Seattle Public Utilities
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CAM
Client Assistance Memo
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Rain Gardens for On-Site Stormwater Management of Sidewalk Runoff

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This CAM provides technical guidance for using rain gardens within the planting strip to satisfy "On-Site Stormwater Management" requirements via the "On-Site List Approach" for new and replaced public sidewalks within the right-of-way.

CAN I USE A RAIN GARDEN TO MANAGE MY SIDEWALK RUNOFF?

Refer to the Seattle Stormwater Manual's "On-Site List Infeasibility Criteria" (Volume III Appendix C) to determine if rain gardens are feasible for your project.

You may use rain gardens to manage runoff from sidewalks to meet the "On-Site List Approach" if your project meets the following criteria:

- Project triggers "**On-Site Stormwater Management**" requirements per the Seattle Stormwater Code (i.e., projects with 2,000 square feet (e.g., approximately 330 linear feet of 6-foot-wide sidewalk) or more of new plus replaced hard surface or 7,000 square feet or more of land disturbing activity).
- Project is classified as a "**Trail and Sidewalk Project"** or **"Roadway Project**."
- Rain garden will receive a minimal amount of runoff from pollution-generating hard surfaces.
- Designated street type or classification is **not** "Downtown," "Urban Center Connector," or "Principal Arterial" as defined per the Right-of-Way Improvement Manual (ROWIM).

You may not use rain gardens to meet the "Flow Control," "Water Quality Treatment," or "On-Site Performance" requirements (see the Seattle Stormwater Manual, Volume 1).

DOES THIS CAM APPLY TO MY PROJECT?

This CAM covers the anticipated "typical" rain garden installations for managing sidewalk runoff. To use this CAM, your project must satisfy the following "typical" criteria:

- Street has existing or new curbs to prevent roadway runoff from entering the rain garden.

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- Top of curb is at least 1 inch lower than the adjacent sidewalk.
- Planting strip width is at least 5 feet wide.
- Street longitudinal slope does not exceed 4 percent.
- Rain gardens have sloped facility sides and a maximum ponding depth of 3 inches.

See the Seattle Stormwater Manual for a full description of "On-Site Stormwater Management" requirements and rain garden design requirements, including alternate rain garden configurations.

DEFINITIONS

See Appendix A of the 2016 Stormwater Manual for a complete list of definitions.

Rain Gardens are shallow, landscaped depressions with compost-amended soil or imported bioretention soil and plants that capture and infiltrate stormwater runoff, typically from small areas. Rain gardens reduce flows that cause flooding and clean runoff to protect waterways. Within the right-of-way, these systems are typically constructed in the planting strip.

Hard Surface means an impervious surface, a permeable pavement, or a vegetated roof.

Pollution-Generating Hard Surfaces means those hard surfaces considered to be a significant source of pollutants in drainage water. Surfaces include hard surfaces regularly used by motor vehicles, such as driveways, roads, alleys, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, and parking lots.

The Planting Strip is that portion of the right-of-way between the constructed curb and the property line, exclusive of the sidewalk area (see SMC 11.14.475).

MANAGING SIDEWALK RUNOFF WITH RAIN GARDENS

Designers can use rain gardens to manage sidewalk runoff that would otherwise flow, unmanaged, to the public drainage system. When a rain garden is installed within the planting strip, runoff from the sidewalk sheet flows to the planting strip, where it is collected and conveyed to the rain garden. Within the rain garden, runoff ponds and filters through the compost amended soil/bioretention soil, supplying water to the rain garden vegetation, and then infiltrating into the underlying soil to recharge ground water, and ultimately reducing the quantity of runoff. During larger storm events, the sidewalk runoff may exceed the infiltration capacity of the rain garden. In these instances, the excess runoff overflows over the curb or via a depressed curb to the gutter.

Figures 1, 2, and 3 show a sidewalk and a sample rain garden layout, integrated into the planting strip, to manage runoff from the sidewalk.

CONSIDERATIONS FOR RAIN GARDEN SITING AND LAYOUT

The following are some key considerations and requirements for rain garden siting and planting strip layout.

