U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

Drilling and Well Installation for the Environmental Management Program at Los Alamos National Laboratory

ENVIRONMENTAL MANAGEMENT
SAFETY ❖ EFFICIENCY ❖ TRANSPARENCY

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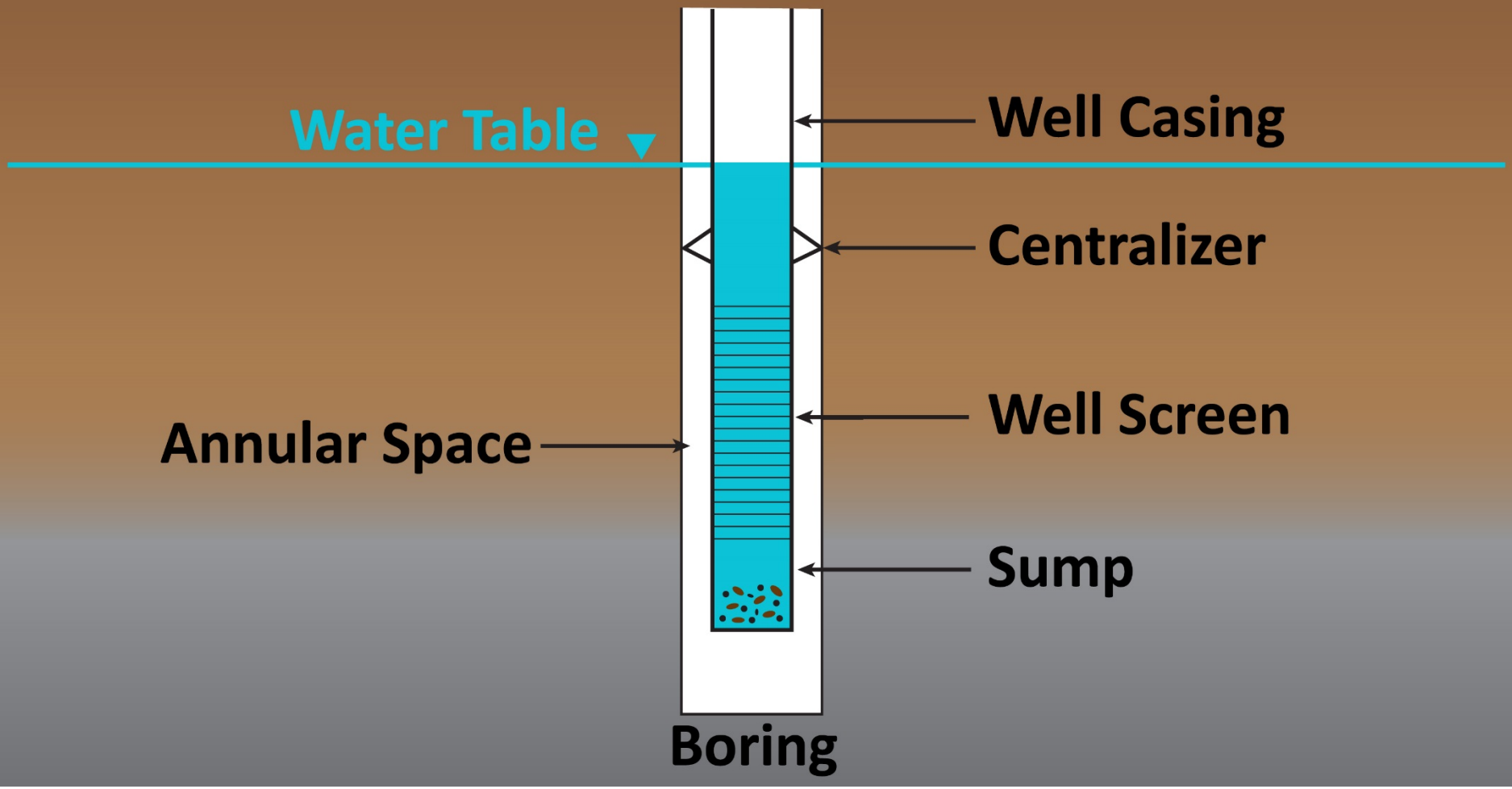
Strapped Down Load

How Many Wells Are There?

There are a total of 151 environmental groundwater wells at LANL

- 20 are screened in shallow alluvial deposits
- 41 are screened in the discontinuous intermediate-perched zones
- 90 are screened in the regional aquifer

What Are The Components of a Well?

