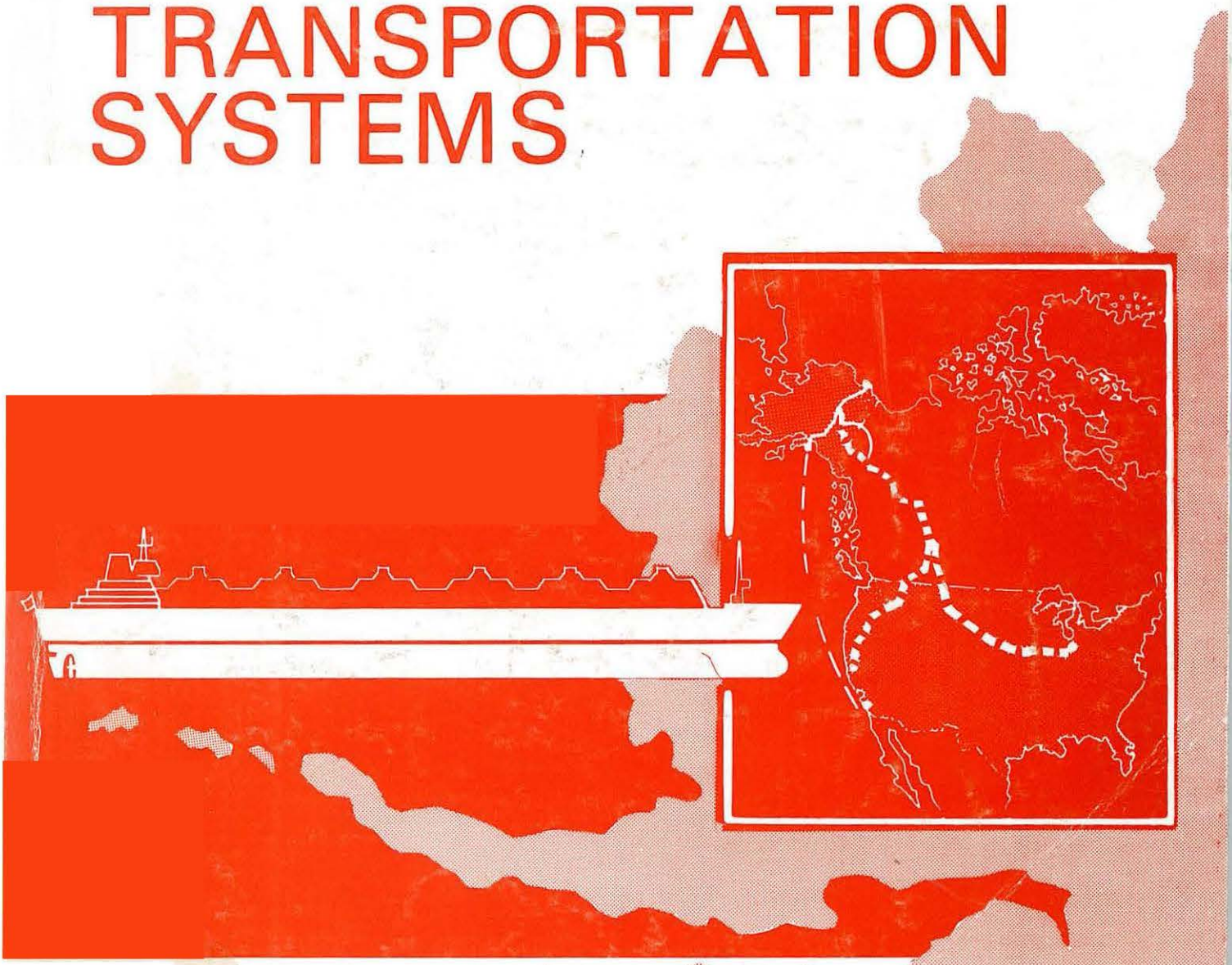
ALASKA NATURAL GAS TRANSPORTATION SYSTEMS



EDERAL POWER COMMISSION STAFF

ALCAN PIPELINE PROJECT

ENVIRONMENTAL ASSESSMENT

TAYLOR HIGHWAY-KLONDIKE HIGHWAY REALIGNMENT

August 1977

FEDERAL POWER COMMISSION STAFF

ENVIRONMENTAL ASSESSMENT OF THE TAYLOR HIGHWAY-KLONDIKE HIGHWAY REALIGNMENT

EL PASO ALASKA COMPANY

Docket No. CP75-96, et al.

August 1977

FOREWORD

The Federal Power Commission, pursuant to the Natural Gas Act, is authorized to issue certificates of public convenience and necessity for the construction and operation of natural gas facilities subject to its jurisdiction, on the conditions that:

> /a/ certificate shall be issued to any qualified applicant therefor, authorizing the whole or any part of the operation, sale, service, construction, extension, or acquisition covered by the application, if it is found that the applicant is able and willing properly to do the acts and to perform the service proposed and to conform to the provisions of the Act and the requirements, rules, and regulations of the Commission thereunder, and that the proposed service, sale, operation, construction, extension, or acquisition, to the extent authorized by the certificate, is or will be required by the present or future public convenience and necessity; otherwise such application shall be denied.

15 U.S.C. 717

The Commission shall have the power to attach to the issuance of the certificate and to the exercise of the rights granted thereunder such reasonable terms and conditions as the public convenience and necessity may require.

Section 1.6 of the Commission's Rules of Practice and Procedure allows any person alleging applicant's non-compliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration. 18 C.F.R. §1.6 (1972).

Section 2.82(c) of the Commission's General Rules allows any person to file a petition to intervene on the basis of the staff draft environmental impact statement.

FEDERAL POWER COMMISSION-ORDER 415-C
(Issued December 18, 1972)
STATEMENT OF GENERAL POLICY TO IMPLEMENT PROCEDURES FOR COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

§ 2.80 Detailed Environmental Statement.

(a) It shall be the general policy of the Federal Power Commission to adopt and to adhere to the objectives and aims of the National Environmental Policy Act of 1969 (Act) in its regulation under the Federal Power Act and the Natural Gas Act. The National Environmental Policy Act of 1969 requires, among other things, all Federal agencies to include a detailed environmental statement in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment.

(b) Therefore, in compliance with the National Environmental Policy Act of 1969 the Commission staff shall make a detailed environmental statement when the regulatory action taken by us under the Federal Power Act and Natural Gas Act will have a significant environmental impact. A "detailed statement" prepared in compliance with the requirements of §§ 2.81 through 2.82 of this Part shall fully develop the five factors listed hereinafter in the context of such considerations as the proposed activity's direct and indirect effect on the air and water environment of the project or natural gas pipeline facility; on the land, air, and water biota; on established park and recreational areas; and on sites of natural, historic, and scenic values and resources of the area. The statement shall discuss the extent of the conformity of the proposed activity with all applicable environmental standards. The statement shall also fully deal with alternative courses of action to the proposal and, to the maximum extent practicable, the environmental effects of each alternative. Further, it shall specifically discuss plans for future development related to the application under consideration.

The above factors are listed to merely illustrate the kinds of values that must be considered in the statement. In no respect is this listing to be construed as covering all relevant factors.

The five factors which must be specifically discussed in the detailed statement are:

(1) the environmental impact of the proposed action,
(2) any adverse environmental effects which cannot be avoided should the proposal be implemented;
(3) alternatives to the proposed action,
(4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

(c) (i) To the maximum extent practicable no final administrative action is to be taken sooner than ninety days after a draft environmental statement has been circulated for comment or thirty days after the final text of an environmental statement has been made available to the Council on Environmental Quality and the public.

(c) (ii) Upon a finding that it is necessary and appropriate in the public interest, the Commission may dispense with any time period specified in §§ 2.80-2.82.

§ 2.81 Compliance with the National Environmental Policy Act of 1969 under Part I of the Federal Power Act

(a) All applications for major projects (those in excess of 2,000 horsepower) or for reservoirs only providing regulatory flows to downstream (major) hydroelectric projects under Part I of the Federal Power Act for license or relicense, shall be accompanied by Exhibit W, the applicant's detailed report of the environmental factors specified in § 2.80 and 4.41. All applications for surrender or amendment of a license proposing construction, or operating change of a project shall be accompanied by the applicant's detailed report of the environmental factors specified in § 2.80. Notice of all such applications shall continue to be made as prescribed by law.

(b) The staff shall make an initial review of the applicant's report and, if necessary, require applicant to correct deficiencies in the report. If the proposed action is determined to be a major Federal action significantly affecting the quality of the human environment, the staff shall conduct a detailed independent analysis of the action and prepare a draft environmental impact statement which shall be made available to the Council on Environmental Quality, the Environmental Protection Agency, other appropriate governmental bodies, and to the public, for comment. The statement shall also be served on all parties to the proceeding. The Secretary of the Federal Power Commission shall cause prompt publication in the Federal Register of notice of the availability of the staff's draft environmental statement. Written comments shall be made within 45 days of the date the notice of availability appears in the Federal Register. If any governmental entity, Federal, state, or local, or any member of the public, fails to comment within the time provided, it shall be assumed, absent a request for a specific extension of time, that such entity or person has no comment to make. Extensions of time shall be granted only for good cause shown. All entities filing comments with the Commission will submit ten copies of such comments to the Council on Environmental Quality. Upon expiration of the time for comment the staff shall consider all comments received and revise as necessary and finalize its environmental impact statement which, together with the comments received, shall accompany the proposal through the agency review and decision-making process and shall be made available to the parties to the proceeding, the Council on Environmental Quality, and the public. In the event the proposal is the subject of a hearing the staff's environmental statement will be placed in evidence at that hearing.

(c) Any person may file a petition to intervene on the basis of the staff draft environmental statement. All interveners taking a position on environmental matters shall file timely comments, in accordance with paragraph (b) of this section, on the draft statement with the Commission including, but not limited to, an analysis of their environmental position in the context of the factors enumerated in 2.80, and specifying any differences with staff's position upon which intervener wishes to be heard. Nothing herein shall preclude an intervener from filing a detailed environmental impact statement.

(d) In the case of each contested application, the applicant, staff, and all interveners taking a position on environmental matters shall offer evidence for the record in support of their environmental position. The applicant and all such interveners shall specify any differences with the staff's position, and shall include, among other relevant factors, a discussion of their position in the context of the factors enumerated in §2.80.

(e) In the case of each contested application, the initial and reply briefs filed by the applicant, the staff and all interveners taking a position on environmental matters must specifically analyze and evaluate the evidence in the light of the environmental criteria enumerated in § 2.80. Furthermore, the Initial Decision of the Presiding Administrative Law Judge in such cases, and the final order of the Commission dealing with the application on the merits in all cases, shall include an evaluation of the environmental factors enumerated in § 2.80 and the views and comments expressed in conjunction therewith by the applicant and all those making formal comment pursuant to the provisions of this section.

§ 2.82 Compliance with the National Environmental Policy Act of 1969 Under the Natural Gas Act.

(a) All certificate applications filed under Section 7(c) of the Natural Gas Act (15 U.S.C. 717f(c)) for the construction of pipeline facilities, except abbreviated applications filed pursuant to Sections 157.7(b), (c) and (d) of Commission Regulations and producer applications for the sale of gas filed pursuant to Sections 157.23-29 of Commission Regulations, shall be accompanied by the applicant's detailed report of the environmental factors specified in § 2.80. Notice of all such applications shall continue to be made as prescribed by law.

(b) The staff shall make an initial review of the applicant's report and, if necessary, require applicant to correct deficiencies in the report. If the proposed action is determined to be a major Federal action significantly affecting

the quality of the human environment, the staff shall conduct a detailed independent analysis of the action and prepare a draft environmental impact statement which shall be made available to the Council on Environmental Quality, the Environmental Protection Agency, other appropriate governmental bodies, and to the public, for comment. The statement shall also be served on all parties to the proceeding. The Secretary of the Federal Power Commission shall cause prompt publication in the Federal Register of notice of the availability of the staff's draft environmental statement. Written comments shall be made within 45 days of the date the notice of availability appears in the Federal Register. If any governmental entity, Federal, state, or local, or any member of the public, fails to comment within the time provided, it shall be assumed, absent a request for a specific extension of time, that such entity or person has no comment to make. Extensions of time shall be granted only for good cause shown. All entities filing comments with the Commission shall submit ten copies of such comments to the Council on Environmental Quality. Upon expiration of the time for comment the staff shall consider all comments received and revise as necessary and finalize its environmental impact statement which, together with the comments received, shall accompany the proposal through the agency review and decision-making process and shall be made available to the parties to the proceeding, the Council on Environmental Quality, and the public. In the event the proposal is the subject of a hearing, the staff's environmental statement will be placed in evidence at that hearing.

(c) Any person may file a petition to intervene on the basis of the staff draft environmental statement. All interveners taking a position on environmental matters shall file timely comments, in accordance with paragraph (b) of this section, on the draft statement with the Commission including, but not limited to, an analysis of their environmental position in the context of the factors enumerated in § 2.80, and specifying any differences with staff's position upon which intervener wishes to be heard. Nothing herein shall preclude an intervener from filing a detailed environmental impact statement.

(d) In the case of each contested application, the applicant, staff, and all interveners taking a position on environmental matters shall offer evidence for the record in support of their environmental position. The applicant and all such interveners shall specify any differences with the staff's position, and shall include, among other relevant factors, a discussion of their position in the context of the factors enumerated in §2.80.

(e) In the case of each contested application, the initial and reply briefs filed by the applicant, the staff, and all interveners taking a position on environmental matters must specifically analyze and evaluate the evidence in the light of the environmental criteria enumerated in § 2.80. Furthermore, the Initial Decision of the Presiding Administrative Law Judge in such cases, and the final order of the Commission dealing with the application on the merits in all cases, shall include an evaluation of the environmental factors enumerated in § 2.80 and the views and comments expressed in conjunction therewith by the applicant and all those making formal comment pursuant to the provisions of this section.

FEDERAL POWER COMMISSION

RULES OF PRACTICE AND PROCEDURE

18 CFR 1.8 Intervention

"(a) Initiation of intervention. Participation in a proceeding as an intervener may be initiated as follows:

(1) By the filing of a notice of intervention by a State Commission, including any regulatory body of the State or municipality having jurisdiction to regulate rates and charges for the sale of electric energy, or natural gas, as the case may be, to consumers within the intervening State or municipality.

(2) By order of the Commission upon petition to intervene.

(b) Who may petition. A petition to intervene may be filed by any person claiming a right to intervene or an interest of such nature that intervention is necessary or appropriate to the administration of the statute under which the proceeding is brought. Such right or interest may be:

(1) A right conferred by statute of the United States;

(2) An interest which may be directly affected and which is not adequately represented by existing parties and as to which petitioners may be bound by the Commission's action in the proceeding (the following may have such an interest; consumers served by the applicant, defendant, or respondent; holders of securities of the applicant, defendant, or respondent; and competitors of the applicant, defendant, or respondent).

(3) Any other interest of such nature that petitioner's participation may be in the public interest.

(c) Form and contents of petitions. Petitions to intervene shall set out clearly and concisely the facts from which the nature of the petitioner's alleged right-or interest can be determined, the grounds of the proposed intervention, and the position of the petitioner in the proceeding, so as fully and completely to advise the parties and the Commission as to the specific issues of fact or law to be raised or controverted, by admitting, denying or otherwise answering specifically and in detail, each material allegation of fact or law asserted in the proceeding, and citing by appropriate reference the statutory provisions or other authority relied on: Provided, that where the purpose of the proposed intervention is to obtain an allocation of natural gas for sale and distribution by a person or municipality engaged or legally authorized to engage in the local distribution of natural or artificial gas to the public, the petition shall comply with the requirements of Part 156 of this chapter (i.e., Regulations Under the Natural Gas Act). Such petitions shall in other respects comply with the requirements of §§1.15 to 1.17, inclusive.

(d) Filing and service of petitions. Petitions to intervene and notices of intervention may be filed at any time following the filing of a notice of rate or tariff change, or of an application, petition, complaint, or other document seeking Commission action, but in no event later than the date fixed for the filing of petitions to intervene in any order or notice with respect to the proceedings issued by the Commission or its Secretary, unless, in extraordinary circumstances for good cause shown, the Commission authorizes a late filing. Service shall be made as provided in §1.17. Where a person has been permitted to intervene notwithstanding his failure to file his petition within the time prescribed in this paragraph, the Commission or officer designated to preside may where the circumstances warrant, permit the waiver of the requirements of §1.26(c)(5) with respect to copies of exhibits for such intervener.

(e) Answers to petitions. Any party to the proceeding or staff counsel may file an answer to a petition to intervene, and in default thereof, may be deemed to have waived any objection to the granting of such petition. If made, answers shall be filed within 10 days after the date of service of the petition, but not later than 5 days prior to the date set for the commencement of the hearing, if any, unless for cause the Commission with or without motion shall perscribe a different time. They shall in all other respects conform to the requirements of §§1.15 to 1.17, inclusive.

(f) Notice and action on petitions

(1) Notice and service. Petitions to intervene, when tendered to the Commission for filing, shall show service thereof upon all participants to the proceeding in conformity with §1.17(b).

(2) Action on petitions. As soon as practicable after the expiration of the time for filing answers to such petitions or default thereof, as provided in paragraph (e) of this section, the Commission will grant or deny such petition in whole or in part or may, if found to be appropriate, authorize limited participation. No petitions to intervene may be filed or will be acted upon during a hearing unless permitted by the Commission after opportunity for all parties to object thereto. Only to avoid detriment to the public interest will any presiding officer tentatively permit participation in a hearing in advance of, and then only subject to, the granting by the Commission of a petition to intervene.

(g) Limitation in hearings. Where there are two or more interveners having substantially like interests and positions, the Commission or presiding officer may, in order to expedite the hearing, arrange appropriate limitations on the number of attorneys who will be permitted to cross-examine and make and argue motions and objections on behalf of such interveners."

FEDERAL POWER COMMISSION STAFF

BUREAU OF NATURAL GAS

ENVIRONMENTAL ASSESSMENT OF THE TAYLOR HIGHWAY-KLONDIKE HIGHWAY REALIGNMENT

SUMMARY SHEET

El Paso Alaska Company — Docket No. CP75-96, et al.

1. The Environmental Assessment of the Taylor Highway-Klondike Highway Realignment has been prepared by the staff of the Federal Power Commission pursuant to a directive by the Council on Environmental Quality and the White House Alaska Task Force.

