Using Controlled Fill with Septic Systems

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Introduction

What is a controlled fill?

What do the regulations say?

Why do we have to wait 4 years?

What other best management practices should you consider?

Unsuitable Soils Due to Limiting Zones or Steep Slopes

Areas with limiting zones < 10 inches

- Not suitable for any kind of septic system

Areas with limiting zones between 10 and 19 inches

- Insufficient lot area to accommodate IRSIS or Shallow Limiting Zone alternate system

Areas with slopes greater than is allowed for the preferred septic system option

- >25% for in-ground/drip systems
- >12% for elevated sand mound systems
- >15% for steep slope sand mound systems

Before We Get Too Far…

- **PA Code, Title 25, Chapter 71.1 Definitions:**
  - Limiting zone - A soil horizon or condition in the soil profile or underlying strata which includes one of the following:
  - (i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.
  - (ii) A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.
  - (iii) A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of effluent.
- **PA Code Title 25, Chapter 73.13(c)(10) Isolation Distances to an absorption area**
  - Natural or manmade slope greater than 25%-10 feet.

What limiting zones do we see?

- SHWT
- Open Voids
- Bedrock

Other Options to Consider

Small Flow Treatment Facility (SMTF)

- DEP-issued permit
- Discharge to adjacent stream
- Permitting Issues in Special Protection Watersheds (EV; HQ)

Holding Tank

- Local-issued permit
- Lots of Pumping!

What’s this about fill material???

What Does Chapter 73 Tell Us?

- 73.12(b)
  - Absorption areas or spray fields may not be placed in or on fill unless the fill has remained in place for a minimum of 4 years to allow restoration of natural permeability. The fill shall be composed of clean mineral soil and meet the provisions of § 73.14 (relating to site investigation).

- *Allow restoration of natural permeability?*

- *Clean mineral soil?*

Is There Any Other Official Guidance?

- NO!!!
- In PA Code, there are no additional references to fill and there are no guidance documents regarding the placement of fill material in relation to onsite sewage disposal.

How About Unofficial Guidance?

- **There is no guarantee that after a 4-year waiting period, a controlled fill will be determined to be suitable for onsite sewage disposal.** The information given in this presentation are Best Management Practices with the goal of maximizing the potential for the controlled fill to be successful.

- This presentation is not official guidance from DEP or any other regulatory agency. Should any official guidance be disseminated subsequent to this presentation, it should be followed.

THERE IS NO GUARANTEE THAT A CONTROLLED FILL WILL PASS!

- Soils may exhibit unfavorable limiting zones
- Soils may perc too fast
  - Fill material is unsuitable
- Soils may perc too slow
  - Fill area may not be sufficiently large enough to accommodate system

What is a Controlled Fill?

- Introduction of material onto a property
- Its placement verified by the local agency SEO
- After a period of 4 years, the area may then be tested for onsite sewage feasibility

What if I Already Have a Filled Area on my Property?

How do I know how old the fill material is?

Records of placement observation by the local SEO

Historic records of its placement

- USDA ag conservation plan documents
- Construction/Quarry receipts for materials

Historic aerial photographs

Evaluation by a soil scientist

What if I Already Have a Filled Area on my Property?

- Why was the area previously filled?
  - For the purpose of onsite sewage disposal
  - House/garage/driveway construction
  - Property being used as a “dump”

I Have Fill Material Greater Than 4 Years Old, is it Suitable?

- It may be suitable
  - No limiting zones present to the depth of the preferred system option
  - Passing percolation rate

- What kind of fill material is it?
  - Topsoil or clean fill
  - Construction debris/deleterious materials?
    - If so, may require further testing to determine suitability

- Evaluation by a soil scientist
  - When in doubt, check with DEP as well.

How Do I Construct a Controlled Fill?

