Consultants Guide to the Use of the SP22 Groundwater Sampler

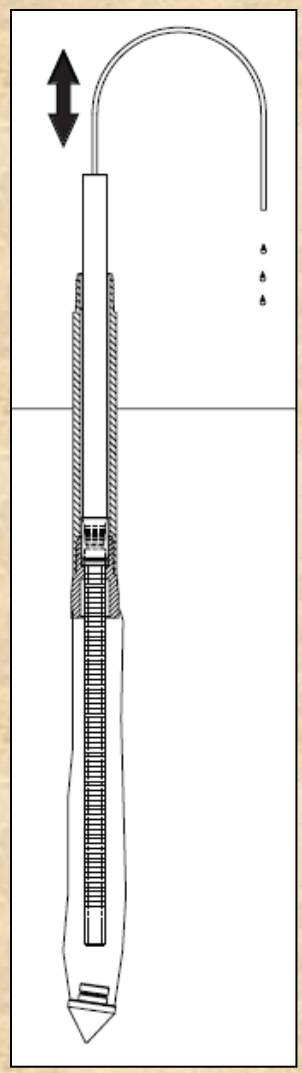
Wes McCall, Geologist KS28, Geoprobe

SS #4 Slot Screen and
Exp. Point on 2.25” Rods

Using MB6120 Actuator with GW4210
Check Valve for Development

SP22

Uses 2.25 in. (57mm) Probe Rods



What is it?

- A direct push installed groundwater sampling device
- Collect discrete interval groundwater samples
- Temporary Installation for characterization
- Use in unconsolidated formations

Why use it?

- This tool allows the operator to collect groundwater samples over a discrete interval
- Sample groundwater at multiple discrete depths at one location – profile
- Slug test to measure hydraulic conductivity (K) over discrete zones of the formation
- It can be decontaminated and re-used multiple times
- No need to install a monitoring well – cost savings
- Minimal formation disturbance
- No waste cuttings generated

Genuine Geoprobe®

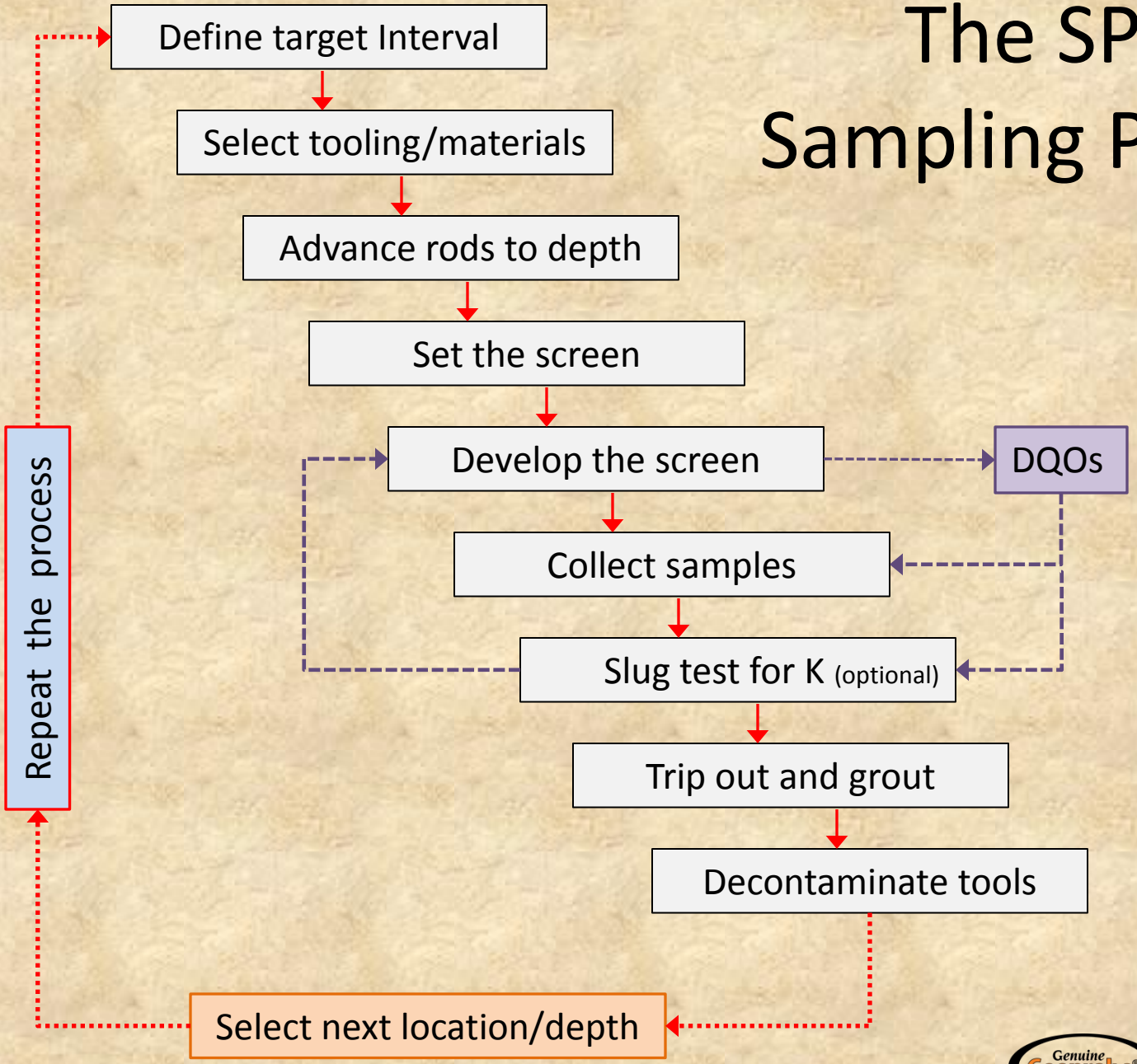
The SP22 Groundwater Sampling System

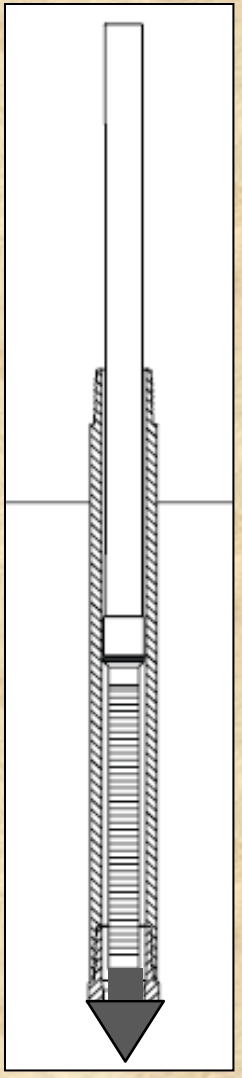
The SP22 can be used in 3 different operating modes

1. Single Depth, Discrete Interval, Groundwater Sampler
2. Soil Coring and Groundwater Sampling
3. Multi-Depth, Discrete Interval, Groundwater Profiling

Each operating mode has its advantages and limitations.
We will focus on mode 1 in this presentation.

The SP22 Sampling Process





Select Screen Material and Length

Select screen based on analyte type and desired length of sample interval. PVC screens require a screen head adapter.
(MN 208316)

<u>Options include:</u>
Stainless Steel #4 slot X 1 ft (30 cm) *
Stainless Steel #4 slot X 4 ft (120 cm)
(MN 208114)

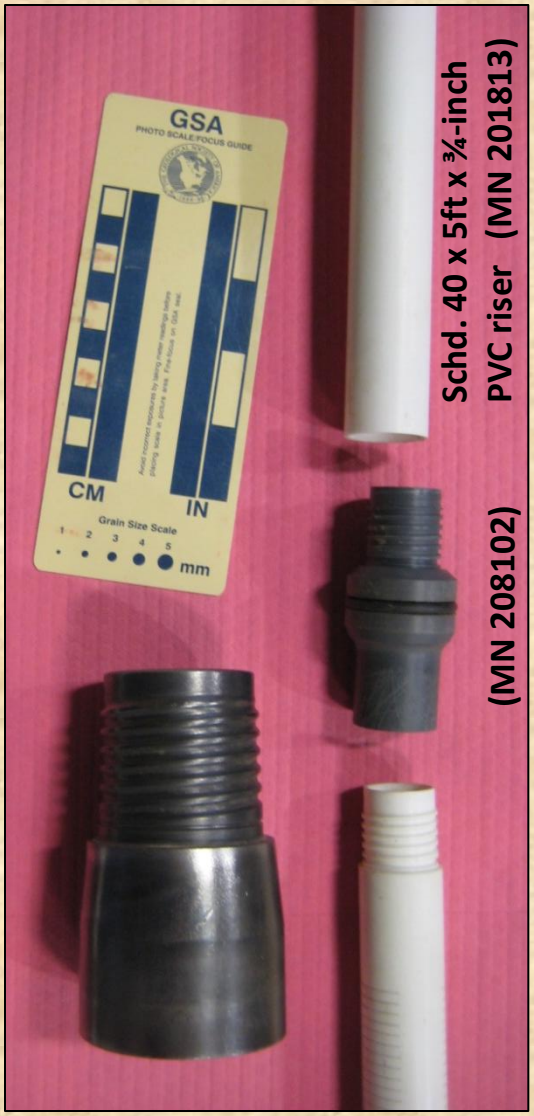
¾" PVC #10 slot X 1 ft (30 cm) #
¾" PVC #10 slot X 5 ft (150 cm)
(MN 203101)

Attaching 1.25” Rods to Screens

1.25” Rod to Stainless Screen

1.25” Rod to PVC Screen

Adapters for Nominal ¾-inch PVC Riser



Schd. 40 x 5ft x ¾-inch PVC riser (MN 201813)

(MN 208102)

PVC Riser to PVC Screen

PVC Riser to Stainless Screen

(MN 218813)

Select the 2.25-inch Point Holder and Expendable Point

Use O-rings or equivalent on all expendable points !

SP16 Point

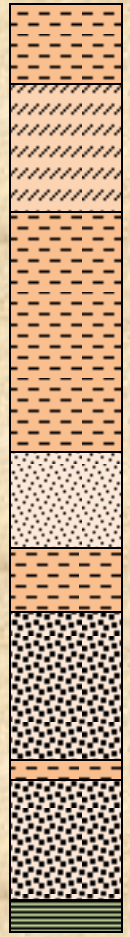
Extended shank 2.25”point

Use under the 8040 in soft materials

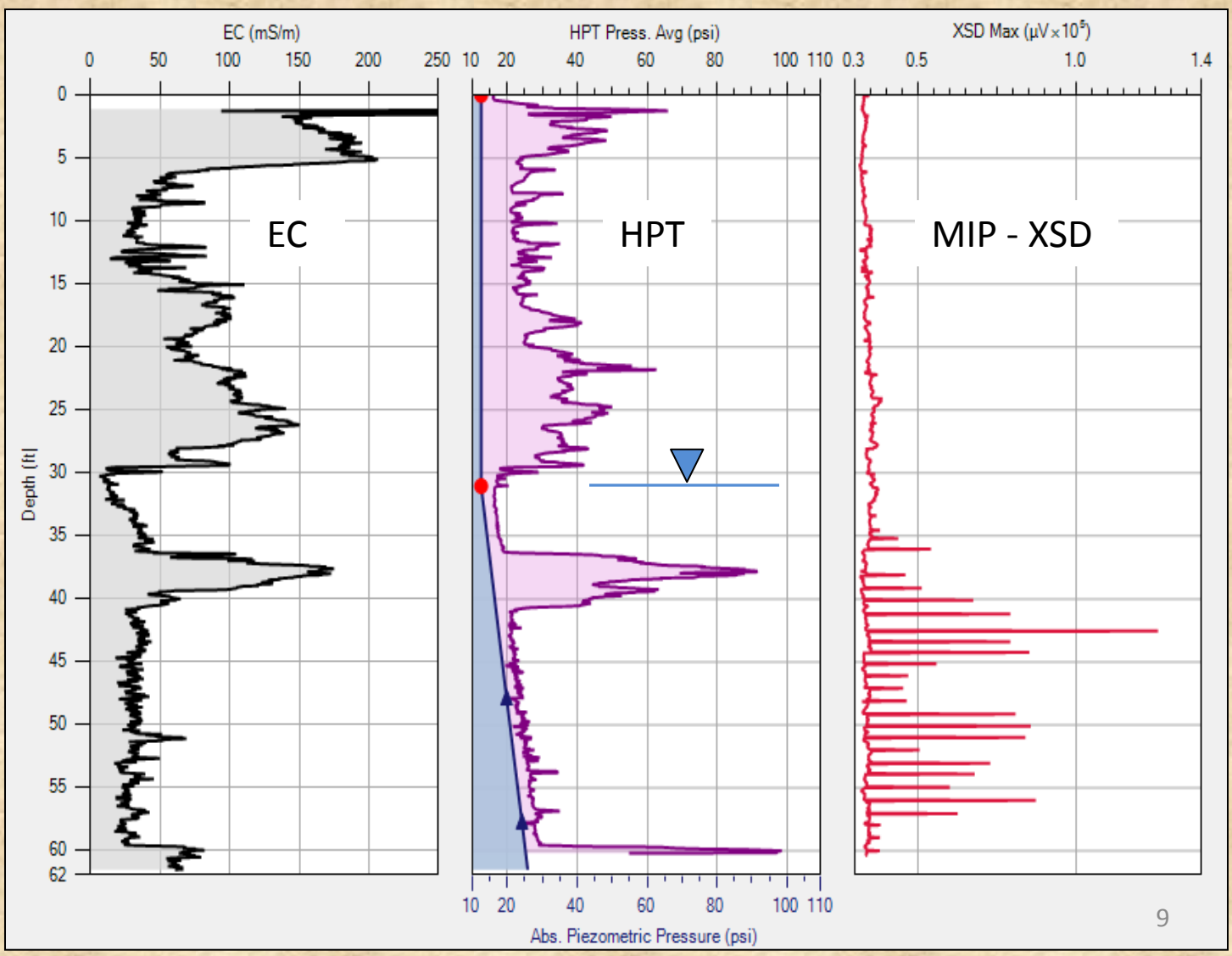
2.25” Std shank point
(MN 213788)

Select the sampling interval

Lithologic Log



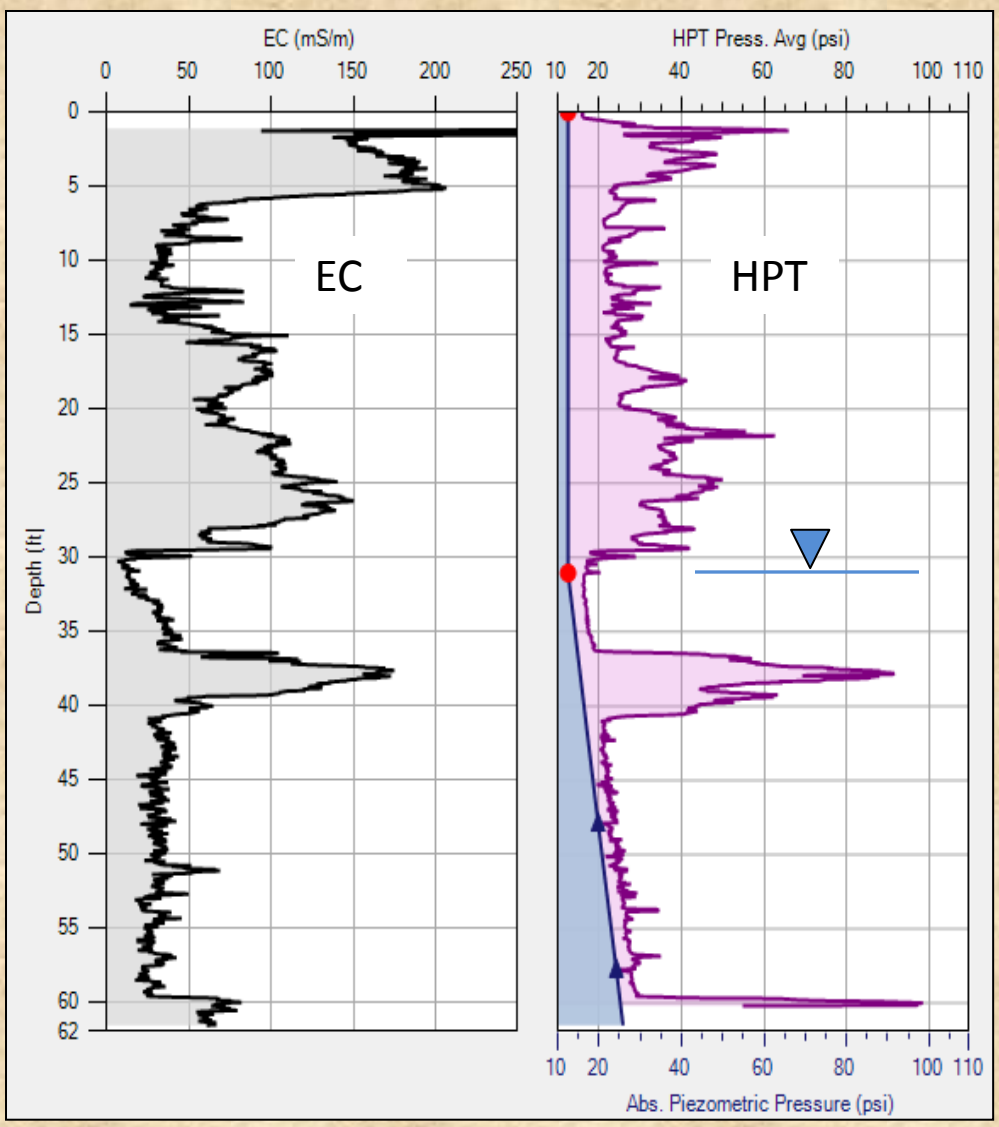
LL MiHpt Log



Select the sampling interval (cont.)

