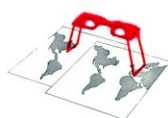

AIRPHOTO GRAVEL SEARCH ALONG THE
NWT HIGHWAY 3
FORT PROVIDENCE AREA,
NORTHWEST TERRITORIES



J D MOLLARD AND ASSOCIATES LIMITED

CONSULTING CIVIL ENGINEERS AND ENGINEERING GEOLOGISTS



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Prepared for:

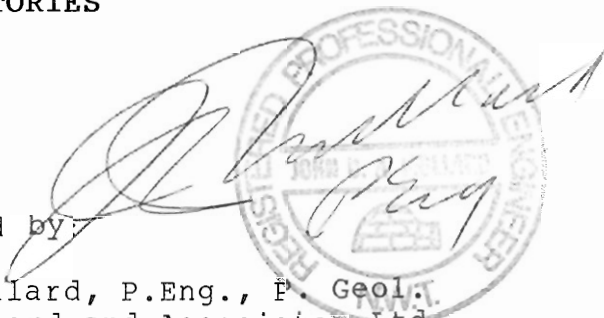
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September, 1988



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1. TERMS OF REFERENCE

Terms of reference call for the location, outlining and description of granular material prospects on airphotos showing a band of terrain along Highway 3 in the Fort Providence, NWT, area. As part of this undertaking, high altitude airphotos were purchased from NAPL in Ottawa.

2. MATERIALS STUDIED

A set of 1:58,000 NAPL airphotos were obtained for a large area around Fort Providence, NWT (Figure 1). Regional agricultural soil survey maps, surficial geology maps, and bedrock geology maps were studied along with the small-scale airphotos.

3. ANNOTATED STRIP MOSAICS AND APPENDICES

The airphotos obtained for this study were assembled into strip mosaics before they were studied stereoscopically -- and before granular material prospects were identified and outlined.

Granular material prospects in the Fort Providence area are shown on strip mosaic sheets 1, 2, and 3.

Descriptions of the granular material prospects are given in Appendix A. Appendix B lists factors to consider in field checking, exploring and exploiting prospects in the Fort Providence area. Appendix C contains comments on potential rock quarry sites in the study area.

A key map showing strip mosaic locations are shown on Figure 1.

4. BEDROCK GEOLOGY AND BEDROCK QUARRY SITES IN THE HIGHWAY 3 FORT PROVIDENCE, NWT, AREA

There are two general areas to prospect for possible quarry rock sites along or near NWT Highway 3 in the Fort Providence area (Figure 2). One is the escarpment area just south of the junction of NWT Highway 1 and NWT Highway 3, west of Kakisa River. The other is the Caen Lake area, north of where Bluefish River crosses NWT Highway 3. Unfortunately, neither area is located within the purchased airphoto coverage. Potential quarry rock areas are suggested from old geologic maps that I have in the office.

In both areas the overburden is likely to be thin (less than 1 m), and the underlying rock is probably badly fractured and shattered. Bedrock strata occur in the Twin Falls Formation and consist of limestone, shale, or sandstone in the area south of the Mackenzie River. Bedrock consists of the Hay River Formation siltstone, sandstone,

shale, or limestone in the Caen Lake area (Figures 1 and 2). Bedrock in both areas is Devonian in age. However, the chances of finding suitable quarry rock in the northern area are less than 50%.

5. GRANULAR MATERIAL PROSPECTS FOR USE ON HIGHWAY 3 IN THE FORT PROVIDENCE, NWT, AREA

Basically, there are two types of road surfacing gravel possibilities in the Fort Providence area. One possibility is the raised beach ridge area located well south of the Mackenzie River. The second possibility includes bars and islands along the Mackenzie River channel south and west of Fort Providence and in the adjoining upland channel-scarred terrain. Granular deposits may occur along the margins of bifurcating channels that are dry most of the time, but carry water during high flows in the Mackenzie.