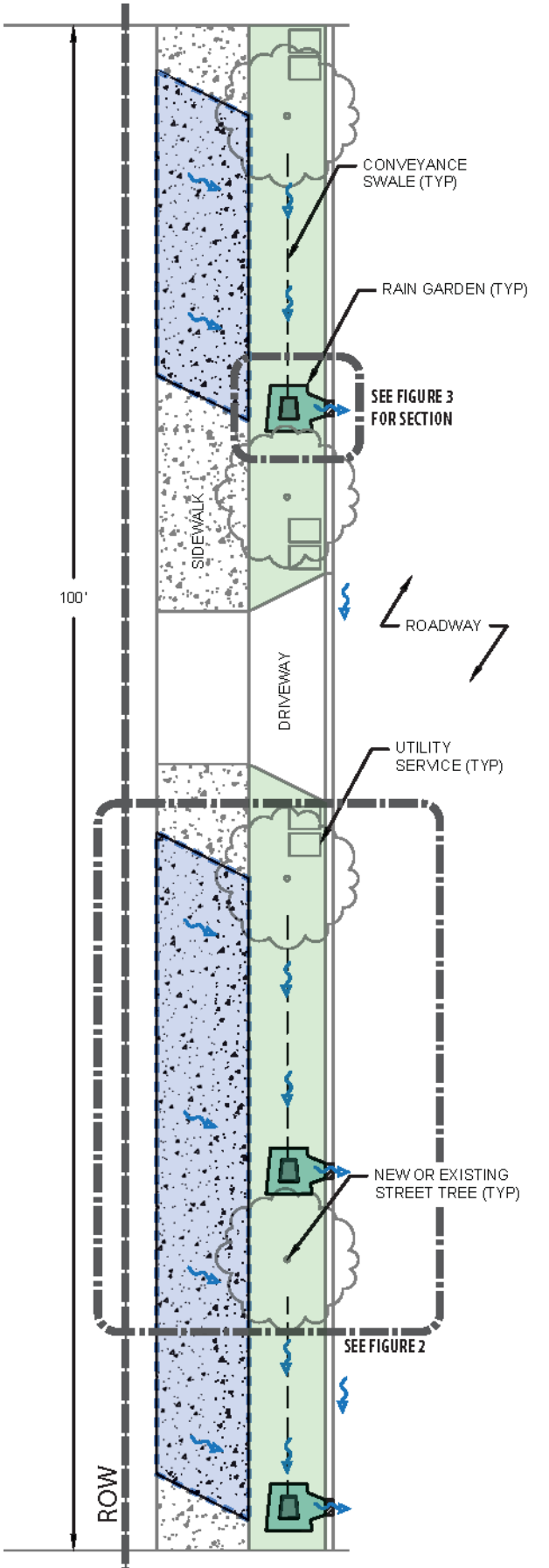

FIGURE 1. EXAMPLE RAIN GARDEN LAYOUT FOR TYPICAL DEVELOPMENT

Existing trees: SMC 15.43 protects all trees growing in the right-of-way—known as "street trees." Rain gardens may be compatible with existing street trees in some cases, but designers and contractors must take care to avoid injuring any street tree.

Changes in soil type, soil grade, and/or water infiltration can cause short-term and long-term health problems for trees.

Locate the rain garden footprint and associated grading (such as grading to help convey flows to the rain garden) outside the dripline of existing trees (as defined on Standard Plan 133). Contact SDOT Urban Forestry during preliminary design for a site specific review of proposed grading within the dripline and/or revisions to soil or existing vegetation within the critical root zone of an existing tree (as defined on Standard Plan 133).

See SDOT's Street Tree Manual for detailed information on tree protection and preservation requirements.

In addition to street trees, consider the location of existing trees on adjacent private property that overhang into the right-of-way and have roots extending into the planting strip when siting rain gardens. Protect existing trees in accordance with SMC 25.11.

New street trees: Rain gardens can accommodate new street trees, and trees are encouraged to promote healthy soil and improve infiltration of stormwater.

SDOT's Street Tree Manual provides detailed information about siting, planting, and maintaining street trees.

