

Project 3: Well Log

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Contents

1	Formal Memo	3
2	Figures of Well Logs and Stratigraphic Column	5
3	Extra Credit	26

1 Formal Memo

Western Exploration and Production (WEP) has been contracted by Mom & Pop Energy to determine the productive interval in the Boonsville Field and advise them on whether they can proceed to drill the area based on the given well log data sets of wells BY11, BY7, BY18D, BY10 and BY13.

In general, well logs assist us in interpreting what's in the subsurface. Therefore, they are widely used in the oil and gas industry. For example, a lot of offset wells data were required in order to assess the presence of the hydrocarbon in the area before we want to drill a new well.

To assess the presence of hydrocarbon, few logs were utilized in order to know the formation properties in the subsurface. For this goal, we had use gamma ray (GR) logs, spontaneous potential (SP) logs and resistivity logs.

1. Gamma ray logs

This log will assist us in determining the organic content i.e. shale in the formation. Usually, high shale content means that the probability of oil to flow in the rock is low since shale usually have low permeability. Low shale content means we will have a higher chance in finding oil in that area since it is a clean sand with no presence of oil

2. Spontaneous potential logs

This log helps us in identifying the permeable layers of the rock. When we ran the SP tool through a shale formation, the SP will measure the shale baseline. Therefore, any deviation from the shale baseline, either positive or negative, can be interpreted as permeable layer.

3. Resistivity logs

This log will measure the resistivity of the formation. We will focus on the deep and medium resistivity since short resistivity values could be affected by the drilling fluid and its filtrate.

4. Porosity logs

This log will measure the porosity of the formation. Porosity correlates to how much the storage capacity of the rock to hold hydrocarbon in it.

The sand intervals can be found in the attached stratigraphy columns shown in "Figures of Well Logs and Stratigraphic Column" section. In determining the sand intervals, we analyze the GR,SP and resistivity logs. Therefore, the sand interval that we created in our stratigraphic columns are permeable sand and contain possible hydrocarbon. If the interval is impermeable, we will rule out the interval from the producing interval as it will impede with the production phase of the well. Also, some of the sands that we have identified are sometimes layered with shale but due to the presence of hydrocarbon in that interval, we

decided to consider them as a producing interval. We will still consider the interval with relatively low shale volume as the producing sand interval since our benchmark in determining sand is based on the permeability of the formation and the hydrocarbon presence not the shale content of the formation. Some of the formations that have sand as it major lithology is Caddo, Vineyard, Jasper Creek and Runaway formations.

To determine the sand intervals that contain hydrocarbon, we utilized two logs such as the resistivity log and porosity log. We used deep and medium resistivity logs and cross-check them with porosity log for further clarification. The deep/medium resistivity log measures the formation resistivity while the porosity log gives insight on how porous the formation is. As what have been mentioned before, we were not using the short resistivity since the presence of drilling fluid and its filtrate will skew the value of the resistivity. For porosity log, the higher the porosity, the higher the capacity of the rock to store the oil. All of our sand interval that contains hydrocarbon have been cross-check with the porosity logs to ensure that they will have a fairly good values of porosity averages around 10%-30%. The producing sand intervals (saturated with hydrocarbon) can be examined in the "Figures of Well Logs and Stratigraphic Column" section.

Based of the resistivity logs and stratigraphy columns, the formations that will have high probability of oil-in-place will be Caddo, Vineyard, Jasper Creek and Runaway formations. All of these formations were saturated with oil since they have a high medium/deep resistivity. On top of that, most of the formations stated have permeable surface, which means we will not be facing any challenges when we start to produce from them. Furthermore, most of these formations major lithology is sandstone. Therefore, the possibility of the formation to store oil is high since sandstone is a well-known reservoir rock in the oil and gas industry. Hence, we are suggesting Mom & Pop Energy to proceed with the drilling operation since we believed that the presence of large volume of oil in place in those formations will yield a better rate of investment (ROI) and net present value (NPV) to the company. Also, based of Figure 6, there are many pipelines that have been built in the surrounding areas, therefore we believe that this will make it easy for Mom & Pop to connect the newly-drilled well with the existing pipelines for further processing in the central processing facility before going to sales line.

2 Figures of Well Logs and Stratigraphic Column

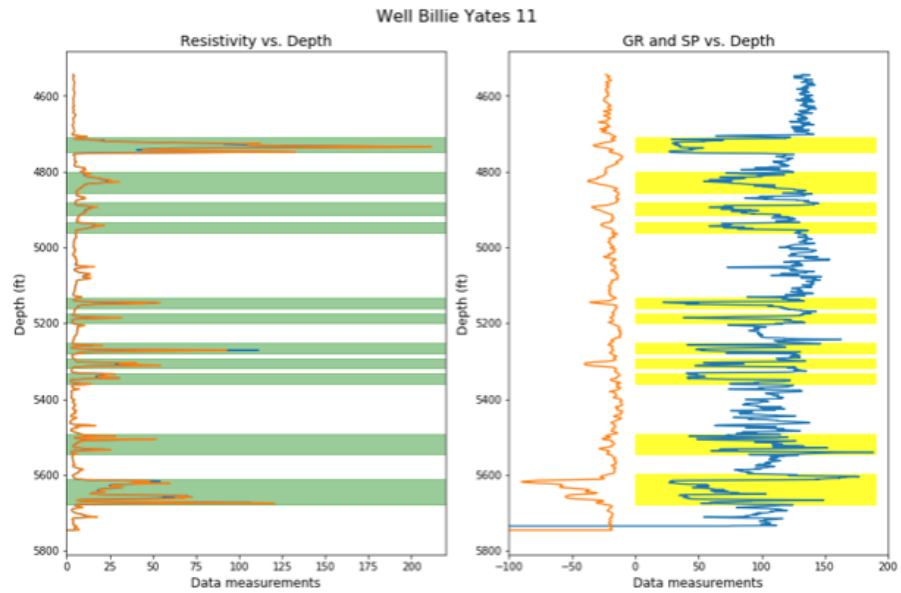


Figure 1: Hydrocarbon and clean sand determination for BY11.

