APPENDIX A

OTHER REPORTS AND INVESTIGATIONS

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Alcan Forest Products

Briana Ogden 5/8/07
DOT
Juneau, AK

Re: Shelter Cove Access.

Enclosed are N ½ and S ½ maps of the Leask Cove project we have been working on Mental Health Trust property. We have constructed about 15 miles of road in the last 2 years. I have done all of the engineering and walked a considerable amount of the area. In addition I constructed a new road east of Harriett Hunt lake, north of the outlet creek.

A few observations for you to consider.
1. I do not believe Harriett Hunt is a very good access point. First off the area sits in a cold air depression with lots of snow accumulation. Ask DOT how much snow had to be removed in late April (over 6 feet). The 2nd point is the amount of elevation you need to drop from Harriet Hunt to George inlet. You will have difficulty with grade. East of Harriet Hunt lake the ground is broken with a large waterfall on the outlet creek. The soils in this area tend to be unstable on steep hillsides.

Large limestone deposit 1.5 miles east of the lake.

2. In the n1/2 of section 35 I crossed a unnamed creek with a 65 foot bridge at about 400 feet in elevation. Between my bridge location and the beach the stream has steep walls and very unstable soils.

3. I crossed Leask Creek with an 80 foot bridge. Best location for the timber harvest but you could cross relative easily 1000 feet upstream from the Bay.

4. Rock in this area has been mixed. Limestone in the south portion of section 35. Soft shale in the northerly portion of 35. Some granite mixed in area and a little volcanic sand and rock..

5. I believe the best access is along Cape Fox roads running north along George inlet. Less snow, better terrain, less costly construction and maintenance.

I get lots of questions locally on when we are going to hook up the road to Shelter Cove. There is a large demand here in Ketchikan for more roaded access.

If you have any questions you can call me or send me an email

Eric Nichols

111 Stedman Street, Suite 100 Ketchikan, AK 99901
Telephone: 907 225 1710 Facsimile: 907 225 1709
Cell: Brian Brown 907 617 1768 Eric Nichols 907 617 1769
Email: alcantimber@kpunet.net

Memorandum

U.S. Department
of Transportation
Federal Highway
Administration

WESTERN FEDERAL LANDS HIGHWAY DIVISION
610 EAST FIFTH STREET
VANCOUVER, WA 98661-3893

DATE: 06/05/03 **GM06-03**

Subject: **INFORMATION:** Geotechnical Memorandum No. GM06-03; **Geotechnical Site Reconnaissance of Shelter Cove Road System [Addendum to Geotechnical Memorandum GM28-99, "AK PFH 39, Shelter Cove Road: PIR Preliminary Geotechnical Information" (2/18/00)**

From: Dave Lofgren, WFLHD Senior Engineering Geologist

To: Dale Lewis, WFLHD Forest Highway Programming Coordinator

Transmitted herewith is Geotechnical Memorandum No. GM06-03 for the Shelter Cove Road System PIR geotechnical reconnaissance. Please address questions or comments regarding the memorandum to Mr. Dave Lofgren, WFLHD Senior Engineering Geologist.

Dave Lofgren

Dave Lofgren

cc: Brian Allen, Alaska Design Operations Engineer
WFLHD Geotechnical Team Memorandum File

U.S. Department
of Transportation
Federal Highway
Administration

Memorandum

WESTERN FEDERAL LANDS HIGHWAY DIVISION
610 EAST FIFTH STREET
VANCOUVER, WA 98661-3801

GM06-03

Subject: **Geotechnical Memorandum GM06-03: Geotechnical Site Reconnaissance of Shelter Cove Road System [Addendum to Geotechnical Memorandum GM28-99, "AK PFH 39, Shelter Cove Road: PIR Preliminary Geotechnical Information" (2/18/00)]**

Date: 6/09/03

From: Dave Lofgren, Engineering Geologist

Reply to Attn of:

To: Brian Allen, Alaska Design Operations Engineer

File:

