Vermont Green Stormwater Infrastructure
Simplified Sizing Tool for Small Sites

2016 NEIWPCC NPS Conference
April 20, 2016
Presented by Amy Macrellis, Project Water Quality Specialist
Topics for This Session

Development of the Vermont Green Stormwater Infrastructure (GSI) Simplified Sizing Tool and Guidance for Small Sites

Overview of guidance and spreadsheet tool

Application to a “real-life” project and in current VT regulations and bylaws

Toolkit available online: http://goo.gl/9YFfcz
The “Toolkit” (in a nutshell)

Vermont League of Cities and Towns (VLCT) Model LID / GSI Stormwater Management Bylaw

• focuses on site design and GSI practices on small sites where the proposed change or increase in impervious cover is below the thresholds for State stormwater permitting.

Guidance and sizing tool

• helps applicants and review boards understand what GSI practices are and how they can be sized to meet the performance standards included in the model bylaw.
Development of the VT GSI Simplified Sizing Tool and Guidance

Supported by VT DEC Clean Water Initiative Program

Reviewed existing simplified sizing methodologies and frameworks

Project steering committee selected performance standard, preferred framework, and GSI practices to be included

- Practice sizing, performance standards, and practices generally mirror anticipated revisions to the VT Stormwater Management Manual

Developed simplified sizing and crediting methodology for 10 GSI practices

Created sizing spreadsheet tool and supporting guidance
VT GSI Simplified Sizing Tool for Small Projects – Overview

Set of 11 fact sheets:

1. Introduction
2. Post-Construction Soil Depth and Quality
3. Retention or Planting of Trees
4. Cisterns and Rain Barrels
5. Rooftop Disconnection
6. Non-Rooftop Disconnection to Filter Strips
7. Drywells
8. Bioretention and Rain Gardens
9. Vegetated Swales
10. Infiltration Trenches
11. Permeable Pavers

Appendix: Simple Infiltration Test

Microsoft Excel-based Sizing Tool
VT GSI Simplified Sizing Tool for Small Projects – Introduction Fact Sheet

When to use this tool:
• 2,500+* square feet of impervious surface, up to ½-acre
• no more than 10,000 square feet of impervious cover directed to any single GSI practice

Managing Stormwater from Small Developments: Why it matters

What is Green Stormwater Infrastructure?

What Needs to be Submitted?
• Stormwater-related elements to include on site plan
• Details for GSI practices, including calculations and specifications

Performance standard: “first inch” of runoff from rain falling on impervious surfaces
VT GSI Simplified Sizing Tool for Small Projects – Practice Fact Sheets

Each fact sheet contains the same basic sections:

- Practice description
- Location (feasibility, setbacks, and siting considerations)
- Design and Sizing (conveyance, pre-treatment, treatment)
- Vegetation and Landscaping
- Maintenance
- Specification sheet
VT GSI Simplified Sizing Tool for Small Projects – Practice Fact Sheets

Design and Sizing:

• Provides specific guidance for properly designing and sizing each GSI practice
• Practice sizing is “baked in” based on capture and treatment of 1 inch of runoff – consistent with forthcoming revised Vermont Stormwater Management Manual Water Quality Treatment Standard
• Design tables or other sizing guidance provided – or use the spreadsheet

### Design and Sizing

#### Level Spreader

A level spreader must be used at the uphill end of practice to evenly distribute stormwater runoff across the top of the receiving area. The level spreader can be a small trench filled with pea gravel or river stone installed along a level contour, a splash pad, or other flow spreading device installed at the downspout outlet.

Downspouts must be at least 10 feet away from the nearest ground-level impervious surface, to prevent runoff from re-connecting to the stormwater drainage system.

Where a gutter/downspout system is not used, runoff should drain either as sheetflow from the contributing surface or into an infiltration trench.

Down-slope overflow points should be protected from erosion and not blocked by vegetation.

#### Receiving Area

This practice is critically dependent on several site conditions—especially down-slope flow path length, soils, slopes, and vegetative cover—in order to function properly.

Measure the rooftop area that is going to be directed to the receiving area. If the rooftop area draining to any one downspout is more than 1,000 square feet, the rooftop disconnection must be paired with another practice like a rain garden.

The flow from each downspout must be spread over a minimum 12-foot wide receiving area flow path extending down-slope from the structure.