Gravel in raised beach ridges is likely to be thin, and locally it may overlie frost-shattered bedrock. Granular deposits on bars and around the margins of tall treed parts of islands are also likely to be thin, and also probably widely discontinuous. Exposed bars may have a cover of gravel, small stones, and boulders over till. For this reason, field reconnaissance by helicopter or motorboat is critical. One should try to single out the thickest and best-graded granular deposits, and also those closest to potential stockpile sites along Highway 3.

A good deal of energetic hand spade work may be required after landing -- either digging into exposed gravel bars, which may also contain many boulders, or digging into undercut riverbanks, where the gravel is buried by sloughed silty topstratum that is a metre or two thick. These old riverbed deposits may be elevated well above the present river because of long-continued riverbed downcutting.

For easy reference I have outlined several factors to consider in Appendix B. Granular material may be absent at one location, then a metre or two thick farther along and, hopefully, even thicker where granular deposits infill the beds of originally deep abandoned river channels.

I have marked 72 granular material prospects in the Fort Providence area. Those closest to the Mackenzie River can be checked easily and quickly.

6. SUMMARY AND CONCLUSIONS

1. The best prospects are inferred gravel-covered bars, the margins of islands covered with tall deciduous trees, and upper riverbank locations along the main Mackenzie River channel. Many such locations have been mapped because gravel may occur at some outlined areas and not at others.

2. Raised beach ridges occur well south of the Mackenzie River. They may be too remote to develop. Cost of developing this area should be compared with prospects in the immediate Fort Providence area and quarry rock possibilities.
3. Rather doubtful rock quarry prospect areas have been noted for checking. They require careful ground checking to discover exposures for assessing rock quality related to road surfacing aggregate and volume of material.
4. Prospects along and near the Mackenzie River may be checked most effectively by helicopter if the river stage is low and by motorboat if river levels are high.

APPENDIX A

NWT HIGHWAY 3
FORT PROVIDENCE SEARCH AREA
SUMMARY OF GRAVEL PROSPECTS
INTERPRETED FROM 1:58,000 AIRPHOTOS

<u>Strip mosaic sheet number</u>	<u>Prospect number</u>	<u>Description of prospect</u>
Sheet 1	1 - 6	Glacial Lake McConnell beach ridges. Areas marked are larger prospects. Check at Xs.
Sheet 1	7	Low terrace. Thin, discontinuous gravel and stones.
Sheet 1	8	Small islands. Check for gravel on exposed shore and, more important, at depth of about 1 m near the top of the banks and islands. Prospect for working in winter or barge haul to a stockpile site along the highway. May be thin, if gravel is present.
Sheet 1	9, 10	Densely wooded areas on a large island. Check where the soils are better drained. Taller trees may indicate greater depth to clay or to permafrost. Deposit may be thin, if present -- thus need a large area.

APPENDIX A (cont'd)

<u>Strip mosaic sheet number</u>	<u>Prospect number</u>	<u>Description of prospect</u>
Sheet 2	11 to 31	Wooded bars and islands in and adjoining abandoned channels of the Mackenzie River. The channels carry water at high flows, and are often dry at low flows. Check exposures around islands (using a helicopter). Dig into bank below the slough layer, which may be 1 to 2 m thick.
Sheet 2	32 - 34	Well drained wooded margins of abandoned stream channels. Fair prospect.
Sheet 2	35 - 45	Generally postglacial channel bars and islands that are heavily wooded and may contain sand and gravel over till. Prospects are easy to check by helicopter and hand spade.
Sheet 2	46, 47, 48	Closer prospects. Easy boat access. Summer barge haul or winter ice haul. Prospect 46 should be good, and easily and quickly verified.
Sheet 2	49	Poor prospect. May be thin. Possibly sand.
Sheet 2	50 - 53	Distributary enclosed islands in an abandoned channel of the Mackenzie River.