Lithologic Log

LL MiHpt Log



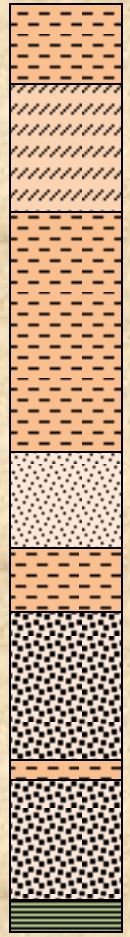
Bid Specification Sampling Protocol :

- Start at depth of 10ft
- Sample every 5ft
- To depth of 70ft

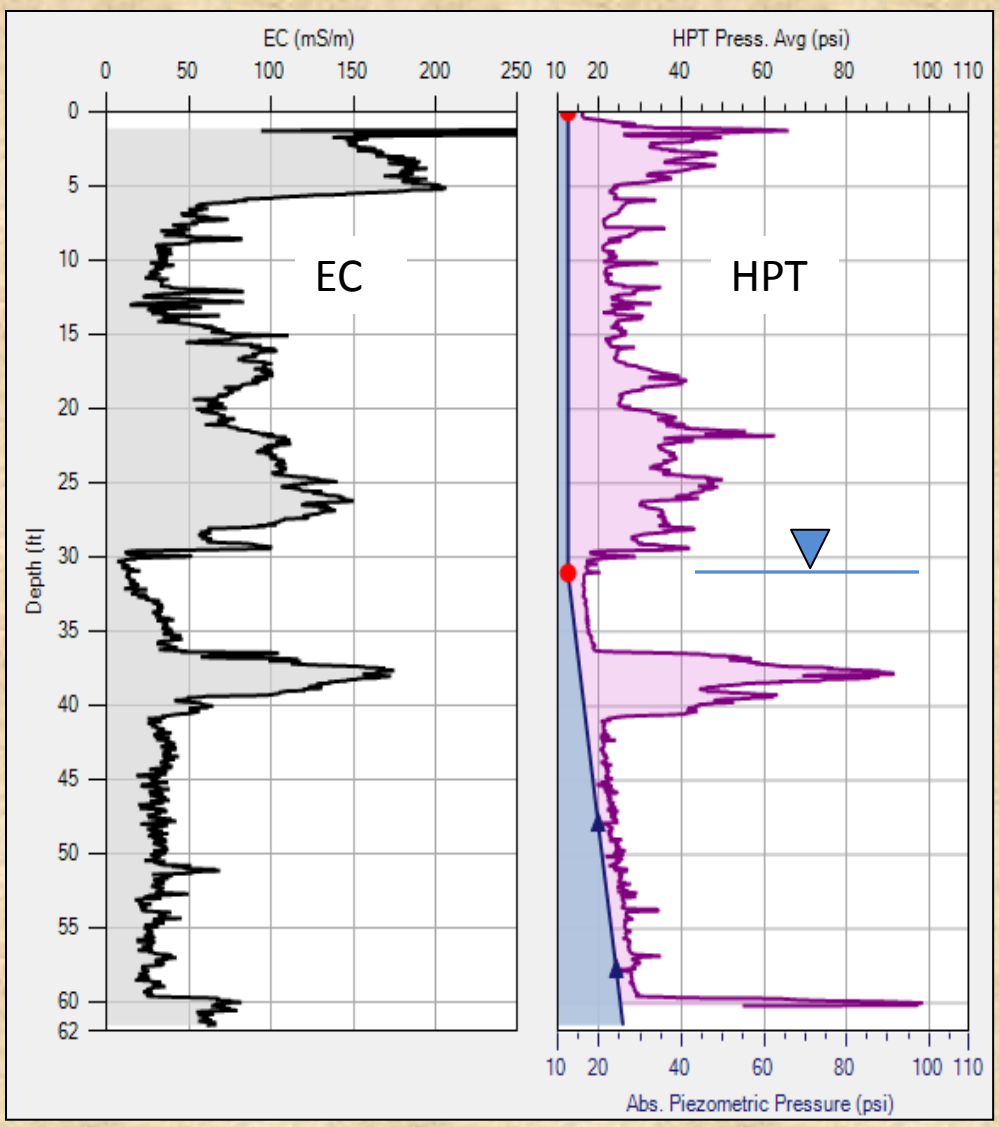
How well with that work here?

Select the sampling interval (cont.)

Lithologic Log



LL MiHpt Log



Results of the Sampling Protocol :

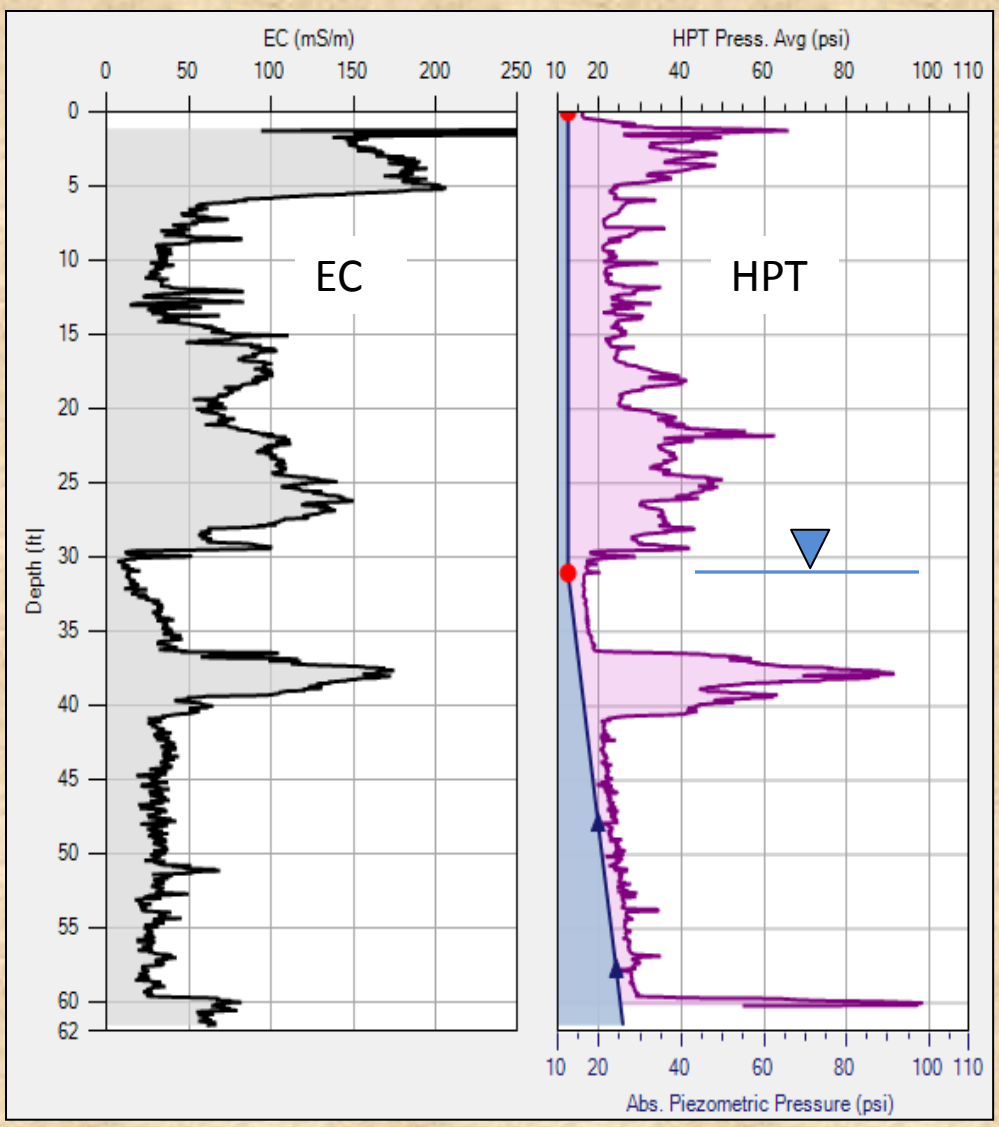
- 10 ft – no yield
- 15 ft – no yield
- 20 ft – no yield
- 25ft – no yield
- 30 ft – no yield
- 35 ft – success
- 40ft – no yield ?
- 45ft – success
- 50 ft – success
- 55ft – success
- 60 ft – success
- 65ft – refusal at 62ft
- 70 ft – refusal at 62ft

Success rate =
(5/13) X 100 = 38.5 %

Select the sampling interval (cont.)

Lithologic Log

LL MiHpt Log



Eliminate the impossible intervals:

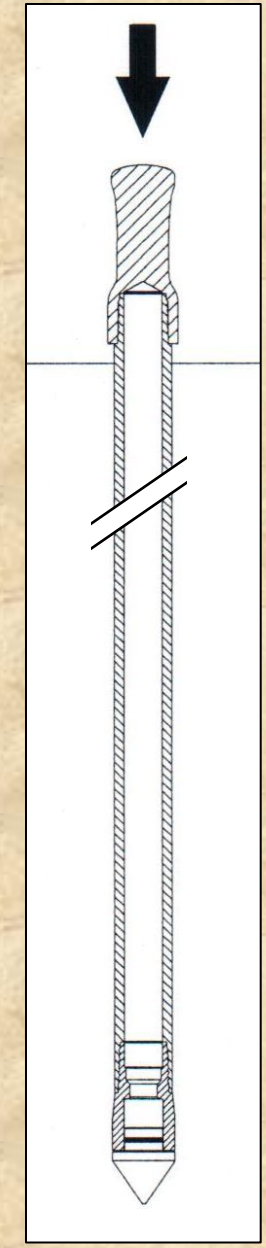
- ~~10 ft – no yield~~
- ~~15 ft – no yield~~
- ~~20 ft – no yield~~
- ~~25ft – no yield~~
- ~~30 ft – no yield~~
- 35 ft – success
- 40ft – no yield ?
- 45ft – success
- 50 ft – success
- 55ft – success
- 60 ft – success
- ~~65ft – refusal at 62ft~~
- ~~70 ft – refusal at 62ft~~

Success rate =
(5/6) X 100 = 83.3%

Advance Outer Casing to Base of Desired Screen Interval

Sequentially add rods to the tool string and advance the expendable point to the target depth for sampling.

The 2.25-inch OD rods have a 1.5-inch ID.

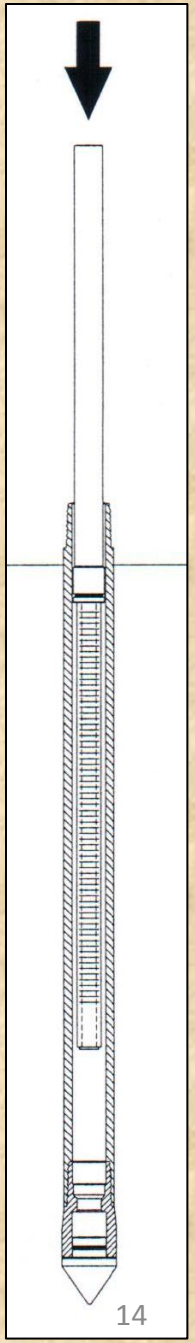


Select Riser or Inner Rod & Install Screen

Use O-rings on each rod or PVC casing joint !

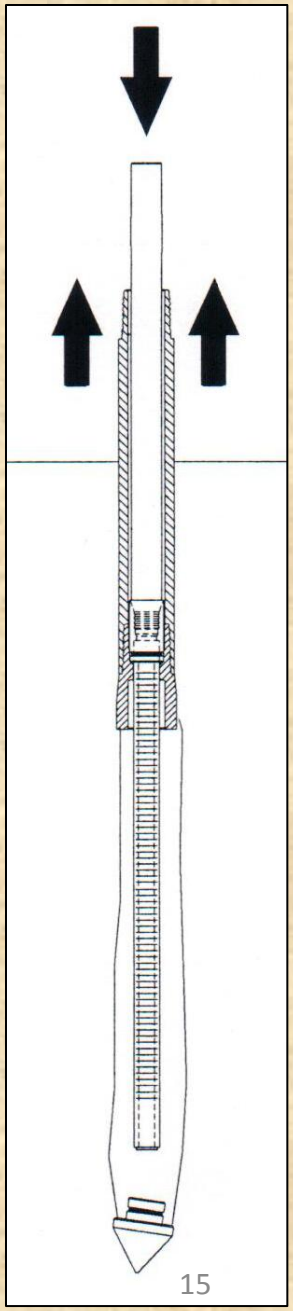
1.25” inner rod

¾” PVC Riser



Retract Casing to Set Screen Over Target Interval

- Lower the screen and riser until it sits on top of the expendable point.
- While holding the screen in position retract the rods.
- The expendable point is dislodged and the screen begins to deploy.
- If the screen is fully deployed the screen head will lock into the point holder.
- At that point the riser will begin to move up with the outer casing.