2. The directive results from the recent announcement of the National Energy Board of Canada (NEB) that transport of Alaskan natural gas through Canada to the lower 48 states should be along the route proposed by the Alcan Pipeline Company (Alcan) with a Taylor Highway-Klondike Highway realignment. This realignment would diverge from the proposed Alcan route at Tetlin Junction, Alaska, and then follow the Taylor Highway to the Alaska-Yukon border. From the border, the realignment would proceed to Dawson, Yukon, and then along the Klondike Highway to Whitehorse, Yukon, where it would rejoin the Alcan prime route. Such a route would facilitate the future connection of Mackenzie Delta gas to the proposed Alcan project via a pipeline along the Dempster Highway from the Delta to Dawson.

3. Environmental impacts resulting from the construction and operation of this realignment would include effects on humans, wildlife, vegetation, soil, water quality, air quality, and noise levels. This assessment describes the expected impacts of such a realignment.

4. Approximately 2,500 copies are being made available to Senators, Congressman, Federal, state, and local government agencies, and to all appropriate agencies and groups appearing on the service list of the Federal Power Commission and the Department of the Interior. The Environmental Assessment was made available to the Council on Environmental Quality and to the public on August 26, 1977.

5. The Council on Environmental Quality has informed the FPC staff that, based on its review of the Assessment, no final supplement is required prior to the President's decision on the basic system and technology.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

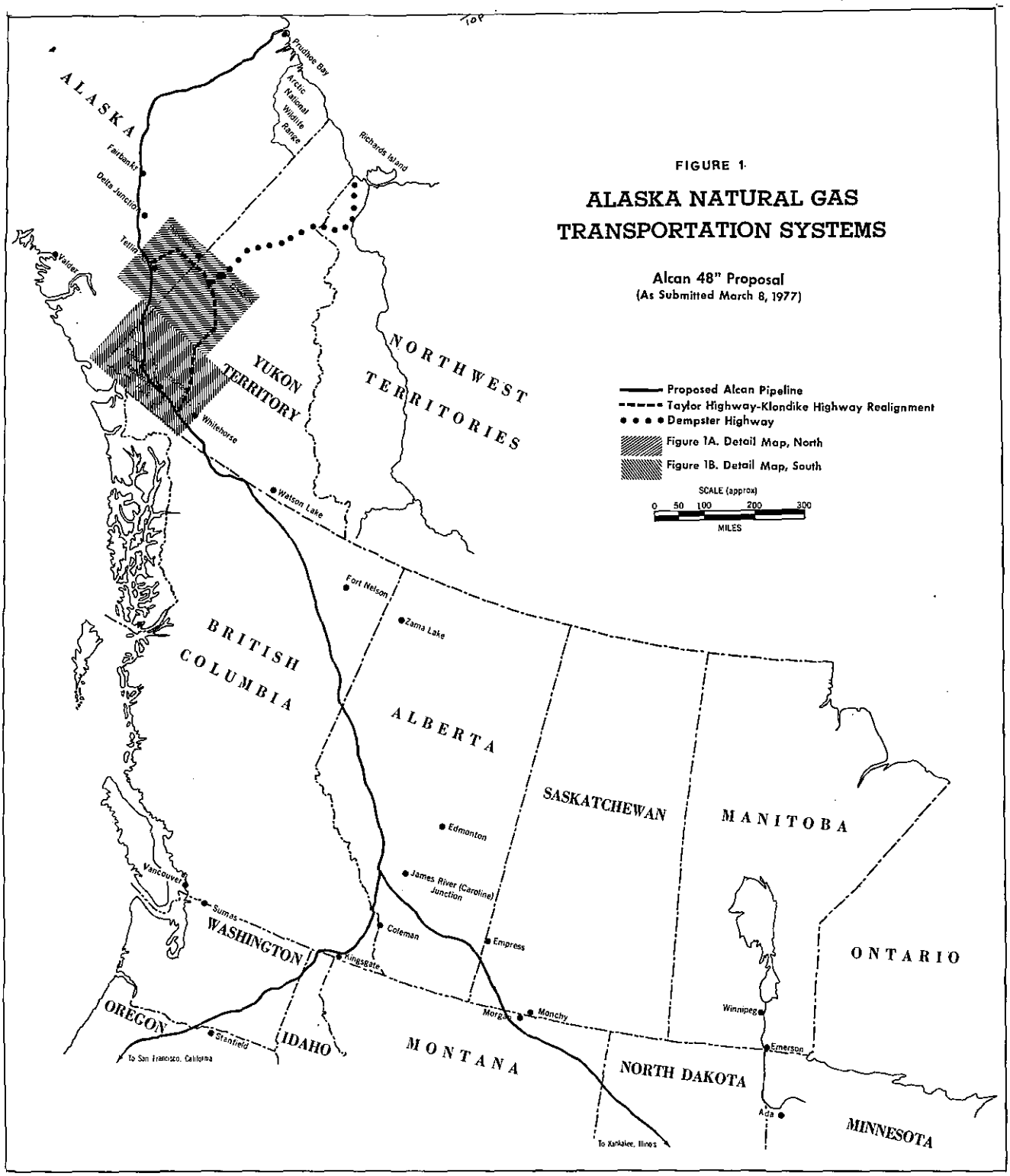
A. DESCRIPTION OF THE PROPOSED ACTION

On July 9, 1976, Alcan Pipeline Company (Alcan) filed an application before the Federal Power Commission (FPC) in Docket No. CP76-433 for a certificate of public convenience and necessity to construct and operate pipeline facilities to convey Alaskan natural gas to the lower 48 states. Similar applications were filed before the Canadian National Energy Board (NEB) to construct and operate the Canadian portion of the project. In September 1976, the FPC staff issued a Supplement to its Final Environmental Impact Statement on the Alaskan Natural Gas Transportation Systems, in which it analyzed the potential environmental impacts of the Alcan Pipeline Project. This document will hereafter be referred to as the Supplement.

On March 8 and 22, 1977, following the close of the FPC hearings, Alcan filed an amended proposal. This proposal (route shown in Figure 1) is for a high-pressure, high-capacity pipeline similar to that suggested by the FPC staff in the Supplement. The main route of this "48-inch alternative," now Alcan's only proposal, is identical to the original proposal in Alaska, the Yukon, southern Alberta, Saskatchewan, and the lower 48 states, excluding the facilities proposed by Northwest Pipeline Company extending from Sumas, Washington, to Kent, Oregon. The originally proposed looping in British Columbia from Fort Nelson to Sumas was eliminated, and a new line was proposed from the vicinity of Watson Lake, the Yukon, to near Crooked Creek, Alberta, where it would coincide with the original proposal.

Given the time constraints imposed by the Alaska Natural Gas Transportation Act of 1976, the coincidence of the new proposal with large portions of the FPC environmental staff's suggested route and the original proposal which had already been studied, and the elimination of significant portions of the original proposal, it was decided that no change to the environmental impact statement was required. The FPC staff did prepare a report dated April 8, 1977, outlining the salient changes in environmental impact involved with the change to the 48-inch diameter system. This report was provided to the task force preparing the Commission's Report to the President.

On July 4, 1977, the NEB issued its decision concerning the various proposals to bring Canadian and Alaska natural gas south across the Yukon. In that decision, the NEB found the Arctic Gas Project to be unacceptable, thereby effectively


ALASKA
Prudhoe Bay
Arctic National Wildlife Range
Richards Island
Fairbanks
Delta Junction
Teslin
Whitehorse
Watson Lake
YUKON TERRITORY
NORTHWEST TERRITORIES
Fort Nelson
Zama Lake
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
Edmonton
James River (Caroline) Junction
Vancouver
Sumas
WASHINGTON
Coleman
Empress
Kingsgate
ONTARIO
Winnipeg
Morgan
Monchy
Emerson
OREGON
Stanfield
IDAHO
MONTANA
NORTH DAKOTA
Ada
MINNESOTA
To San Francisco, California
To Kankakee, Illinois
FIGURE 1
ALASKA NATURAL GAS TRANSPORTATION SYSTEMS
Alcan 48" Proposal
(As Submitted March 8, 1977)
Proposed Alcan Pipeline
Taylor Highway-Klondike Highway Realignment
Dempster Highway
Figure 1A. Detail Map, North
Figure 1B. Detail Map, South
SCALE (approx)
0 50 100 200 300
MILES

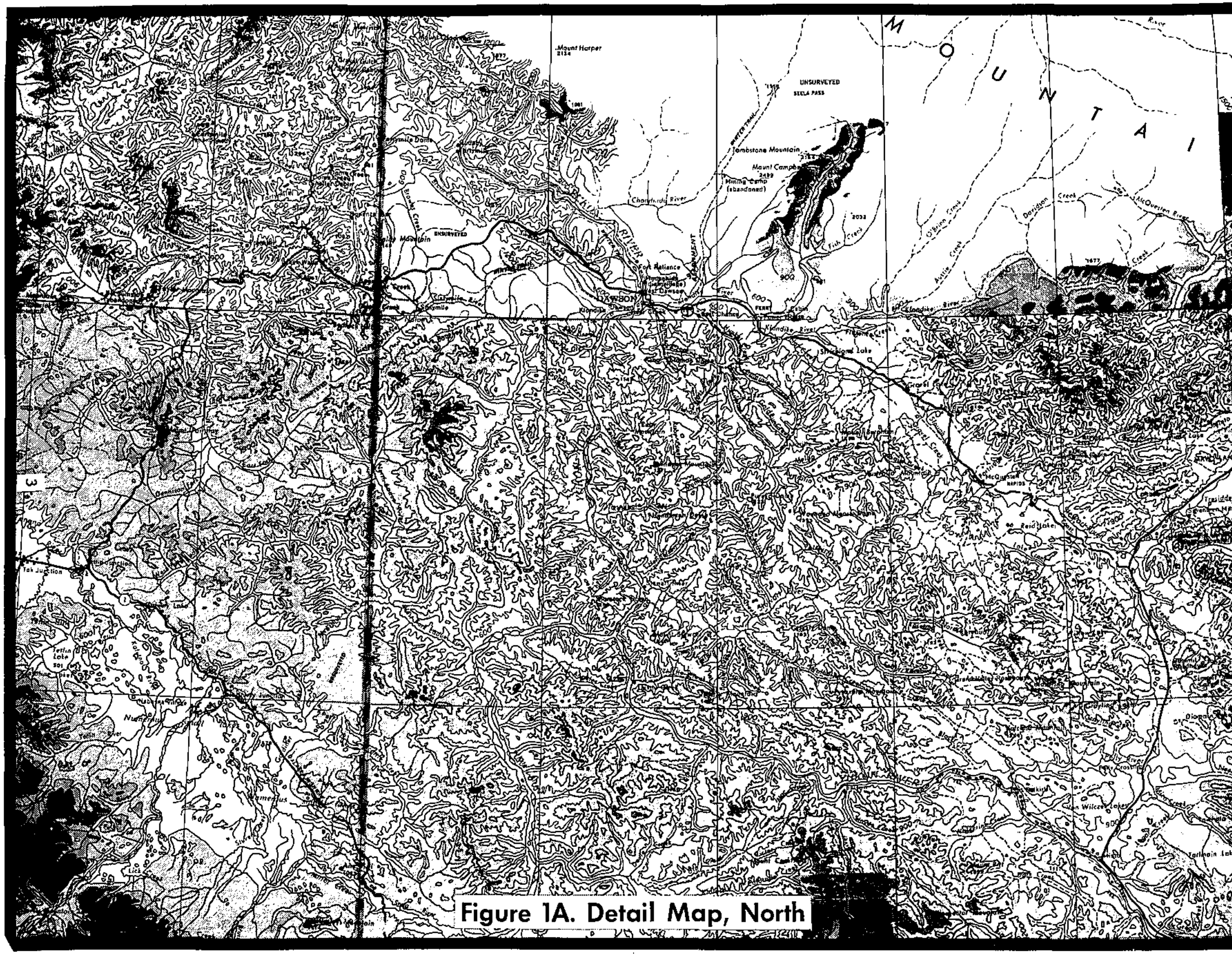


Figure 1A. Detail Map, North

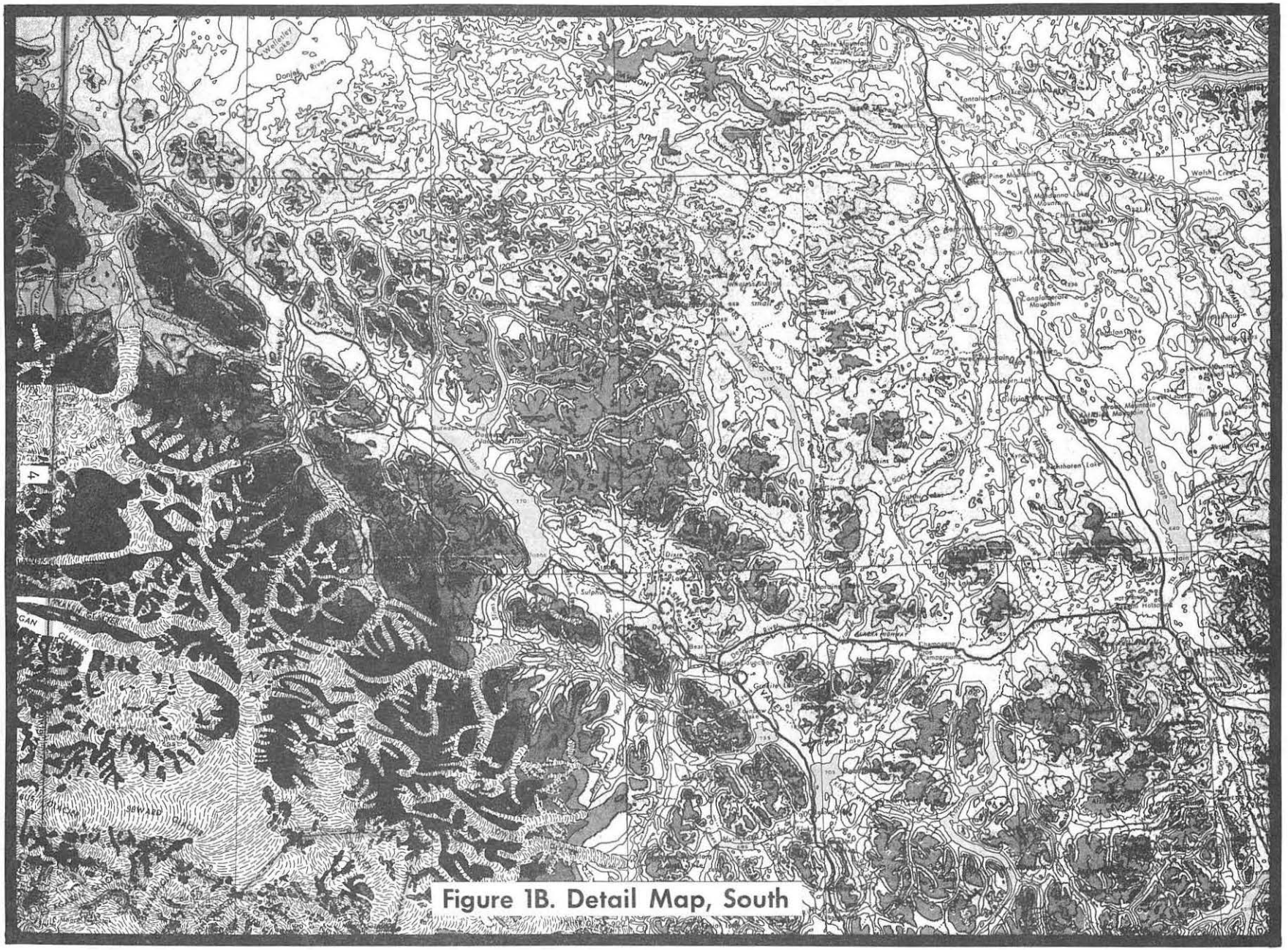


Figure 1B. Detail Map, South

removing it from the competition. In addition, it found that:

> A crucial question in regard to any land bridge proposal for the transmission of United States gas through Canada is whether the project has the potential for bringing Delta [Mackenzie Delta] gas to Canadian markets and the. . .[Alcan] project has such a potential in the form of a Dempster link.... A necessary complement to the undertaking given by the principals of Foothills (Yukon) to undertake the construction of a Dempster link would be a rerouting of the Alaska Highway line [Alcan Project] via Dawson, Yukon. In certificating the. . .[Alcan] project, the Board would require a diversion of the route through Dawson.

Figure 1 shows the approximate location of the potential "Dempster Link."

The only environmentally logical route to connect the original proposal in Alaska and the NEB preferred rerouting in Canada would follow the existing Taylor Highway in Alaska and the Klondike Highway in Canada. The sponsors of the Alcan Project in Alaska and Canada have expressed a willingness to utilize such a route.

This document is an environmental assessment of such a realignment in Alaska and Canada to determine if the environmental impact associated with the NEB modified route is acceptable.

The overall environmental assessment of this project, embodied in the Supplement, includes consideration of environmental impacts that are equally applicable to the Taylor Highway-Klondike Highway realignment. The Supplement has been through the rigorous arena of the hearing process. It was found to be acceptable. This assessment, an update of the Supplement, points out specific impacts of a relatively small portion of the complete project. Except for legal questions associated with construction within a region nominated for inclusion in the National Wild and Scenic Rivers System, there are no environmental concerns unique to this realignment which have not been discussed in the Supplement.

The Council on Environmental Quality has informed the FPC staff that, based on its review of the Assessment, no final supplement is required prior to the President's decision on the basic system and technology.

Taylor Highway-Klondike Highway Realignment

Except for the relocation of a segment of the pipeline and the addition of one more compressor station in Alaska and two more in Canada, there is no difference between the realignment and the prime route discussed in the Supplement. All construction techniques and mitigation measures would be the same.