APPENDIX A (cont'd)

<u>Strip mosaic sheet number</u>	<u>Prospect number</u>	<u>Description of prospect</u>
Sheet 2	54, 55	Islands and bars in the Mackenzie River.
Sheet 2	56, 57	Large islands north of the Mackenzie. Xs are places to check via motorboat or helicopter.
Sheet 2	58 - 63	Islands in Mackenzie west of Fort Providence.
Sheet 2	64 - 66	Abandoned bars and islands back from the Mackenzie River.
Sheet 2	67	Small pit near highway. Difficult to outline area from airphotos. Probably shallow and discontinuous.
Sheets 2 and 3	68	Check along both highway ditches for patches of surface sand and gravel (wave-eroded and redeposited granular material from reworked till).
Sheet 3	69	Check exposed channel bed for gravel and its thickness.
Sheet 3	70, 71	Classic braid bars in abandoned Mackenzie River flood plain.
Sheet 3	72	Wooded point bar deposits.

APPENDIX B

SOME FACTORS TO CONSIDER IN GRANULAR MATERIAL LOCATION, FIELD EXPLORATION, AND DEPOSIT EXPLOITATION NWT HIGHWAY 3, FORT PROVIDENCE AREA

1. The area is covered almost 100% by trees, brush, and muskeg vegetation (sedges, mosses, low shrubs).
2. Relief away from the Mackenzie River channel is very low: nearly level to slightly undulating and scarred with (a) numerous crisscrossing iceberg gouges on the glacial lake plain (Lake McConnell) north, south, and east of Fort Providence, (b) winding channels enclosing river bars and islands.
3. Prospective gravel deposits along and near the Mackenzie River are likely to be relatively thin (1 to 4 m) where they are present. Prospects are best examined in the field on exposed river bars and at riverbank locations slightly below the clayey to silty overburden -- i.e. near the top of steep undercut riverbanks.
4. Near-surface gravel deposits are expected to be thin and in places may consist of a single layer of stones and gravel over river-eroded till. Such areas might merge with local pockets of gravel that is 2 to 3 metres thick. I expect nearly all prospects can be relatively easily and quickly checked in the field.
5. Riverbank and exposed riverbed prospects are checked easily and quickly by (a) helicopter reconnaissance and/or (b) motorboat -- in each case, usually followed by a short walk or climb.
6. Vegetation type and height is susceptible to the depth to water table, as well as the depth to permafrost. Thus, taller, denser, deciduous trees are more likely to be underlain at a metre or two by granular material than wet scrub vegetation areas.

APPENDIX B (cont'd)

7. It is important to consider the economics of such things as (a) mode of exploration by test pitting vs backhoe, (b) gravel haul by a towed small barge in summer vs over-ice truck haul in winter, and (c) good accessible locations for stockpile sites along the highway or river near the ferry crossing of the Mackenzie River.
8. During field reconnaissance, notes should be made of expected prospect volume, gradation, access problems, haul distance, type of haul, overburden thickness, depth to water table or permafrost, river water depth. This information is needed to estimate costs and to plan subsurface exploration and follow-up exploitation of deposits.