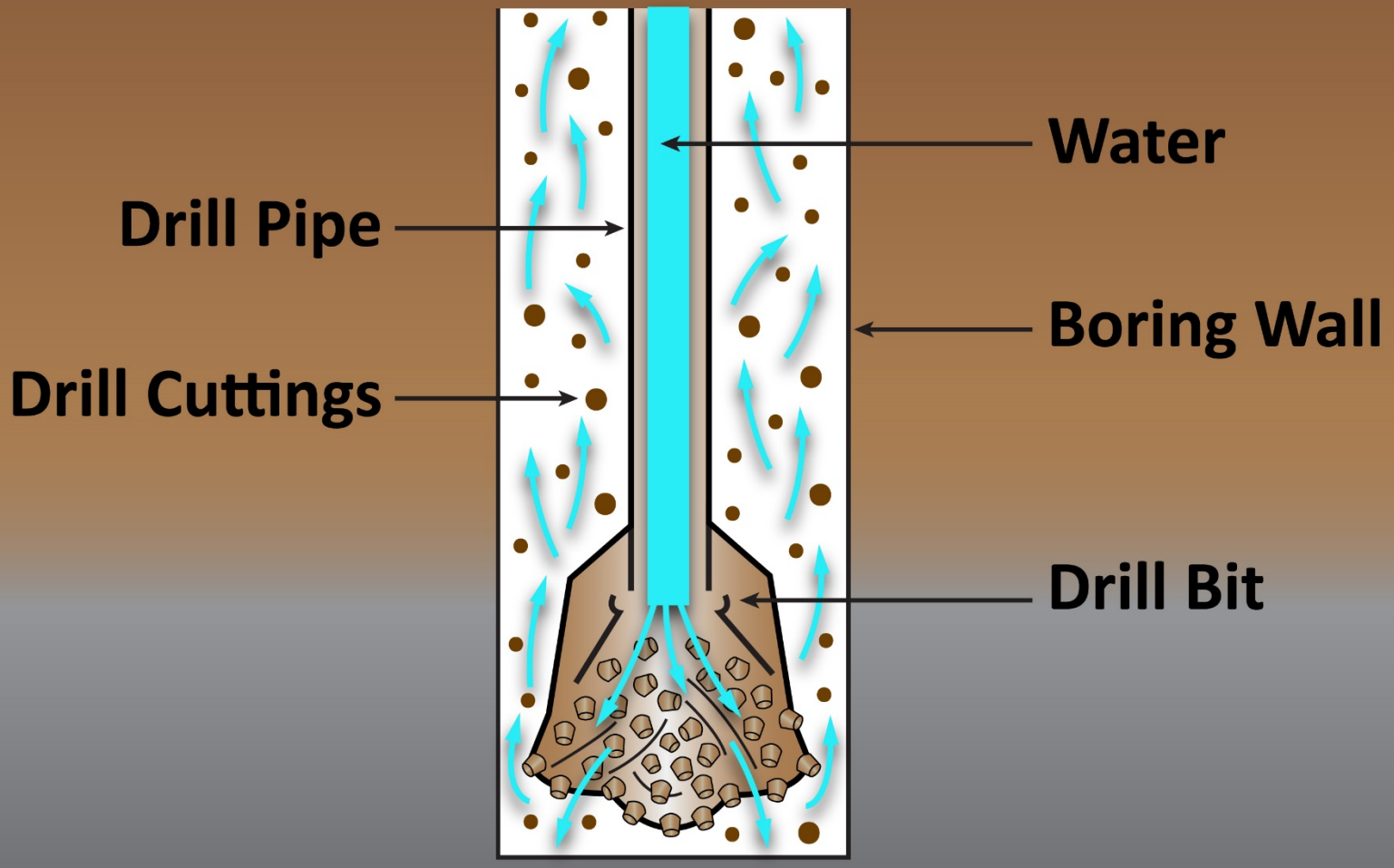


Well Screen

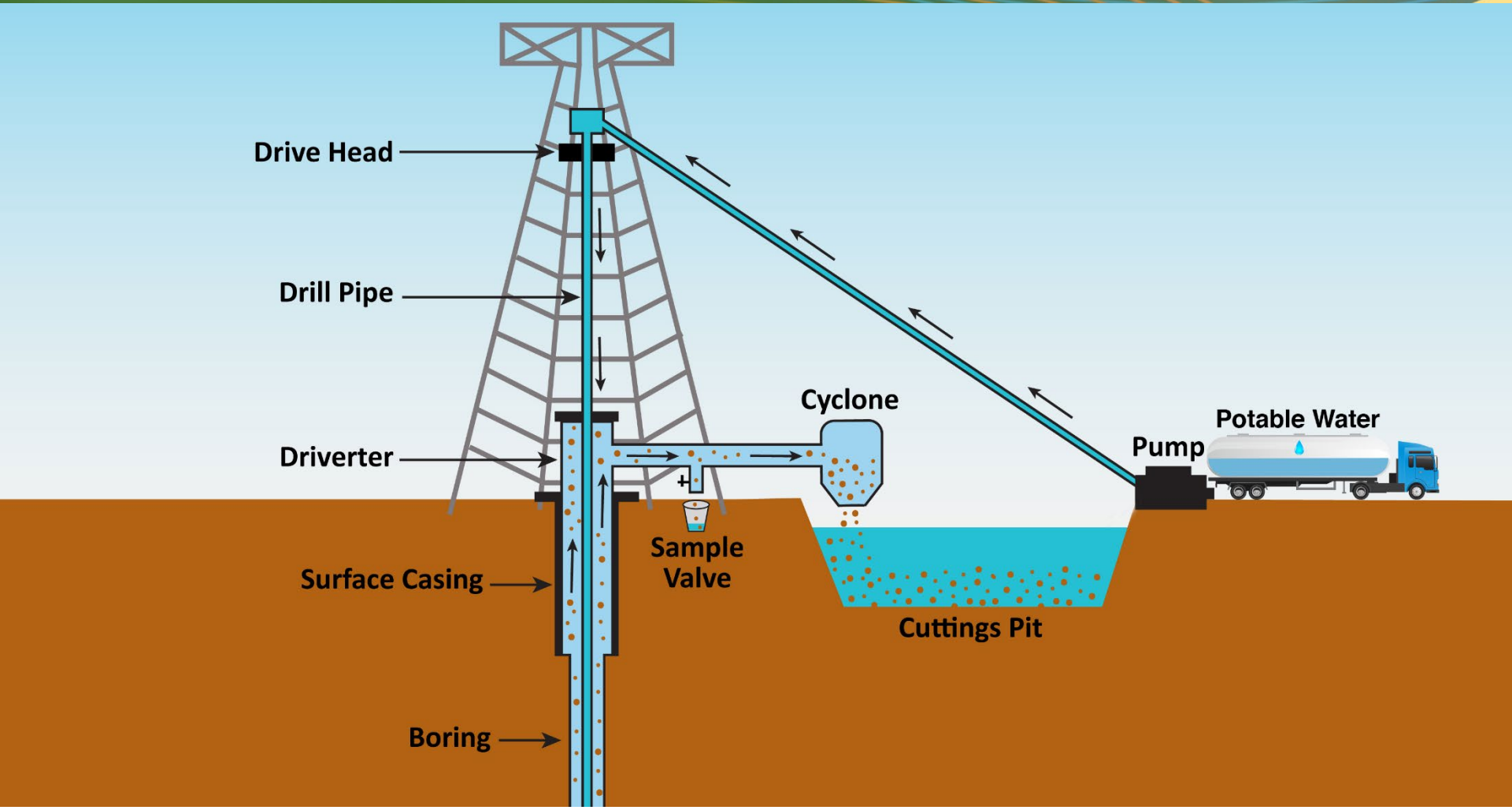
Drill Rig

Tricone Drill Bit

Advancing the Boring

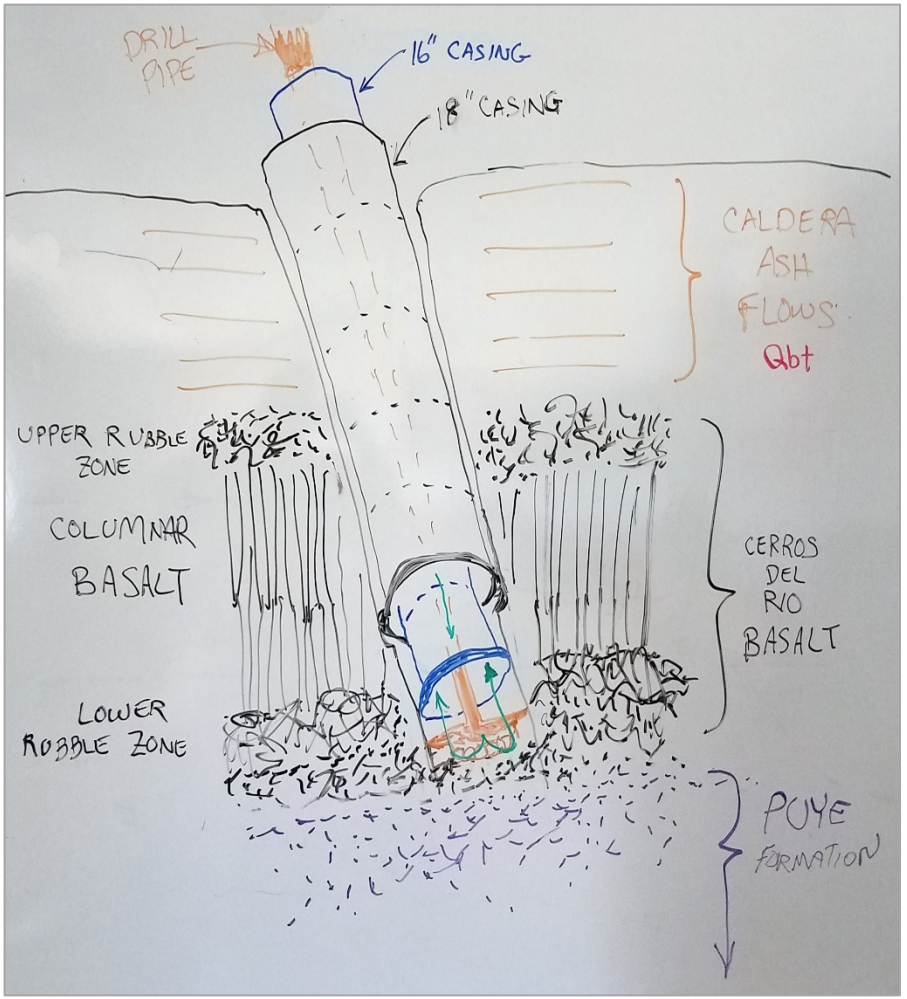


Drilling in Action



Dual Casing

- How do we keep pieces of the rock walls from falling into the boring?
- Dual casing rotary advance
- As the boring is advanced, a steel casing is lowered into the boring a few feet above the drill bit