The realignment diverges from the prime route east of the Tanana River crossing, approximately 1½ highway miles west of Tetlin Junction. This point of divergence is approximately 655 pipeline miles from Prudhoe Bay. The route then proceeds to the Taylor Highway, exits the Tanana River Valley and enters the drainage of the Fortymile River, a principal tributary of the Yukon River. Within this drainage, which extends to the Alaska-Yukon border, the route parallels the highway, staying within the existing corridor. The realignment crosses Logging Cabin Creek, the West Fork Dennison Fork, and the Mosquito Fork of the Fortymile River as it proceeds toward Chicken at approximately pipeline milepost (MP) 715. Turning east the route continues adjacent to the highway, generally following the valley of the South Fork and its tributaries, Wade and Walker Creeks. After crossing Gilliland Greek in the vicinity of pipeline MP 735, the route turns southeast to Boundary, Alaska, and terminates at the border approximately 3 miles east of Boundary and 55 miles west of Dawson, Yukon Territory. The pipeline milepost at the border is approximately 755.5, indicating 23.6 additional pipeline miles are required in Alaska because of the realignment.

Preliminary estimates for locations of compressor station sites would be pipeline MP 672 and 745. These are adjacent to the Taylor Highway at highway MP 18, and 6 miles southeast of the Eagle cutoff, highway MP 95.7.

The Canadian realignment (Klondike Highway realignment) follows the remainder of the Klondike loop, proceeding eastward along the Boundary Highway to Dawson, east along the Klondike Highway to Stewart Crossing, and then south and southeast on the same highway through Pelly Crossing, Midway, and Carmacks, to Whitehorse. Near Whitehorse the original routing is resumed. Approximate locations for the eight compressor stations along the Canadian realignment would be pipeline MP's 840, 888, 925, 962, 1000, 1036, 1072, and 1116, all measured from Prudhoe Bay. This realignment crosses the following major rivers in Canada: some of which may require aerial pipeline bridge construction, the Yukon at Dawson, the Stewart at Stewart Crossing, the Pelly at Pelly Crossing, the Yukon at Carmacks and the Yukon at Whitehorse.

The highway mileage in Canada from the border near Boundary along the Klondike Highway to Whitehorse is 400 miles. This means that the Taylor Highway-Klondike Highway realignment is about 96.3 miles longer in Canada, and a total of about 119.9 miles longer than the original proposal.

B. DESCRIPTION OF THE EXISTING ENVIRONMENT

1. Climate (Alaska)

The area of Alaska to be traversed by the proposed Taylor Highway realignment lies wholly within the continental climatic zone, which exists in most of the interior of the state. The area is almost entirely sheltered from moderating maritime influences by mountain ranges, so that the weather within this area may be characterized as extreme in temperature in both summer and winter with light annual precipitation. Except for a few isolated locations, surface winds are usually light.

Summer temperatures within the area usually range from 35°F to about 73°F; winter temperatures are usually -31°F to 26°F. Extreme winter-to-summer records range from -75°F to 95°F. Diurnal variations of 60°F have been recorded. July is the warmest month, and January is generally the coldest. The period of frost-free days in this area is relatively short, averaging about 100 days per year. Freezing temperatures have been recorded in every month except July.

Precipitation averages 11 to 15 inches per year and includes 41 to 56 inches of snow. Precipitation is most prevalent in late summer and early fall (June through September) when primary storm tracks penetrate to the interior of the state. Snow generally remains on the ground from mid-October to mid-May. On high ground, snow, which usually begins to fall in early September, lasts into July. High roads and trails are snowbound by late October. Snowfall in the higher elevations can reach 120 inches per year. Lakes and streams start to freeze in early October. Lake ice may be as thick as 50 inches during the winter, with breakup usually occurring in early May.

The calm winds, thermal inversion conditions, and winter temperatures below -25°F, common in the Alaskan interior, result in a potential for ice fog formation associated with the discharge of water vapor by vehicles, compressor stations, or heating facilities along the Taylor Highway realignment.

Daylight along the 64th parallel ranges from almost 24 hours between mid-May and late July to less than or about 7 hours in December and January. Aviation weather is generally good throughout the year because the mountain barriers to both the north and south protect the Yukon area. Exceptions occur during episodes of ice fog and late summer storms.

Climate (Canada)

The interior section of the Yukon which would be crossed by the Klondike Highway realignment is classified as having a continental climate. As in Alaska, temperatures are variable on a monthly, yearly, and location basis. Mean monthly winter (January) temperatures range from 0°F at Carcoss to 13°F at Mayo to -21°F at Dawson. Summer temperatures throughout the area range from 50°F to 60°F. In July, daily maxima may reach 85°F. Average annual precipitation is low, ranging from 9 to 13 inches, of which about 50 percent falls in four summer months. The Dawson area has an average of approximately 75 frost-free days a year.

Additional climate information on this area can be obtained from the Supplement as well as the Department of the Interior FEIS on the Alaska Natural Gas Transportation Systems.

2. Topography and Physiography (Alaska)

The Taylor Highway realignment crosses the Yukon-Tanana Upland, a physiographic province characterized by low mountains and rolling hills and bounded on the north and south by the rivers for which it is named. Rounded ridges with gentle slopes trend northeast and north between the Tanana River and the vicinity of Chicken. Altitudes of 1,500 to 3,000 feet predominate on the ridge crests, with occasional peaks exceeding 5,000 feet. Mount Fairplay, the highest peak adjacent to the Alaskan portion of the realignment, is 5,540 feet in elevation. To the east of Chicken, ridges show no predominant orientation and relief is greater, commonly 1,500 to 1,800 feet from ridge crest to valley floor compared to no more than 1,200 feet to the south. In addition, the valleys are much narrower.

Figure 2 shows the topographic profile at 1-mile intervals along the Taylor Highway from Tetlin Junction to the Alaska-Yukon border. The lowest point is 1,540 feet at the crossing of the South Fork. Six miles beyond Jack Wade and 1,100 feet higher, at about 3,600 feet, the route passes the turnoff to Eagle and continues along a ridge crest to the Canadian Border. From the turnoff to Boundary, a distance of 9 miles, the route gradually descends to 3,000 feet and then ascends to 4,150 feet in the additional 4 miles to the border.

Topography and Physiography (Canada)

The Dawson cutoff-Klondike Highway portion of the NEB alternative route lies entirely within the Yukon Plateau physiographic province, a basin-like area with an average elevation of about 2,000 to 3,000 feet, almost completely encircled by much higher mountains. The plateau land surface consists of rolling, hilly uplands separated by rather deeply entrenched V-shaped valleys along some watercourses. Several minor mountain ranges also exist within the plateau area, with some elevations reaching 7,000 feet. Much of the Yukon Plateau was not glaciated during the Pleistocene epoch; however, rivers in the area did carry large volumes of runoff water and bedload sediments from melting glaciers to the east. This runoff helped create the famous placer gold deposits in the Yukon region as the coarse gravels and gold particles were left behind by the receding glacial floodwaters.

The Klondike Highway realignment would follow the upland plateau surface for most of the 400-mile distance from the Alaskan border to Whitehorse. This route would occasionally descend into broader river valleys and skirt minor mountain ranges. Elevation along the route would vary between about 4,000 and 1,000 feet, with no major topographic obstacles. However, because of the generally narrow, incised stream and river valleys which transect the region and the minor mountain ranges which would be skirted by the pipeline, the Klondike Highway realignment is somewhat more rugged than the prime Alaska Highway route to the south.

The following discussion provides a more detailed understanding of the route topography and its effect on pipeline construction considerations.

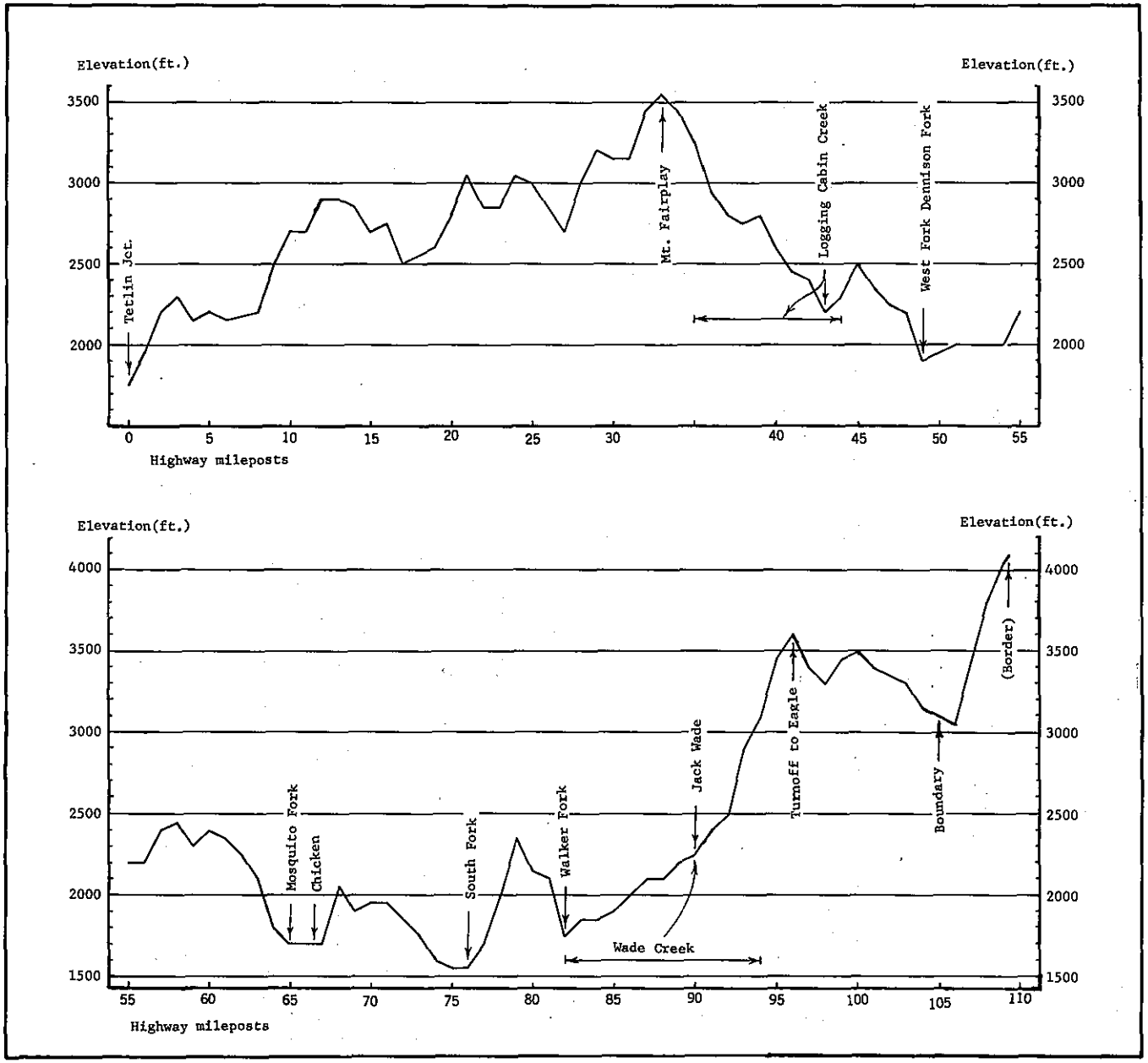


Figure 2 TOPOGRAPHIC PROFILE, TAYLOR HIGHWAY

From the Alaskan border to Dawson, the alternative pipeline route follows the upland ridgeline at elevations ranging from 3,000 to over 4,000 feet. Although the route is somewhat contorted, it does avoid crossing numerous incised stream valleys in the general area. A substantial portion of this route segment is unforested because of the higher elevation above treeline. Excavations in hard rock and substantial bank cutting may be necessary.

Approaching Dawson, the pipeline route descends to an elevation of about 1,050 feet at the Yukon River crossing and then proceeds southeast through the Tintina Valley at a general elevation of about 1,300 to 2,000 feet. Topography and soils in this area should present relatively few construction problems until the pipeline leaves the valley southeast of Stewart Crossing. There is potential, however, for land slumping near Flat Creek which could complicate the pipeline design.

Between Stewart Crossing and Pelly Crossing, the pipeline would cross a divide reaching elevations near 3,000 feet. Some excavation in hard rock and bank cutting may be necessary.

From Pelly Crossing south to Carmacks, the route would follow a fairly broad segment of the Yukon River Valley with elevations ranging from about 1,500 to 2,500 feet. Immediately before Carmacks, the Yukon River would be crossed for the second time, and some bank cutting may be necessary in this vicinity.

After Carmacks, the route enters a more extensively glaciated portion of the Yukon River drainage basin, crossing another divide at somewhat under 3,000 feet in elevation. The route passes through narrow, glacially carved valleys in this region and skirts a minor mountain range near Lake Laberge. After the lake, no further obstructions are encountered as the topography becomes more open at Whitehorse where the alternative route intersects the prime Alaska Highway route.

While the preceding discussion should serve to provide some means of comparison between the Klondike Highway and the Alaskan Highway routes, the discussion is based on very general soils and physiographic information and should not be substituted for detailed data necessary for actual route planning. What is apparent from the discussion is that the Klondike Highway route appears to necessitate substantially increased excavation and bank cutting operations which, although they would be fairly routine, would contribute to increased project costs and environmental impact.

3. Geology and Soils (Alaska)

A thick mantle of wind-deposited silt (aeolian deposits) covers deep alluvial materials (gravel, sand, and silt) in the valley bottoms. Gravelly stream terraces often lie adjacent to the bottom, while colluvial gravel, sand, and silt derived from in-situ breakup of bedrock becomes predominant on hillsides. As the realignment follows ridge crests over much of its length, bedrock is generally close to the surface. The most extensive deposits of unconsolidated material would be crossed prior to leaving the Tanana River drainage, at and near the West Fork, Dennison Fork and Taylor Creek, and between Taylor Highway MP 63 and MP 78 in the vicinity of Chicken. With the exception of those deposits near the Tanana River, which are sand dunes, the other deposits are as previously outlined.

Bedrock along the route is comprised of each major rock type: igneous, metamorphic, and sedimentary. The igneous and metamorphic rocks predominate, with most detrital sedimentary rocks outcropping only between MP 15 and MP 20 on the Taylor Highway. Mesozoic and Tertiary igneous rocks, including granodiorite, basalt, and volcanic rocks of both mafic and felsic composition, occur from the vicinity of Tetlin Junction to Chicken. The volcanics are associated with Mount Fairplay.

Metamorphic rocks, highly deformed and altered by heat and pressure, are occasionally found south of Chicken, but are found practically to the exclusion of all other rock types from Chicken east to the border. These units, of Precambrian and Paleozoic age, are comprised primarily of gneiss and schist.

In general, gravel is scarce along the Taylor Highway, and most construction materials must be extracted from bedrock. Highway maintenance needs are met by using decomposed granite and other weathered bedrock material that is not especially desirable but is available.

The Alaska Road Commission opened about 200 material sites on the Taylor Highway and Eagle Spur during construction of these roads from late 1940's through the early 1950's. At least 100 of these sites have been identified between Tetlin Junction and the Eagle cutoff. None are located beyond the cutoff to the Yukon Border. Only a few of these sites, in fact only 20 from Tetlin Junction to Walker Fork Highway, MP 82, have been granted to the Alaska Department of Highways and have been used for maintenance.

River run material sites are nonexistent along the highway. A possible source of additional material is tailings from placer mining activities on private active claims at Chicken, Jack Wade, and Poker Creek.

Metallic mineral resources are abundant along the Taylor Highway route. In the hills overlooking Tetlin Junction and in the vicinity of Mount Fairplay, there is abundant evidence of copper, tungsten, and molybdenum mineralization. A 2-mile long claim is adjacent to the highway in the Tetlin Junction area. The next claims along the highway are located near Chicken adjacent to Mosquito Fork, and many others are scattered along the highway to the border. All of these are gold, silver, or lead deposits, most of them placer. The Taylor Highway crosses or is adjacent to about 11 miles of claims. While the status of these claims is unknown, the majority are active because current assessment work statements have been filed with the appropriate authorities and the on-ground inspection indicated much visible activity.

No active geologic faults are known to be crossed by the realignment. As it leaves Tetlin Junction, the route moves away from the Denali fault, which is 40 miles distant at that point. The Tintina Fault System, which parallels the Yukon River Valley, is the next major fault structure to the north. It is at least 45 miles from the realignment, and the degree of activity on the system is uncertain. Apparently it is less active than the Denali Fault System. There is little potential for fault-related ground rupture on the route. Figure 2 shows that the potential for ground shaking along the alignment is less than for the prime route.

There are no glaciers near the route, so outwash flooding is not a hazard. While there are old volcanoes in the area, all have been inactive for several million years.

Soil depths range from shallow or nonexistent on steep rock outcrops near the rivers to moderately deep gravel deposits covered with peaty to silty soils in the valley bottoms adjacent to the southern portion of the alternate. The specific type of soil at any location reflects, among other things, the adjacent and parent bedrock material, slope, permafrost, and the extent of past placer mining and forest fires. The best immediate indication of soil types is the overlying vegetation.

There is little potential for agriculture along the route because of the general lack of irrigation water and, more importantly, the adverse climate. The short warm season does not allow sufficient time to properly decompose dead organic material and to effectively release nutrients. Poor drainage makes some areas unsuitable.

The realignment lies entirely within the region of widespread discontinuous permafrost, as does the prime route. A general discussion of permafrost and related problems may be found in the Supplement. Some soil and geologically related construction considerations along the highway are indicated below. The mileposts given are those on the Taylor Highway and, beyond 95.7, the 13-mile extension of that highway to Boundary and the border.

The section from the Tanana River to the crossing of Porcupine Creek, MP 6, is dominated by aeolian fine sand and silts. They are moderately well drained and are generally not susceptible to landsliding, mass movement, or significant erosion by water following disturbance. Wind erosion is a local problem. There are few engineering problems associated with construction on these materials.

From MP 6 to MP 35 near Logging Cabin Creek, bedrock is predominant, accompanied by weathered glacial till and gravel deposits. Permafrost would offer no major problems. Excavation and construction may be difficult in these materials.

From Logging Cabin Creek to the West Fork, MP 49, alluvium, colluvium, and gravel terraces are common. Fine-textured materials which tend to hold moisture are frequent and greatly increase the extent of permafrost. Special construction precautions would be necessary.

Although the route beyond the West Fork Dennison Fork to the Mosquito Fork at MP 64 generally traverses bedrock, several streams are crossed in which fine-grained alluvial material can be expected with attendant permafrost. Excavation may be difficult in the bedrock, and water quality problems would occur.

While the same types of materials are encountered to Warner Creek at MP 92, few construction or water quality problems are likely. The probability of permafrost is low, although it may exist on north-facing slopes.