The length of the flow path extending down-slope varies based on the soil’s infiltration rate and the slope of the receiving area. From the design table below, select the flow path length based on your area’s infiltration rate and slope. In order to qualify for the shorter receiving area flow path lengths, the soils need to be able to absorb least 0.5 inches of water per hour (see Appendix for testing method). Low-permeability soils require a longer flow path and careful attention to grading in order to maintain sheetflow.

Design Table – rooftop disconnection receiving area lengths (in direction of flow) by infiltration rate and slope class

<table>
<thead>
<tr>
<th>HSG of soil in receiving area</th>
<th>Receiving Area Slope</th>
<th>Less than 5%</th>
<th>5-15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/6 ft</td>
<td>infiltration rate &lt; 0.8 in/hr</td>
<td>35 feet</td>
<td>50 feet</td>
</tr>
<tr>
<td>B/6 ft</td>
<td>infiltration rate &gt; 0.8 in/hr</td>
<td>60 feet</td>
<td>85 feet</td>
</tr>
</tbody>
</table>

Even distribution of rooftop runoff and a rigorous, healthy vegetative cover are keys to the success of rooftop disconnection in labs.
VT GSI Simplified Sizing Tool for Small Projects – Practice Fact Sheets

Applicants can fill out “tear-off” specification sheets and attach to plan submittal along with calculator results (if used)
VT GSI Simplified Sizing Tool for Small Projects – MS Excel Spreadsheet Sizing Tool

Applicants fill in basic project information and use the practice-specific worksheets to size individual practices.

### GREEN STORMWATER INFRASTRUCTURE SIMPLIFIED SIZING TOOL FOR SMALL PROJECTS

#### PROJECT INFORMATION SUMMARY

<table>
<thead>
<tr>
<th>Project Name/Number</th>
<th><a href="#">Enter</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Submittal Date</td>
<td>1/1/2015</td>
</tr>
<tr>
<td>Name of Applicant (if different from Owner)</td>
<td><a href="#">Enter</a></td>
</tr>
<tr>
<td>Primary Contact Phone Number</td>
<td><a href="#">Enter</a></td>
</tr>
<tr>
<td>Primary Contact E-mail Address</td>
<td><a href="#">Enter</a></td>
</tr>
<tr>
<td>Project Location</td>
<td><a href="#">Enter</a></td>
</tr>
<tr>
<td>Site Address</td>
<td><a href="#">Enter</a></td>
</tr>
<tr>
<td>Description</td>
<td><a href="#">Enter</a></td>
</tr>
</tbody>
</table>

#### Total Project Site Area (acres)

- Total Earth Disturbance (square feet)
- Total New Impervious Surface Area (square feet)
- Total Redeveloped or Replaced Impervious Surface Area (square feet)
- Total Post-Project Impervious Surface Area (square feet)

#### Green Stormwater Infrastructure Practices Selected

- Grassed detention basin (optional)
- Stormwater quality buffer
- Underground detention
- Infiltration
- Vegetated swale
- Constructed wetland

#### Total Area Treated Using Selected Practices (sq. ft.)

| Grassed detention basin (optional) | 0 |
| Stormwater quality buffer | 0 |
| Underground detention | 0 |
| Infiltration | 0 |
| Vegetated swale | 0 |
| Constructed wetland | 0 |

#### SIZING CALCULATION RESULTS:

- Required Disconnection Area Width (across slope, on contour): 12 feet
- Required Disconnection Area Length (down-slope): 35 feet
- Grade controls every 20 feet: NOT REQUIRED

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### ROOFTOP DISCONNECTION SIZING DETAILS

#### DESIGN TABLE

<table>
<thead>
<tr>
<th>Disconnection Area Slope</th>
<th>Disconnect Area Width</th>
<th>Disconnect Area Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10%</td>
<td><a href="#">Enter</a></td>
<td><a href="#">Enter</a></td>
</tr>
<tr>
<td>More than 10%</td>
<td><a href="#">Enter</a></td>
<td><a href="#">Enter</a></td>
</tr>
</tbody>
</table>

#### AREA NO. (roof-top area only)

- Square footage: 100 square feet (minimum 1,000 square feet per downspout)
- Slope of the discharge area: 0% (half of number slope %)
- Infiltration rate: 0.5 inches / hour

#### SIZING CALCULATION RESULTS:

- Required Disconnection Area Width (across slope, on contour): 12 feet
- Required Disconnection Area Length (down-slope): 35 feet
- Grade controls every 20 feet: NOT REQUIRED