Introduction

The following memorandum and addendum to the Shelter Cove geotechnical PIR provides reconnaissance geotechnical information for the Tongass National Forest's Shelter Cove road system on Revillagigedo Island, Alaska. The Shelter Cove road system is being considered for inclusion in the Alaska Forest Highway 39 Ward Lake Extension (aka Shelter Cove Road) project, which was discussed in Geotechnical Memorandum No. GM28-99. The geotechnical reconnaissance was performed on May 14th, 2003 in the company of Dale Lewis (WFLHD Forest Highway Programming Coordinator), Betty Wilt (Tongass National Forest Engineer) and Bob Emley (Tongass National Forest Civil Engineering Technician). The purpose of the reconnaissance was to determine if geotechnical problems exist on the route that could significantly increase the cost of roadway improvements required to upgrade the road for recreational use by the public.

Discussion

The Shelter Cove road is a single lane Forest Service timber sale road about nine miles in length and an average of 5.5 m to 6.7 m (18 to 22 ft.) in width. The road has good alignment and width for timber sale purposes but the vertical and horizontal alignment are deficient from the standpoint of AASHTO standards.

The geotechnical reconnaissance was performed with the aid of a Forest Service vehicle to about mile 6, where the road was blocked by a fallen tree. The remainder of the reconnaissance was performed on foot to the bridge at about mile 7.5. During the reconnaissance, Bob Emley provided specific design and construction information for the Shelter Cove Road and more general information for the construction of timber sale roads in the Tongass National Forest.

Based on the visual reconnaissance of the existing road corridor, the primary geotechnical features of the proposed project appeared to be cut slope stability, muskeg deposits, and existing road construction. Brief discussions of those features are presented below and site photographs are presented in Attachment 1.

Cut Slope Materials and Stability Problems

The cut slope materials on this road system consist primarily of bedrock overlain by about 0 to 6 m of colluvium consisting of mixed sandy silty soil and angular rock fragments. The bedrock is primarily phyllite which is a highly jointed, fractured, and thinly laminated metamorphic rock of lower metamorphic grade than schist and generally not as micaceous. The phyllite on the Shelter Cove road system forms prominent outcrops along the roadway in which the rock varies from relatively massive, unfractured and unjointed rock to highly fractured and jointed and from slightly weathered to deeply weathered. Existing road cuts in harder rock appeared to have been excavated at slope ratios of about 1V:2H to 1V:1.33H (1/2 to 1 to ¾ to 1) and in softer rock at about 1V:1H. Rock cut heights varied from about 3 m to 20 m (10 to 65 ft.).

Bob Emley stated that approximately 20% of the Shelter Cove road system excavation was in soft, rippable rock and 20 % had been in hard rock that required blasting. The remaining 60% was in common material that was mechanically excavatable. Bob also stated that the average cost of all excavation (common plus soft and hard rock) for Forest Service timber sale roads on Revillagigedo Island was $6.00/ m3 ($4.63/yd3) {not Davis Bacon wages}.

One rock cut in which a significant rock slide had occurred was observed; otherwise, the existing rock cuts on the Shelter Cove Road appeared to be generally stable. If roadway widening is required for the proposed project, new cuts in rock will be necessary. The rock cut slope ratios used by the Forest Service (approximately 1V:2H to 1V:1H) appeared to be reasonably stable and similar cut ratios should be anticipated for new cuts on a WFLHD project.

Cut sections in bedrock were separated by sections of common material consisting primarily of fine sandy organic silt with varying amounts of broken rock. The common materials had been excavated at slope ratios of 1V:1.33H to 1:1. (Bob Emley stated that the cut slopes for timber sale roads aren't "designed". Instead, the contractor typically excavates "blast" rock about 1V:2H to 1V:1.33H, rippable rock about 1V:1.33, and common material 1:1 or flatter. Contractors do not get paid for excavation flatter than 1:1 but they excavate flatter cuts when they need additional material elsewhere on the job. It appeared that common materials on the Shelter Cove road had been excavated in the range of 1:1 to 1V:1.25H.) The common cuts appeared to be generally stable, but I did see a section of 4 to 5 m (13.1 to 16.4 ft.) high cuts in moist silty soil in which which several failures had occurred. The failures had been stabilized with Class 4 or Class 5 riprap stacked steeply against the slope like a shallow inlay, which seemed to be working pretty well.

