

Module 3.3: Intermediate LID Design: Permeable Pavement

Section 3: Permeable Pavement Siting & Design

Site Exploration of Geological/Soil Characteristics

The most critical component of site exploration is getting enough soil information to know whether water can be infiltrated into the subgrade for a successful permeable pavement system.

There are many resources available for researching a site before heading out into the field:

- [Washington State Department of Ecology Well Log](#) - complete with location, ownership, construction details, and lithology of completed wells
- [Washington State Department of Natural Resources Geologic Information Portal](#) - interactive earth science mapping, data, and related information
- [Washington State Department of Natural Resources Lidar \(Light Detection and Ranging\)](#) - detailed information about WA geology using lidar technology
- [USDA Natural Resources Conservation Service \(NRCS\)](#) - soil surveys by county
- [US Geological Survey](#) - find site information and maps from a geologist's perspective
- [Google Earth](#) - find site history with photo documentation



Field investigation of soil type on a steep slope

In the field, exploration needs to show a continuous soil profile between the surface and 10 feet below the planned facility. Grain size analysis will give you a good handle on soil permeability and other important characteristics but should not be the only method used to understand the soils.

Three common site infiltration exploration approaches include:

- Digging exploration pits with a backhoe
- Vactor explorations – best for city environments where there are a lot of utilities that might potentially impede other types of exploration, or where the space is tight.
- Borings or wells – ideal for deeper explorations that are harder to do with a backhoe



A boring machine digging deep on a site for site infiltration exploration

From these explorations there will be an initial assessment of soil types – identifying whether the soils are outwash or non-outwash.

Outwash soils were historically deposited by flowing water, typically streams that emanated from glaciers transporting material downstream, with transport distances a function of how much energy the stream had. These soils are often stratified in sedimentary layers and drain fairly quickly.

Non-outwash soils are those deposited directly by glaciers and can be poorly draining or well-draining depending on how they were deposited. If the soils were directly deposited beneath a glacier they tend to be hard pan soils or basal tills. Hard pan soils are compressed, dense, and poorly stratified. Basal tills have very slow infiltration rates (inches per year) due to being comprised of mostly silt, and having been compressed by thousands of feet of glacial ice. Advance outwash soils, which were formed when glaciers overrode outwash deposits and compressed them into dense soil layers, are fairly well draining due to being comprised mostly of sand, gravel, and cobbles.