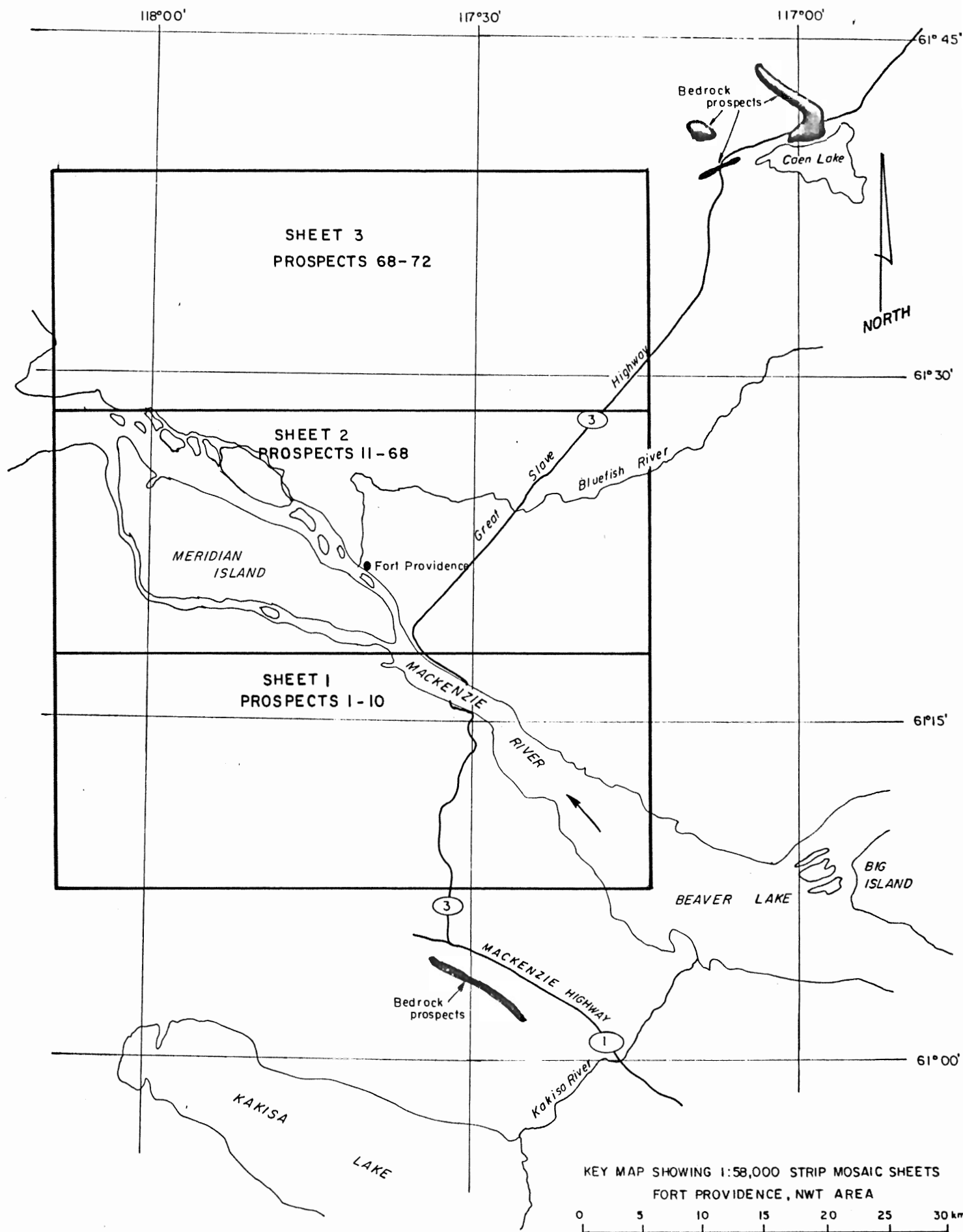
APPENDIX C

POTENTIAL BEDROCK QUARRY SITES NWT HIGHWAY 3, FORT PROVIDENCE AREA

I have tried to identify areas where the bedrock may be at or near ground surface along or near Highway 3. The few sites I have shown are taken from old maps that I have in the office. My ordered airphoto coverage does not extend to the areas shown north of Bluefish River and south of the Mackenzie River.

The outlined areas are worth examining in the field to determine whether (a) the overburden is thin and easily removed, and (b) the rock is strong and durable enough to stand up under repeated vehicular traffic.

Any bedrock is likely to be fractured and fragmented sandstone, and to be located within a metre or so of ground surface.