- Telescoping casings are used to prevent excess friction from getting the casing stuck

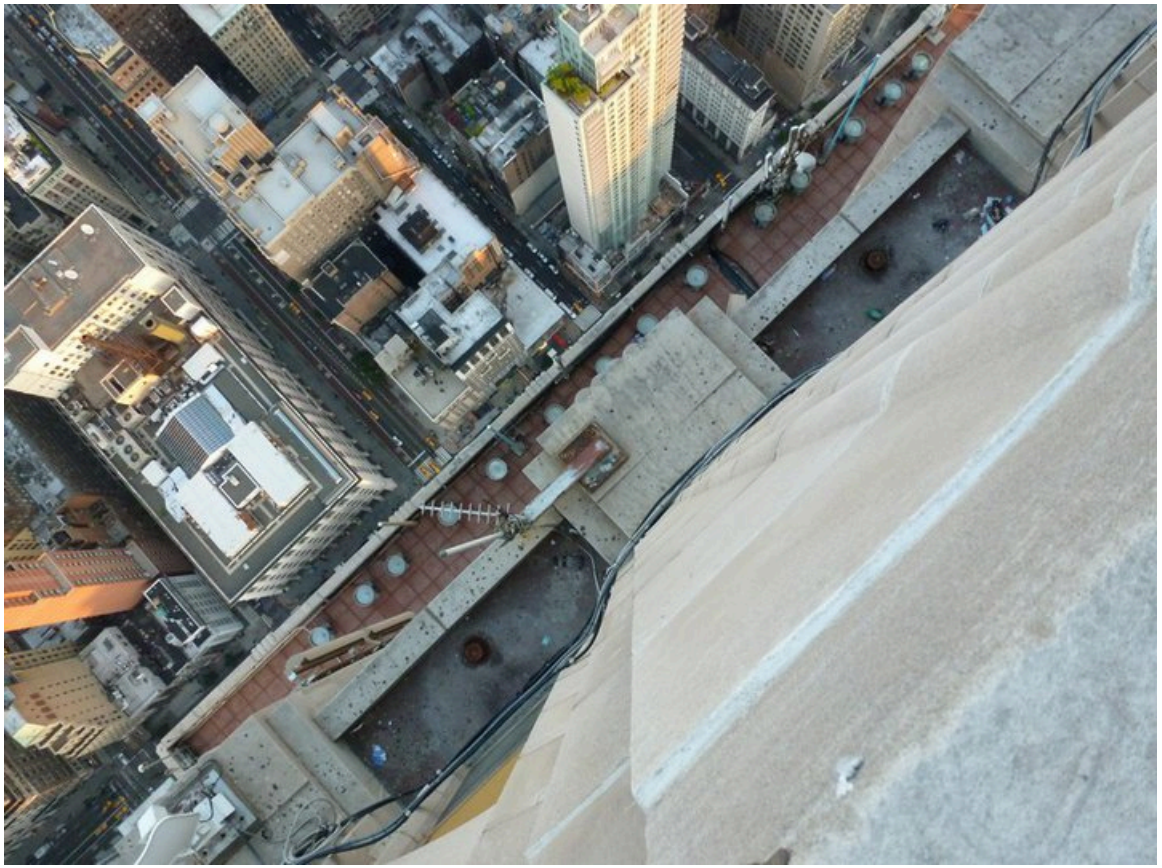


Retracting Wing Rotary Drill Bit

- How do we lower a bit inside a steel casing to cut a boring with a diameter bigger than the casing?
- Retracting wing rotary drill bit
- When the bit is lowered, the wings are retracted, so it fits inside the casing
- When the bit is in place, the high pressure water is turned on, causing the wings to expand