Beyond MP 92 to the border at MP 109, the highway follows the ridge top and slides, and metamorphic bedrock regularly appears at the surface. Permafrost is relatively rare; however, the steep terrain and resistant materials would cause some construction, erosion, water quality, and reclamation problems.

Geology and Soils (Canada)

Bedrock along the realignment route is composed primarily of ancient sediments in the Cordillera Geosyncline which have been subjected to varying degrees of metamorphism and deformation. Paleozoic gneisses and schists are the predominant bedrock types in the western route area, with ultramafic intrusives prominent in the vicinity of Dawson. The highest elevations encountered by the Klondike Highway realignment occur in this area near the U.S.-Canada border. Southeast of Dawson to the Mayo cutoff, the route would lie within the Tintina trench, a feature of apparent seismic origin associated with the Tintina Fault System. This fault system is thought to be less active than the Denali Fault System traversed by the prime Alcan Highway pipeline route. Accordingly, potential for seismic shaking along the Klondike Highway realignment is probably less than for the prime Alcan route. Figure 3 depicts earthquake acceleration contours for Alaska and northwest Canada. Additional discussion of regional seismicity and attendant pipeline hazards is found in the Supplement.

Farther to the south and east to Carmacks and on to Whitehorse, surface rocks consist of Jurrassic and Triassic sediments generally less altered by regional metamorphism. Volcanic rock types also exist in the region between Carmacks and Whitehorse, creating several small mountain ranges which the realignment would have to avoid. There are no glaciers or active volcanoes near the Klondike Highway realignment.

A variety of mineral resources are known to occur in the vicinity of the Klondike Highway realignment. Present mining activities include an asbestos mine 50 miles northwest of Dawson, a coal mine 30 miles north of Carmacks, and a copper mine 7 miles south of Whitehorse. The general vicinity is believed to have substantial potential for other mineral deposits including gold, silver, lead, zinc, nickel, and molybdenum. Construction materials are generally available from a number of small unreclaimed bank-cuts in the weathered bedrock along the Klondike Highway.

The Klondike Highway realignment lies entirely within the zone of widespread discontinuous permafrost, as does the prime Alaska Highway route. A general discussion of permafrost and related soil problems may be found in the Supplement. The soils along the route may generally be classified as Eutrochrepts, which are characteristic of cool, humid climates

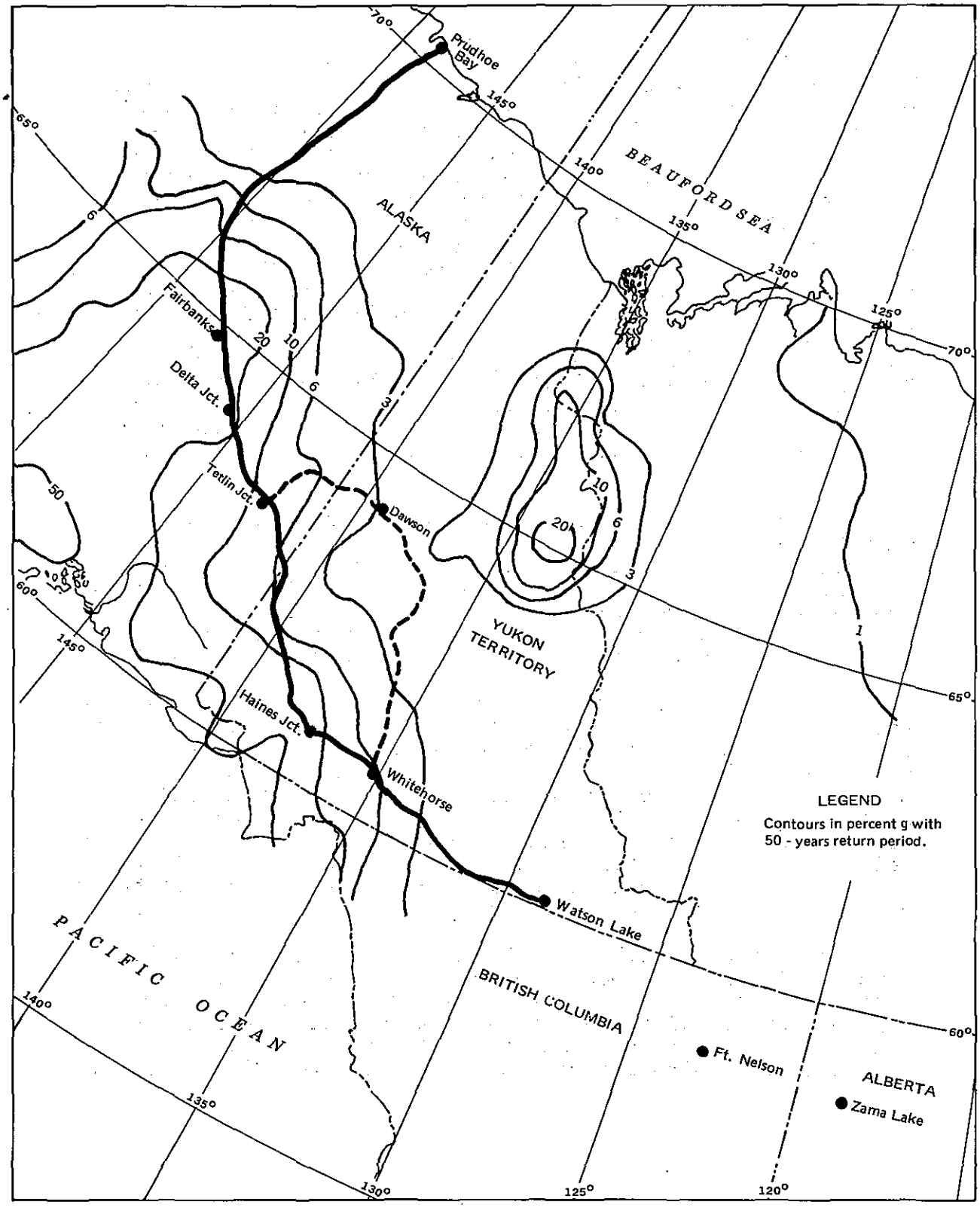


Figure 3 Earthquake Acceleration Contour map, Northwestern Canada and Eastern Alaska

without prolonged dry seasons. Available maps show the occurrence of a significant strong and lithic phase for the soils on the Yukon Plateau, which is probably indicative of generally shallow soil depths. Relatively few permafrost problems are expected for the proposed Klondike Highway realignment. There is some potential for ground slumping near Flat Creek which could affect pipeline design and construction.

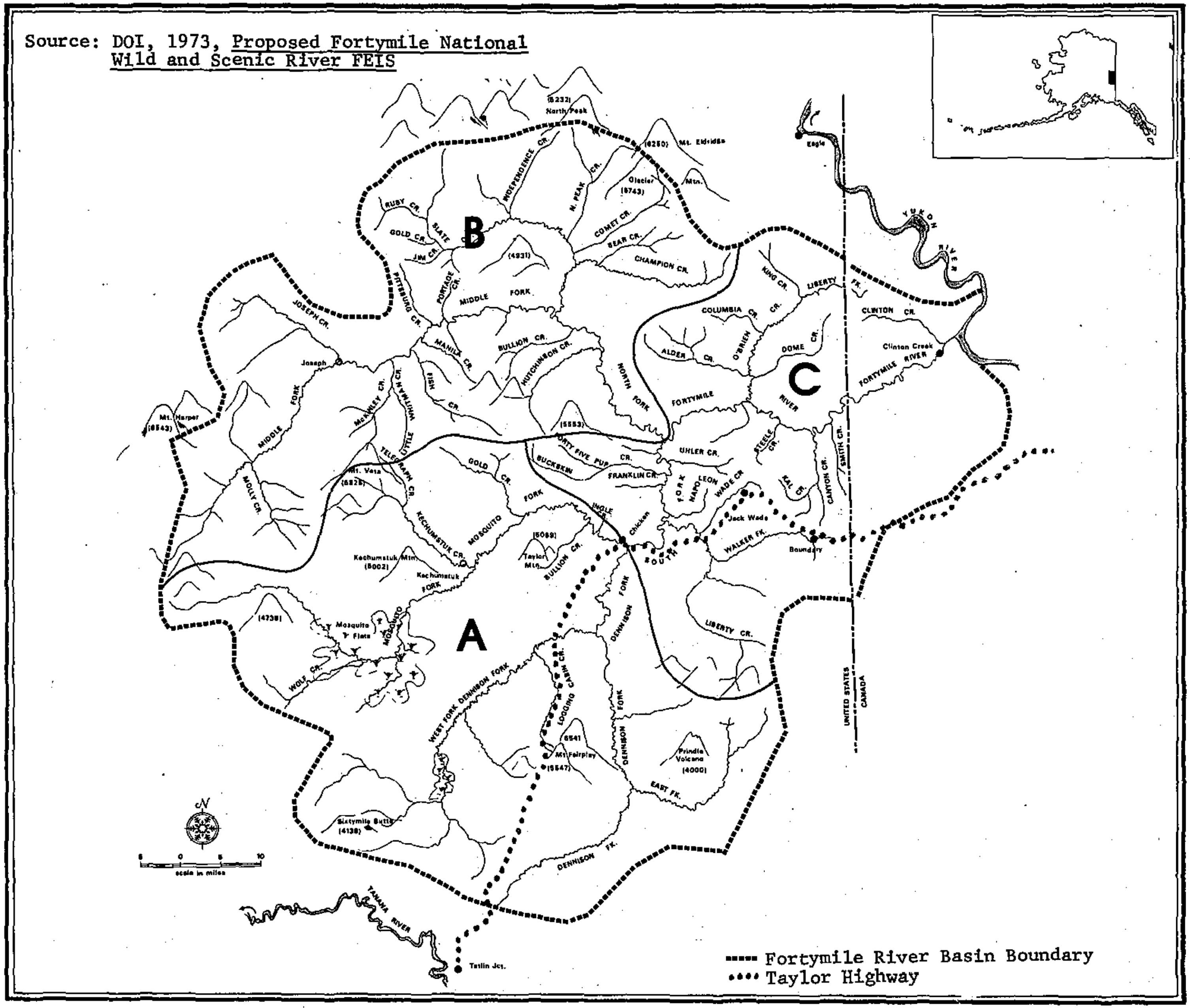
4. Hydrology (Alaska)

The realignment would involve two major watersheds. The first 8 to 10 miles of the route north of Tetlin Junction would be in the Tanana River Basin. Since the Tanana River Basin was discussed in the Supplement and no major tributaries in this drainage would be crossed by the realignment, it will not be discussed further. The rest of the route would pass through the Fortymile River Basin.

The Fortymile River and its tributaries drain some 6,562 square miles of the Yukon-Tanana Uplands. About 95 percent of the basin is in Alaska; the rest lies in Yukon Territory, Canada. The basin and its three major drainage subsystems are illustrated in Figure 4. Subsystems A (the Dennison and Mosquito Forks) and C (the South Fork and the Fortymile River mainstream) would be crossed by the Taylor Highway realignment. Specifically, the route would require crossings of the West Fork Dennison Fork, Mosquito Fork, South Fork, Walker Fork, and numerous other smaller streams. The Dennison Fork, downstream from the confluence of the West Fork Dennison Fork, and the Mosquito Fork, downstream from Gold Creek, are from 15 to 45 feet wide. The bed of the Dennison Fork consists of bedrock and boulders about 10 to 15 inches in diameter, while the bed of the Mosquito Fork is gravel. Both streams are generally shallow, although pools 5 to 10 feet deep are not uncommon. The South Fork and the Fortymile River into which it runs are 30 to 60 feet wide and frequently over 5 feet deep. The bottoms of these streams are composed of gravel, bedrock, and boulders several feet in diameter.

The following flows were measured on October 6, 1960:

Stream	Tributary to	Location	CFS
West Fork	Dennison Fork	Bridge on Taylor Hwy. 5 mi. above mouth	102
Mosquito Fork	South Fork	Bridge on Taylor Hwy. 2½ mi. above mouth	324
South Fork	Fortymile River	Bridge on Taylor Hwy. 5 mi. east of Chicken	620


B
C
A
North Peak
(6232)
Mt. Eldridge
(6250)
Glacier Mtn.
(6743)
Eagle
YUKON RIVER
INDEPENDENCE CR.
RUBY CR.
GOLD CR.
SLATE
JIM CR.
N. PEAK CR.
COMET CR.
BEAR CR.
CHAMPION CR.
(4931)
MIDDLE FORK
PITTSBURG CR.
PORTAGE CR.
KING CR.
LIBERTY FK.
CLINTON CR.
Clinton Creek
FORTYMILE RIVER
COLUMBIA CR.
O'BRIEN CR.
DOME CR.
ALDER CR.
FORTYMILE RIVER
NORTH FORK
JOSEPH CR.
Joseph
MANILA CR.
BULLION CR.
HUTCHINSON CR.
FISH CR.
MIDDLE FORK
McKINLEY CR.
LITTLE WHITMAN CR.
Mt. Harper
(6543)
(5553)
FORTY FIVE PUP
BUCKSKIN
FRANKLIN CR.
UHLER CR.
STEELE CR.
SMITH CR.
CANYON CR.
NAPOLEON CR.
WADE CR.
Jack Wade
WALKER FK.
Boundary
TELEGRAPH CR.
Mt. Veta
(5826)
GOLD CR.
MOLLY CR.
MOSQUITO FORK
INGLE
Chicken
SOUTH FORK
KECHUMSTUK CR.
Kechumstuk Mtn
(5002)
Kechumstuk
Taylor Mtn.
(5089)
BULLION CR.
DENNISON FORK
LIBERTY CR.
(4738)
Mosquito Flats
MOSQUITO
WOLF CR.
WEST FORK DENNISON FORK
LOGGING CABIN CR.
6541
Mt. Fairplay
(5547)
DENNISON FORK
Prindle Volcano
(4000)
EAST FK.
Sixtymile Butte
(4138)
DENNISON FK.
TANANA RIVER
Tetlin Jct.
UNITED STATES
CANADA
scale in miles
Fortymile River Basin Boundary
Taylor Highway

Source: DOI, 1973, Proposed Fortymile National Wild and Scenic River FEIS

Stream velocities throughout the Fortymile River Basin are generally swift, averaging better than 5 mph. The streams are clear except during high flows when moderate to heavy silt loads are carried. The waters of a few streams, such as the upper Mosquito Fork, are slightly brown, probably due to leaching of nearby peaty soils. There are no glacial streams in the basin. A few lakes are located on valley floors.

High stream flows occur from May through September, with low flows from November through April. Groundwater, which is limited generally to small alluvial aquifers by the presence of discontinuous permafrost throughout the basin, is the major contributor to streamflows in the winter. As the groundwater storage is gradually depleted, streamflow diminishes to a minimum during March or April. Ice develops to a thickness of 3 to 6 feet in the streams. During April and May, snowmelt runoff increases the streamflows and causes the spring breakup of the ice. Some flooding apparently may occur soon after breakup, since evidence of ice scouring on trees up to 10 feet above normal water levels may be seen along the narrow floodplains of the Dennison and Mosquito Forks. Following breakup, flows increase, generally reaching their peaks in May or June. Throughout the rest of the summer, rains usually sustain a relatively high discharge. Mean annual peak runoff for the area varies from 10 to 25 cfs per square mile.

There have been no comprehensive water quality studies in the Fortymile River Basin. Surface water quality is considered good, and the stream waters are used without treatment for drinking and cooking. There are few dwellings along the route and no industrial activities except those associated with mining. The effect of human wastes on water quality is unknown but probably not significant. Mining and road maintenance cause occasional short-term siltation of some surface waters.

Surface waters are of the calcium bicarbonate type. Dissolved solids concentrations average less than 200 mg/1. Groundwater quality and availability are essentially unknown along the route.

A joint study by the Federal Power Commission and the Alaska Power Administration in 1965 indicated a potential hydroelectric dam site on the Fortymile River about 6 miles upstream from the Alaska-Yukon Territory border. The projected reservoir area would be about 23 square miles, inundating the valleys of about 20 miles of the Fortymile River, 15 miles of the North Fork, 18 miles of the South Fork, and 6 miles of O'Brien Creek. This reservoir would flood the Taylor Highway near its crossing of the South Fork about 10 miles east of

Chicken. The Alaska Power Administration concluded the hydroelectric development would be of low priority relative to other regional needs. Should the Fortymile River system be incorporated into the National Wild and Scenic River System, all possibility of hydroelectric development would be precluded.

Hydrology (Canada)

The realignment in Canada would lie entirely within the Yukon River Basin. Approximately 127,000 square miles of the Yukon Plateau are drained by the Canadian portions of this watershed. The realignment would require major river crossings at Dawson (Yukon River), Stewart Crossing (Stewart River), Pelly Crossing (Pelly River) and Carmacks (Yukon River). (See Figure 5.) Riverflow data at or near these crossings and on the Yukon River at Whitehorse are given below.

River	Location	Long-Term Mean (cfs)	Minimum (cfs)	Maximum (cfs)
Yukon	Dawson	76,723	6,350	526,000
Stewart	Stewart Crossing	14,860	900	153,000
Pelly	Pelly Crossing	18,266	1,020	152,000
Yukon	Carmacks	26,406	4,800	127,000
Yukon	Whitehorse	8,215	1,150	22,800

High streamflows occur in early summer, reaching a peak in June on the Yukon River at Dawson. Minimum flows generally occur from February to April. Average annual freezeup dates range from the second week in October to the second week in November, but may occur as early as the first week in October or as late as the end of December in some locations. Average ice thicknesses measured on April 15 vary from 1.5 to 4.8 feet. Breakup generally takes place between April 29 and May 18, but may come as early as April 15 or as late as June 4. Ice jamming associated with the breakup has been a major contributor to flooding in the Yukon Territory.

