



Lecture One



Formation Evaluation

Petroleum & Mining Engineering Collage

Reservoir Engineering Department / Third Year

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Introduction



What is Formation Evaluation?



Formation Evaluation is the application of scientific principles, engineering concepts and technological innovations in evaluate the characteristics of the subsurface reservoirs, such as determining the physical properties of rocks and their contained fluids.

What are the parameters that the manager, the geologist, the geophysicist, and the reservoir and production engineers need?



The Geophysicist

The Geologist

The Reservoir Engineer

The Production Engineer

The Manager

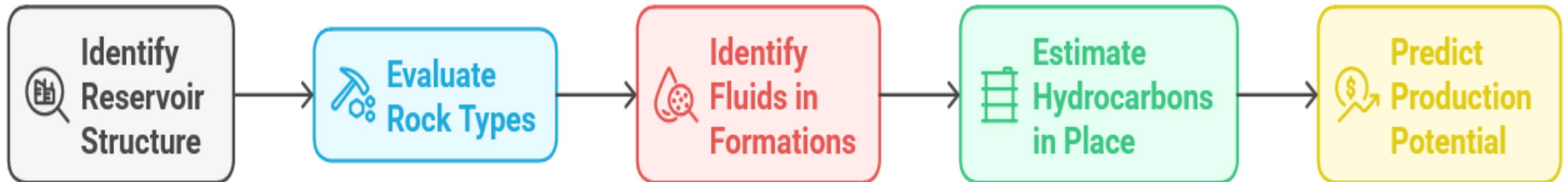
Formation- Evaluation Methods:



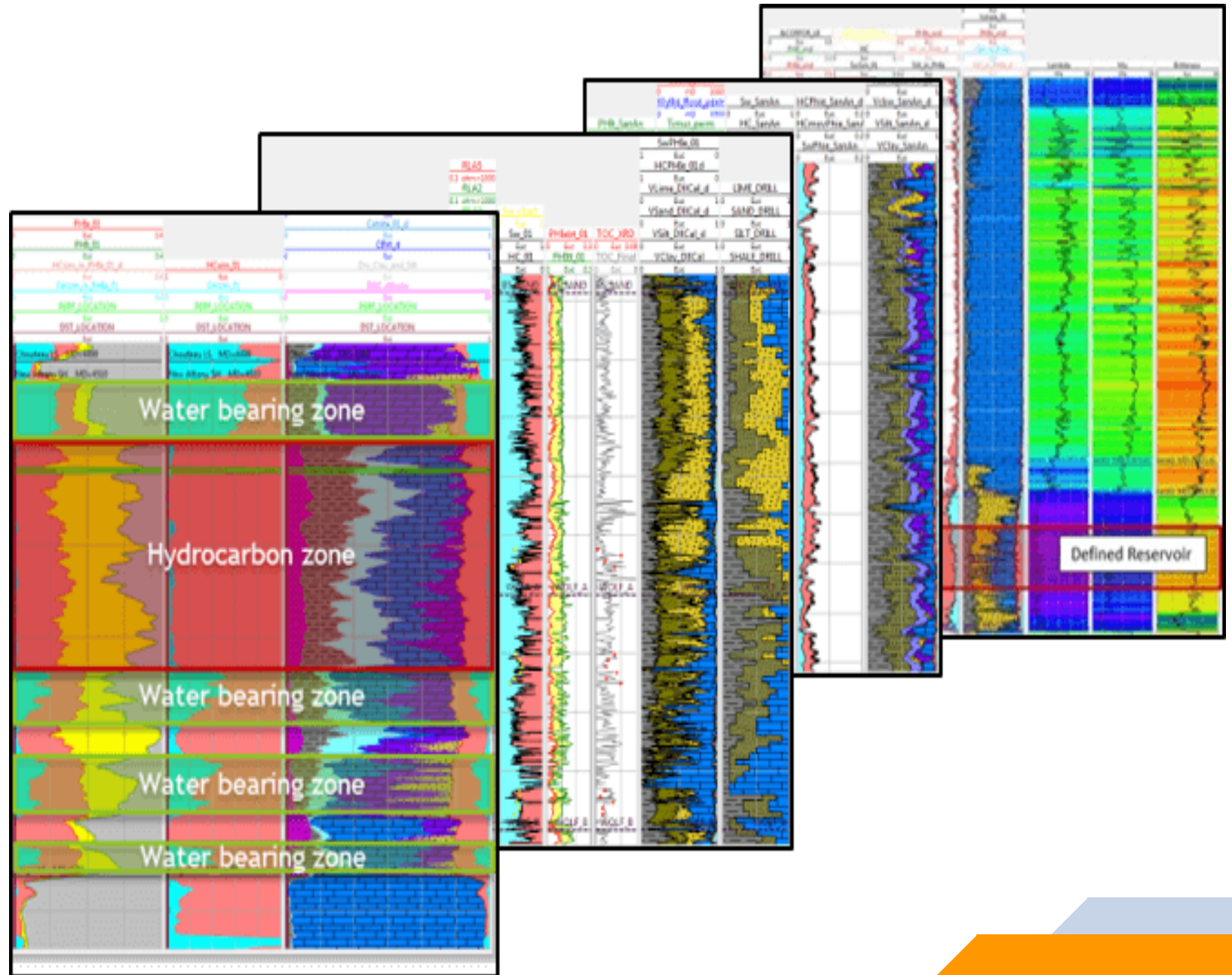
What are the Importance of Formation Evaluation?



