Module 3.6: Intermediate LID Design: Hydrologic Modeling
General instructions: You may model facility dimensions to the nearest half foot.

Exercise #2: Modeling Bioretention and Permeable Pavement

<table>
<thead>
<tr>
<th>Site:</th>
<th>WSU Extension in Everett</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000 Tower St. Everett, WA 98201</td>
</tr>
</tbody>
</table>

Site Design Assumptions:
- Predominant Soil: Till
- Pre-developed Land Cover: Forest

Exercise #2a: Bioretention (Water Quality)

<table>
<thead>
<tr>
<th>Site:</th>
<th>Post-developed Land Cover: Impervious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Standard:</td>
<td>Water Quality Treatment (91% Infiltration)</td>
</tr>
</tbody>
</table>

Project:
New construction of 5,000 square foot moderately sloped parking lot. Design a bioretention system to provide water quality treatment for all 5,000 sf of parking area.

Facility Design Assumptions:
- Sideslopes: 3:1
- Ponding Depth: 6 inches
- Freeboard: 6 inches
- BSM Thickness: 18 inches
- BSM Porosity: 40 % effective porosity ("porosity" - "wilting")
  (46 % porosity in WWHM)
- BSM Infiltration Rate: 6 inches/hour
- Native Soil Infiltration Rate: 0.5 inches/hour
- Overflow pipe diameter: 12 inches

Assume:
- No underdrain permitted
- Square facility geometry
- Neglect facility footprint in post-developed area
- 15 minute computational timestep

Results: WWHM
- Facility Bottom Area: _______ square feet
- Facility Footprint: _______ square feet
- Percent of Development: _______ % (top area)

Results: MGSFlood
- Facility Bottom Area: _______ square feet
- Facility Footprint: _______ square feet
- Percent of Development: _______ % (top area)
### Exercise #2b: Bioretention (Flow Control)

**Site:** Post-developed Land Cover: Impervious  
Design Standard: Flow Control (match predeveloped flows and durations from 50% 2-year to full 50-year recurrence interval flow)

**Project:** New construction of 5,000 square foot *moderately sloped parking lot*. Design a bioretention system to provide flow control for all 5,000 sf of parking area. Use same facility assumptions as Exercise 1a.

Use a 15 minute computational timestep.

**Results:**  
MGSFlood  
Facility Bottom Area: _________ square feet  
Facility Footprint: _________ square feet  
Percent of Development: _________ %
Exercise #2c: Permeable Pavement

Site: Post-developed Land Cover: Impervious/Permeable Pavement
Design Standard: Flow Control (match predeveloped flows and durations from 50% 2-year to full 50-year recurrence interval flow)

Project: New construction of 5,000 square foot parking lot. Design permeable pavement facility to provide flow control for 2,000 square feet of permeable pavement (parking stalls) and run-on from 3,000 square feet of adjacent impervious parking area (driving lanes).

Facility Design Assumptions:
- Pervious Area: 2,000 square feet
- Pavement Slope: 2% (model as flat, layout check dams outside of model to provide required ponding)
- Pavement Infiltration Rate: 50 inches/hour
- Gravel Porosity: 30%
- Native Soil Infiltration Rate: 0.5 inches/hour

Use a 15 minute computational timestep.

Results:
- **WWHM**
  - Average Ponding Depth: __________ feet

- **MGSFlood**
  - Average Ponding Depth: __________ feet