeries and provide construction monitoring and testing as appropriate. Specific design parameters may include: Rock quality, density, frequency of testing, slopes, keyways, surcharges, drainage, rock sizes, face inclination and surface drainage.

5.4 Reinforced Soil Structures

- Geogrid or geotextile fabric may be used to reinforce a fill. If reinforced slopes are used, the geotechnical engineer shall specify, at a minimum, the fill soil materials, vertical spacing of the reinforcement, the specific type of reinforcement and the distance to which it must extend into the fill, the amount of overlap at the reinforcement joints, and the construction sequence. Additional design parameters will be required for each specific site.

5.5 Structure And Foundations

- Provide seismic design recommendations for: 1) Building Code soil type and site coefficients, and 2) any specific recommendations to reduce the risk of damage due to earthquakes.
- Spread footing foundations – provide design recommendations for: 1) bearing soils, 2) bearing capacity, 3) minimum footing depths and widths for both interior and exterior footings, 4) lateral load resistance, 5) foundation drainage systems, and 6) frost protection.
- Mat foundations – provide design recommendations for: 1) bearing soils, 2) bearing capacity, 3) modulus of subgrade reaction, 4) minimum dimensions, and 5) lateral load resistance.
- Pile foundations – provide design recommendations for: 1) type of pile, 2) means of support (end of friction), 3) minimum dimensions and depths, 4) allowable vertical and uplift capacity, 5) allowable lateral loads and deflections, and 6) group effects and minimum spacing.
- Spread footing or mat foundations – provide construction recommendations for: 1) foundation subgrade preparation and protection, 2) verification of bearing capacity, and 3) installation of foundation drainage system.
- Pile foundations – provide construction recommendations for: 1) pile driving equipment, 2) pile installation, 3) pile load tests or verification piles, and 4) monitoring and testing during pile installation.

5.6 Floors

- Slab-on-Grade Floors – provide design recommendations for 1) slab base rock thickness, 2) capillary break, 3) vapor barrier, and 4) floor system drainage.
- Supported Wood Floors – provide design recommendations for: 1) vapor barrier and 2) crawl space drainage.
- Slab-On-Grade Floors – provide construction recommendations for: 1) subgrade preparation, 2) slab base rock placement and compaction, 3) capillary break and vapor barrier installation, and 4) floor drainage system installation (when appropriate).

5.7 Pavements

- Provide design recommendations for 1) pavement design section and 2) pavement drainage.
- Provide construction recommendations for 1) pavement subgrade preparation and verification, and 2) pavement base and subbase materials, placement and compaction.

5.8 Utilities

- Provide construction recommendations for 1) utility excavation, 2) bedding material placement and 3) backfill material, placement and compaction.

5.9 Drainage

- Recommend provisions for subsurface drainage at walls, floors and footings.
- Evaluate permanent and temporary surface and subsurface drainage for both walls and floors if applicable. Provide approximate flow rates in gallons per minute and pipe sizes if required by design.
- Provide design and recommendation for infiltration facilities, including setbacks from steep slopes per the adopted Stormwater Manual.

5.10 Hazards

- Present additional information if natural or man-made hazards exist on the property. The City's Critical Areas maps identify hazards such as wetlands, streams and flood hazards, erosion, and steep slopes. Recommendations should be general, and further studies may be required.

6.0 FIGURES AND ILLUSTRATIONS

6.1 Vicinity Map

- Include a Vicinity or Location Map that presents adequate street and/or other physical references to allow clear identification or the project location. This map may be an individual figure or may be included on the Site Plan.

6.2 Site Plan

- Show the project boundaries, property lines, existing features and the proposed development and structures. A north arrow and scale should be included along with all subsurface exploration locations. The accuracy of exploration locations should be indicated on the Site Plan or in the report.

6.3 Exploration Logs

- Include logs of all explorations describing soil units encountered, soil classification, density or stiffness, moisture conditions, groundwater levels, stratigraphic sequence, common geologic unit name, and other descriptive information.

6.4 Laboratory Test Data

- Include figures or tables of laboratory test results if presentation of all the data, in the text, would require more than a simple paragraph to supplement the data provided in the exploration logs.

6.5 Cross Sections

- Include cross sections to visually present all but the simplest subsurface conditions.

6.6 Standard Plans

- Include figures, graphs and other visual aids to clearly present detailed recommendations. Provide design details (stamped by a professional engineer licensed in Washington State) on drawings such as: rockeries, reinforced earth, interceptor trenches, wall and footing drains, utility backfill and other details used for a particular design.

7.0 PROJECT ENGINEER'S CERTIFICATION

The report shall contain a page with the project engineer's seal, signature, and date signed, with the following statement:

"I hereby state that this geotechnical report for _____ (name of project) has been prepared by me or under my supervision and meets the standard of care and

expertise which is usual and customary in this community for professional engineers. I understand that the City of Shoreline does not and will not assume liability for the sufficiency, suitability, or performance of facilities prepared based on this report."

APPENDIX E - TRANSPORTATION IMPACT ANALYSIS REPORT GUIDELINES

Transportation Impact Analysis Guidelines

GENERAL REQUIREMENTS

- Provide two (2) copies, printed double-sided and one (1) electronic copy in PDF format.
- The estimate of vehicle trips shall be conducted in accordance with the most recent version of the Trip Generation Manual, published by the Institute of Transportation Engineers.
- Traffic Level of Service (LOS) analysis shall be conducted using methodology consistent with the most recent version of the Highway Capacity Manual.
- The year of completion of the project's final phase shall be used as the horizon year.
- Shall be prepared by a Professional Engineer licensed in the State of Washington with a background in traffic analysis.

TRANSPORTATION IMPACT ANALYSIS OUTLINE

Regional/ Standard	Section	Content to include
Standard	Cover Page	• Applicant • Project title • Project address • Preparer's contact information, signature, and Professional Engineer stamp.

Standard	Introduction	• Complete project description
		  ○ Current and proposed zoning, Comprehensive Plan Designation;
		  ○ Proposed land use(s);
		  ○ Size of development such as number and type of housing units and/or gross floor area;
		  ○ Phasing plan for complex projects.
		• Project location and study area boundary.
		• Executive summary of findings and mitigations, if applicable.

Standard	Site Evaluation	• Sight distance evaluation for all access points; include plan showing required sight triangles and any obstructions located within. • Access design and vehicle queueing. • Pedestrian and bicycle access from the public Right-of-Way and adjacent land uses to all principal entrances.
Standard	Traffic Impacts	**Existing conditions** • Description of critical intersections and roadways; • Identification of peak usage period(s)

Regional/ Standard	Section	Content to include

		• Identify City capital projects and planned transportation improvements located in the study area;
		• Identify transportation improvements in the study area planned by other private developers or by governments or agencies other than the City of Shoreline;
		• Identify existing roadway volumes as well as entering, and exiting volumes from the site during the PM and peak usage period(s). Existing trips must be measured assuming full occupancy of the existing use on site. If the site and/or existing buildings have been vacant for more than one year, the trips associated with the site and/or use will not be utilized to determine net new trips resulting from the proposed development.
		• Existing Level of Service (LOS) at intersections and applicable roadway segments in the study area.
		• Description of other travel modes and facilities serving the project location within ¼ mile of the project site. (If Regional analysis is required, this element may be covered in other sections)
		• If applicable, a gap analysis, transportation network model analysis may be required at the discretion of the City Traffic Engineer
		
		Safety
		• Document collisions within the study area boundary for the most recent 3 years of collision data available.
		
		Future conditions
		• Trip generation
		• Background traffic growth
		• Pipeline project growth
		• Trip distribution
		  ○ Determined by existing characteristics if proposal is consistent with existing land uses in the study area;
		  ○ Origin/destination studies;
		  ○ Trip distribution models; or
		  ○ Market studies.

Regional	Pedestrian Facility Impacts	**Existing conditions** • Within ¼ mile of the project, specifically describe the characteristics of the pedestrian facilities on all arterial streets.

Regional/ Standard	Section	Content to include
		For local streets, summarize pedestrian facilities. Note any important characteristics of specific local streets; • Summary of pedestrian counts at study intersections and on trails, if within the ¼ mile study area; • Identify key pedestrian trip generators within ½ mile of the project. **Accessibility** • In accordance with 2011 PROWAG, inventory barriers to accessibility along all arterials within ¼ mile of the project. Barriers include but are not limited to: ○ **Non-accessible or missing curb ramps;** ○ **Obstructions within the sidewalk or pedestrian pathway;** ○ **Vertical discontinuities;** ○ **Non-standard cross slopes and/or running slopes;** ○ **Sub-standard pedestrian pushbuttons at signalized intersections.** **Safety** **Within ¼ mile of the project:** • **Inventory all locations with pedestrian related collisions within the most recent 5 years of collision data available.** • **Inventory all locations along arterials where there is no buffer between the pedestrian space and traffic.** • **For intersections greater than 250 feet from a signalized crossing or grade separated crossing, identify all legal crossings where pedestrians must cross more than one lane in each direction and/or locations where the posted speed limit is greater than 25 mph.** • **Identify all school crossings.** **Pedestrian Network Gaps** Describe all bike facilities within ¼ mile of the project that are identified within the Transportation Master Plan pedestrian element, and which have not yet been constructed and/or planned improvements will not be constructed by the horizon year.

Regional/ Standard	Section	Content to include
Regional	Bicycle Facility Impacts	**Existing Conditions** • Describe all bicycle facilities within ¼ mile of the project that are present on arterials. **Safety** Within ½ mile of the project: • Inventory all locations with bicycle related collisions within the most recent 5 years of available collision data. • Inventory all locations along arterials where there is no buffer between the bicycle facility and traffic. • Identify any locations with significant pavement irregularities. **Bicycle Network Gaps** Describe all bike facilities within ¼ mile of the project that are identified within the Transportation Master Plan bicycle element and which have not yet been constructed and/or planned improvements will not be constructed by the horizon year.

Regional	Transit Impacts	**Existing Conditions**
		• Inventory all transit routes and stops within ¼ mile of the project.
		• Inventory all Park & Ride locations and usage within ½ mile of the project.
		• For routes within ¼ mile of the station and referring to King County Metro's most recent Service Guidelines Report, identify routes that:
		  ○ Serve corridors below target service levels;
		  ○ Need investments to reduce crowding, and/or;
		  ○ Need investments to improve schedule reliability.
		
		Accessibility
		• For all transit stops within ¼ mile of the project, identify barriers to accessibility including but not limited to:
		  ○ Bus stop front door landing.
		  ○ Access to and from bus shelter where applicable.

Regional/ Standard	Section	Content to include
		Future Conditions Considering results of traffic modeling, report on added delay to transit routes within the study area.
Regional	Parking Impacts	**Existing Conditions** Within ¼ mile of the project, inventory all available on street parking and parking restrictions. **Parking Demand** • Forecast anticipated parking demand for horizon year build out. • Compare project's proposed parking provisions with demand and with Shoreline Code.
Regional	Neighborhood Impacts	**Existing Conditions** • Identify neighborhoods within ¼ mile of the project with active Neighborhood Traffic Safety Projects (NTSP). (To be supplied by City). • Identify which elements of the neighborhood's Traffic Action Plan have not yet been completed. • Identify neighborhood streets where project traffic is anticipated. Document speeds and traffic volumes for these streets. **Neighborhood Outreach and Action Plan** A public meeting shall be arranged for residents within ¼ mile of the project to explain the project, gather feedback, and develop an action plan for project impacts. An alternative outreach strategy may submitted in writing with adequate documentation for review by the City Traffic Engineer. An Action Plan shall be consistent with the City of Shoreline's NTSP criteria available on the Traffic Services webpage.
Standard	Conclusions	Describe project impacts and proposed plans and/or mitigations. In addition, all projects should strive to incorporate Transportation Demand Management (TDM) strategies – describe how this will be achieved.

APPENDIX F – STREET MATRIX

Master Street Plan

The 2011 Master Street Plan identifies specific roadway cross-sections for all Arterial Streets and Local Primary Streets in the City of Shoreline. It is intended to guide the development of streets throughout the City. The planned cross-sections for these streets establish the location of future curbs so that streets can be constructed in the proper location.

The Master Street Plan also identifies a general cross-section for Local Secondary Streets which provide for travel in each direction, on-street parking and sidewalks on each side of the street. Due to the large number of Local Secondary Streets in the City, a determination of the appropriate cross-section for a given Local Secondary Street shall be made at the time modifications to the street are funded or redevelopment occurs. Additionally, because the needs and conditions of the Local Secondary Streets vary greatly throughout the City, the design criteria must be flexible.

In accordance with the adopted policies and implementation strategies associated with the Master Street Plan, the following principles accompany its implementation:

A. Frontage improvements shall support the adjacent land uses and fit the character of the areas in which they are located. Five feet is the standard sidewalk width adjacent to single-family residential land uses, and eight feet is the standard sidewalk width adjacent to all land uses other than single-family residential. Increased width may be required if determined by a traffic study.

B. The amenity zone should be developed in a manner that is appropriate and complimentary to the adjacent land uses and use of the street. The minimum width for amenity zones is five feet. Amenity zones should generally be landscaped and, where possible, utilized for stormwater management purposes. Amenity zones adjacent to roadways that do not have off-street parking shall be landscaped as much as possible. In areas where a wide pedestrian walking surface is desired, such as commercial areas, the amenity zone may be a hard surface treatment with trees in pits. Amenity zones that are adjacent to on-street parking areas should be landscaped as much as possible but may include limited hard surface areas for drivers or passengers exiting vehicles.

C. The identified cross-sections should still allow for flexibility to account for site specific, unique or unforeseen circumstances (such as presence of bus stops or proximity to intersections as

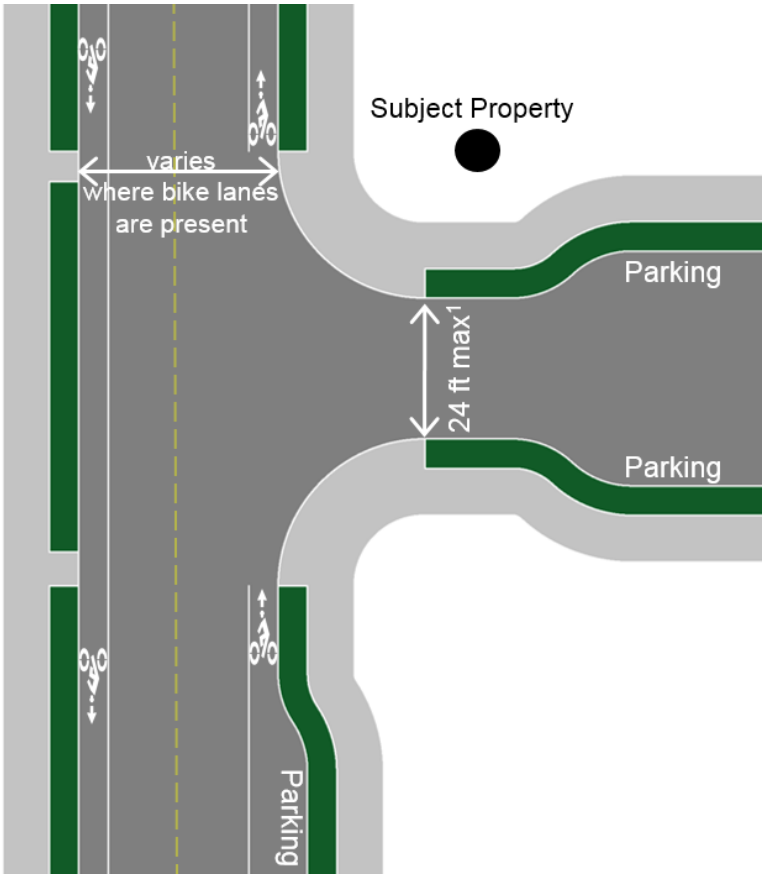
described below), topography, sensitive areas, and presence of significant vegetation (large trees).

D. The maximum right-of-way needs for street classifications are as follows:
    - Principal Arterial – 120 feet
    - Minor Arterial – 95 feet
    - Collector Arterial – 80 feet
    - Local Primary Street – 66 feet
    - Local Secondary Street – 90 feet

Frontage Improvements at a Public Street Intersection

If required frontage improvements abut a public street intersection, the intersection radii shall be extended to reduce the throat of the intersection to the maximum extent feasible as shown in the diagram below. This treatment should also be applied at driveways and private streets where feasible. Near intersections, additional right-of-way width may be required to accommodate the need for turn lanes or other features. See Figure F1 below for frontage improvements with a reduced throat at a public street intersection. Refer to Standard Plan 314 for additional details.

Figure F1. Reduced throat at a public street intersection



[1]*Except where:*

- *Bike lanes are present.*
- *Additional lanes of traffic are present.*
- *Large vehicle turning movements occur frequently.*

In these cases, the width may be increased to accommodate the intended movements through the intersection. See Standard Plan 314 for additional details.

Bus Stops within Frontage Improvements

Any frontage improvements where an existing bus stop is located shall improve the bus stop per Standard Plan 520. Some variations to the plan are acceptable depending on site constraints, however a minimum requirement of a 10-foot by 10-foot landing pad shall be required for all front improvements where bus stops are located.

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	1st Ave NE	N 145th St	N 149th St	60	26-37	W-E	1	8	5	0.5	0	8	10	0	10	8	0	0.5	5	8	1	65	36	East side properties shall dedicate 3 feet in conjunction with redevelopment. Protected bike lanes.
Collector Arterial	1st Ave NE	N 149th St	NE 153rd St	60	30	W-E	0	14	5	0.5	0	0*	10	0	10	8	0	0.5	5	8	1	62	28	*SB bicycle facility is a 14’ shared use path. Protected bike lane NB.
Collector Arterial	1st Ave NE	NE 153rd St	NE 155th St	82-123	30-36	W-E	0	14	5	0.5	0	0*	10	0	10	8	0	0.5	5	8	1	62	28	*SB bicycle facility is a 14’ shared use path. Protected bike lane NB. Wider amenity zones where there is extra ROW.
Local Secondary	1st Ave NE	NE 157th St	NE 159th St	40-50	22	W-E	1	14	5	0.5	0	0	11	0	11	0	0	0.5	0	6	1	50	22	
Local Secondary	1st Ave NE	NE 170th St	Approx. 180’ south of NE 174th St	60	30	W-E	1	14	5	0.5	0	0	9	0	9	0	7	0.5	7	5	1	59	25	
Local Secondary	1st Ave NE	Approx. 180’ south of NE 174th St	NE 174th St	40-60	30	W-E	1	14	5	0.5	0	0	9	0	9	0	7	0.5	5	5	1	57	25	
Collector Arterial	1st Ave NE	NE 185th St	Approx. 175’ south of NE 190th St	60	35	W-E	1	5	5.5	0.5	0	5	10	0	10	5	8	0.5	5.5	8	1	65	38	Property on the east shall dedicate 5 feet at the time of redevelopment
Collector Arterial	1st Ave NE	Approx. 175’ south of NE 190th St	Approx. 130’ north of NE 192nd St	60	47-60	W-E	1	5	5.5	0.5	0	5	10	0	10	5	18					60	48	Utilize the eastern 18' for back in angle parking and sidewalk. A portion of the sidewalk is on City property or shall be dedicated.