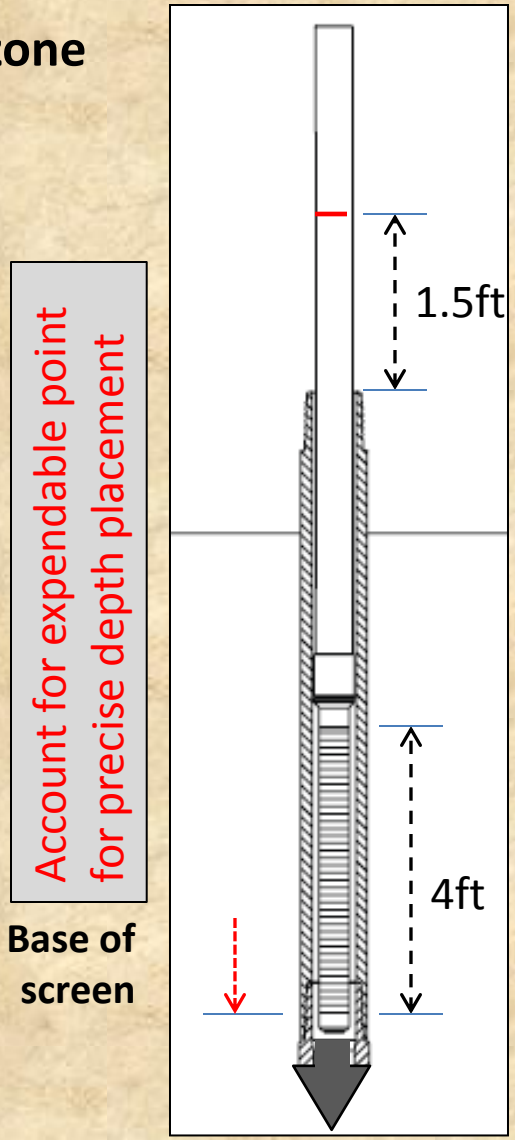


Partial Deployment of Long Screens

When you need a shorter interval for your target zone

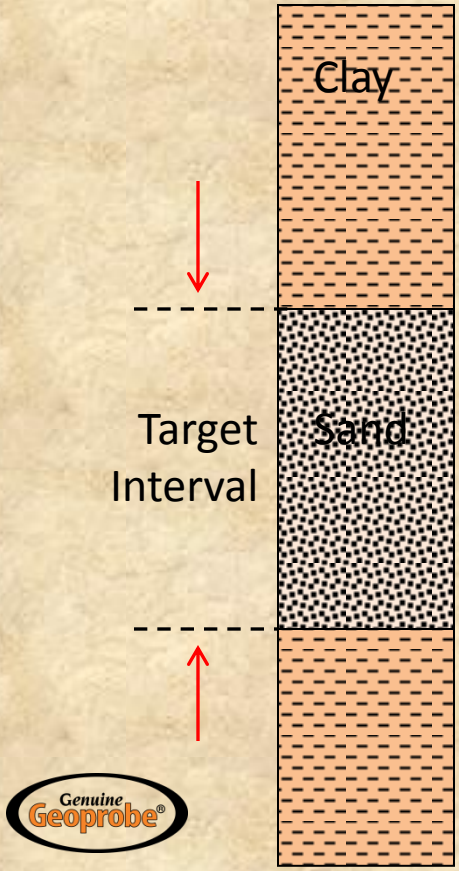
- With screen resting on expendable point
- Measure and place a reference mark on the riser
- Hold screen in position
- Retract outer casing to the reference mark

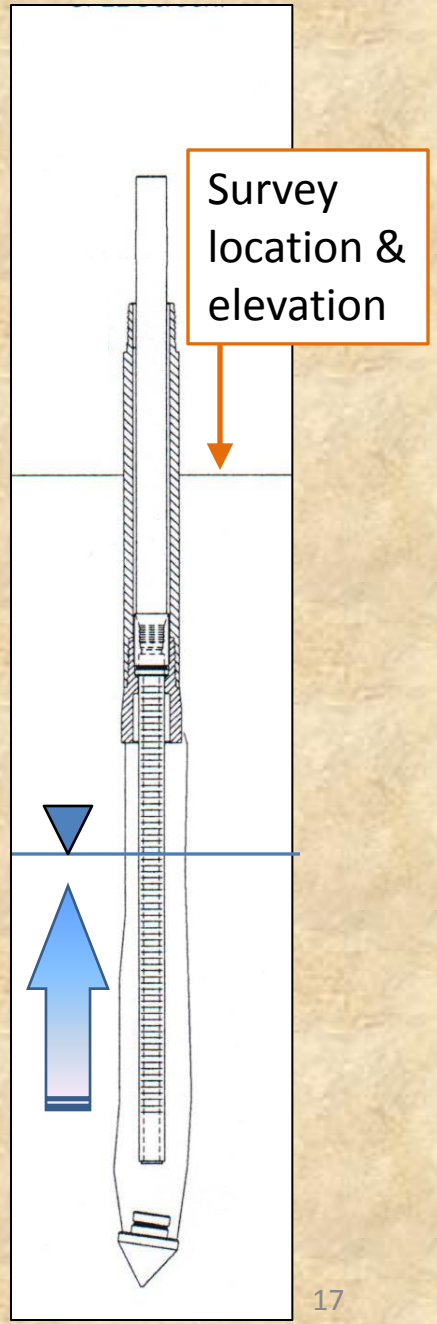
NOTE : Cannot run a slug test in a partially deployed SP22 screen (but you can in an SP16)



Water Level

It usually does not stabilize instantly !



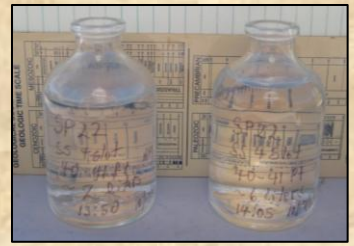


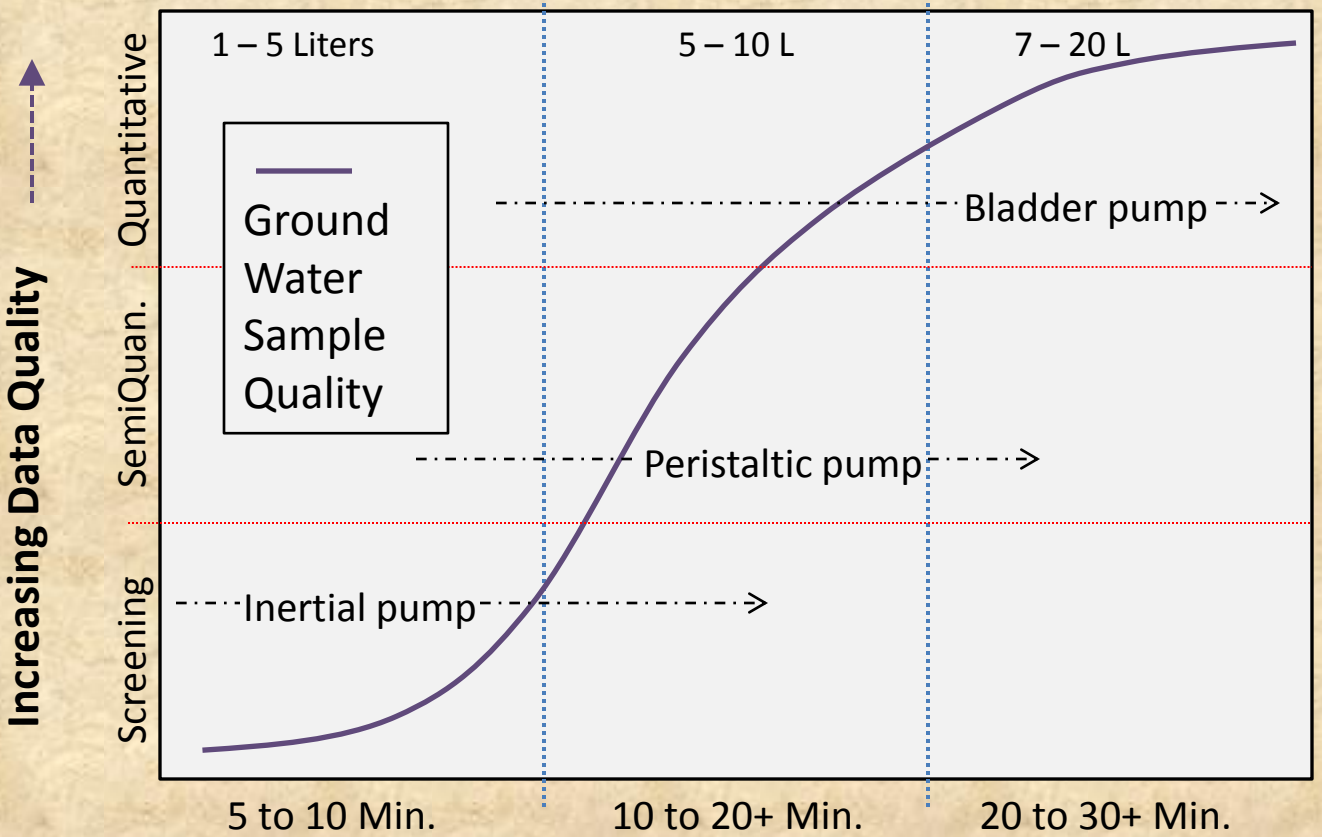
Development and Purging

Sample Quality ?
Representativeness ?

Sample Turbidity ?

Define Data Quality Objectives





The Project Managers Responsibility, not the drillers

Use your DQOs to guide you in the selection of appropriate sampling device(s) for your project. This will also control the amount of development needed.

Development and Purging with Check Valve

Manual development with inertial pump

GW4210 for 1.25” rods
GW4220 for ¾” PVC

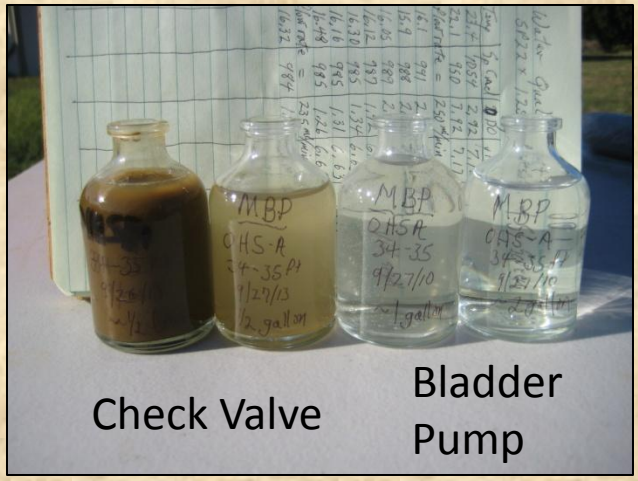
Always start development with the inertial pump (check valve)

Formation Yield ?

Genuine Geoprobe®

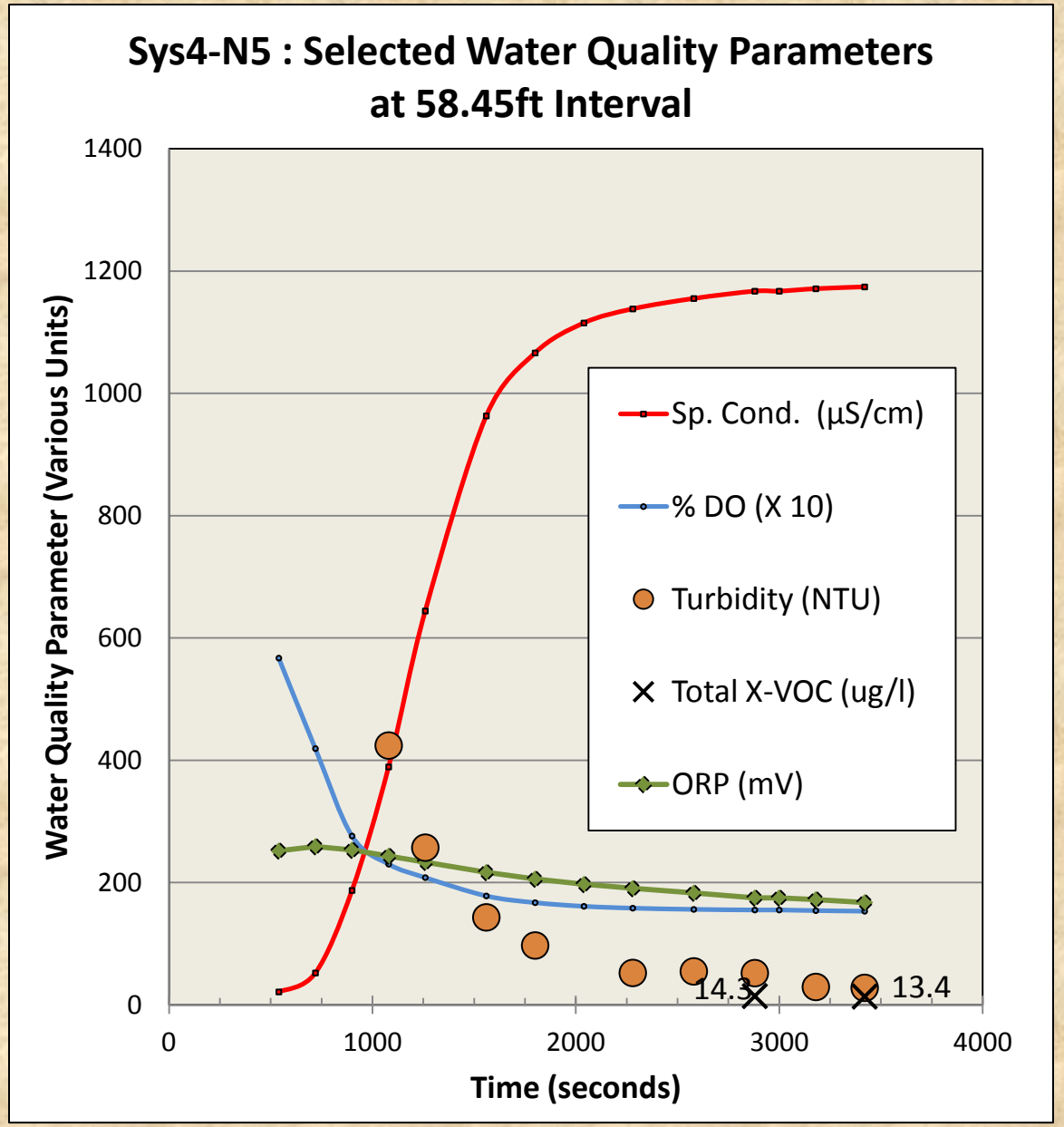
Purging and Sampling with MB470 Bladder Pump

Monitoring water quality while purging



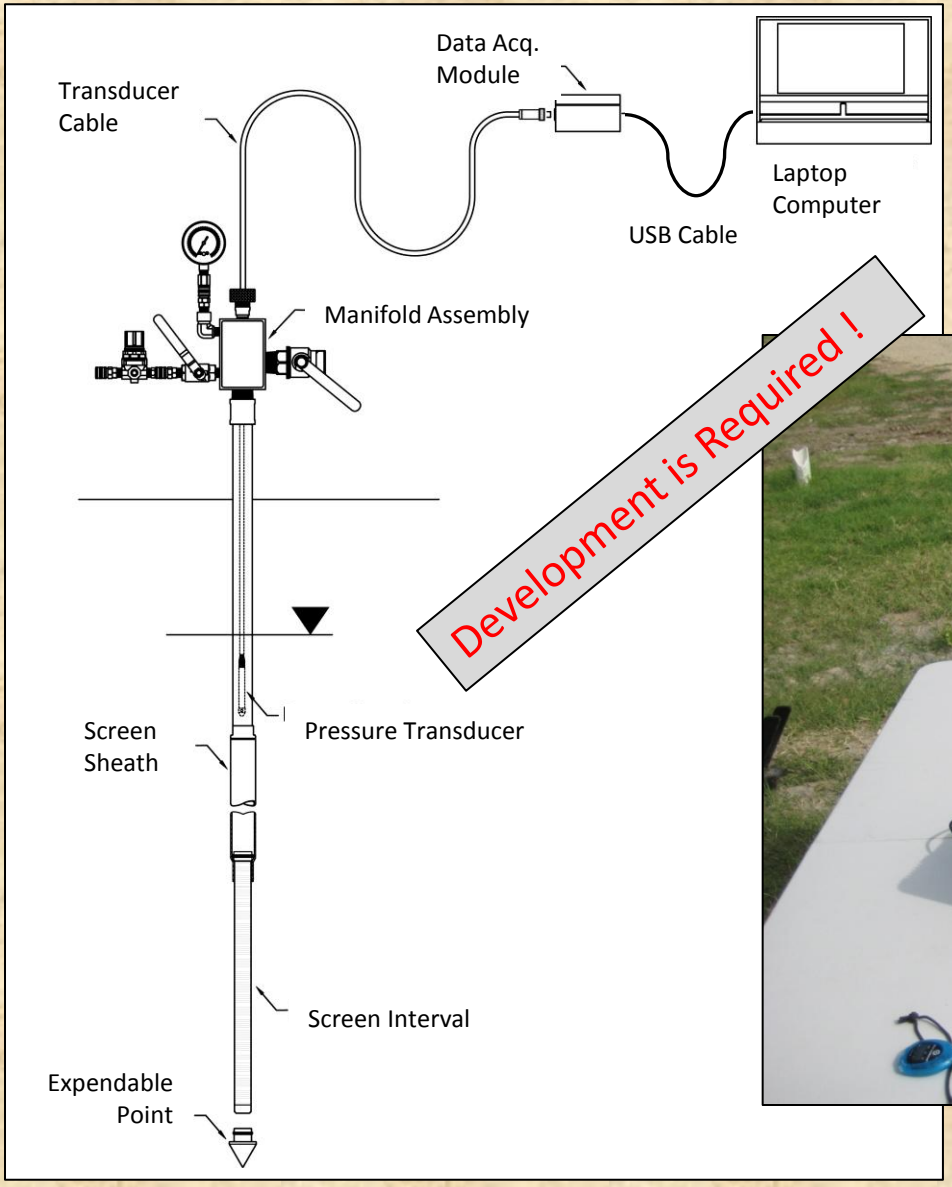
Turbidity

Water Quality Data with MB470 Bladder Pump Sampling



No development with check valve before bladder pump purging/sampling.