Muskeg Problems

Muskeg was encountered infrequently during the reconnaissance. Bob Emley commented that only about 10 percent of the existing road is underlain by muskeg and that the average depth of muskeg deposits encountered during construction was 1.2 m (4 ft.). Mr. Emley also indicated that the Forest Service does not excavate muskeg. Instead, a 0.6 m (2 ft.) thick cap of rock fill is placed on top of the muskeg where it is necessary to cross it. Recent Forest Service practice has been to skirt around the edge of muskeg deposits and construct the road bed as close to adjacent hillsides as possible to avoid impacting the muskeg. The main problem encountered by the Forest Service in crossing muskeg was reported to be deep pockets of muskeg into which equipment can sink that are occasionally encountered during construction.

Existing Roadbed Construction

Much of the existing timber sale road consists of a 0.6 (2 ft.) rock embankment placed directly on top of logs, stumps, muskeg, and other vegetation. The decay and settlement of those materials over time does not present a problem for a timber sale road but it would to an asphalt paved road. If the road is reconstructed to AASHTO design standards, it may be necessary to excavate entire sections of the existing roadbed to remove the underlying vegetation. The cost of a reconstruction alternative will be partially dependent on the amount of existing roadway that can be used "as-is" versus the amount that must be totally reconstructed with new embankment and subgrade.

Upgrading Existing Roadway

The road width and vertical and horizontal alignment of the existing Shelter Cove timber sale road may be need to be upgraded if the road is included in the Shelter Cove Forest Highway Project. The following design and construction concerns will need to be addressed if the road is upgraded:

Cut Slope Design and Construction

Cut excavation in both hard rock requiring blasting and softer rock that can be ripped will be required. It is anticipated that new cuts in rock would have slope ratios similar to those used by the Forest Service on the existing road (1V:2H to 1V:1H). Cut slopes in common materials would probably be flatter than those employed by the Forest Service (1V:1.25H to 1V:1.75H). Rock excavation materials could be used for embankment construction and subexcavation backfill but common materials may be too wet to be useable.

The phyllite bedrock on this project is foliated, fractured, and moderately to highly jointed. Well-developed planar joints were observed at some locations. It is possible that rock stabilization measures such as rock bolting or doweling would be required in some places to stabilize adversely oriented blocks or masses of rock exposed by new cuts.

Some back slope failures in the wet silty soils may occur. The Forest Service practice of placing large riprap inlays against failures appeared to work well in those materials.

Muskeg Construction

The Forest Service crosses muskeg by grading and placing fill on it, whereas the WFLHD practice for crossing muskeg deposits up to about 4.5 m (15 ft.) deep has been to subexcavate and replace the material with rock or common borrow material. The Forest Service method results in long term settlement of the roadway whereas settlement of replacement rock borrow would not occur. If the existing roadway in muskeg areas is widened, it may be necessary to remove the entire road fill and subexcavate the underlying muskeg as well to avoid diffrential settlement between the existing roadway and widened sections. Since muskeg is estimated to occur on only 10 percent of the Shelter Cove Road, the cost of excavating the entire road width would not be a major cost factor for those sections in which it was necessary.

No waste disposal sites for subexcavated muskeg were identified during the project reconnaissance but several old borrow pits exist in which in might be possible to dispose of the material.

Retaining Walls and Embankment Construction

The existing road consists of cuts and fills in hilly terrain. Road widening on the fill side could be accomplished with either fills or retaining walls. Retaining walls could help to avoid construction in wetlands by confining the construction footprint to existing embankment areas; however, the Forest Service indicated that there is no need to protect wetlands in the Tongass National Forest and they would prefer the construction of new fills instead of retaining walls wherever fill side widening is required.

Roadbed Construction

Incorporating logs, stumps, and other woody debris lying within the construction limits into the subgrade and capping those materials with 0.6 m (2 ft.) of rock borrow is practical for the construction of timber sale roads but would not be acceptable practice for construction of a Forest Highway. Woody debris would need to be removed from the roadway prism and hauled to a waste disposal site and grading would need to be be performed with acceptable borrow materials, both of which would add cost to a reconstruction project.