1	What type(s) of limiting zone do you have?	Controlled fill options vary based on the LZ
2	What kind of flows are being generated?	# of Bedrooms, or Projected Flows for Non-Residential
3	Where does the water flow across the property?	Want to keep the controlled fill as dry as possible

Scenarios and Key Design Factors

- A thorough evaluation of the soils is required.
- It is recommended to evaluate **up to 2-ft below the limiting zone**.
- Identification of:
  - Texture
  - Structure
  - Redoximorphic Features
  - Limiting layers
  - Rock content

In Thinking About Limiting Zones…

- Not all limiting zones are the equal!
  - Controlled fills most often fail due to hydraulic concerns (i.e. too wet)

In Thinking About Limiting Zones

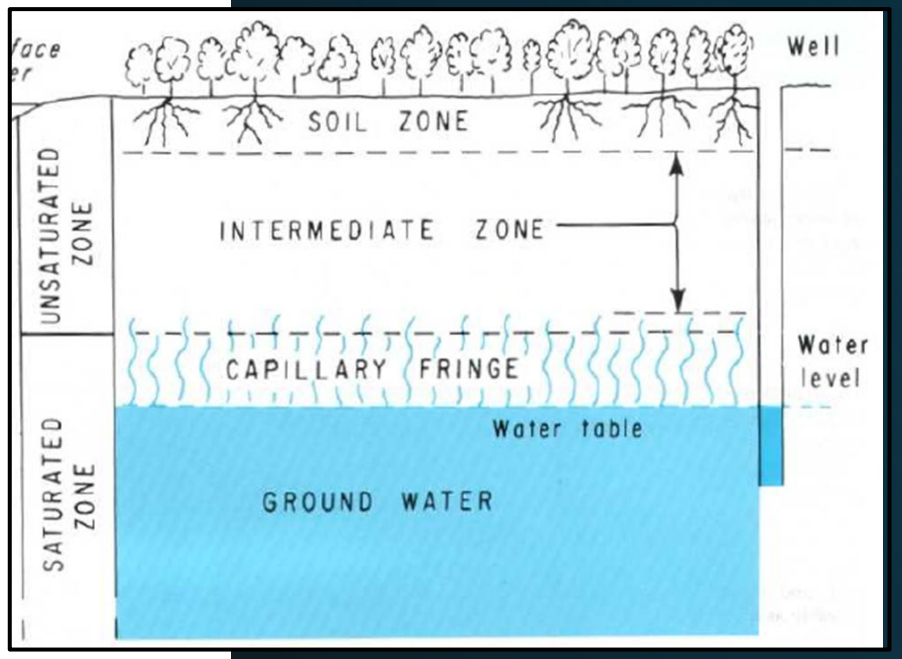
1. (ii) A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments. Greatest chance for success.

2. (iii) A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of effluent. Middle chance for success.

3. (i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling. Least chance for success.

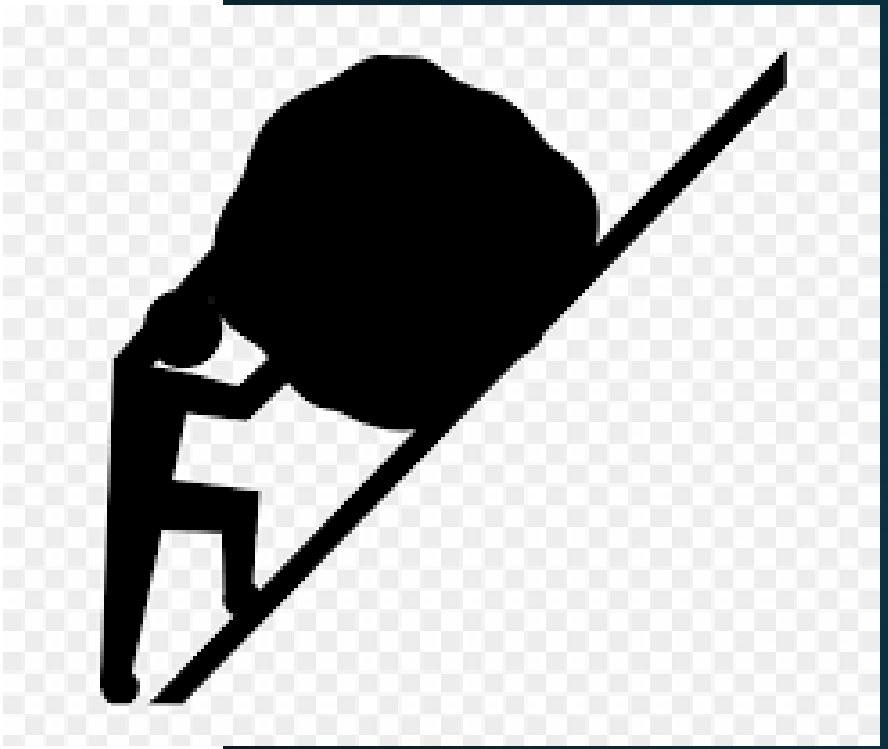
Why is SHWT Limiting Zone Problematic with Controlled Fill?