Estimating Recoverable Hydrocarbons



Types and locations of fluids



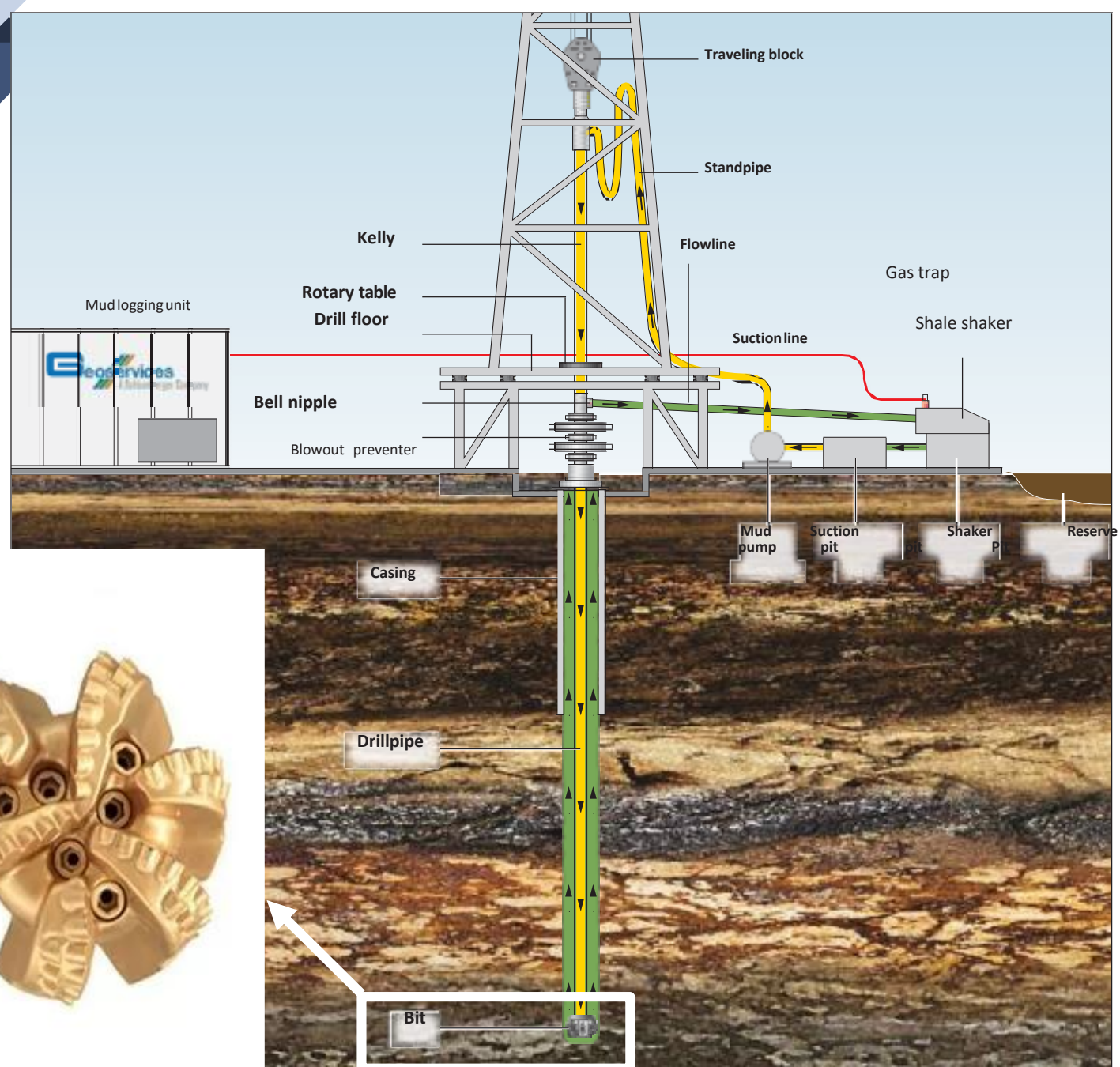
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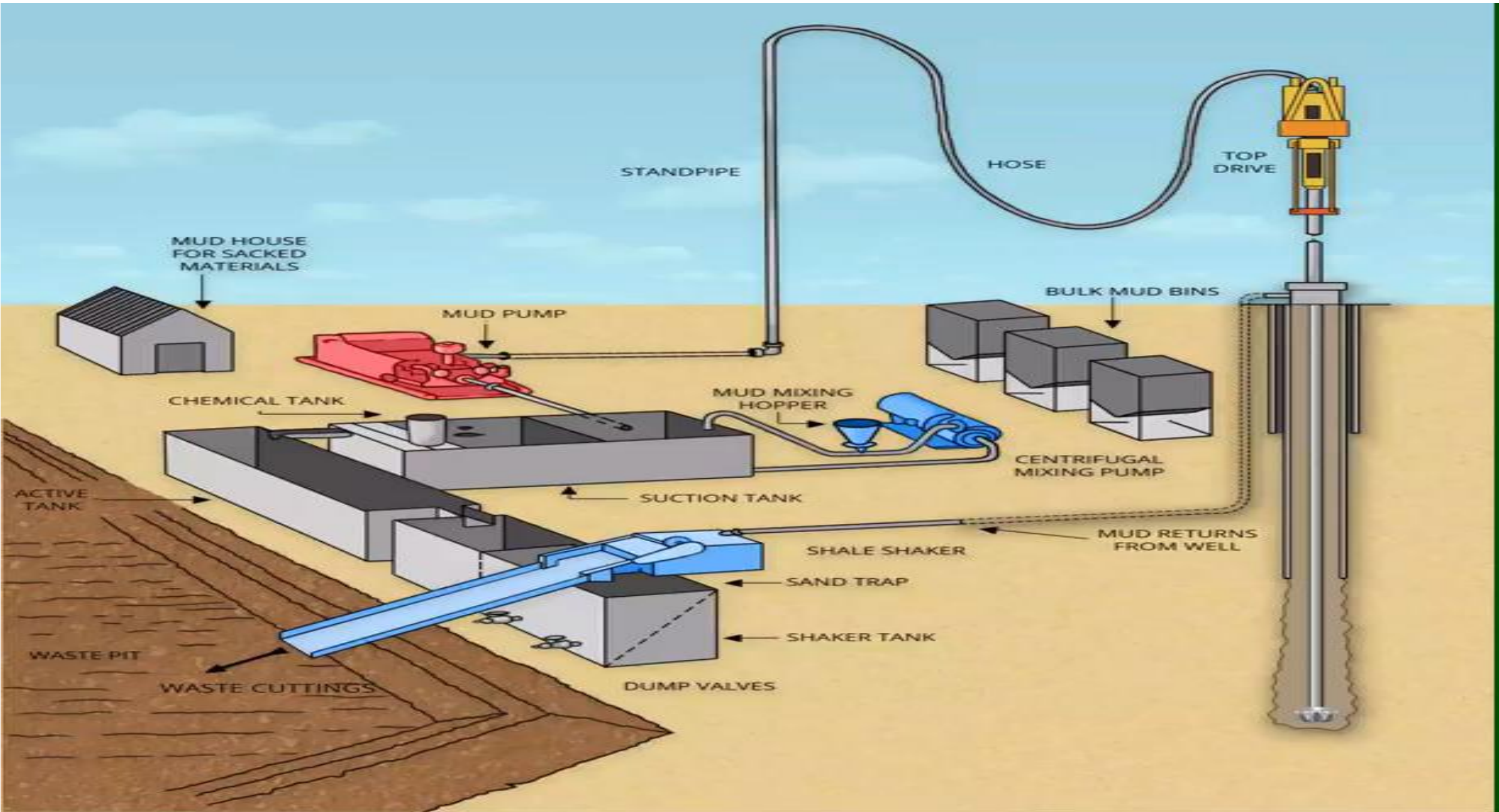
Mud Logging

Mud logging (Surface logging): *is the process of studying the general physical characteristics of rocks during the drilling operations to report information about the drilling and well construction process.*