Material Sources

There are several existing sources of construction aggregate along the Shelter Cover Road. The rock appeared to be of marginal quality with respect to standard WFLHD requirements, but, because of the remoteness of the location, it is assumed that the rock for new road construction would come form an existing material source or from the rock cut excavation.

Conclusions and Recommendations

The Forest Service's Shelter Cove timber sale road is a one lane gravel surfaced facility with horizontal and vertical alignment typical of a low volume forest road. The main geotechnical feature observed during the reconnaissance that could unduly affect the cost of reconstructing the road was the existing road construction. Excavation of a significant portion of the existing roadbed to remove underlying vegetation could add considerable expense to a reconstruction project.

Upgrading the road to AASHTO design standards would require widening the existing cuts and fills. Excavation would include blasting and ripping of bedrock and mechanical excavation of common materials. Based on the Forest Service's experience constructing the existing timber sale road, the excavation could be expected to consist of 20 percent hard rock requiring blasting, 20 percent soft, rippable rock, and 60 percent common material consisting of mixed fine sandy silt and broken rock.

It may be possible to estimate the cost of upgrading the Shelter Cove timber sale road from the cost of similar roads on Prince of Wales Island. The Tongass National Forest has provided the WFLHD Forest Highway Programming Coordinator with their cost estimating procedure and spreadsheet for timber sale road construction, and that information may also be useful in estimating the cost of this project.

Improvement Alternatives and Cost Estimates

Following are three improvement alternatives with "ball park" cost estimates for upgrading the Shelter Cove Road:

<u>Minimum Improvement Alternative</u>

This alternative would provide minimum grading, surfacing, and drainage improvements and minor alignment corrections to correct a few of the worst vertical and horizontal alignment problems. The road width would not be increased but additional intervisible turnouts would be added. No new cuts or fills would be created. The estimated cost of this alternative is **$250,000/km ($400,000/mi.)**.

<u>Minor Reconstruction Alternative</u>

This alternative would increase the road width to 6.7 m (22 ft) with gravel surfacing. Minor corrections in the vertical and horizontal alignment would be made. Some cut and fill side widening would be required and drainage improvements would be made. Based on the cost estimate of $1,353,400/km ($2,165,440/mi.) provided for Alternative 2 (3R) of the Ward Lake Extension (see page 28 of the Ward Lake Extension PIR), the estimated cost of the minor reconstruction alternative is **$468,750 to $781,250/km ($750,000 to $1,250,000/mi.).**

<u>Full Reconstruction Alternative</u>

This alternative would provide full reconstruction and improvements to a width of 7.9 m (26 ft.) as described in Alternative 2 (3R) of the Ward Lake Extension on page 28 of the Ward Lake Extension PIR. The estimated cost of this alternative would be the same as Ward Lake Extension Alternative 2, i.e., **$1,353,400/km ($2,165,440/mi.).**

(END MEMORANDUM)

cc: Brian Allen, Alaska Design Operations Engineer
Geotechnical Memorandum File

ATTACHMENT 1

Site Photographs

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Photo 1 : Typical roadway section to Shelter Cove road system. Note poor vertical roadway alignment.

Photo 2 : Typical roadway section showing steep cut slopes in mixed soil and rock common material. Note irregular roadway alignment.

SHELTER COVE ROAD
PROJECT PHOTOS

Photo 3 : Close-up of typical steep cut construction in common material. Note steep brow at top of cut.

Photo 4 : Large riprap stacked against shallow cutslope failure.

Photo 5 : Another cut failure stabilized with steeply stacked riprap.

Photo 6 : Bridge at about MP 7.5.

Photo 7 : Another view of bridge at MP 7.5. Proposed project would realign road with new bridge.