- The soil is already wet
- A restrictive layer is often present, which inhibits the downward movement of water
- Water can migrate vertically through capillary forces into the controlled fill
- SOME SITES ARE NOT SUITABLE FOR CONTROLLED FILLS!



Scenarios and Key Design Factors

- This is really hard!
- We are going to review some scenarios for controlled fills and then discuss Best Management Practices to maximize their chance for success.



SCENARIO 1: Can I Excavate 7 Feet Down and Place a Controlled Fill for an In-Ground System?

- It depends on the limiting zone that is present
  - Voided rocks? Then, yes it is possible, but still a greater risk than an above-ground controlled fill.
  - SHWT? Then, **NO** it is strongly not recommended

- Has to be sized according to the projected flows
  - 73.52; 73.53

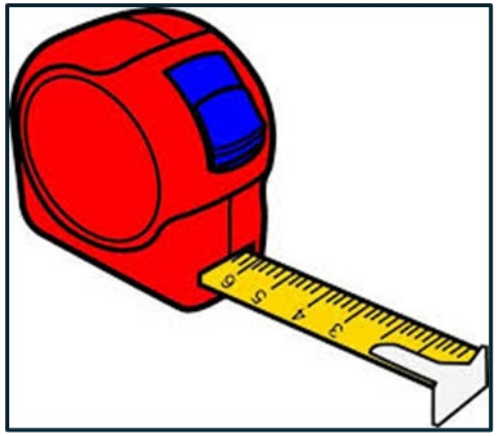
- The type of material must not be too fine
  - Possibility of a textural discontinuity that could lead to redox features forming

Scenarios and Key Design Factors

- If a voided limiting zone is observed, it is recommended that permeability tests are completed in the native materials to ensure positive drainage

- Controlled fill soil should not be substantially finer (more silt and clay) than the underlying native soils; otherwise water will perch and redox features may form

SCENARIO 2: If I Have a 16” Limiting Zone in the Woods, Can I Just Add 4 Inches Over the Leaf Litter to Get to 20”?



- It’s not recommended
- Soils settle over time
- Topsoil/organic materials can be hydrophobic and can restrict permeability
- Redox features can form (limiting zone)

Scenarios and Key Design Factors

- Existing topsoil should be removed prior to placement of controlled fill

- Allow for settlement of soil materials
  - Add 6 to 12 inches of additional material to allow for settling or for the potential for redox features to ‘wick’ from the underlying soil
    - With SHWT limiting zones, you may want to add a greater amount of fill material.

SCENARIO 3: I Have a Wooded Boulder Field; Can't I Just Cover Them Up With Fill Material?

- Not recommended
- Rocks can prevent a 'knitting' of the controlled fill material with the underlying soils

- Boulders can impact the future soil evaluation (possible rock LZ) or percolation tests (cannot reach perc depth)

Scenarios and Key Design Factors

- Identify controlled fill area that is relatively free of large surface boulders.
- Remove surface vegetation so as to allow for a better ‘knitting’ of the controlled fill with the underlying native soil.

SCENARIO 4: My Neighbor Just Dredged Their Pond; Can I Use This Material for the Controlled Fill?

- NO!!!