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	1st Ave NE	Approx. 130' north of NE 192nd St	NE 195th St	60	21-29	W-E	1	5	5	0.5	0	5	10.5	0	10.5	5	8	0.5	0	8	1	60	39	Property at the SE corner of 1st and 193rd was required to install parking as part of Conditional Use permit.
Collector Arterial	1st Ave NE	NE 195th St	N 205th St	60	29	W-E	1	8	5	0.5	8	0	10.5	0	10.5	0	0	16.5				60	29	Utilize the eastern 16.5' for stormwater BMP
Local Secondary	3rd Ave NE	NE 149th St	NE 151st St	N/A	N/A	W-E	1	14	TBD	0.5	7	0*	9	0	9	0*	7	0.5	5	8	0	60	32	Parking lane on west side to be load/unload only. Parking lane on east side may have bulbed out landscape areas. Amenity zone TBD through woonerf design. *Bicycle facility is a 14' shared use path under the light rail guide way in an easement. Amenity zone/plaza shall be in City ROW and easement as needed
Local Secondary	3rd Ave NE	NE 151st St	Approx. 150' south of NE 152nd St	48.5	28	W-E	1	14	5	0.5	7	0*	9	0	9	0*	0	0.5	5	8	1	60	25	*Bicycle facility is a 14' shared use path
Local Secondary	3rd Ave NE	Approx. 150' south of NE 152nd St	NE 152nd St	60	N/A	W-E	0	0	0	0.5	20							0.5	0	0	0	21	N/A	Fire lane with non-motorized access only.
Local Secondary	3rd Ave NE	NE 152nd St	NE 153rd St	60	N/A	W-E	1	14	5	0.5	7	0*	9	0	9	0*	0	0.5	5	8	1	60	25	*Bicycle facility is a 14' shared use path
Local Secondary	3rd Ave NE	NE 165th St	NE 170th St	60	25	W-E	1	14	5	0.5	0	0*	9	0	9	0*	7	0.5	5	5	1	57	25	*Bicycle facility is a 14' shared use path
Collector Arterial	3rd Ave NW	NW 171st St	NW 175th St	60-90	22-34	W-E	1	8	5	0.5	8	0	10	0	10	0	8	0.5	5	5	1	62	36	On-street parking to be provided where feasible

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Local Primary Street	3rd Ave NW	NW 180th St	NW Richmond Beach Rd	60	24-30	W-E	1	5	8.5	0.5	0	0	15	0	15	0	0	0.5	8.5	5	1	60	30	
Collector Arterial	3rd Ave NW	NW Richmond Beach Rd	NW 205th St	60	28-36	W-E	1	5	5.5	0.5	0	0	14	0	14	0	8	0.5	5.5	5	1	60	36	
Minor Arterial	5th Ave NE	NE 145th St	I-5 on-ramp	30	68-72	W-E	1	14	5	0.5	0	0	33	0	22	0	0	0.5	5	14	1	96	55	Cross-section dependent on 145th Interchange Design. Western portion of ROW is WSDOT Limited Access.
Minor Arterial	5th Ave NE	I-5 on-ramp	NE 148th St	60	43	W-E	1	14	5	0.5	0	0	22	0	22	0	0	0.5	5	14	1	96	44	Cross-section dependent on 145th Interchange Design
Minor Arterial	5th Ave NE	NE 148th St	NE 155th St	60	43	W-E	1	8	5	0.5	0	8	11	0	11	8	0	0.5	5	8	1	67	38	
Minor Arterial	5th Ave NE	NE 155th St	NE 167th St	60-90	43-50	W-E	1	8	5	0.5	7	7	11	0	11	7	0	0.5	5	8	1	72	43	
Minor Arterial	5th Ave NE	NE 167th St	NE 174th St	60	43	W-E	1	5	5	0.5	7	5	11	0	11	5	0	0.5	5	5	1	62	39	Protected bike lanes are not required due to parallel shared use path along Transit Way
Minor Arterial	5th Ave NE	NE 174th St	NE Serpentine Pl	60	43	W-E	1	8	5	0.5	0	7	11	11	11	7	0	0.5	5	8	1	76	47	Protected bike lanes
Minor Arterial	5th Ave NE	NE Serpentine Pl	NE 180th St	60	30-36	W-E	1	8	5	0.5	0	7	11	0	11	7	0	0.5	5	8	1	65	36	Protected bike lanes
Minor Arterial	5th Ave NE	NE 180th St	700’ south of NE 185th St	60	28	W-E	1	8	5	0.5	0	5	11	0	11	5	0	0.5	5	8	1	61	32	Protected bike lanes not required due to parallel shared use path along Transit Way
Minor Arterial	5th Ave NE	700’ south of NE 185th St	NE 185th St	52-124	27-38	W-E	1	14	6.5+	0.5	0	0	12	12	12	0	0	0.5	0	0	1	63+	36	

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Collector Arterial	5th Ave NE	NE 185th St	NE 195th St	30-116	16-28	W-E	0.5	8	5	0.5	0	5	10	0	10	5	8	0.5	5	8	0.5	66	38	
Collector Arterial	5th Ave NE	NE 195th St	NE 205th St	60	25	W-E	17				0	0	11	0	11	0	21					60	43	Utilize the western 17 feet for natural stormwater treatment; use the eastern 21 ' for a combination of parking, amenity zone, natural stormwater treatment and sidewalk, based upon topography and soils.
Collector Arterial	6th Ave NW	NW 175th St	NW 180th St	60	24	W-E	1	5	5.5	0.5	8	0	11.5	0	11.5	5	0	0.5	5.5	5	1	60	36	This cross-section allows for an uphill climbing lane and downhill shared/signed lane
Local Secondary	8th Ave NE	NE 185th St	NE 190th St	60	27	W-E	1	14	5	0.5	8	0	11	0	11	0	0	0.5	5	8	1	65	30	
Collector Arterial	8th Ave NW	NW 180th St	NW 185th St	60	20	W-E	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Collector Arterial	8th Ave NW	NW 185th St	NW Richmond Beach Rd	60	29-35	W-E	1	5	5	0.5	0	5	10	0	10	5	8	0.5	5	8	1	64	38	Property on the east side shall dedicate 8' at the time of redevelopment
Minor Arterial	8th Ave NW	NW Richmond Beach Rd	Approx. 80 feet north of NW 190th St	60	22	W-E	0.5	5	5	0.5	12	10	12	0	11	5	0	0.5	5	8	0.5	75	50	For this cross-section, no parking on either side of the street and no bicycle lane on the west side. Figures include a right turn lane, SB through lane, left turn lane and NB through lane.
Minor Arterial	8th Ave NW	Approx. 80 feet north of NW 190th St	NW 205th St	60-75	20-32	W-E	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	On-street parking allowed where ROW is wider

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Local Primary Street	10th Ave NE	NE 155th St	NE 175th St	70-80	25-36	W-E	1	5	7.5	0.5	0	0	16	0	16	0	0	0.5	7.5	5	1	60	32	
Collector Arterial	10th Ave NE	NE 175th St	NE 185th St	70-80	32	W-E	10.5-20.5	5	5	0.5	0	8	11	0	11	8	0	0.5	5	5	0.5	70-80	38	Utilize the space behind the sidewalk for natural stormwater management
Collector Arterial	10th Ave NE	NE 185th St	NE 190th St	60-160	32	W-E	0.5	5	5	0.5	8	0*	11	0	11	0*	8	0.5	5	5	0.5	60	38	Would consider vacating and squaring the intersection at 185th and 10th; *Sharrows in both travel lanes
Local Secondary	10th Ave NE	NE 190th St	NE 195th St	50-60	22	W-E	3	14	0	0.5	0	0	9	0	9	0	7	0.5	0	5	2	50	25	
Collector Arterial	10th Ave NW	NW Innis Arden Way	NW 175th St	60	20	S-N	0	0	0	0	8	0	12	0	12	0	0	0.5	5	5	17.5	60	32	No sidewalk on the south side. On-street parking on the south side accommodated where possible. Cross-section across the bridge is two 12-foot travel lanes and an 8-foot sidewalk on the north side with no amenity zone.
Local Primary Street	10th Ave NW	NW 175th St	NW 180th St	50-60	20	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	14th Ave NW	Springdale Ct NW	NW 175th St	60	20	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Principal Arterial	15th Ave NE	NE 145th St	NE 150th St	60-77	52-55	W-E	1	8	5.5	0.5	0	0	22	12	22	0	0	0.5	5.5	8	1	86	56	Two travel lanes in each direction
Principal Arterial	15th Ave NE	NE 150th St	NE 152nd St	60-73	44-54	W-E	1	8	5.5	0.5	0	0	24	12	24	0	0	0.5	5.5	8	1	90	60	Two travel lanes in each direction

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Principal Arterial	15th Ave NE	NE 152nd St	NE 155th St	60-65	44-50	W-E	1	8	5.5	0.5	0	5	11	12	11	5	0	0.5	5.5	8	1	74	44	
Principal Arterial	15th Ave NE	NE 155th St	NE 165th St	60-65	42-50	W-E	1	5	5	0.5	0	5	11	12	11	5	0	0.5	5	8	1	70	44	
Principal Arterial	15th Ave NE	NE 165th St	NE 169th St	60	44	W-E	1	5	5.5	0.5	0	5	11	12	11	5	0	0.5	5.5	5	1	68	44	
Principal Arterial	15th Ave NE	NE 169th St	NE 172nd St	60	44	W-E	1	5	5	0.5	0	5	11	12	11	5	0	0.5	5	8	1	70	44	
Principal Arterial	15th Ave NE	NE 172nd St	NE 175th St	60-70	52-44	W-E	0	5	2	0.5	0	5	11	12	11	5	0	0.5	2	5	0	59	44	
Principal Arterial	15th Ave NE	NE 175th St	NE 180th St	70-80	40-54	W-E	0	6	4	0.5	7	0	22	0	22	0	7	0.5	4	6	0	79	58	Sidewalk located on private property in some locations. Two travel lanes in each direction
Principal Arterial	15th Ave NE	NE 180th St	24th Ave NE	42-95	40-44	W-E	1	8	5.5	0.5	0	5	11	12	11	5	0	0.5	5.5	8	1	74	44	Narrower sidewalks and less dedication required in front of SF properties
Principal Arterial	15th Ave NE	24th Ave NE	NE 190th St	57-80	42-44	W-E	1	5	5.5	0.5	0	5	11	12	11	5	0	0.5	5.5	5	1	68	44	
Principal Arterial	15th Ave NE	NE 190th St	Ballinger Way NE	60-90	40-60	W-E	1	8	5.5	0.5	0	5	11	12	11	5	0	0.5	5.5	8	1	74	44	Narrower sidewalks and less dedication required in front of SF properties
Collector Arterial	15th Ave NW	NW 167th St	NW 175th St	60	20	W-E	1	5	5.5	0.5	0	0	13	0	13	0	0	0.5	5.5	5	1	50	26	
Collector Arterial	15th Ave NW	NW 188th St	Approx. 50 feet north of NW 191st St	60	20	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	All dedication would come from the west side, as the ROW is offset 10 '
Collector Arterial	15th Ave NW	Approx. 50 feet north of NW 191st St	NW Richmond Beach Rd	50-60	20-37	W-E	1	8	5	0.5	8	0	10	0	10	0	8	0.5	5	8	1	65	36	MF properties shall dedicate 7.5 feet on each side.

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	15th Ave NW	NW Richmond Beach Rd	NW 205th St	40-60	24-100	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Minor Arterial	19th Ave NE	Forest Park Dr NE	NE 199th St	60	36	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Minor Arterial	19th Ave NE	NE 199th St	NE 205th St	60-70	36-40	W-E	0.5	8	5	0.5	8	0	10	0	10	0	8	0.5	5	8	0.5	64	36	
Local Primary Street	20th Ave NW	Saltwater Park Entrance	NW 195th	60	18	W-E	0.5	8	0	0.5	8	0	11	0	11	0	0	0.5	5	5	0.5	50	30	
Collector Arterial	20th Ave NW	NW 195th St	NW 205th St	40-50	22-30	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	22nd Ave NE	NE 171st St	NE 172nd St	60	24-34	W-E	0.5	5	5	0.5	8	0	11	0	11	0	8	0.5	5	5	0.5	60	38	
Minor Arterial	24th Ave NE	24th Pl NE	15th Ave NE	60-110	26-37	S-N	0.5	5	5	0.5	8	5	10	0	10	5	0	0.5	5	5	0.5	60	38	
Collector Arterial	25th Ave NE	NE 145th St	NE 150th St	30-60	28-38	W-E	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Collector Arterial	25th Ave NE	NE 150th St	NE 153rd St	60	31	W-E	3	5	3	0.5	0	5	10	0	10	5	7.5	0.5	5	5	0.5	60	37.5	
Collector Arterial	25th Ave NE	NE 153rd St	NE 165th St	30	30 - 31	W-E	0	8	5	0.5	0	5	10	0	10	5	7.5	0.5	5	5	0.5	60	37.5	
Collector Arterial	25th Ave NE	NE 165th St	NE 168th St	60	35-43	W-E	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Collector Arterial	25th Ave NE	NE 168th St	NE 175th St	60	24-30	W-E	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Collector Arterial	25th Ave NE	NE 175th St	NE 177th St	60	23-26	W-E					38											60	38	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	25th Ave NE	NE 177th St	NE 178th St	60-110	27	W-E	0	5	8	0	0	0	12	0	12	0	0	0	8	5	0	45	24	Amenity zone will be the shoulder. Preferred width on the east. No sidewalk is planned for the west side of the street due to topography and surface water management needs.
Collector Arterial	25th Ave NE	NE 178th St	NE 185th St	55-67	26	SW-NE	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Local Primary Street	25th Ave NE	NE 195th St	NE 200th St	60	23-25	W-E	0.5	8	5	0.5	0	0*	13	0	11	0*	8	0.5	5	8	0.5	60	32	*Sharrows in travel lanes
Local Primary Street	25th Ave NE	NE 200th St	NE 205th St	60	23	W-E	0.5	5	5	0.5	8	0*	11	0	11	0*	8	0.5	5	5	0.5	60	38	*Sharrows in travel lanes
Local Primary Street	Ashworth Ave N	N 155th St	N 175th St	60	24-28	W-E	1	5	7.5	0.5	0	0	16	0	16	0	0	0.5	7.5	5	1	60	32	
Local Primary Street	Ashworth Ave N	N 175th St	N 185th St	60	23-28	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	Ashworth Ave N	N 185th St	N 192nd St	60	24-30	W-E	0.5	5	5	0.5	8	0	11	0	10	4	9			6	1	60	42	Shoulder is 4 feet wide.
Collector Arterial	Ashworth Ave N	N 192nd St	N 195th St	60	20-29	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5	8	1	62.5	36	Development on the east shall dedicate 2.5’
Collector Arterial	Ashworth Ave N	N 195th St	N 199th St	60	23	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	Ashworth Ave N	N 199th St	N 200th St	60	27	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5	8	1	62.5	36	Development on the east shall dedicate 2.5' if developed as something other than single-family; the cross-section on the west shall match the park if the City acquires additional property and extends the existing improvements.
Principal Arterial	Ballinger Way NE	15th Ave NE	Approx. 600 feet south east of 19th Ave NE	90-120	62-86	W-E	1	8	21.5	0.5	0	0	24	12	24	0	0	0.5	19.5	8	1	120	60	2 travel lanes in each direction. The amenity zone width to be adjusted for BAT lanes.
Principal Arterial	Ballinger Way NE	Approx. 600 feet south east of 19th Ave NE	22nd Ave NE	100	48-56	W-E	1	8	15.5	0.5	0	0	14	12	14	0	0	0.5	15.5	8	1	90	40	The amenity zone width to be adjusted for BAT lanes.
Principal Arterial	Ballinger Way NE	22nd Ave NE	25th Ave NE	80-90	42-58	W-E	1	8	5.5	0.5	0	0	14	0	14	0	0	0.5	15.5	8	1	68	28	All widening to occur on the east/northeast, the amenity zone width to be adjusted for topography or for BAT lanes.
Collector Arterial	Carlyle Hall Rd N	NW 171st St	Dayton Ave N	60-90	22-34	W-E	1	8	5	0.5	8	0	10	0	10	0	8	0.5	5	5	1	62	36	On-street parking to be provided where feasible
Collector Arterial	Carlyle Hall Road N	Evanston Place N	Dayton Ave N	60+	30+	N-S	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Minor Arterial	Dayton Ave N	Westminster Way N	N 160th St	90-111	38-54	W-E	0.5	5	5	0.5	12		10	0	10	12		0.5	5	5	0.5	66	44	
Minor Arterial	Dayton Ave N	N 160th St	Carlyle Hall Road N	95-108	30-38	W-E	0.5	5	5	0.5	8	5	10	0	10	5	0	0.5	5	5	0.5	60	38	
Minor Arterial	Dayton Ave N	Carlyle Hall Road N	N 172nd St	60	22-30	W-E	0.5	5	5	0.5	8	0	11	0	11	0	8	0.5	5	5	0.5	60	38	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Minor Arterial	Dayton Ave N	N 172nd St	St. Luke Pl N	60	22-30	W-E	1	6	4	0.5	0	0	12	0	12	0	8	0.5	0	8	1	52	32	
Minor Arterial	Dayton Ave N	St. Luke Pl N	N Richmond Beach RD	60-75	22-28	W-E	0.5	5	5	0.5	8	0	11	0	11	0	8	0.5	5	5	0.5	60	38	
Local Secondary	Firlands Way N	N 185th St	N 188th St	92	25	SW-NE	0.5	10	5	0.5	17	0	12	0	12	0	17	0.5	5	10	0.5	90	58	This is a Storefront Street per the Town Center Code; redesign the intersection at Firlands & Linden
Collector Arterial	Forest Park Dr	15th Ave NE	NE 196th St	60	21-23	SW-NE	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	Fremont Ave N	N 165th St	N 205th St	60-72	28-39	W-E	0.5	5	5	0.5	8	5	10	0	10	5	8	0.5	5	5	0.5	68	46	
Principal Arterial	Greenwood Ave N	N 145th St	Westminster Way N	80+	62+	To be determined in conjunction with 145th Street Corridor study																		
Collector Arterial	Greenwood Ave N	Westminster Way N	N 155th St	60	22-39	W-E	5	3	2.5	0	0	5	10	0	10	5	8	0.5	5	5	1	60	38	West side pedestrian improvements are trail-like due to topographic separation
Collector Arterial	Greenwood Ave N	N 155th St	N 160th St	60	22-32	W-E	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Collector Arterial	Greenwood Ave N	N Innis Arden Way	Carlyle Hall Rd N	60	22	W-E	0	8	5	0.5	8	0	10	0	10	0	8	0.5	5	5	0	60	36	
Local Primary Street	Innis Arden Drive	Ridgefield Rd NW	NW Richmond Beach Rd	60-120	20	SE-NW	1	5	5.5	0.5	0	0	13	0	13	0	8	0.5	5.5	5	1	58	34	Sidewalk with no amenity zone across culvert/bridge
Collector Arterial	Linden Ave N	N 175th St	N 185th St	60	20-26	W-E	1	5	5	0.5	8	0	11	0	11	0	8	0.5	5	8	1	64	38	This is a Green Link Street per the Town Center Code
Collector Arterial	Midvale Ave N	N 175th St	N 185th St	20-60	22-37	W-E	0	0	0	0.5	0	0	12	0	10	0	8	0.5	5	10	0.5	46.5	30	17’ on SCL property for back in angle parking; This is a Storefront Street per the Town Center Code