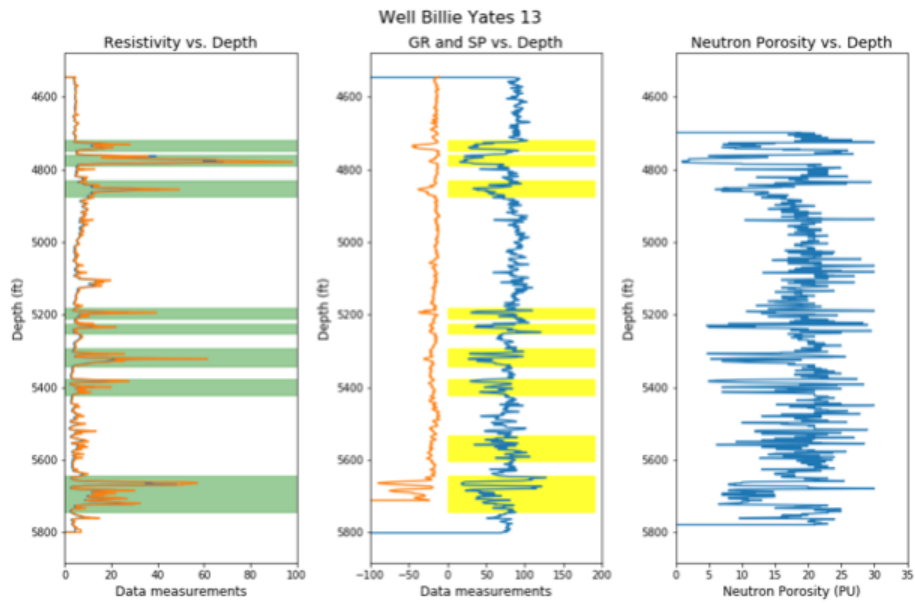


Figure 2: Hydrocarbon and clean sand determination for BY13.

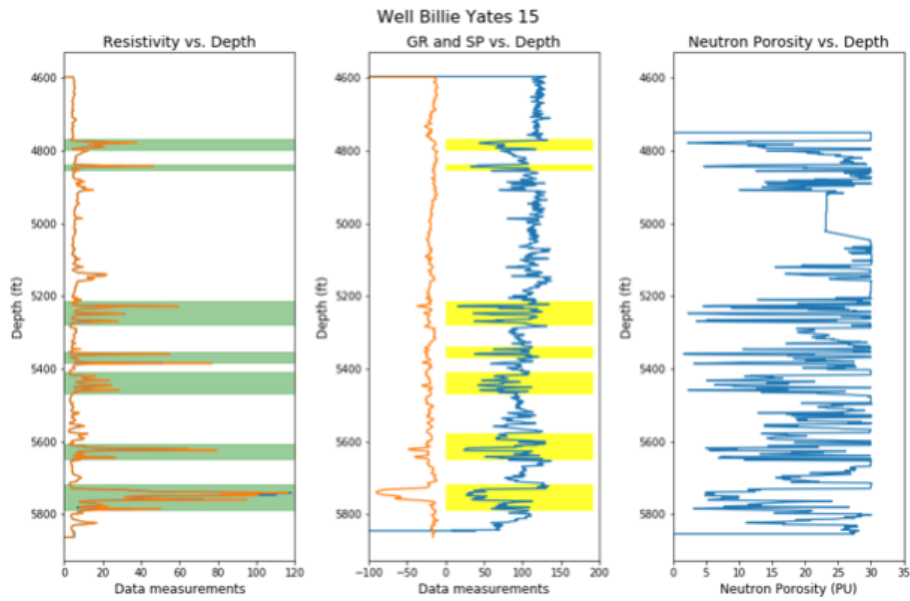


Figure 3: Hydrocarbon and clean sand determination for BY15.

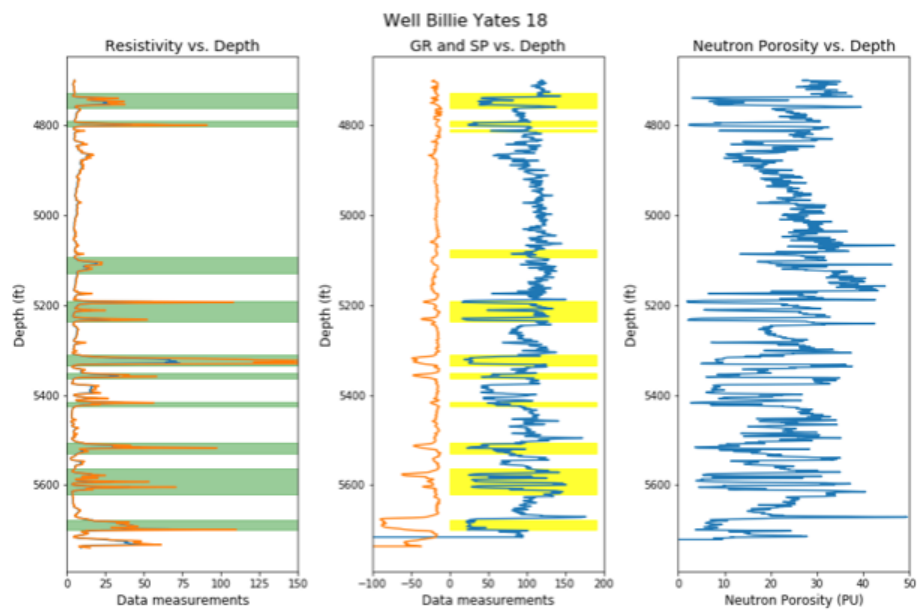


Figure 4: Hydrocarbon and clean sand determination for BY18.