#### AREA NO. (roof-top area only)

- Square footage: 100 square feet (minimum 1,000 square feet per downspout)
- Slope of the discharge area: 0% (half of number slope %)
- Infiltration rate: 0.5 inches / hour

#### SIZING CALCULATION RESULTS:

- Required Disconnection Area Width (across slope, on contour): 12 feet
- Required Disconnection Area Length (down-slope): 35 feet
- Grade controls every 20 feet: NOT REQUIRED

#### Total Impervious Area Treated Using Rooftop Disconnection:

- Transfer this number to Sheet #1 Project Information: 0 square feet
Spreadsheet Tool and Guidance Application to a “Real-Life” Project

Residential addition

Based on recent site plan submitted to a Chittenden County municipality

The example shows:

- Existing condition
- Proposed project
- Proposed GSI practices
- Specific GSI practice application for each impervious or disturbed area on site, including use of the spreadsheet
- Summary of the proposed project with GSI practices
Residential Example – Existing Single Family Home

14,400 square foot lot (~0.33 acres)
3,650 square feet of impervious surface
25% of lot covered by impervious surface

Image credit: PlaceSense
Residential Example – Proposed Re-Development

New garage and driveway extension
Addition of 2,130 square feet of impervious surface
Total impervious area now 5,780 square feet
Impervious surface on lot is greater than 2,500* square feet, so must comply with LID/GSI Stormwater Management Bylaw
33% of lot proposed to be covered by impervious surface

*Note:

Image credit: PlaceSense
Residential Example – Proposed GSI Practices

Retention and Planting of Trees
Rooftop Disconnection
Bioretention and Rain Gardens
Permeable Pavers
Post-Construction Soil Depth and Quality (required within area of earth disturbance)
Retention and Planting of Trees
Residential Example – Area 1 - Driveway

Retention and Planting of Trees:
- Existing trees preserved (4 deciduous, 7 evergreen)
- New trees planted (2 deciduous, 7 evergreen)

Key location and sizing details:
- Trees must be within 20’ of ground-level impervious, be retained for life of development
- Retained trees must be protected from construction disturbance
- Soils must meet Post-Construction Soil Depth and Quality standards
- “Credit” is based on existing canopy area, or set square footage for newly planted trees
- Max credit: 25% of impervious surface area needing treatment
Residential Example – Area 1 - Driveway

Retention and Planting of Trees:

- Existing trees preserved (4 deciduous @ 2,400 ft², 7 evergreen @ 1,440 ft²)
- New trees planted (2 deciduous, 7 evergreen)

![Tree Retention and Planting Credit Details Table]

- **BMP**: Retained Tree, Newly Planted Tree
- **Tree Type**: Evergreen, Deciduous
- **Impervious Area Credit**: 25% canopy area (min. 100 ft² / tree)
- **Number of Evergreen Trees to Be Retained**: 7
- **Total Canopy Area of Evergreen Trees to Be Retained**: 1,440 square feet
- **Number of Deciduous Trees to Be Retained**: 4
- **Total Canopy Area of Deciduous Trees to Be Retained**: 2,000 square feet
- **Number of New Evergreen Trees to Be Planted**: 7
- **Number of New Deciduous Trees to Be Planted**: 2

**Tree Credit Calculation Results**:

- Total impervious area reduction credit for retained evergreen trees: 288 square feet
- Total impervious area reduction credit for retained deciduous trees: 240 square feet
- Total impervious area reduction credit for newly planted evergreen trees: 350 square feet
- Total impervious area reduction credit for newly planted deciduous trees: 40 square feet
- Total tree credits (maximum 25% of impervious area needing treatment): 787.5 square feet

**Total Impervious Area Treated Using Tree Credits** - Transfer this number to Sheet #1, Project Information: 787.5 square feet
Bioretention and Rain Gardens - Residential
Residential Example – Area 1 - Driveway

Bioretention and Rain Gardens

• Rain garden created to capture driveway runoff (3,150 ft² minus tree credits = 2,362 ft² remaining)

Key location and sizing details:

• Locate to intercept maximum amount of runoff
• Max. of 10,000 ft² impervious surface directed to single practice
• Min. soil infiltration rate of 0.5 inches/hour (or underdrain)
• Rain garden size varies depending on impervious area draining to it, soil media and ponding depths

Proposed Bioretention Area
Residential Example – Area 1 - Driveway

- Rain garden created to capture 1” runoff from 2,362 ft² impervious surface
- Rain garden bottom area adjusts depending on ponding depth, soil mix depth, and infiltration rate entered by user