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Minor Arterial	Meridian Ave N	N 205th St	N 145th St	60-105	38-55	W-E	1	5	5.5	0.5	0	5	11	12	11	5	0	0.5	5.5	5	1	68	44	
Collector Arterial	Perkins Pl NE	NE 185th St	Perkins Way NE	60	20	SW-NE	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	Richmond Beach Dr NW	NW 195th	NW 196th	60	20	W-E	0.5	5	5	0.5	8	0	12	0	10	0	8	0.5	5	5	0.5	60	38	
Collector Arterial	Richmond Beach Dr NW	NW 196th St	NW 199th St	60	20	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Local Primary Street	Ridgefield Rd NW	NW Innis Arden Dr	Springdale Ct NW	60	20	S-N	0.5	8	0	0.5	0	0	13	0	13	0	8	0.5	5	5	0.5	54	34	Add amenity zone to sidewalk on the south side where possible
Collector Arterial	Springdale Ct NW	14th Ave NW	NW 188th St	60	20	W-E	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	St. Luke Pl	NW 175th St	Dayton Ave N	60	37	W-E	0	5	2	0.5	8	0	10	0	10	0	8	0.5	5	5	0	54	36	
Local Street - Greenlink Street	Stone Ave N	Town Center Boundaries				W-E	0.5	8	5	0.5	0	0	16	0	16	0	0	0.5	5	8	0.5	60	32	Combined travel lanes/on-street parking
Principal Arterial	Westminster Way N	Greenwood Ave N	Fremont Ave N	90	60-68	W-E	1.5	8	5	0.5	0	0	24	12	24	0	0	0.5	5	8	1.5	90	60	Two travel lanes in each direction.
Principal Arterial	Westminster Way N	Fremont Ave N	400' south of N 155th St	90-125	60-78	W-E	0+	14	5	0.5	0	0*	22	11	22	0*	0	0.5	5	8	14+	96	55	Center Turn Lane could be paved median with openings at turn locations. *Bicycle Facility for this segment shall be 14’ shared use path

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Principal Arterial	Westminster Way N	400' south of N 155th St	N 155th St	110-125	78	W-E	0+	14	5	0.5	0	0*	22	0	46	0*	0	0.5	0	8	14+	96	68	Additional right turn pocket at intersection (dual NB to EB right turns, 1 thru lane, 1 left turn lane). *Bicycle Facility for this segment shall be 14’ shared use path
Principal Arterial	Westminster Way N	N 155th St	N 157th St	100	56	W-E	0-8	14	5	0.5	8	0*	11	0	11	0*	8	0.5	5	14	0	85	38	Roadway segment to have mid-block crossing with raised crosswalk, curb bulb-outs at midblock crosswalk and along the roadway where on-street parking is not provided. Cross-Section at the intersection of N 155th St to include a 100' long left turn pocket in addition to the travel lane in each direction. *Bicycle Facility for this segment shall be 14’ shared use path
Minor Arterial	Westminster Way N	N 157th St	Aurora Ave N	100-110	24	W-E	1+	14	5	0.5	8	0*	13	0	0	0	0	0.5	0	0	0	42	13	Roadway segment to provide asphalt speed hump just north of N 157th St Intersection. Striping at Connection to Aurora Ave N shall meet WSDOT Design Manual requirements and is subject to WSDOT Channelization Plan Approval. *Bicycle Facility for this segment shall be 14’ shared use path

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Local Primary Street	N 152nd St	Aurora Ave N	Approx. 375 feet west of Ashworth Ave N	50-60	20-34	N-S	1	8	5.5	0.5	0	0	12	12	12	0	0	0.5	5.5	8	1	66	36	Each side of the street shall dedicate 3'; begin on-street parking at Scottish Rite center
Local Secondary	N 152nd St	Approx. 375 feet west of Ashworth Ave N	Ashworth Ave N	60	30	N-S	1	5	11.5	0.5	0	0	12	0	12	0	0	0.5	11.5	5	1	60	24	Amenity zone width needs to be flexible to accommodate topography.
Principal Arterial	N 155th St	Westminster Way N	Linden Ave N	150-220	70-80	N-S	19+	10	5	0.5	0	0	36	0	24	0	0	0.5	5	8	58+	166		
Principal Arterial	N 155th St	Linden Ave N	Aurora Ave N	115-150	70-80	N-S	18+	10	5	0.5	0	0	22	0	44	0	0	0.5	5	8	20+	133+		Striping at Connection to Aurora Ave N shall meet WSDOT Design Manual requirements and is subject to WSDOT Channelization Plan Approval. For sidewalk segment previously constructed with the Aurora Project, existing 4' amenity zone may be maintained if tree pits are increased in size to 5'x5'.
Minor Arterial	N 155th St	Aurora Ave N	Midvale Ave N	74-88	47-70	N-S	0	7	4	.5	0	0	12-34	10	20-23	0	0	.5	0	6	0-3	75-88	48-69	
Minor Arterial	N 155th St	Midvale Ave N	Stone Ave N	74	42	N-S	1	8	5.5	0.5	0	5	11	10	11	5	0	0.5	5.5	8	1	72	42	
Minor Arterial	N 155th St	Stone Ave N	I-5	72	42	N-S	1	5	5	0.5	0	5	11	10	11	5	0	0.5	5	8	1	68	42	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Minor Arterial	N 157th St	Westminster Way N	Aurora Ave N	52.5		N-S	0	10	7.5-69	0.5	0	0*	0	0	15	0*	0	0.5	5	14	0+	52.5	15	Roadway segment to provide raised crossing for the Interurban Trail. Striping at Connection to Aurora Ave N shall meet WSDOT Design Manual requirements and is subject to WSDOT Channelization Plan Approval. *Bicycle Facility for this segment shall be 14’ shared use path
Minor Arterial	N 160th St	Greenwood Ave N	Aurora Ave N	50-72	40-43	N-S	1	8	5	0.5	0	5	10	13	10	5	0	0.5	5	8	1	72	43	
Local Primary Street	N 165th St	Aurora Ave N	Interurban Trail	60	27-36	N-S	1	8	4	0.5	0	0	12	0	12	12	0	0.5	4	8	1	63	36	The cross-section does not have bicycle lanes, it has a 12’ left turn pocket; redevelopment shall dedicate 1.5’ on both sides and expand the sidewalk width to 8’.
Local Primary Street	N 165th St	Interurban Trail	Ashworth Ave N	60	27-36	N-S	1	5	8.5	0.5	0	0	15	0	15	0	0	0.5	8.5	5	1	60	30	
Collector Arterial	N 165th St	Evanston Place N	Aurora Ave N	60	26	N-S	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Local Primary Street	N 167th St	Ashworth Ave N	Meridian Ave N	60	22	N-S	1	5	8.5	0.5	0	0	15	0	15	0	0	0.5	8.5	5	1	60	30	
Collector Arterial	N 172nd St	Fremont Ave N	Dayton Ave N	60	36	N-S	0	5	4	0.5	8	0	10	0	10	0	8	0.5	8	5	1	60	36	
Collector Arterial	N 175th St	Fremont Ave N	Fire Dept	73	42	S-N	1	8	5	0.5	0	5	11	12	11	5	0	0.5	5	5-8	1	70-73	44	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	N 175th St	Fire Dept	Aurora Ave N	66-71	43-52	N-S	.5	7	4	.5	0	0	22-28	0-10	28	0	0	.5	4	7	.5	82-90	50-66	
Principal Arterial	N 175th St	Aurora Ave N	Midvale Ave N	62	54-55	N-S	1	7	4	.5	0	0	.7-38	12-22	25-29	0	0	.5	4	7	1	112	78-88	
Principal Arterial	N 175th St	Midvale Ave N	Meridian Ave N	70-100	44-60	N-S	1	13	5	0.5	0	0	22	11	22	0	0	0.5	5	13	1	94	55	2 travel lanes in each direction. Wider sidewalks to accommodate bicycles.
Principal Arterial	N 175th St	Meridian Ave N	1st Ave NE	90-159	50-75	N-S	1	13	5	0.5	0	0	33	11	22	0	0	0.5	5	13	1	105	66	Includes a right turn lane at on ramps. Wider sidewalks to accommodate bicycles
Local Street	N 178th St, N 180th St, N 183rd St	Town Center Boundaries				N-S	0.5	8	5	0.5	8	0	10	0	10	0	8	0.5	5	8	0.5	64	36	This is a Storefront Street per the Town Center Code.
Minor Arterial	N 185th St	Fremont Ave N	Approx. 140 feet west of Aurora Ave N	70-80	56	N-S	1	5 to 8	5	0.5	0	0	22	11	22	0	0	0.5	5	5 to 8	1	67	55	
Minor Arterial	N 185th St	Approx. 140 feet west of Aurora Ave N	Aurora Ave N	60	44	N-S	0	7	0	.5	0	0	22-30	12	32	0	0	.5	4	7	0	83-90	66-74	
Minor Arterial	N 185th St	Aurora Ave N	Midvale Ave N	60	42	N-S	0-8	7	0-4	.5	0	0	22-29	0-12	22-24	0	0	.5	4	12	0	78-92	53-56	
Minor Arterial	N 185th St	Midvale Ave N	Ashworth Ave N	60-72	41-42	N-S	1	8	5.5	0.5	0	5	11	10	11	5	0	0.5	5.5	8	1	72	42	
Minor Arterial	N 185th St	Ashworth Ave N	1st Ave NE	60-70	42	N-S	1	5	5.5	0.5	0	5	11	10	11	5	0	0.5	5.5	5	1	66	42	
Collector Arterial	N 192nd St	Aurora Avenue N	Interurban Trail	60	22-34	N-S	2	13	5	.5	0	0	11	12	11	0	0	.5	0	5	0	60	22-34	
Collector Arterial	N 192nd St	Interurban Trail	Ashworth Avenue N	60	22-26	N-S	11.5	6	3.5	.5	0	0	12	0	18	0	0	.5	0	8	0	60	30	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	N 195th St	Greenwood Ave N	Fremont Ave N	60-88	22-28	N-S	1	8	5.5	0.5	0	0	13	10	13	0	0	0.5	5.5	8	1	66	36	
Collector Arterial	N 195th St	Fremont Ave N	Linden Ave N	60	30	N-S	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Local Secondary	N 195th St	Ashworth Ave N	Wallingford Ave N	60	40	N-S	1	5	5	0.5	8	0	10	0	10	0	17	0.5	5	8	1	71	45	The south side shall dedicate 11 feet. Less ROW is needed if parallel parking is installed on-street instead of angle-in parking.
Local Secondary	N 195th St	Wallingford Ave N	Meridian Ave N	60	30	N-S	1	5	7	0.5	0	0	15	0	15	0	0	0.5	7	8	1	60	30	
Collector Arterial	N 200th St	1st Ave NW	Whitman Ave N	58-60	32-36	N-S	0.5	5	5	0.5	12		10	0	10	12		0.5	5	5	0.5	66	44	
Collector Arterial	N 200th St	Whitman Ave N	Aurora Ave N	60	37-40	N-S	1-2	7-8	4.5	.5	0	0	11	12	11	0	0	.5	4.5	7-8	1-2	62-64	34	
Collector Arterial	N 200th St	Aurora Ave N	Approx. 720 feet east of Aurora Ave N	60	40	N-S	0	10	0	.5	0	0	12	12-16	12	0	0	.5	4	7-8	0-1	60-64	36-40	
Collector Arterial	N 200th St	Approx. 720 feet east of Aurora Ave N	Ashworth Ave N	60	50	N-S	0.5	8	5	0.5	0	5	11	10	11	5	0	0.5	5	8	0.5	70	42	All widening to the north
Collector Arterial	N 200th St	Ashworth Ave N	Meridian Ave N	60	40		0	5	5	0.5	7	5	11	0	11	5	0	0.5	5	5	0	60	39	
Local Secondary	NE 149th St	3rd Ave NE	5th Ave NE	60	22	N-S	1	8	5	0.5	7	0	9	0	9	0	0	0.5	5	14	1	60	25	
Collector Arterial	NE 150th St	15th Ave NE	20th Ave NE	60	30-36	N-S	1	8	5	0.5	0	5	10	0	10	5	8	0.5	5	5	1	64	38	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	NE 150th St	20th Ave NE	25th Ave NE	60	39	N-S	5	2-10	0	0	0	5	10	0	10	5	8	0.5	5	5	1	62	38	City has constructed meandering path on the north side, resulting in a varying sidewalk/amenity zone width
Local Secondary	NE 151st St	3rd Ave NE	5th Ave NE	60-77	32-77	N-S	1	14	5	0.5	0	0	9	0	9	0	7	0.5	5	8	1	60	25	
Minor Arterial	NE 155th St	I-5	15th Ave NE	60-72	41	N-S	1	5	5	0.5	0	5	11	10	11	5	0	0.5	5	8	1	68	42	
Local Secondary	NE 159th St	1st Ave NE	5th Ave NE	60	27-30	N-S	1	5	5	0.5	0	0	9	0	9	0	7	0.5	5	8	1	60	25	
Local Secondary	NE 161st St	3rd Ave NE	5th Ave NE	60	32	N-S	1	8	5	0.5	0	0	9	0	9	0	7	0.5	5	5	1	51	25	
Local Secondary	NE 165th St	1st Ave NE	3rd Ave NE	60	27	N-S	1	14	0	0.5	7	0	9	0	9	0	7	0.5	5	5	1	59	32	Future project to work with nearby residents to determine whether on-street parking space should be provided
Local Secondary	NE 165th St	3rd Ave NE	5th Ave NE	60	27	N-S	1	8	5	0.5	7	0*	9	0	9	0*	7	0.5	5	8	1	61		*Bike lane provided by sharrows
Collector Arterial	NE 165th St	5th Ave NE	10th Ave NE	60	30-45	N-S	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60-65	36	
Collector Arterial	NE 165th St	10th Ave NE	15th Ave NE	60	44	N-S	1	8	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	63	36	
Collector Arterial	NE 168th St	15th Ave NE	25th Ave NE	60-64	22-29	N-S	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	NE 168th St	25th Ave NE	25th Ave NE	64	27	W-E/ S-N	0.5	5	5	0.5	0	5	10	0	10	5	8	0.5	5	5	0.5	60	38	
Local Secondary	NE 170th St	1st Ave NE	3rd Ave NE	60	28	N-S	1	5	7	0.5	7	0	9	0	9	0	7	0.5	0	14	1	61	32	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	NE 171st St	22nd Ave NE	25th Ave NE	60	20	W-E/ S-N	0.5	5	5	0.5	8	0	11	0	11	0	8	0.5	5	5	0.5	60	38	
Local Secondary	NE 174th St	1st Ave NE	5rd Ave NE	60	30	N-S	1	8	5	0.5	7	0*	9	0	9	0*	7	0.5	5	8	1	61	32	Wider sidewalk due to trail connection. *Bikes lane provided by sharrows
Principal Arterial	NE 175th St	1st Ave NE	Approx. 120 feet west of 3rd Ave NE	90-159	50-75	N-S	1	13	5	0.5	0	0	33	11	22	0	0	0.5	5	13	1	105	66	Includes a right turn lane at on ramps. Wider sidewalks to accommodate bicycles
Principal Arterial	NE 175th St	Approx. 120 feet west of 3rd Ave NE	15th Ave NE	60-100	26-56	N-S	1	13	5	0.5	0	0	22	11	22	0	0	0.5	5	13	1	94	55	2 travel lanes in each direction. Wider sidewalks to accommodate bicycles.
Collector Arterial	NE 175th St	15th Ave NE	Approx. 300 feet east of 15th Ave NE	60-81	40	S-N	0	10			0	0	22	0	22	0	0	10			0	60	44	Two travel lanes in each direction, 8 feet of north sidewalk in ROW, 2 feet on private property
Collector Arterial	NE 175th St	Approx. 300 feet east of 15th Ave NE	NE 172nd St	60	24-33	W-E/ S-N	0.5	5	5	0.5	8	0	11	0	11	0	8	0.5	5	5	0.5	60	38	
Minor Arterial	NE 178th St	24th Pl NE	25th Ave NE	60	30	W-E	0.5	5	5	0.5	8	5	10	0	10	5	0	0.5	5	5	0.5	60	38	
Local Secondary	NE 180th St	4th Ave NE	5th Ave NE	60	27	N-S	1	8	5	0.5	7	0*	9	0	9	0*	0	0.5	5	8	1	54	25	Wider sidewalk due to trail connection. *Bikes lane provided by sharrows
Collector Arterial	NE 180th St	10th Ave NE	14th Ave NE	60	32	N-S	0.5	8	0	0.5	8	0	10	0	13	0	8	0.5	4	7.5	0	60	39	
Collector Arterial	NE 180th St	14th Ave NE	15th Ave NE	60	35	N-S	0.5	8	4.5	0.5	0	0	13	0	13	0	8	0.5	4	8	0	60	34	
Minor Arterial	NE 185th St	1st Ave NE	5th Ave NE	60-115	42	N-S	1.5	5	5	0.5	0	5	11	10	11	5	0	0.5	5	5	1.5	66	42	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Minor Arterial	NE 185th St	5th Ave NE	8th Ave NE	87+	46	N-S	1	8	5	0.5	0	7	11	11	11	7	0	0.5	5	8	0	75	47	Protected bike lanes
Local Secondary	NE 189th St	7th Ave NE	8th Ave NE	60	32	N-S	1	8	5	0.5	7	0	9	0	9	0	0	0.5	5	8	1	54	25	
Local Secondary	NE 190th St	8th Ave NE	10th Ave NE	60	43	N-S	1	14	5	0.5	7	0	10	0	10	0	7	0.5	5	8	1	69	34	
Local Secondary	NE 195th St	5th Ave NE	8th Ave NE	60	20	N-S	1	5	5	0.5	0	0	9	0	9	0	7	0.5	5	14	1	57	25	Cross-section could be flipped based on Trail Along the Rail Phase 1 Design Project
Local Secondary	NE 195th St	8th Ave NE	10th Ave NE	60	20-30	N-S	1	5	5	0.5	0	0	9	0	9	0	7	0.5	5	14	1	57	25	
Minor Arterial	NE 196th St	15th Ave NE	Forest Park Dr NE	60-80	36-39	N/ W-S/ E	1	5	5	0.5	0	0	12	0	12	0	10-15	0	0	0	0	45.5-49.5	24	Parking to be accommodated on SE side where possible
Minor Arterial	NE 196th St	Bridge		60-80	36-39	N-S	11 (curb, walkway and railing)				0	0	12	0	12	0	0	0.5	2.5 (guardrail)			38	24	
Collector Arterial	NE Perkins Way	10th Ave NE	15th Ave NE	60	26-36						27											40	27	Cross section shall be no less than 40 feet. It shall consist of 27 feet of asphalt to accommodate two 12-foot travel lanes and one 5-foot bicycle lane in each uphill direction, a pedestrian walkway on the north side of the roadway and widened shoulder and parking where possible.
Collector Arterial	NE Perkins Way	15th Ave NE	18th Ave NE	60	25-41	W-E/ S-N	0.5	5	5	0.5	8	5	10	0	10	5	0	0.5	5	5	0.5	60	38	
Minor Arterial	NE 205th Street	19th Ave NE	30th Ave NE	N/A	N/A	CL-S	In Mountlake Terrace							0	10	12		0.5	0	7.5	0	30	22	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Collector Arterial	NW 167th St	10th Ave NW	15th Ave NW	60	20	N-S	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	NW 175th St	St. Luke's Pl	3rd Ave NW	60	28	S-N	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	Provide amenity zone on the south where feasible and allow the sidewalk to meander due to topography.
Collector Arterial	NW 175th St	3rd Ave NW	6th Ave NW	60	28-34	S-N	0	5	3.5	0.5	8	0	10	0	10	0	8	0.5	4	5	0	54.5	36	
Collector Arterial	NW 175th St	6th Ave NW	10th Ave NW (s leg)	60	28	S-N	0	8	0	0.5	0	0	12	0	13	0	8	0.5	0	8	0	50	33	Parking on the north side to consist of parking pullouts where feasible
Local Primary Street	NW 175th St	10th Ave NW (s leg)	10th Ave NW (n leg)	60	20	S-N	0	8	0	0.5	0	0	13	0	13	0	0	0.5	5	8	0	48	26	
Local Primary Street	NW 175th St	10th Ave NW (n leg)	14th Ave NW	60	20	S-N	1	5	7.5	0.5	0	0	16	0	16	0	0	0.5	7.5	5	1	60	32	
Local Primary Street	NW 180th St	3rd Ave NW	6th Ave NW	60	32	N-S	1	5	8.5	0.5	0	0	15	0	15	0	0	0.5	8.5	5	1	60	30	
Collector Arterial	NW 180th St	6th Ave NW	8th Ave NW	50-60	20-35	S-N	1	5	5.5	0.5	0	0	14	0	14	0	8	0.5	5.5	5	1	60	36	
Local Primary Street	NW 180th St	8th Ave NW	10th Ave NW	60	20	N-S	1	5	5.5	0.5	8	0	10	0	10	0	8	0.5	5.5	5	1	60	36	
Collector Arterial	NW 188th St	15th Ave NW	Springdale Ct NW	60	20	N-S	1	5	5.5	0.5	8	0	10	0	14	0	0	0.5	9.5	5	1	60	32	
Collector Arterial	NW 195th St	8th Ave NW	Greenwood Ave N	50-60	28-32	N-S	1	8	5.5	0.5	0	0	13	10	13	0	0	0.5	5.5	8	1	66	36	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Minor Arterial	NW 195th St	15th Ave NW	20th Ave NW	60-85	44	Curb to curb cross-section to remain the same until corridor study is complete.																		
Local Primary Street	NW 195th St	Richmond Beach Dr NW	NW 196th	60	27	NW-SE	0.5	5	5	0.5	8	0	10	0	12	0	8	0.5	5	5	0.5	60	38	
Collector Arterial	NW 196th St	20th Ave NW	24th Ave NW	64-74	42-44	Curb to curb cross-section to remain the same until corridor study is complete.																		
Collector Arterial	NW 196th St	Richmond Beach Dr NW	24th Ave NW	60	26-32	N-S	0.5	5	5	0.5	8	5	10	0	10	5	8	0.5	5	5	0.5	68	46	
Collector Arterial	NW 200th St	1st Ave NW	3rd Ave NW	60	30	N-S	0.5	5	5	0.5	12		10	0	10	12		0.5	5	5	0.5	66	44	
Local Secondary	NW 200th Ave	3rd Ave NW	8th Ave NW			N-S	1	5	5.5	0.5	0	0	16	0	16	0	0	0.5	5.5	5	1	56	32	Combined travel lanes/on-street parking
Collector Arterial	NW 205th Street	3rd Ave NW	8th Ave NW	40-50	19-20	N-S	0.5	8	0	0.5	0	0	11	0	11	0	8	0.5	5	5	0.5	50	30	
Collector Arterial	NW Innis Arden	Greenwood Ave N	Approx. 450 feet east of 6th Ave NW	80	22	To Be Determined in conjunction with Shoreline Community College Master Development Permit application																		
Collector Arterial	NW Innis Arden	Approx. 450 feet east of 6th Ave NW	6th Ave NW	80	22	W-E	0.5	8	5	0.5	8	0	10	0	14	0	0	0.5	5	8	0.5	60	32	8-foot width on south/west side is shoulder
Collector Arterial	NW Innis Arden	6th Ave NW	10th Ave NW	60-81	21-24	W-E	0	0	0	0	8	0	10	0	14	0	0	0.5	5	8	0.5	46	32	
Minor Arterial	NW Richmond Beach Rd	Fremont Ave N	2nd Ave NW	80-110	44	Curb to curb cross-section to remain the same until corridor study is complete.																		
Minor Arterial	NW Richmond Beach Rd	2nd Ave NW	8th Ave NW	60-80	44-54	N-S	1	5 to 8	5	0.5	0	5	22	12	22	5	0	0.5	5	5 to 8	1	89-95	66	