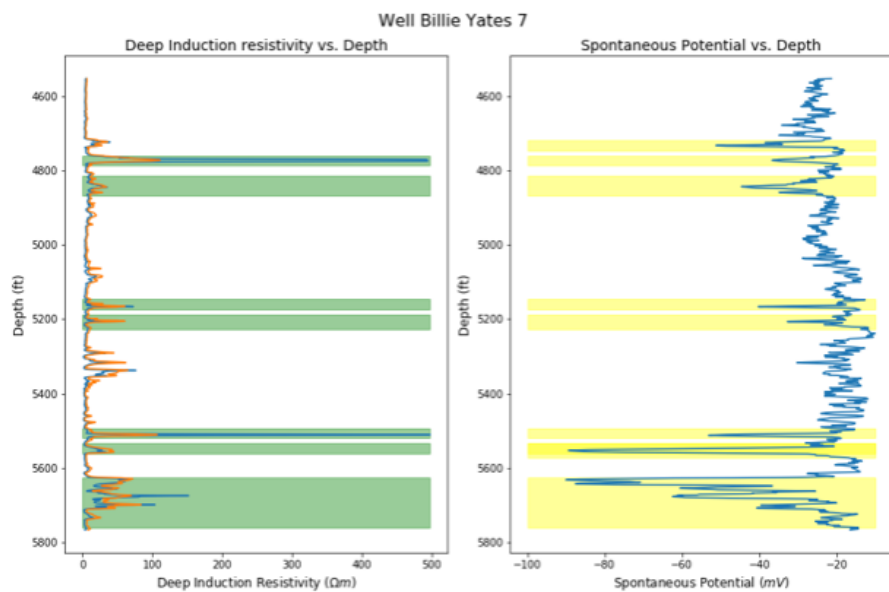
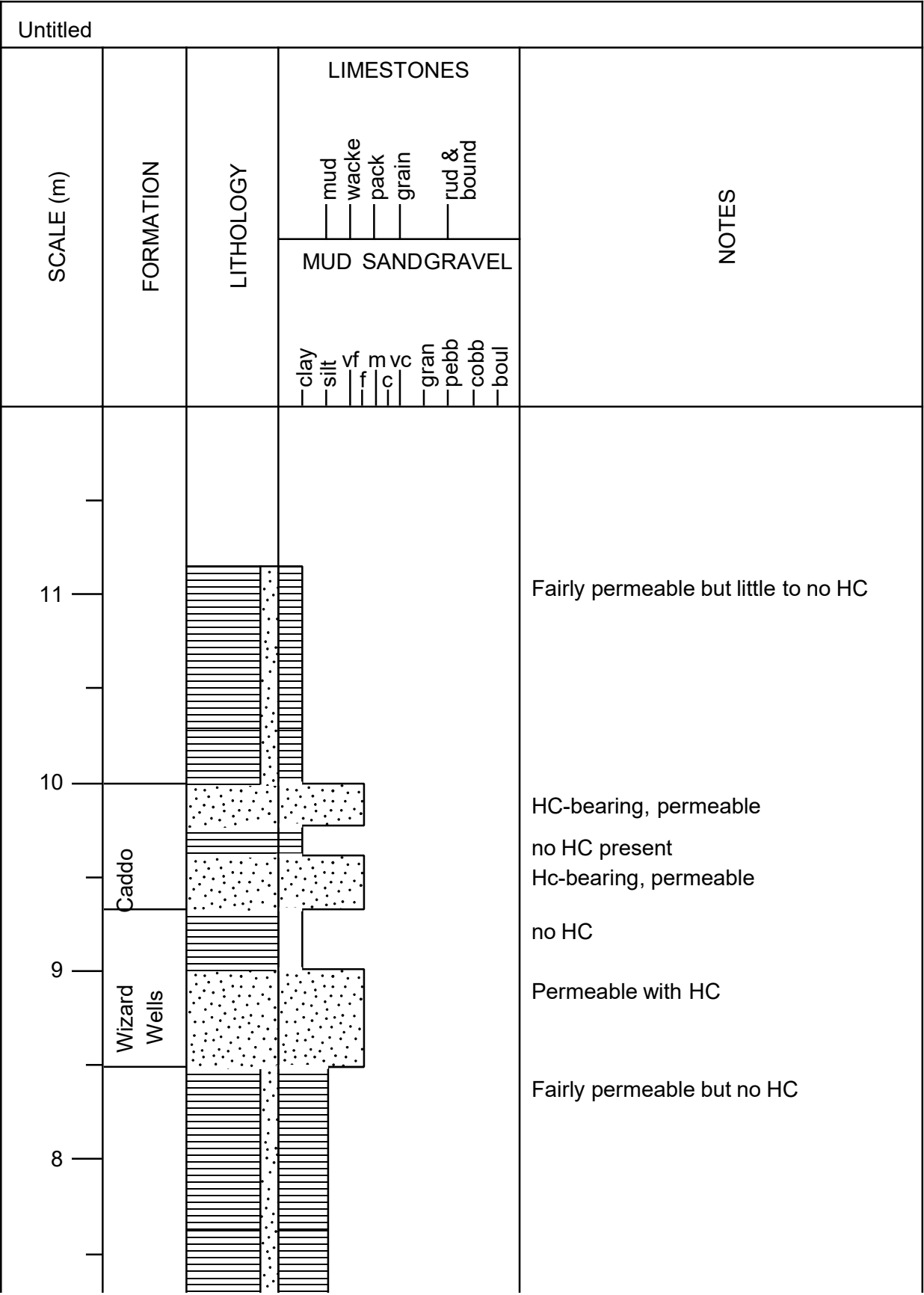
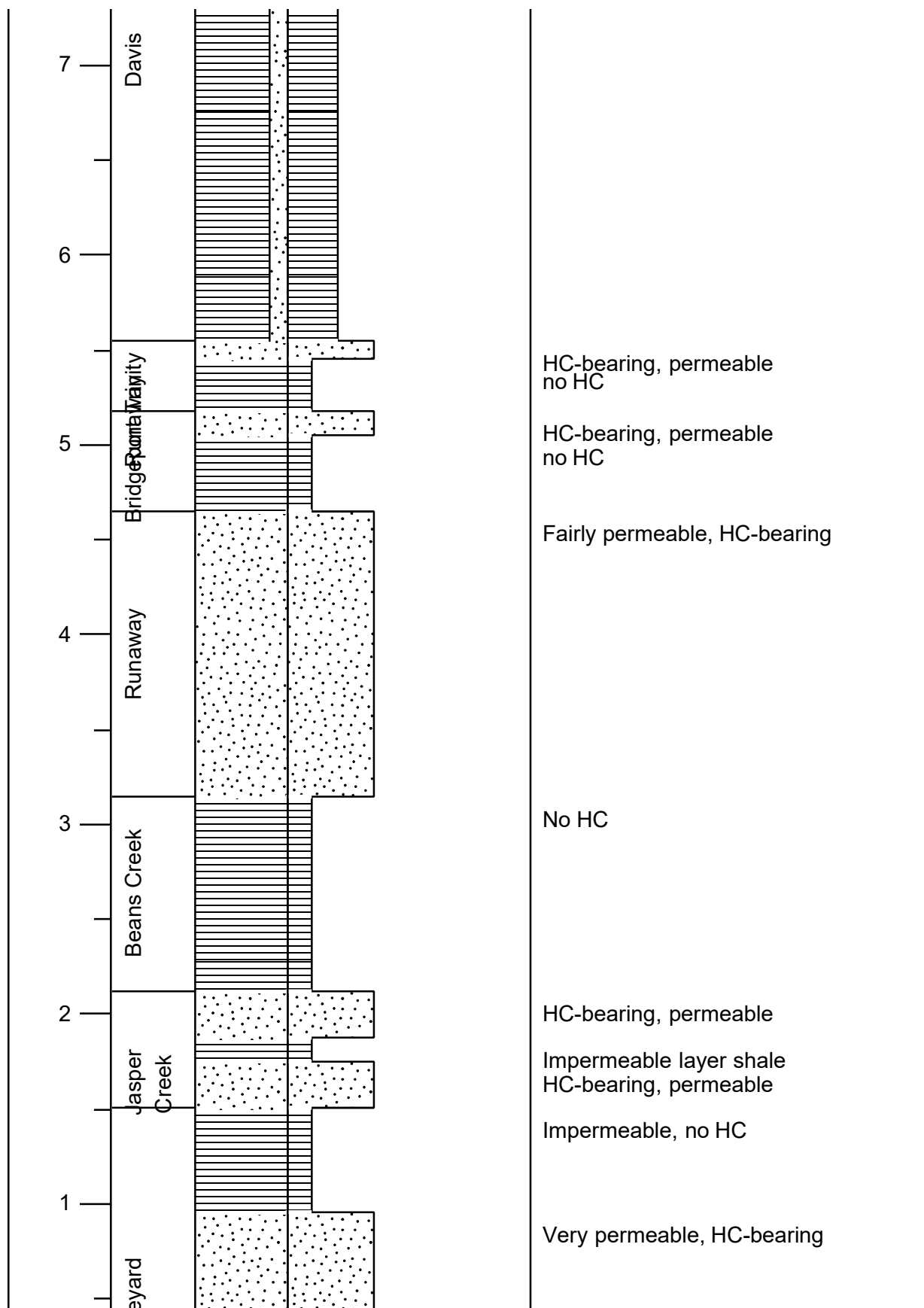