<table>
<thead>
<tr>
<th>BIORETENTION AND RAIN GARDENS SIZING DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name/Number</td>
</tr>
<tr>
<td>Application Submit Date</td>
</tr>
</tbody>
</table>

### DESIGN TABLE (ASSUMES 6 INCHES OF PONDING AND 0.5 INCHES/HOUR INFILTRATION RATE)

<table>
<thead>
<tr>
<th>Total impervious surface area (square feet)</th>
<th>Depth of Bioretention Soil Mix (inches)</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Bioretention Filter Bed Surface Area (sq. ft.)</td>
<td>7.2</td>
<td>6.3</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>42</td>
<td>32</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td>83</td>
<td>63</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>167</td>
<td>127</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td></td>
<td>250</td>
<td>190</td>
<td>170</td>
<td></td>
</tr>
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<td>4000</td>
<td></td>
<td>333</td>
<td>253</td>
<td>226</td>
<td></td>
</tr>
<tr>
<td>5000</td>
<td></td>
<td>417</td>
<td>317</td>
<td>283</td>
<td></td>
</tr>
<tr>
<td>7500</td>
<td></td>
<td>625</td>
<td>475</td>
<td>424</td>
<td></td>
</tr>
<tr>
<td>10000</td>
<td></td>
<td>833</td>
<td>633</td>
<td>565</td>
<td></td>
</tr>
</tbody>
</table>

### AREA NO. 1

- **Type of impervious surface:** Driveway
- **Width of impervious surface:** 20 feet (measured at the down-slope edge parallel to contour)
- **Length of impervious surface:** 157.5 feet (measured from uphill to downhill edge, in flow direction)
- **Impervious area treated using tree credits:** square feet (maximum 25% of impervious area, enter from "Tree 788 Retention and Planting" sheet)
- **Remaining impervious area to be treated:** 2,362 square feet (max. 10,000 sq. ft impervious per bioretention area)
- **Ponding depth (inches):** 6 inches (minimum 6 inches, maximum 9 inches)
- **Depth of bioretention soil mix:** 24 inches (minimum 18 inches, maximum 48 inches)
- **Infiltration rate:** 0.5 inches / hour

### SIZING CALCULATION RESULTS:

- **Volume of stormwater to be treated:** 125 cubic feet
- **Required Bioretention Bottom Area (not counting sides, berms, etc.):** 113 square feet

**NOTE:** Required bioretention bottom area is proportionately reduced when tree credits are used in combination with bioretention.

**Underdrain is:** NOT REQUIRED

**Total Impervious Area Treated Using Bioretention and Rain Gardens - Transfer this number to Sheet #1, Project Information:** 2,362 square feet
Rooftop Disconnection
Residential Example – Area 2 - Garage

Rooftop Disconnection

- Garage rooftop disconnected to backyard (980 ft²)

Key location and sizing details:

- Max. of 1,000 ft² impervious surface directed to single area
- Soils in receiving area must meet the Post-Construction Soil Depth and Quality requirements
- Ideal slope of receiving area is 1 - 8%; allowed on steeper slopes with berms or other grade control
- Min. receiving area width is 12 feet
- Min. receiving area length is 35 feet, sloping away from structure
- The length of the flow path varies based on soil infiltration rate and receiving area slope
Residential Example – Area 2 - Garage

- Garage rooftop disconnected to backyard (980 ft²)
- Receiving area slope is 6% and soil infiltration rate is 0.5 inches/hour

![Table and Diagram]
Residential Example – Area 3 - House

Bioretention and Rain Gardens

• Rain garden captures rooftop runoff from the house (1,440 ft²)

Key location and sizing details:

• Locate to intercept maximum amount of runoff
• Max. of 10,000 ft² impervious surface directed to single practice
• Min. soil infiltration rate of 0.5 inches/hour (or underdrain)
• Rain garden size varies depending on impervious area draining to it, soil media and ponding depths
Residential Example – Area 3 - House

• Rain garden created to capture 1 inch of runoff from the house (1,440 ft²) of impervious surface)
Permeable Pavers - Residential
Residential Example – Area 4 – Front Walkway

Permeable Pavers:
- Concrete sidewalk replaced with permeable paver system (210 ft²)

Key location and sizing details:
- No “run-on” from other pervious or impervious areas
- Soil infiltration rate of 0.5 inches/hour of higher
- Slopes less than 5%, slope away from structures, bottom of system should slope 0.5% or less
- Max. of 10,000 ft² per paver area
- Paver systems include three courses: pavers and crushed aggregate between joints, bedding course, and base course or reservoir layer (min. 6 inches of properly compacted #57 stone)
Residential Example – Area 4 – Front Walkway

