Achieving the Post-construction Soil Standard

Meeting King County's regulations to preserve and restore healthy soils on developments in King County

King County

Why do we need post-construction standards?

Land development and landscaping practices can damage natural soil functions by removing or compacting topsoil. The result is increased runoff, erosion, unhealthy landscapes that are difficult and expensive to maintain, polluted water, destroyed fish habitat, and increased need for costly storm water management structures.

How does building healthy soil help?

Healthy soil is vital to a clean environment and healthy landscapes. Deep soil that is rich in organic material absorbs rainwater, helps prevent flooding and soil erosion, and filters out water pollutants. Healthy soil also stores water and nutrients for plants to use in dry times, promoting healthy plants that require less irrigation, toxic pesticides, and other resources. For more information, visit www.soilsforsalmon.org.

Regulatory requirements for post-construction soils

King County's Clearing and Grading regulations (King County Code 16.82) were developed to preserve and restore healthy soils on developments. They apply to all construction site development activities, whether permits are required or not, except for surface mine operations conducted pursuant to permits issued by King County and the Washington Department of Natural Resources.

To the maximum extent possible, construction areas that have been cleared and graded must have the soil moisture holding capacity restored to that of the original undisturbed native soil. Areas exempt from this rule are those that will be covered by impervious surfaces, or have been incorporated into a stormwater facility. Areas that have been compacted or had the topsoil or duff layer removed must be amended by adding compost, importing topsoil, stockpiling site topsoil, or through other techniques that are capable of mitigating lost moisture holding capacity.

King County Code 16.82 requires the following at applicable construction sites:

- Replaced topsoil must:
  - Have an organic matter content of 5 percent dry weight for turf applications and 10 percent for planting beds (Note: 5-10 percent soil organic matter content in soil is not the same as 5-10 percent by volume of compost in soil. This brochure explains how to achieve the required 5-10 percent soil organic matter content.)
  - Have a pH suitable for the proposed landscape plants.
  - Be a minimum of eight inches thick, unless the applicant demonstrates that a different thickness will provide conditions equivalent to the soil moisture holding capacity native to the site.
- Soil amendment must take place between May 1 and Oct. 1 when soils are typically driest and less subject to compaction.

It is recommended that compacted subsoils be tilled or plowed before placing amendments or topsoil. Avoid plowing or tilling within the drip line of trees to be retained. Planting beds should be mulched with two inches of forest duff, ground bark, wood chips or other organic material after planting.

How to meet code requirements

To ensure that the post-construction soil standard will be met, a permit application must be submitted to Department of Permitting and Environmental Review (DPER) and include:

- A completed *Soil Management Plan for King County Soil Improvement Code* (*Soil Management Plan*) is available at http://your.kingcounty.gov/solidwaste/documents/soil-management-plan.pdf or at the DPER office. The plan must show the amount of compost and/or topsoil to be imported and be submitted with:
  - A site plan marked to identify areas where each soil treatment option will be applied, and any stockpiling or staging areas.
  - Test result reports and receipts for compost and/or topsoil delivered to the site. These will be used during inspection to verify that the soil requirement has been met.

Start by selecting soil management options listed on pages 6 and 7, then follow the steps for preparing a *Soil Management Plan* as outlined in this brochure.

Checklist to meet code requirements

- ❑ Select a soil management option.
- ❑ Prepare a *Soil Management Plan*.
- ❑ Provide the *Soil Management Plan* to DPER permitting staff.

Select a soil restoration option

There are economical ways to retain the benefits of healthy soil and avoid more costly damage to streams, wildlife, human health and property value. The most convenient and cost-effective methods for achieving the standards depends on site soil conditions, grading and subgrade compaction, practicality of stockpiling site topsoil during grading and site access issues.

There are four common ways to meet the post-construction soil standard. They can be used individually, or in combination in different areas of a single site. Option 1 applies to areas where the soil will not be disturbed or compacted during construction activities. Choose Option 2, 3 and/or 4 to restore soil quality in areas where grading and soil disturbance are unavoidable. Follow the information provided on the *Summary of Soil Management Options* chart on pages 6 and 7 in this brochure for each option applicable to your site.

OPTION 1:

Leave native soil undisturbed, and protect from compaction during construction.

This option is the most economical and best for the environment, but is not always feasible.

- Plan site development to leave areas where native vegetation does not need to be disturbed - undisturbed areas do not require soil amendment.
- Fence off areas of native vegetation on the site that will not be stripped, logged or graded. During construction, protect these areas from vehicle traffic, materials storage or other forms of compaction or disturbance.

OPTION 2:

Amend existing soil in place.

The simplest way to restore soil quality where the soil has been compacted or the forest duff or topsoil removed is to rototill compost into the existing soil.

- Apply a layer of compost to existing soil at the pre-approved amendment rate of 1.75 inches for turf areas, or 3 inches for planting beds. Use the online compost calculator at http://your.kingcounty.gov/solidwaste/compost-calculator.htm to calculate the amount of compost needed. **Retain copies of receipts for compost delivered to the site**, as they will be used during inspection to verify the soil requirements have been met.
- Rototill compost into soil to a depth of at least 8 inches. Note that tilling to this depth will require repeated passes with a large machine, such as a tractor mounted or heavy rear tine rototiller.