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
Minor Arterial	NW Richmond Beach Rd	8th Ave NW	15th Ave NW	60-83	44	Curb to curb cross-section to remain the same until corridor study is complete.																		

FUNCTIONAL CLASSIFICATION	STREET NAME	FROM	TO	TOTAL EXISTING RIGHT-OF-WAY	EXISTING CURB TO CURB WIDTH	CROSS-SECTION DIRECTION	BEHIND SIDEWALK	SIDEWALK	AMENITY ZONE	CURB	PARKING	BICYCLE LANE	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	BICYCLE LANE	PARKING	CURB	AMENITY ZONE	SIDEWALK	BEHIND SIDEWALK	REQUIRED RIGHT-OF-WAY	PLANNED CURB TO CURB WIDTH	NOTES
GENERIC CROSS SECTION																								
Local Secondary Street	Generic Cross-Section			Varies	Varies		3.5	5	5	0.5	0	0	16	0	16	0	0	0.5	5	5	3.5	60	32	Five footsidewalk adjacent to single family residential land uses; eight foot sidewalk adjacent to all other land uses. Increased sidewalk width may be required if determined by a traffic study.

APPENDIX G – RIGHT-OF-WAY STREET TREE LIST

Large Columnar Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Acer nigrum 'Green Column' Green Column Black Sugar Maple	50	10	No	6	N/A		Good close to buildings
Ginko biloba 'Princeton Sentry' Princeton Sentry Ginkgo	40	15	No	6	N/A		Very narrow growth.
Nyssa sylvatica Tupelo	60	20	No	6	N/A		Handsome chunky bark – Great Plant Pick
Quercus 'Crimschmidt' Crimson Spire Oak	45	15	No	6	N/A		Hard to find in the nursery trade
Quercus frainetto Italian Oak	50	30	No	6	N/A		Drought resistant – beautiful green, glossy leaves in summer. Great Plant Pick
Quercus robur 'fastigiata' Skyrocket Oak	40	15	No	6	N/A		Columnar variety of oak
Taxodium distichum 'Mickelson' Shawnee Brave Bald Cypress	55	20	No	6	N/A		Deciduous conifer - tolerates city conditions

Large Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Acer saccharum 'Bonfire' Bonfire Sugar Maple	50	40	No	6	N/A		Fastest growing sugar maple
Acer saccharum 'Commemoration' Commemoration Sugar Maple	50	35	No	6	N/A		Resistant to leaf tatter. Great Plant Pick
Acer saccharum 'Green Mountain' Green Mountain Sugar Maple	45	35	No	6	N/A		Reliable fall color. Great Plant Pick
Acer saccharum 'Legacy' Legacy Sugar Maple	50	35	No	5	N/A		Limited use - where sugar maple is desired in limited planting strip area. Great Plant Pick
Aesculus flava Yellow Buckeye	60	40	No	6			Least susceptible to leaf blotch – large fruit – fall

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
							color is varied, but quite beautiful
Cercidiphyllum japonicum Katsura Tree	40	40	No	6	N/A		Needs lots of water when young – can produce large surface roots. Great Plant Pick
Fagus sylvatica Green Beech	50	40	No	6	N/A		Silvery-grey bark
Fagus sylvatica 'Asplenifolia' Fernleaf Beech	60	50	No	6	N/A		Beautiful cut leaf. Great Plant Pick
Ginkgo biloba 'Magyar' Magyar Ginkgo	50	25	No	6	N/A		more upright and narrow than 'Autumn Gold'
Gymnocladus dioicus 'Espresso' Espresso Kentucky Coffee	50	35	No	6	N/A		Very coarse branches - extremely large bi-pinnately compound leaves
Liriodendron tulipifera Tulip Tree	60	30	No	8	N/A		Fast-growing tree – can get very large in open conditions
Metasequoia glyptostroboides Dawn Redwood	50	25	No	6	N/A		Fast growing deciduous conifer. Great Plant Pick
Quercus bicolor Swamp White Oak	60	45	No	8	N/A		Interesting shaggy peeling bark
Quercus coccinea Scarlet Oak	60	40	No	6	N/A		Best oak for fall color
Quercus garryana Oregon Oak	50	40	No	8	N/A		Native to Pacific Northwest. Great Plant Pick

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Quercus imbricaria Shingle Oak	60	50	No	6	N/A		Nice summer foliage - leaves can persist throughout the winter
Quercus muhlenbergii Chestnut Oak	60	50	No	6	N/A		coarsely toothed leaf
Quercus robur English Oak	60	40	No	8	N/A		Large, sturdy tree. Acorns do not need dormant cold period to germinate, so can be invasive.
Quercus rubra Red Oak	60	45	No	8	N/A		Fast growing oak – large tree that needs space
Quercus velutina Black Oak	60	50	No	8	N/A		More drought tolerant than red oak
Taxodium distichum Bald Cypress	55	35	No	8	N/A		A deciduous conifer, broadly spreading when mature – columnar when young. Great Plant Pick
Ulmus 'Homestead' Homestead Elm	60	35	No	6	N/A		Complex hybrid - close in form to American elm - Resistant to Dutch elm disease
Ulmus 'Frontier' Frontier Elm	50	35	No	6	N/A		Resistant to Dutch elm disease
Zelkova serrata 'Greenvase' Green Vase Zelkova	45	40	No	6	N/A		Attractive exfoliating bark provides Winter appeal. Dark green leaves turn orange-red and purple in Fall. Great Plant Pick
Zelkova serrata 'Village Green' Village Green Zelkova	40	40	No	6	N/A		Green Vase, Mussichino and Halka are improved forms. Great Plant Pick

Medium / Large Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Acer campestre Hedge Maple	50	30	No	5	N/A		Contrary to its name, this is not a small tree – nice overall shape and structure
Acer campestre 'Evelyn' Queen Elizabeth Hedge Maple	40	30	No	5	N/A		More upright branching than the species.
Acer freemanii 'Autumn Blaze' Autumn Blaze Maple	50	40	No	6	N/A		Cross between red and silver maple – fast growing with good fall color
Acer miyabei 'Morton' State Street Maple	40	30	No	6	N/A		Similar to, but faster growing and larger than Hedge maple
Acer pseudoplatanus 'Atropurpureum' Spaethii Maple	40	30	No	5	N/A		Leaves green on top purple underneath.
Aesculus x carnea 'Briottii' Red Horsechestnut	30	35	No	6			Resists heat and drought better than other horsechestnuts
Betula jacquemontii Jacquemontii Birch	40	30	No	5	N/A		White bark makes for good winter interest – best for aphid resistance, but does have issues with Bronze Birch Borer
Ginko biloba 'Autumn Gold' Autumn Gold Ginkgo	45	35	No	6	N/A		Narrow when young
Nothofagus antarctica Antarctic Beech	50	35	No	5	N/A		Rugged twisted branching and petite foliage – difficult to find in the nursery trade
Tilia americana 'Redmond' Redmond Linden	50	30	No	8	N/A		Pyramidal, needs extra water when young
Tilia cordata 'Greenspire' Greenspire Linden	40	30	No	6	N/A		Symmetrical, pyramidal form – sometimes has structural issues due to tight branch attachements
Ulmus parvifolia 'Emer II' Allee Elm	45	35	No	5	N/A		Exfoliating bark and nice fall color – Resistant to Dutch Elm Disease

Medium Columnar Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Carpinus betulus 'Fastigiata' Pyramidal European Hornbeam	40	15	No	5	N/A		Broadens when older. Great Plant Pick
Fagus sylvatica 'Dawyck Purple' Dawyck Purple Beech	40	12	No	6	N/A		Purple foliage.
Liriodendron tulipifera 'Fastigiatum' Columnar Tulip Tree	40	10	No	6			Good next to buildings – can have problems with tight branch angles. Great Plant Pick
Malus 'Tschonoskii' Tschonoskii Crabapple	30	15	Yes	5			Sparse green fruit, pyramidal
Oxydendron arboreum Sourwood	35	12	No	5			Consistent and brilliant fall color. Great Plant Pick
Pyrus calleryana 'Cambridge" Cambridge Pear	40	15	No	5			Narrow tree with better branch angles and form than the species – brittle limbs may be a problem with ice or wet snow

Medium Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Acer grandidentatum 'Schmidt' Rocky Mt. Glow Maple	25	20	Yes	5	N/A		Intense red fall color - Limited availability in nursery trade
Acer truncatum x A. platanoides 'Keithsform Norwegian Sunset Maple	35	25	No	5	N/A		Reliable fall color - nice reddish orange
Acer truncatum x A. platanoides 'Warrensred' Pacific Sunset Maple	30	25	Yes	5	N/A		Limited use under higher wires
Betula albosinenesis var septentrionalis Chinese Red Birch	40	35	No	5	N/A		White and pink peeling bark. Great Plant Pick
Carpinus caroliniana American Hornbeam	25	20	Yes	5	N/A		Outstanding fall color (variable – yellow, orange, red) – nice little tree. Great Plant Pick

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Cladrastis kentukea Yellowwood	40	40	No	5			White flowers in spring, resembling wisteria flower – blooms profusely only every 2 to 4 years – yellow/gold fall color
Cornus controversa 'June Snow' Giant Dogwood	40	30	No	5			Frothy, 6-inch clusters of white flowers in June – Great Plant Pick
Crataegus crus-galli 'Inermis' Thornless Cockspur Hawthorne	25	30	Yes	5			Red persistent fruit
Cornus 'Eddie's White Wonder' Eddie's White Wonder Dogwood	30	20	Yes	5			A hybrid of C. florida and C. nuttalii
Crataegus x lavalii Lavalle Hawthorne	25	20	Yes	5			Thorns on younger trees. Great Plant Pick
Davidia involucrata Dove Tree	40	30	No	5		N/A	Large, unique flowers in May. Great Plant Pick
Eucommia ulmoides Hardy Rubber Tree	50	40	No	6	N/A	N/A	Dark green, very shiny leaves – insignificant fall color
Fagus sylvatica 'Rohanii' Purple Oak Leaf Beech	50	30	No	6	N/A	N/A	Attractive purple leaves with wavy margins. Great Plant Pick
Halesia monticola Mountain Silverbell	45	25	No	5			Attractive small white flower
Halesia tetraptera Carolina Silverbell	35	30	No	5			Attractive bark for seasonal interest
Koelreuteria paniculata Goldenrain Tree	30	30	Yes	5			Midsummer blooming – slow growing. Great Plant Pick
Magnolia denudata Yulan Magnolia	40	40	No	5		N/A	6" inch fragrant white flowers in spring. Great Plant Pick
Magnolia grandiflora 'Victoria' Victoria Evergreen Magnolia	25	20	Yes	5		N/A	Evergreen magnolia – can be damaged in years with wet, heavy snow. Great Plant Pick
Magnolia kobus 'Wada's Memory' Wada's Memory Magnolia'	30	20	Yes	5			Does not flower well when young. Great Plant Pick
Ostrya virginiana Ironwood	40	25	No	5	N/A		Hop like fruit – slow growing

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Phellodendron amurense 'Macho' Macho Cork Tree	40	40	No	5	N/A		This variety is fruitless – fall color can be varied. High drought tolerance
Prunus cerasifera 'Krauter Vesuvius' Vesuvius Flowering Plum	30	20	Yes	5		N/A	Burgundy colored leaves – tree best used as an accent rather than in mass plantings
Pterostyrax hispida Fragrant Epaulette Tree	40	30	No	5			Pendulous creamy white flowers – fragrant – difficult to find in the nursery trade
Quercus Ilex Holly Oak	40	30	No	5	N/A	N/A	Evergreen oak - Underside of leaf is silvery-white. Often has a prominent umbrella form
Rhamnus purshiana Cascara	30	20	Yes	5	N/A		*Native tree* – fall color depends on exposure – purplish fruit feeds many native birds
Robinia x ambigua Pink Idaho Locust	35	25	No	5			Fragrant flowers. Sterile variety. Drought tolerant. Some varieties will sucker profusely.
Sorbus x hybridia Oakleaf Royal Mt. Ash	30	20	Yes	5			It has leaves which are similar to English oak, and interesting bark for seasonal features.
Styrax japonica Japanese Snowbell	25	25	Yes	5			Reliable and easy to grow, it has plentiful, green ½" inch seeds. Flowers similar to lily in the valley. Great Plant Pick
Tilia cordata 'De Groot' De Groot Littleleaf Linden	30	20	Yes	5	N/A		One of the smaller stature littleleaf lindens.
Tilia cordata 'Chancole' Chancelor Linden	35	20	No	6	N/A		Pyramidal when young. Fragrant flowers that attract bees.
Ulmus parvifolia 'Emer I' Athena Classic Elm	30	35	No	5	N/A		High resistance to Dutch Elm Disease. Drought resistant. Cinnamon colored exfoliating bark for seasonal interest.