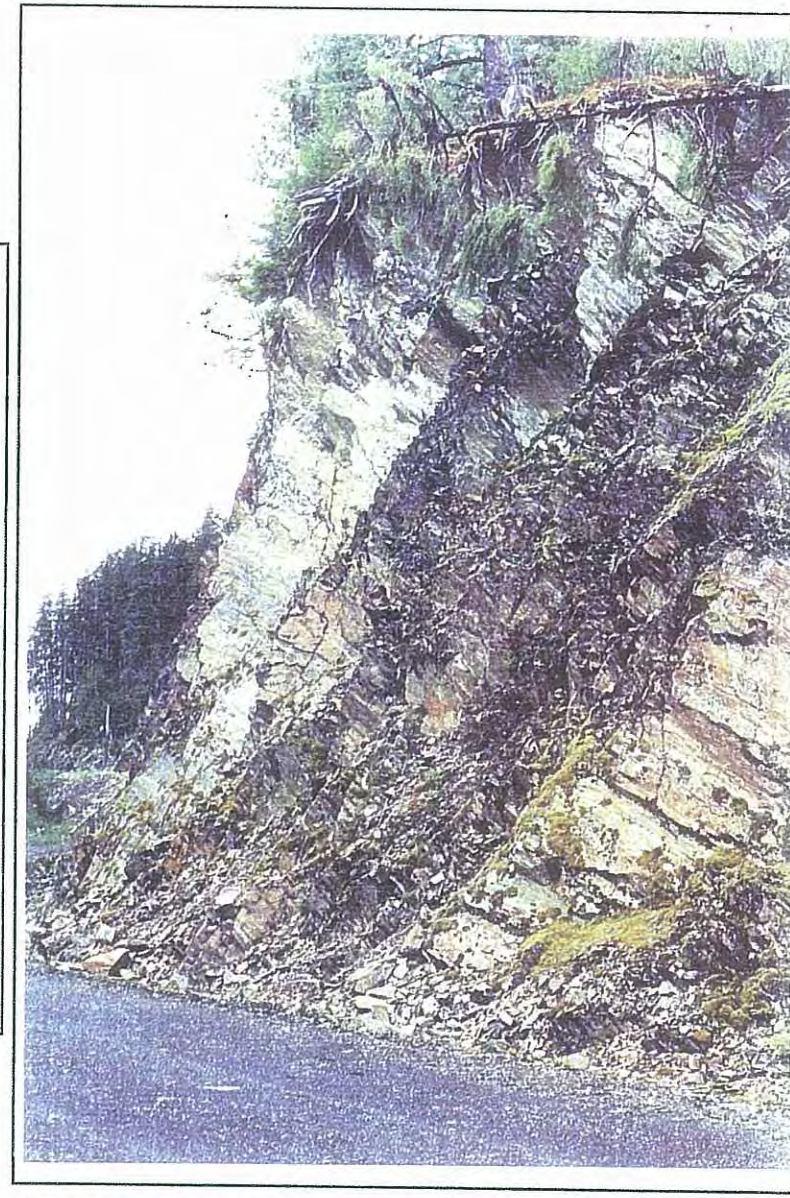

Photo 8 : Highly fractured, jointed, and thinly laminated phyllite bedrock typical at Shelter Cove road system.

