You have been selected to assist the structural engineer for a bridge replacement project. Your task is to design the size of the footing for an interior bridge pier, based on the allowable stress design method. A soil test boring was drilled at the location of the bridge pier. The soil test boring log has shown that the soil is fairly uniform at the pier location and consists of a layer of clay overlying a three-layer system of silty sand, well graded sand, and uniform sand. Detailed information about each layer is given in Fig. 1. Groundwater table was encountered at the depth of 9.1 meters during subsurface exploration, but seasonal changes may raise the water table to a depth of 7.5 meters below ground surface.

The following information was provided by the structural engineer:

- Scour is not an issue at the site.
- Frost penetration depth is 1.0 m.
- Tolerable settlement for the project is 38 mm.
- Factored Axial Load = 8500 kN
- Factored Shear Load = 225 kN
- Factored Moment in Z-direction = 600 kN-m
- Factored Moment in Y-direction = 950 kN-m
- Use Schmertmann's (1975) and Kulhawy and Mayne (1990) correlation between SPT and ϕ', and round to nearest degree.
- The increase in stress in each layer may be estimated using the 2:1 method
- Settlement analysis should be based on the Hough Method

Using the information provided above, design the size of the footing for the interior bridge pier, based on the allowable stress design method. You should consider both settlement and bearing capacity, and check for overturning and sliding. You should provide the structural engineer with a formal typed report that will include all of your analyses and final size of the footing. You should also include all of your design assumptions in your report.
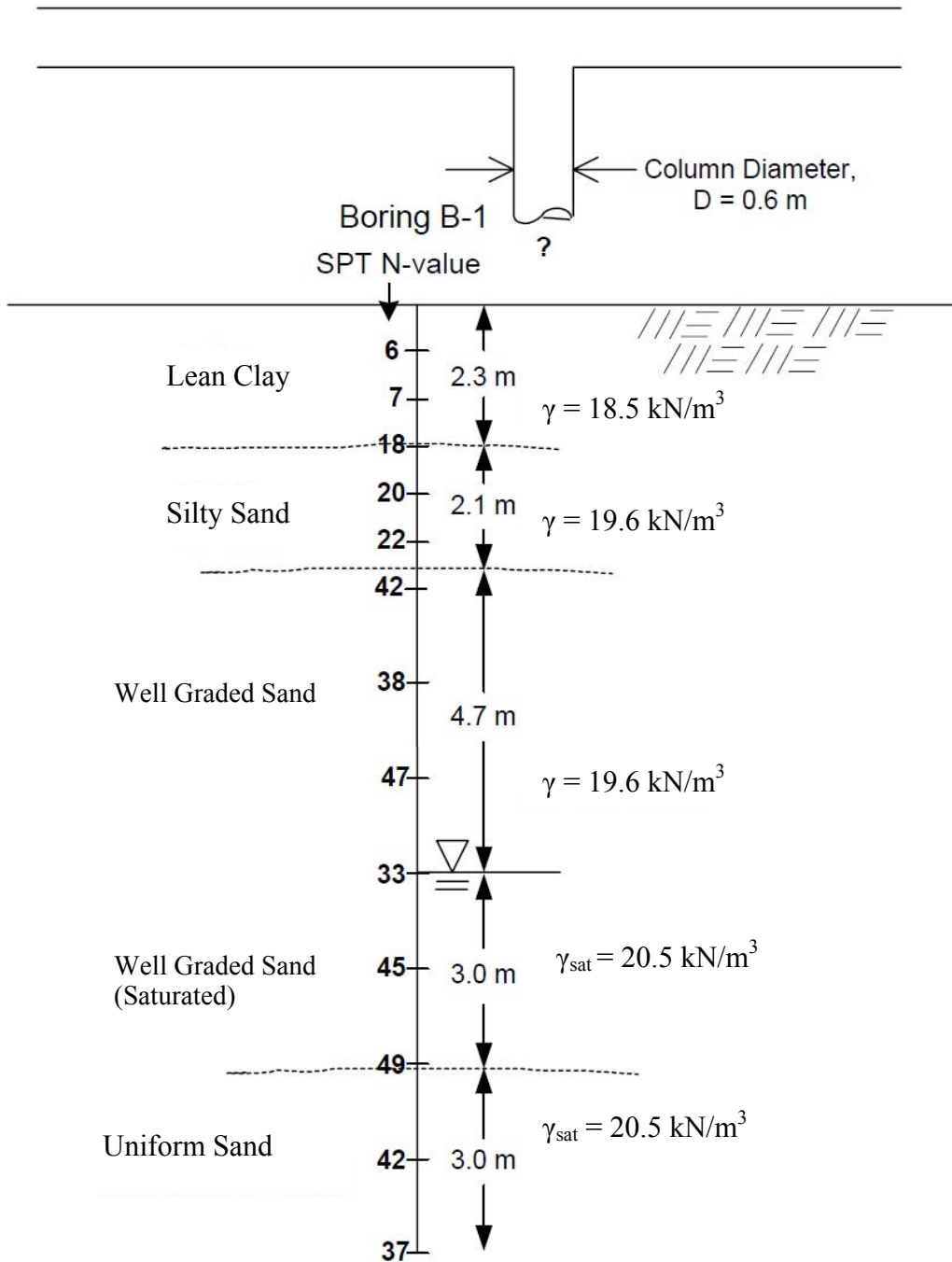
Figure 1: Subsurface Profile