PEI SEPTIC SITE ASSESSMENTS

Common Mistakes & Misunderstandings

Engineering Technologies Canada Ltd.

Conducting test pits and logging of the soil profile

1. For the purpose of measuring **permeable soil thickness, the "zero point" starts at the first mineral soil horizon**, i.e. at the underside of the rootmat.
2. For the purpose of indicating the **distance to groundwater or bedrock, the "zero point" starts at the ground surface**.
3. Describe soil and bedrock layers and any groundwater seepage all the way to a depth of 122cm (4 feet) unless:
    a. Heavy groundwater inflow is encountered that makes entering the test pit unsafe or not feasible.
    b. Bedrock is encountered that could not be excavated with a machine (refusal on bedrock).
4. After excavating the test pit to 120cm and logging the subsurface profile, get out of the test pit and excavate it to a total final depth of 180cm unless machine refusal on bedrock occurs. IT IS UNSAFE TO GET INTO A TEST PIT IF IT IS DEEPER THAN 120cm. Therefore, **make your remaining observations of any bedrock or groundwater from ground level.**
5. Don't forget to indicate the **soil moisture content for each layer** as "dry, moist or wet". Soil below the water table would always be "wet", and also usually for some distance above this in the "capillary saturated" zone. Finer textured soils (e.g. loam, sandy loam) will be capillary saturated to a higher level than coarse textured soils (e.g. sand).
6. Soil must be in a **moist condition** to be assessed. If the soil is dry, spray down the wall of the test pit with water.
7. **Soil samples selected for texture-by-feel assessment in the field must have sufficient natural moisture or have water added** in order to conduct the various field texture tests (i.e. to make a moist cast, do a ribbon test).

Soil/Lot Categorization

8. In ETC's experience, **Category 1 conditions are the exception, rather than the rule. Category 2 sites are much more common**.
9. **The soil or lot category needs to selected based on the <u>worst case</u> of:**
    a. Thickness of the permeable natural soil layer
    b. Depth to bedrock
    c. Highest estimated seasonal groundwater table.

    For example:
    - ➢ Less than 30cm of permeable soil is a more restrictive condition (Cat 4) than bedrock at 110cm depth (Cat 3). Therefore, the lot/soil is PEI Category 4.
    - ➢ Water table at 100cm depth is a more restrictive condition (Cat 3) than 90cm of permeable soil (Cat 1). Therefore, the lot/soil is PEI Category 3.
10. If there is less than 30cm of permeable soil (i.e. PEI Cat 4), you should still estimate exactly how much permeable soil there is (based on soil permeability, texture, structure, density) rather than just saying there is "less than 30cm". If you are unsure, or want to be conservative, say there is "zero" permeable soil. But keep in mind that even 15cm of permeable soil will save the developer or lot owner 15cm of septic fill.

Permeability Testing

11. Kelly has yet to encounter sandy soils on PEI which are “too fast” or “too permeable”. Gravelly soil (e.g. pit run gravel) with very little sand is likely too permeable.
12. **Ensure the permeameter is sitting on the bottom of the well hole** and not hanging suspended from the ground surface which will change the H value (height of constant head of water).
13. For **moderately permeable, sandy soils, the “field saturated bulb” of soil will typically extend at least 10cm below the bottom of the well hole**. This zone of soil becomes part of the soil test volume. If the soil within 10cm of the bottom of the well hole appears to be of a similar texture and structure as the soil above this depth, then it can be reasonably assumed that the soil Kfs is representative to at least this depth. Therefore, if for example, you are trying to prove there is at least 61cm of permeable soil (i.e. PEI Category 1 conditions), it is acceptable to auger the well hole to a depth of 51cm and the resulting Kfs can be assumed to apply to a depth of at least 61cm.
14. Just because a permeability test **didn't reach steady state conditions**, doesn't necessarily mean that the soil is not permeable. It's just that the test was inconclusive. The most common reason is that the test was not allowed to run long enough to reach steady state conditions. Other possible explanations could be that an error in taking or recording readings was made, or the permeameter was disturbed during the test. In such cases, either let the test run long enough to reach steady state, or try another test in a slightly different location.
15. When testing **very sandy soil**, be sure to fill the permeameter full of water. Otherwise, the permeameter may run out of water before the test reaches steady state conditions. If the soil is very permeable, it may not be possible to reach steady state conditions before the permeameter runs out of water. This doesn’t necessarily mean that the soil is too permeable.
16. Be sure to indicate the **test depth** (i.e. to the bottom of the well hole) and **which α* (capillary category)** is being used on the permeability test data sheet.
17. The field for "Equipment" on the **PEI Gov Figure B4 Permeability Data Sheet** should be for indicating which Permeameter type was used (eg. ETC Pask, another Pask, or other). You don't need to list off all the equipment in the kit.