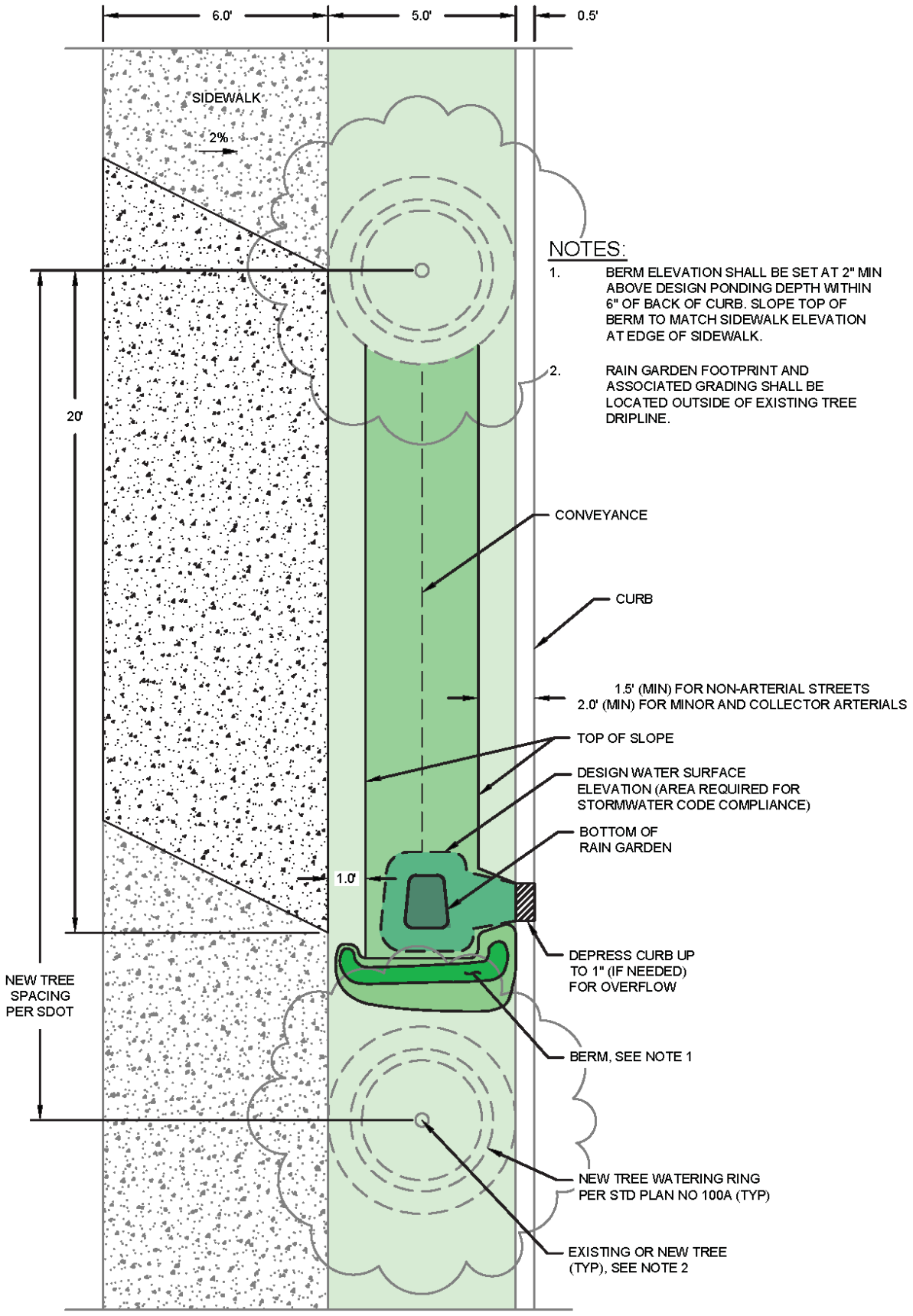

FIGURE 2. TYPICAL RAIN GARDEN LAYOUT

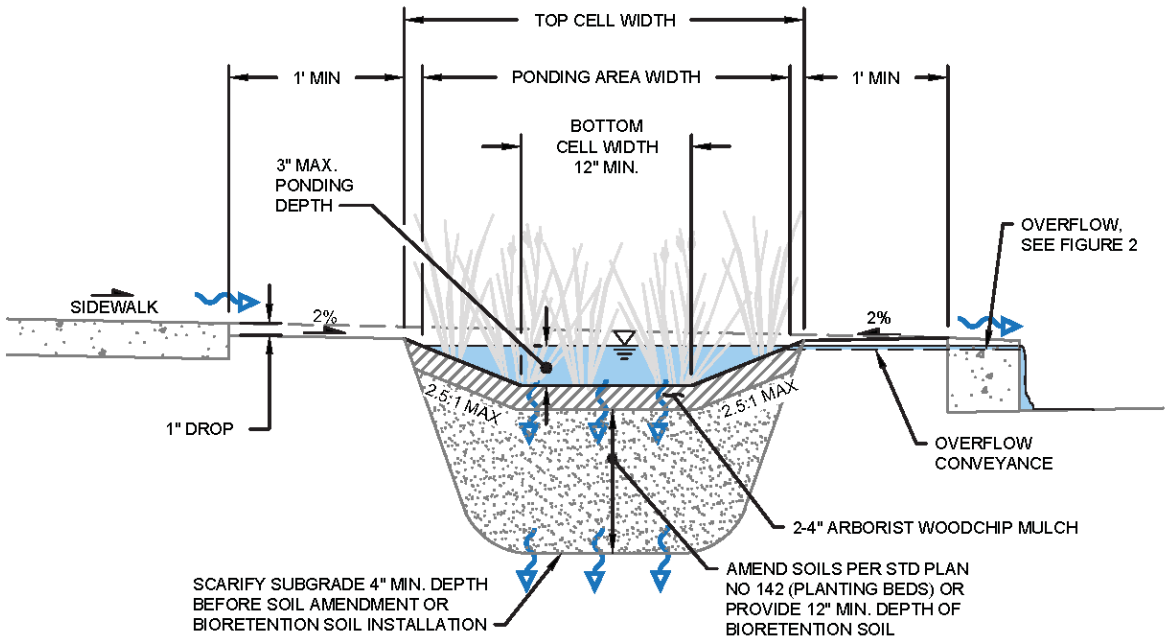

FIGURE 3. TYPICAL RAIN GARDEN SECTION

Existing utilities and services: Locate rain gardens away from existing utilities and services to the extent feasible. Uncompacted soil with concentrated infiltration very near utilities can sometimes present safety and reliability issues for the utilities. See the ROWIM for setback and clearance requirements.

New utilities and services: Locate utility services upslope or downslope of rain garden to maximize portion of sidewalk managed by the rain garden (see Figure 1). See the ROWIM for setback and clearance requirements.

Access Zones/Paths: Provide a minimum of one access path across the planting strip (between the street and public sidewalk) for each parcel with on-street parking. Locate the access path within 15 feet of the structure access point (such as path to doorway or stairs), whenever possible.

Paving of access paths in not required, but the path must maintain a uniform slope between sidewalk and top of curb.

Access zones must be a minimum of 5 feet wide, which includes a 3-foot level access path (paved or unpaved) plus an additional level 1-foot transition area on each side of the path to the top of slope of the rain garden).

Street and Sidewalk Slope: Longitudinal slope cannot exceed 4 percent.

Setbacks: Rain gardens must meet the following setback requirements:

- Sidewalks: Provide 1-foot minimum setback from edge of sidewalk to top of rain garden slope.
- Sidewalk/curb ramp at intersection: Provide 2-foot minimum setback from edge of pavement to top of rain garden slope.