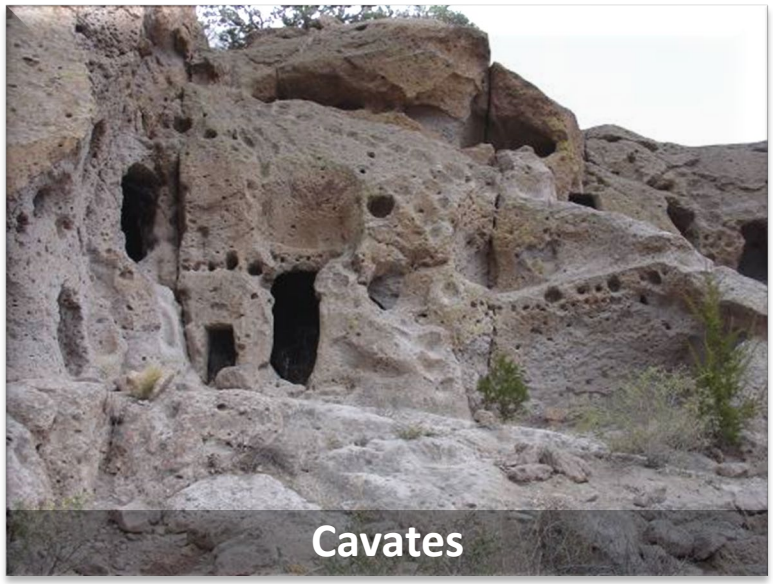
Drill Pad Layout

Vertical Distance and Small Diameter



Challenge – Protecting Cultural Sites

- Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties
- There are approximately 2,000 cultural sites on Laboratory property. Some archaeological sites are as old as 7,000 years while others are associated with the Manhattan Project
- Many sites might appear unremarkable to the untrained eye, but they hold great value to today's Pueblo communities

