CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

TOPICAL REPORT NO. 14

YUKON RIVER DRAINAGE BASIN
DAM SITE INVESTIGATION

SITE NO. 8

WOLVERINE DRAW SECTION

(MAP AND PRELIMINARY REPORT)

BY

E. B. OWEN

OTTAWA

1959

CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

TOPICAL REPORT NO. 14

YUKON RIVER DRAINAGE BASIN

DAM SITE INVESTIGATION

Site No. 8

WOLVERINE DRAW SECTION

(Map and Preliminary Report)

By

E.B. Owen

OTTAWA
1959

Contents

WOLVERINE DRAW SECTION

General Description

The Wolverine Draw section is situated one mile east of Yukon River and approximately three miles north of the proposed power site located on the river immediately below Wolverine Creek.

The drift-filled valley in which the draw section is situated is separated from Yukon River by several high hills on which are exposed thick deposits of unconsolidated sand and gravel intruded and overlain by recent lava flows. Excellent exposures of these materials occur in a high bluff on the east side of Yukon River about a mile downstream from the main dam site. The left abutment of the draw section is located on the east side of a hill near the base of the slope. The ground surface about the abutment is completely covered with silt and fine sand. Bedrock is not exposed.

A high ridge of volcanic rocks of the Mount Nansen Group forms the east side of the draw valley. This ridge probably constituted the east side of the former Yukon River Valley prior to the partial filling of this valley by a tongue of recent lava flows. Following the advent of the flows which at the main dam site reached an elevation of at least 1,760 feet above sea level, Yukon River was diverted for a time though the draw valley, the lowest elevation of which is now 1,650 feet. Both upper and lower ends of the draw valley are continuous with Yukon River Valley. The draw valley continued to act as a spillway for the river until a channel was eroded through the lavas blocking the former valley. At this stage the route through the draw valley was abandoned and the river commenced following its present course.

Evidence at the Fort Selkirk site suggests the final lava flows occurred after the last glaciation. Consequently, it is thought the draw valley was partially filled with glacio-fluvial material at the time the Yukon River was diverted through it and the present sand covering is the result of sorting and deposition by the river and subsequent wind action. The existence of the draw valley presents

a potential area of leakage for water impounded behind the power dam constructed across Yukon River at Wolverine.

The topography of the draw valley is irregular, consisting of level terraces with scattered, shallow depressions separated by high ridges or knolls. Several of the smaller ridges are in the form of crescent-shaped dunes suggesting deposition by wind moving in a southerly direction. The area is extremely dry. Numerous test pits put down across the section to a maximum depth of six feet encountered chiefly silt-free, medium-grained sand. Bedrock outcrops about 350 feet east of the draw section but the thickness of overburden beneath most of the section is probably considerable. The uniformity of the sand encountered in the upper six feet indicates a relatively high permeability for this material.

The elevation of the pool behind the power dam on Yukon River will be 1,635 feet above sea level. The lowest elevation across the draw section is about 1,650 feet. Consequently, as in the case of the Five Fingers saddle dam the chief requirements at the draw section will be for materials that would decrease the quantity of water seeping beneath the section and for materials to increase the stability of the overburden along the section against which the hydrostatic pressure of the water in the reservoir would be exerted.

Unconsolidated Deposits

Two types of soils were identified in the area about the proposed draw section. They are as follows:

1. Alluvium (silt-free, medium-grained sand): This is a loose, uniform, medium-grained sand which covers most of the draw section except in the extreme west part where it underlies silt and fine sand. The thickness of the material is at least six feet which was the maximum depth to which test pits were dug. Its uniformity suggests a high permeability.

2. Alluvium (silt and fine-grained sand): This is a very fine, compact material encountered only in a small area in the west end of the draw section. The maximum thickness encountered was 18 inches. It grades downward into a silt-free, medium-grained sand.

Engineering Considerations

Depth of Overburden

Overburden is believed to be relatively thick across the draw section especially beneath the west half and in the west abutment area. Seismic line no. 1 located about 1,600 feet east of the west abutment indicates depths to bedrock greater than 232 feet.

In the extreme east end of the section fine talus material was encountered beneath sand varying in thickness from twelve to forty-two inches. The rock fragments in the talus consisted of Mount Nansen volcanic rocks similar to those exposed in the bluffs about five hundred feet to the east. Bedrock here is probably twenty to thirty feet below ground surface.

Permeability of the Overburden

The material filling the draw valley consists of glacio-fluvial sands and gravels overlain by alluvial sand. The permeability of all these materials is high and considerable leakage could occur through them. Till, which is relatively impermeable, may occur between the glacio-fluvial materials and bedrock but there is nothing on surface to indicate its presence. Permeability tests should be conducted on these materials and at the same time information regarding the quality and thickness of overburden could be obtained.

Construction Materials

Aggregate

The aggregate requirements for the draw section will probably not be large. A program of test pitting and sampling would be necessary to determine if

glacio-fluvial sand and gravel of sufficient quality to make satisfactory aggregate occurs in the draw valley. The silt-free, medium-grained sand overlying the area would be excellent for blending purposes. Its uniformity, however, limits its use. The nearest known deposits of gravel are those underlying the terrace immediately west of the river at the power site. This gravel is described in the geological report on the Wolverine dam site. The volcanic rocks exposed in the bluff immediately east of the draw section could probably be crushed to produce large aggregate. This is a relatively expensive method, however, and should only be considered after all attempts at obtaining satisfactory natural aggregate have failed.

Impervious Material:

The shallow deposit of silt which occurs on ground surface at the west end of the draw section is the only material in the vicinity of the section which might be used in the impervious core of the proposed earth dam. This silty material should compact readily. It is comparable in places to the silt used as impervious material at the Whitehorse Rapids dam. The deposit, however, is thin and the quantity of material available is probably small.

A more extensive deposit of impervious material covers the floor of the valley in which the Fort Selkirk Saddle dam site is located. The material is a clayey, silty sand and is described in the geological report for the Fort Selkirk Saddle dam site (topical report no. 16, site no. 10). The deposit is located about eight miles downstream on the opposite side of the river. It is easily accessible.

Riprap

The volcanic rocks east of the section should provide excellent riprap. They are massive, durable and have a relatively high specific gravity. They would also be an excellent, but expensive, source of rock fill to increase the stability

of the overburden across the draw section. There is no talus visible along the bluff which could be used as riprap or rock fill. It is suggested, however, test borings could be put down along the base of the bluff downstream from the section to investigate the possibility of talus material occurring in that area.

Ground Water

There is little information concerning ground water in the vicinity of the draw section. The area is extremely dry and the ground-water table is thought to be low. This would increase the danger of leakage through the permeable sand and gravel underlying the section. Accurate information concerning the water table can only be obtained by a drilling program involving the installation of several ground-water observation holes.

Further Investigations

Several test borings are required at the Wolverine Draw section to obtain the following information.

1. The quality and permeability of the materials underlying the draw section.
2. The thickness of the overburden underlying the draw section and consequently the elevations of bedrock surface.
3. Ground-water table elevations and fluctuations.

All the required information can be obtained from the individual holes. It is suggested the holes be located on a grid pattern and that a considerable saving can be made by proper location of the holes.