Small Columnar Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Maackia amurensis Amur Maackia	30	20	Yes	5		N/A	Interesting exfoliating bark – flowering in June or July - varies in intensity from year to year
Malus 'Adirondack' Adirondack Crabapple	20	10	Yes	5			Very resistant to apple scab – one of the narrowest crabapples – persistant reddish ¼" fruit. Great Plant Pick
Malus 'Red Barron' Red Barron Crabapple	20	10	Yes	5			Deep pink blossom and persistent red berries for seasonal interest
Prunus serrulata 'Amanogawa' Amanogawa Flowering Cherry	20	8	Yes	6			Pinkish flower bud, changing to white flower.
Sorbus americana 'Dwarfcrown' Red Cascade Mountain Ash	20	10	Yes	5			Nice winter form - Red berries persistent in clusters

Small Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Acer buegerianum Trident Maple	30	30	Yes	5	N/A		Somewhat shrub-like – must train to a single stem – interesting bark. Great Plant Pick
Acer circinatum Vine Maple	25	25	Yes	5	N/A		*Native tree.* Avoid using on harsh sites. Great Plant Pick
Acer ginnala 'Flame' Flame Amur Maple	25	20	Yes	5			Clusters of small cream colored flowers in spring – very fragrant. Nice fall color. Informal branch structure.
Acer griseum Paperbark Maple	30	20	Yes	5	N/A		Peeling cinnamon colored bark for seasonal interest. Great Plant Pick
Acer palmatum Japanese Maple	20	25	Yes	5	N/A		Many varieties available – select larger varieties for street planting
Acer triflorum Three-Flower Maple	25	20	Yes	5	N/A		Multi seasonal interest with tan, exfoliating bark

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
							and red, orange/red fall color. Great Plant Pick
Amelanchier grandiflora 'Princess Diana' Princess Diana Serviceberry	20	15	Yes	4			Good for narrower planting strips
Amelanchier x grandiflora 'Autumn Brilliance Autumn Brilliance Serviceberry	20	15	Yes	4			Good for narrower planting strips – reliable bloom and fall color
Arbutus unedo 'Marina' Strawberry Tree	25	20	Yes	5		N/A	Substitute for Pacific madrone – can suffer severe damage or death due to cold weather - evergreen
Carpinus japonica Japanese Hornbeam	20	25	Yes	5	N/A		Wide spreading, slow growing – fall color is not outstanding. Great Plant Pick
Cercis canadensis Eastern Redbud	25	30	Yes	5			Deep pink flowers on bare twigs in spring
Cercis siliquastrum Judas Tree	25	30	Yes	5			Deep pink flowers on bare twigs in spring – drought resistant
Cornus alternifolia Pagoda Dogwood	25	25	Yes	5			Small white flowers in flat clusters – fall color is varied. Great Plant Pick
Cornus kousa 'Chinensis' Kousa Dogwood	20	20	Yes	4			Does not do well on harsh, dry sites. Great Plant Pick
Cotinus obovatus American Smoke Tree	25	25	Yes	4			Showy pinkish panicles of flowers in the spring – reddish purple leaves on some varieties. Great Plant Pick
Lagerstroemia 'tuscarora' Tuscarora Hybrid Crape Myrtle	20	20	Yes	4			Light cinnamon brown bark lends year round interest – drought resistant – likes a warm site
Magnolia 'Elizabeth' Elizabeth Magnolia	30	20	Yes	5		N/A	Yellowish to cream colored flower in spring. Great Plant Pick
Magnolia 'Galaxy' Galaxy Magnolia	25	25	Yes	5			Showy pink flowers. Great Plant Pick
Magnolia x loebneri Loebner Magnolia	20	20	Yes	5			Flower is 'star' shaped rather than tulip like – white to pinkish white in

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
							March or April. Great Plant Pick
Malus 'Golden Raindrops' Golden Raindrops Crabapple	20	20	Yes	5			Disease resistant – persistent yellow fruit in fall and winter. Great Plant Pick
Malus 'Donald Wyman' Donald Wyman Crabapple	25	25	Yes	5			Large white blossom – nice green foliage in summer
Malus 'Lancelot' ('Lanzam') Lancelot Crabapple	15	15	Yes	4			Red flower buds, blooming white – red persistent fruit
Parrotia persica Persian Parrotia	30	20	No	5			Blooms before it leafs out – drought tolerant - Varied fall color - reds, oranges and yellows. Great Plant Pick
Prunus 'Frankthrees' Mt. St. Helens Plum	20	20	Yes	5		N/A	Burgundy colored leaves – tree best used as an accent rather than in mass plantings
Prunus 'Newport' Newport Plum	20	20	Yes	5		N/A	Burgundy colored leaves – tree best used as an accent rather than in mass plantings
Prunus 'Snowgoose' Snow Goose Cherry	20	20	Yes	5			This selection sports abundant white flowers and healthy green, disease-resistant foliage
Prunus x yedoensis 'Akebono' Akebono Flowering Cherry	25	25	Yes	6			Has masses of large, semi-double, pink flowers – most widely planted cherry in Pacific Northwest
Sorbus alnifolia Korean Mountain Ash	35	30	No	5			Simple leaves and beautiful pink/red fruit. Great Plant Pick
Stewartia monodelpha Orange Bark Stewartia	30	20	Yes	5			Extraordinary cinnamon colored bark – avoid hot, dry sites. Great Plant Pick
Stewartia psuedocamellia Japanese Stewartia	25	15	Yes	5			Patchwork bark, white flower in spring. Great Plant Pick
Styrax obassia Fragrant Styrax	25	20	Yes	5			Smooth gray bark and fragrant white flowers. Great Plant Pick

Unimproved Right-of-Way Trees

Scientific & Common Name	Mature Height (ft)	Spread (ft)	Under Wires/View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Comments
Pseudotsuga menziesii Douglas Fir	80	30	No	20	N/A	N/A	Unimproved right-of-way only
Abies procera Noble Fir	60	25	No	20	N/A	N/A	Unimproved right-of-way only
Pinus contorta Shore Pine	80	30	No	20	N/A	N/A	Unimproved right-of-way only
Thuja plicata Western Red Cedar	70	25	No	15	N/A	N/A	Unimproved right-of-way only
Pinus strobus White Pine	80	35	No	20	N/A	N/A	Unimproved right-of-way only
Arbutus menziesii Pacific Madrone	80	40	No	15		N/A	Unimproved right-of-way only
Fraxinus latifolia Oregon Ash	80	60	No	20			Unimproved right-of-way only
Acer macrophyllum Big Leaf Maple	75	60	No	20	N/A		Unimproved right-of-way only
Picea sitchensis Sitka Spruce	80	30	No	20	N/A	N/A	Unimproved right-of-way only
Tsuga heterphylla/mertensiana Mountain/Western Hemlock	70	30	No	20	N/A	N/A	Unimproved right-of-way only
Amelanchier alnifola Serviceberry	25	20	Yes	5			Unimproved right-of-way only

APPENDIX H – INFILTRATION TEST METHODS

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Methods in this appendix may be used for Medium Impact Projects.

Small-Scale PIT

Resource: SWMMWW 2014, Vol II 3.3.6, adapted for medium impact projects within the City of Shoreline

CONDUCTING A PILOT INFILTRATION TEST

Small-scale PIT can be used instead of a large-scale PIT when:

- The drainage area to the infiltration site is less than 1 acre
- The testing is for the LID BMP's of bioretention or permeable pavement that serve small scale drainage areas and/or are widely dispersed throughout a project site
- The site has a high infiltration rate, making a full-scale PIT difficult, and the site geotechnical investigation suggests uniform subsurface characteristics

Excavate the test pit to the estimated surface elevation of the proposed infiltration facility. In the case of bioretention, excavate to the estimated elevation at which the imported soil mix shall lie on top of the underlying native soil. For permeable pavements, excavate to the elevation at which the imported subgrade materials, or the pavement itself, will contact the underlying native soil. If the native soils (road subgrade) shall meet a minimum subgrade compaction requirement, compact the native soil to that requirement prior to testing. Note that the permeable pavement design guidance recommends compaction not exceed 90% - 92%. Finally, lay back the slopes sufficiently to avoid caving and erosion during the test. Alternatively, consider shoring the sides of the test pit.

- The horizontal surface area of the bottom of the test pit should be 12 to 32 square feet. It may be circular or rectangular, but accurately document the size and geometry of the test pit.

Install a vertical measuring rod adequate to measure the ponded water depth and that is marked in half inch increments in the center of the pit bottom. Use a rigid pipe with a splash plate on the bottom to convey water to the pit and reduce side-wall erosion or excessive disturbance of the pond bottom. Excessive erosion and bottom disturbance will result in clogging of the infiltration receptor and yield lower than actual infiltration rates. Use a 3-inch diameter pipe for pits on the smaller end of the

recommended surface area, and a 4-inch pipe for pits on the larger end of the recommended surface area.

During pre-soak period, add water to the pit so that there is standing water for at least 6 hours. Maintain the pre-soak water level at least 12 inches above the bottom of the pit. At the end of the pre-soak period, add water to the pit at a rate that will maintain a 6-12 inch water level above the bottom of the pit over a full hour. The depth should not exceed the proposed maximum depth of water expected in the completed facility.

- Every 15 minutes, record the cumulative volume and instantaneous flow rate in gallons per minute necessary to maintain the water level at the same point (between 6 inches and 1 foot) on the measuring rod. The specific depth should be the same as the maximum designed ponding depth (usually 6 – 12 inches).
- After one hour, turn off the water and record the rate of infiltration (the drop rate of the standing water) in inches per hour from the measuring rod data, until the pit is empty.

A self-logging pressure sensor may also be used to determine water depth and drain-down. At the conclusion of testing, over-excavate the pit to see if the test water is mounded on shallow restrictive layers or if it has continued to flow deep into the subsurface. The depth of excavation varies depending on soil type and depth to hydraulic restricting layer and is determined by the engineer or certified soils professional. The soils professional should judge whether a mounding analysis is necessary.

DATA ANALYSIS

Calculate and record the saturated hydraulic conductivity rate in inches per hour in 30 minutes or one-hour increments until one hour after the flow has stabilized.

Grain Size Analysis

Resource: Stormwater Manual, Vol II 3.3.6, adapted for medium impact projects within the City of Shoreline.

METHOD

For each defined layer below the infiltration pond to a depth below the pond bottom of 2.5 times the maximum depth of water in the pond, but not less than 10 feet, estimate the initial saturated hydraulic

conductivity (K_{sat}) in cm/sec using the following relationship (See Massmann 2003, and Massmann et al., 2003):

$$\log_{10}(K_{sat}) = -1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08f_{fines}$$

Where, D_{10}, D_{60} and D_{90} are the grain sizes in mm for which 10 percent, 60 percent and 90 percent of the sample is more fine and f_{fines} is the fraction of the soil (by weight) that passes the number-200 sieve (K_{sat} is in cm/s).

For bioretention facilities, analyze each defined layer below the top of the final bioretention area subgrade to a depth of at least 3 times the maximum ponding depth, but not less than 3 feet. For permeable pavement, analyze for each defined layer below the top of the final subgrade to a depth of at least 3 times the maximum ponding depth within the base course, but not less than 3 feet.

This equation for estimating K_{sat} assumes minimal compaction consistent with the use of tracked (i.e., low to moderate ground pressure) excavation equipment.

If the soil layer being characterized has been exposed to heavy compaction (e.g., due to heavy equipment with narrow tracks, narrow tires, or large lugged, high pressure tires) the hydraulic conductivity for the layer could be approximately an order of magnitude less than what would be estimated based on grain size characteristics alone (Pitt, 2003). In such cases, compaction effects must be taken into account when estimating hydraulic conductivity.

For clean, uniformly graded sands and gravels, the reduction in K_{sat} due to compaction will be much less than an order of magnitude. For well graded sands and gravels with moderate to high silt content, the reduction in K_{sat} will be close to an order of magnitude. For soils that contain clay, the reduction in K_{sat} could be greater than an order of magnitude.

If greater certainty is desired, the in-situ saturated conductivity of a specific layer can be obtained through the use of a pilot infiltration test (PIT). Note that these field tests generally provide a K_{sat} combined with a hydraulic gradient. In some of these tests, the hydraulic gradient may be close to 1.0; therefore, in effect, the test infiltration rate result is the same as the hydraulic conductivity. In other cases, the hydraulic gradient may be close to the gradient that is likely to occur in the full-scale infiltration facility. The hydraulic gradient will need to be evaluated on a case-by-case basis when interpreting the results of field tests. It is important to recognize that the gradient in the test may not be

the same as the gradient likely to occur in the full-scale infiltration facility in the long-term (i.e., when ground water mounding is fully developed).

Once the K_{sat} for each layer has been identified, determine the effective average K_{sat} below the pond. K_{sat} estimates from different layers can be combined using the harmonic mean (Equation 2):

Equation 2:

$$K_{equiv} = \frac{d}{\sum \frac{d_i}{K_i}}$$

Where, d is the total depth of the soil column, d_i is the thickness of layer "i" in the soil column, and K_i is the saturated hydraulic conductivity of layer "i" in the soil column. The depth of the soil column, d, typically would include all layers between the pond bottom and the water table. However, for sites with very deep water tables (>100 feet) where ground water mounding to the base of the pond is not likely to occur, it is recommended that the total depth of the soil column in Equation 2 be limited to approximately 20 times the depth of pond, but not more than 50 feet. This is to ensure that the most important and relevant layers are included in the hydraulic conductivity calculations. Deep layers that are not likely to affect the infiltration rate near the pond bottom should not be included in Equation 2.

Equation 2 may over-estimate the effective K_{sat} value at sites with low conductivity layers immediately beneath the infiltration pond. For sites where the lowest conductivity layer is within five feet of the base of the pond, it is suggested that this lowest K_{sat} value be used as the equivalent hydraulic conductivity rather than the value from Equation 2. Using the layer with the lowest K_{sat} is advised for designing bioretention facilities or permeable pavements. The harmonic mean given by Equation 2 is the appropriate effective hydraulic conductivity for flow that is perpendicular to stratigraphic layers and will produce conservative results when flow has a significant horizontal component such as could occur due to ground water mounding.

Correction Factors

Resource: Stormwater Manual, Vol II 3.4, adapted for medium impact projects within the City of Shoreline.

APPLICATION TO BIORETENTION

If deemed necessary by a qualified professional engineer, a correction factor may be applied to the measured K_{sat} of the subgrade soils to estimate its design (long term) infiltration rate.

The overlying bioretention soil mix provides excellent protection for the underlying native soil from sedimentation. Accordingly, the correction factor for the sub-grade soil does not have to take into consideration the extent of influent control and clogging over time. The correction factor to be applied to in-situ, small-scale infiltration test results is determined by the number of tests in relation to the number of bioretention areas and site variability. Correction factors range from 0.33 to 1 (no correction) and are determined by a licensed geotechnical engineer or licensed engineering geologist.

Tests should be located and be at an adequate frequency capable of producing a soil profile characterization that fully represents the infiltration capability where the bioretention areas are to be located. The correction factor depends on the level of uncertainty that variable subsurface conditions justify. If a pilot infiltration test is conducted for all bioretention areas or the range of uncertainty is low (for example, conditions are known to be uniform through previous exploration and site geological factors) one pilot infiltration test may be adequate to justify a correction factor of one. If the level of uncertainty is high, a correction factor near the low end of the range may be appropriate. Two example scenarios where low correction factors may apply include:

- Site conditions are highly variable due to a deposit of ancient landslide debris, or buried stream channels. In these cases, even with many explorations and several pilot infiltration tests, the level of uncertainty may still be high.
- Conditions are variable, but few explorations and only one pilot infiltration test is conducted. That is, the number of explorations and tests conducted do not match the degree of site variability anticipated.

Correction Factors for in-situ Saturated Hydraulic Conductivity Measurements to Estimate Design (Long-Term) Infiltration Rates of Subgrade Soils Underlying Bioretention

Site Analysis Issue	Correction Factor
Site variability and number of locations tested	CFv = 0.33 to 1
Degree of influent control to prevent siltation and bio-buildup	No correction factor required

APPLICATION TO PERMEABLE PAVEMENT

The correction factor for in-situ, small-scale pilot infiltration test is determined by the number of tests in relation to the size of the permeable pavement installation, site variability and the quality of the aggregate base material. Correction factors range from 0.33 to 1 (no correction).

Tests should be located and be at adequate frequency capable of producing a soil profile characterization that fully represents the infiltration capability where the permeable pavement is located. If used, the correction factor depends on the level of uncertainty that variable subsurface conditions justify. If enough pilot infiltration tests are conducted across the permeable pavement subgrade to provide an accurate characterization, or the range of uncertainty is low (for example, conditions are known to be uniform through previous exploration and site geological factors), then a correction factor of one for site variability may be justified. Additionally, a correction factor of 1 for the quality of pavement aggregate base material may be necessary if the aggregate base is clean washed material with 1% or less fines passing the 200 sieve.

If the level of uncertainty is high, a correction factor near the low end of the range may be appropriate. Two example scenarios where low correction factors may apply include:

Site conditions are highly variable due to a deposit of ancient landslide debris, or buried stream channels. In these cases, even with many explorations and several pilot infiltration tests, the level of uncertainty may still be high.

Conditions are variable, but few explorations and only one pilot infiltration test is conducted. That is, the number of explorations and tests conducted do not match the degree of site variability anticipated.

Correction Factors for in-situ Saturated Hydraulic Conductivity (K_{sat}) Measurements to Estimate Design (Long-Term) Infiltration Rates

Site Analysis Issue	Correction Factor
Site variability and number of locations tested	CFv = 0.33 to 1
Quality of pavement aggregate base material	CFm = 0.9 to 1

Source: Stormwater Manual, Table III-3.4.2

Total correction factor (CF_T) = CF_v x CF_m

APPENDIX I - RECORD DRAWING CRITERIA

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Record Drawing Requirements (As-Builts)

A. Record drawings are required prior to request for final inspection or issuance of Certificate of Occupancy for all right-of-way construction projects and for surface water drainage systems that connect to City infrastructure.

B. Record drawings should accurately reflect revisions made to approved plans during construction. The record drawings should locate all newly installed, existing, and abandoned utilities encountered during construction, but not shown on the approved plans.

C. Record drawings shall be stamped, signed, and dated by a Professional Engineer licensed in the State of Washington.

D. As-constructed survey information provided on a record drawing shall be provided by a licensed land surveyor. Information from sources such as the contractor's red-lined drawings, for which the surveyor is not responsible, shall be clearly noted/identified on the face of the record drawings.

E. The Permittee shall provide the City Inspector preliminary record drawings on paper. Once the City approves the preliminary submittal, the Permittee shall provide an AutoCAD drawing of the as-builts on a CD under the guidelines below.

F. Each sheet of the record drawings shall include the following statement, preferably located in the bottom right hand corner of the each sheet.

"These plans are record drawings and the information shown accurately reflects existing field conditions as of this date _____."

CAD GUIDELINES

The City of Shoreline is currently using AutoCAD Civil 3D 2014. Submittal of as-built drawings on CD shall be saved to the AutoCAD 2013 format and shall meet the following guidelines.

- All elements should be created in Model space. Our GIS software does not draw features created in Paper space.
- Drawings shall be horizontally referenced to WA State Plane Coordinates, North Zone, NAD 83 HARN GCS 4602 in Survey Feet.
- Drawings shall be vertically referenced to NAVD 1988, feet

- Provide eastings and northings for existing and new monuments and benchmarks in the coordinate system referenced, as an embedded or separate table.
- Layering Designations in CAD files should be separated and delineated for storm facilities (separate layers for pipes, catch basins and other structures), water utilities, sanitary sewer utilities, buildings, pavement edges, sidewalks, curb ramps, water bodies, wetlands, poles, trees, property lines, ROW boundaries, luminaires, signs, pavement markings, traffic signals, barriers, handrails, guard rails, landscape areas, and fences.
- All lines should be snapped and closed, and attributes should be defined on Layer 0.
- Drawings shall be purged of empty, unused, or non-essential drawing data.
- Drawings should be in full scale format (1ft =1ft).

