

Change Pages for the Stormwater Management Manual 2012 Edition

Revision Date: October 30, 2012

Please reference the following pages for recent changes or corrections to the information presented in the manual.

Changes included:

Volume 3, Chapter 5, pages 3-37 to 3-39 – Added two paragraphs to section 5.2.3. Renumbered Section 5.4 to Section 5.3.2, with the concatenation of Section numbers that followed. Added two paragraphs to the new Section 5.3.3 (formerly Section 5.4.2).

Volume 3, Chapter 9, page 3-93 – Modified Section 9.1 to clarify peak flowrate analysis and conveyance sizing.

removed or die shall be replaced with like species during the next planting season (typically in fall). Trees shall be pruned according to industry standards, City of Tacoma Urban Forest Manual, ANSI A300 Part 1 and the International Society of Arboriculture's Best Management Practices-Tree Pruning.

5.2.3 Flow Control Credit

Flow control credits for retained trees are shown in the *Stormwater Credits for Trees* table available at www.cityoftacoma.org/stormwater.

The credits provided in the table are square footage of impervious surface available for flow credit per tree. The total credits for retained and newly transplanted trees shall not exceed 25 percent of the total project impervious surface requiring mitigation. For retained and transplanted trees located within 20 feet of an impervious surface, the impervious surface credit can be applied by reducing that square footage from the total impervious surface on the project site when determining project thresholds. For retained and transplanted trees located greater than 20 feet from an impervious surface, the impervious surface credit can be applied by converting the equal portion of impervious surface to lawn/landscape area when determining project thresholds.

The applicant will be required to enter into a covenant and easement agreement with the City to ensure the trees are properly maintained and will remain in place.

Flow credits only apply to flow control thresholds. Flow credits do not apply to water quality thresholds. Credits are given as a percentage of the existing tree canopy area.

To use these credits, the retained tree and protection measures must meet the requirements outlined in this section.

Tree credits are not applicable to trees in native vegetation areas used for flow dispersion or other flow control credit. The total tree credit for retained and newly transplanted trees shall not exceed 25 percent of the total project impervious surface requiring mitigation.

5.2.4 Operations and Maintenance Requirements

Operations and maintenance requirements for trees are provided in Volume 1, Appendix C, Checklist #30.

5.3 Newly Transplanted Trees

5.3.1 Site Considerations

Mature tree height, size, and rooting depth must be considered to ensure that the tree location is appropriate given adjacent and above- and below-ground infrastructure. Setback requirements are presented below. Setbacks are measured from the tree trunk center.

- Minimum 5 foot setback from structures
- Minimum 5 foot setback from underground utility lines
- Minimum 5 foot setback from property lines
- Minimum 2 foot setback from edge of any paved surface

5.3.2 Design Criteria

The following provides requirements and recommendations associated with tree transplanting for flow control credit. Submittal for review shall include the tree species, tree size (caliper or height),

and tree location (with setbacks from ground level impervious surfaces structures and belowground utilities) on the plan set.

5.3.2.1 Tree Species

Newly transplanted trees shall be chosen from the *Stormwater Credits for Trees* table available at www.cityoftacoma.org/stormwater. Tree species that are not provided on this list are not eligible for flow credits.

5.3.2.2 Tree Size

To receive flow control credit, new deciduous trees shall be at least 1.5 inches in caliper measured 6 inches above the ground. New evergreen trees shall be at least 4 feet tall.

5.3.2.3 Tree Location

Trees shall be sited according to sun, soil, and moisture species culture preference. Transplanting locations shall be selected to ensure that sight distances and appropriate setbacks are maintained given mature height, size, and rooting depths. Similar to retained trees, flow control credit for newly transplanted trees varies upon proximity to ground level impervious surfaces. For all projects, the credit is also given for trees that are 20 feet or less from existing ground level impervious surfaces. Distance from impervious surfaces is measured from the edge of the surface to the center of the tree at ground level.