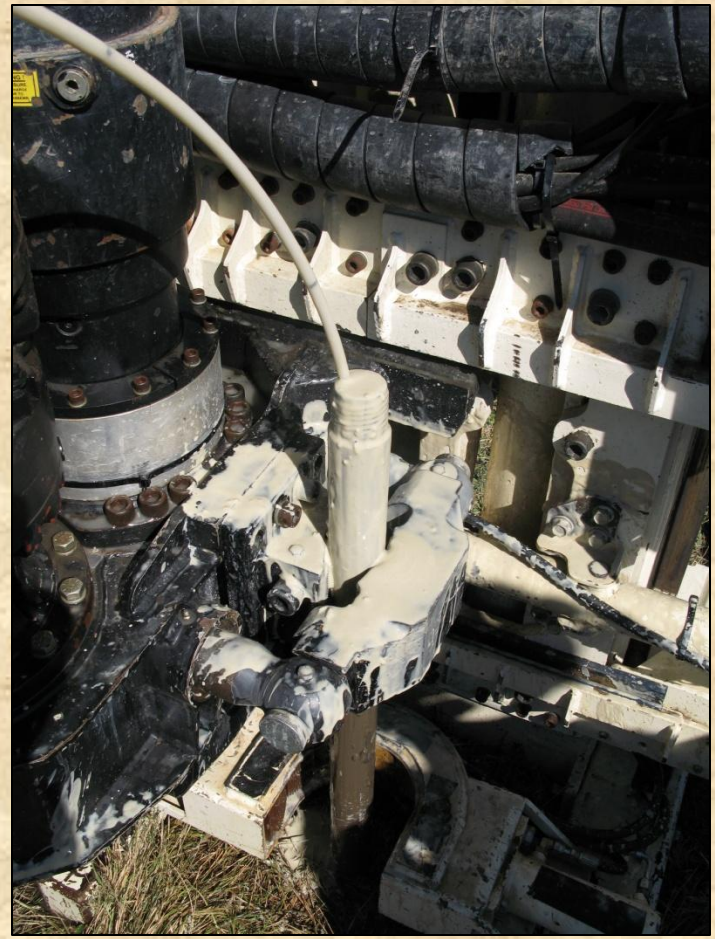
Slug Test to Determine Hydraulic Conductivity (K)



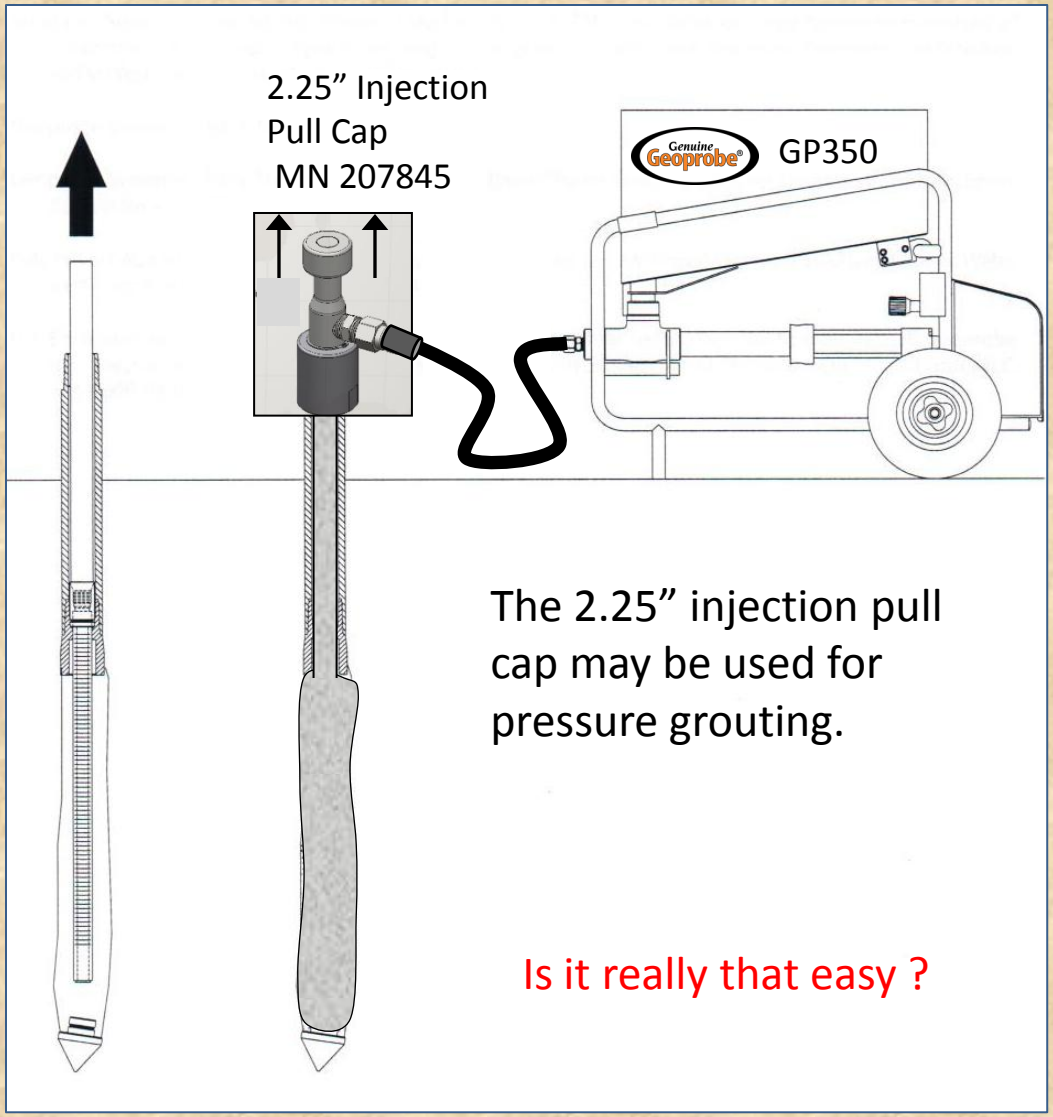
Pneumatic slug test method for DP tools and wells : ASTM D 7242 (www.astm.org)

Geoprobe SOP: (http://geoprobe.com/pst-technical-documents)

Trip Out and Grout …



A nylon tremie tube can be used to grout bottom-up with bentonite or cement grouts

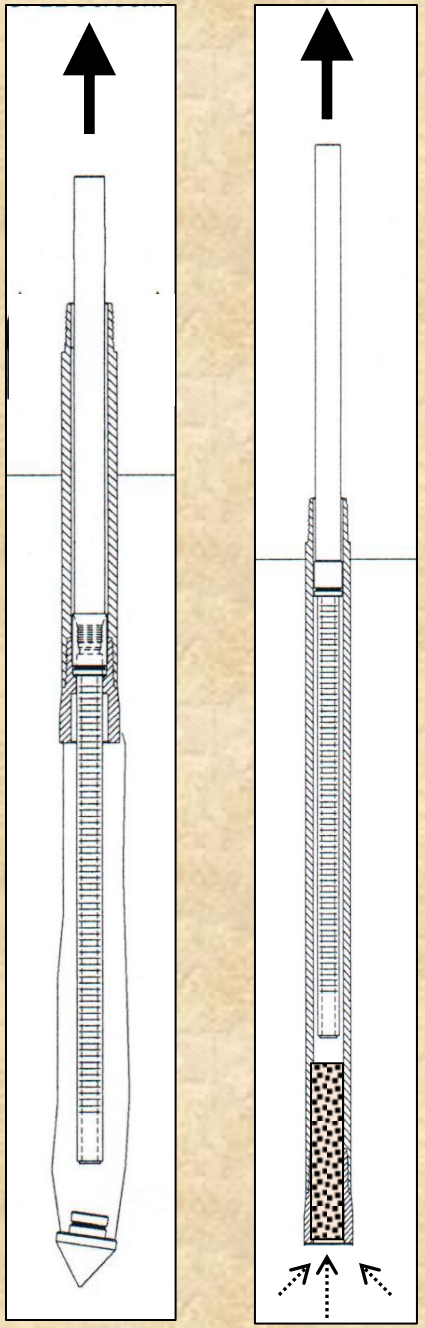


Sand Heave and Bridging

In flowing sands …

Trip out slowly and add water to the rods as retracting the screen. This will prevent sand heave into the rods.

Sand heave can bridge in the base of the rods and prevent grout from filling the borehole properly.



Summary

- **Define your quality control objectives first**
- **Understand the local geology/hydrogeology**
- **Come to the field prepared with the correct materials**
- **Use O-rings to prevent cross contamination**
- **Work with the operator to assure depth & screen interval**
- **Use a reference mark on the casing when setting the screen**

Summary

- **Develop the formation before sampling and slug testing**
- **Water quality monitoring can be conducted**
- **Slug testing to determine discrete K zones is valuable, define migration pathways, seepage velocities, FLUX**
- **Abandon the borings properly to protect the groundwater resource !**
- **Document the sampling process**

For additional information on the SP22 groundwater sampler and other Geoprobe groundwater and soil sampling tools please contact:

Geoprobe at 1-800-436-7762

or visit

www.geoprobe.com

Other on-line resources for the SP22 Groundwater Sampler:

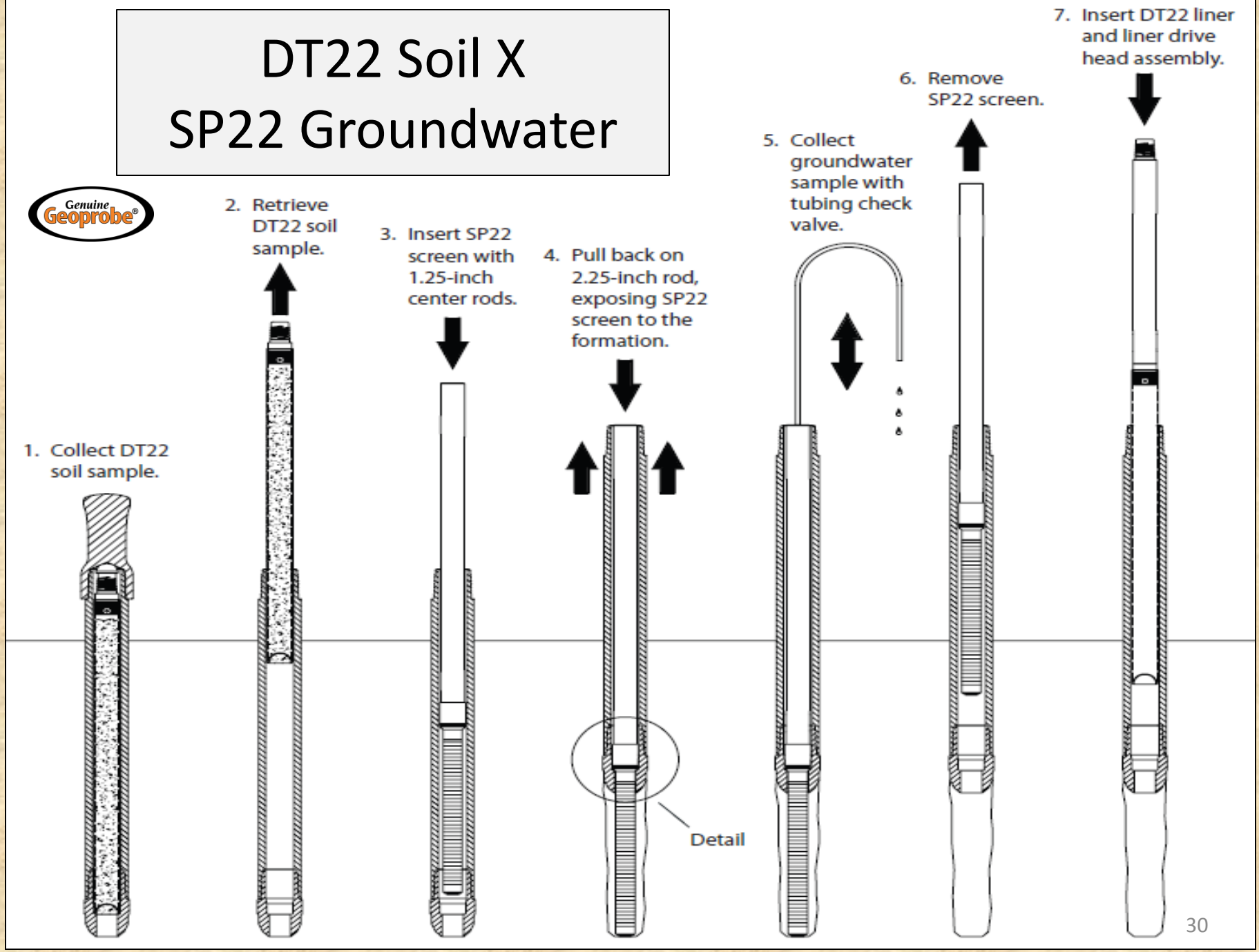
Tool string diagram:
http://geoprobe.com/tool-string-diagrams/sp22-tsd

SP22 SOP:
http://geoprobe.com/literature/sp22-groundwater-sampler-sop

Further Topics for Consideration

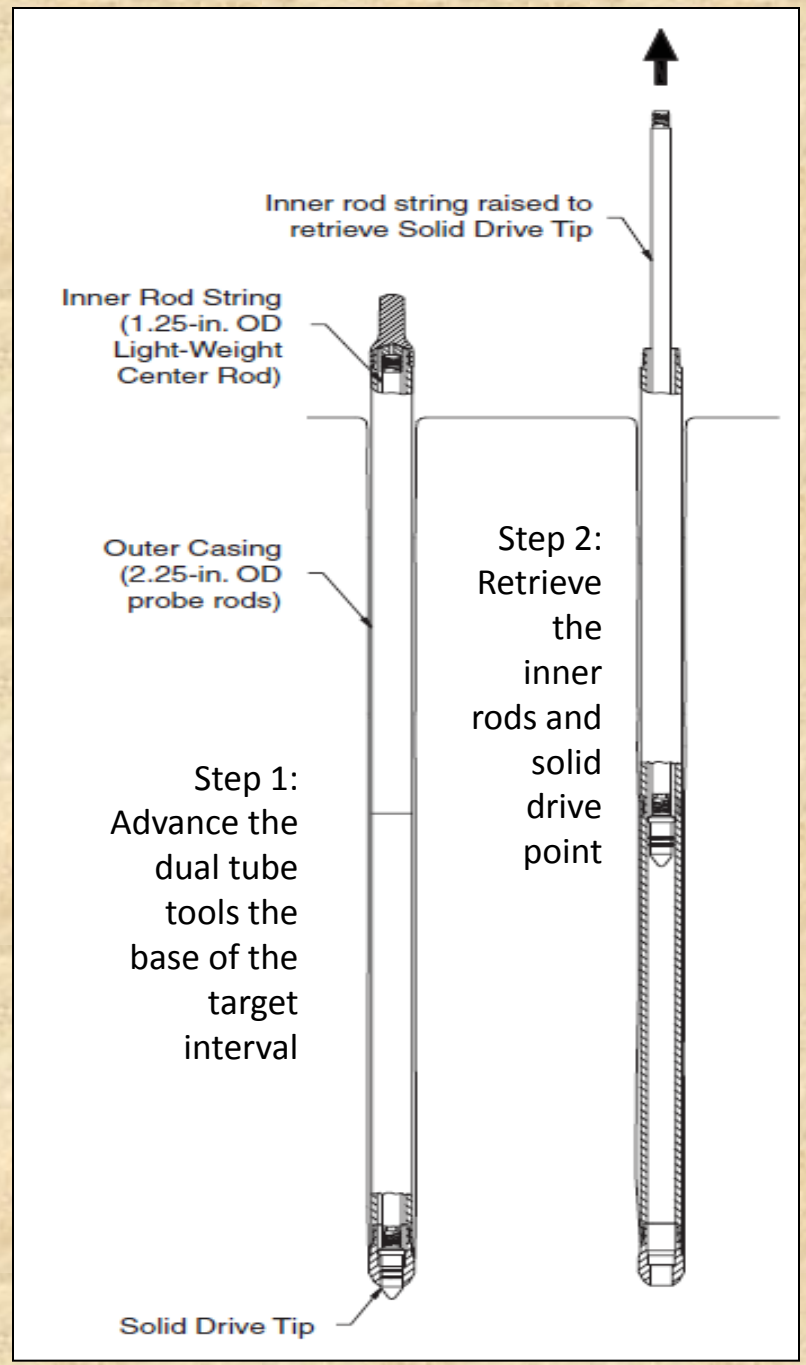
- DT22 soil sampling combined with SP22 Groundwater sampling
- Multi-Interval, dual tube, depth discrete groundwater profiling with the SP22
- Hints and tips for successful SP22 sampling