APPENDIX J – STREET LIGHTING LEVELS CRITERIA

Lighting Level Requirements

ROADWAY CLASSIFICATION	Area Classification[1]	Target Light Levels		Luminaire Mounting Height (ft)	Maximum Arm Length (ft)	Maximum Wattage[4]
		Minimum Maintained Average (fc)	**Uniformity Ratio (Avg/Min)**			
PRINCIPAL ARTERIAL	Commercial	1.6	3:1	40	12	271
	Residential	0.8	3:1	40[3]	16	271
				35[2]	12	183
MINOR ARTERIAL	Commercial	1.1	3:1	40	12	271
	Residential	0.5	4:1	35[3]	12	183
				35[2]	12	135
COLLECTOR ARTERIAL	Commercial	1.1	3:1	40	12	271
	Residential	0.6	4:1	35	12	135
LOCAL STREET	Commercial	0.8	6:1	35	12	183
	Residential	0.4	6:1	25	12	92
		Decision Point Lighting[5]		12-35	n/a	112

1. *See City of Shoreline Zoning Map; Industrial, Business, and Mixed Business are to be considered Commercial. All others, including Mixed Use are considered residential for the purposes of lighting standards.*
2. *Use for roadway width of 36 ft or less*
3. *Use for roadway width over 36 ft*
4. *Maximum wattage values are for LED fixtures only. Coordinate with City of Shoreline for High Pressure Sodium and Metal Halide maximum wattage values.*
5. *Decision Point Lighting may be applied to residential local access streets with 300 ft maximum spacing between luminaires. Luminaires are placed at intersections, crossings, changes in roadway geometry, dead ends, hazards, etc.*

APPENDIX K – TRAFFIC CONTROL PLAN SUBMITTALS

Typical Elements for Traffic Control Plan Submittals

This section provides information about elements that should be included in all traffic control plans submitted for review. Incorporating these elements into the plan will reduce delay in the review process and reduce the need for possible re-submittal of the plans.

All plans shall be consistent with the MUTCD. To the extent possible, applicants should utilize Shoreline Standard Plan 900 Series to eliminate delays and ensure a consistent review process.

Basic Elements of a Traffic Control Plan

- A clear and accurate plan view representation of the streets and the intersection where the temporary traffic control plan will be implemented. Should include the following:
    - Street names
    - Lane configurations
    - Existing channelization devices (include pavement markings such as crosswalks)
    - Traffic signals
- Clearly indicate the active work area and the proposed temporary channelization device set up.
- Include a legend indicating symbols used to represent various traffic control device elements.
- Clearly indicate the temporary signing to be used. Label sign by appropriate signs code as per MUTCD and include size and color of signs. (Size and color can be referenced in the general notes shown on the plan.) Using both a sign image and sign code will help clarify the appropriate sign intended.
- Include all applicable tables as shown on Shoreline Standard Plan 900 series, including channelizing device spacing, sign spacing, buffer data, and minimum lane closure taper length.
- Label sign spacing on plan and clearly indicate the applicable length in the table.
- Label all transition and/or taper length and clearly indicate the applicable length in table.
- Label buffer lengths on plan and clearly indicate the applicable length in table.

- Per RCW 47.36.200, include special warning signs for motorcycles (W21-1701 – "Motorcycles Use Extreme Caution") if any of the following conditions exist at the work zone:
    - Grooved Pavement
    - Abrupt land edge
    - Steel Plates
    - Loosed material (such as gravel or dirt) on roadway
- Indicate approved work hours. Typical work hours are 9 am to 3pm unless otherwise approved.
- Include in general notes that a minimum of 11' lanes shall be maintained, unless otherwise approved.
- All cones shall be orange in color, at least 28" tall and have two retroreflective bands.
- Where bike lanes are present, temporary traffic control addressing bike traffic is required.
- All traffic control plans shall address pedestrian access. This includes complete pedestrian detour routes and temporary ADA compliant ramps where applicable. In some cases, pedestrian access can be addressed by using a flagger to assist pedestrians through the work zone. This should be noted on plans.

Signalized Intersection Impacts

- A minimum of two uniformed police offers are required.
- The traffic engineer shall be contacted a minimum of 3 business days at 206-801-2432.
- The signal technician shall be contacted a minimum of 3 business days in advance at 206-477-1571.

Bus Stop and Bus Route Impacts

For bus stop or bus route impacts, King County Metro is to be notified via the following contacts:

- By phone: 206-477-1140
- By Email: construction.coord@kingcounty.gov

Minimum notification requirements are listed below:

- 3-business days: For work resulting in a temporary closure/relocation to a bus stop or for work within an area of a bus stop that will limit full access to it by coaches and pedestrians/passengers. (Relocated stop is to remain ADA accessible if the affected stop is designated as such).
- 5-business days: For work resulting in a road closure that buses operate on which will require them to be detoured.
- 15-business days: For work resulting in Metro removing any of its transit facility structures (e.g. shelters, benches, information boards/kiosks and bus stop signs).

APPENDIX L – APPROVED STORMWATER FACILITY PLANTING LIST

Stormwater Facility Plantings

The following tables were compiled to specify the approved plants for stormwater facilities that require plantings, such as rain gardens and bioretention. The lists were compiled using the 2012 Low Impact Development Technical Guidance Manual for Puget Sound (2012 LID Manual) and the 2013 Rain Garden Handbook (RGH). Precedence was given to data from the RGH in instances where information was contradictory, since it is a more recent and up-to-date resource.

Stormwater facilities in the right-of-way shall only use plants from the approved plant list. Any trees planted in the right-of-way shall be also be on the approved street tree list in Appendix G. Stormwater facilities on private property may use other plant species listed in the 2012 LID Manual. The 2012 LID Manual shall be used for any other relevant specifications.

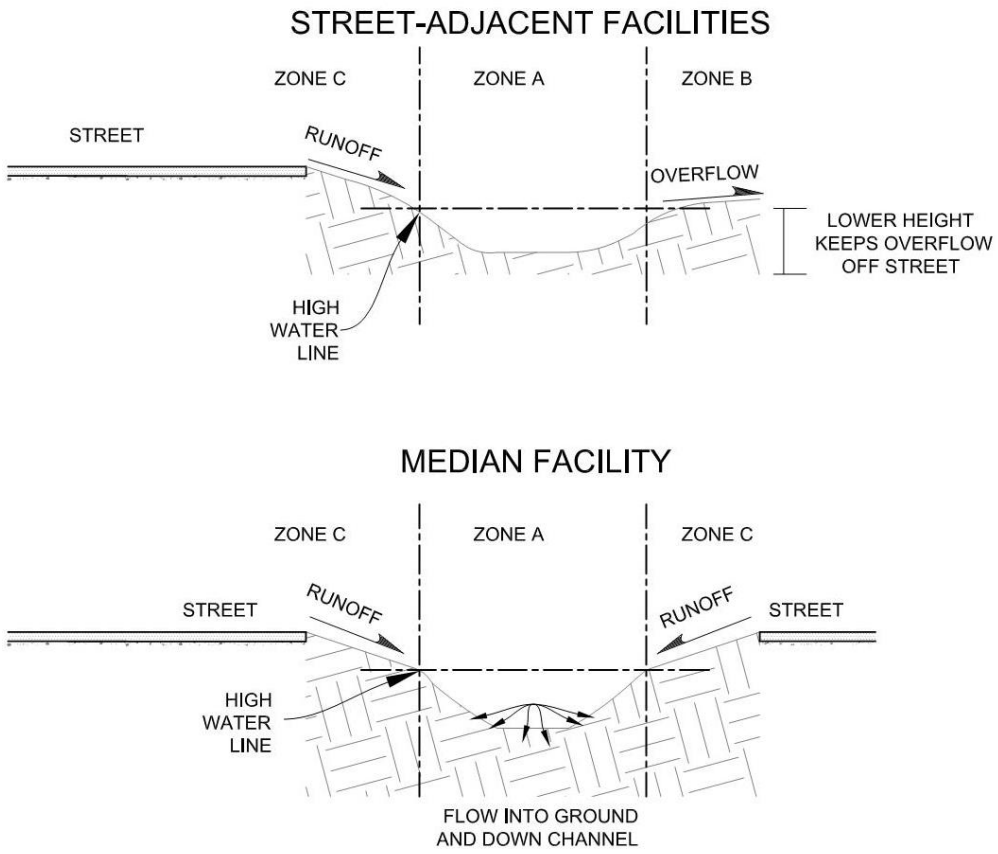
The approved plant list is separated into six tables:

- Emergents: This table was compiled after referencing with a representative from Earthcorps and contains sedges, rushes, bulrushes, and Carex, and a few other plants that can thrive in saturated soil.
- Herbaceous/Ornamentals/Ferns: This table contains any plants without woody stems that are not emergents or groundcovers.
- Groundcovers: This list was compiled after referencing our contact, and containing evergreen vegetation with a creeping, covering growth habit.
- Small Shrubs
- Large Shrubs: This table includes any shrubs whose max height and max spread added up to greater than 14'.
- Trees: This table includes any plant with a max height greater than or equal to 20' or labeled as a tree, excluding Cornus mas so that it could be placed into shrubs with the rest of the dogwoods. Tree species that are on the approved right-of-way tree list in Appendix G are demarcated by an asterisk (*).

The plant list includes several columns of information useful in the selection of appropriate plant species. The recommended plant zones A, B, and C represent the recommended planting area based on tolerance and preference for soil moisture. Refer to Figure F2 below. The plant list also includes a

column of special consideration, which note warnings, benefits, and other useful non-aesthetic information.

Figure L1. Bioretention Planting Zones



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Emergents

SPECIES	COMMON NAME	PLANTING ZONE (SEE FIGURE 7)			EVERGREEN OR DECIDUOUS	NATIVE (Y/N)	SUN	PARTIAL SUN	SHADE	MAX. HEIGHT	SPREAD	TIME OF BLOOM	PHYSICAL DESCRIPTION	SPECIAL CONSIDERATIONS
Acorus calamus 'Variegatus'	Sweet flag		B	C	E (semi)	N	X	X		24"	18"-24"		Fragrant, sword shaped leaves	Fragrant; Be aware: May require more water to get established
Acorus gramineus 'Ogon'	Golden variegated sweet flag	A	B		E (semi)	N	X	X	X	10"	4"-6"		Grows in clumps, brighter in sun, fragrant flowers	Grows brighter in sun, deer resistant, fragrant flowers; Be aware: May require more water to get established
Carex buchanaii	Leather leaf sedge			C		N	X	X		36"			Copper-colored foliage, perennial clumping grass, inconspicuous flowers	Tolerates: Wide range of soils
Carex comans	New Zealand hair sedge	A	B	C	E	N	X	X		18"	18"	June-August	Fine-textured, tufted 1/16" wide, hair-like almost cylindrical silvery leaves, shimmers iridescent in the breeze, illusion of falling water, inconspicuous flowers	Tolerates: drought when established
Carex obnupta	Slough sedge	A	B		E	Y	X	X		36"	48"	April-May	Shiny foliage	Tolerates: Drought; Excellent soil binder; Be aware: Can spread rapidly
Carex oshimensis 'Evergold'	Variegated Japanese sedge		B	C	E	N	X	X	X	24"	24"-36"	Late Spring or Early Summer	Deep green variegated creamy white band on foliage that turns to yellow	Great accent plant, good for edges and borders
Carex stipata	Sawbeak sedge	A			E	Y	X	X	X	36"		May-August	Non-rhizomatous, evergreen perennial found in erect, dense clumps,	Excellent soil binder, tolerant of disturbed soils
Carex testacea	Orange New Zealand sedge	A	B	C	E	N	X	X	X	15"	15"	Early Summer	Mounding form, orange-brown/bronze color in spring and summer; more intensive orange in winter	
Eleocharis palustris	Creeping spike-rush	A				Y	X			42"		May-August	Small clumps, rhizomatous perennial	Tolerates: Alkali
Juncus acuminatus	Taper-tipped rush	A			E	Y	X	X		18"	12"-24"	Late May-August	Delicate rush with purole to reddish brown flowers in an open array of clusters	Not rhizomatous
Juncus tenuis	Slender rush	A	B		E	Y	X			20"	6"-30"	June-Sept	Soft, bright green foliage and delicate yellow flowers	
Scirpus acutus	Hardstem bulrush	A				Y	X			96"				Excellent soil binder
Scirpus microcarpus	Small-fruited bulrush	A			E	Y		X	X	36"	12"-24"	June-August	Large, round flower clusters persist over winter, attractive in combination with spiky flowers	Tolerates: prolonged inundatinon, drought; Good soil binder; Be aware: Spreads aggressively

Sidalcea hendersonii	Henderson's checker-mallow	A			D	Y	X	X		48"	24"-36"	June-August	Spiky pink flower clusters atop long stems	Nice complement to tall bulrushes; Be aware: Can spread aggressively to quickly fill in Zone A with emergents

Herbaceous/Ornamentals/Ferns

SPECIES	COMMON NAME	PLANTING ZONE (SEE FIGURE 7)			EVERGREEN OR DECIDUOUS	NATIVE (Y/N)	SUN	PARTIAL SUN	SHADE	MAX. HEIGHT	SPREAD	TIME OF BLOOM	PHYSICAL DESCRIPTION	SPECIAL CONSIDERATIONS
Achillea millefolium	Western yarrow			C		Y	X			30"		April-October	White to pink/reddish flowers; many other yarrows are also available	Tolerates: Disturbance
Adiantum aleuticum	Western maidenhair fern0	A	B			Y		X	X	24"			Graceful, delicate fern, vivid bright green with black stems, spreads through creeping rhizomes; often called A. pedatum, but this refers to a related east coast maidenhair fern; also try A. capillis-veneris (Venus-hair fern)	
Anaphalis margaritacea	Pearly everlasting			C		Y	X	X		18"		July-Sept		Tolerates: Drought; Attracts butterflies; Be aware: Spreads quickly
Aquilegia formosa	Western columbine		B	C	D	Y	X	X		36"	12"-36"	May-August	Red and yellow flowers	Tolerates: seasonal flooding; Attracts hummingbirds and butterflies; Be aware: Will re-seed
Aster chilensis	Common California aster		B	C		Y	X			36"		June-Sept	White to purple flowers	
Aster modestus	Great northern aster		B	C	D	Y	X			42"	36"	July-August	Violet to purple flowers	Be aware: Thrives in full sun
Aster subspicatus	Douglas' aster		B	C		Y	X			30"		June-Sept	Blue to purple flowers	
Athyrium filix-femina	Lady fern	A	B	C	D	Y		X	X	60"	18"-24"		Finely textured wide frond	Tolerates: shallow flooding, full sun in wet conditions; Vigorous grower; Be aware: Prefers shade
Blechnum spicant	Deer fern	A	B	C	E	Y		X	X	36"	24"		Both evergreen and deciduous leaves, long narrow,dark, glossy leaves with wavy, crinkled edges	Tolerates: shallow flooding; Be aware: Sensitive to frost, avoid sun exposure
Bromus carinatus	Native California brome			C		Y	X	X		60"		May-August		Tolerates: Seasonal saturation
Camassia leichtlinii	Large or giant camas		B	C	D	Y	X	X		48"	18"	April-May	Loose clusters of flowers ranging from light to deep blue	Particularly showy planted in groups; Be aware: Watering may be needed to establish… to use less water plant in Oct and they'll adjust to the proper depth to capture the right amount of water

Camassia quamash	Common camas		B	C	D	Y	X	X		18"	12"	April-June	Loose clusters of deep blue flowers	Particularly showy planted in groups; Be aware: Watering may be needed to establish… to use less water plant in Oct and they'll adjust to the proper depth to capture the right amount of water
Cistus salviifolius	White rockrose			C		N	X			36"	6"	Late Spring	White flowers	Tolerates: Windy conditions and drought
Coreopsis spp.				C		N	X			36"			Excellent cut flowers	Tolerates: Drought; Seeds attract birds
Coreopsis verticillata or C. lanceolata	Tickseed		B	C	E (semi)	N	X	X		36"	12"-18"	Late Spring-Early Summer	Smooth stems and leaves, flowers of yellow, orange, maroon, and bronze; try 'Moonbeam', 'Zagreb' or 'Full Moon'	Be aware: Thrives in full sun
Deschampsia cespitosa 'Northern Lights'	Tufted hair grass		B	C	E (semi)	N	X	X		12"	6"-12"	Late Spring to Early Summer	Stunning, grassy foliage with creamy white variegation that turns pink in winter; several other cultivars available	Attractive in winter months
Echinacea purpurea	Purple coneflower			C	D	N	X			48"	24"	Mid-Summer to Late Fall	Hardy, flowers have rosy-purple hue with a large orange cone in center; many cultivars available with various flower colors	Flowering may continue until frost; Be aware: May need watering in dry season, and thrives in full sun
Echinops	Globe thistle			C	D	N	X	X		48"	18"-24"	Mid-Summer to Late Fall	Wide, course, prickly, grayish-green leaves; spherical blue-purple golf-ball sized flowers; several species	Great plant for butterflies/pollinators
Elymus glaucus	Blue wildrye			C		Y	X	X		60"		June-August		Tolerates: Shade; Be aware: Bad lawn grass
Elymus magellanicus	Megellan wheatgrass			C	D	N	X	X		36"	18"-24"	Summer	Metallic blue leaves	Often grown for foliage over summer-blooming flowers; Be aware: Self-seeds readily
Erigeron speciosus	Showy fleabane		B	C	D	Y	X	X		18"	24"	June-August	Leafy stems, produces clusters of dark violet/violet flowers with bright yellow eye, fibrous roots; various other cultivars available	
Erythranthe ssp.	Monkey-flower	A				varies	X	X		36"		Spring-Summer	Many including natives, M. guttata (Yellow mf), tilingii (Mountain mf), lewisii with rose red to pale pink flowers	Be aware: Reseeds nicely and keeps spreading
Festuca glauca 'Elijah Blue'	Blue Fescue			C	E (semi)	N	X	X		12"	12"	Summer	Striking blue gray to silvery white clumping grass	Good as edging

Festuca idahoensis	Idaho fescue			C		Y	X	X		12"		Late May-July	Bluish green bunching grass	Tolerates: Drought
Festuca ovina 'Glauca'	Sheep fescue/ blue fescue			C	E	N	X	X		10"		May-June	Blue green evergreen grass; shearing will stimulate new growth	Tolerates: Drought
Fragaria vesca	Wood strawberry			C		Y	X	X	X	10"		April-June	White flowers	
Geranium cantabrigiense 'Biokovo'	Biokovo hardy geranium		B	C	E (semi)	N	X	X	X	8"	6"-8"	Early Spring to Summer	Pleasantly scented foliage, pinkish white blooms	Pleasant scent
Geranium macrorrhizum	Hardy geranium, crane's bill			C	D	N	X	X	X	18"	18"-24"	Summer	Flower colors vary by cultivar; aromatic leaves when crushed; many cultivars available including 'Album', 'Bevan's Variety', and 'Ingwersen's Variety'	
Geranium maculatum	Spotted geranium			C		N	X	X	X	18"		July	Low, pale pink, blue to purple flowers	Tolerates: Sun; Be aware: Does poorly in acidic soil
Geum macrophyllum	Large-leaved avens			C		Y	X	X		36"		April-August	Bright yellow flowers, other Geum cultivars available	Be aware: Other cultivars may require supplemental watering
Glyceria elata	Tall mannagrass	A				Y	X	X		54"		May-July	Loosely tufted; try taller G. grandis (Native Reed mannagrass)	Be aware: Spreads through creeping rhizomes
Gunnera manicata	Gunnera	A				N	X	X		6'	4'-8'		Non-native from Brazil and Columbia, referred to as 'giant rhubarb', huge rounded leaves; also G. tinctoria from Chile	Be aware: Needs mulching protection in winter and plenty of space
Hakonechloa macra	Japanese forest grass	A				N		X	X	36"			Green leaves turn coppery orange in fall	
Helichrysum italicum	Curry plant			C	E	N	X			24"		Summer	Bright yellow flowers, fragrant	Hardy, good companion to lavender
Hesperantha coccinea	Crimson flag	A	B	C	E (semi)	N	X	X		24"	18"-24"	Spring and Late Summer (repeat bloom sequence)	Showy red or coral flowers in gladiolus-type arrangement; clump-forming habit with sword-like foliage; some cultivars are evergreen	
Hosta	Plantain lily	A				N		X	X	30"		Summer	Varieties in different sizes, foliage textures, and colors available; thin spikes of blue or white flowers	Tolerates: Sun for some varieties; Be aware: Most varieties prefer shade