Figure 5: Hydrocarbon and clean sand determination for BY7.

BY7 well stratigraphy column

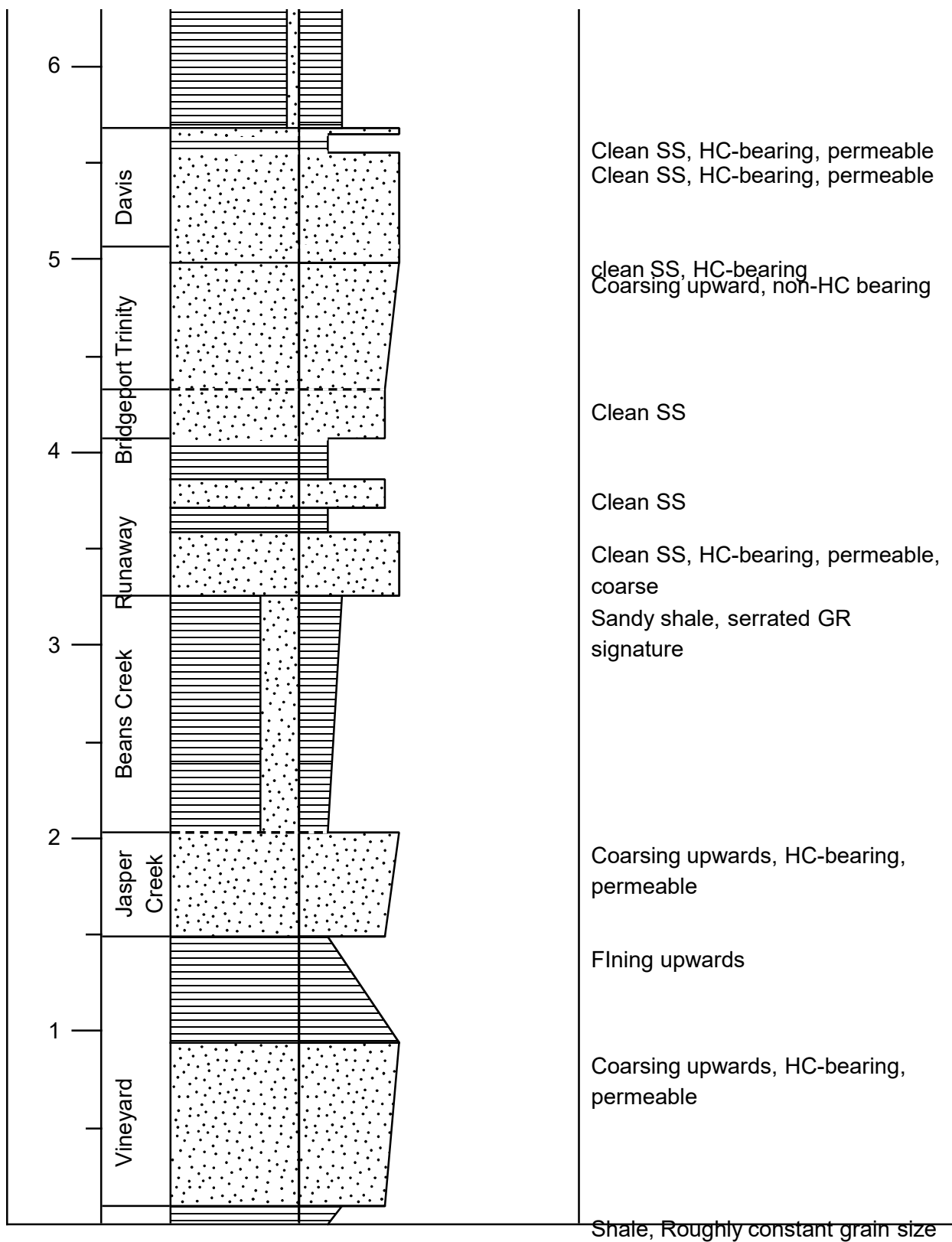