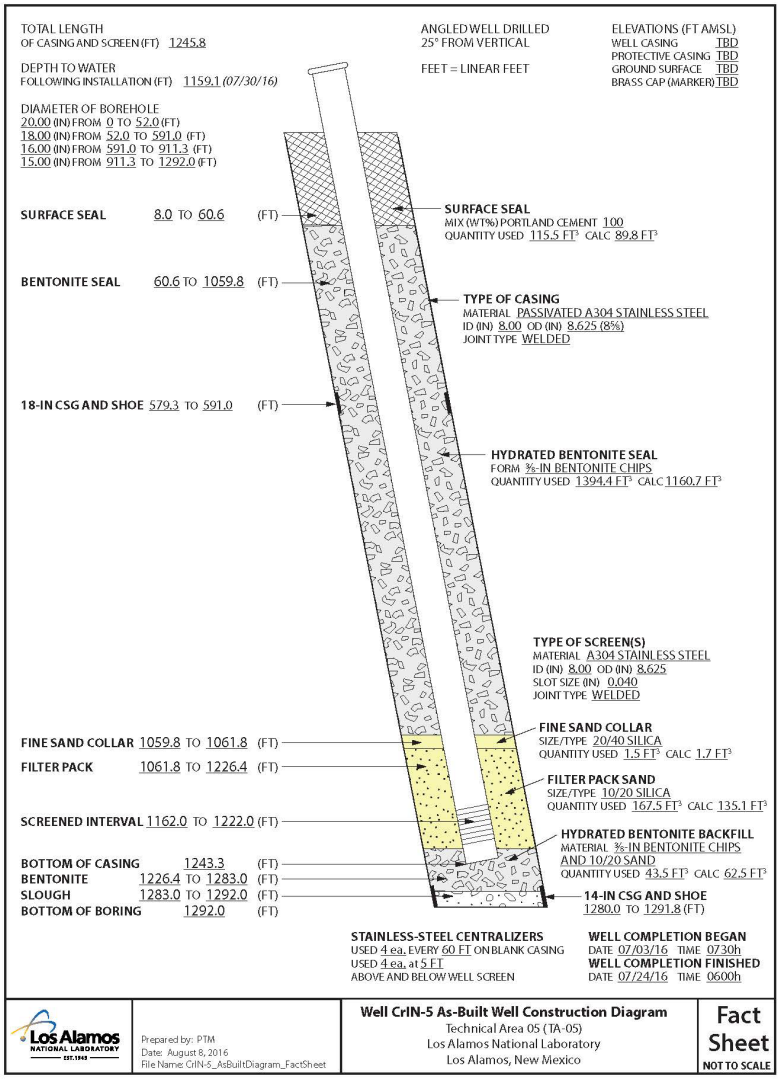


Cavates

Ceramic and lithic artifact scatter

Challenge - Topography

Solution – Angled Drilling



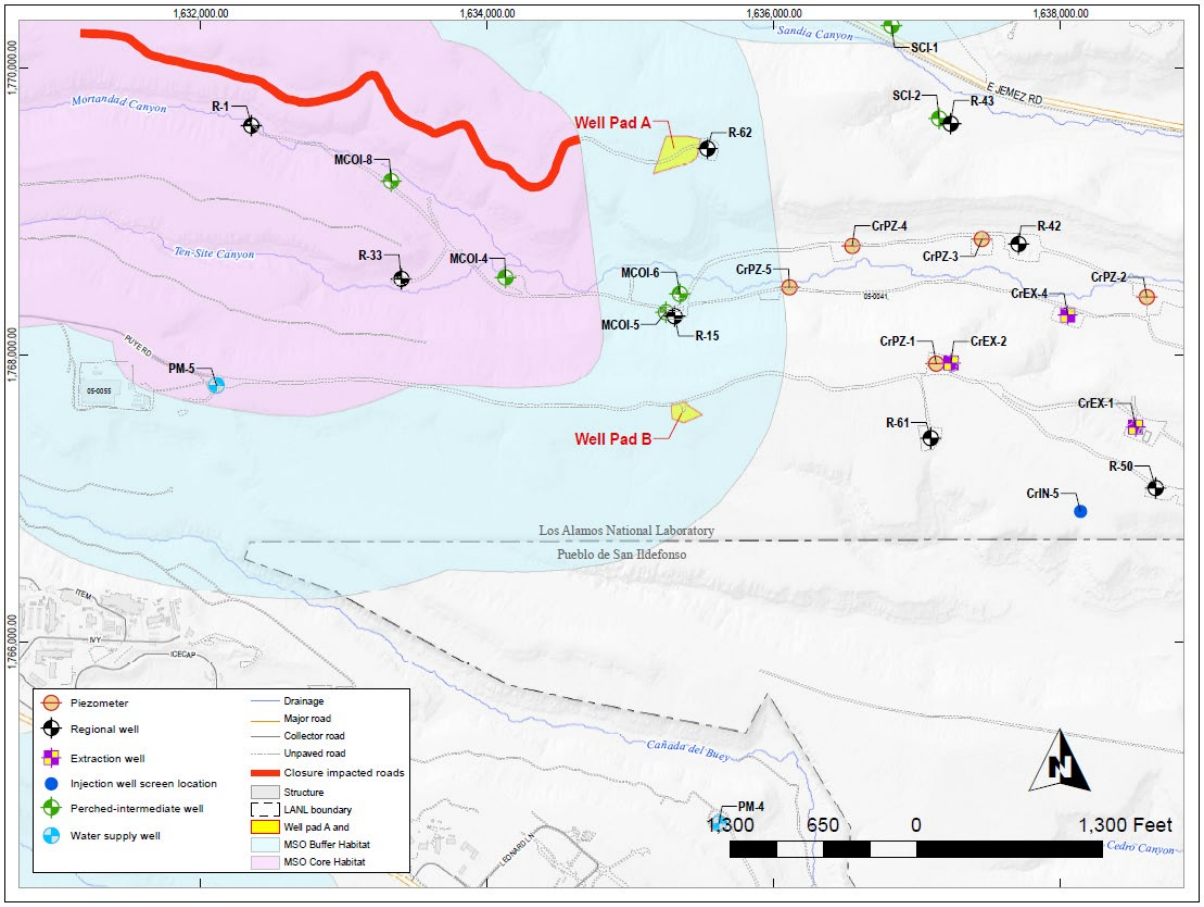
Challenge – Endangered Species

Constrained Scheduling

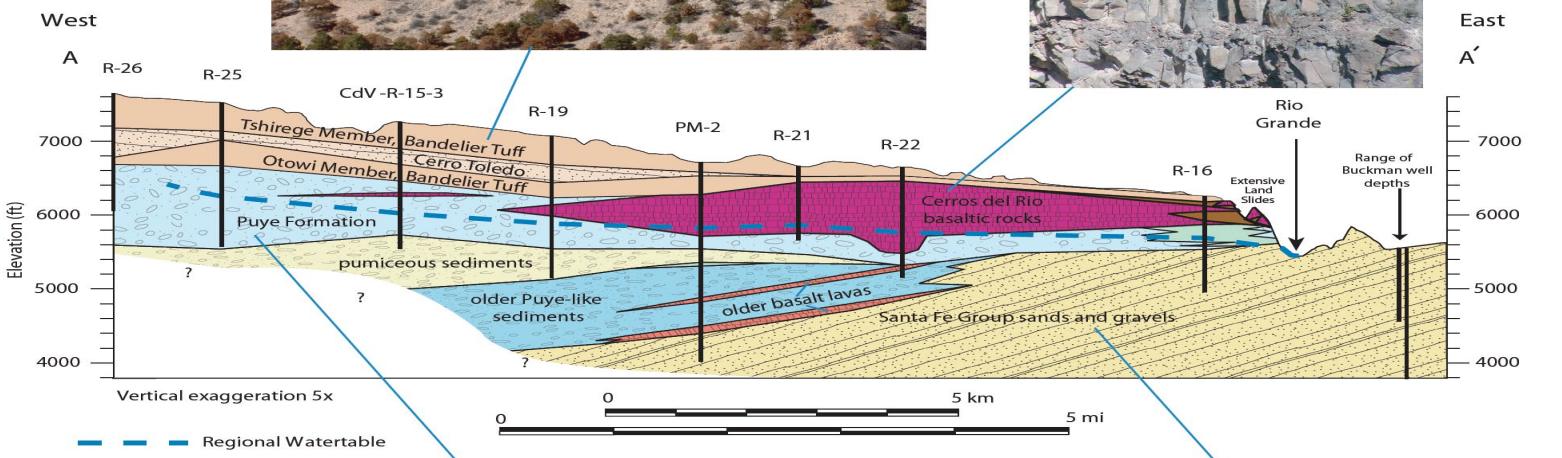
LANL has developed a Biological Resources Management Plan under the authority of the US Fish and Wildlife Service

In this case it restricts activities during the owl breeding season (March 1 to August 31) along the portion of the access road shown in red

Drilling will commence as soon as the restrictions are lifted



LANL Lithology



Challenges to Drilling

What Can Go Wrong During Drilling? Pretty Much Everything

- Unstable/incompetent rock layers can spall or collapse. In a worst case scenario, the boring can be lost
- The oblique jointing of columnar basalt can push or pull the bit off of its intended track, leading to a deviated boring
- Drilling fluid circulation can be lost if voids are encountered
- Separation or other damage to the drill string can occur. Remember, the drive head on the rig and the drill bit can be separated by 1,000 feet or more
- Mechanical breakdown of the rig or circulation equipment.
- Complications during installation of the well and annular space materials
- Human error

Drilling Safety (1 of 2)