Hyssopus officinalis 'Rosea' or 'Nana'	Hyssop (pink or blue)		B	C	E	N	X	X		24"	18"-24"	Summer to Fall	Subshrub with pungent foliage, dark blue flower spikes	Attracts butterflies and bees
Iris douglasiana	Douglas Iris	A	B	C	E	N	X	X		24"	18"-24"	Early Spring	Purple and blue flowers, narrow foliage in clumps similar to course grass	Tolerates: Summer drought and seasonal flooding; Be aware: Do not use the exotic and invasive yellow-flag iris (I. pseudacorus)
Iris foetidissima	Gladwin iris; stinking iris		B	C		N	X	X		24"		May-June	Pale lilac flower	Be aware: Do not use the exotic and invasive yellow-flag iris (I. pseudacorus)
Iris sibirca	Siberian Iris		B	C		N	X			30"		Late Spring-Early Summer	Deep blue, purple to white flowers	Be aware: Do not use the exotic and invasive yellow-flag iris (I. pseudacorus)
Iris tenax	Oregon or tough-leaf iris	A	B	C	E	Y	X	X		18"	12"	April-June	Attractive and showy bule flowers	Be aware: Do not use the exotic and invasive yellow-flag iris (I. pseudacorus)
Lavandula stoechas	Spanish lavendar			C	E	N	X			36"	24"	May-July	Gray-green leaves, dark purple flowers with bracts above like bunny ears; many cultivars are available	Highly attractive to butterflies and honey bees
Liatris spicata	Gayfeather		B	C	D	N	X	X		48"	6"-18"		Spikey purple-to-pink flowers	Tolerates: broad range of soils, clay to sand; Nice complement to ornamental grasses, daylilies
Ligularia dentata	Bigleaf ligularia	A				N		X	X	60"		Summer	Large leaved, clumping, yellow-orange blooms; try cultivars 'Othello' and 'Desdemona', also L. przewalskii (Shavalski's ligularia) and L. stenocephala (Narrow-spiked ligularia)	Be aware: Not tolerant of high heat or low humidity
Lobelia cardinalis	Cardinal flower	A				N	X	X		48"		Summer	Clumping, tubular bright red inch-long flowers; try L. siphilitica ('Blue lobelia') with blue flowers	
Lysichiton americanum	Skunk cabbage	A			D	Y		X	X	36"		April-July	Some smell a smoky odor when blooming, yellow hooded fleshy flower spike, great leaves dominate	
Matteuccia struthiopteris	Ostrich fern	A				N	X	X	X	72"			Clumping narrowly at base with foliage spreading to 3 ft in width	Hardy
Molinia caerulea 'Variegata'	Moor grass (variegated)	A	B		D	N		X		18"	12"-18"	July	This cultivar has creamy yellow and white striped foliage; many others available	Provides an attractive edge
Nepeta x faassenii	Catmint			C	E (semi)	N	X			12"	18"-24"	Late Spring-Early Summer	Heart-shaped, gray-green leaves, lavendar-blue flowers; many cultivars with differing heights, spread, and flower color	Be aware: Attractive to cats, thrives in full sun

Nothochelone nemorosa	Turtlehead, woodland beard-tongue			C	D	Y	X	X		42"	12"-42"	July-August	Long-flowering with purple-pink flowers	
Ophiopogon planiscapus	Black mondo grass			C	E (semi)	N	X	X		12"	12"	Late Spring-Early Summer	Striking black grass-like foliage, bell-shaped white or purple flowers; try 'Nigrescens' or 'Ebony Knight'	Nice background for brightly colored flowers; Be aware: Spreads slowly, best in filtered light
Oplopanax horridus	Devil's club	A				Y		X	X	10'		May-July	Extensive clumps, huge decorative palmate leaves, clusters of small whitish flowers, wand-like stems with spines	Be aware: Aggressive grower, sharp spines
Osmunda cinnamomea	Cinnamon fern	A			D	N	X	X		60"			Large, unfolding fiddlehead fronds are edible	
Panicum virgatum	Switch grass		B	C	D	N	X	X		72"	48"-72"	Summer	Clump-forming grass with showy, airy flowers, foliage ranges from bright red to bluish, great fall color and winter interest; try 'Heavy Metal,' 'Dallas Blues,' or 'Shenandoah'	
Pennisetum alopecuroides	Fountain grass			C	D	N	X			48"	12"-24"	Summer, some over Winter	Clump forming grasses, bottle-brush-like flowers, some persist through winter; several varieties in dwarf and various colors, 'Hameln', 'Little Bunny,' or 'Moudry'	Be aware: Cut dried foliage in late winter/early spring
Pennisetum orientale	Oriental fountain grass			C		N	X	X		36"		June-October	Small clumping, blooming grass, showy pink flowers	Tolerates: Drought; Be aware: Benefits from annual shearing in late winter/early spring, but not required
Penstemon cardwellii	Cardwell's penstemon, beard tongue			C	E (semi)	Y	X	X		30"	12"-24"	Late May-July	Bright purple to blue purple flowers; found in west side forests and on rocky slopes; other natives available including other evergreens	
Penstemon davidsonii	Davidson's penstemon			C	E	Y	X			3"		June-August	Low growing, blue to purple flowers	Tolerates: Drought
Penstemon fruticosus	Bush penstemon			C		N	X			10"		May-August	Evergreen 1" long violet blue flowers	Tolerates: Drought; Flowers attract hummingbirds
Potentilla palustris	Marsh cinquefoil	A				Y				36"			Reddish purple flowers, stems both prostrate and ascending	
Ribes divaricatum	Wild gooseberry	A				Y		X	X	6.5'		April-May	Green or purple flowers, smooth dark purple berries, also try T. lacustre (native black gooseberry)	Hedge or screen provides good habitat for birds and wildlife; Be aware: Prickly spines
Smilacina racemosa	False Solomon's seal			C		Y		X	X	36"		April-May	Creamy white flowers, red berries	

Solidago canadensis	Canadian goldenrod			C		Y	X	X		24"		Late Summer-Early Fall	Yellow flowers, really lovely native plant	Colonizes disturbed sites well.
Symphyotrichum chilense	Pacific aster		B		D	Y	X			36"	36"	June-Sept	White to purple flowers	Be aware: Thrives in full sun
Symphyotrichum subspicatum	Douglas aster	A	B	C	D	Y	X	X		36"	36"	July-Sept (Late season bloomer)	Blue to purple flowers with yellow centers; other species and cultivars are available	Tolerates: some shade; nice complement to checker-mallow and bulrushes; Be aware: Prefers full sun
Tellima grandiflora	Fringecup		B	C	D	Y		X	X	12"	12"	April-July	Yellowish-green to pink flowers, foliage persists somewhat over winter	
Trientalis arctica	Northern starflower	A				Y		X	X	8"			Small perennial, star shaped white flowers, or with a pink tinge	
Trillium ovatum	Western trillium		B	C	D	Y		X	X	18"	12"	March-June	Unique, white flowers	Be aware: Not easily adaptable

Groundcovers

SPECIES	COMMON NAME	PLANTING ZONE (SEE FIGURE 7)			EVERGREEN OR DECIDUOUS	NATIVE (Y/N)	SUN	PARTIAL	SHADE	MAX. HEIGHT	SPREAD	TIME OF BLOOM	PHYSICAL DESCRIPTION	SPECIAL CONSIDERATIONS
Andromeda polifolia	Bog rosemary	A			E	Y	X	X		18"		May-July	Low-growing shrub, white to pink flower clusters; ornamental varieties include 'Blue Ice', 'Grandiflora' and 'Nana'	
Arctostaphylos uvaursi	Kinnikinnick		B	C	E	Y	X	X		12"	24"-36"	April-June	Low-growing ground cover, pink buds open to small, bell-shaped white flowers, bright red berries	Easy care once established; Be aware: Plant closely for good results
Asarum caudatum	Wild ginger		B	C	E	Y		X	X	6"	36"	April-July	Unique dark purple-reddish-brown three-lobed blooms; kidney shaped glossy leaves smell like ginger when crushed; Asarum caudatum f. album has white flowers	
Caryopteris clandonensis	Blue mist			C	E (semi)	N	X			36"	24"-36"	Mid-Summer to Fall	Low-growing, woody perennial, small lavender-blue or sapphire-blue flowers in robust clusters; many cultivars available, some cultivars have golden yellow fall foliage	
Dicentra formosa	Western or Pacific bleeding-heart		B	C	D	Y	X		X	12"	24"	Spring	Delicate foliage with attractive pink to red, heart shaped flowers; many cultivars available, including D. spectabilis, a popular non-native bleeding heart	
Empetrum nigrum	Crowberry	A			E	Y	X			8"		Early Spring	Low-growing, small purplish flowers and purplish black berries	
Fragaria chiloensis	Beach/Coastal strawberry		B	C	D	Y	X	X		10"	36"	Summer	Shiny, evergreen foliage with large white flowers; small hairy strawberries	Great groundcover for weed control; Be aware: Aggressive spreader
Gaultheria ovatifolia	Oregon wintergreen/Western teaberry	A			E	Y	X	X	X	12"		Late Spring-Summer	Low-growing, pink or whitish flowers and red berries; also G. humifusa (Native alpine wintergreen)	
Gaura lindheimeri	Gaura or wand flower		B	C	E (semi)	N	X	X		36"	30"-36"	May- Aug	Airy clusters of small, attractive pink flowers; many cultivars available including 'Siskiyou Pink,' 'Whitling Butterflies,' and 'Passionate Rainbow'	Tolerates: Drought; Long blooming period
Helianthemum nummularium	Sunrose			C	E (semi)	N	X	X		24"	36"	May-July	Low growing, woody, many varieties with salmon, pink, red, yellow, white, and golden flowers	Great for berms and front of borders
Helictrotrichon sempervirens	Blue oat grass			C	E	N	X	X		48"	24"-48"	Summer	Striking blue foliage, bluish white flowers	Great accent alone or in clusters; Be aware: Thrives in full sun

Heuchera	Coral bells or alumroot		B	C	D	varies		X	X	36"	12"-18"	Late Spring to Early Summer	Variable cultivars, foliage from chartreuse to black; flowers white to scarlet; try 'Purple Palace,' or 'Obsidian'	Tolerates: sun; Be aware: some cultivars are more sun tolerant than others
Heuchera americana	Coral bells (alumroot)			C		N	X	X		24"		June-August	Red, greenish white flowers	Easily transplantable; Be aware: May need supplemental watering in dry season
Heuchera micrantha	Palace purple' (alumroot)			C	E	N	X	X		24"		June-August	Bronze to purple foliage in shade, small yellowish white flowers; other varieties available "H. sanguinea" for bright red flowers	
Kalmia occidentalis	Swamp-laurel	A				Y	X			24"		Spring-Early Summer	Also known as K. polifolia, low with aromatic leaves, rose purple flowers; try K. microphylla (Native Western bog-laurel), a mat-forming, evergreen shrublet generally found in wet subalpine conditions	
Lavandula angustifolia	English Lavendar			C	E	N	X	X		24"	24"-60"	June-August	Blue to purple flowers, aromatic flowers and leaves; many cultivars available	Attracts insects, great for edges
Linnaea borealis	Twinflower	A			E	Y		X	X	6"		June-Sept	Pink fragrant trumpet-like flowers, trailing ground cover; try on less saturated margins of a bog garden	Be aware: May be difficult to establish
Lonicera pileata	Boxwood honeysuckle		B	C	E	N	X	X	X	3'	5'	April-June	Low growing, spreading shrub with glossy evergreen leaves	Great for covering berms and side slopes
Lupinus	Lupine			C	D	varies	X	X		48"	24"-30"	Summer	Clusters of blue, purple, or reddish flowers on spikes; many species and cultivars available	Important for butterflies and butterfly caterpillars
Lupinus bicolor	Two-color lupine			C		Y	X			18"		Spring	Small flowered	
Lupinus latifolius	Broadleaf lupine			C		Y	X			12"		June-August	Bushy herb, bluish flowers	
Lupinus polyphyllus	Large-leafed lupine			C		Y	X			36"		Spring-Summer		
Mahonia nervosa	Cascade/Dull/Low Oregon grape		B	C	E	Y		X	X	36"	24"-36"	April-June	Glossy leaves, yellow flowers, blue berries	Tolerates: Drought; Attracts hummingbirds
Maianthemum dilatatum	False lily-of-the-valley			C		Y		X	X	12"		Spring	Small white flowers, light green to red berries	
Oxycoccus oxycoccos	Bog cranberry	A			E	Y	X			16"			Low creeping and vine like, pink to red flowers, red berries	Be aware: Shade intolerant
Perovskia atriplicifolia	Russian sage			C	E (semi)	N	X	X		48"	36"-48"	Late Spring to Late Summer	Semi-woody, aromatic gray-green foliage; small lavender-blue flowers	Very adaptable

Polystichum munitum	Western sword fern		B	C	E	Y		X	X	48"	36"-60"		Large fern, dark green fronds with dagger shaped leaflets, stately appearance	Tolerates: Drought; Hardy and easy to grow; Be aware: Prefers some shade
Rubus calycinoides 'Emerald Carpet'	Creeping raspberry/bramble			C	E	N	X	X		8"	36"-60" slowly	Spring	White flowers producing orange berries, turns raspberry red with the onset of autumn	Produces berries; Be aware: Requires more regular water to become established
Tiarella trifoliata	Foamflower		B	C	D	Y		X	X	12"	12"	Early-mid Summer	Can form dense colonies, showy sprays of creamy-white flowers, foliage persists somewhat over winter	Tolerates: Drought after established
Tolmiea menziesii	Youth-on-age/Piggyback plant		B		D	Y		X	X	24"	12"	April-August	Brownish-purple flowers, foliage present in winter, when tiny leaves are seen in axils of older leaves	Effective ground cover in summer
Vancouveria hexandra	Inside-out flower or duck's foot		B	C	E (semi)	Y		X	X	12"	12"-36"	Spring	Unique flowers, foliage is somewhat persistent over winter	Groundcover blends with other natives
Viola species	Violets		B	C		Y		X	X	12"		Late Spring-Early Summer	Yellow to blue flowers	

Small Shrubs

SPECIES	COMMON NAME	PLANTING ZONE (SEE FIGURE 7)			EVERGREEN OR DECIDUOUS	NATIVE (Y/N)	SUN	PARTIAL	SHADE	MAX. HEIGHT	SPREAD	TIME OF BLOOM	PHYSICAL DESCRIPTION	SPECIAL CONSIDERATIONS
Arbutus unedo Compact*	Dwarf strawberry tree*			C	E	N	X	X		8'	5'-6'	Fall	White to greenish-white flowers, striking red-orange fruit	Tolerates: climate extremes; Adaptable; A. unedo "Marina' is present in street trees list
Taxodium distichum 'Peve Minaret'*	Dwarf bald cypress*	A	B	C	E	N	X			5'	3'-4'		Dwarf variety with compact spire form;see other cultivars such as 'Cascade Falls' (weeping to 20'), 'Shawnee Brave' (narrow pyramid to 20')	Dwarf variety, compact spire form; Be aware: May require occasional summer irrigation; T. distichum is present in street trees list
Abelia x grandiflora	Glossy abelia			C		N	X	X	X	8'	5'	Summer	White or faintly pink flowers	Tolerates: drought
Cistus purpureus	Orchid rockrose			C		N	X			4'		June-July	Reddish purple flowers	Tolerates: Drought
Cornus sanguinea 'Midwinter Fire'	Bloodtwig dogwood	A	B	C	D	N	X	X		6'	4'-6'	May to June	Tiny white flower clusters, bright red stems in winter	Adaptable to various soil conditions
Cornus sericea 'Flaviramea'	Yellow-twig dogwood	A	B	C	D	Y	X	X		8'	5'	May to June	Small white flowers, reddish-purple fall color, yellow stems provide color in winter	Yellow stems provide color in winter, adaptable to various soil conditions
Cornus sericea 'Kelseyi'	Dwarf red-twig dogwood	A	B	C	D	Y	X	X		3'	3'	May-June	Small white flowers, berry-like fruit, compact form, striking winter color with red stems	Compact form, good groundcover, striking winter color with red stems
Escallonia x exoniensis 'fradesii'	Pink princess			C		N	X	X		6'		Spring-Fall	Pink to rose colored flowers; good hedge or border plant	Tolerates: Drought when established; Attracts butterflies
Gaultheria shallon	Salal		B	C	E	Y		X	X	5'	5'	March-June	White or pinkish flowers, reddish blue to dark purple berries	Spreads well in shade
Hebe spp.	Hebe			C	E	N	X			4'	2'-5'	Varies, mostly Summer	Small/compact, flowering, choose the hardiest cultivars available (USDA Zone 7 or below); many cultivars including 'Autumn Glory', 'Buxifolia', and 'Blue Mist'	Small and compact

Hydrangea quercifolia	Oakleaf hydrangea			C	D	N		X	X	8'	4'-6'	Summer to Fall	Features unusual oak-like leaves and long white flower clusters; several cultivars offer dwarf to taller shrubs and single to double flowers	Tolerates: Drought; the only drought tolerant hydrangea
Ledum groenlandicum	Labrador tea	A			E	Y		X	X	4.5'		Summer	Small white flower clusters, foliage aromatic when crushed	
Mahonia aquifolium 'Compacta'	Compact or dwarf tall Oregon grape		B	C	E	Y	X	X		3'	3'-4'	April-June	Dwarf form of native Oregon grape has the same flowers, stays compact	Stays compact
Mahonia repens	Creeping mahonia		B	C	E	N	X	X	X	3'	3'	April-June	Yellow flowers, blue berries, eastern WA native performs best in part day sun/shade; tidy, compact form	Tolerates: Drought; Tidy, compact form; Be aware: Does best in part day sun/shade conditions
Myrica gale	Sweet gale	A	B	C	D	Y	X	X	X	8'	4'-6'	May-June	Aromatic, deciduous, glossy green leaves, similar to Pacific wax miyrtle, but deciduous and smaller	Nitrogen fixer; Be aware: May need more water to get established
Osmanthus dalavayi	Dalavay Osmanthus			C		N	X	X		6'		March-May	Attractive foliage and clusters of white fragrant flowers	
Osmanthus x burkwoodii	Devil wood			C		N	X	X		6'		March-April	Masses of small, white fragrant flowers	Tolerates: Drought when established
Philadelphus x lemoinei	Belle Etoile' Mock-orange		B	C		N	X	X		6'	6'	May-June	Fragrant, large white flowers tinged red at the base, other cultivars available	Soil and pH adaptable, easily transplanted and established
Pinus mugo mugo	Dwarf mugho pine			C	D	N	X	X		4'	3'-5'	May-June	Low-growing; several cultivars available, some stay very low others grow taller	Great for berms and anchoring corners; Be aware: Some cultivars stay very low, others grow taller
Pinus mugo pumilio	Mugho pine			C	E	N	X			5'	4'-6'		Newer additions available "Slo-Grow" or "Lo-Mound" (trademark names)	Hardy
Potentilla fruticosa	Shrubby cinquefoil			C		N	X			4'		May-Sept	Several cultivars with varying hues available "Tangerine" or "Moonlight"	
Potentilla gracilis	Graceful cinquefoil			C		Y	X			2'		July	Yellow flowers	
Rhododendron	PJM' hybrids			C		N	X	X		4'		Mid-Late April	Lavender to pink flowers	
Ribes bracteosum	Stink currant	A			D	Y		X	X	7'	5'-7'	April-May	Big palmate leaves have pungent but pleasant aroma, long clusters of white flowers followed by blue fruit	Fruit attracts native birds; Be aware: May require loamier soils, pungent aroma