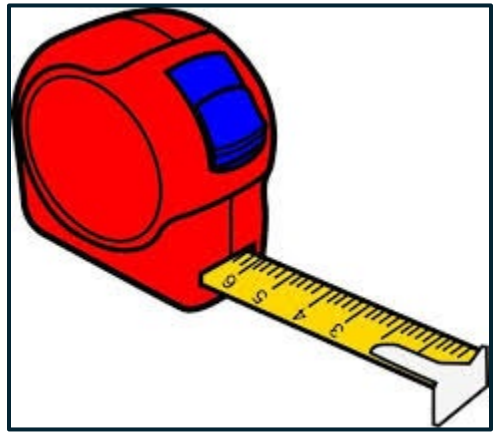
- Controlled fill material with redox features makes it difficult for an SEO to determine (in 4 years) if the redox features were there when it was placed or if it formed during the waiting period.

- Using material from a pond or compacted area; it likely would take much more than 4 years to *allow the restoration of natural permeability*.

Scenarios and Key Design Factors

- Find fill material that does not have redox features
- Identify clean, uniform fill material that is not substantially finer than the underlying soil material

SCENARIO 5: I am Using DEP Sand For My Controlled Fill and I am Going to Fill an Area 24-inches Tall and 10 x 60 for a 3-Bedroom Residence?



- Not big enough!
- Absorption areas must be 10-ft from slopes of 25% or greater
  - PA Code 73.13(c)(10)
- Controlled fills should be sized to accommodate both the absorption area and the berm

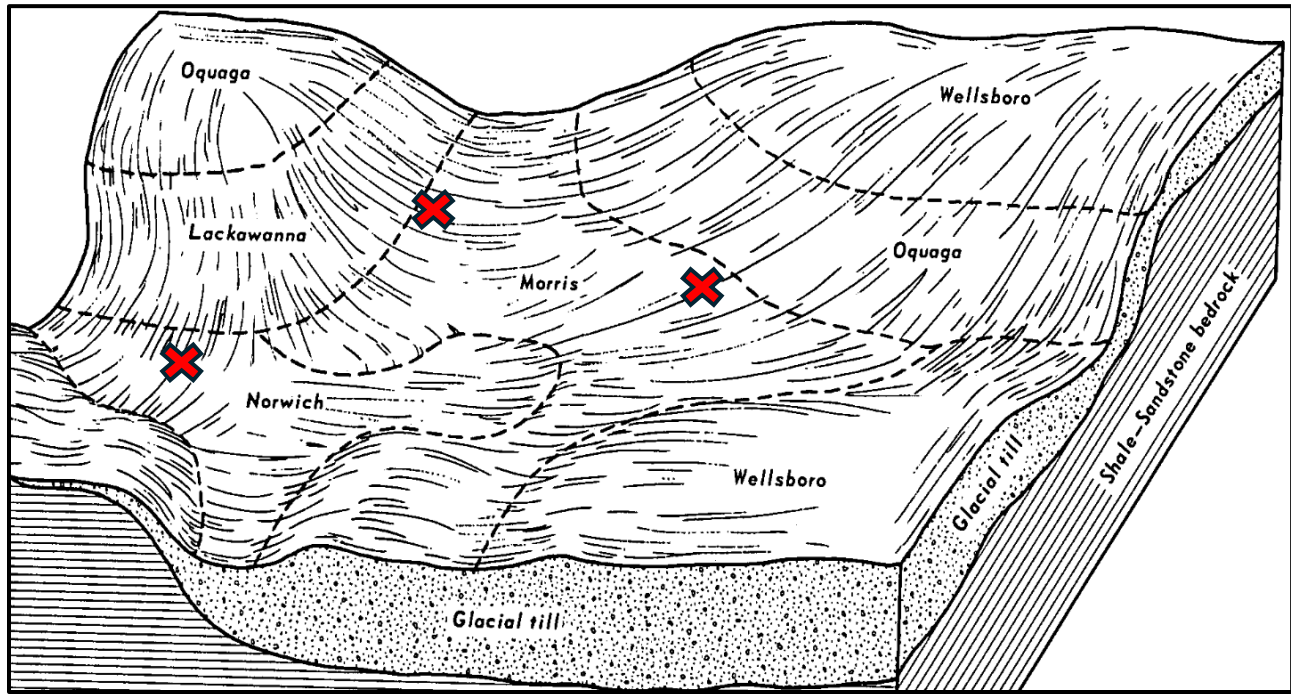
Scenarios and Key Design Factors

- Fill mound should be 10-ft wider on all sides to account for a berm and to maintain the required isolation distance.