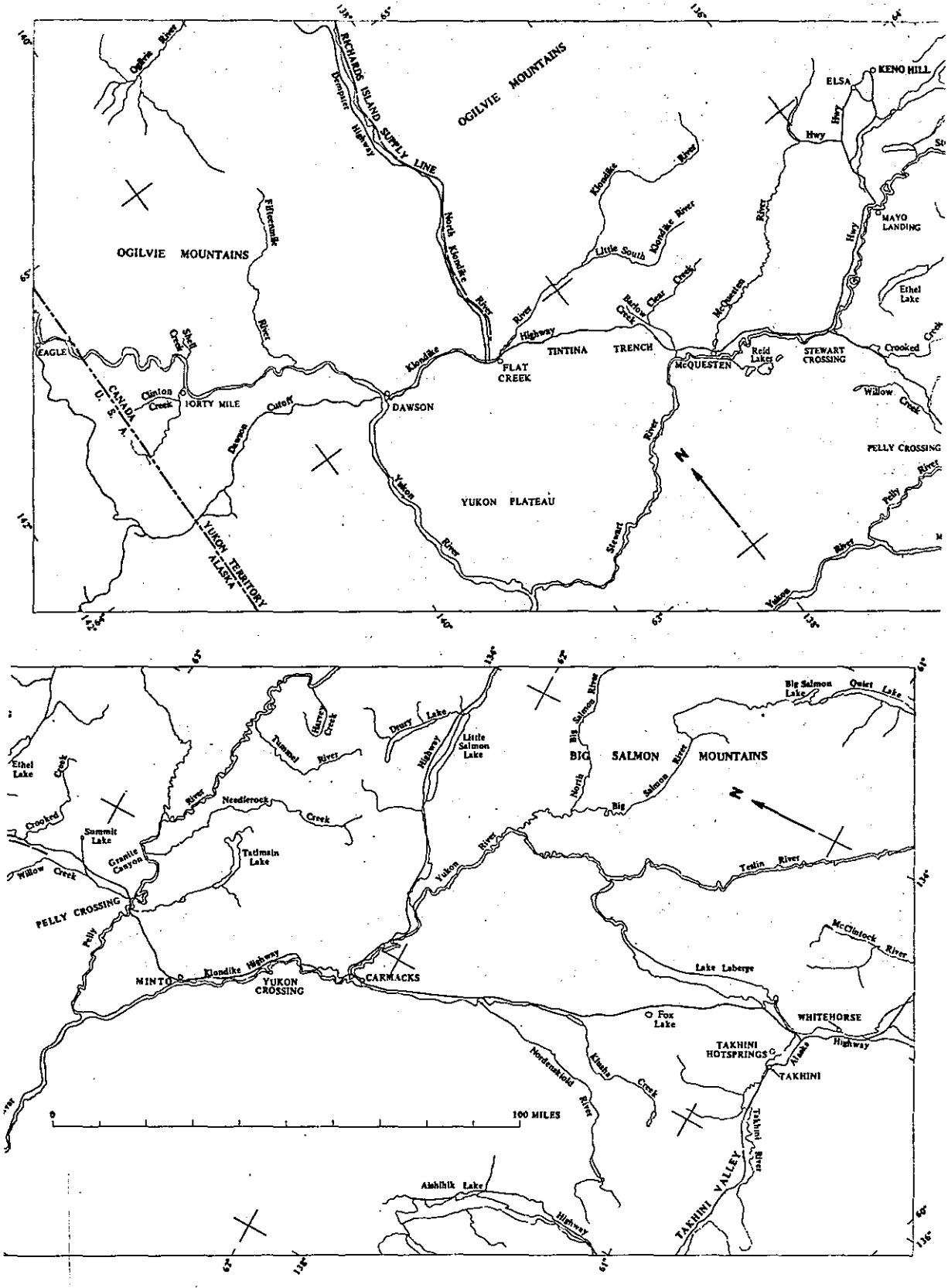


Figure 5 MAJOR RIVERS ALONG KLONDIKE HIGHWAY REALIGNMENT

Surface water quality data for various rivers along the realignment are given in Table 1. Little information about waste discharges, water usage, and the quality and quantity of groundwater is available at this time. Lake Laberge, a 78-square mile body of water north of Whitehorse, reportedly has water of questionable potability due to that city's discharge of raw sewage into the Yukon River 19.2 miles upstream from the lake. The Yukon River is navigable in the summer from its mouth to the city of Whitehorse.

5. Vegetation (Alaska)

Vegetation along the Taylor Highway is classified as subarctic. The boreal forests of the region are composed of mixed and pure stands of white spruce, black spruce, balsam poplar, tamarack, birch, and aspen. The forest stands often consist of two or more tree types, but are classified by the dominant species. In typical white spruce-paper birch stands, the area below the canopy is usually open. Stands of black spruce are the most common type along the highway and consist of trees 1 to 3 inches in diameter, spaced 1 to 5 feet apart. Some shrubs such as alders, willows, blueberries and low bush cranberries may be found in combination with a thick mat of moss and lichen throughout most of the forest. Timberline occurs at an average elevation of 3,500 feet, although on north slopes it drops to approximately 3,000 feet. The relationship between vegetative types and topography is illustrated in Figure 6.

Alpine tundra is present above the timberline and is characterized by barren rock and rubble interspersed with low mat-type plants. In the Fortymile River drainage, alpine tundra is dominated by white mountain avens, low heath shrubs, prostrate willows, dwarf birch, and a variety of lichen species.

Some treeless bogs may be found within the area where drainage is poor and conditions are too wet for tree growth. In some regions such as the uplands, bogs may be encountered along old river terraces, in filled ponds and oxbows, and on some gentle, north-facing slopes. Grasses, sedges and mosses are common, and some woody shrubs may be encountered. Flowering plants are particularly conspicuous during the summer months.

TABLE 1

MEAN SURFACE WATER QUALITY VALUES ALONG KLONDIKE HIGHWAY REALIGNMENT

Water Quality Criterion / Sampling Area	Specific Conductance (µmho/cm)	Turbidity (J.T.U.)	Non-Filterable Residue (mg/l at 105°C)	Sodium (mg/l)	Total Organic Carbon (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Alkalinity (Total $CaCo_3$, mg/l)	Hardness (Total $CaCo_3$, mg/l)	Nitrate and Nitrite (mg/l)
Yukon R. at Dawson	223	7.6	58	2.2	6	0.6	0.10	78	104	0.09
Stewart R. at Stewart Crossing	286	3.0	-	2.0	0.0	0.4	0.07	100	135	0.10
Pelly R. at Pelly Crossing	284	7.7	27.8	2.6	7	0.3	0.10	100	141	0.10
Yukon R. at Carmacks	129	3.0	-	1.6	0.0	0.2	0.11	56	61.6	0.06
Yukon R. at Whitehorse	98	1.5	13.5	1.2	4	0.2	0.10	42	46.3	<0.02

Source: Department of Indian Affairs and Northern Development, Northern Natural Resources and Environment Branch, 1975, Surface Water Data, Yukon Territory.

Source: DOI, 1973, Proposed Fortymile National Wild and Scenic River FEIS

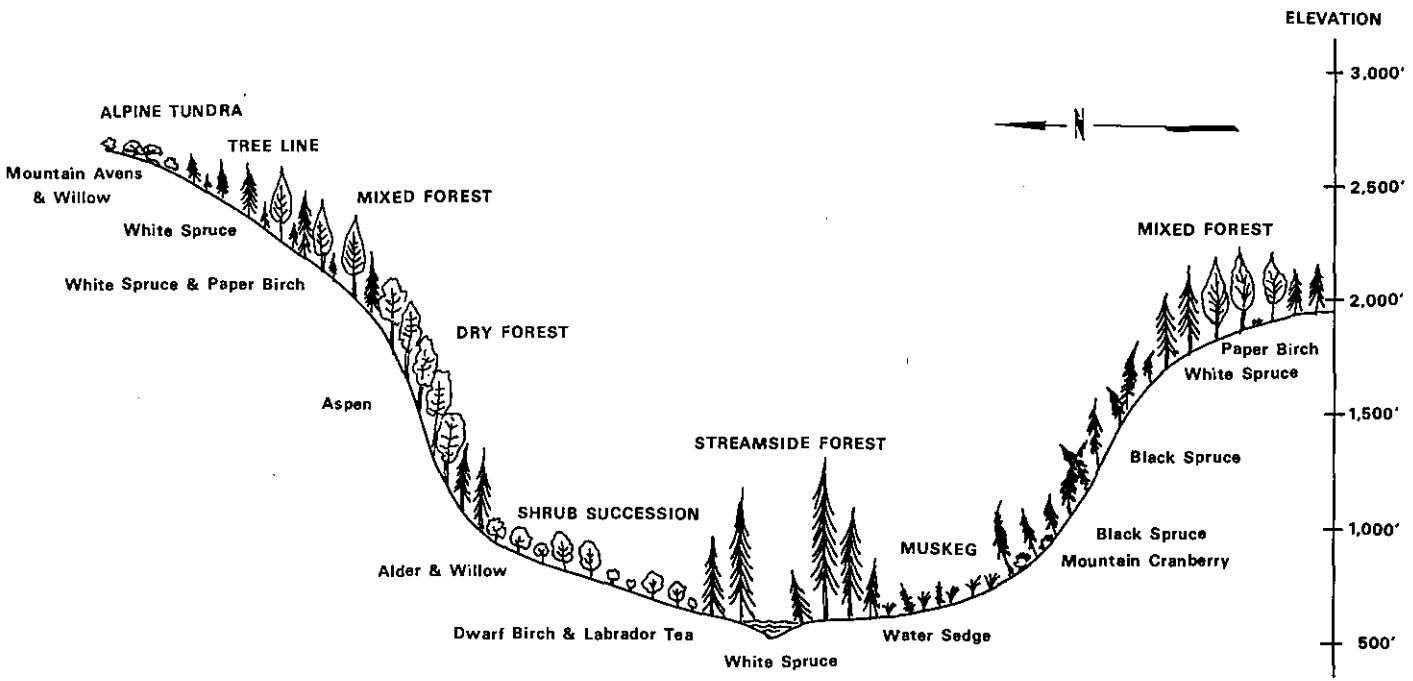


Figure 6 DIAGRAM OF TYPICAL VEGETATION ALONG A TOPOGRAPHICAL GRADIENT

This boreal forest suffers the greatest climatic extremes of any forest system in North America. The interaction with repeated fires, discontinuous permafrost and braided drainage systems results in a very complex pattern of vegetation. Vegetation types on the Taylor Highway are as follows:

- 82 miles of upland/lowland spruce-hardwood forest
- 16 miles of brush/tundra
- 7 miles of muskeg
- 3 miles of spruce/poplar forest

Preliminary reports indicate that plant species identified as endangered are present adjacent to the Taylor Highway in the Boundary area. Further study is needed to identify and delineate critical areas.

Vegetation (Canada)

Vegetation along the realignment in Canada is similar to that described in Alaska. Evergreen forests predominate. The principal tree species are white spruce, lodgepole pine, alpine fir, balsam and aspen poplar. Grasslands and transitional poplar forests occur in patches in the drier areas. Much of the vegetation appears drought-stricken, and the dryness has contributed to numerous forest fires. Fireweed now covers vast areas of burned timber and is especially prevalent along the highway. Other plants common to the Yukon are wild rose, purple lupine, violets, labrador tea, wild onion, creeping snowberry, blueberry, and raspberry.

A subalpine-alpine tundra zone exists along the highway between the Alaska-Yukon Territory border and Dawson. Grasslands are most prevalent on the steep, dry, south-facing slopes along the Pelly River, near the Yukon River south of Minto, and above the Nordenskiold River south of Carmacks.

No information is available about mileages of vegetation types along the realignment or about the possible presence of unique habitats or rare and endangered plants.

6. Wildlife (Alaska)

Grayling, burbot and round whitefish are the principal fish species occurring along the Taylor Highway realignment.

Grayling make up the majority of the sport catch; fishing for them in the Fortymile River drainage is considered fair to excellent. Grayling migrate upstream in May to spawn, then return to the larger rivers before freezeup (October) for overwintering.

Four Mile Lake, near MP 4.9 of the Taylor Highway north of Tetlin Junction, contains introduced sheefish, silver salmon, and rainbow trout and is managed by the Alaska Department of Fish and Game (ADFG). The lake is accessible from the highway by a 0.5 mile hiking trail.

The Fortymile River Basin is a high-use area for over 200 species of birds, including waterfowl, shorebirds, songbirds, upland game birds, and raptors. Because the area lies within a northward extension of the Great Plains and is also on the fringe of coastal areas, there is a mixture of birdlife in the basin which is not typical of that found in interior Alaska.

Principal waterfowl habitat along the route occurs in the valley of the West Fork Dennison Fork. Nesting ducks include pintails, wigeons, mallards, buffleheads, canvasbacks, and shovelers. Canada and white-fronted geese and little brown cranes are common in the wet muskeg areas. Trumpeter swans may also nest in the area. The fall migration route of sandhill cranes normally follows the Tanana Valley, but weather conditions, primarily wind patterns, sometimes deflect the migration route northward into the Fortymile River area. The primary period of waterfowl sensitivity is the nesting season, from May 1 through July 31. See Figure 7 for locations of waterfowl nesting areas.

Upland game birds include spruce, ruffed and sharp-tailed grouse, and willow and rock ptarmigan. Ptarmigan nest from April through June in the alpine tundra areas around American Summit and Mount Fairplay in proximity to the highway.

Nearly all species of raptors found in Alaska frequent the Fortymile River Basin. Bald and golden eagles nest near the rivers and the highway. Four nests of the endangered American peregrine falcon have been located on the North and Middle Forks. Although no nesting area has yet been located near the Taylor Highway, four peregrines were sighted in the Chicken area in April 1977. The principal period of sensitivity for these and other raptors is the nesting season, from April 1 to August 15.