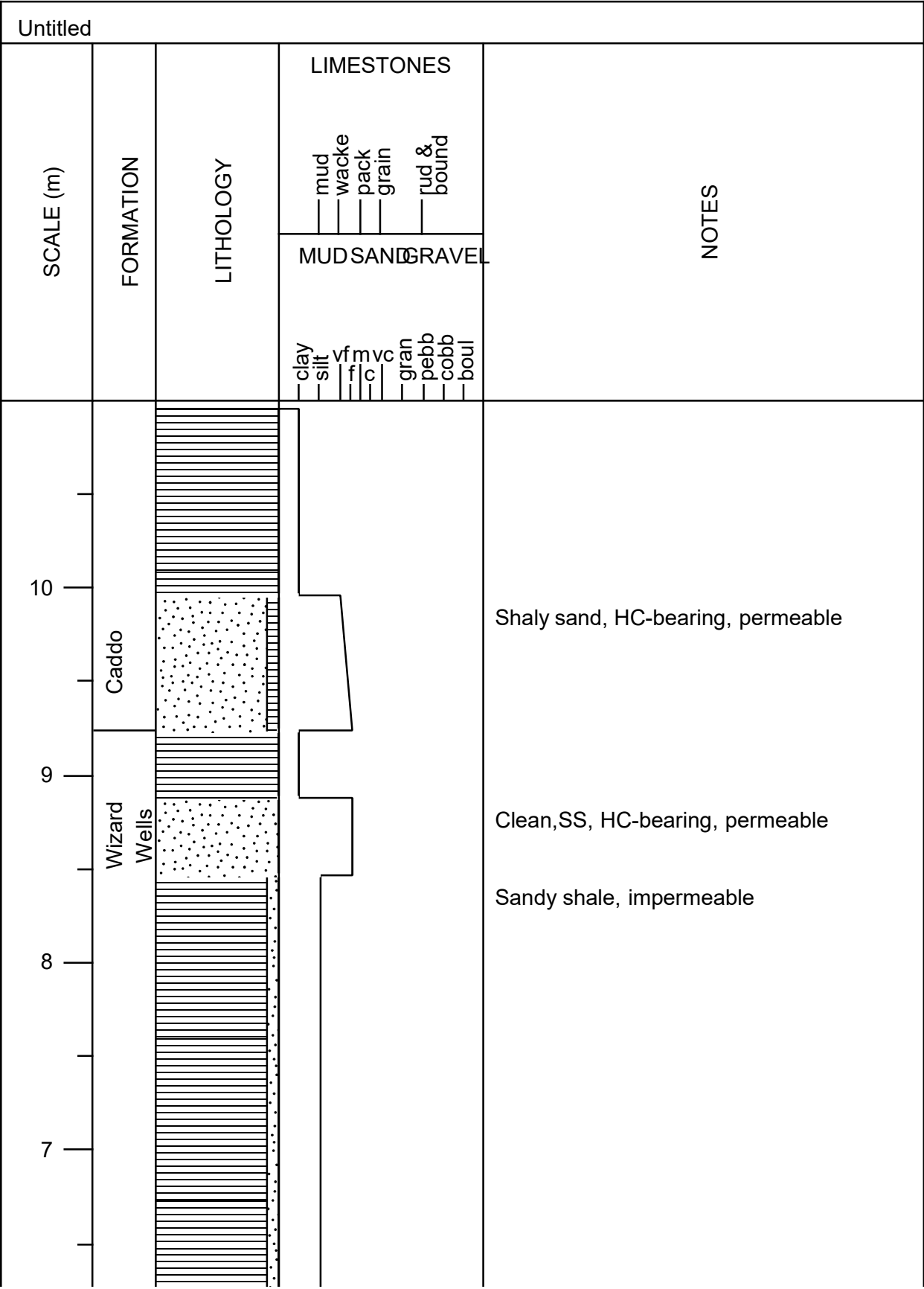
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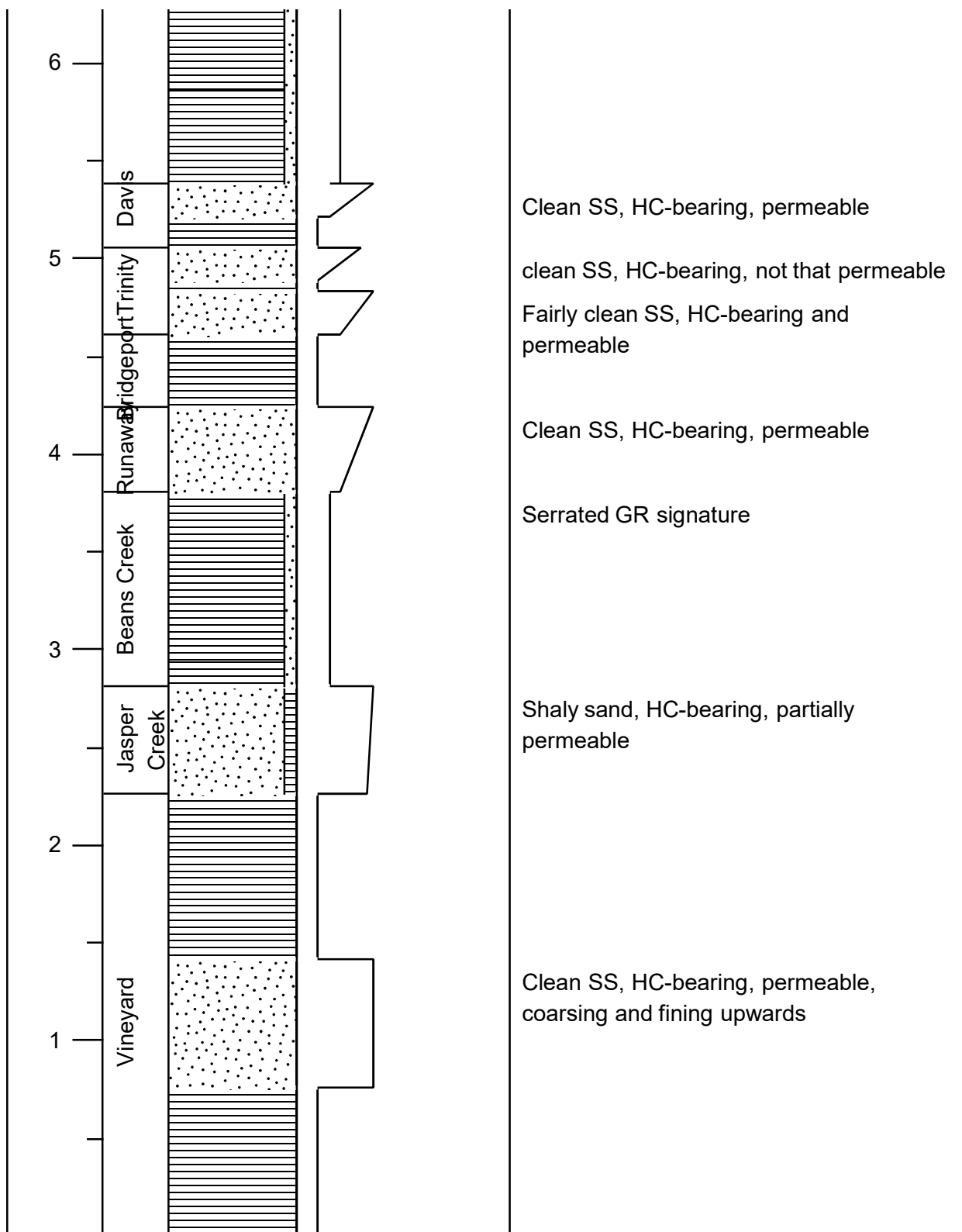
BY11 well stratigraphy column