Drilling Is Inherently Dangerous

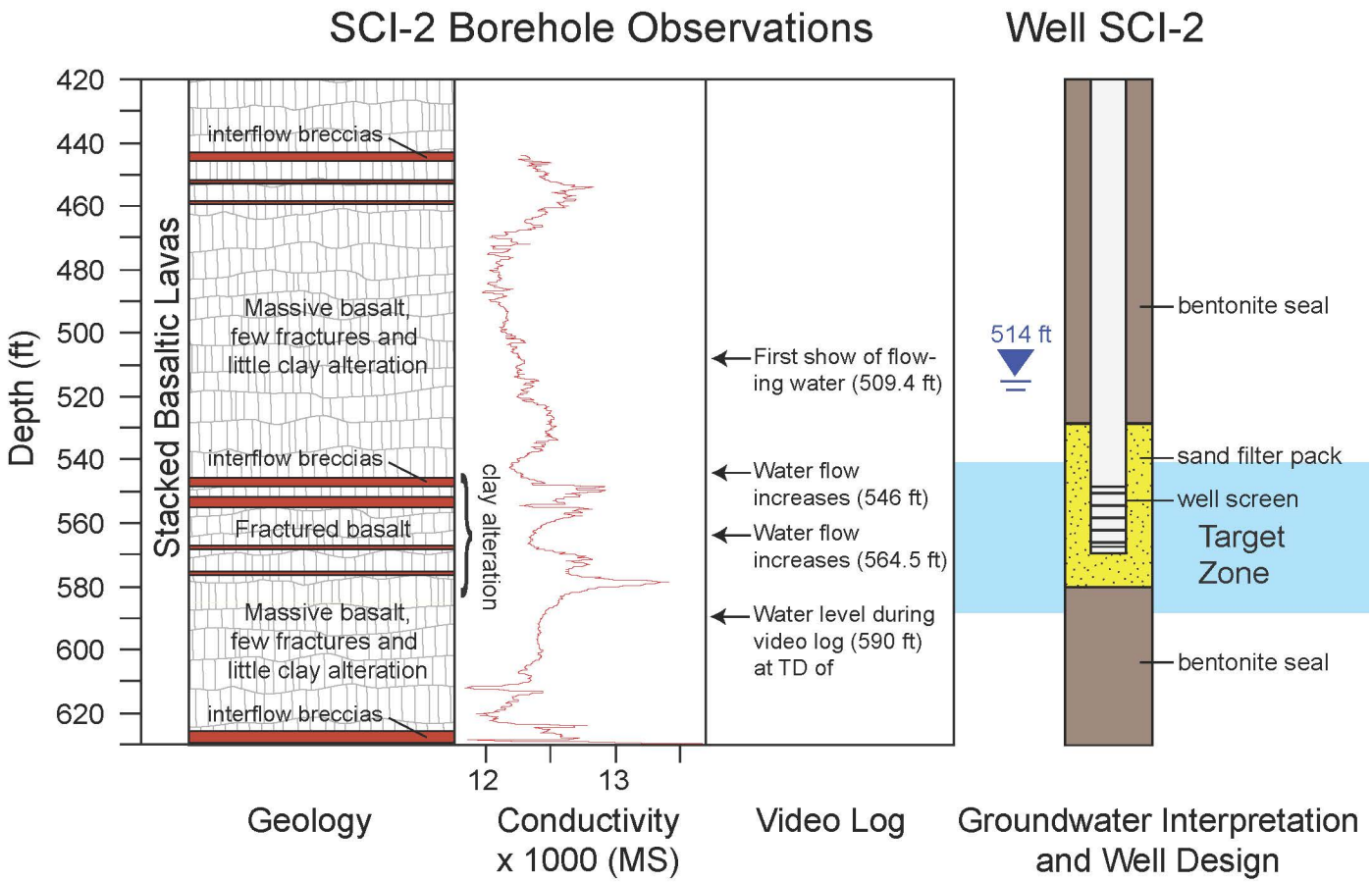
- Loads weighing many tons are repeatedly hoisted high into the air
- Fluid hoses are under very high pressure and may rupture
- There are many opportunities for pinching or getting trapped by equipment or materials
- Heavy vehicles and loads are driven to and around the site
- Long hours and working at night (drilling wells to these depths is typically 24/7)
- Noise

Drilling Safety (2 of 2)

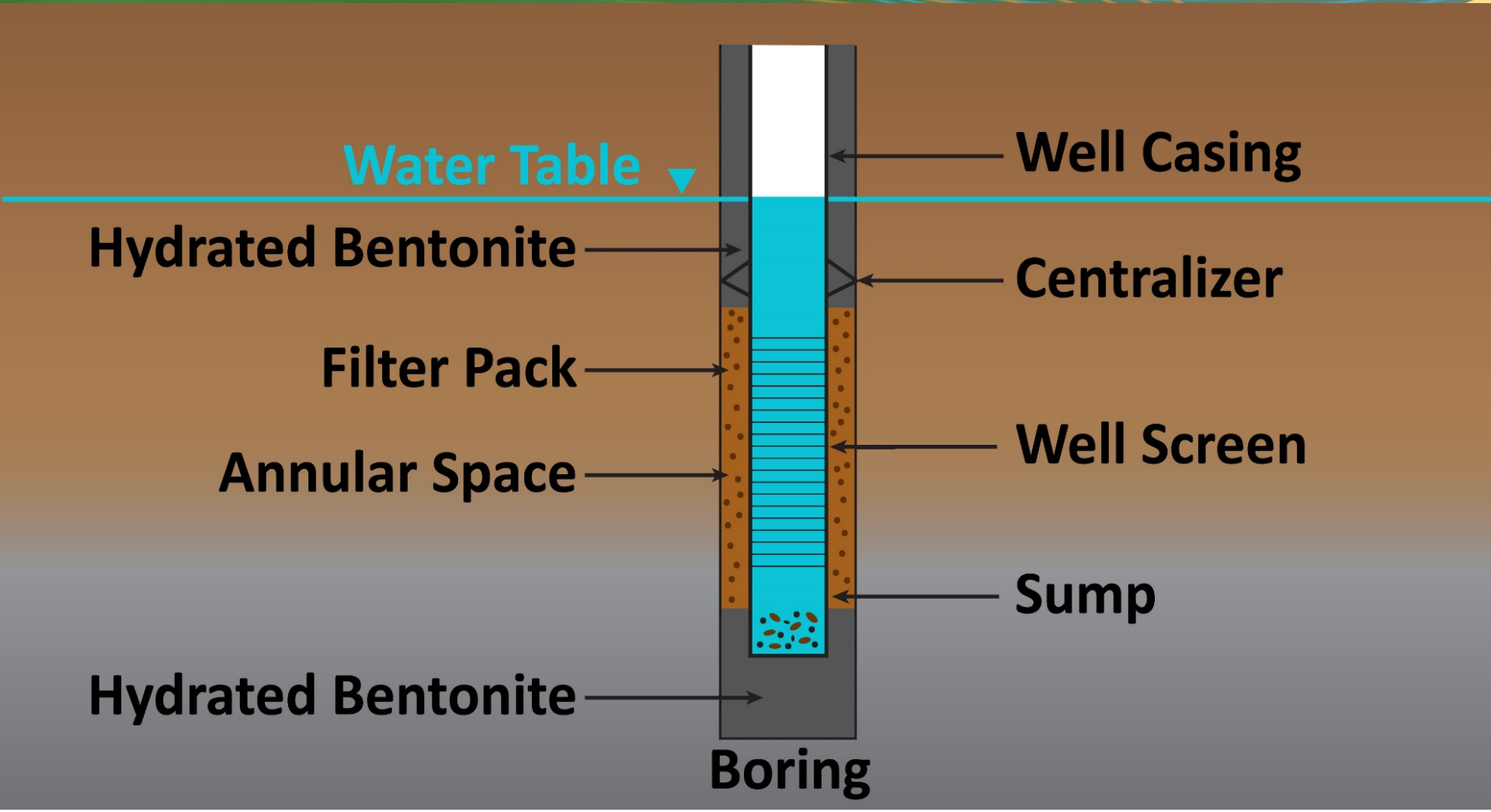
For these reasons, the strictest health and safety protocols are followed:

- Only essential personnel are allowed within the drill pad area
- Mandatory safety training (both general and site specific) before field work begins
- All personnel wear required Personal Protective Equipment
- Daily health and safety discussions
- Constant awareness of the situation and surroundings
- Oversight by health and safety professionals

Designing the Well

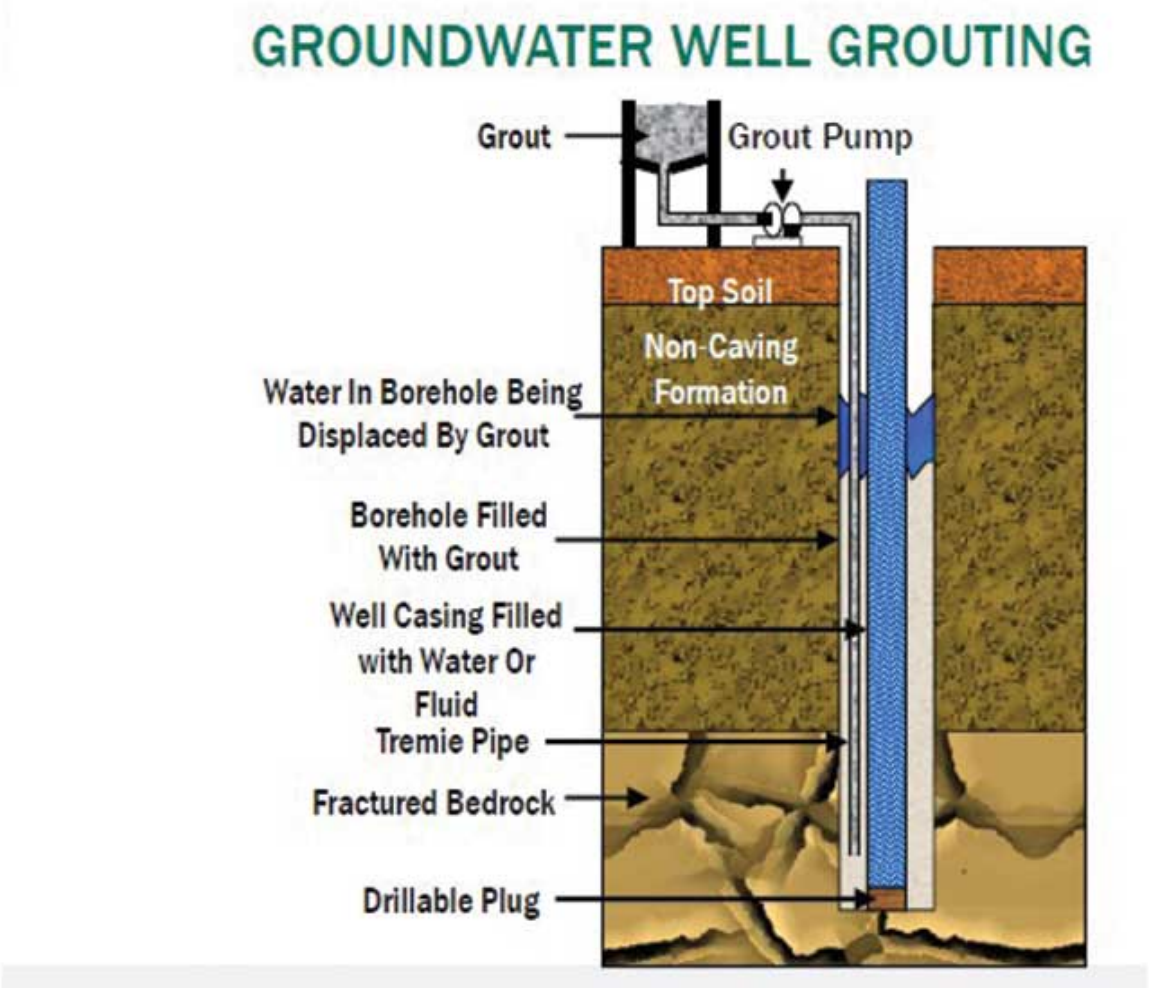


Well Installation