OPTION 3:

Import topsoil mix with 5 percent (turf) or 10 percent (planting beds) soil organic matter content.

Where subsoil is too rocky, compacted or poorly drained to amend effectively, a topsoil mix with 5 percent (turf) or 10 percent (planting beds) soil organic matter can be imported and placed on the surface.

- Import and apply a topsoil mix:
  - For turf areas: a soil mix including 20-25 percent compost by volume, or a mix with a lab test documenting 5 percent soil organic matter.
  - For planting beds: a soil mix including 35-40 percent compost by volume, or a mix with a lab test documenting 10 percent organic matter.
- The soil depth should be 8 inches and the pH suitable for proposed plants. Ask topsoil suppliers for test results of their product to verify the material contains the desired organic matter content and pH. **Retain test result reports and receipts for material delivered to the site**, as they will be used during inspection to verify that the soil requirements have been met.
- For best results, plow or till compacted subsoil at least 2 inches deep before applying topsoil mix, and/or rototill some of the newly applied topsoil into the subsoil.

OPTION 4:

Stockpile site soil, reapply, and amend in place.

- Remove soil and stockpile in an approved location prior to grading. Cover soil with woven weed barrier (available from nursery supply stores) that sheds moisture yet allows air flow.
- Reapply stockpiled soil to landscape areas to a minimum 8-inch depth after grading and other disturbances are completed. In some cases, purchasing additional topsoil will be needed to achieve the 8-inch depth.
- For best results, plow or till compacted subsoil at least 2 inches deep before replacing stockpiled soil, and/or rototill some of the replaced soil into the subsoil.
- Apply a layer of compost to the reapplied soil at the pre-approved amendment rate of 1.75 inches for turf or 3 inches for planting beds, then till the compost into the upper 8 inches of soil. Or, use custom-calculated rates for soils that contain significant organic matter (see box on page 8). Use the online compost calculator at http://your.kingcounty.gov/solidwaste/compost-calculator.htm to calculate the amount of compost needed. **Retain receipts for compost delivered to the site**, as they will be used during inspection to verify the soil requirements have been met.
- Rototill compost into soil to a depth of at least 8 inches. Note that tilling to this depth will require repeated passes with a large machine, such as a tractor or heavy rear tine rototiller.

Summary of Soil Management Options

Soil Management Options and pH	Using pre-approved amendment rates		Using Custom Amendment rates*
	Turf	**Planting Beds**	**Turf or planting beds**
Option 1 Leave native soil undisturbed, protect from compaction.	Not applicable – Undisturbed areas do not require soil amendment.	Not applicable – Undisturbed areas do not require soil amendment.	Not applicable – Undisturbed areas do not require soil amendment.
Soils that have been cleared and graded, and not covered by impervious surfaces or developed as a storm water structure, must be restored to 8 inches deep, using one of the following three options. Visit http://your.kingcounty.gov/solidwaste/compost-calculator.htm to calculate quantities of compost and/or topsoil needed for Options 2-4 below.			
Option 2 Amend soil in place.	Mix 1.75 inches of compost 8 inches deep.	Mix 3 inches of compost 8 inches deep.	Use online calculator*.
Option 3 Import topsoil containing adequate organic amendment.	Import 8 inches of soil mix containing approximately 75-80% sandy loam and 20-25% compost.	Import 8 inches of soil mix containing approximately 60-65% sandy loam and 35-40% compost.	Not applicable.
Option 4 Stockpile site soil, reapply, amend in place.	Reapply stockpiled soil and amend in place with 1.75 inches of compost, for a combined minimum depth of 8 inches of soil and compost.	Reapply stockpiled soil and amend in place with 3 inches of compost, for a combined minimum depth of 8 inches of soil and compost.	Use online calculator to determine amendment rate.* Reapply stockpiled soil and amend in place with a combined minimum depth of 8 inches of soil and compost.

* Custom amendment rates must be approved based on soil and amendment tests and calculations using the soil amendment calculator at http://your.kingcounty.gov/solidwaste/compost-calculator.htm.

How to prepare a *Soil Management Plan*

In preparation for meeting code requirements, a *Soil Management Plan* available through the DPER permit office must be completed. Follow these steps to prepare the plan.

STEP 1.

Review site conditions, landscape and grading plans.

- Examine site plans and soils. Use a shovel to dig in several areas that will be graded (or already have been graded) to determine if the newly exposed grades can be easily amended, or if compaction will require plowing/tilling of the subsoil or topsoil import. Determine if there are areas where soil could be stockpiled on-site.
- Identify areas where soil can be left undisturbed (Option 1), amended in place with compost (Option 2), replaced with purchased topsoil (Option 3), or stockpiled and later reapplied (Option 4).

STEP 2.

Select soil treatment option and suitable pH for planting areas.

