



**Highway Division  
Construction & Materials Bureau  
Geotechnical Engineering Section**

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**To:** Brandon Kipp, P.E., Project Manager

**From:** Christopher Eddy, Transportation Geologist and Ethan Thomas, Senior Transportation Geologist, via Callie Ewald, P.E., Geotechnical Engineering Section Manager

**Date:** September 4, 2019

**Subject:** Cavendish-Weathersfield STP 0146(14) Addendum

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**Introduction**

This addendum presents findings from a recent site visit and summarizes current site conditions and recommendations for addressing these conditions within the scope of the current project plan set, dated 09/2018.

**Solid Rock Excavation Areas**

As shown in the current plan set typical section, the ledge in these areas is to be cut to a 4V:1H (76°) slope angle with 6 ft from the toe of slope to edge of ditch. This requires 4 ft of toe material to be cut back into the current slope. Moving along the roadway, the exposed ledge shows substantial variation in rock type, composition, and physical properties. These variations dictate the following conditions and recommendations:

- From STA 294+50 – 296+50, Rock Cut # 432 outcrops and is a moderately weathered garnetiferous biotite Schist. Gneissic banding of mica and 1-2 mm long augens of aggregated quartz grains make this rock moderately hard. When fractured, the rock readily cleaves along the mica composing the gneissic banding.

We anticipate the rock present at these station limits to be rippable by means of heavy machinery. Using controlled blasting techniques to accommodate the road widening is also feasible.

- From STA 219+50 – 224+25 Rock Cut # 431 outcrops and is a fresh to slightly-weathered quartz, biotite & garnet para-Gneiss. The gneiss's layering is tightly banded and forms the dominate structure (foliation) of this rock. Leucocratic dikes composed primarily of large subhedral plagioclase grains in a finer-grained matrix containing 1-2 cm garnets cross-cut perpendicular to the foliation; and locally harden the gneiss. These dikes are 15-20 cm wide and irregularly spaced at this location.

The rock at this location is very hard and the structures within the rock are oriented in a way that likely makes ripping the rock using heavy machinery difficult and time consuming. Controlled blasting methods could be utilized to remove the rock faster and more effectively, however, we anticipate it will be difficult to blast without going outside of our ROW and site access for drill rigs will be difficult due to the steep topography above the rock cut. There are also utility poles behind the rock cut. If blasting is pursued by the Contractor, the blaster may propose to extend the limits of rock removal to allow for more burden to blast more safely.

### **Slope Stabilization Areas**

The current plan for a wire mesh stabilization with soil nails extending a minimum of 5 ft into rock at this location is appropriate for the conditions previously reported, but there is a new recognition of significantly more bedrock exposed and reported below. The plan set typical shows a 3.5V:1H slope and calls for 6 ft clearance from toe of slope to edge of ditch which requires 2 ft to be cut back into current slope. However, the current plan sets do not mention ledge removal or solid rock excavation for this area.

- From STA 196+50 – 203+80, Rock Cut # 185 outcrops and is a moderately weathered biotite Schist. This rock is similar in composition to the rock at STA 294+50 – 296+50 but has a lower garnet content. The Geotechnical Report, dated November 2014, does not go into detail regarding the amount of rock exposed at this location. Based on our observations on site, we believe the rock itself underlies the entire cut, except where the rock has been either severely damaged by previous blasting or preferentially eroded away to a deeper level. This may enable the Engineer to make field decisions to reduce number of soil nails where solid rock is present and exposed.

Overall, we anticipate the rock to be rippable, but care should be taken as to not undermine areas. This includes over-scaling or over-blasting which would lead to overhanging or overburdened areas of ledge.

### **Conclusions**

We have evaluated the rock conditions exposed between STA 294+50 – 296+50, STA 219+50 – 224+25 and STA 196+50 – 203+80. We anticipate that the rock exposed between STA 294+50 – 296+50 will be rippable by use of heavy machinery. Rock exposed between STA 219+50 – 224+25 is anticipated to be difficult to rip using heavy machinery and pneumatic hammers or controlled blasting techniques may be considered to accommodate solid rock excavation at this location. From STA 196+50 – 203+80 we anticipate that a majority of the station limits is underlain by bedrock and we anticipate this area to be rippable.

If you have any questions please feel free to reach out to us at (802) 595-6752.

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