SHELTER COVE ROAD
PROJECT PHOTOS

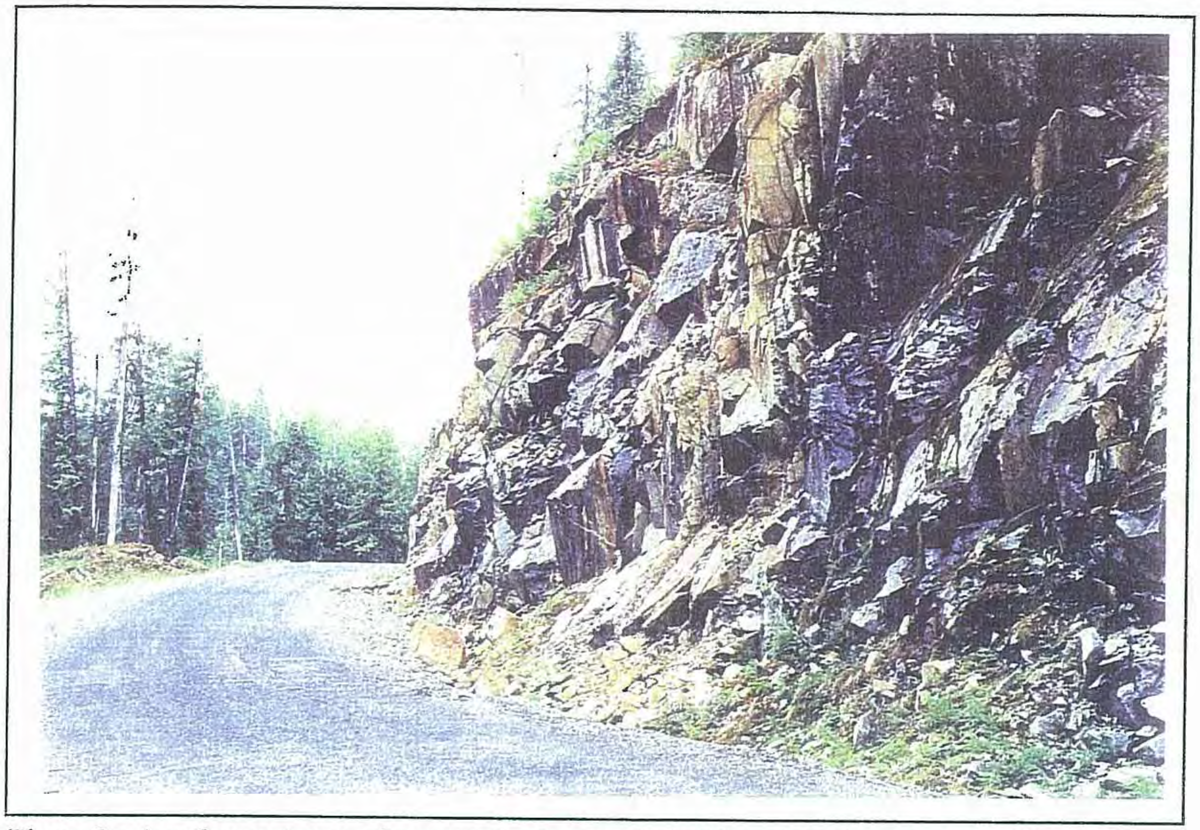

Photo 9 : Another outcrop of extremely fractured phyllite with planar joints inclined toward roadway (right side of photo).