Amending with compost is often the most economical way to bring poor soils up to the required soil organic matter content. On sites with loose topsoil and where space permits, stockpiling and reapplying topsoil may be less costly. Importing topsoil usually costs more than amending existing soil, though it may be easier where subsoil conditions make cultivation difficult.

- Identify the areas where the selected soil treatment option(s) will be applied. Outline those areas on the site plan with a dark, thick-line pen.
- Assign each area an identifying letter (A, B, C…) on the site drawing.
- Determine desired pH for each lettered area, based on suitability for proposed plants (see *Soil pH* box on page 10 in this brochure).
- Include required information with permit application (see *How to meet code requirements* section on page 3 in this brochure).

Pre-Approved versus Custom Amendment Rates

Either a pre-approved or custom soil amendment rate can be used to meet the organic content requirements of King County's Clearing and Grading regulations (King County Code 16.82). Pre-approved amendment rates have been calculated for the soil treatment options presented in this brochure that require adding compost to existing or stockpiled soil. The pre-approved amendment rate is 1.75 inches (turf) or 3 inches (planting beds) of compost, applied to the soil as directed.

Use of the pre-approved amendment rate may simplify planning, however a custom calculated rate, based on tests of the soil and

STEP 3.

Calculate compost and/or topsoil volumes for each area.

- Determine whether you will use a pre-approved or custom amendment rate (see box). Use of the pre-approved amendment rate could simplify planning, however a custom calculated rate, based on tests of the soil and proposed compost, can save on effort and expense. Many pasture or woodland soils have adequate organic matter without amendment. Also, some compost products will provide the required soil organic matter content at lower application rates than the pre-approved rate
- Calculate the square footage of each lettered area on site plan.
- Use the square footage figures to complete the online compost calculator at http://your.kingcounty.gov/solidwaste/compost-calculator.htm. This will calculate the amounts of topsoil and/or compost in cubic yards needed to achieve the 8-inch soil depth.

STEP 4.

Identify compost and/or topsoils to be applied and retain records.

- Contact compost or topsoil sources and select products that meet the requirements. Compost used as amendment or in topsoil mixes must be supplied by a permitted composting facility (see *Resources* box).
- Retain compost and/or topsoil product delivery tickets and test reports, as they will be used as verification records during inspection.

STEP 5.

Turn in completed DPER *Soil Management Plan* to DPER staff for review during the permit process.

proposed compost, can save on effort and expense. For example, many pasture or woodland soils have adequate organic matter without amendment. Also, some compost products will provide the required soil organic matter content at lower application rates than would be needed to meet code requirements. See the *Resources* box in this brochure for a list of soil testing laboratories. For information on how to calculate and use custom amendment rates, see the *Soil Management Plan* or visit http://your.kingcounty.gov/solidwaste/documents/soil-management-plan.pdf.

How to determine soil pH

Use an accredited soil testing laboratory to test the pH of the soil. Ask the laboratory to provide information on how to adjust the soil pH, if necessary. To find accredited soil testing laboratories, see *Resources* box in this brochure.

The soil pH should be compatible with specific plant needs. Nurseries can provide specific information about suitable pH for landscape plants. Here are general guidelines for optimal soil pH ranges for various plant types:

- **Lawns** – 5.5 to 7.5 pH
- **Shrubs (except acid-tolerant plants)** – 5.5 to 7.0 pH
- **Acid-Tolerant Shrubs (Rhododendrons, Azaleas, Mountain Laurels, Camellias, Blueberries, native plants)** – 4.5 to 5.5 pH
- **Annual Flower and Vegetable Gardens** – 6.0 to 7.0 pH

Compost and topsoil sources

Compost sold in Washington must be produced in a state permitted facility to ensure that it meets state health and environment standards. Some compost facilities produce compost and topsoil mixes. Topsoil suppliers might use compost produced elsewhere to create topsoil products. Ask suppliers for product test results to verify it contains the desired organic matter content and pH. Retain test results and receipts for compost and/or topsoil material delivered to the site. These will be used during inspection to verify the soil standard requirements have been met.

See *Resources* box in this brochure to find a list of permitted compost facilities. Also see your local business directory for suppliers of compost and topsoil products.

RESOURCES

Permitted compost facilities

For a list of permitted compost facilities, see the Washington State Department of Ecology website at www.ecy.wa.gov/programs/swfa/compost, and click on "Permitted Compost Facilities" in the text, or call the Department's Northwest Regional Office at 425-649-7000.

Soil testing laboratories

For a list of soil testing laboratories, see the *Building Soil* manual at www.buildingsoil.org.

Contacts

For questions related to King County's post-construction soil standards, please contact:

Department of Permitting and Environmental Review
Permitting Services Center
Ph – 206-296-6600
Fax – 206-296-6728
E-mail - dperwebinquiries@kingcounty.gov
TTY Relay:711

King County

Department of Natural Resources and Parks
Solid Waste Division

Alternative Formats On Request
206-296-4466 | TTY Relay: 711

Please reuse this guide by sharing it with a friend, or recycle it. *Thank you!*

® SFI-01234 1202 M Printed on recycled paper – Nov15DK