- Non-arterial streets: Provide 1.5-foot minimum setback from face of curb to top of rain garden slope.
- Minor and collector arterials: Provide 2-foot minimum setback from face of curb to top of rain garden slope.
- Driveways/alleys: Provide a 2-foot minimum setback from the pavement edge of driveway wing to the top of rain garden slope.

DETERMINING RAIN GARDEN GEOMETRY

Rain garden must meet siting and design requirements in the Seattle Stormwater Manual, including:

Bottom Area: The bottom area of a cell must be no less than 4 square feet, unless this minimum bottom area triggers installation of a check dam to achieve grading requirements. In this case, designers may reduce the minimum bottom area to 2 square feet to eliminate check dams.

Ponding depth: Ponding depths of 3 inches typically result in rain garden footprints small enough to fit in a 5-foot-wide planting strip.

Berms: Earthen berms may be required at the downstream end of a rain garden to prevent ponded water from overflowing into the downslope planting strip or sidewalk.

Set berms a minimum of 2 inches above the design ponding depth, orienting the berm to ensure ponded water in rain garden drains to the gutter.

Designers may use a downstream tree watering ring to create an earthen berm, provided the ring meets the requirements of the berm described in this section.

Soil used for berming, where the permanent restoration is landscape, must be imported bioretention soil or amended subgrade soil, and must be compacted to a minimum of 90 percent dry density.

Overflow: The rain garden may overflow via the curb provided the maximum ponding depth is 3 inches or less.