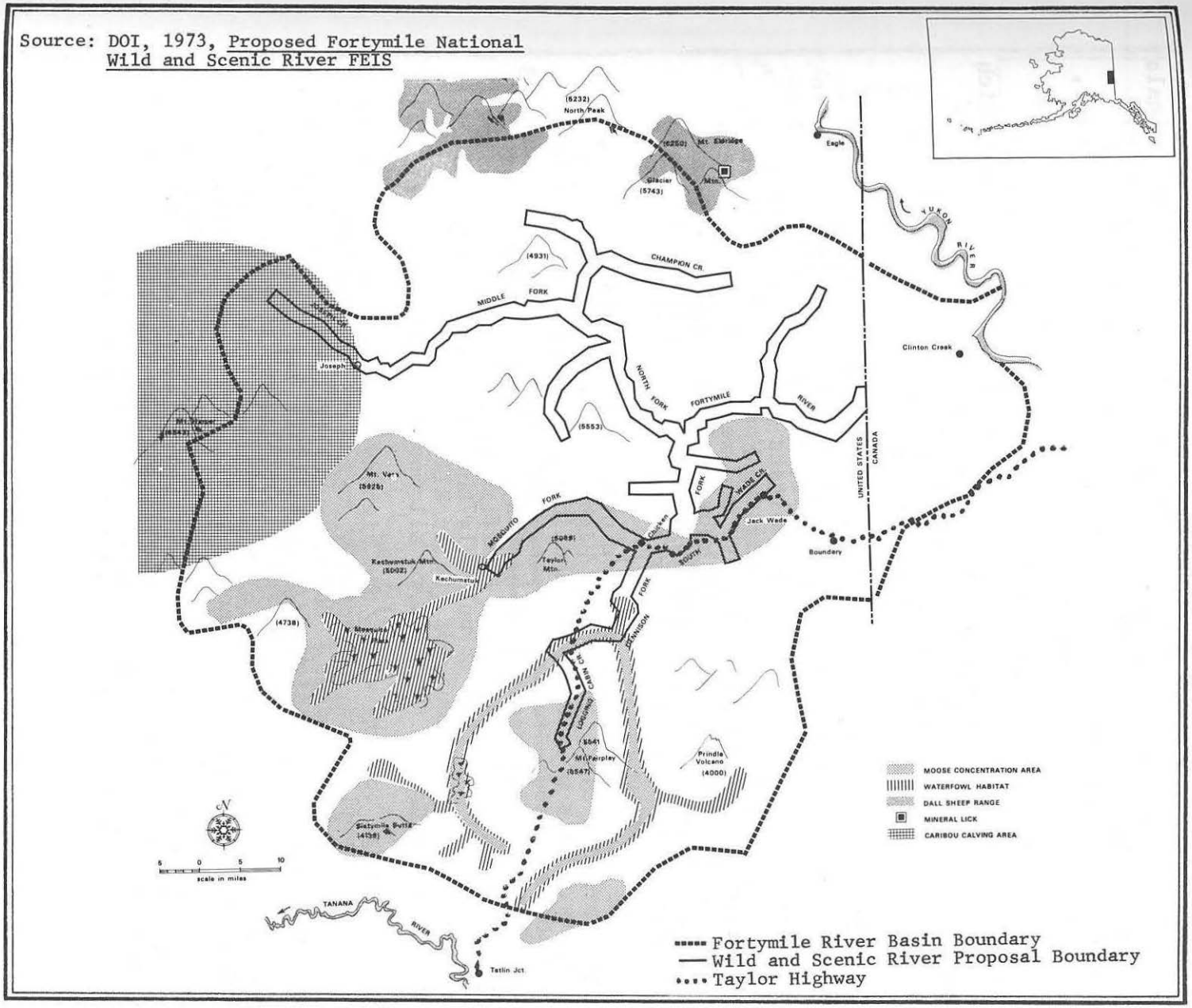


Figure 7 SENSITIVE WILDLIFE HABITATS

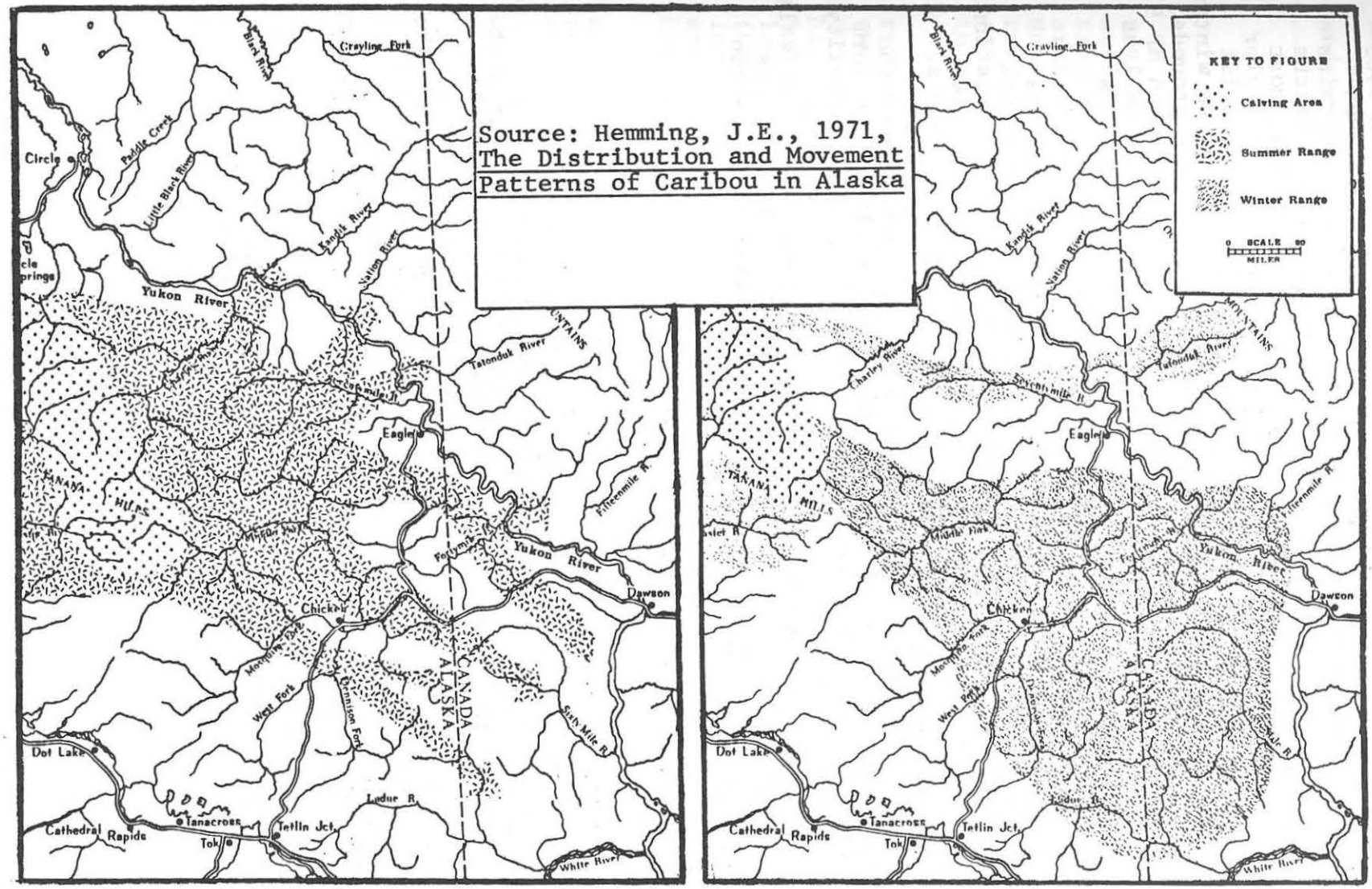
With the notable exception of Dall sheep, nearly every species of mammal originally discussed as appearing in Alaska along the Alcan prime route south of Fairbanks would also be present along the Taylor Highway realignment. Large game animals found near the highway include grizzly and black bear, moose, caribou, wolves, and wolverine. Small game and fur-bearing mammals include the snowshoe hare, red squirrel, marmot, beaver, weasel, mink, and red fox.

Grizzly bear are more numerous along the Taylor Highway realignment than along the portion of the Alcan prime route which it replaces, but no concentration areas exist. Black bear are distributed fairly evenly throughout the Yukon-Tanana region. The black bear outnumber the grizzlies and seem particularly prone to dangerous interactions with humans in the area.

Moose occupy nearly all the habitats in the Fortymile River drainage basin except high, steep, rocky slopes. Riparian communities constitute the most critical winter habitats. Alcan has identified fall and winter habitats near the realignment in the Mount Fairplay area, along the West Fork Dennison Fork, and along the Mosquito Fork south and west of Chicken. Alcan also states that several known moose calving areas are found near the route. Calving usually takes place between mid-May and Mid-June. See Figure 7 for sensitive habitat locations.

The current estimated moose population within a 25-mile wide corridor along the Taylor Highway is between 500 and 1,000 animals. This population is declining, probably for a combination of reasons. Predation, poor range quality, and over-hunting along the readily accessible highway zone are thought to be contributing to the decline. Calf survival in 1974 was so low that the ADFG reported it unlikely that recruitment equaled natural losses. Because of the locally depressed population, the ADFG has closed the area to all moose hunting this year.

The high country along the highway is frequented by caribou of the Fortymile herd, especially during migrations between the winter and summer ranges. Calving usually takes place well to the northwest of the highway. (See Figure 8.) Soon after calving, the caribou congregate in increasingly larger groups and then disperse over the rolling mountains and hills around the upper portions of the Chena, Salcha, Charley, Goodpaster and Fortymile Rivers. They usually remain on this summer range until September, when they begin drifting towards their winter range. Fall crossings of the Taylor Highway frequently occur from September 15 through November 15 between MP 9 and MP 150. Recently, main crossings have been between MP 9 and MP 55.



Summer Range and Migration Routes to Winter Range

Winter Range

Figure 8 DISTRIBUTION OF THE FORTYMILE CARIBOU HERD, 1965-1970

The location of the Fortymile herd's wintering area changed almost annually between 1952 and 1970. Between 1965 and 1970 the major winter ranges included the Ladue River-Sixtymile River area, the foothills of the Ogilvie Mountains north of Dawson, the headwaters of the Goodpaster and Salcha Rivers, and the White Mountains. During 1973 and 1974, most wintered in Alaska near their summer range east of the Taylor Highway. During March and April, while the rivers are still frozen, the Fortymile caribou herd leave their respective winter ranges and move along the lowlands toward the calving grounds. This spring migration may cross the Taylor Highway between MP 9 and Chicken (MP 67). The whole migration sequence, as well as the destinations, may vary considerably, for this group is considered the least predictable herd in Alaska.

Like the moose, the caribou of the Fortymile herd are declining in number. In the 1920's the herd reached a peak estimated to have exceeded 500,000 individuals. The population fell to a low of 10,000 to 20,000 in the early 1940's, then increased again to approximately 50,000 in the early 1950's. By 1969, the population had fallen to no more than 20,000 animals. The current population is 5,000 to 6,000. Over the years, a large portion of the Fortymile herd split off to form new herds or join other herds, but recently high calf mortality from unknown causes has been the major factor in steadily decreasing the population size. Predation by wolves and grizzly bears may be a major factor in this mortality. The ADFG has restricted the annual sport harvest of this herd to less than 100 caribou since 1973.

Wildlife (Canada)

Grayling, whitefish and northern pike are abundant in the Yukon River and its tributaries. Burbot, cisco, Dolly Varden char, inconnu, and lake trout are also known to inhabit the waters of the upper Yukon River Basin. Chinook and chum salmon, lake trout and whitefish spawning, migration and/or overwintering take place on the Yukon, Klondike, North Klondike, Stewart, McQueston, Pelly, and Nordenskiold Rivers. Chinook salmon also spawn and overwinter in Crooked Creek. No information is available about the exact locations of sensitive fish habitats along the realignment.

Bird and mammal species along the realignment are similar to those described in Alaska. Dall sheep populations are found in the Ogilvie and Cassiar Mountains, and the former

wintering grounds of the Fortymile Caribou herd extend the whole length of the Klondike Highway. No specific information is available about sensitive habitats or the presence of rare and endangered species.

7. Land Use, Recreation, and Aesthetics (Alaska)

Present land use in the vicinity of the Taylor Highway realignment primarily includes limited mineral extraction activity and recreational activities, such as hunting, fishing, trapping, boating, and sightseeing. Subsistence uses in the area are primarily trapping, with hunting of minor importance. No significant agricultural activity occurs in the area traversed by the realignment route. The area supports extensive stands of timber; however, no commercial logging is underway in the area.

All of the land in the project area, except for previously registered (patented) mining claims and existing privately owned land, is presently being included in a land use plan. Most of the land is being selected under the terms of the Alaska Statehood Act and the Alaska Native Claims Settlement Act (ANCSA). Basically, there are three different categories of lands being selected under ANCSA: national interest lands (designated d-2 lands), public interest lands (designated d-1 lands), and Native regional deficiency selection lands. Lands are being selected for State ownership under the Alaska Statehood Act.

The lands tentatively chosen for a particular land category are considered to be "withdrawn for consideration," meaning they cannot be considered for another category or use until decisions are reached on the suitability of their inclusion in the selected category. If it is determined that they are not suitable, they can then be withdrawn for consideration for another category.

To insure that national interests are protected, national interest lands (d-2) are withdrawn from all forms of appropriation under the public land laws, including the mining and mineral leasing laws, under the Alaska Statehood Act, and by the regional Natives. Most of these lands are converted into some type of natural preserve area.

Public interest lands (d-1) are lands withdrawn from all forms of appropriation under the public land laws, including the mining (except for metalliferous minerals) and the mineral

leasing laws, to insure that the public interest in these lands is properly protected. These lands may at a future date be opened to appropriation under the public land laws.

Native regional deficiency selection lands are former public domain lands which have been set aside for the regional Natives to select if other lands more available to them are not sufficient in size to allow full choice of all land to which they are entitled. Twelve organized corporations have been founded to conduct the business of the Natives in carrying out the provisions of ANCSA. The corporation involved in land selections in the Fortymile River Basin area is called the Doyon, Ltd. Native Regional Corporation (Doyon).

The majority of the area traversed by the proposed realignment includes public interest lands (d-1). The d-1 lands along the Taylor Highway are open to mineral mining. Currently, several mining companies are exploring for copper and asbestos, and for oil and gas north of the Yukon River. A portion of the realignment would also traverse lands tentatively approved as state selection lands (Taylor Highway MP 2.5 to MP 14) and other lands have been withdrawn as Native regional deficiency selection lands (Taylor Highway MP 0 to MP 2.5 and MP 14 to MP 32). Included in this area also are lands in the Fortymile River Basin which have been withdrawn as national interest lands (d-2) for potential inclusion in the National Wild and Scenic Rivers System. The status of final land ownership in the area will remain unsettled until the Doyon Native Corporation, the State of Alaska, and the Federal Government have finalized their withdrawal selections. Figure 9 shows the current proposed land use withdrawals. Small parcels of land along the realignment which were appropriated prior to ANCSA include mining claims, homesteads, campgrounds, airports, and Native allotments. The most numerous of these are mining claims. There are very few residences in the area. Four Native allotment parcels are located adjacent to the proposed realignment (Taylor Highway MP's 49, 54, 95.5 and 105). 1/

Transportation through the area to be affected by the proposed realignment is furnished primarily by the Taylor Highway. A 66-mile long unimproved road (Eagle Spur) to the town of Eagle begins at MP 95.7. Primitive roads and fire lanes lead from the Taylor Highway to various parts of the

---

1/ The Alaska Native Allotment Act of 1906 authorizes the Secretary of the Interior to allot individual Natives title to 160 acres --in up to four separate tracts-- of land they use and occupy. No improvements are necessary. All that has to be certified and verified is that the applicant has substantially used the lands in accordance with the provisions of the 1906 Act.

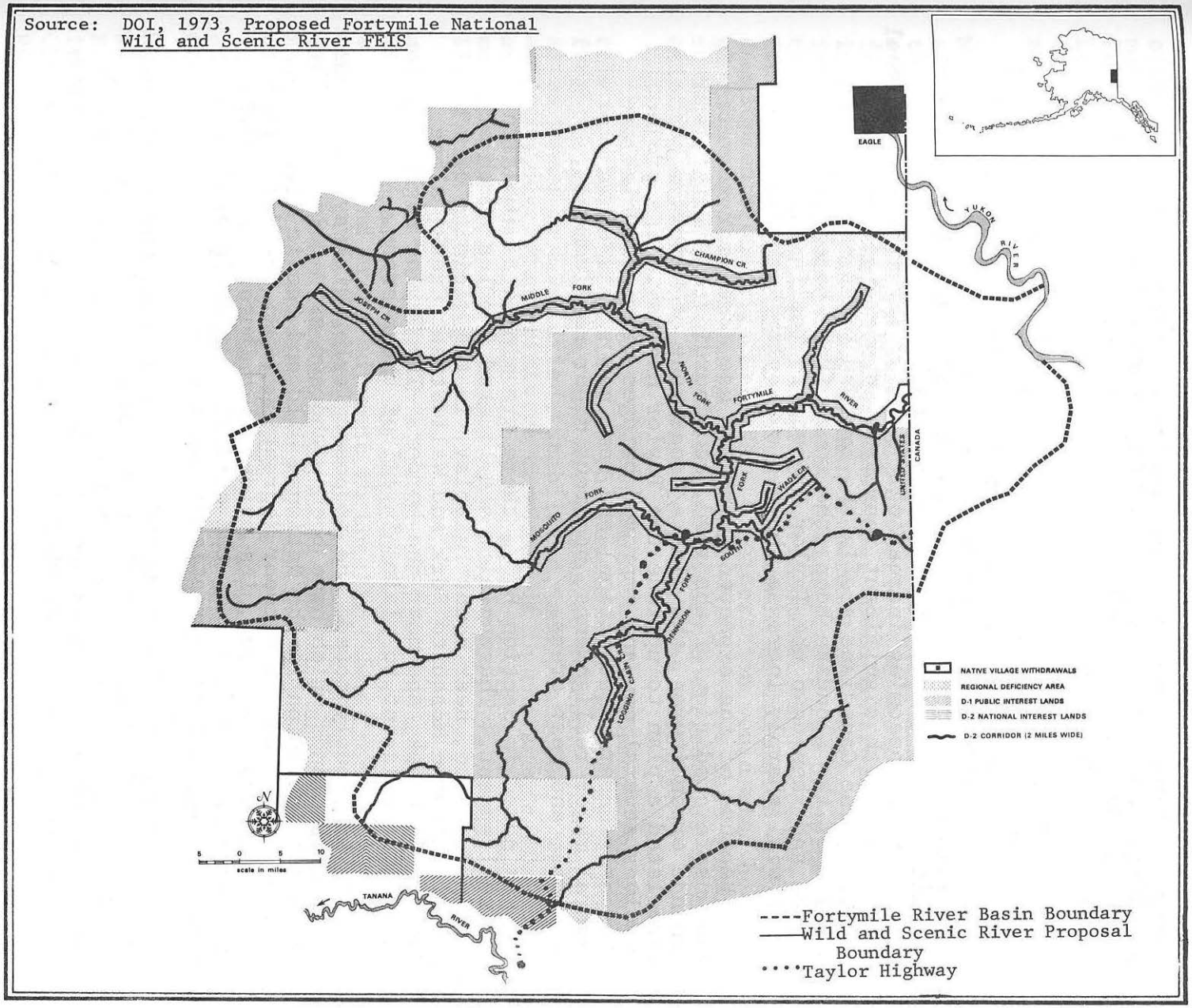


Figure 9 LAND STATUS

Fortymile River Basin, and scheduled and chartered air service provides access to Eagle and Chicken. More primitive air strips at Jack Wade, Boundary, and other locations throughout the area provide access.

The Taylor Highway was originally built during the late 1940's and early 1950's to provide access to Eagle and to gold mining operations in the Fortymile River area. It would also serve as primary access for development of other areas of mineralization currently being explored, although they are 30 to 60 miles from the nearest highway approach. The Fortymile River area is becoming increasingly popular for many recreational activities, with significant increases in use expected. In addition, the Canadians are in the process of upgrading their portion of the Klondike Loop (the route from Whitehorse to Dawson and then down the Taylor Highway to Tetlin Junction), which will sharply increase the use of Taylor Highway.

Because of the expected increased use, the poor geometry and unsafe condition of the road, and inordinately large maintenance expenditures, the Alaska Department of Highways has formulated a plan to upgrade the Taylor Highway. The project involves several new and improved bridges (five of which are presently under construction) and some new rights-of-way for several major realignments, numerous minor realignments, turnouts, and rest areas.

As noted in Section B.3., there are mining claims along the realignment. These claims are located 6 miles north of Tetlin Junction, near Mount Fairplay, in the vicinity of Chicken between Mosquito Fork and Wall Street Creek, along Jack Wade Creek, and near the border. The Taylor Highway passes through or adjacent to claims in all of these areas.

As previously noted, the proposed Taylor Highway realignment would cross lands which have been withdrawn as d-2 lands pending potential inclusion in the National Wild and Scenic Rivers System. The Bureau of Outdoor Recreation (BOR) has determined that the Fortymile River, its principal tributaries, and their immediate environments meet the criteria for designation as wild, scenic, and/or recreational river areas.

Boundaries of the recommended wild, scenic, and recreational segments of the river area are shown in Figure 8. Lateral boundaries would average no more than 1 mile on either side of the river and would not exceed 320,000 acres. Of the 375 miles of river recognized in the proposal, 205 miles including all

of the South Fork and portions of the Dennison Fork, Fortymile River, Mosquito Fork, Walker Fork, West Fork Dennison Fork and representative tributary streams--Franklin, Hutchinson, Logging Cabin, Napoleon, and Uhler Creeks--have been suggested as Scenic River Areas, and the 9-mile long Wade Creek has been suggested as a Recreational River Area.

The management plan to be prepared by Bureau of Land Management (BLM), should these lands be designated as wild, scenic, or recreational, would restrict development and use of the land if it would detract from the overall existing water quality, recreational, scenic, historic, archaeological, or fish and wildlife values of the area. Such controls would include the prohibition of new commercial uses within the immediate environment of the Fortymile River, its principal tributaries and their immediate environments, and acreage, frontage, and set-back requirements would be initiated on new developments on private lands. Consideration would also be given to developing design standards which assure that structures, recreation facilities, or other necessary modifications of the existing environment are harmonious with the setting.

Recreational facility management and development for short-term use would be limited to the development of access points from the Taylor Highway and air access at Joseph. Historic sites would be identified, stabilized, and protected. The existing developed primitive campgrounds in the scenic river areas at Walker Fork and Liberty Creek would be maintained, as would primitive river access points at MP's 49, 63, 75 and 112 of the Taylor Highway.

The areas proposed for scenic designation which would be directly impacted by the realignment would be a crossing and areas adjacent to Logging Cabin Creek; a crossing of the West Fork Dennison Fork downstream from its confluence with Logging Cabin Creek; a crossing and land adjacent to the Mosquito Fork; a proposed crossing of the South Fork in the vicinity of the Taylor Highway, and a crossing of Walker Fork. The realignment would also cross Wade Creek and lands adjacent to Wade Creek for almost the entire length of the stream, which has been designated recreational under the proposal.

