

GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

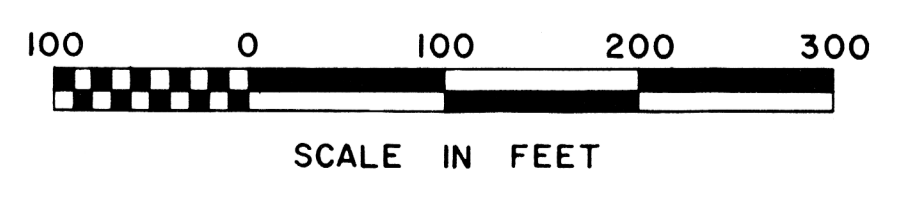
LEGEND

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|--|---|--|----------|-------|---------|-------|-------------|-------|-------|----------|-----------------|----------|-----------------------------------|----------|--|
| CENOZOIC | 5 | RECENT ALLUVIUM: sand and gravel containing boulders up to 14 inches in diameter | | | | | | | | | | | | | |
| | 4 | TALUS | | | | | | | | | | | | | |
| | 3 | GLACIO-LACUSTRINE: silt | | | | | | | | | | | | | |
| | 2 | GLACIO-FLUVIAL: sand, gravel | | | | | | | | | | | | | |
| PALAEOZOIC | SHALE: dark grey to black | | | | | | | | | | | | | | |
| | <table border="0" style="width: 100%;"> <tr> <td>Jointing</td> <td style="text-align: right;">65-53</td> </tr> <tr> <td>Bedding</td> <td style="text-align: right;">44-79</td> </tr> <tr> <td>Schistosity</td> <td style="text-align: right;">55-64</td> </tr> <tr> <td>Fault</td> <td style="text-align: right;">[Symbol]</td> </tr> <tr> <td>Edge of outcrop</td> <td style="text-align: right;">[Symbol]</td> </tr> <tr> <td>Geological boundary (approximate)</td> <td style="text-align: right;">[Symbol]</td> </tr> <tr> <td>Magnetic declination: 34 12' approximate</td> <td></td> </tr> </table> | | Jointing | 65-53 | Bedding | 44-79 | Schistosity | 55-64 | Fault | [Symbol] | Edge of outcrop | [Symbol] | Geological boundary (approximate) | [Symbol] | Magnetic declination: 34 12' approximate |
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Descriptive Notes

Recent alluvium at Upper Direction dam site is exposed on a large bar along the right (south) side of Flat River. The material consists of sand and gravel containing boulders up to 14 inches in diameter. Shale constitutes about 15 per cent of the rock fragments in the one-quarter to 3 inch range. If time had permitted during the investigation the bar would have been an excellent place on which to locate a seismic line to determine the thickness of overburden beneath the river. By comparison with other dam sites on Flat River where more information is available it is believed bedrock surface is at least 50 feet beneath the river at Upper Direction dam site. It is not certain that all the soil beneath the river is Recent alluvium or a material of similar quality. However, if such is the case, it would have a high permeability and would probably be excavated during construction. The boulders exposed in the material on the bar are not sufficiently large to prevent the driving of steel-sheet piling. The presence of large boulders at depth could be determined by test borings. Talus consisting of rock fragments which have resulted from the mechanical disintegration of adjacent bedrock covers the right side of Flat River valley at the site. The fragments are small, angular and platy. Their size and shape are what would be expected from material derived from the shale bedrock exposed at the site. The thickness of the talus should nowhere exceed 10 feet. Glacio-fluvial sand and gravel directly overlying bedrock is exposed along the left side of the river. This material is similar to the Recent alluvium except the silt content is lower and it contains more boulders. The permeability of the glacio-fluvial material is probably high and it may have to be replaced in the abutments of the dam to avoid leakage. The glacio-lacustrine silt which overlies the glacio-fluvial sand and gravel is similar to the silty clay described in the report on Lower Direction dam site (sample 15). The silt is an extensive deposit which is exposed for several miles along South Nahanni and Flat Rivers. It has a potential use as core material for a rolled earth dam.

Bedrock exposed at the dam site consists of hard, dark grey to black, thinly-bedded shale. In general the bedding closely parallels the river, i.e. trends in a northeast direction, and dips at angles between 15 and 42 degrees into the left side of the valley. This parallelism between the strike of the bedding and the direction of the river is common along Flat River. One prominent joint set strikes in a southeast direction and dips upstream. A small thrust fault trending in a northerly direction and dipping steeply downstream is visible in bedrock exposed along the left side of the river. The vertical movement along the fault is about 4 feet. There are no springs or seepages of groundwater in the dam site area. However, thin coatings of brown carbonate probably deposited by circulating groundwater occur along many of the bedding and joint planes in bedrock. Frozen soil was not observed in the site area.



MACKENZIE RIVER DRAINAGE BASIN
SITE NO. 22
UPPER DIRECTION DAM SITE
TO ACCOMPANY TOPICAL REPORT NO. 121
GEOLOGY BY E.B. OWEN, 1964