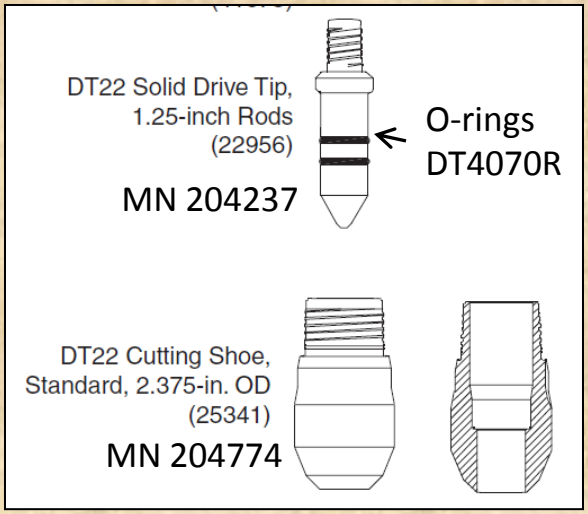
DT22 Soil X
SP22 Groundwater



Discrete Interval Groundwater Profiling with SP22

This is a "Dual Tube" technique



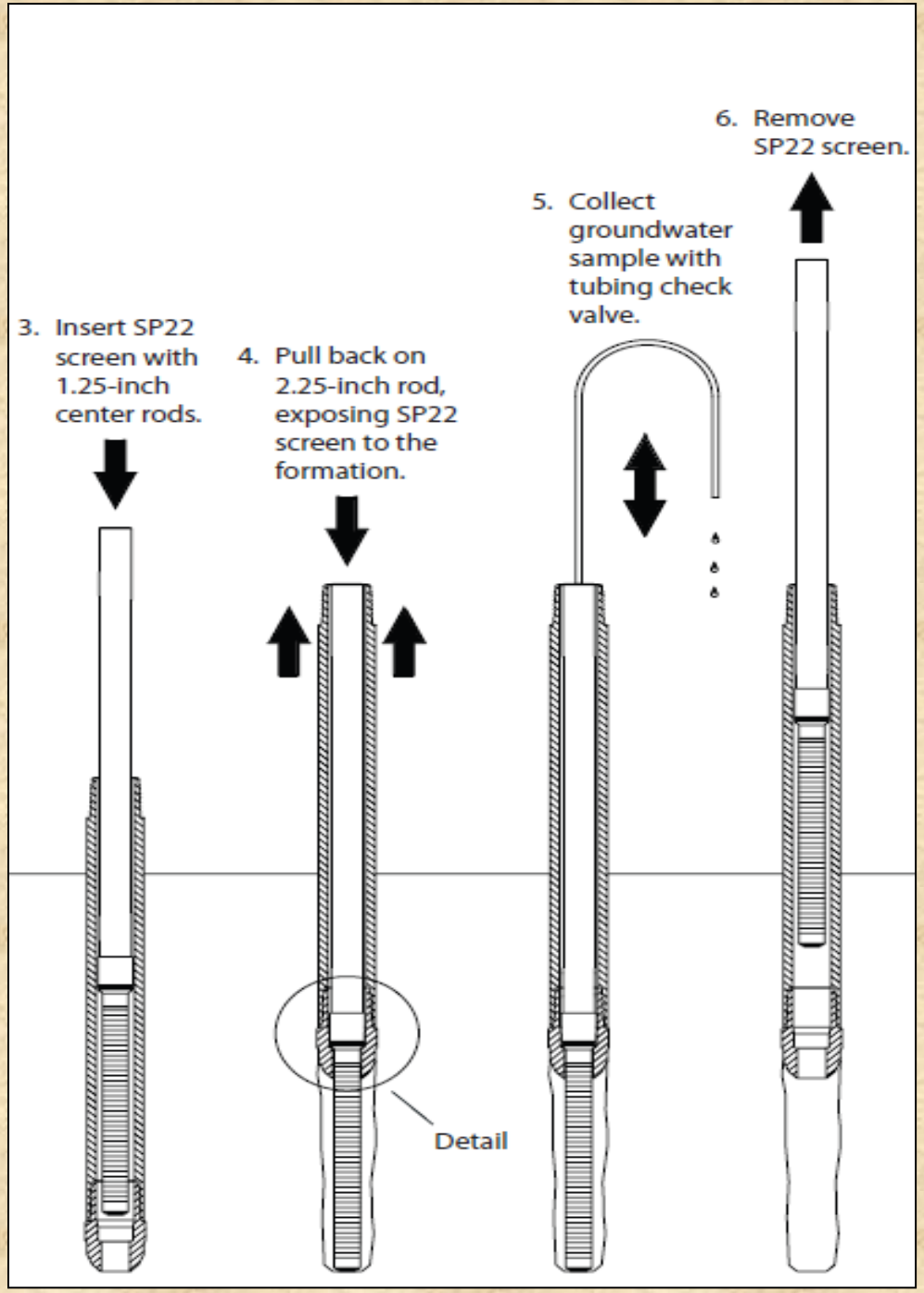


Hydraulic Control !

Profiling with SP22
(cont.)

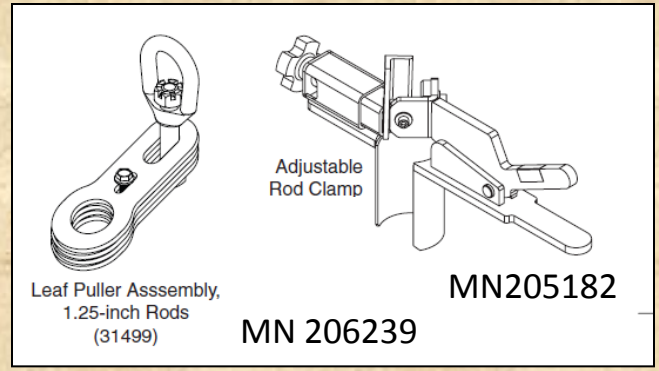
Setting the screen, development and sampling, and then tripping out the screen is the same as we saw above.

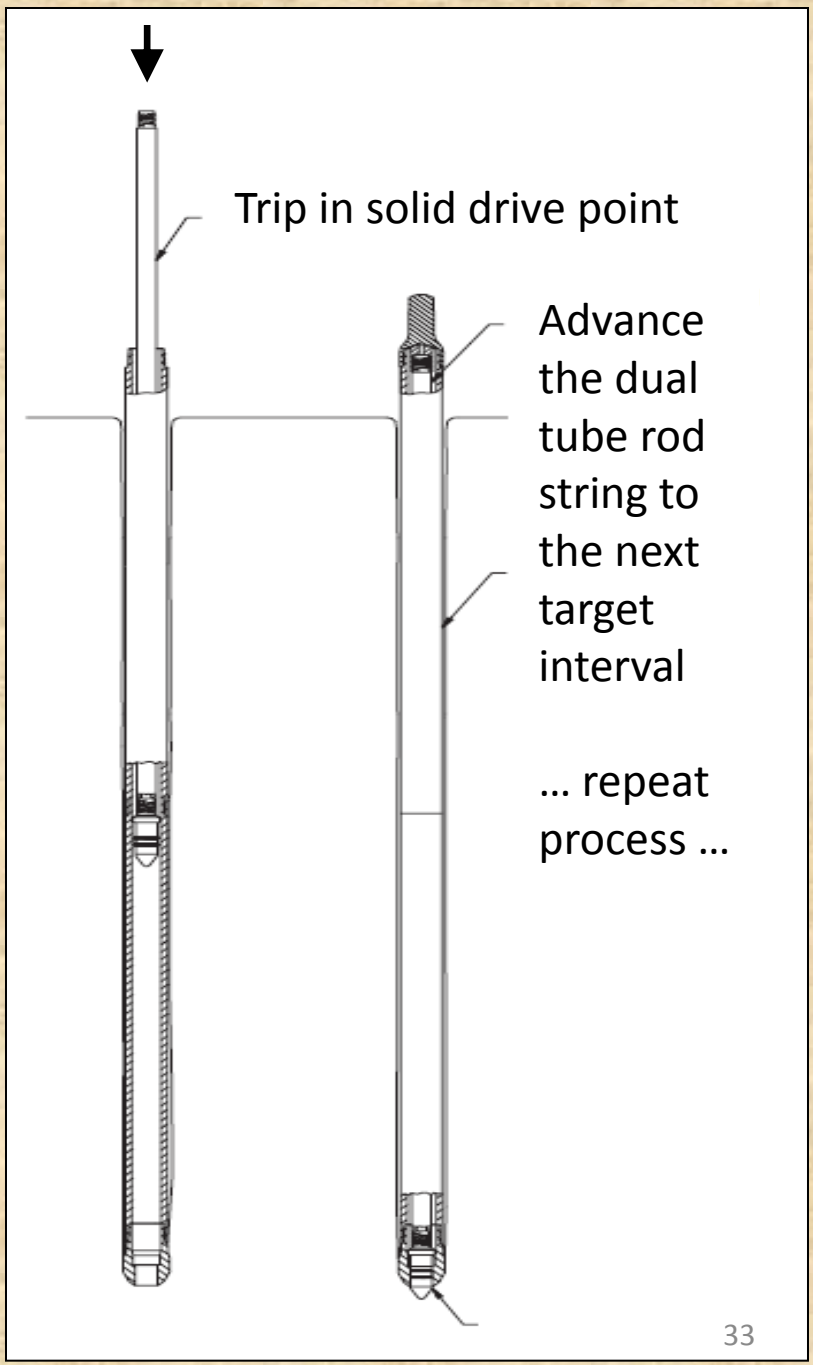
Don't forget hydraulic control when tripping out the screen



Profiling with SP22 (cont.)

Use the winch … save your back !

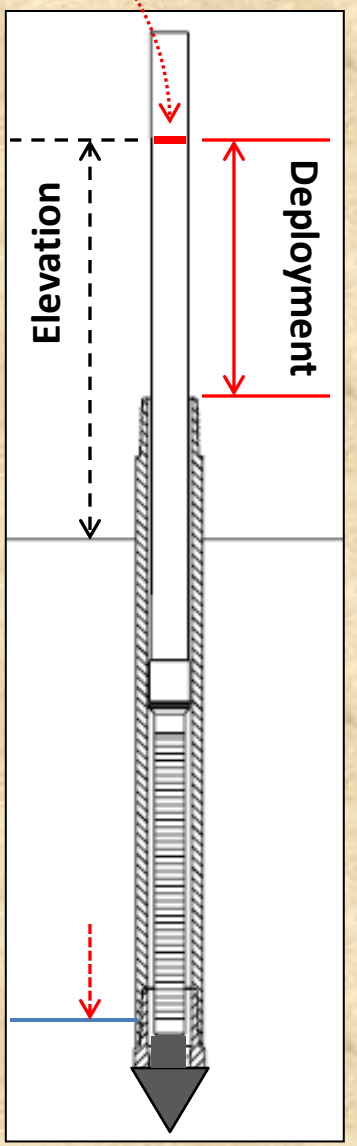




Screen Deployment Detail

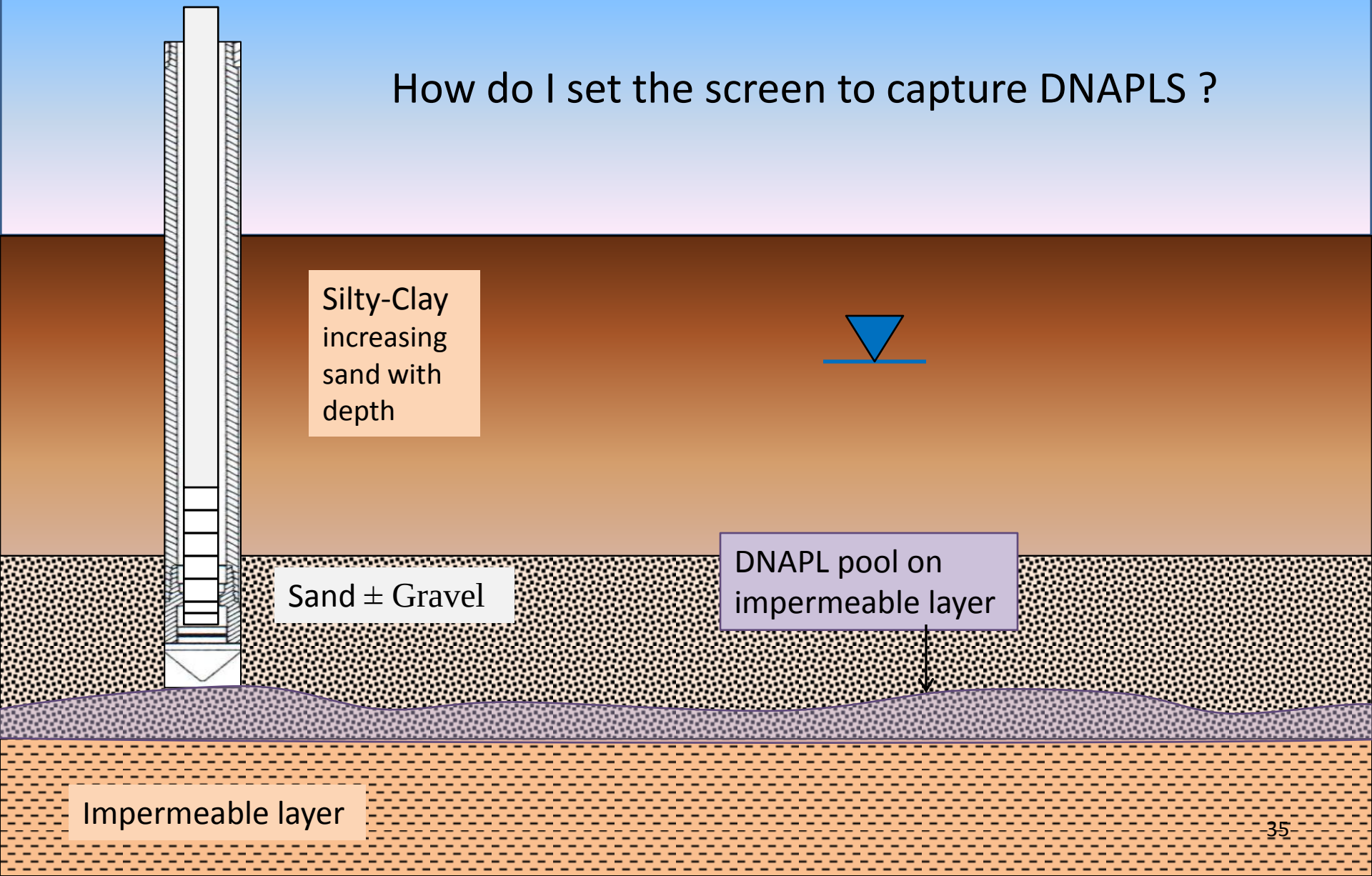
Use a reference mark on the casing to verify screen deployment.

Reference mark can be measured relative to ground surface to verify elevation of screen does not change as screen is deployed (or what the change is).