Should the Fortymile River area not be included in the National Wild and Scenic Rivers System, the National Wilderness Preservation System, or other National Conservation Systems, it is probable that the Middle Fork and Upper North Fork, Champion and O'Brien Creeks, and the Fortymile River would pass into private ownership.

Upon statutory expiration of the d-2 withdrawals now in effect, lands not selected for Native ownership (Native regional deficiency selection lands) would automatically revert to d-1 withdrawal status. In this situation, a range of management options would be available. Possible actions range from the retention of the protective d-1 status for an indefinite period of time to the opening of the land to all forms of use and entry allowed on unreserved public domain. The lands in this case would not be subject to the protection afforded by the Wild and Scenic Rivers Act of 1968. As private lands, it is presumed that the management decisions would be made on the basis of maximizing net revenue. It is doubtful the existing environment of the river would be maintained in the long run.

The heavy tourism in the basin will increase, and so will demands for homesites, recreation cabins, business sites and other associated enterprises. Increased ease of access of all-terrain vehicles and more efficient means of getting far away from the existing road system will accelerate the loss of historic artifacts.

The ready access to the Fortymile River Basin combined with prospective mineral development and resumption of active placer gold mining makes it a certainty that the existing environment will not be maintained without an intensive management program.

Tourism, as a general category, describes the principal recreational activity within the area. The recreational and tourism values of the area are derived from both natural and environmental features as well as historical and cultural resources.

Current recreational use of the Taylor Highway area consists primarily of (a) recreational travel to and/or from the historic Klondike mining area near Dawson, Yukon Territory, (b) recreational mining in the streams of the Fortymile area, (c) river float trips including fishing and visiting historic sights on the Fortymile River system, and (d) general sightseeing, hiking, camping, fishing, hunting, and examining of historic structures and artifacts throughout the area. The primary recreation season in the proposal area is from May through October, which coincides with the breakup and freezeup of the Fortymile River and the period during which the Taylor Highway is maintained.

The traveler is exposed to continuous panoramas of the vast expanses of the Fortymile River Basin, major stretches of some of the more scenic reaches of the river, dramatic changes in vegetation, varying samples of regional geology, and numerous examples of various levels of past gold mining and exploration activities. From a statewide perspective, the historic - cultural features of the area are probably even more unique than the natural features. The impact of past human activity in the area has resulted in unique historic resources and related recreational opportunities.

BLM maintains a campground-picnic area on the Walker Fork, a small campground along the highway in the upper part of the O'Brien Creek drainage, the Fortymile River Wilderness Canoe Trail southeast of Chicken, and the Liberty campground on the Taylor Highway south of Eagle. Space for parking at bridge crossings located MP's 49, 63, 75, and 112 on the Taylor Highway are also maintained by BLM.

Historical features of the area that attract tourists include Ft. Egbert (near Eagle) which is in the process of being restored, several abandoned mining dredges in tributaries of the Fortymile River, numerous abandoned mining cabins and small mining towns, and sections of the old Washington-Alaska Military Cable and Telegraph System installed in the early 1900's to connect the Alaskan interior to the "outside world." Sections of the telegraph system right-of-way running from Eagle (Ft. Egbert) to Valdez (Ft. Liscum) are being recommended for designation as a National Historic Trail and Travelway, which would most probably increase recreational use of the area.

The Taylor Highway is a primary tourist route to and from Dawson, Yukon Territory, and to Eagle, approximately 70 miles north of Chicken. The Eagle Spur leading directly from the Taylor Highway to Eagle carried more than 3,500 vehicles during the 6 months the highway was open in 1970 and 18,000 vehicles in 1971. The percentage of recreational use as opposed to business travel is unknown. However, based upon campground data, it is evident that much of the travel can be attributed to tourism and that much of the tourism is by nonresidents. (More recent vehicle-use data for the spur was not available at the time this document was prepared.)

Recreational use of established campgrounds in or adjacent to the Taylor Highway in the Fortymile River Basin area increased 96 percent over the past 5 years. Data compiled by BLM showed 78 percent of the campground use was by out-of-state visitors. Though actual vehicle data is not presently available, information from BLM indicates that the Fortymile River Basin area receives 36,325 visitor-days of recreational use annually.

It is estimated that the ecological capacity of the resources of the area is approximately 118,930 visitor-days. Future use of the area is anticipated to accelerate sharply, and plans are being made by BLM to increase recreational facilities in the area.

The Taylor Highway passes through an area which shows little evidence of human activities. The highway itself is usually the only visual evidence of man's presence. In a few places in the vicinity of Chicken, placer mines, placer mine dredge tailings, cabins, winter tractor trails, and fire lines are visible. The area south of Chicken is virtual wilderness.

The terrain which the highway traverses consists of rolling hills. These hills are typically more gradual on the southern half of the highway, and become steeper, with narrow creek and river valleys along the northern and eastern half of the route. At lower elevations, the area along the highway is sparsely forested with birch, aspen, and spruce. In some areas, the highway crosses open muskeg with sparse spruce and willow stands. Large areas of burned forest are visible immediately south of Chicken. Willows are common along rivers and creeks. The highway climbs above the timber and brush lines at Mount Fairplay and near the Eagle cutoff to the border. Here the vegetation is predominately alpine tundra.

The principal use of the Taylor Highway is for recreational travel, thus accentuating the importance of its visual resources. The scenery is typical of many other parts of Alaska and Yukon Territory. Although it does not contain rugged snow clad peaks and sparkling blue lakes, it has a charm of its own and is especially endowed with color changes in spring, summer, and fall.

Land Use, Recreation and Aesthetics (Canada)

The land uses and the recreational and aesthetic values of the area traversed by the Klondike Highway realignment in the Yukon are very similar to those along the realignment in Alaska. The Yukon depends primarily on the mining industry and tourism. Fur-trapping is increasingly less important, as is forestry and small-scale agriculture.

During recent years in northern Canada, there has been considerable activity in all phases of the mineral industry--exploration, claim staking, property development and mining.

In 1973, six mines operated in the Yukon producing lead, zinc, silver, cadmium, coal, nickel, copper, platinum, and asbestos. These mines employ approximately 1,000 persons. The Anvil Mining Corporation site is located in the Ross River area, 130 air miles northeast of Whitehorse. Cassiar Asbestos Corporation Ltd. operates an open pit asbestos mine at Clinton Creek, 48 miles northwest of Dawson City. United Keno Hill Mines Ltd. owns a consolidated operation at Elsa. Whitehorse Copper Mines Ltd. operates in the Whitehorse area. The Tantalus Butte Coal Mine is located in Carmacks and is operated by Anvil Mining Corporation Ltd. A nickel-copper mine located on the Alaska Highway, 20 miles northwest of Burwash Landing, was shut down in 1973. Numerous other sites in the Yukon area are being explored for potential development. It appears that mining operations are more active in the Yukon area than that which presently occurs in the Taylor Highway area of Alaska. Information on small-scale placer mining in the Yukon is not presently available.

In addition to mining, the Yukon region also possesses tremendous potential for hydroelectric development. Thus far, the development of power generating capacity in the Yukon has been small-scale in keeping with the relatively low demand of local markets. However, the river systems of the Yukon Territory offer considerable potential for further development, and power generation may become a large-scale industry there. Numerous areas on the Yukon and Liard Rivers have been identified as potential electric generating sites. Ten sites have been identified on the Yukon mainstream, and 26 have been identified on Yukon tributaries. Three have been identified in the Watson Lake area, and two have been identified in the Fort Liard area of the Liard River.

The road system of the Yukon is in the process of being extended to meet increasing resource development needs. Much of the construction of the Yukon's internal road system took place during the 1950's, and the system has since been steadily expanded. The roads between Whitehorse, Mayo, Dawson, and Carcross are usually in good condition and are well traveled. All major Yukon roads are gravel surfaced but are generally well maintained. See Figure 10 for locations of roads and mineral centers.

Mayo and Whitehorse were linked by an all-weather road in 1951. In 1955, a similar road was completed between Stewart Crossing on the Whitehorse-Mayo Road and Dawson. Dawson had previous road access by means of the "Dawson-Boundary" Road, which connects with the Taylor Highway in Alaska. This road

Source: Yukon Today, 1968

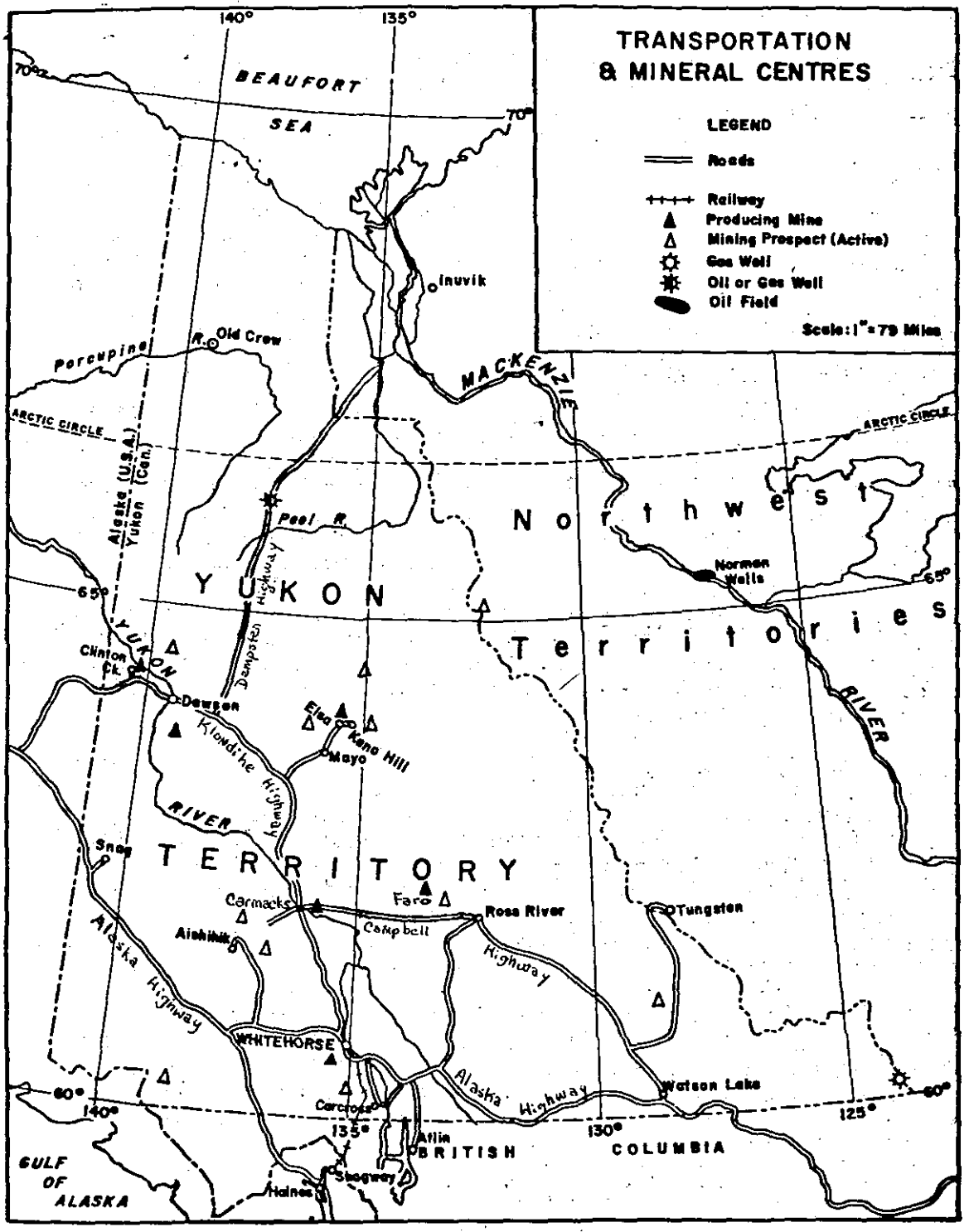


FIGURE 10 . TRANSPORTATION AND MINERAL CENTERS

system from the border to Dawson and on to Stewart Crossing and Whitehorse is the Klondike Highway which would be followed by the pipeline realignment in Canada.

Other major roads in the Yukon include the Alaska Highway (proposed to be followed by the prime Alcan pipeline route) and the recently completed, 370-mile long, Robert Campbell Highway running from Carmacks to Watson Lake and providing access to the townsite of Faro and the Anvil mine. Construction of the Dempster Highway in the upper Yukon is currently underway, as is construction of a route from Carcross in the southern Yukon to the Alaska seaport of Skagway.

Air travel is facilitated by airstrips at Mayo and Dawson which are operated by the territorial government under Federal subsidy. Watson Lake and Whitehorse also provide passenger airflight operations. Old Crow, the only Yukon community remotely removed from good ground transportation, maintains a gravel airstrip with twice-weekly air service. The use of helicopters and small bush aircraft is extensive.

The recreational and aesthetic resources of the Yukon along the realignment are similar to those discussed for Alaska. The related tourism industry is second only to mining in its importance to the territory's economy. There are several factors contributing to the Yukon's position as a tourist region, including its interesting and colorful history dating from the Klondike gold rush period. In addition to the recreational interests associated with its cultural resources are the interests in its natural resources including rolling hills, snowcapped mountains, clear streams, and vast expanses of relatively unimpacted "wilderness" areas. The Federal Government's announcement of the establishment of Kluane National Park (in the area of the Alaska Highway) will further promote the tourist attractions of the Yukon and could potentially increase the recreational use of the Klondike Highway area. The recreational pursuits of the visitors in the Klondike Highway area are similar to those discussed for Alaska in Section B.8.

A total of 41 government campgrounds provide basic facilities for campers in the Yukon. Details on these campgrounds are not known at this time. The territory, as a whole, has more than 1,300 rooms in hotels, motels, and lodges, with a considerable number of these located in Whitehorse. These facilities are completely booked during the peak (summer) tourist season. Details on these accommodations are also unavailable.

It is expected that there are probably more tourist facilities located along the Klondike Highway than along the Taylor Highway. This assumption is based upon the greater number of communities and the larger sizes of the communities located along the Klondike Highway.

8. Socioeconomics (Alaska)

Socioeconomic information for this area is sketchy at best, and therefore only generalized statements can be made at this time. Most socioeconomic data available for interior Alaska are centered around the Fairbanks and Delta Junction area, which has little relevance to the fairly remote area of the realignment.

During the early part of the century, there were several thriving mining communities in the Taylor Highway area, but the current permanent area population level is low and varies from year to year. There are approximately a dozen residences located along the highway, and it is not definitely known how many are occupied year-round. Chicken, which at one time could boast of 175 inhabitants, has a permanent population of 8 and a summertime population of as many as 30. Jack Wade, which was once a thriving mining community, currently has only one year-round resident. Boundary was also established as a mining community. It has since relocated from its initial mining era location to a site adjacent to the highway, and its population is small (2 to 3 people) and fluctuates seasonally. Eagle, located approximately 70 miles north of the proposed realignment, has a winter population of 50 to 70 and a summer population of 200. This is a far cry from a town that once had a population of about 800 and was a mining, communication, trade, and military center. There are also a handful of prospectors and homesteaders scattered throughout the Fortymile River area who would probably be directly or indirectly impacted by the proposed realignment. The two Native villages in the area of the Taylor Highway are Tetlin (located near the intersection of the Taylor and Alaska Highways with a population of around 100) and Eagle Village (located 3 miles from Eagle with a population of 70).

The Taylor Highway area has a relatively undeveloped economy which is primarily dependent upon mining and recreation and related activities. The greatest opportunity for wage employment comes during the summer months when local residents are employed on an emergency basis to fight forest fires. In the long-term, tourism and probable mineral development, other than oil and gas, appear to have the greatest growth potential for the region encompassing the Fortymile River Basin. A

significant portion of the local population (both Native and non-Native) depends on subsistence trapping, hunting, and fishing for a substantial amount of its food. There is an increased dependence, however, upon the cash economy.

The non-Native people of eastern interior Alaska place a high value on the undeveloped character of the area, its sparse population, and the perception of few man-made restrictions on their activities. On one hand they see the development potential of the area and have a personal stake in that future, while on the other hand they appreciate the wilderness of the area and value its challenge and beauty.

It is not easy to make a living in the area. Many depend on jobs outside the area during part of the year for income. Others are only very marginal members of the cash economy, and most try to supplement their income with game, fish, firewood, and other natural products from the surrounding area. The advent of the snowmobile is suspected to be one of the driving forces in the growing shift from a subsistence economy to an increasing dependence upon a cash economy.

Judged by the traditional indicators of social well-being such as average income, education, unemployment levels, etc., the Taylor Highway area residents seem to be below average. In comparison to the health care, retail service, higher education, artistic events, and job activities of urban areas, the Taylor Highway area clearly has a lower quality of life. However, as residents would be quick to assert, the area is superior to urban areas in many other components of a high quality of life, including low pollution levels, the slow pace of life, informality, personal relationships, and open space. Perhaps the best indicator of the residents' perceptions of their quality of life is that they came to the area by choice and they remain there.

Indications are that the residents of Eagle, located in a remote region of the Taylor Highway area, are very protective of their lifestyles and resist any form of development that may result in increased population or activity. Eagle's populace is oriented towards subsistence living supplemented by seasonal employment. Such is also the orientation of the area's Natives. On the other hand, the Tok-Tanacross area, located in a more accessible region near the intersection of the Alaskan and Taylor Highways, is more oriented to the transportation, recreation, and mining industries.

The outlook for the Fortymile River Basin area is for substantial growth in the next 15 years. The mining, recreation and transportation industries are all expected to expand during the next 15 years and provide more diversity in the local economy.

According to Bureau of Mines projections, the U.S. and world demand for various minerals located in the Taylor Highway area will increase significantly, with the U.S. copper demand more than doubling by the year 2000 and the demand for gold quadrupling. What specific activity this will cause cannot be forecast, but demand should increase the exploration in the area, so that by 1990 at least one major mineral development such as asbestos would likely be underway. Several of the Native corporations have proposed Native deficiency selection land withdrawals in many of these mineral-rich areas.

