Soil Sampling Methods

Hollow Stem Auger Borings

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psi Information To Build On
Engineering • Consulting • Testing

Rig Selection

Diedrich D 50 Drill Rig mounted on a Freightliner 4X4 carrier.

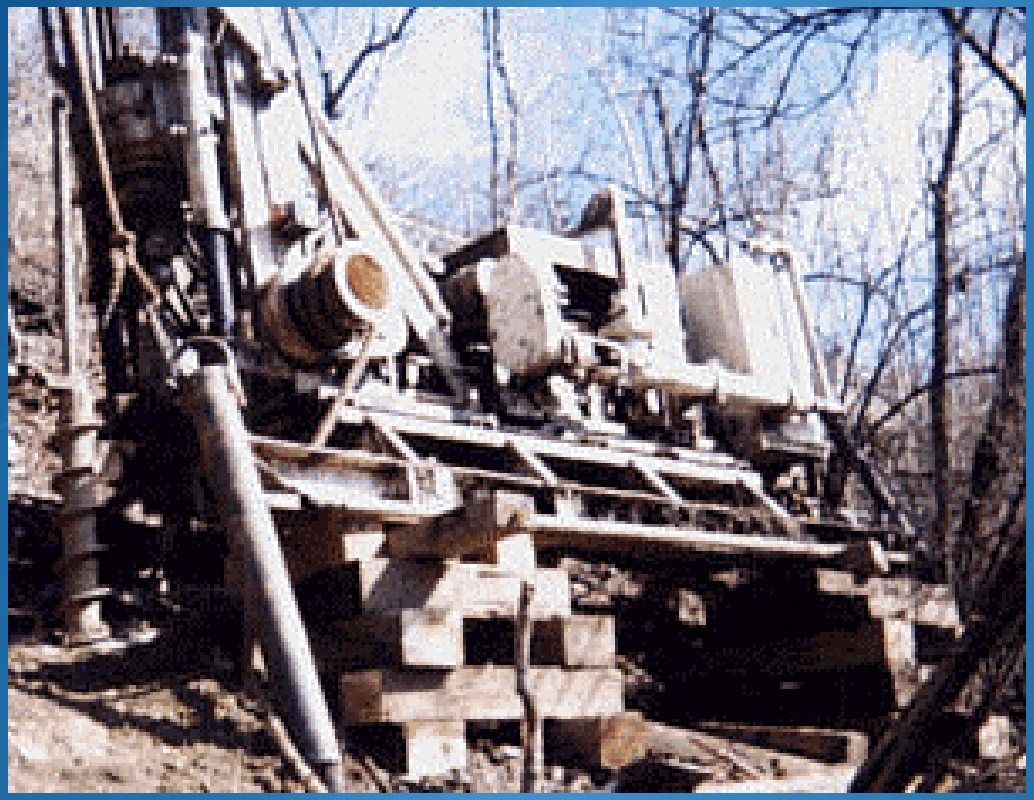
Can be equipped with large ATV tires to access soft wet areas not accessible to conventional truck mounted drill rigs

Rig Selection

Diedrich D 50 Drill Rig mounted on a Morooka rubber tracked ATV carrier can access virtually all project locations

Rig Selection

- Skid Rigs for level to moderately sloping, wooded sites (anchor off of trees, etc..)



Drilling of Test Borings

- Drilling of boring using hollow-stem augers

Drilling of Test Borings

- Connecting Split-Spoon sampler to the drilling rods

Drilling of Test Borings

- Marking 6-inch increments on the drilling rod

Drilling of Test Borings

- Driving Split-Spoon with a 140-pound hammer falling 30 inches (blow counts)
- "N-Value"
  - *Number of blows to drive each 6" interval recorded*
  - *Last two numbers are added together to give us the "N Value"*