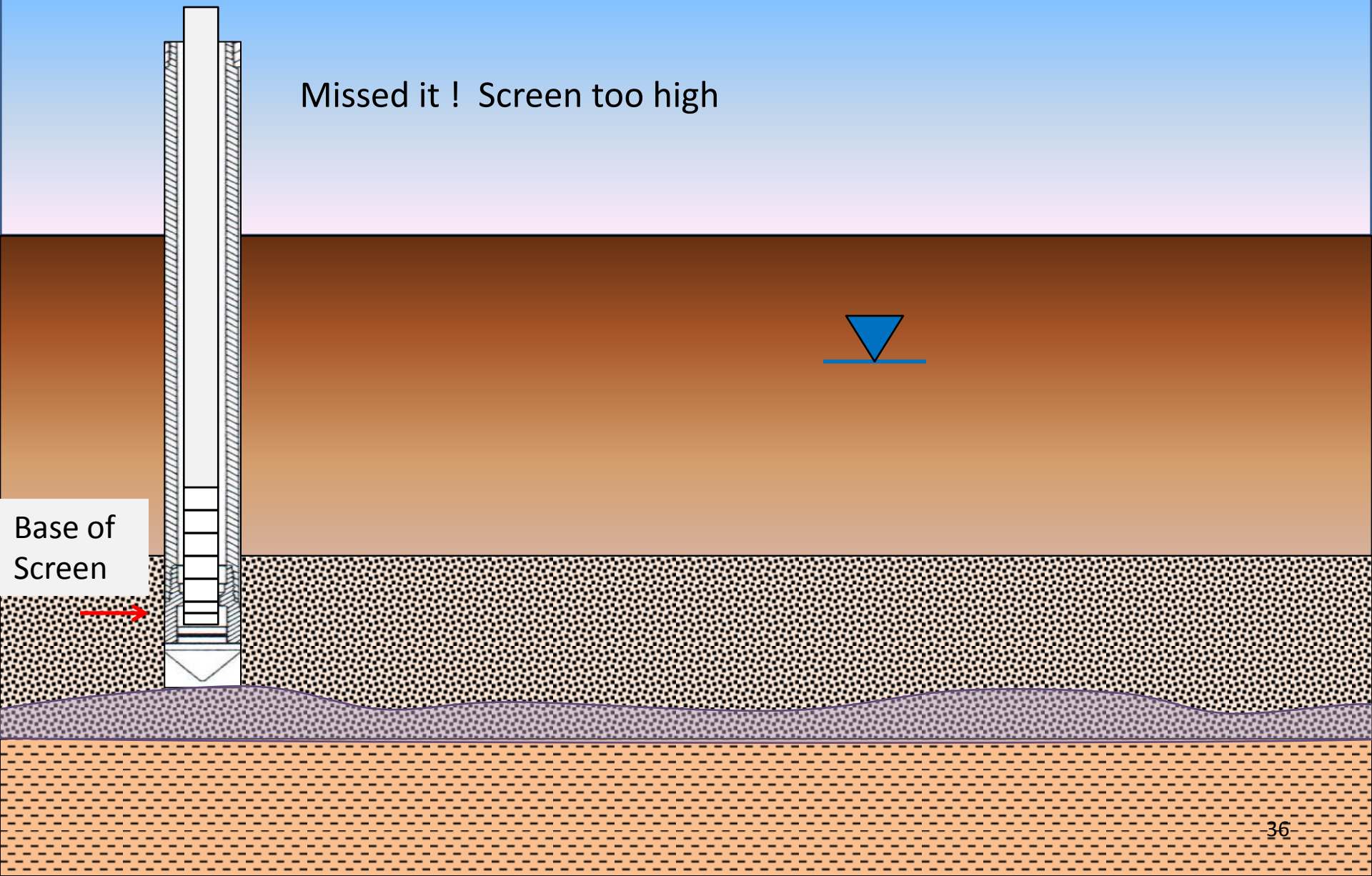


Depth and DNAPLs

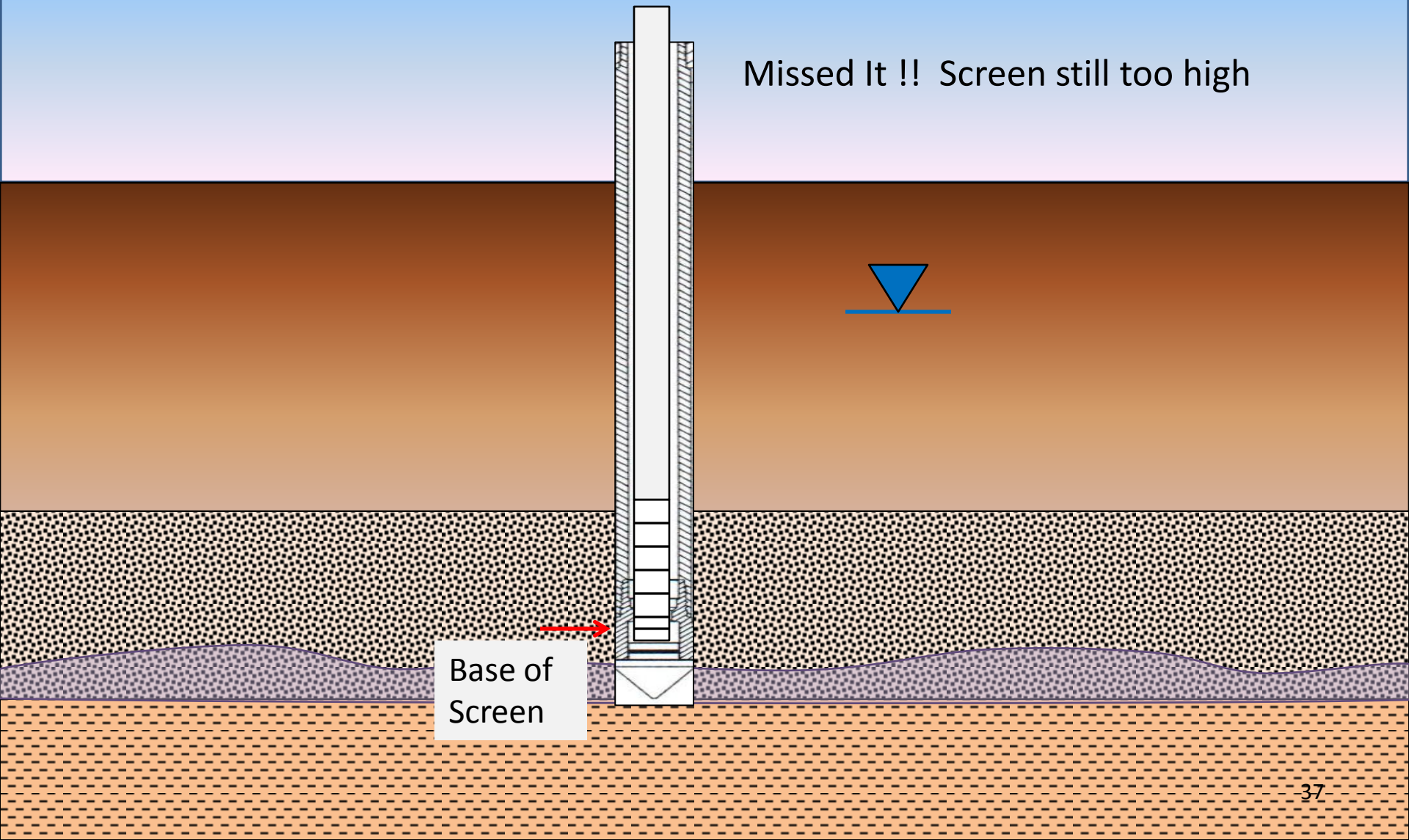
How do I set the screen to capture DNAPLS ?



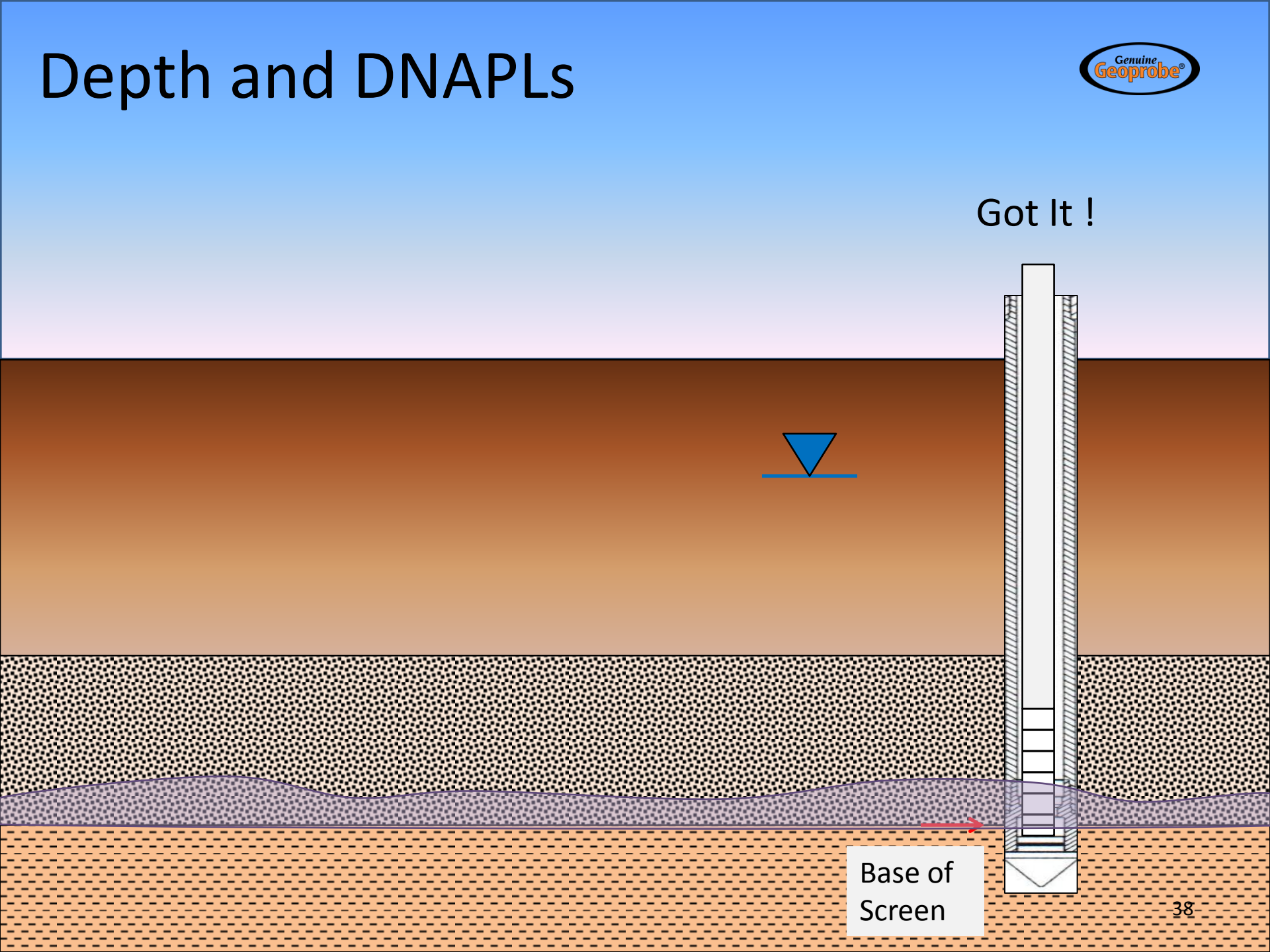
Depth and DNAPLs



Depth and DNAPLs



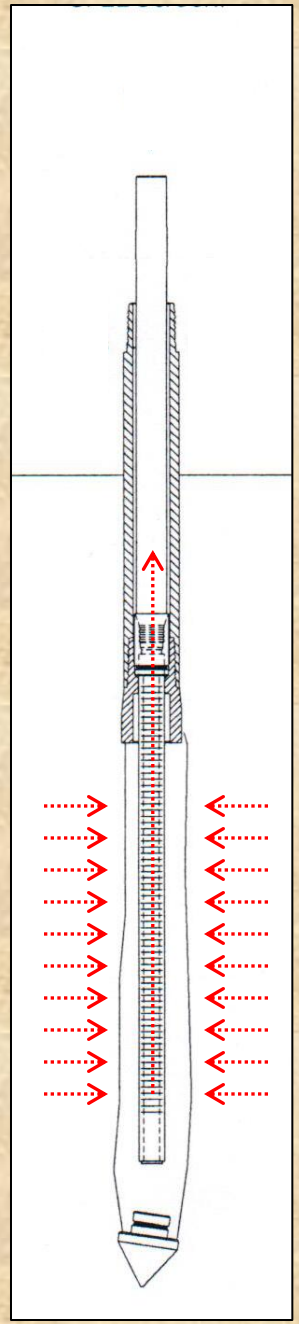
Depth and DNAPLs



No Hydraulic Control … Blocked Screen?

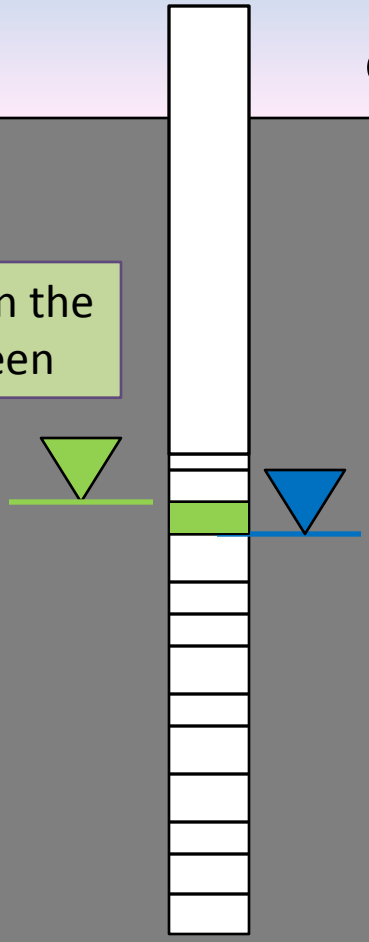
In very high K formations … with screen placed well below the water level = large Δ head:

If no water is added to the rods as the screen is opened fines in the formation may be entrained as water rushes into the screen. The fines may be "plastered" on the screen clogging the slots and preventing groundwater flow into the screens.



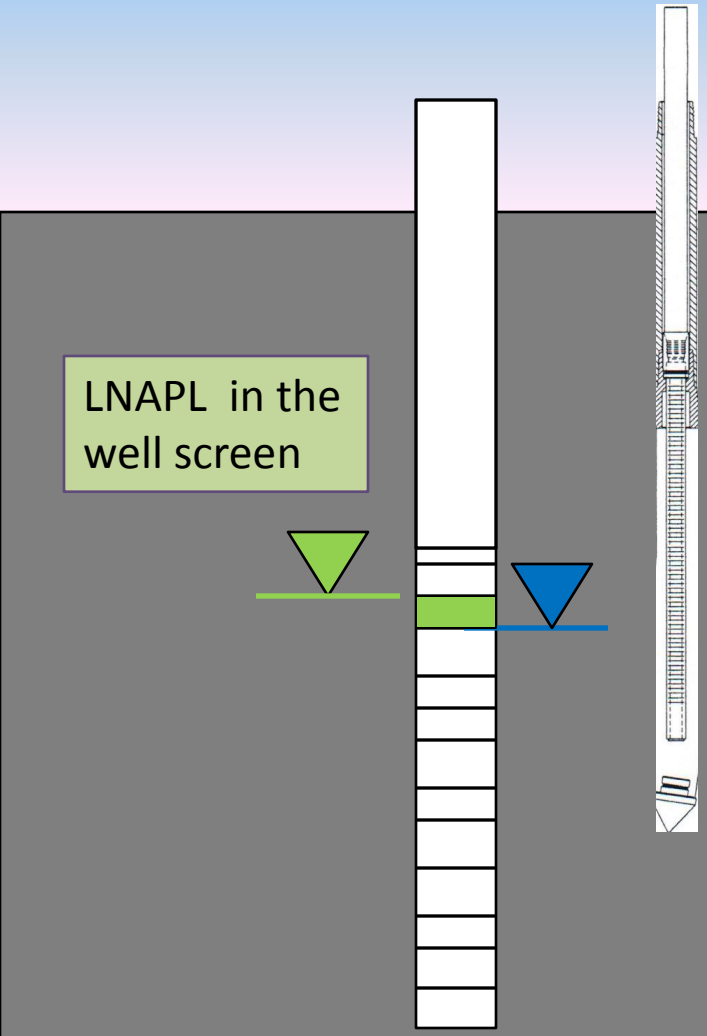
Sampling LNAPLs

A monitoring well installed 3 years ago has about 6-inches of LNAPL on top of the water. How should I use the SP22 to track the extent of the LNAPL body around this well ?



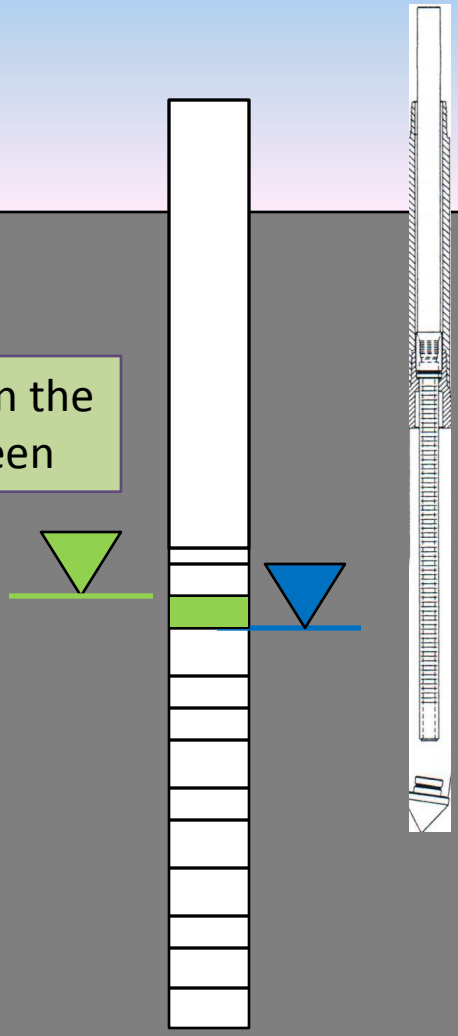
Well was purposefully designed to screen across the water table to capture any “floating” product / LNAPLs.