Ribes lacustre	Black swamp gooseberry		B	C	D	Y	X	X	X	3'	3'		Reddish flowers in drooping clusters, dark purple berries	
Rosa gymnocarpa	Baldhip rose			C	D	Y	X	X	X	6'		May-July	Small pink to rose flowers	Tolerates: Drought
Rosa pisocarpa	Clustered wild rose	A	B		D	Y	X	X		8'		May-July	pink clustered flowers, fruit persists	Tolerates: Seasonal flooding, dry conditions
Salix arctica	Arctic willow	A			D	Y	X	X	X	2'		Spring	Prostrate or trailing, leaves are dark green on bottom and lighter on top, brownish to pink flowers; see S. purpunea 'Nana'	
Stranvaesia davidiana undulata				C		N	X			5'		July	Lower growing irregularly shaped shrub, great screening plant	Great screening plant; Be aware: Low growing
Symphoricarpos albus	Snowberry		B	C	D	Y	X	X	X	6'	6'	April-June	White berries from summer to winter, clusters of pink flowers	Tolerates: Drought and urban air; Excellent soil binder, good erosion control, flowers attract hummingbirds, great for pollinators, spreads well in the sun, live-stakes easily, great combined with red-twig dogwood and Oregon grape; Be aware: Spreads and forms thickets
Symphoricarpos x chenaultii 'Hancock'	Hancock coralberry		B	C	D	N	X	X		2'	6'-10'	May-June	Bright magenta berries	Berries persist through the winter, protects berms from erosion
Symphoricarpos x doorenbosii 'Magic Berry'	Coralberry		B	C	D	N	X	X	X	6'	4'-6'	April-June	Magenta berries cover this upright coralberry and add winter interest	Berries add winter interest
Thuja plicata 'Whipcord'	Dwarf western red cedar		B	C	E	Y	X	X		5'	4'		Dwarf variety of western red cedar, unusual thredlike cascading bright green branches, turns bronze in winter; smaller cultivars such as 'Collyer's Gold' available	Dwarf variety

Large Shrubs

SPECIES	COMMON NAME	PLANTING ZONE (SEE FIGURE 7)			EVERGREEN OR DECIDUOUS	NATIVE (Y/N)	SUN	PARTIAL	SHADE	MAX. HEIGHT	SPREAD	TIME OF BLOOM	PHYSICAL DESCRIPTION	SPECIAL CONSIDERATIONS
Acer circinatum*	Vine maple*		B	C	D	Y		X	X	20'	15'-20'	Early Spring	Small, multi-stemmed tree, billiant red-orange fall color, beautiful in fall	Tolerates: shade and clay; Excellent soil binder; A. circinatum is present in street trees list
Cornus mas	Cornellan cherry			C	D	N	X	X		20'	20'	March-April	Yellow flowers, red fruit	Adaptable
Cornus sericea	Red-osier dogwood/ Red-twig dogwood	A	B	C	D	Y	X	X		9'	12'	May to June	Multi-stemmed, small white flowers in clusters, berry-like bluish-white fruits in fall; striking red stems provide winter color; red fall color	Tolerates: seasonal flooding; Striking red stems provide winter color, soil adaptable
Hamamelis intermedia	Diane witchhazel		B	C		N	X	X		20'	10'	January-March	Long lasting, slightly fragrant, coppery-red flowers, showy fall color- yellow to yellow-orange	Be aware: Not drought tolerant, may require watering in dry season
Holodiscus discolor	Oceanspray			C	D	Y	X	X		15'	6'-15'	June-July	Creamy-white flower clusters persist as brown seeds over winter	Tolerates: Drought; Good soil binder, great for native butterflies and birds
Lonicera involucrata	Black twinberry	A	B	C	D	Y		X	X	9'	8'-10'	Summer/ June	Yellow tubular flowers with bright red bracts, shiny black berries	Tolerates: Shallow flooding; Flowers attract hummingbirds; Be aware: Need space to look their best, pruning may be necessary to keep looking tidy
Mahonia aquifolium	Tall Oregon grape		B	C	E	Y	X	X		10'	5'	March-April	Glossy leaves, yellow flowers, blue-black berries	Tolerates: Drought; Great low screening barrier, attracts hummingbirds
Myrica californica	Pacific wax myrtle	A	B	C	E	Y	X	X		18'	10'-20'	May-June	Evergreen, inconspicuous spring flowers; Native M. gale is a smaller option if drought tolerance is not an issue	Tolerates: Drought; If drought tolerance is not an issue try the smaller native M. gale, best for large areas or where pruning will be regular, provides good wildlife habitat; Be aware: Will need pruning
Oemleria cerasiformis	Indian plum/Osoberry		B	C	D	Y		X	X	16'	5'-12'	Feb-April	Peach-like berries in spring, then plum-like berries in summer, spreads via underground stems	Tolerates: Fluctuating water table; One of the first natives to bloom in early spring; Be aware: Prefers shade
Philadelphus lewisii	Mock-orange		B	C	D	Y	X	X		10'	5'-10'	June-July	Fragrant white flowers, makes thickets	Tolerates: Drought
Physocarpus capitatus	Pacific ninebark	A	B	C	D	Y	X	X	X	13'	6'-15'	May-June	White flowers, snowball shaped, seeds persist into winter, beautiful peeling multi-colored bark; see also P. opulifolius and cultivars in the "small to medium" shrub list	Tolerates: Drought; Be aware: Best in part shade
Physocarpus opulifolius	Common ninebark		B	C	D	N	X	X		10'	3'-8'	May-July	Cultivars offer differing heights, leaf color, fall color; all offer peeling bark, white flowers; see "Large" list for native Pacific ninebark; try 'Diablo', or 'Center Glow'	

Ribes sanguineum	Red-flowering currant		B	C	D	Y	X	X		12'	4'-10'	March-May	Large clusters of white to rosy-red flowers, dark blue to black berries, vase shaped form, thornless	Tolerates: Drought; Flowers attract hummingbirds and other pollinators; thornless
Rosa nutkana	Nootka rose		B	C	D	Y	X	X		10'	10'	April-June	Fruit persists	Tolerates: Inundation and saturated soil; less thorny than R. rugosa; Be aware: Aggressive spreader
Rubus parviflorus	Thimbleberry		B	C	D	Y	X	X	X	8'	8'	April-June	Thornless raspberry shrub features large, fuzzy palmate leaves, giant white flowers, and red berries	Thornless, produces berries; Be aware: Spreads by rhizome, sometimes aggressively, makes thickets
Rubus spectabilis	Salmonberry	A	B	C	D	Y		X	X	10'	10'	Feb-April	Magenta flowers, yellow-orange fruits	Good soil binder, early nectar source for hummingbirds; Be aware: Spreads aggressively, makes thickets
Sambucas caerulea	Blue elderberry		B	C	D	Y	X	X		20'	8'-12'	May-June	A large, fast growing shrub with blue fruits that appear in mid-summer following the large clusters of creamy-white flowers	Edible fruits; Be aware: typically a low surivial rate unless it's well tended to
Sambucus nigra 'Black Lace'	Black lace elderberry	A	B	C	D	N	X	X		8'	6'-8'		Rosy flowers contrasting with blackish, deeply dissected foliage, blackish red berries	Dramatic accent plant, berries attract wildlife; Be aware: May need to prune after blooming
Sambucus racemosa	Red elderberry		B	C		Y	X	X	X	20'		April-May	Vase shaped, small white flowers, bright red berries	Be aware: Pithy stems lead to messy form- prune for tidiness
Spiraea douglasii	Douglas' spirea/ Steeplebush	A	B		D	Y	X	X		7'	6'-10'	June-August	Spikes of small rosy-pink flower clusters	Great for butterflies; Be aware: Can self-seed readily and may spread and crowd out other plants in consistently wet soils
Stranvaesia davidiana				C		N	X			20'		June	White flowers in clusters, showy red berries	
Vaccinium ovatum	Evergreen huckleberry			C	E	Y		X	X	10'	6'	March-June	Small pinkish-white flowers, berries in August	for partly or very shady spots, provides beautiful foliage and wildlife habitat
Vaccinium parvifolium	Red huckleberry		B	C		Y		X	X	10'				Tolerates: Dry, shaded conditions; Be aware: Tricky to transplant

Trees

NOTE: ONLY TREES INCLUDED IN THE APPROVED STREET TREE LIST IN APPENDIX G MAY BE PLANTED IN THE RIGHT-OF-WAY.

SPECIES	COMMON NAME	PLANTING ZONE (SEE FIGURE 7)			EVERGREEN OR DECIDUOUS	NATIVE (Y/N)	SUN	PARTIAL	SHADE	MAX. HEIGHT	SPREAD	TIME OF BLOOM	PHYSICAL DESCRIPTION	SPECIAL CONSIDERATIONS
Acer truncatum*	Pacific sunset maple*		B	C	D	N	X			25'	20'			Tolerates: drought; Cold hardy; A. truncatum x A. platanoides 'Keithsform' and 'Warrensred' are present in the approved street tree list
Arbutus unedo*	Strawberry tree*			C		N	X	X		35'	8'-20'	Nov-Dec	White or greenish white flowers	Tolerates: Extremes, urban/industrial pollution; A. unedo ''Marina' is present in street trees list
Betula albosinensis 'Septentrionalis'*	Chinese red birch*			C	D	N	X	X		60'	10'		Tall slender tree, peeling copper-orange bark	Attractive accent; B. albosinensis var. septentrionalis is present in the approved street tree list
Betula jacquemoctii*	Himalayan or Jacquemonti birch*			C	D	N	X	X		40'	18'-20'	April	Showy white bark	B. jacquemontii is present in the approved street tree list
Crataegus x lavallei*	Lavalle hawthorn*			C	D	N	X	X		30'	15'-30'	May-June	Small white flowers, small orangey-red fruits	Crataecus x lavallei is present in the approved street tree list
Magnolia virgiana 'Moonglow'*	Sweet bay or swamp magnolia*	A			E (semi)	N	X	X		40'	15'-18'	Late Spring-Early Summer	Creamy, white flowers	Best for large rain gardens, cultivar is hardier and more upright; Be aware: Needs acidic soils, may require some summer irrigation after established; M. 'Elizabeth', 'Galaxy' and M. x loebneri are present in the approved street tree list
Malus fusca*	Pacific crabapple*	A	B	C	D	Y	X	X		30'	10'-30'	April-May	White to pink apple blossoms in small clusters, clusters of yellowish-red fruits, nice fall color	Tolerates: Prolonged soil saturation; Best suited to large rain gardens; Be aware: Produces fruit, do not plant near public walkways, attractive to wildlife; M. 'Tschonoskii', 'Adirondack', and 'Red Barron' are present in the approved street tree list
Malus transitoria 'Schmidt cutleaf' Golden Raindrops TM*	Cutleaf crabapple*			C	D	N	X			20'	15'	Spring	Upright growing, vase shaped, small star-shaped flowers from pink buds, profuse blooms; also explore other disease resistant non-native species	Explore other disease resistant non-native species; M. 'Tschonoskii', 'Adirondack', and 'Red Barron' are present in the approved street tree list
Parrotia persica 'Vanessa'*	Persian ironwood*			C	D	Y	X	X		30'	15'	Late Winter-Early Spring	Multi-stemmed, colorful tree particularly in fall, this cultivar is dense and narrowly upright, tiny flowers with red stamens	P. persica is present in the approved street tree list

Prunus emarginata*	Bitter cherry*			C		Y	X	X		50'	20'	May-June	Purple to black cherries	Fruit is attractive to birds; Be aware: Intolerant of full shade, roots spread extensively; P. 'Frankthrees', 'Newport', 'Snowgoose', and P. x yedoensis 'Akebono' are present in the approved street tree list
Quercus garryana*	Oregon white oak*			C		Y	X			75'			Acorns	Q. garryana is present in the approved street tree list
Rhamnus purshiana*	Cascara sagrada*		B	C	D	Y	X	X	X	40'	25'		Small greenish-yellow flowers, yellow fall color	Be aware: Sensitive to air pollution; R. purshiana is present in the approved street tree list
Amelanchier alnifolia	Western serviceberry		B	C	D	Y	X	X		20'	5'-10'	April-May	Large white flower clusters, purple to blue-black berries	Tolerates: drought; Attracts native birds
Betula nigra	River birch			C	D	N	X	X		70'	30'	April-May	Tall narrow form, peeling bark	Be aware: Best suited to larger rain gardens
Betula papyrifera	Paper birch			C	D	Y	X			90'	25'-45'		Creamy white peeling bark	Be aware: Best suited to larger rain gardens
Calocedrus decurrens	Incense cedar			C	E	Y	X			90'	12'		Fragrant with narrow growth habit	Tolerates: Poor soil; drought after established
Chamaecyparis obtusa	Hinoki false cypress			C		N	X	X		50'	15'-30'			Tolerates: shade, but prefers sun; Many alternate varieties (in size and form) to choose from; Be aware: Does not transplant well or do well in alkaline soils
Corylus cornuta	Beaked hazelnut		B	C	D	Y	X	X	X	20'	8'-15'	March-May	Catkins in winter, edible nuts, deciduous	Dangling male catkins add winter interest, beautiful for large spaces, can be pruned into tree-like form or left to its natural vase-like shape; Be aware: Intolerant of saturated soil, will attract wildlife
Crataegus douglasii	Black hawthorn		B	C	D	Y	X	X		30'	25'	Spring	Small white flowers, black berries, 1" spines, forms thickets	
Fraxinus latifolia	Oregon ash	A				Y	X	X		80'	30'		Small, green-white flowers	Tolerates: Flood
Pinus mugo	Swiss mountain pine			C	E	N	X	X		20'	25'-30'		Broadly spreading, bushy	Hardy
Pseudotsuga menziesii	Douglas-fir			C	E	Y	X			250'	50'-60'		Conifer	Provides nice canopy; Be aware: Potential height will restrict placement
Salix lucida	Pacific willow	A				Y	X			60'	30'			Tolerates: Seasonal flooding; Live stake well; Be aware: Do not plant near pavement or underground structures
Salix scouleriana	Scouler willow		B	C	D	Y	X	X		40'	15'			Tolerates: Drought; Live stake well; Be aware: Do not plant near pavement or underground structures

Salix sitchensis	Sitka willow		B	C	D	Y	X	X		26'	25'			Tolerates: Seasonal flooding; Live stake well; Be aware: Do not plant near pavement or underground structures
Thuja plicata	Western red cedar		B	C		Y		X	X	200'	60'			Tolerates: Seasonal flooding and saturated soil; Be aware: Prefers shade while young
Xanthocyparis nootkatensis (Chamaecyparis nootkatensis) 'Pendula'	Weeping Alaska yellow cedar			C	E	N	X	X		30'	12'		Smaller weeping form, slender and pyramidal	

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APPENDIX M – STANDARD PLANS

Standard Plan Number	Title
201	Typical Non-Arterial (Local) Street Cross Section
202	Typical Arterial Street Cross Section
203	Typical Alley
204	Half Street
205	Shoulder Treatment
207	Median
209	Street Ends
210	Traffic Circle
211	Concrete Traffic Circle Details
212	Asphalt Traffic Circle Details
213	Speed Hump Design
214	Speed Cushion Design
215	Intersection Landing
301	Driveway
302	Driveway: No Amenity Zone
303	Driveway: Drop Down
306	Driveway: Shoulder & Ditch Section
307	Shared Driveway
308	Amenity Zone
309	Curb & Sidewalk Joints
310	Asphalt Thickened Edge
311	Asphalt Transition Ramp to Shoulder
312	Curbs
313	Pedestrian Curb
314	Curb Extension
315	Crosswalk with Single Approach Lane
316	Crosswalk with Multiple Approach Lanes

Standard Plan Number	Title
317	Single Direction Curb ramp
318	Curb Ramp: Type Perpendicular
320	Curb Ramp: Type Parallel
321	Curb Ramp Locations
324	Pedestrian Railing
325	Stairs
326	Cement Concrete Stairway
327	Chain Link Fencing
329	Typical Trail Section
335	Greenbelt Fence
401	Pavement Markings
403	Pavement Marking Details
410	Bike Lane Markings
420	Traffic Signal Loop Locations
430	Pedestrian Pushbutton Location
440	Pedestrian Lighting
501	Rock Facing - Cut Section
502	Rock Facing - Fill Section
503	Rock Facing Under Sidewalk
505	Bollards
507	Traffic Sign & Wood Post Installation
508	Traffic Sign & Metal Post Installation
509	Post Cap
510	2" Square Metal post Installation
512	Object Marker Installation
514	Mailbox Stand (Non-Arterial)
515	Mailbox Stand without Amenity Zone

Standard Plan Number	Title
516	Neighborhood Delivery & Collection Box Unit Installation
517	Street Name Sign Detail
520	Bus Stop Improvements
701	Beveled End Pipe Section
702	Trash Rack
703	Debris Cage
705	Catch Basin Type 1
706	Catch Basin Type 1L
707	Catch Basin Installation
708	Catch Basin Type 2
709	Catch Basin Details
712	Manhole Type 1
713	Manhole Type 2
714	Manhole Type 3
716	Manhole Details
720	Circular Frame and Cover
721	Locking Manhole Frame
723	Combination Inlet Installation
724	Combination Inlet
725	Storm Drain Medallion Installation
726	Rectangular Vaned Grate
729	Rectangular Herringbone Grate
730	Rectangular Frame
731	Rectangular Solid Metal Cover
761	Flow Restrictor
762	Shear Gate
763	Flow Restrictor (Baffle)

Standard Plan Number	Title
771	Control Structure
773	Pipe Zone Bedding and Backfill
801	Rigid Pavement Restoration Details
802	Flexible Pavement Patching
901	One-Lane, Two-way Traffic Control with Flaggers
902	Pilot Car Operation
903	Single-Lane Closure for Multi-Lane Roadways
904	Double-Lane Closure for Multi-Lane Roadways
905	Shoulder Closure - Low Speed (40 mph or less)
906	Right Lane Closure with Shift - 5 Lane Roadway
907	Left Lane and Center Turn Lane Closure - 5 Lane Roadway
908	Lane Shift - Three Lane Roadway
909	Short Term Ramp Closures
910	Intersection Lane Closure - Three Lane Roadway
911	Intersection Lane Closure - 5 Lane Roadway
912	Intersection Pedestrian Traffic Control
913	Single-lane Closure with Shift
914	Typical Roundabout Flagging Operation