Minimum vertical separation distances and depth of permeable soil

18. When a septic system is to be installed on a **Category 1, 2 or 3 lot, the Regulations require a minimum of 600 mm of separation between the bottom of the trench and bedrock, maximum water table or soil with unacceptably high permeability**.
19. **For Category 1, 2 or 3 lots, the Regulations require a minimum of 300 mm of permeable soil under the disposal trench. Permeable soil may be natural (site native) or a combination of natural soil plus approved *good quality fill*)**
20. For systems installed on a **Category 4 lot, the Regulations require the addition of a minimum of 1.2 meters (4 feet) of *Good Quality Fill*.** All other minimum vertical separation distances and minimum depth of permeable soil/fill must be met.

In-filled sites, borrow pits, cut/fill sites

21. Sites in which the original ground level has been raised (by in-filling) or lowered (by excavating or grading) require special consideration and may need to be assessed by a professional engineer.
22. **In-filled sites have had the original soil covered up by fill from another area of the site or from off-site.** Excavating and moving soil from one place to another destroys the soil's original structure, which can render it less permeable than it was in its original natural state.
23. If at any time you encounter a layer of soil over top of what looks like an old sod or rootmat layer, you can be sure that the site has been infilled. Another indication of in-filling is the presence of unnatural or foreign material in the soil profile such as: glass, garbage, cigarette butts, ashes, shells, construction debris, etc.). Samples of the fill would likely need to be collected and submitted for laboratory *sieve analysis testing* to determine if it meets guidelines for approved septic fill.
24. **Borrow pit sites** have had the original natural soil removed, often to significant depths or into layered sandstone bedrock. Groundwater contamination could result if septic disposal fields were installed in fractured bedrock.
25. In some cases, the PEI Soil Survey (1988) will show the location of **former borrow pit areas which will be indicated with the map unit symbol "Pb"**. Neighbours or local contractors will often be aware if a site was used as a borrow pit or if the land topography has been significantly changed by grading.
26. On borrow pit or cut sites, the depth of permeable soil and depth to the groundwater table and bedrock still need to be reported **with reference to the original ground surface**.
27. There are no clear government guidelines on the assessment of in-filled and borrow pit or cut/fill sites. However, ETC suggests that if the original ground surface appears to have been changed by more than 30cm up or down, you should probably refer the client to a professional engineer to conduct the site assessment.

Fine sands, cemented soils.

28. **Sandy soils with a large amount of fine or very fine sand may allow clean water to infiltrate quickly, but over time, could develop a very slowly permeable, restrictive, biological clogging layer (biomat)** when septic tank effluent is applied. Exercise caution if permeability tests are at the lower end of the acceptable range. When in doubt, collect a sample for laboratory sieve analysis testing to accurately determine the proportion of fine and/or very fine sand.
29. Some sandy soils, especially in the B horizon, will appear to be **cemented** together. If they are weakly cemented and friable (break apart easily with slight pressure), and the permeability is good, then this condition should not constitute a limiting layer. However, if the cementation is moderate to strong, this could interfere with water infiltration. **If in doubt, perform a "slake test" on some chipped out chunks.** If the chunks "dissolve" and fall apart quickly in water, then the degree of cementation is not likely to be a problem.