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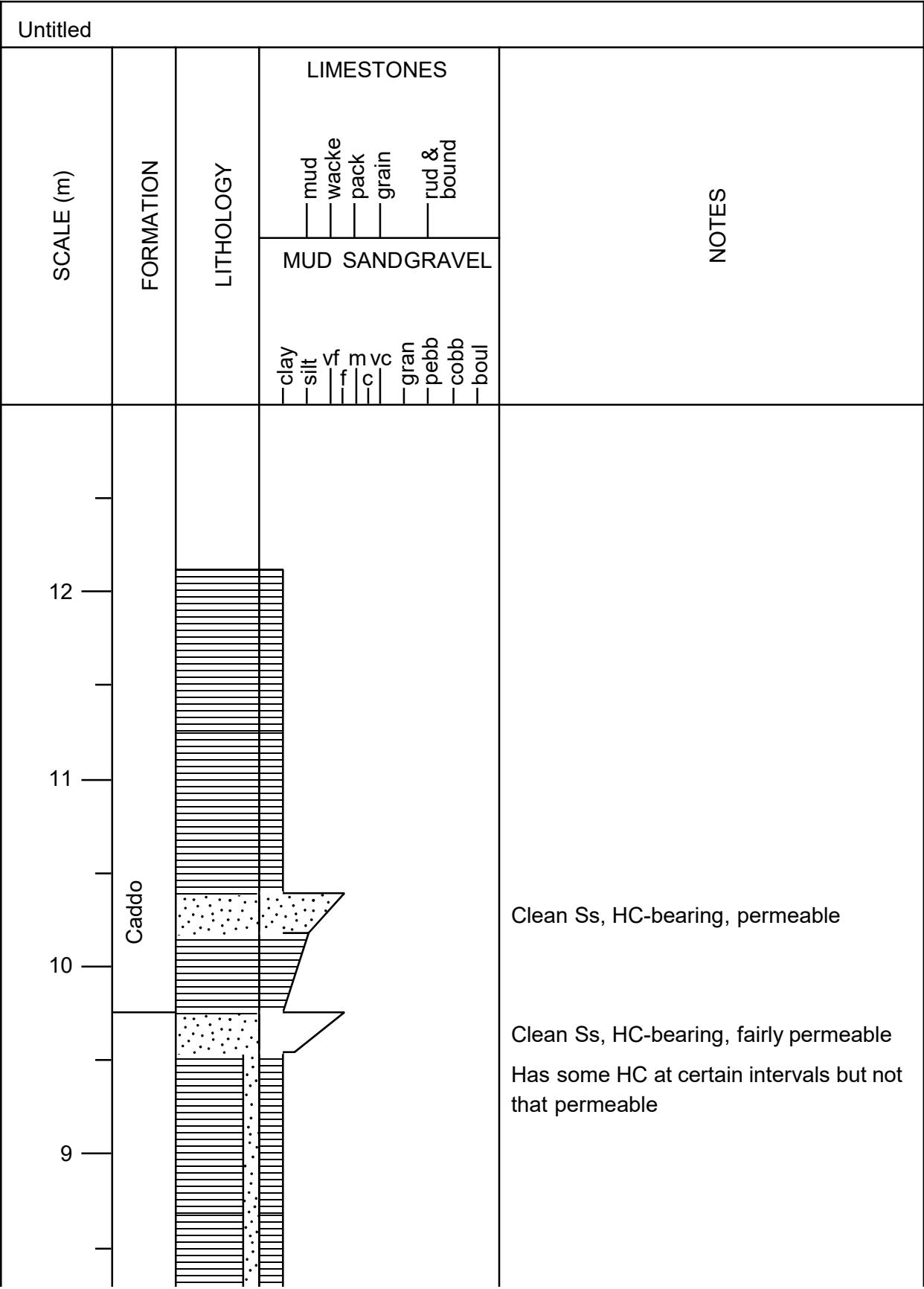