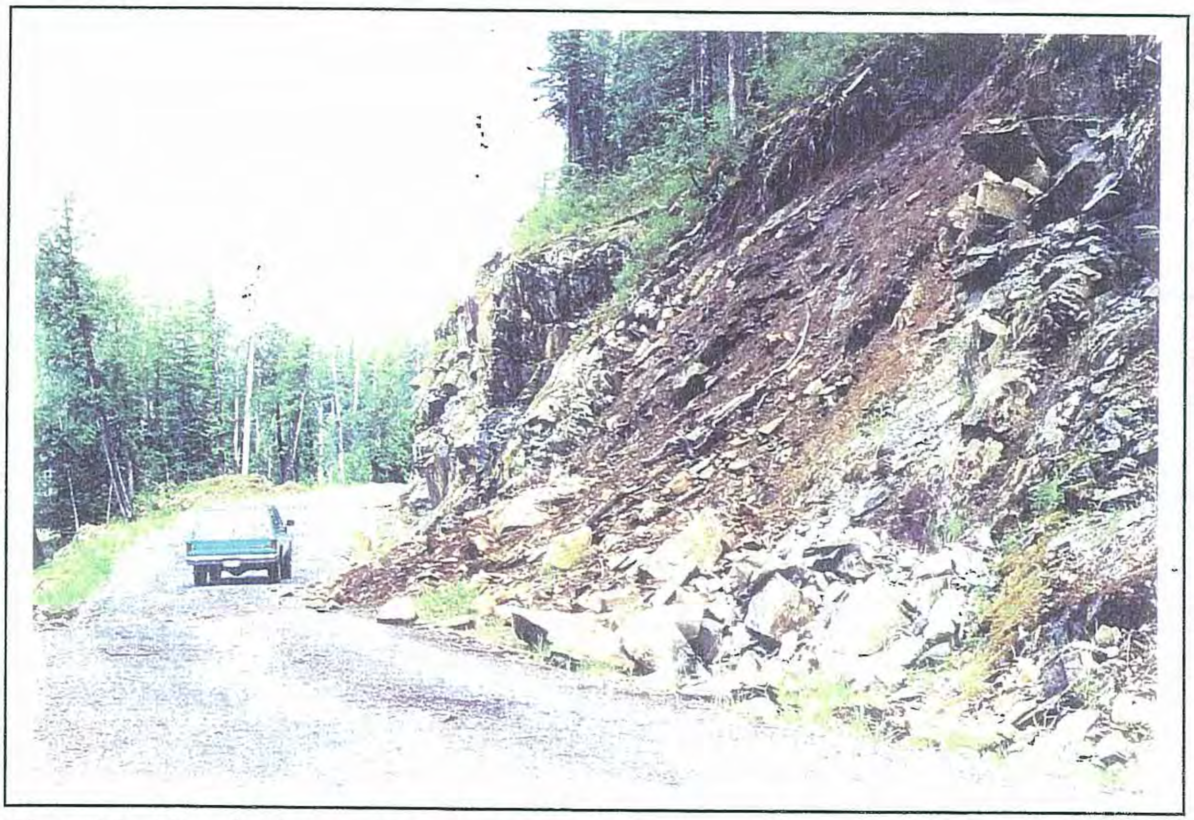

Photo 10 : View back from Photo 2 showing rock slope failure on steeply inclined joint system. Overburden is about one meter thick.

