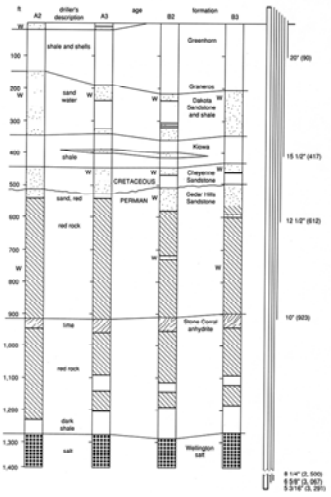
ES486 Petroleum Geology Lab Exercise **Drill Cuttings – Rock Identification – Lithologic Logs**
Part 1 – Rock Identification from Drill Cuttings

Introduction

Developed during the late 19th and early 20th century, mud rotary drilling is one of the main methods of well drilling for water and oil in areas that contain unconsolidated formations. In mud rotary drilling, fluid is pumped down the hollow drill pipe, called the kelly, and forced out of jets in the drill bit. That fluid then carries the cuttings, or cut materials, through the hole and up to the surface and the mud is reused either thru a mud containment system or pit. The cuttings will then settle in a pit. From there, mud will flow from another trench from the pit. A suction hose then re-pumps the mud back into the kelly and bit. After the kelly has drilled all the way down and disconnected, a joint of a 20' or 40' drill pipe is then used, starting the drilling process over again. As the joint drills deeper, more pipe is added until the hole is finished being drilled. Drilling fluids most commonly used contain clay additives, in the form of bentonite, or polymer based additives. Sometimes a combination of the two are used. This fluid also acts as a borehole stabilizer. It helps keep the structural integrity of the hole in place by forming what is known as a "wall cake." This added support allows for greater well depth.



Drill Cuttings Analysis (Mud Logging)

Cuttings provide the first opportunity and, in some wells, the only opportunity to actually look at the rock that has been drilled. Cuttings give the geologist information about the formation lithology needed for geologic correlation, the mineral composition for marker beds, input for the petrophysicist or log analyst, and, in some cases, enough hydrocarbon to allow some oil-quality measurements to be performed. Cuttings are also a source for microfossils used in biostratigraphy.

Samples of drilled cuttings are normally taken at the shaker screens, although some have proposed and tested devices for diverting a small stream of cuttings-laden mud from the return line. At predetermined depth or time intervals, the logger or sample catcher collects a composite sample that contains cuttings representative of the entire interval drilled since the previous collection. Very typically, cuttings samples will be taken every 30 ft (10 m), until target bed boundaries are approached, such as thin marker beds, anticipated reservoir sections, casing points, or coring points.

Lithologic Logs

As the well cuttings are retrieved at known depth intervals, the site geologist works with the drillers to properly catalog samples and create a log of rock types, stratigraphic trends, and related geologic information with depth, as the drilling stem is advanced.

The geologist's cuttings log should include an estimate of the percentage of each rock type, which is an assessment of what is actually seen in each individual sample, as well as an interpretation of the lithology, which is based on all the data available to the logger, including:

Rock type (with classification)	Color	Texture (grain size, roundness, sorting)
Cement and/or matrix material	Fossils	Sedimentary structures
Porosity and oil shows	Depth Interval	Sample Quality or Other Observations

Many special tests are run on rock samples to make on-the-spot determination of specific minerals. The sample should be viewed under ultraviolet (UV) light, and any fluorescence noted, as related to the presence of minerals or hydrocarbon.

Lab Exercise

The first step in analyzing drill logs is the basic identification of lithologies in cuttings, as retrieved from the bore hole. A set of drill cuttings ("rock chips") have been collected, washed, and cleaned in sample boxes available in the Geology Lab. Samples are identified with a number, and organized in wooden storage boxes. Your first task is to use binocular microscopes to systematically observe the samples, record your observations and determine rock type. Work in teams of two, and record your observations and results in the tables on pages 3-4.