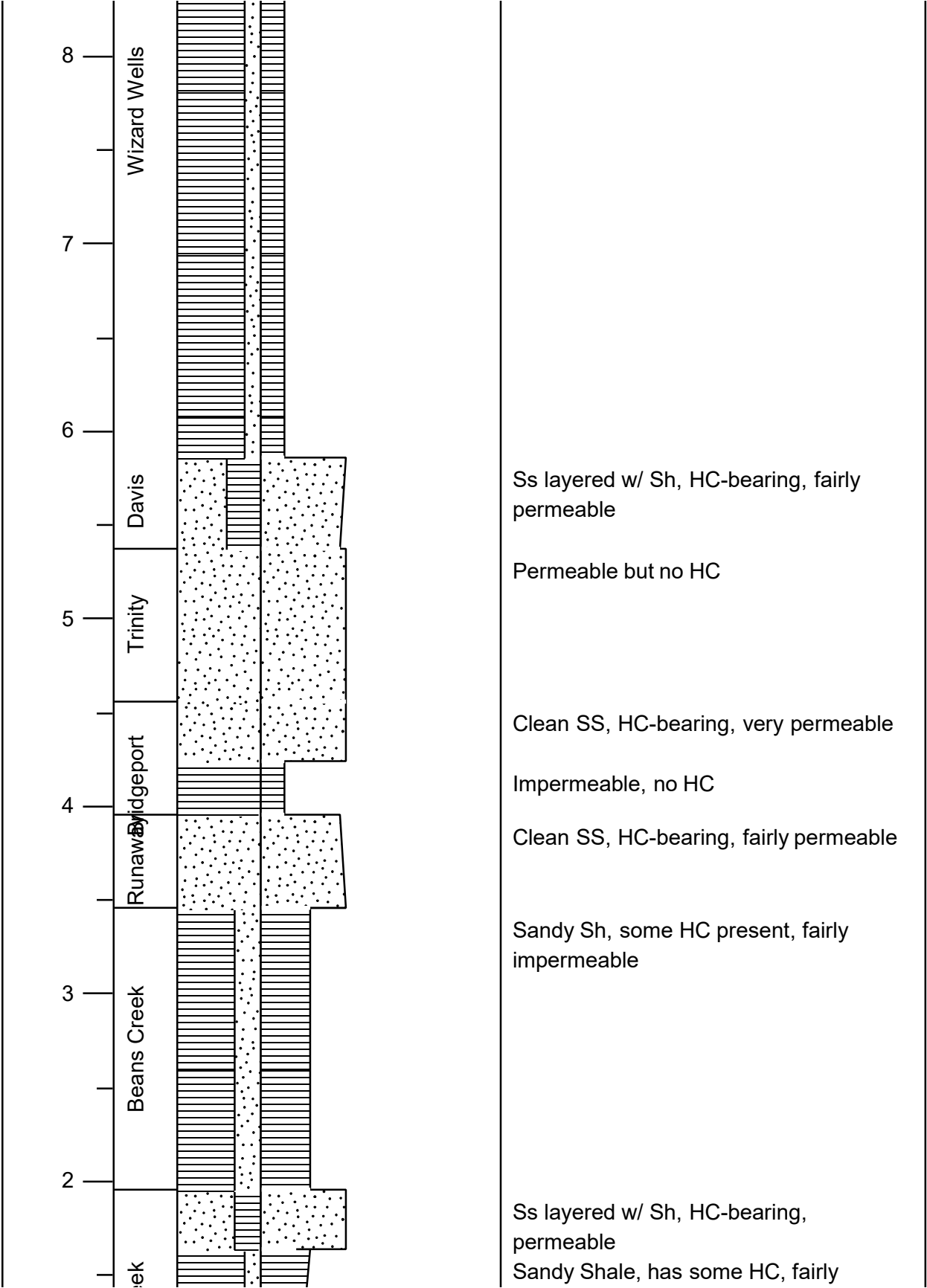
BY13 well stratigraphy column

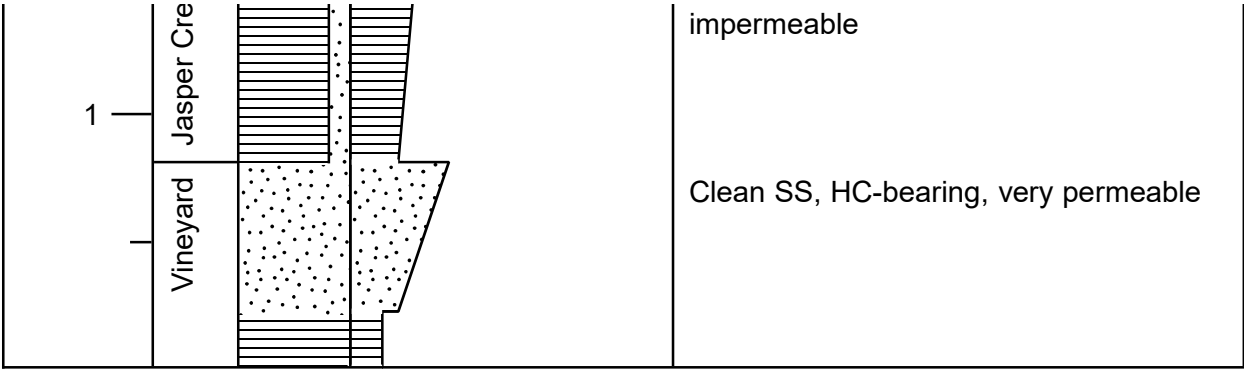




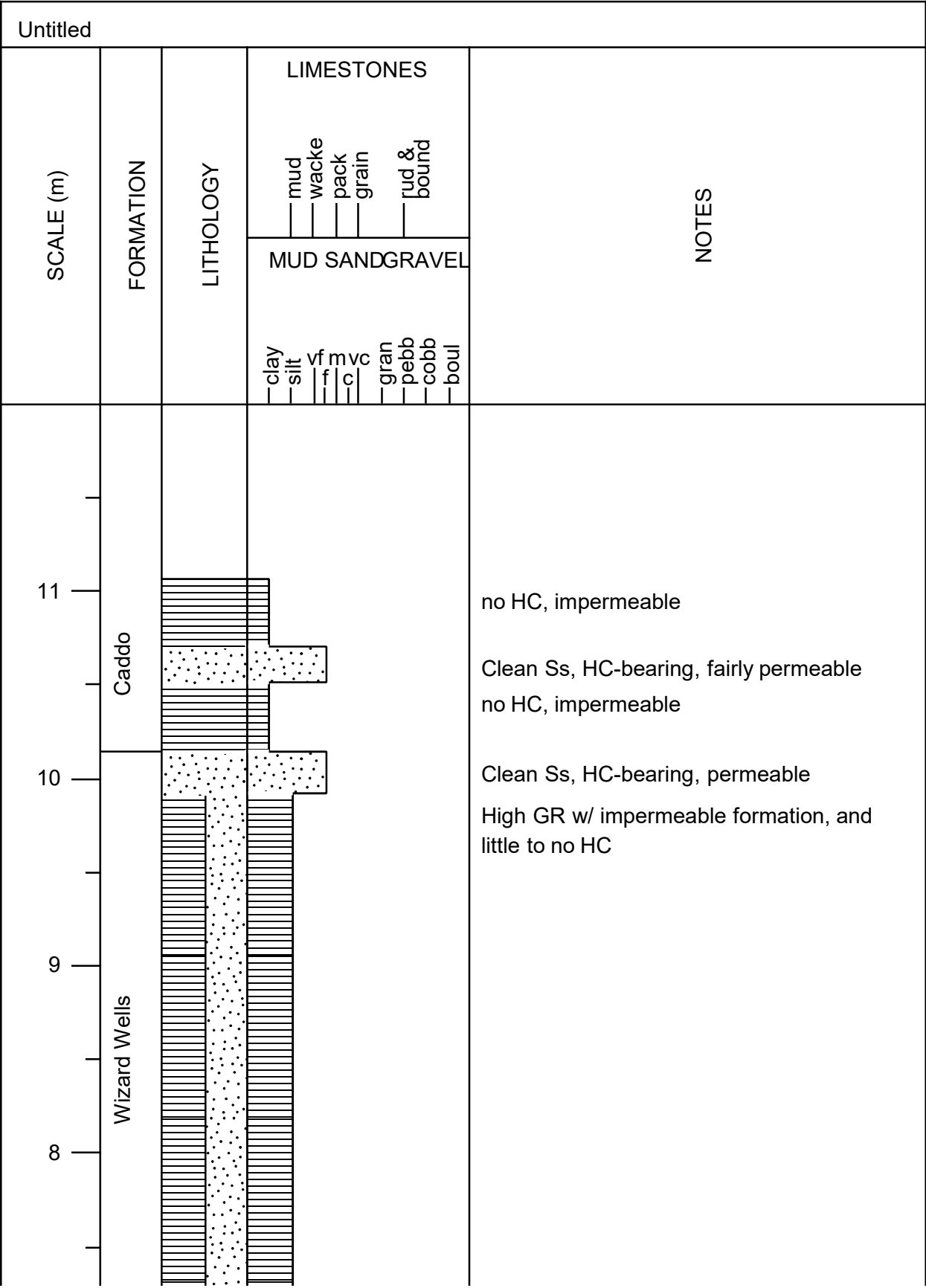
BY15 well stratigraphy column