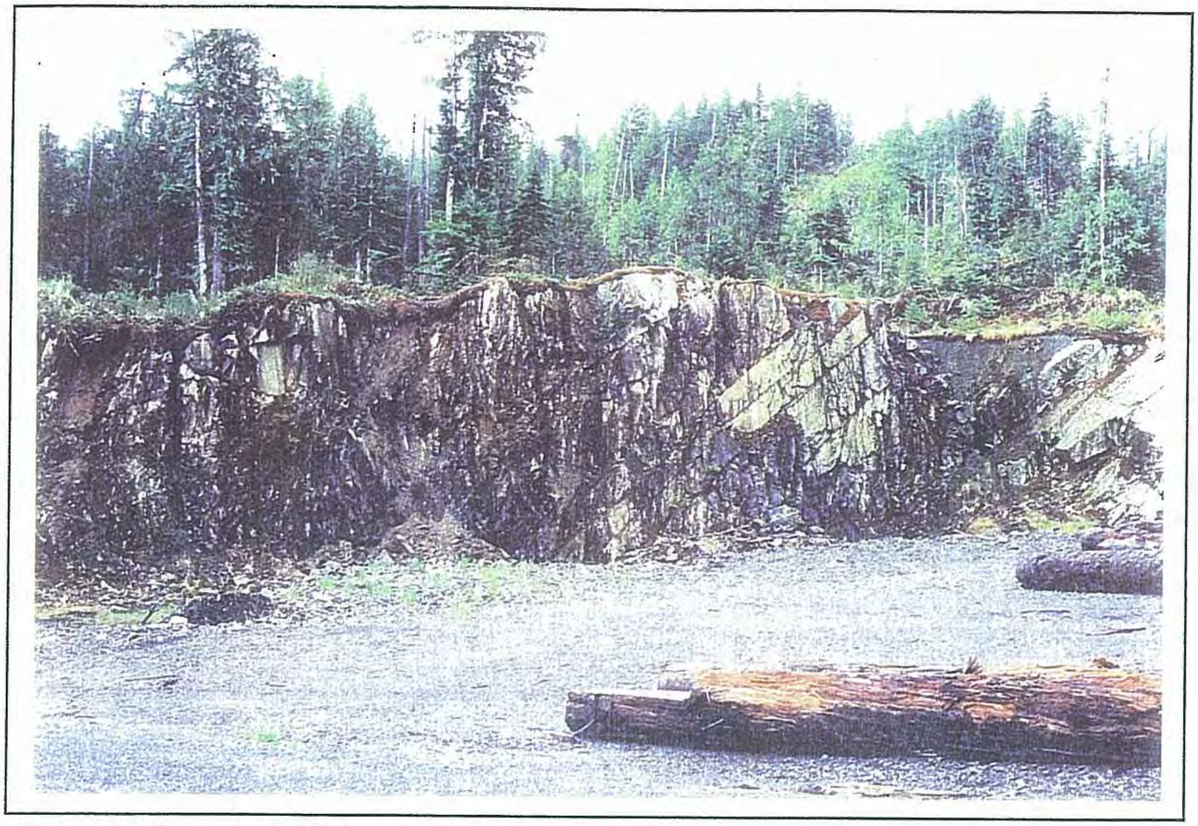

Photo 11 : Quarry on Shelter Cover Road.

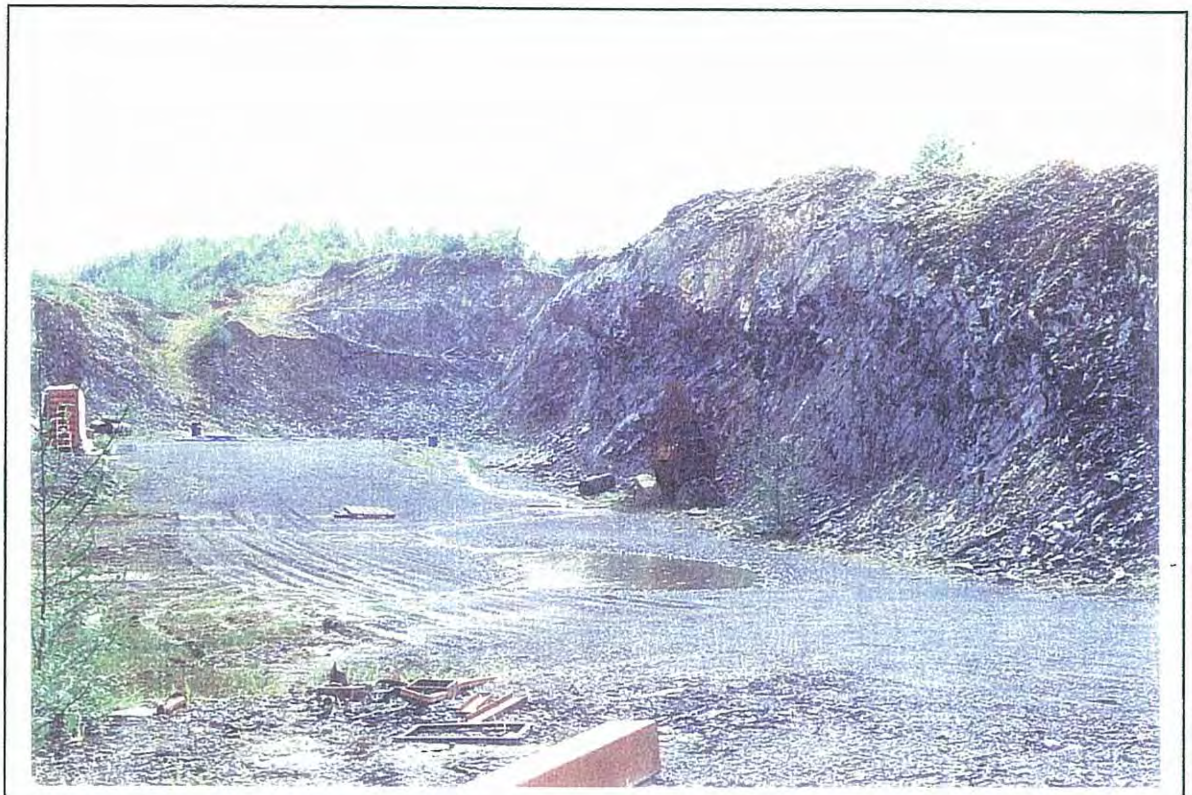

Photo 12 : Largest existing quarry on Shelter Cove road system. Rock is highly fractured phyllite.