- Alternate technologies may reduce the absorption area required for a future system.
  - Alternate system guidance may change over that 4-year period!
  - There may be Sewage Planning considerations that do not allow for alternate systems.

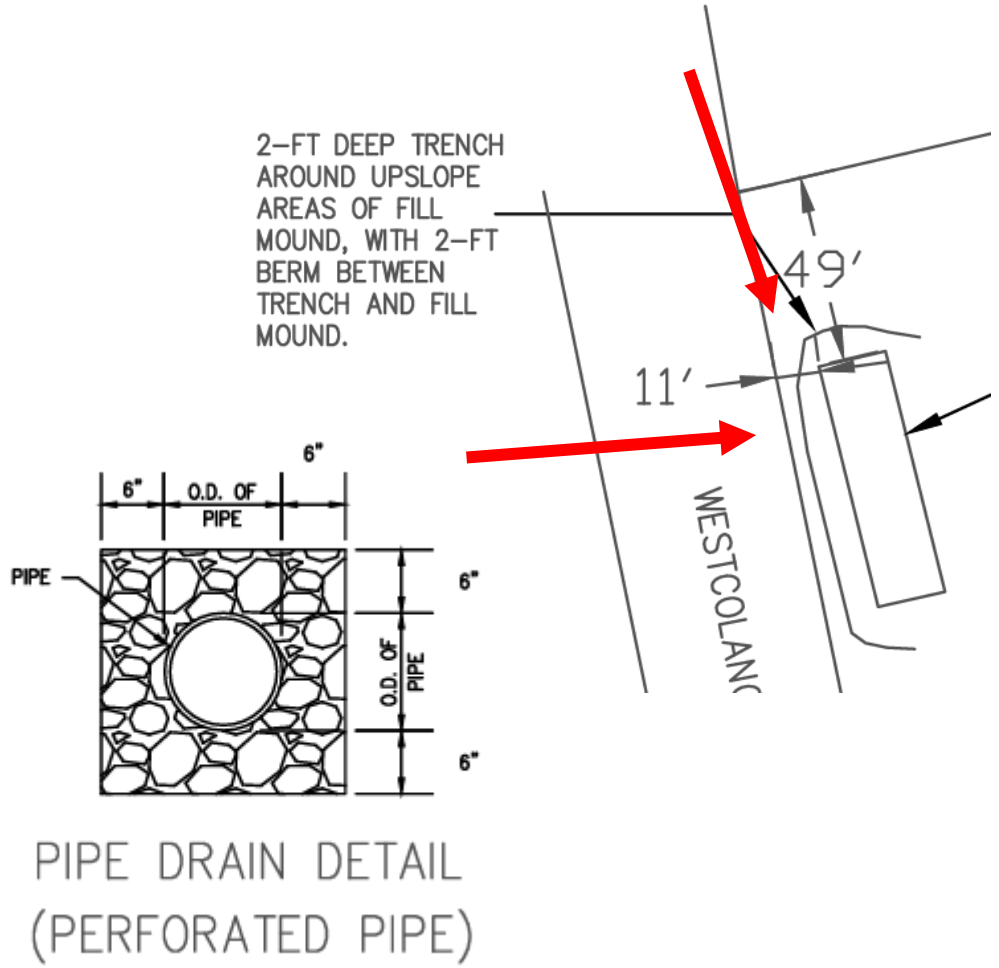
SCENARIO 6: My Controlled Fill is at the Base of a Hill; is This a Problem? Should I Keep an Eye on it Over the 4-Year Period?