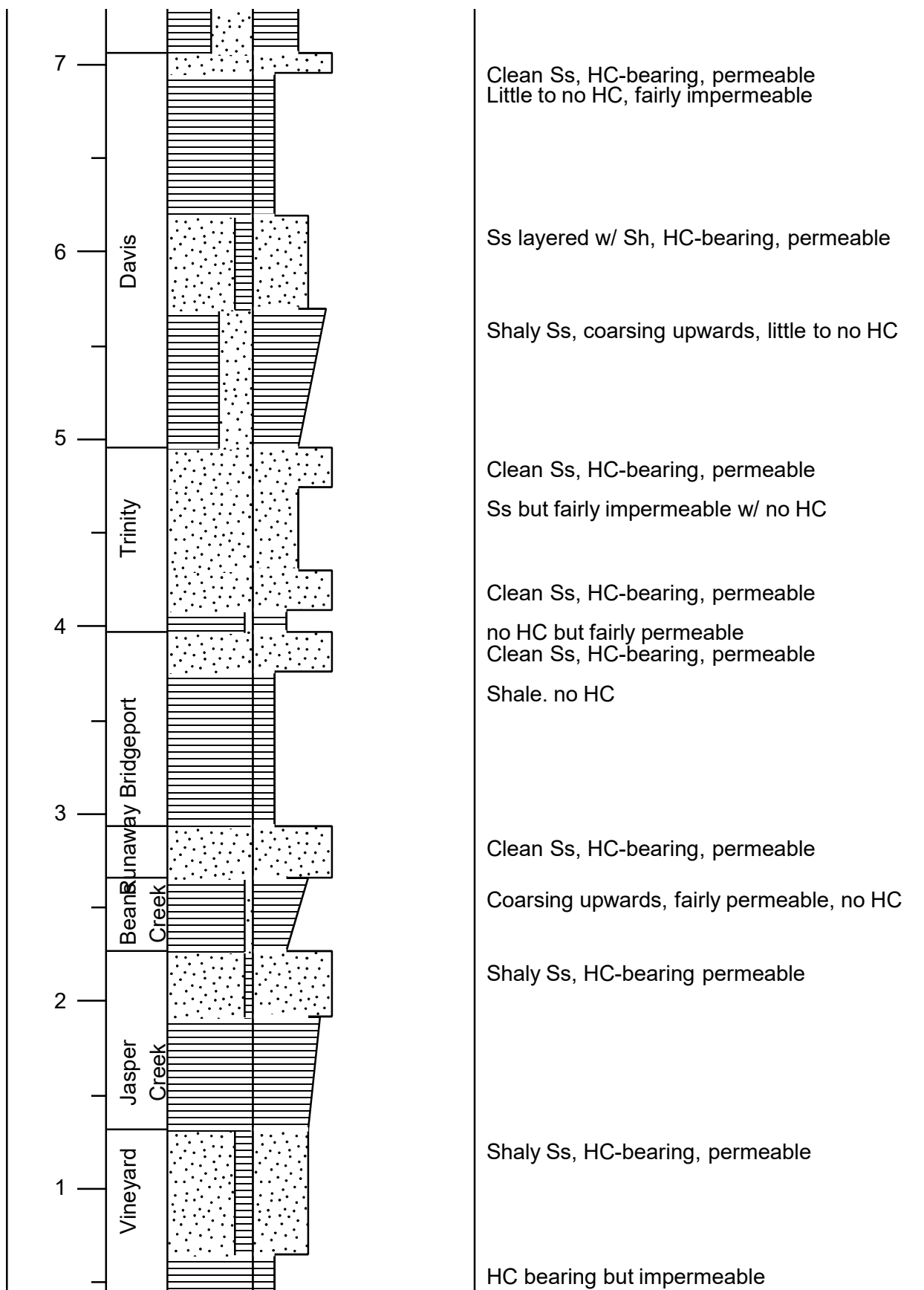






BY18 well stratigraphy column





3 Extra Credit

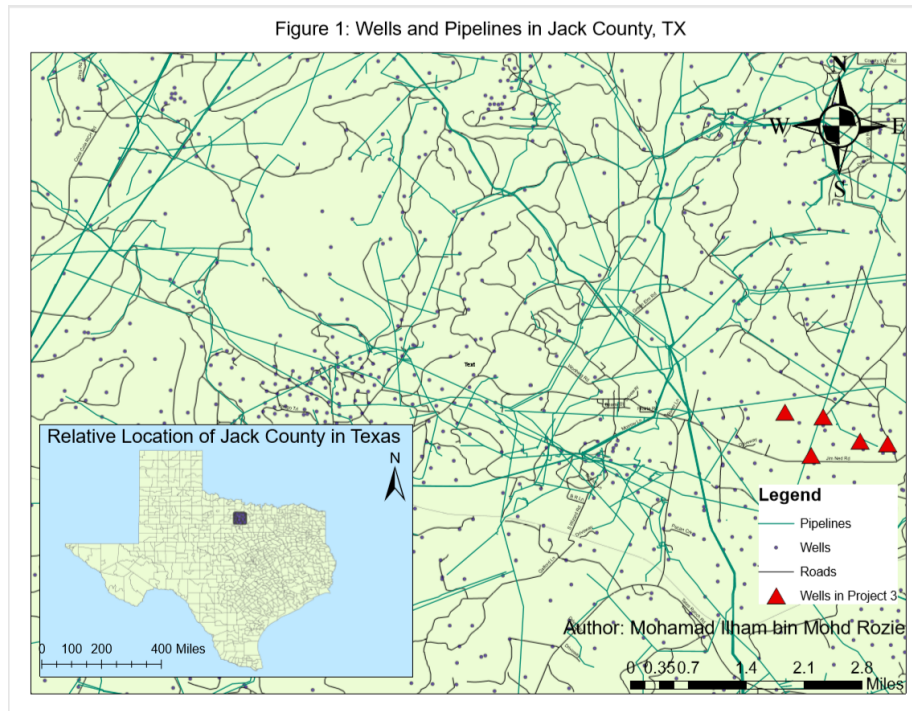


Figure 6: Pipelines and Wells in Jack County, TX.