Permeable Pavers:
- Concrete sidewalk replaced with permeable paver system (210 ft²)

![Green Stormwater Infrastructure Simplified Sizing Tool for Small Projects](image)

### Residential Example

**Project Name/Number:** Residential Example  
**Application Submission Date:** 11/10/2015

**NOTE:** THERE IS NO DESIGN TABLE FOR THIS PRACTICE.
A 6-inch gravel reservoir course provides storage for 2.5 inches of rainfall, or roughly the two-year storm across VT.

<table>
<thead>
<tr>
<th>AREA NO. 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of permeable paver surface:</td>
<td>5 feet (measured at the down-slope edge parallel to contour)</td>
</tr>
<tr>
<td>Length of permeable paver surface:</td>
<td>42 feet (measured from uphill to downhill edge, in flow direction)</td>
</tr>
<tr>
<td>Square footage of permeable paver area:</td>
<td>210 square feet (maximum 10,000 sq. ft. per permeable paver area)</td>
</tr>
<tr>
<td>Slope of proposed permeable paver area:</td>
<td>5% (feet of rise / feet of run), maximum 5%</td>
</tr>
<tr>
<td>Infiltration rate:</td>
<td>0.5 inches/hour (minimum 0.3 inches/hour for paver systems)</td>
</tr>
</tbody>
</table>

**SIZING CALCULATION RESULTS:**

<table>
<thead>
<tr>
<th>Bedding Course Depth (3/8&quot; pea gravel or #8 stone):</th>
<th>3 inches (minimum 2-3 inches or per manufacturer's instructions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Bedding Course Stone Volume Needed:</td>
<td>1.9 cubic yards</td>
</tr>
<tr>
<td>Reservoir Course Gravel Depth (1/2&quot; to 1 1/2&quot; clean aggregate):</td>
<td>6 inches (minimum 6 inches)</td>
</tr>
<tr>
<td>Total Gravel Volume Needed:</td>
<td>3.9 cubic yards</td>
</tr>
</tbody>
</table>

**Total Impervious Area Treated Using Permeable Pavers - Transfer this number to Sheet #1, Project Information:** 210 square feet
Residential Example – Area 5 – Disturbed Areas

Post-Construction Soil Depth and Quality:

- Standards must be met in any disturbed area not covered by impervious surface, incorporated into stormwater treatment practice, or engineered as structural fill or slope (700 ft²)

Key location and sizing details:

- Undisturbed areas meet intent
- Existing topsoil – stockpile on-site and replace
- Disturbed areas restored to include 8” topsoil layer with 5% organic matter content in turf areas (10% in planting beds), subsoils scarified at least 4 inches with some incorporation of topsoil
Post-Construction Soil Depth and Quality – What It Looks Like

MULCH

LOOSE SOIL
with visible dark organic matter

LOOSE OR FRACTURED SUBSOIL

Source: WCOE 2012
Residential Example – Area 5 – Disturbed Areas

Post-Construction Soil Depth & Quality: Multiple Options for Meeting Standard

**Option 1:** Leave native vegetation and soil undisturbed, and protect from compaction during construction.

- Identify areas of the site that will not be stripped, logged, graded or driven on, and tence off those areas to prevent impacts during construction. If neither soils nor vegetation are disturbed, these areas do not require amendment.

**Option 2:** Amend existing site topsoil or subsoil at a default “pre-approved” rate.

- Scarification: Scrape or till subgrade to 8 inches depth (or to depth needed to achieve a total depth of 12 inches of uncompacted soil after calculated amount of amendment is added). Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained. Amend soil to meet required organic content.