Sampling LNAPLs



Of course you will set the SP22 screen across the water table to capture any “floating” product / LNAPLs.

Sampling LNAPLs

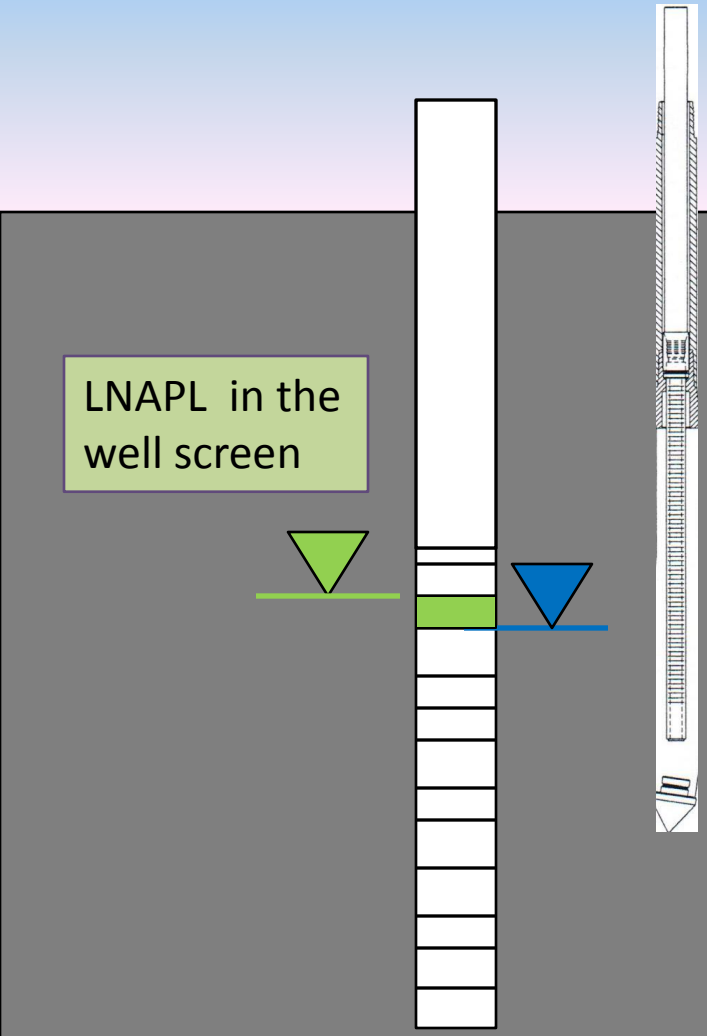


LNAPL in the well screen

Hmmm … one problem. When the SP22 is installed like this you get no water in the screen and no LNAPL.

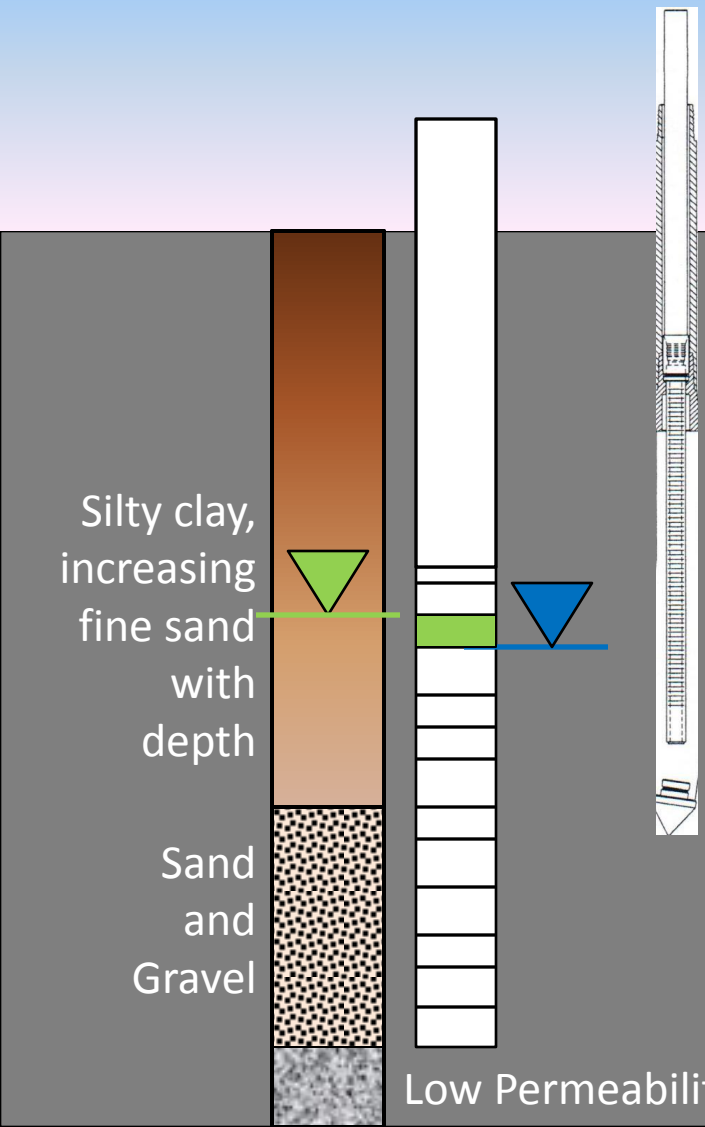
So, what is wrong with that SP22 sampler?

Sampling LNAPLs



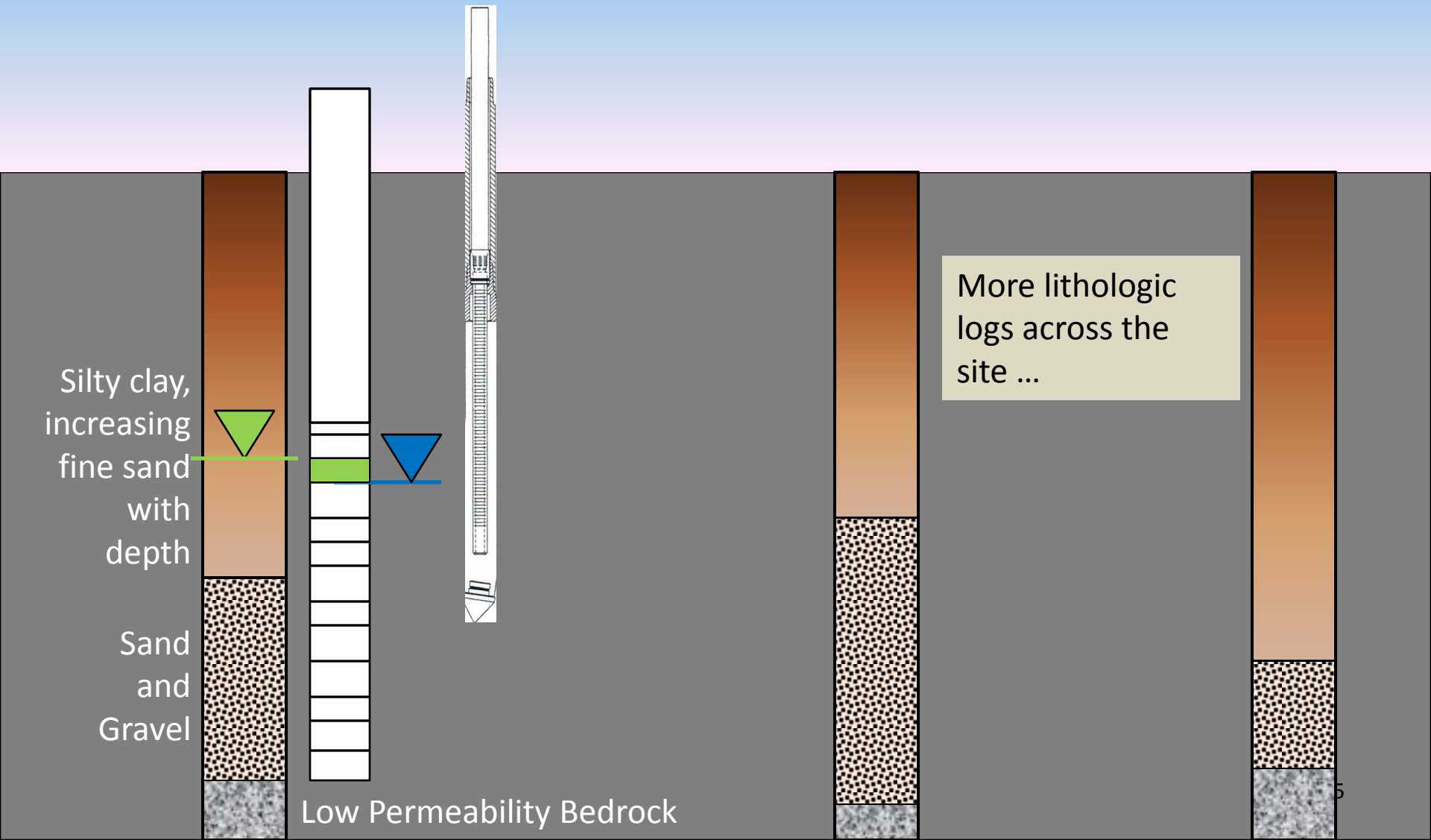
Let's look at the lithologic log from this well and see what we can learn about the local hydrogeology

