

Groundwater measurements were recorded within each borehole utilizing a weighted 100-foot tape from a survey reference location at the top of each boring. Readings were recorded immediately after boring termination and after a 24-hour waiting period.

**4.0 LABORATORY TESTING**

Representative split-spoon samples were selected from soil test borings to verify visual field classification and determine soil index properties. Fifteen split-spoon samples were analyzed in our laboratory for Atterberg limits, and grain size with hydrometer analysis. Four samples were tested to determine natural moisture. One Shelby tube sample was obtained and transported to the (NCDOT) laboratory for consolidation analysis. Five alluvial split-spoon samples were analyzed for grain size determination to assist the NCDOT in theoretical scour elevations. Three rock core samples were analyzed in our laboratory for unconfined compression strength and Young's Modulus. All testing was performed in accordance with the following American Society for Testing and Materials (ASTM), NCDOT Modified and/or AASHTO procedures:

- AASHTO T-88-00 (As Modified) "Particle Size Analysis of Soil"
- AASHTO T-89-02 (As Modified) "Determining the Liquid Limits of Soil"
- AASHTO T-90-00 "Determining the Plastic Limit and Plasticity of Soils"
- AASHTO T-265-93 (2000) "Laboratory Determination of Moisture Content of Soils"
- ASTM D 1140-97 "Amount of Material in Soils Finer than the #200 Sieve"
- ASTM D 2938-95 "Unconfined Compressive Strength of Intact Rock Core"
- ASTM D 3148-02 "Elastic Moduli of Intact Rock Core in Uniaxial Compression"

**5.0 SUBSURFACE AND GROUNDWATER CONDITIONS**

**5.1 End Bents**

Soils beneath End Bent 1 and 2 consist of alluvium and residual material. Alluvium soils consist of 12.5 to 13.8 feet of very soft clays and silts (A-7-5, A-4, A-5) and very loose to medium dense silty sand (A-1-b, A-3, A-2-4). Alluvial soils are underlain by residual soils, at approximately 708 and 707 feet Mean Sea Level (MSL). The thickness of the residual layer varies from approximately 16 feet beneath End Bent 1 to an average of 3 feet beneath End Bent 2. Residual soils consist of loose to very dense silty sand (A-2-5). Residual soils directly overlie weathered gneiss and schists (WR), at varying elevations between 705 and 690 feet (MSL) before transitioning to crystalline rock (CR), between elevations of 700 and 678 feet (MSL).

The following table summarizes approximate (MSL) rock elevations across the end bents.

| Location | Boring Elevation | WR Elevation | CR Elevation |
|----------|------------------|--------------|--------------|
|----------|------------------|--------------|--------------|

|      | (ft)  | (ft)  | (ft)  |
|------|-------|-------|-------|
| EB1A | 720.2 | 689.9 | 688.6 |
| EB1B | 721.1 | 694.1 | 678.2 |
| EB2A | 721.3 | 705.8 | 694.1 |
| EB2B | 720.4 | 704.4 | 700.1 |

**5.2 Interior Bents**

Soils beneath Bents 1 and 2 consist of alluvium and residual material. Alluvium soils consist of 11 to 13 feet of soft to medium stiff clays and silts (A-7-5, A-4, A-5) and very loose to loose silty sand (A-1-b, A-3, A-2-4). Alluvial soils are underlain by residual soils, at approximately 710 and 709 feet (MSL). The thickness of the residual layer varies from 11 feet beneath Bent 1 to 4 feet beneath Bent 2. Residual soils consist of very loose to very dense silty sand (A-2-4, A-2-5). Residual soils directly overlie weathered gneiss and schist (WR), at varying elevations between 706 and 697 feet (MSL).

Crystalline rock (CR), was encountered at varying elevations between elevation 702 and 690 feet (MSL) consisting of schists and gneisses with recoveries (REC) between 89 and 100 percent. A majority of the rock is moderately severely weathered to fresh, hard to soft, and very close to moderately closely fractured. Strata rock quality designations (RQD) were between 10 and 88 percent and increased with depth.

| Location | Boring Elevation (ft) | WR Elevation (ft) | CR Elevation (ft) |
|----------|-----------------------|-------------------|-------------------|
| B1A      | 721.0                 | 697.2             | 694.8             |
| B1B      | 720.7                 | 697.0             | 689.9             |
| B2A      | 721.0                 | 699.8             | 696.9             |
| B2B      | 720.9                 | 705.9             | 702.3             |

**5.3 Groundwater**

Groundwater across the site ranges in elevation between 719 and 720 feet (MSL). Surface water elevation within Troublesome Creek, at the time of the investigation, was approximately 719 feet (MSL).

**6.0 NOTES TO DESIGNER**

Based on our field exploration the following conditions may impact design and construction of the proposed structure. Therefore the designer should be aware of the following subsurface and groundwater conditions:

- The upper 12 to 13 feet of alluvium beneath the proposed end bent locations consist of soft silts and clays in the top 2 to 3.5 feet overlying very loose to medium dense sands.
- The interior bents consist on average 9 feet of residual very loose very dense sands.