<table>
<thead>
<tr>
<th>A. Planting Beds</th>
<th>B. Turf Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-APPROVED RATE: Place 3 inches of composted material and routill to 5 inches of soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches). Raise beds to smooth and remove surface rocks larger than 2 inches diameter. Mulch planting beds with 2 inches of organic mulch.</td>
<td>PRE-APPROVED RATE: Place 1.75 inches of composted material and routill to 6.25 inches of soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches). Water or roll to compact to 85% of maximum dry density. Raise to level, and remove surface woody debris and rocks larger than 1 inch diameter.</td>
</tr>
</tbody>
</table>

**Option 3:** Stockpile topsoil during grading. Replace it before planting.

- Stockpiled topsoil must also be amended at a pre-approved default rate if needed to meet the organic matter or depth requirements.

| Scarification: If placed topsoil plus compost or other organic material will amount to less than 12 inches; Scrape or till subgrade to depth needed to achieve 12 inches of loosened soil after topsoil and amendment are placed. Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained. Stockpile and cover soil with weed barrier material that sheds moisture yet allows air transmission, in approved location, prior to grading. Replace stockpiled topsoil prior to planting. Amend if needed to meet required organic content. |

**Option 4:** Import topsoil mix of sufficient organic content and depth to meet requirements.

- Scarification: Scrape or till subgrade in two directions to 6 inches depth. Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.

| A. Planting Beds: Use imported topsoil mix containing 10% organic matter (typically around 40% compost). Soil portion must be sand or sandy loam as defined by the USDA. Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil. Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil. Place second lift of 3 inches topsoil mix on surface. Raise beds to smooth, and remove surface rocks over 2 inches diameter. Mulch planting beds with 2 inches of organic mulch. |
| B. Turf Areas: Use imported topsoil mix containing 5% organic matter (typically around 25% compost). Soil portion must be sand or sandy loam as defined by the USDA. Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil. Place second lift of 3 inches topsoil mix on surface. Water or roll to compact soil to 85% of maximum dry density. Raise to level, and remove surface rocks larger than 1 inch diameter. |

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**GREEN STORMWATER INFRASTRUCTURE SIMPLIFIED SIZING TOOL FOR SMALL PROJECTS POST-CONSTRUCTION SOIL DEPTH AND QUALITY, SOIL MANAGEMENT PLAN DETAILS**

<table>
<thead>
<tr>
<th>Project Name/Number</th>
<th>Residential Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Submittal Date</td>
<td>11/10/2015</td>
</tr>
</tbody>
</table>

**Area No.:**

- **PLANTING TYPE:**
  - X Turf
  - Unamplified native vegetation
  - Planting Beds
  - Other

**Square footage of this area:** 700 square feet

**SCARIFICATION:**

- Subsoil will be scarified 4 inches (depth) of scarification needed to achieve finished total 12" loosened depth.

**PRE-APPROVED AMENDMENT METHOD:**

- **Topsoil import:** 1.75 inches of compost or imported topsoil applied
  - Amend with compost
  - Stockpile and amend
  - Total cubic yards stockpiled
  - Water or roll to compact soil to 85% maximum dry density
  - Raise to level, and remove surface rocks larger than 1 inch diameter

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified compost</td>
<td>3.8 cu. yds.</td>
</tr>
<tr>
<td>Cubic yards of amendment needed to cover this area to designated depth</td>
<td>0.500</td>
</tr>
<tr>
<td>Cubic yards of mulch needed</td>
<td>0.062</td>
</tr>
</tbody>
</table>

**MULTCH:**

- 0.500 square feet to be mulched
- 0.062 (conversion factor, to give 2 cu. m. mulch depth)

**Total Site Area Treated Using the Post-Construction Soil Depth and Quality Requirements:**

- Transfer this number to Sheet #1, Project Information: 700 square feet
Residential Example – Summary

New garage and driveway extension

33% of lot proposed to be covered by impervious surface

First inch of runoff from existing and proposed impervious surfaces on site fully managed using GSI practices

Soils in disturbed/graded areas also capable of soaking in roughly the first inch of rainfall
Is the VT GSI Simplified Sizing Tool being applied?

Resource for lakeshore property owners to use in demonstrating compliance with VT Shoreland Protection Act permitting requirements (http://www.watershedmanagement.vt.gov/permits/htm/pm_BMPs.htm)

The Town of Colchester is integrating the sizing tool into a zoning update for Malletts Bay, on Lake Champlain: http://colchestervt.gov/608/Malletts-Bay-Initiative

The City of Montpelier is integrating the tool into a city-wide update of the Unified Development Regulations: http://www.placesense.com/current/montpelier
Questions?

Acknowledgements and Resources

Funding from the VT DEC Vermont Clean Water Initiative Program

Justin Kenney, VT DEC
Julie Moore, P.E.

Project Steering Committee:

- Milly Archer
- Christy Witters
- Amy Picotte
- Brian Swisher
- Dan Homeier
- Kevin Burke
- Michaela Stickney
- Jim Pease

Toolkit available online:

http://goo.gl/9YFfcz

(scroll to “Green Stormwater Infrastructure”)

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