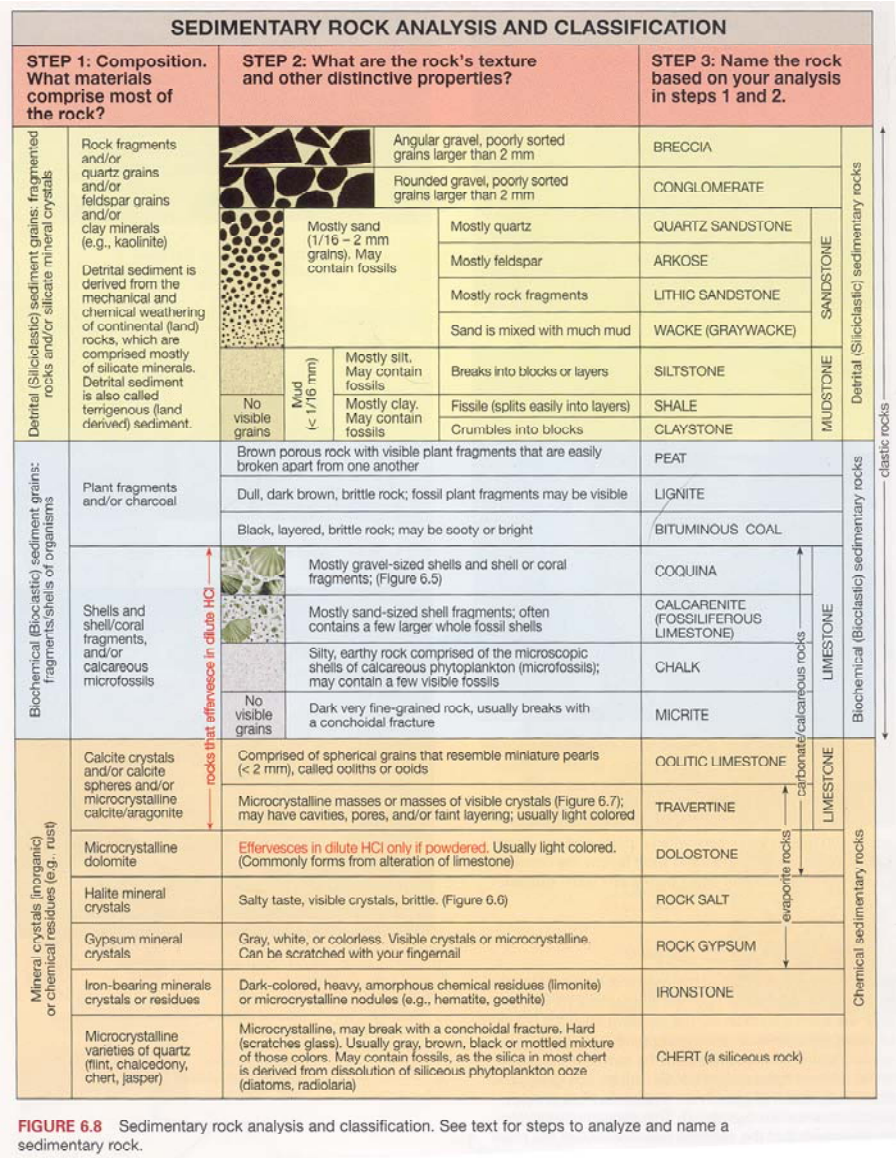


FIGURE 6.8 Sedimentary rock analysis and classification. See text for steps to analyze and name a sedimentary rock.

Sample No.	Color	Mineral Composition	Texture	Porosity	Cement	Acid Test	Other obs.	Rock Name
DC-15								
DC-38								
DC-44								
DC-61								
DC-71								
DC-73								
DC-74								
DC-87								
DC-89								
DC-90								
DC-93								
DC-97								
DC-98								
DC-115								
DC-121								
DC-132								
DC-146								
DC-164								
DC-166								
DC-168								
DC-184								

Sample No.	Color	Mineral Composition	Texture	Porosity	Cement	Acid Test	Other obs.	Rock Name
DC-188	____	_____	_____	_____	_____	____	_____	_____
DC-197	____	_____	_____	_____	_____	____	_____	_____
DC-256	____	_____	_____	_____	_____	____	_____	_____
DC-262	____	_____	_____	_____	_____	____	_____	_____
DC-264	____	_____	_____	_____	_____	____	_____	_____
DC-266	____	_____	_____	_____	_____	____	_____	_____
DC-304	____	_____	_____	_____	_____	____	_____	_____
DC-305	____	_____	_____	_____	_____	____	_____	_____
DC-314	____	_____	_____	_____	_____	____	_____	_____
DC-315	____	_____	_____	_____	_____	____	_____	_____
DC-320	____	_____	_____	_____	_____	____	_____	_____
DC-343	____	_____	_____	_____	_____	____	_____	_____
DC-999	____	_____	_____	_____	_____	____	_____	_____
DC-1000	____	_____	_____	_____	_____	____	_____	_____
DC-1001	____	_____	_____	_____	_____	____	_____	_____
DC-1002	____	_____	_____	_____	_____	____	_____	_____
DC-1003	____	_____	_____	_____	_____	____	_____	_____
DC-1004	____	_____	_____	_____	_____	____	_____	_____
DC-	____	_____	_____	_____	_____	____	_____	_____
DC-	____	_____	_____	_____	_____	____	_____	_____
DC-	____	_____	_____	_____	_____	____	_____	_____
DC-	____	_____	_____	_____	_____	____	_____	_____