KEY MAP SHOWING 1:58,000 STRIP MOSAIC SHEETS
FORT PROVIDENCE, NWT AREA

0 5 10 15 20 25 30 km
0 5 10 15 miles

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September, 1988

FIGURE 1

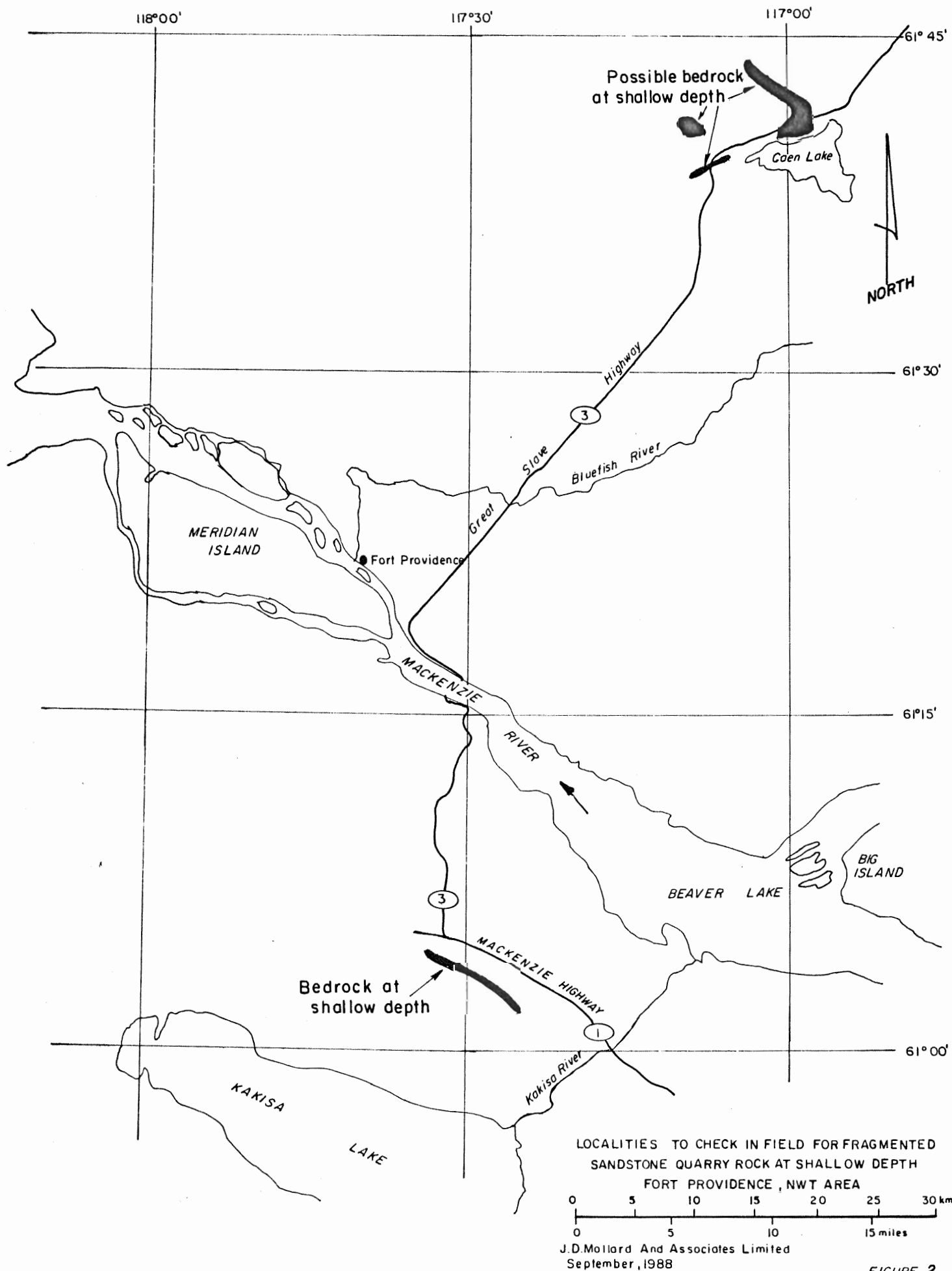
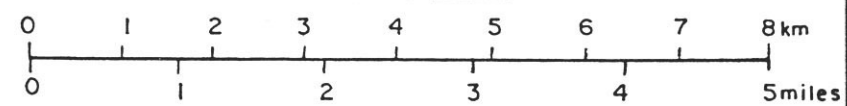


FIGURE 2



AIRPHOTO MOSAIC SHOWING PROSPECTS

1 to 10



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SHEET 1



AIRPHOTO MOSAIC SHOWING PROSPECTS
11 to 68

0 1 2 3 4 5 6 7 8 km
0 1 2 3 4 5 miles

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SHEET 2



END OF REPORT