GEOLOGY OF THE TENNESSEE PASS AREA

LAKE AND EAGLE COUNTIES, COLORADO

DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY

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SUMMARY

The present Tennessee Pass Tunnel is in schist with some granite beginning at East Portal and continuing north for a distance of 1800 to 1900 feet. North of the schist and to the West Portal for a distance of 600 to 700 feet the tunnel is in a glacial moraine consisting of clay with sand, gravel, and large boulders.

Evidence of faulting is lacking. Drainage is assured by a favorable topography and because the tunnel level is shallow.

An approximately parallel tunnel either to the east or west for say 200 feet of the present tunnel will show conditions similar to those in the present tunnel. The schist will require support in an opening as large as a railroad tunnel, and since the balance of the tunnel is in a glacial moraine support must be planned for the entire length of the tunnel.

Due to topography a new tunnel to the east would be slightly shorter than one to the west. A detailed topographic map is necessary to determine if the differences are important in amount.

PURPOSE

This is an account of a study made of the geology of Tennessee Pass and the D.&R.G. Tunnel under the Pass. The purpose of the study was to determine the conditions to be expected in driving a new railroad tunnel within a few hundred feet either to the east or west of the present tunnel. The examination was made on August 26 in company with Mr. A. L. Kleine, Division Engineer.

The Tennessee Pass Tunnel is 2550 feet long, and it runs N9°E directly under the Pass. The West Portal, north end, is at

an elevation of 10,228 feet, and the East Portal elevation is 10,237 feet. Tennessee Pass is at an elevation of 10,448 feet, and the Pass is on the Continental Divide, which is the boundary between Lake and Eagle Counties, Colorado.

MAP

A small accompanying plan map shows the general distribution of the schist and glacial moraine as determined from a study of the surface. The contours were compiled from a part of the Leadville Topographic sheet. The accompanying profile was prepared from date obtained from a 40-scale progress profile of the original construction of Tennessee Pass Tunnel, which was furnished by Mr. A. L. Kleine.

Both plan and profile are much generalized and intended primarily for convenient reference in the descriptions that follows.

SURFACE GEOLOGY

The surface from the West Portal to within a few hundred feet of the East Portal is covered with glacial moraine. The moraine is glacial deposit over a hundred feet thick consisting of unassorted clay, sand, gravel, and boulders of hard rock, varying in sizes up to nearly 2 feet in diameter. Northwest of the West Portal the glacial material stands in cut banks at angles of 45 to 50 degrees showing the usual compaction that is characteristic of glacial material of this type.

Schist forms the surface at East Portal and extends for a few hundred feet to the east and north and farther to the west as shown on the accompanying map. About 200 feet S50°E of Shaft No. 1 there is a small exposure of granite. The presence of pegmatite is indicated by float only.

The distribution and interrelation of the rock types could not be determined due to a thin mantle of weathered material which conceals these features.

The schist and associating granite are ancient rocks known as pre-Cambrian in Colorado geology. The schist is medium to fine-grained foliated rock, whichvaries from a more granitic type to a schistose rock with an abundance of biotite mica and quartz. The general distribution of pegmatite float suggests the presence of numerous small stringers rather than large masses.

The granite outcrop referred to above is about 50 feet across and consists of a medium-grained hard rock and probably represents a sill-like mass occurring in the schist.

The schist found at surface is much decomposed as a result of surface weathering. Some decomposition extends below the tunnel level as is shown by the brown iron stained and weathered material in the dumps at both Shafts No. 1 and 2. Weathering affects the biotite mica more readily than other minerals; therefore, the more micaceous parts of the rock will be softer than other types.

TENNESSEE PASS TUNNEL

The tunnel itself is closely timbered and hence offers no opportunity to study the rock in which it occurs. The progress profile of the original construction contains some generalized notes referring to places where some trouble in tunnel construction or replacing timbers had occurred.

Earth, rock, and gravel are shown to a depth of about 40

feet in Shaft No. 1 and for the entire depth of Shaft No. 2. This is the basis for the bottom of the glacial morain as shown on the accompanying profile.

The dump at Shaft No. 1 shows a mixture of coarse and fine rubble of schist and granite, and at Shaft No. 2 the material is similar except that it is coarser and harder. The dumps as a whole represent a fairly strong rock.

The tunnel is never more than 75 feet below the top of bedrock and never more than 200 feet below surface. This shallow depth in itself is not favorable for good ground, but there is no history of overly bad ground in the tunnel after it was driven in 1889-90.

FAULTS

Evidence of faulting is lacking, although the schist will show slips and fissures as is usual in ancient rocks of this type.

DRAINAGE

Drainage is assured by a favorable topography and because the tunnel level is shallow. Added to this is the drainage resulting from the present tunnel. A small amount of surface water is to be expected, which will be at a minimum from about October to May each year.

CONCLUSIONS

The predominating rock, biotite schist cut by stringers of pegmatite and local bodies of granite, is continuous from East Portal in for about 1800 to 1900 feet. The balance of the tunnel is in a mixture of boulders and clay of glacial origin.

A like section will be found in a parallel tunnel for at least two hundred feet either to the east or west of the present tun-

nel line. The course of Piney Creek is such that to the east of the tunnel, distances including overall length of a new tunnel line tend to be less than to the west. The exact amount of such differences will require an accurate topograph map.

Not much opportunity is offered for low-cost open trenching at either end of a new tunnel line. The slopes are too steep at the West Portal, and at the East Portal where slopes are more favorable the schist comes to surface, which will require blasting.

Tennessee Pass is naturally well drained, and the added drainage of the present tunnel precludes the possibility of any troublesome quantities of water.

The decomposed schist though not classed as a good rock has considerable strength and no tendency to swell or cause trouble so long as it is properly supported. However, all the rock section probably will require support.

Support of the glacial material, of course, will also be necessary. The clay content has resulted in sufficient compaction so that serious difficulty need not be anticipated; it will be least troublesome during the dry season, that is from September or October to May.

Respectfully submitted,
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