Drilling of Test Borings

- Recovered soil sample in Split-Spoon sample

Number of Borings

DNR Code 1002; Table 1

Table 1: Evaluation Requirements Specific to Proposed Infiltration Devices

Infiltration Device	Tests Required[1]	Minimum Number of Borings/Pits Required	Minimum Drill/Test Depth Required Below the Bottom of the Infiltration System
Irrigation Systems[2]	Pits or borings	NA[2]	5 feet or depth to *limiting layer*, whichever is less.
Rain Garden[2]	Pits or Borings	NA[2]	5 feet or depth to limiting layer, whichever is less.
Infiltration Trenches (≤ 2000 sq feet impervious drainage area)	Pits or borings	1 test/100 linear feet of trench with a minimum of 2, and sufficient to determine variability	5 feet or depth to limiting layer, whichever is less.
Infiltration Trenches (> 2000 sq ft of impervious drainage area)	• Pits or borings • Mounding potential	1 pit required and an additional 1 pit or boring/100 linear feet of trench, and sufficient to determine variability	Pits to 5 feet or depth to limiting layer Borings to 15 feet or depth to limiting layer
Bioretention Systems	• Pits or borings • Mounding potential	1 test/50 linear feet of device with a minimum of 2, and sufficient to determine variability	5 feet or depth to limiting layer
Infiltration Grassed Swales	Pits or borings	1 test/1000 linear feet of swale with a minimum of 2, and sufficient to determine variability	5 feet or depth to limiting layer
Surface *Infiltration Basins*	• Pits or borings • Mounding potential	2 pits required per infiltration area with an additional 1 pit or boring for every 10,000 square feet of infiltration area, and sufficient to determine variability	Pits to 10 feet or depth to limiting layer Borings to 20 feet or depth to limiting layer
Subsurface Dispersal Systems greater than 15 feet in width.	• Pits or borings • Mounding potential	2 pits required per infiltration area with an additional 1 pit or boring for every 10,000 square feet of infiltration area, and sufficient to determine variability	Pits to 10 feet or depth to limiting layer Borings to 20 feet or depth to limiting layer

Definitions

DNR Code 1002; section VIII

Limiting Layer: A limiting layer can be bedrock, an aquatard, aquaclude or the seasonal high groundwater table

Number and Depth of Borings

Irrigation Systems and Rain Gardens

Number:

- N/A, Borings or Pits used for field verification of initial screening can suffice

Minimum Boring Depth below Bottom of System:

- 5 feet or to limiting layer, whichever is shallower

Number and Depth of Borings

Infiltration Trenches < 2000 sq ft of impervious drainage area

Number:

- 1 pit/boring per 100 linear feet of trench with a minimum of 2 and sufficient to determine variability

Minimum Boring Depth below Bottom of System:

- 5 feet or to limiting layer, whichever is shallower

Number and Depth of Borings

Infiltration Trenches > 2000 sq ft of impervious drainage area

Number:

- 1 boring/pit and 1 pit/boring per 100 linear feet of trench and sufficient to determine variability

Minimum Boring Depth below Bottom of System:

- 5 feet or to limiting layer, whichever is shallower

Number and Depth of Borings

Bioretention Systems

Number:

- 1 boring per 50 linear feet of device with a minimum of 2 and sufficient to determine variability

Minimum Boring Depth below Bottom of System:

- 5 feet or to limiting layer, whichever is shallower

Number and Depth of Borings

Surface Infiltration Basins and Subsurface Dispersal Systems

Number:

- 2 boring/pit plus an additional 1 pit or boring for every 10,000 sq ft of infiltration area and sufficient to determine variability

Minimum Boring Depth below Bottom of System:

- 20 feet or to limiting layer, whichever is shallower

Advantages of Borings over Pits

- Can be completed under same mobilization as the geotechnical borings for the building, pavements, etc.
- Borings can be completed to much greater depths than pits
- Less Site Disturbance

Disadvantages of Borings Compared to Pits

- Much smaller samples
- Takes much longer to sample continuously
- Cannot observe boundary
- Sample Disturbance
- Soil mottling is difficult to spot, if not impossible in granular soils

Disadvantages of Borings Compared to Pits

- If the soil has gravel, sample recovery will be very low

Groundwater Monitoring Well Construction

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Bad News?

Don’t fret, there is another way……..

Groundwater Wells

Chapter SPS 385.6(3)b

- A minimum of 3 groundwater elevation pipes shall be installed; the governmental unit may require more
- At least 1 of the wells shall extend to a depth of 15 feet below ground surface but no one pipe shall be less than 2 feet in depth;

Groundwater Wells

Figure 385.60–2
Latest Date to Begin Spring Soil Saturation Monitoring

Zone A	February 15
Zone B	March 1
Zone C	March 15

Waukesha County is Zone A; must have wells in by Feb. 15 and monitored weekly until June 1