To help ensure tree survival and canopy coverage, the minimum tree spacing for newly transplanted trees shall accommodate mature tree spread. In no circumstance shall flow control credit be given for new trees transplanted less than 15 feet on center spacing for evergreen trees and 25 feet on center spacing for deciduous trees. Trees transplanted in above-ground structures (e.g. pots, planter boxes, etc.) are not eligible for flow control credit.

5.3.2.4 Plant Material and Planting Specifications

Recommended guidelines for planting materials and methods are provided in the City of Tacoma Urban Forest Manual.

5.3.2.5 Irrigation

Provisions shall be made for supplemental irrigation during the first three growing seasons after installation to help ensure tree survival.

5.3.2.6 Long-term Tree Retention and Protection

Trees shall be retained, maintained and protected on the site after construction and for the life of the development as required for retained trees (Section 5.2).

5.3.3 Flow Control Credit

Flow control credits for newly transplanted trees are provided in *Stormwater Credits for Trees* table available at www.cityoftacoma.org/stormwater.

The credits provided in the table are square footage of impervious surface available for flow credit per tree. The total credits for retained and newly transplanted trees shall not exceed 25 percent of the total project impervious surface requiring mitigation. For retained and transplanted trees located within 20 feet of an impervious surface, the impervious surface credit can be applied by reducing that square footage from the total impervious surface on the project site when determining project thresholds. For retained and transplanted trees located greater than 20 feet from an impervious surface, the impervious surface credit can be applied by converting the equal portion of impervious surface to lawn/landscape area when determining project thresholds.

The applicant will be required to enter into a covenant and easement agreement with the City to ensure the trees are properly maintained and will remain in place.

Flow credits only apply to flow control thresholds. Flow credits do not apply to water quality thresholds.

Tree credits are not applicable to trees in native vegetation areas used for flow dispersion or other flow control credit. The total tree credit for retained and newly planted trees shall not exceed 25 percent of impervious surface requiring mitigation.

Chapter 9 Conveyance System Design and Hydraulic Analysis

This chapter presents acceptable methods for the analysis and design of storm and stormwater conveyance systems. Conveyance systems can be separated into the following categories:

- Pipe systems
- Culverts
- Open Channels (ditches, swales)
- Outfalls

The purpose of a conveyance system is to drain stormwater, up to a specific design flow, from properties so as to provide protection to property and the environment. This chapter contains detailed design criteria, methods of analysis and standard details for all components of a conveyance system. A complete basic understanding of hydrology and hydraulics and the principles on which the methodology of hydrologic analysis is based is essential for the proper and accurate application of methods used in designing conveyance systems.

9.1 Design Methods for Conveyance Systems

New conveyance systems shall be designed using the backwater analysis per Section 9.3.2. **The peak flowrate inputs into the analysis shall be calculated using the Santa Barbara Unit Hydrograph (SBUH) method.**

Existing conveyance systems shall be analyzed for capacity using the backwater analysis per Section 9.3.2. **The peak flowrate inputs into the analysis shall be calculated using the SBUH method.**

Preliminary conveyance system sizing for land use planning (short plats, plats, wetland development permits, etc.) **shall use either a Uniform Flow Analysis or the backwater analysis per Section 9.3.2. The peak flowrates may be determined using either SBUH or the Rational Method per Section 9.3.3, however, SBUH is the preferred method for determining peak flowrates.** The Rational Method **may not** be used for the final design of new conveyance systems.

All conveyance system analyses shall use the design criteria outlined in Section 9.1.1 and other applicable sections of the SWMM.

9.1.1 Design Criteria

- Conveyance systems shall be modeled as if no onsite detention is provided upstream.
- Conveyance systems shall be analyzed for fully developed conditions. The fully developed conditions shall be derived from the following percentages of impervious area:
 - In commercial areas, the percent impervious shall be 85%.
 - In industrial areas, the percent impervious shall be 70%.
 - In residential areas, the percent impervious shall be 60%.

The fully developed conditions shall apply to both the offsite and onsite basins.

- Projects proposed in areas subject to tidal influence shall be analyzed at the mean high tide, which is +4.64 feet using current City datum.