Designers may use a depressed curb at the downstream end of the rain garden to create a preferential flow path for water overflowing the rain garden to enter the gutter. A depressed curb may be constructed by grinding the top of curb a maximum of 1 inch in depth as long as the existing curb height at the depression is not less than 4 inches. Depressed curb section may be up to 1 foot long and must transition up to full curb height at a minimum 1:1 taper.

SIZING RAIN GARDENS

Size rain gardens for the “On-Site List Approach” using the sizing factors provided in Table 1. Factors are organized by subgrade design infiltration rate and average ponding depth. Select the appropriate sizing factor by rounding down the subgrade design infiltration rate to the nearest rate in the sizing table.

See Volume 3, Chapter 3, and Appendix D of the Stormwater Manual for guidance on Infiltration Testing.

Table 1. Rain Garden Sizing for On-Site List Approach.

Average Ponding Depth	Subgrade Soil Design Infiltration Rate	Sizing Factor for Rain Garden Bottom Area*
2 inches	0.15 inch/hour	8.0%
	0.3 inch/hour	4.7%
	0.6 inch/hour	4.5%
	1.0 inch/hour	4.5%
	2.5 inch/hour	4.5%
3 inches	0.15 inch/hour	7.7%
	0.3 inch/hour	4.4%
	0.6 inch/hour	4.3%
	1.0 inch/hour	4.3%
	2.5 inch/hour	4.3%

*For rain gardens with sloped sides no steeper than 2.5H:1V.

Designers can calculate the bottom area for a rain garden as a function of the hard surface area routed to it using the sizing factors provided in Table 1. As an example, the bottom area of a rain garden with an average ponding depth of 3 inches would be equal to 4.4 percent of the hard surface area routed to it when the design infiltration rate is less than 0.6 inch/hour and equal to or greater than 0.3 inch/hour.

Designers can calculate the rain garden top area based on the cell bottom area, side slopes, and total rain garden depth (i.e., ponding and freeboard depth).

For sidewalk rain gardens, designers should include all sidewalk area along the property frontage in their contributing hard surface area calculations. For example, a property fronting 100 linear feet of a new or replaced 6-foot-wide public sidewalk would size a rain garden, or series of rain gardens, to manage 600 square feet of contributing hard surface area.

PLANTING RAIN GARDENS

Designers should select rain garden plants from the plant lists for bioretention in Appendix E of the Seattle Stormwater Manual.

MANAGING ADDITIONAL SITE DRAINAGE (RUN-ON)

Where feasible, bypass stormwater flows from other areas (beyond the area for which the rain garden is sized) around the rain garden to reduce sediment loading and the potential for clogging. For sidewalk applications, runoff from adjacent hard surfaces (e.g., driveways, patios, roof downspouts) may comingle with sidewalk runoff, making bypass infeasible. In these cases, the designer may route the additional flows (run-on) through the rain garden(s) with the following limitations:

- The maximum impervious drainage area routed to each rain garden must not exceed twice the area for which it is sized. Additional runoff contributions from pervious areas are acceptable.
- Seattle does not give “On-Site Stormwater Management” credit for runoff from areas beyond the design area.
- Runoff from pollution generating hard surfaces (e.g., alleys, driveways) must not exceed 10 percent of the total area flowing to the rain garden.

ADDITIONAL RESOURCES

- 2016 City of Seattle Stormwater Manual
  http://www.seattle.gov/dpd/codesrules/codes/stormwater/
- Seattle Municipal Code (SMC)
  https://www.municode.com/library/wa/seattle/codes/municipal_code
- Seattle Right-of-Way Improvements Manual
  http://www.seattle.gov/transportation/rowmanual/manual/
- SDOT Client Assistance Memos (CAMs)
  http://www.seattle.gov/transportation/stuse_docs.htm
- SDOT Street Use Website
  http://www.seattle.gov/transportation/stuse_home.htm
- SDOT Street Improvement Permit
  http://www.seattle.gov/transportation/stuse_sip.htm
- Standard Specifications for Road, Bridge, and Municipal Construction and the Standard Plans for Municipal Construction. Bioretention is in section 9-14.1(3)
  http://www.seattle.gov/util/engineering/
- SDOT Street and Sidewalk Pavement Opening and Restoration Rule (SDOT Director's Rule 5-2009)
  http://www.seattle.gov/transportation/stuse_pavementopen.htm
- Utility Location Regulations
  http://www.callbeforeyoudig.com/
- SDOT Street Tree Manual
  http://www.seattle.gov/transportation/forestry.htm