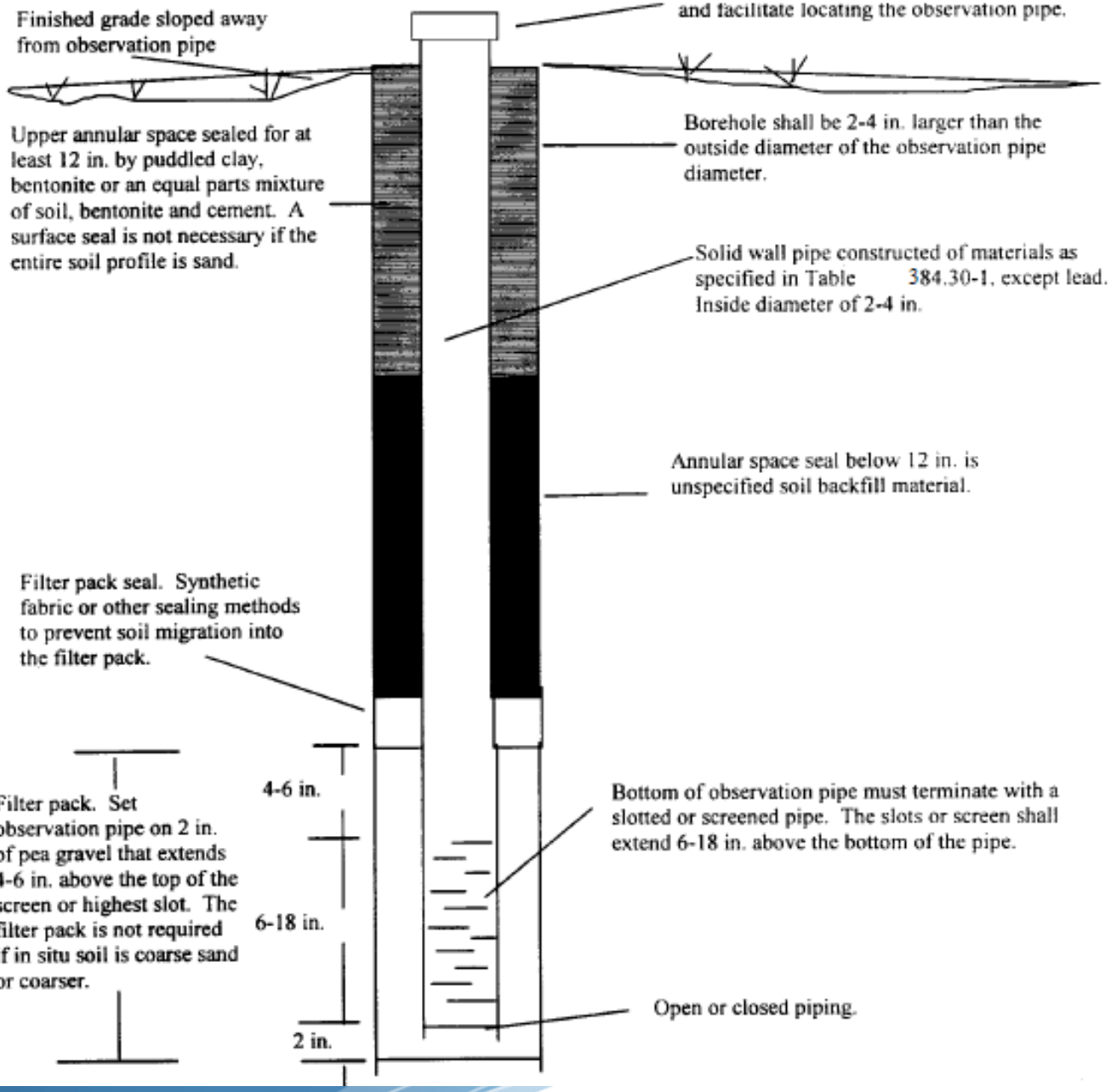
Groundwater Wells

Highest level of soil saturation shall be considered the highest level of free water observed in an observation pipe on 2 occasions 7 days apart during the observation period

DISCLAIMER:

- Must get at least 7.6 inches of precept from March 1 to May 31 and;
- Must get at least 8.5 inches of precipitation from September 1 through February

Groundwater Elevation Observation Pipe



Well Development

- Minimum of 12 hours after installation
- Pump dry if possible
- If not possible than surge and purge for 30 mins, then pump 10 well volumes

Document-Document

- Forms for Well Construction
  - 4400 113A
- Forms for Well Development
  - 4400 113B

Questions?