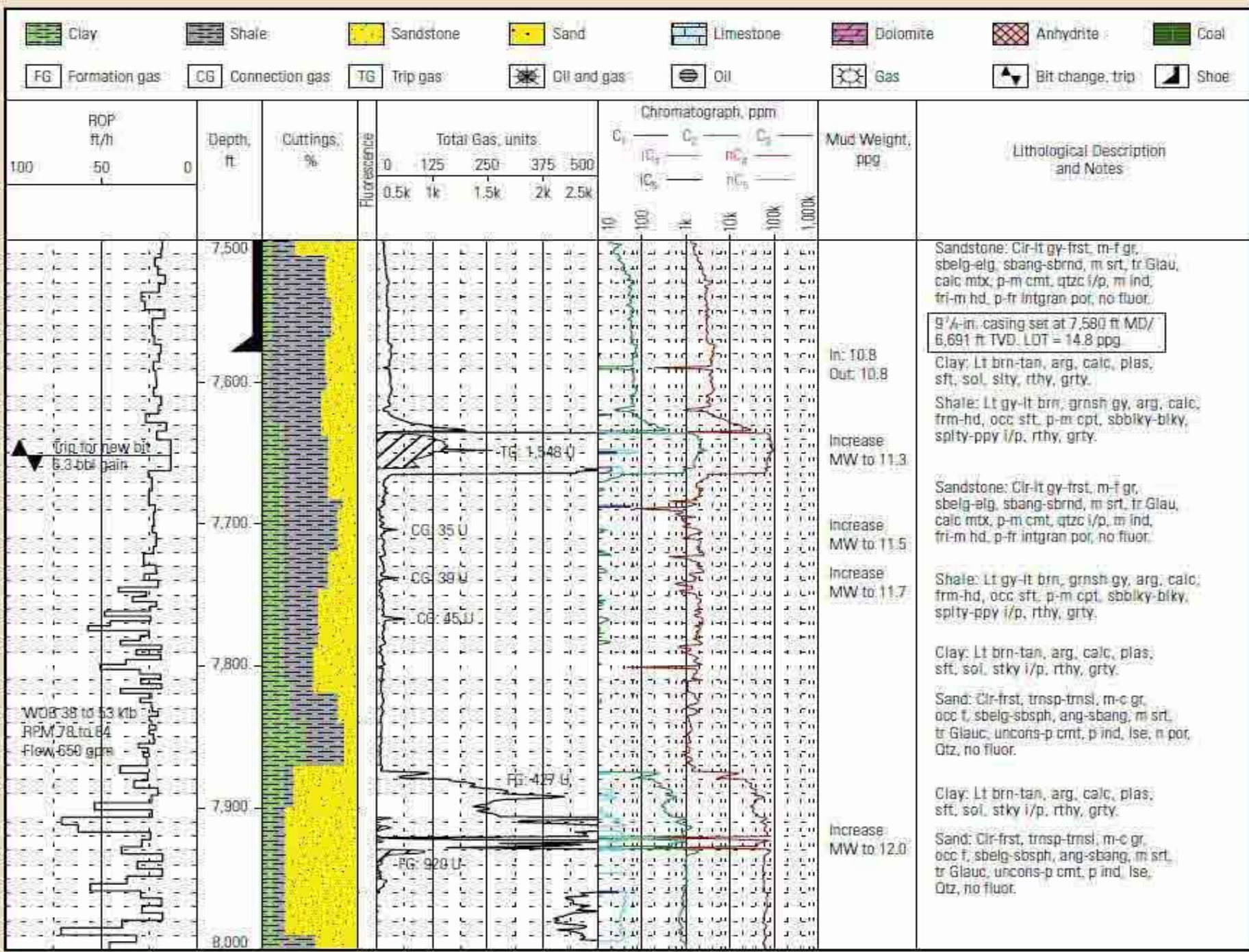
During the drilling operations, the fluid is continuously circulated down the inside of the drill pipe, through the bottom of bit and back up the annular space.














Fluid Drilling Mud

Drilling mud consists of a variety of clay and other materials (barite, hematite) in a fresh or saline aqueous solution.

Borehole muds classify into two groups, are *conductive and non-conductive*.

Current flow in conductive muds varies depending upon two factors: **the type of mud and the temperature**





The density of the mud is kept high enough so that *hydrostatic pressure in the mud column is always greater than formation pressure*.

When formation pressure is greater than the mud hydrostatic pressure the following may be seen:

- Large quantities of cavings (due to wellbore instability)
- Connection of gases
- Trip gases
- Fluid incursions to the mud system

Things to Interest by the Drilling Engineer

01

*Mud
Properties*

02

*Leakage (Loss) of
drilling mud*

03

*Rate of
Penetration*

04

*Weight on the
bit*

05

Mud system



Oil Drilling Engineer

What is the main information that the mud log gives vs. depth?



- Weight on bit and drill string rotation speed.
- Detection of gas and oil in the mud.
- Speed and pressure for mud pump.
- Identification of the lithology and formation type being drilled.
- Identification of porous/permeable zones (These information supports wireline log data).
- Detection of hydrogen sulfide (H₂S).
- Hydrocarbon staining on the cuttings.