Sampling LNAPLs

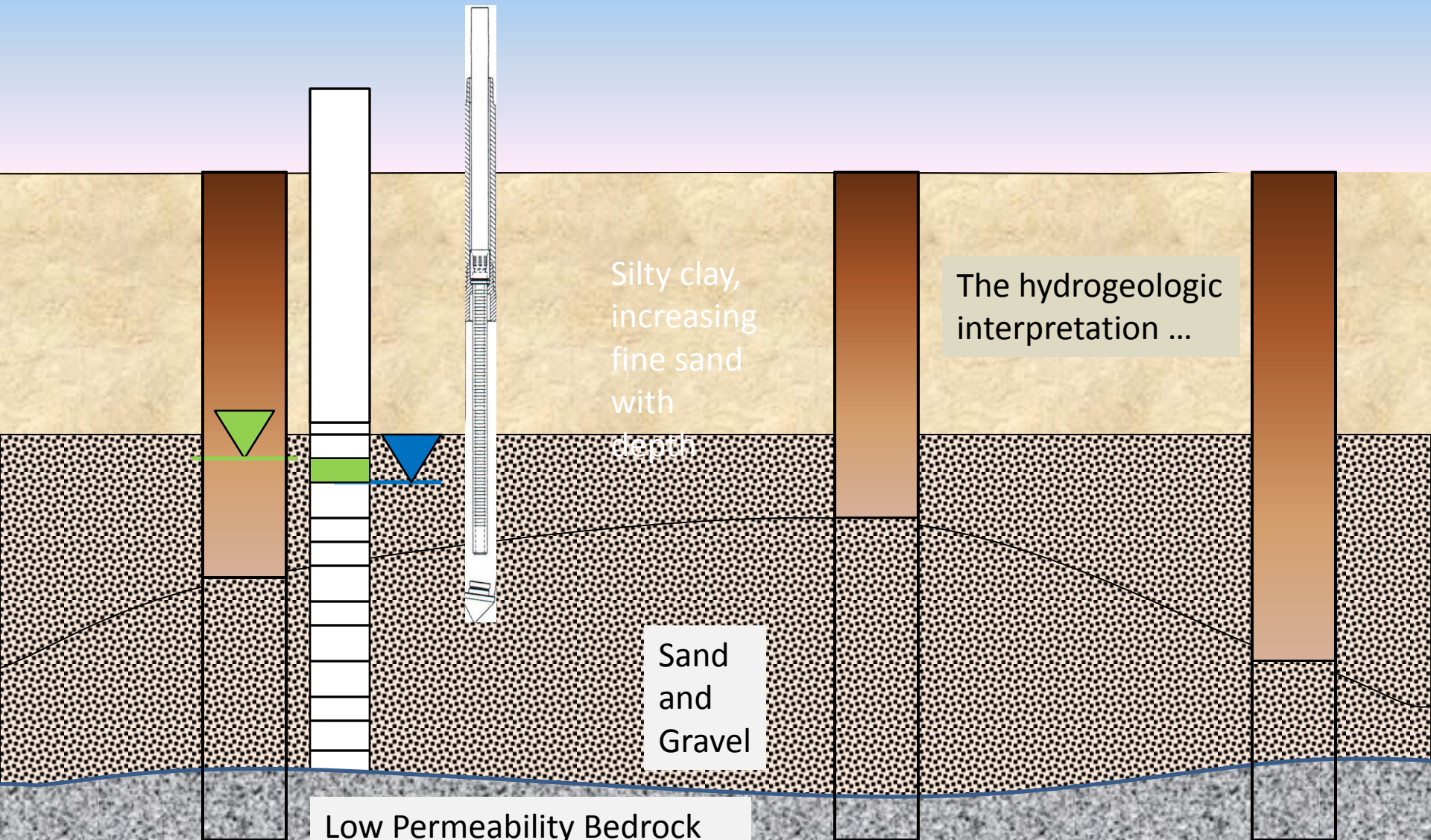


This is interesting, maybe we should look at more logs across the site …

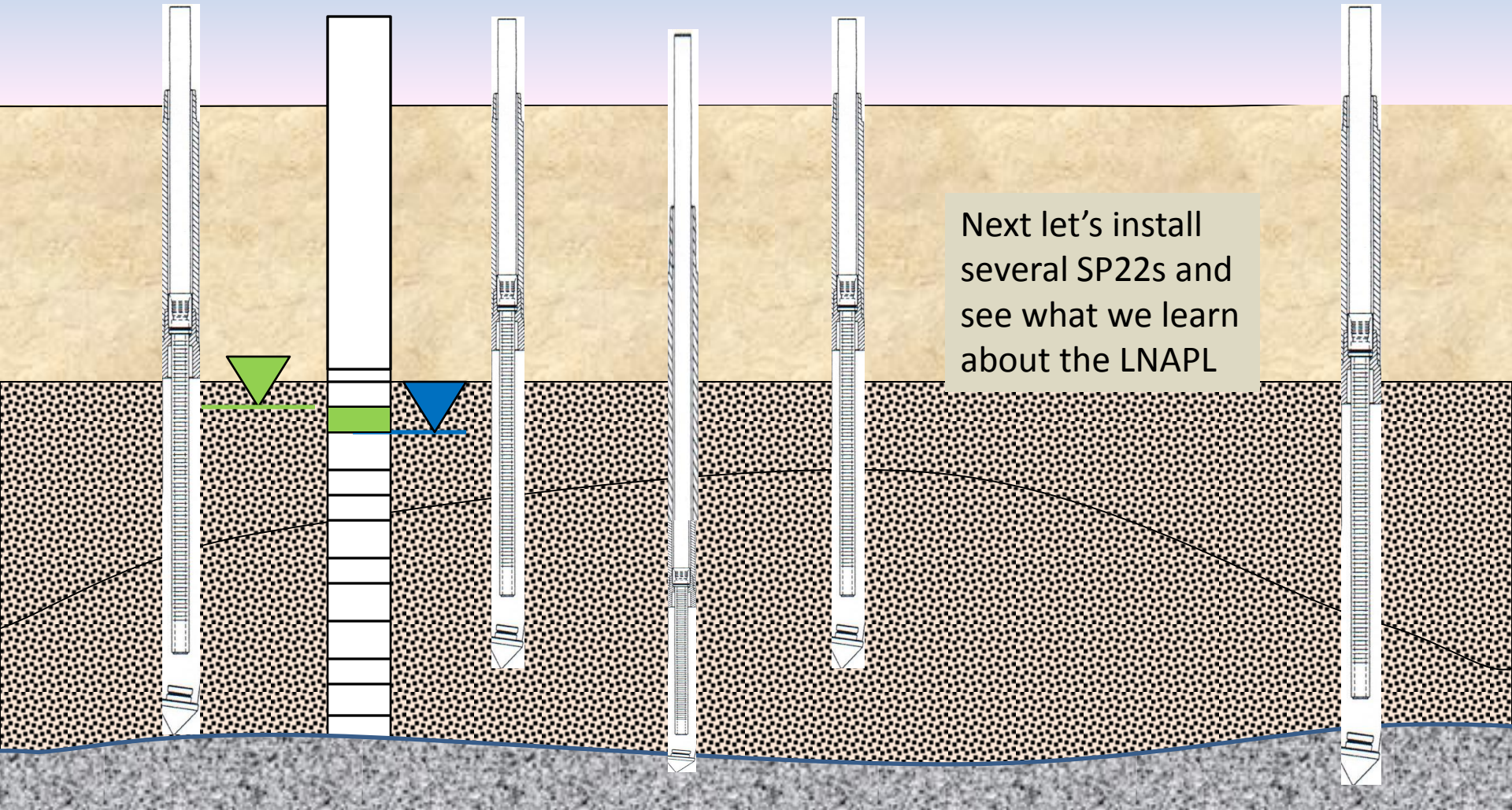
Sampling LNAPLs



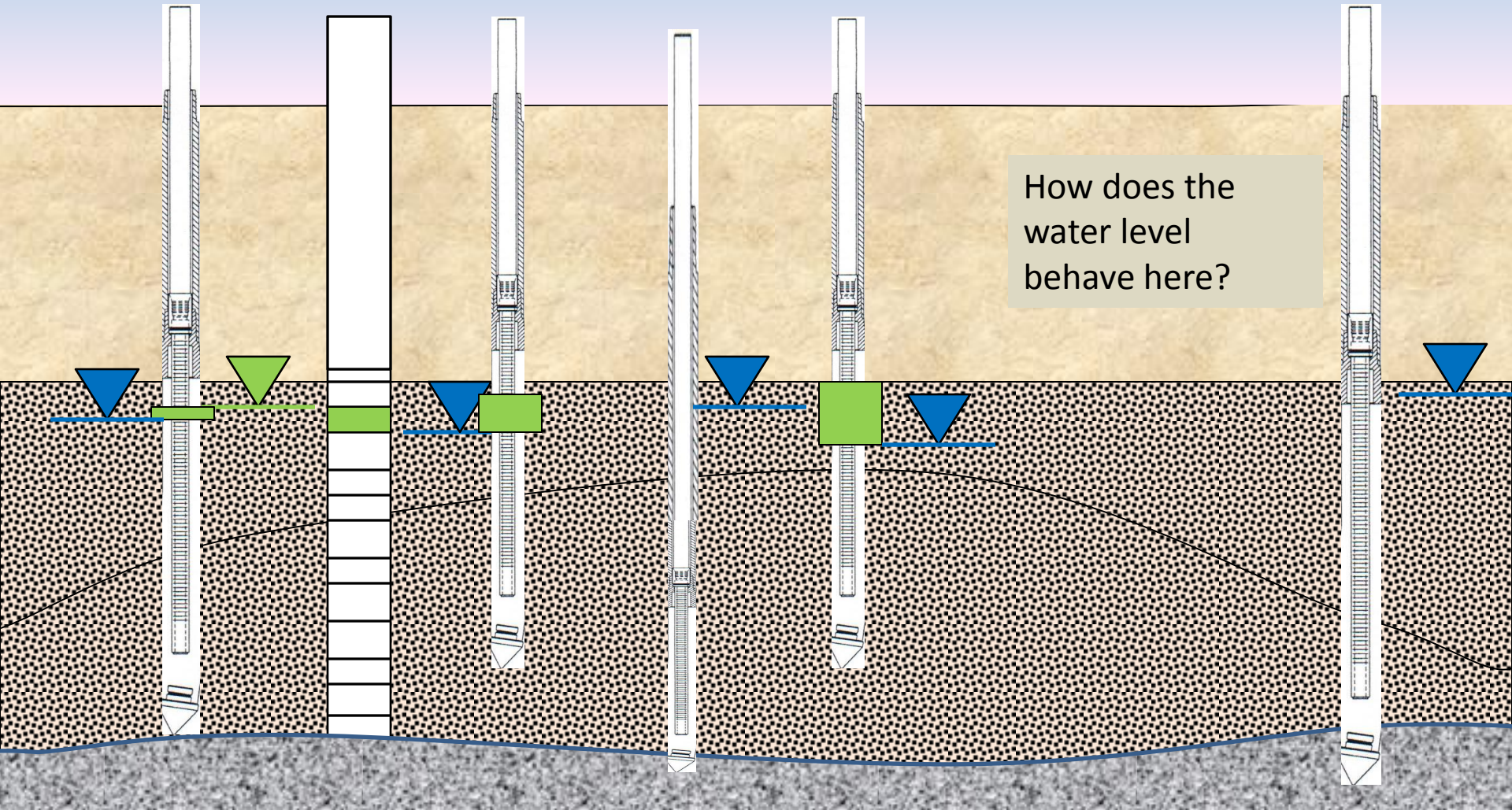
Sampling LNAPLs



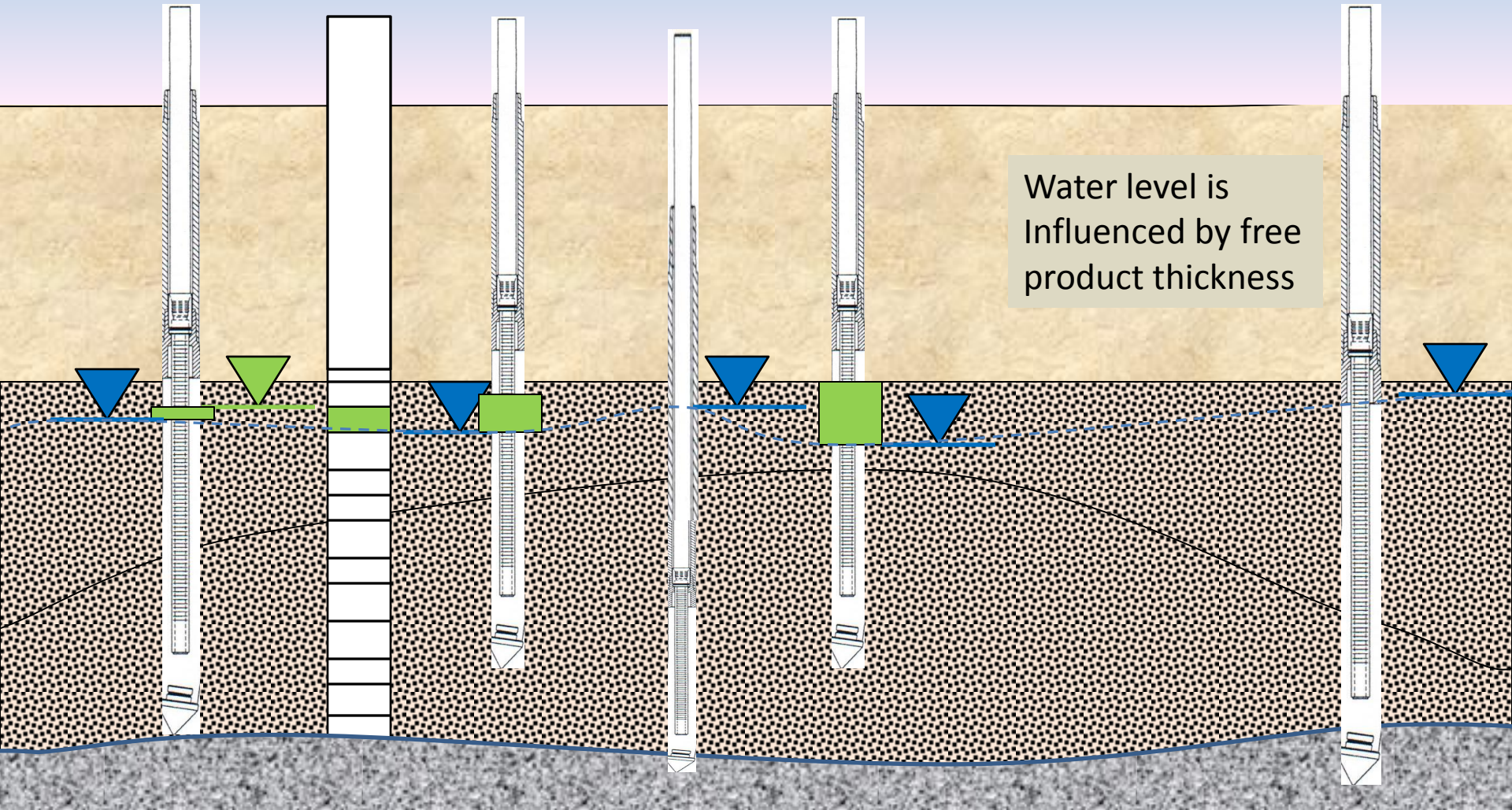
Sampling LNAPLs



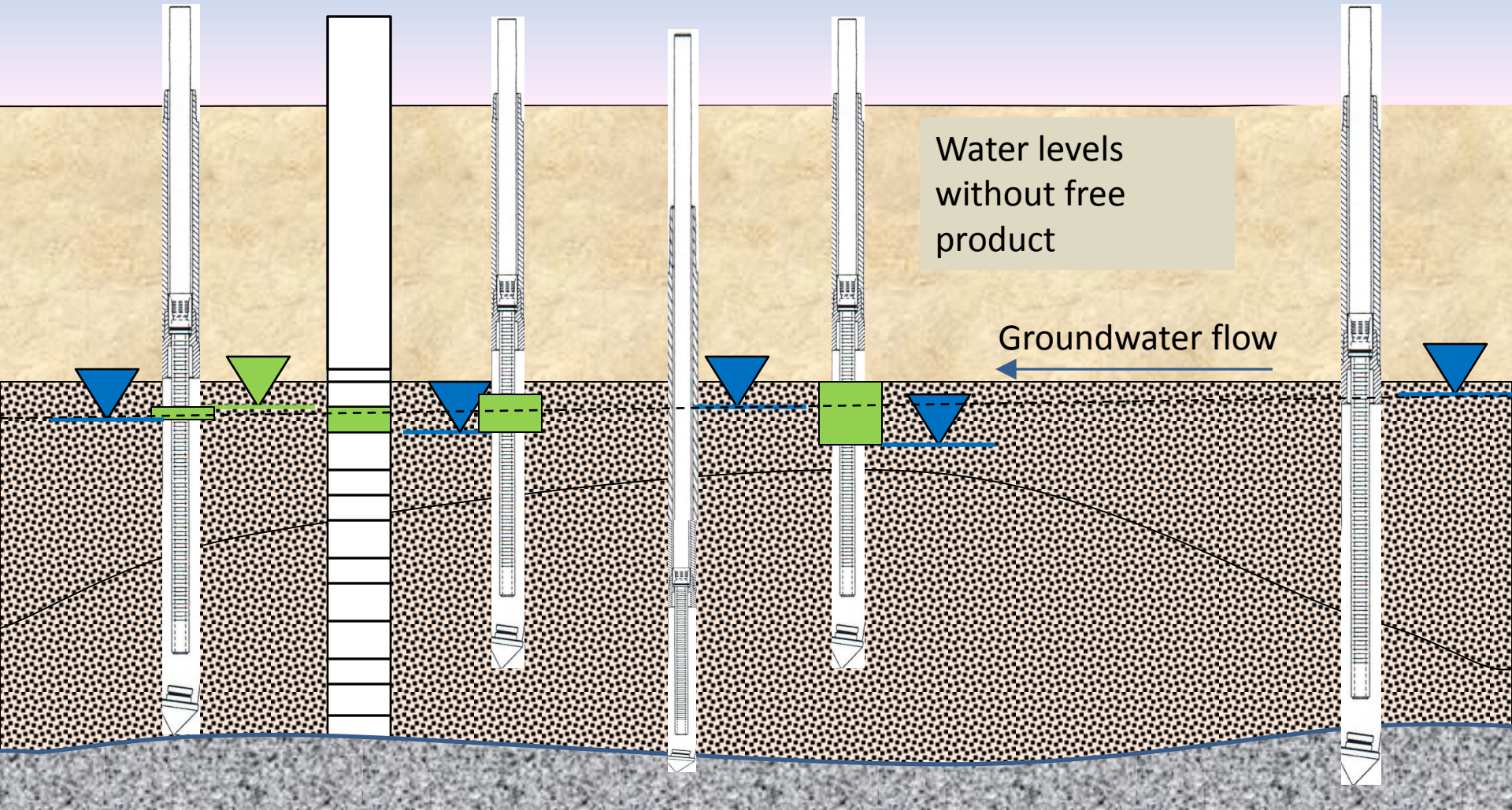
Sampling LNAPLs



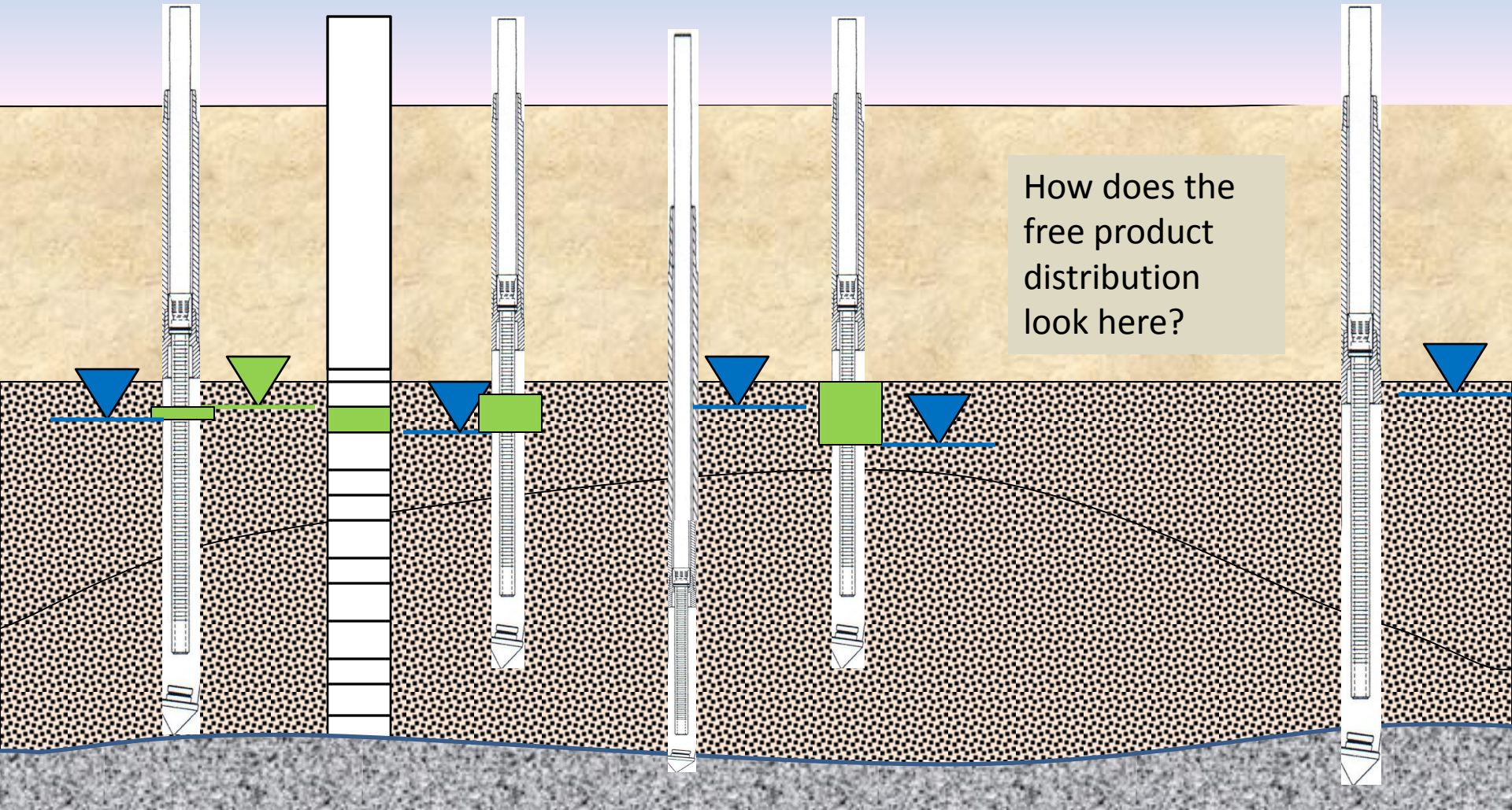
Sampling LNAPLs



Sampling LNAPLs



Sampling LNAPLs



Sampling LNAPLs