- Water is not your friend!
- You want to keep water away from the controlled fill



Scenarios and Key Design Factors

- A curtain drain upslope of the system area is recommended
- A berm upslope of the system area isn't a bad idea either
- Annual monitoring is recommended
  - Is water sitting in the controlled fill?
  - Have redox features begun forming?



PIPE DRAIN DETAIL
(PERFORATED PIPE)

SCENARIO 7: My Cousin Has 10 Triaxles of Dirt That He Has to Move; He's Going to Deliver Them This Sunday; I Will Let the Township Know About Later on This Spring.

- The 4-year waiting period must be documented by the local agency SEO!

- They may be able to help identify issues/concerns from other controlled fills in their municipality.
  - Setback rules/drainage easements
  - Requirements for replacement areas

Scenarios and Key Design Factors

- Do your homework!
  - Understand municipal regulations regarding setbacks and easements
  - Determine if replacement areas are required
- Document the placement of the controlled fill with the local agency

SCENARIO 8: I’m Going to Design and Install This Myself!

- Not recommended.
- The controlled fill should be designed by a qualified professional
- The controlled fill should be installed by a qualified contractor
  - Installation is similar to that for an above-ground septic system.
  - **Final site restoration and seeding**

Scenarios and Key Design Factors

- Find a qualified professional to design it
- Find a qualified professional to install it

Controlled Fill Best Management Practices

1. Evaluate the existing soil conditions, at least 2 feet below the limiting zone depth (if possible).

2. Determine the proposed flows for the controlled fill.

3. Considering proposed limiting zone depth and estimated perc rate range, identify an area large enough to accommodate both the absorption area and the berm.

Controlled Fill Best Management Practices

4. Identify a fill source, with materials that are similar to, or coarser than what is in the underlying soil.
   a. Overfill 6-12 inches to account for settling

5. Create a design of the controlled fill, including:
   a. Grading around the controlled fill
   b. Curtain drain upslope
   c. Diversion berm around the controlled fill

6. Remove vegetation and surface rocks
   a. One may have to remove topsoil, depending on depth to limiting zone encountered and the location of the property (ag field vs woods).

Controlled Fill Best Management Practices

7. Meet with contractor to review controlled fill design.

8. Notify local agency SEO to document placement of controlled fill (starting the clock).

9. Construction Observation/Supervision
    a. Ensure that ground is sufficiently dry prior to construction
    b. Verify that fill material matches what is specified
    c. Material placement and sufficient compaction (some, but not too much)
    d. Controlled fill is vegetated (soils are living systems!)

Controlled Fill Best Management Practices

10. Annual inspections
    a. Hand auger evaluation
    b. Vegetation maintenance
    c. Identify areas of saturation or redox features
    d. Identify problems before they occur; if the site requires some re-construction (starting the 4-year period over again), it is better to do this after Year 1 and starting the 4-year waiting period then waiting for the entire 4-year period to find this out!

Even With All of These BEST MANAGEMENT PRACTICES….

IT STILL MIGHT NOT PASS!

- Soils may exhibit unfavorable limiting zones
- Soils may perc too fast
  - Fill material is unsuitable
- Soils may perc too slow
  - Fill area may not be sufficiently large enough to accommodate system

Summary

- PA Code stipulates that fill material greater than 4-years old may be considered for onsite sewage disposal
- There is no official guidance for the placement of fill materials
- The information provided in this presentation represent Best Management Practices and are not official guidance.

Summary

- What is a controlled fill?
  - Establishment and placement of fill soils to accommodate future onsite sewage disposal
  - After a period of 4 years, it may be considered for testing to determine suitability.

- Existing fill material that is greater than 4-years old may be suitable for onsite sewage disposal
  - Documentation/evidence of the age of the material

Summary

- There are several Best Management Practices that you should consider when designing a controlled fill.
  - Local agency SEO should be included in this entire process.

- Even with these Best Management Practices, there is no guarantee that it will be suitable in 4 years!

Questions?

Thank You!!!

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