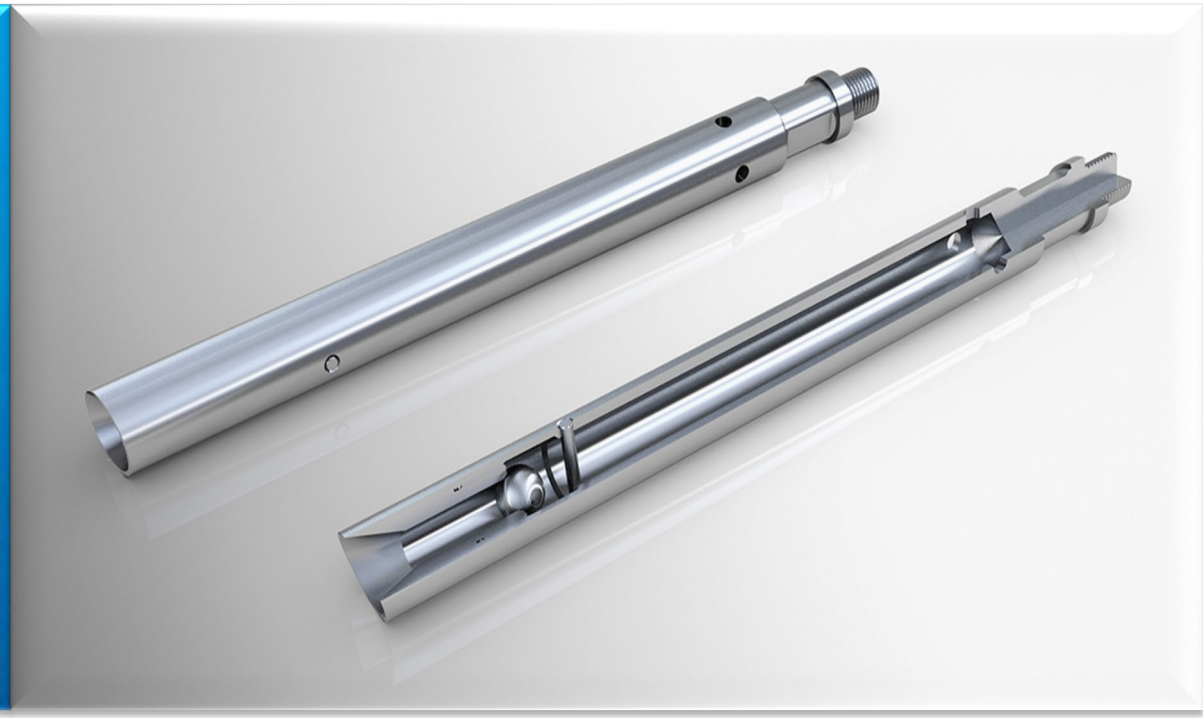


Filter Pack and Bentonite Pellets

Installing the Annular Materials

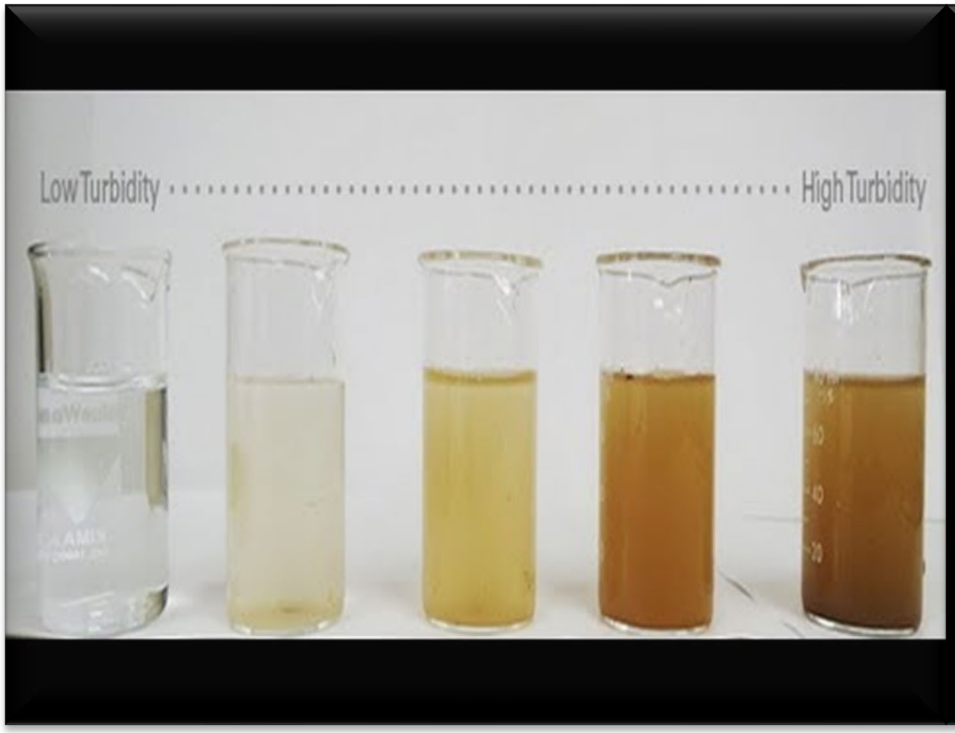


Well Development – Surge and Bail

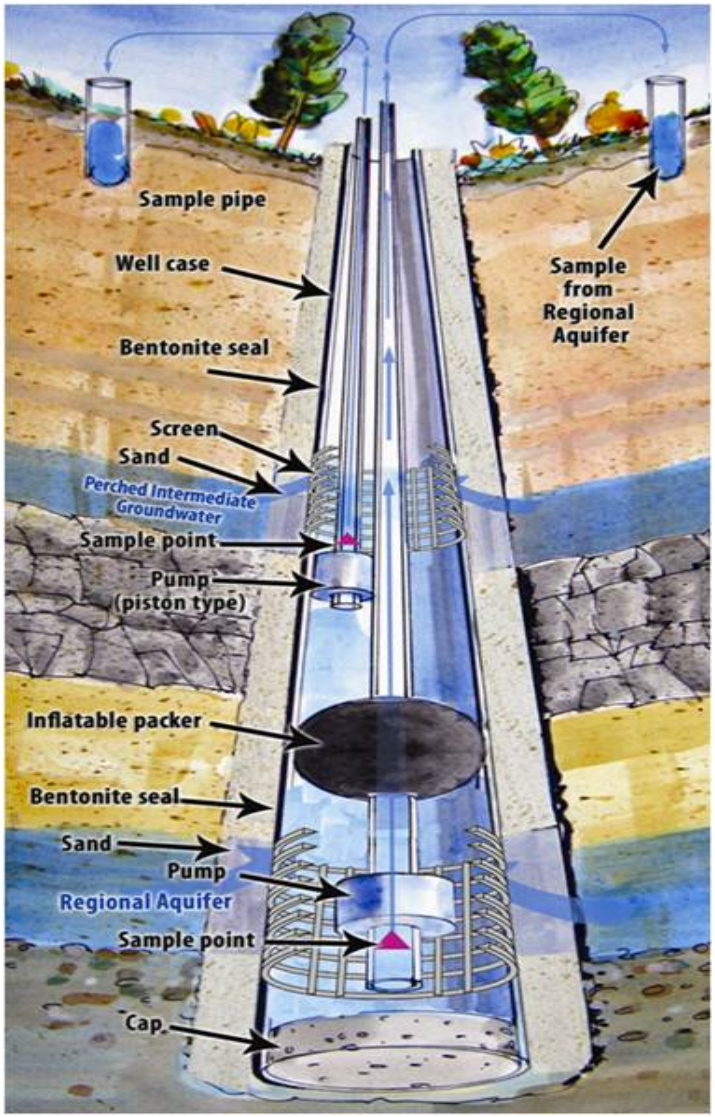


Well Development – Pumping

Turbidity Testing



Dual Screen Well



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Thank You!

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