Presently, the main saleable mineral in the area is material for construction such as sand and gravel. For the next 15 to 20 years, it is expected that production of sand and gravel and crushed rocks will vary widely with major projects, such as the pipeline realignment. For these major projects, gravel will be required from National Resource Lands, but for the regular yearly maintenance activities, most should be supplied from private or state lands.

Socioeconomics (Canada)

As in Alaska, the present Yukon economy depends primarily upon the mining industry, with tourism ranking second in importance, followed by fur-trapping, and forestry and small-scale agriculture being of minor importance.

The Yukon first came into mining prominence in 1898 at the time of the Klondike gold rush, and by 1901 the population of the territory (located primarily in Dawson City) numbered 27,219. After the boom, however, the population dropped, reaching a low of 4,914 in 1941. During the 50's and 60's, however, the Yukon began to prosper again under the stimulus of government assistance in mineral exploration and development. By 1970, mining was reestablished as a dominant force in territorial development.

The tourism industry is second only to mining in its importance to the territory's economy. Up until the present, tourist facilities have only been developed for the summer

months, but the potential for winter sports increases with improved transportation facilities. Existing tourist accommodations are heavily used during peak tourist months, necessitating more and better quality accommodations. Tourists passing through the area numbered 40,016 in 1962 and 311,374 in 1973.

The present Native people of the Yukon are Indians and a very few Eskimos. The Eskimos are usually considered to be in transit along the northern Yukon coast, to and from the Mackenzie Delta or Alaska. Before arrival of the white man in the Yukon, the Natives depended entirely on fishing and hunting for their livelihood. Present generations in the Yukon, however, as elsewhere, have adopted many of the white man's ways and in so doing have departed more and more from traditional customs and languages. Fur-trading provides livelihood for a diminishing proportion of Indian residents and fewer and fewer white trappers because of cyclic variations in the prevalence of furbearers, the unpredictable fluctuations in the fur market, and the tendency of all trappers to seek other occupations during the mining booms.

The forests of the Yukon Territory have contributed relatively little to northern economic development. Much of the territory supports tree growth, although only a portion of the area supports merchantable timber. However, recent technical developments in timber harvesting methods, combined with heavy demand for forest products, have stimulated the forest industry's interest in the North, and the potential of large-scale integrated forest product operations is now evident.

There has been some agricultural activity in the Yukon, but the industry has not expanded to any significant extent. Physical factors such as the severe climate and poor soils are impediments to farming in the Yukon. In addition, the region is too remote from major urban markets and sources of supply for any volume production. Yukon agricultural soils occur only in intermittent pockets and narrow bands along the main rivers, and their tributaries and much of that land is now forest-covered.

The population of the Yukon has fluctuated primarily with the fortunes of the mineral industry. Following the boom population of 1901, the population dropped to 8,512 by 1910, and for the next 35 years remained between 4,000 and 5,000. From 1941 to 1951 the population doubled from 4,194 to 9,906, resulting from an influx of construction workers and military personnel required to build and maintain national defense installations and communications facilities required by the

United States during World War II. The upward trend increased with the government-subsidized renewal of mining activity. The 1951 population of 9,096 increased to 14,628 in 1961 and then to 18,388 in 1971.

The 1971 census showed that 61 percent of the Yukon population lived in Whitehorse (population of 11,217). The registered Indian population of the territory numbered 2,590 or 14 percent of the total Yukon population. The Indian population of Whitehorse numbered 560 in the 1971 census. The following list shows the populations of some of the larger communities which would be impacted by the proposed Taylor Highway realignment in Canada. (See Figure 5 for locations.)

	Indian Population	Total Population
Clinton Creek	5	381
Dawson City	120	762
Flat Creek	-	71
Stewart Crossing	12	43
Elsa	15	298
Keno Hill	1	79
Mayo	70	381
Pelly Crossing	121	141
Carmacks	200	348

9. Archaeological and Historical Resources (Alaska)

The first known inhabitants of this portion of Alaska were Athapaskan Indians, especially the subgroups known as Tanana, Upper Tanana, Han, and Kutchin. They were a seminomadic hunting and gathering people dependent upon a variety of plant and animal resources spread over a wide area. The staples of their diet were caribou and moose, occasionally supplemented by fish, roots, berries, birds, and other small animals which served as alternate food when the large mammals could not be obtained.

In spite of their nomadic ways, the wealth of resources available in the Fortymile region led the Indians to establish settlements, now abandoned, at Joseph and Ketchumstuk. As many as 200 to 300 people overwintered in each of these villages.

The mid-1800's brought the Indians of the Fortymile region their first exposure to European culture in the form of explorers, trappers, and traders. When the Hudson's Bay Company established a post north of the Yukon River in 1847, the Natives began regular fur trading. The discovery of gold attracted large numbers of white men to the region, and villagers left the established communities to trade with them. They supplied food and wood for as many as 700 prospectors and miners in the area, in the process decimating the local big game populations to the extent that it became necessary to substitute fish as the mainstay of the Native diet.

The Fortymile region was the site of the first gold strike in interior Alaska. Successful prospecting occurred as early as 1881, and the region was thoroughly prospected by 1900. Several small communities such as Chicken, Franklin, Jack Wade, and Steele Creek provided the prospectors with basic services. About 1890, as richer finds were made elsewhere and the diggings in the area became poorer, the miners began to leave. A second wave of miners entered the region in the 1920's armed with mechanical mining methods to profitably extract gold from the remaining deposits. This activity continued until World War II when most mining ceased, never to regain its momentum. Small operations have continued to mine gold, and the current high price of gold has renewed interest in the area.

Recent surveys of the Taylor Highway and the Fortymile region in general have located about 30 sites of archaeological and historical interest, as well as showing the need for additional study. 1/ No sites currently included in or nominated

---

1/ W. Bell and M. Sullivan, A Cultural Resource Inventory of the Fortymile River (1976); P. M. Bowers, et al., Archaeological and Historical Investigations Along the Taylor Highway (1975).

for inclusion in the National Register of Historic Places are in the vicinity of the realignment. The Washington-Alaska Military Cable and Telegraph System (WAMCATS) has been found worthy of inclusion in the National Trails System. 1/ This telegraph system, completed in 1903 by then-Lt. William "Billy" Mitchell, linked the military forts in Alaska with the lower 48 states. However, the realignment does not approach the ruins of this facility.

Archaeological and Historical Resources (Canada)

The Yukon River drainage basin is an area of considerable interest to archaeologists since the river and its tributaries may have provided a major pathway for the first human migration from Asia along the Bering Sea into North America. Archaeological sites in the Yukon have already yielded artifacts determined to be at least 7,000 years old. Present Native peoples of the Yukon divide into two principal groups--the Athapaskans in the interior and a northern fringe of the Tlingit tribe in the southwestern portion of the territory.

The long isolation of the Yukon was broken in 1840 when Robert Campbell of the Hudson's Bay Company entered the immense region to assess fur-trading prospects. In 1848, Fort Selkirk was established at the confluence of the Yukon and Pelly Rivers for the purpose of opening the fur trade. The fort's activities were of short duration, however, due to Indian attacks and later to the regional preoccupation with gold. The city of Dawson became the center of "gold rush" activity, growing rapidly to a population of about 25,000 after the initial Klondike gold discovery in 1896. Within 10 years, however, the gold rush abated and the city came close to becoming a ghost town. Today, a number of historical buildings have been and continue to be restored to their earlier gold rush character, and Dawson has become a part of the Klondike Gold Rush International Historic Park, a cooperative undertaking between Canada and the United States. Outside the city and along area watercourses are scattered many ruins and other indications of past mining activities.

1/ L. Greenfield, and D. Hawley, A Recreation Resource Management Plan for the Washington-Alaska Military Cable and Telegraph System (1975).

10. Air and Noise Quality (Alaska)

Existing air quality along the proposed realignment is good. Present traffic loads do not generate enough emissions to significantly degrade air quality, and emissions from highway traffic are in no danger of exceeding Federal emissions standards. Other emission sources include a few domestic heating units and localized mining and mineral exploration activities. Emissions from these sources are also low and do not significantly degrade air quality.

Forest fires, which occur frequently in the Yukon-Tanana upland, often have a significant temporary effect on air quality. During the summer fire season, it is common for smoke to block distant land features from view and occasionally reduce even short-range vision.

During dry weather, traffic on the existing road surface generates dust. Although it is limited to the immediate road area, it can be irritating and can impede driver vision.

The noise level along the Taylor Highway is low. With the exception of Tetlin Junction, Chicken, and Boundary, the land is undeveloped. In addition to the highway, localized mining operations and air traffic centered around the Chicken and Boundary airstrips generate noise.

Air and Noise Quality (Canada)

Although specific information is presently unavailable, it is expected that existing air and noise quality along the proposed realignment in the Yukon is similar to that found along the Taylor Highway in Alaska. (See Section B.10.) Except for possibly the Dawson and Whitehorse areas, the existing air quality and noise levels are expected to be similar to those associated with a rural area. The data for areas such as Dawson and Whitehorse are presently unavailable, but it is expected that air quality and noise levels in these areas are also good.

C. ENVIRONMENTAL IMPACT OF THE REALIGNMENT

1. Climate (Alaska)

The proposed Taylor Highway realignment will have no short- or long-term impacts on the climate of interior Alaska.

During the winter, emissions of water vapor associated with the operation of compressor stations or vehicles traveling to such stations would, under certain conditions, be likely to cause the formation of ice fog. A similar problem would also occur along the originally proposed Alcan route along the Alaskan Highway. A final analysis of the severity and potential impact of ice fog formation along the Taylor Highway realignment requires additional study of terrain and meteorological conditions after the final locations of compressor stations have been identified. Due to the fact that ice fog formation is primarily a winter phenomenon and the fact that pipeline construction is expected to take place during the non-winter months, ice fog is not expected to be a significant construction related impact.

Alcan indicates that the regulations for water vapor emissions covered by the Alaska Air Pollution Control Regulations would be observed during operation in order to minimize the possibility of generating ice fog at compressor station locations where such fog may interfere with the safety of workers or other persons using the Taylor Highway transportation corridor.

Climate (Canada)

The realignment would not impact the climate.

During the winter, emissions of water vapor associated with the operation of compressor stations or vehicles traveling to such stations along the realignment would, under certain conditions, be likely to cause formation of ice fog. A similar problem would also occur along the originally proposed prime route. If Foothills undertook winter construction along the western end of the route, ice fog could also be formed from construction-related vehicle emissions. Although this could cause possible temporary local safety hazards, the impact of ice fog formation is not considered a significant project-related impact.

2. Topography (Alaska)

The topographic impact of construction within a pipeline right-of-way is normally minimal. Only where sidehill construction is necessary would there be the potential for long-term impact. Extraction of construction material from borrow sites would also involve a significant impact. Because the Taylor Highway realignment would traverse more hilly terrain than the prime route, it would involve more impact. Despite the scarcity of quality construction material (gravel) along the realignment, it is unclear whether the impact of material extraction would be worse than on the prime route. Material sites of any kind along the prime route are uncommon southeast of Tetlin Junction (most gravel material had to be hauled in for highway construction), while they are common but of poor quality along the Taylor Highway and have not generally been reclaimed.

A normal backfill berm disappears in a short time. If geotechnical study indicates that a surcharge berm would be necessary to control frost heave, then there would be an impact. However, this would be of no greater consequence than on the prime route. See Sections B.2 and 3, and C.2 and 3 of the Supplement for further discussion of this and related topics.

Topography (Canada)

The Klondike Highway realignment would cause substantially more sidehill construction and borrow site impact than the prime Alaska Highway route. Generally, topographic impact would be similar to that described for Alaska.

3. Geology and Soils (Alaska)

The main impact related to geology and soils would be the potential for increased erosion within the right-of-way during construction. The impacts would be similar to those expected along the prime route, although of greater magnitude because of the hillier terrain. Because the soils of the area are not particularly fertile, the project would not affect any existing or potential cropland. However, the small amount of topsoil which might exist within the right-of-way would be destroyed.

The Taylor Highway realignment would have a significant impact on the availability of construction material. No other mineral resources would be significantly affected, although a small portion within the right-of-way would no longer be available for exploitation. In general, the impact would be similar to that of the original Taylor Highway construction and the proposed highway upgrading.

Since the prime route would not cross mineralized areas, the realignment would involve additional impact. However, this is not a serious problem and could be handled by minor route changes in many cases.

See Section C.3 of the Supplement, pages 214 to 223, 226 to 229, and 239 to 240, for additional discussion of geological- and soil-related impact.

Geology and Soils (Canada)

Erosion-related impacts along the Klondike Highway realignment would be greater than those expected for the prime Alaska Highway route because extensive hard-rock excavation and bank cutting would probably be needed. Permafrost problems and seismic hazards, on the other hand, would be less than those encountered in the Alaska Highway corridor. Some potential for landslides on the Klondike Highway realignment could require special pipeline design and should be investigated further. Inasmuch as soils in the area are not particularly fertile, the project would not affect any existing or potential cropland.

The Klondike Highway realignment could have some impact on the availability of construction material, particularly in the unglaciated upland areas along the western portions of the route. Construction materials along the route might be developed by blasting, crushing, and screening bedrock, which is considered less environmentally harmful than drag lining such materials from active river channels. No other mineral resources would be significantly affected, with the possible exception of several miles of untested potential gold-bearing strata in the Klondike River, where pipeline emplacement could limit future gold-dredging operations.

4. Hydrology (Alaska)

The usual impacts on hydrology associated with pipeline construction (see Sections B.5 and C.5 of the Supplement) can be expected along the Taylor Highway realignment. Slightly more impact may be expected in Alaska along the realignment than along the prime route because more stream crossings would be required and the longer pipeline would affect a larger drainage area. However, since there is much less muskeg and peat, one may expect less permafrost degradation and hence less related erosion and stream siltation along the realignment.

The construction of the pipeline along the Taylor Highway would probably hasten the proposed upgrading of the highway, but the impacts of highway construction would take place eventually whether or not the pipeline were constructed. The prime route would also follow a highway which undergoes maintenance independent of the pipeline proposal. However, since both the pipeline construction and the improvement of the Taylor Highway would require extensive excavation of fill material, the Taylor Highway realignment would probably cause more stream siltation associated with borrow pit construction.

The operation of the pipeline along the Taylor Highway route would have more impact on the hydrology than the operation of the pipeline on the prime route because an extra compressor station, with its associated sewage treatment and disposal facility, would be required on the former route.

Hydrology (Canada)

As is the case in Alaska, more impact on hydrology may be expected along the realignment in Canada than along the prime route because more major stream crossings would be required and because the greater length of pipeline would affect a greater drainage area. Because the Canadians are presently upgrading the Klondike Highway and should have it completed by 1979, it is possible that gravel might be scarce by the time construction of the pipeline would begin, and siltation associated with borrow pit construction might be more severe along the realignment.

Since two more compressor stations would be required in Canada if the pipeline were constructed along the realignment, the impact from sewage treatment and disposal would be proportionally greater along the realignment.

In its environmental comparison of alternative pipeline routes in the Yukon Territory, which included the Klondike Highway realignment and the Alcan prime route, Envirocon, Ltd. found that the Klondike Highway realignment would cross 19 fewer lakes, rivers, streams, and ephemeral channels in Canada than the prime route. Primarily for this reason, it was predicted there would be less impact to hydrology along the realignment than on the prime route. However, Envirocon also considered the swift, constricted channel of the Yukon River near Dawson to be the most difficult river crossing it examined. In its conclusion, Envirocon stated:

> Hydrological and sedimentological data are inconsistent and of short duration for most major watersheds and are non-existent for most small watersheds. It is felt that the level of knowledge about Yukon hydrology is insufficient for either river crossing design work or comprehensive environmental impact assessment, especially on small watersheds and glacier-fed river systems.
>
> The basic fundamentals of groundwater flow in continuous and discontinuous permafrost have not been defined in relationship to warm and chilled pipelines. The potential for aufeis formation, interflow ponding, high pore water pressure problems and drainage disruption in all Yukon terrain types during pipeline activities is meagerly documented and poorly understood. Accordingly, the importance of this parameter may be seriously under-rated in this analysis. (Emphasis added.)

Envirocon went on to rate the realignment better than the prime route on the basis of lesser hydrological impact. However, because of the trade-offs identified, i.e., number of water crossings versus difficulty of water crossings, etc., and the general lack of basic hydrologic data for the Klondike Highway realignment, the FPC staff feels that a meaningful comparison of hydrological impact of the routes is not possible at this time. The underlined portion of the quotation above is probably a more realistic appraisal of the situation.

5. Vegetation (Alaska)

The primary impact to vegetation would be removal of vegetation during construction. On the basis of an additional average width of 75 feet of clearing along the existing roadway, 40 acres for a construction camp, and 15 acres for two compressor stations, a total of approximately 1,100 acres of vegetation

would be cleared. Additional acreage would be lost through the construction of borrow pits and access roads, but an accurate estimate of the acreage that would be cleared is not possible at this time. Because of the greater length of the Taylor Highway realignment, it is expected that its construction would have a greater impact to vegetation than the construction of the prime route. Further study is needed to estimate possible impact to the endangered plants near Boundary.

The operation of the pipeline on the Taylor Highway realignment should not produce an impact significantly different from the operation of the pipeline on the prime route.

Vegetation (Canada)

Because of the greater length of the realignment, it is expected that its construction would have a greater impact on vegetation than the construction of the prime route. Fires would also be a greater hazard along the realignment than along the prime route. Although Alcan would require further research regardless of which route were chosen, the realignment would require much more site-specific data, particularly on rare and endangered plants, before construction began. The extensive area of subalpine and alpine tundra west of Dawson on the realignment would be particularly sensitive because revegetation would be severely limited by the steep slopes, excessively dry soils, winds, and short growing season. The grasslands along the Yukon, Pelly, and Nordenskiold Rivers would present similar problems. There is much less tundra and grassland along the prime route.

The operation of the pipeline along the realignment should not produce an impact significantly different from that of the prime route.

6. Wildlife (Alaska)

The potential impacts to fish and their aquatic habitats have been addressed in the Supplement. There would be more impact to grayling habitat along the realignment, but, unlike the prime route, the Taylor Highway realignment would not pass near any salmon spawning or migration areas once it left the vicinity of Tetlin Junction.

Impact to waterfowl should be less along the realignment than along the prime route because less nesting habitat exists along the Taylor Highway. Of principal concern is the possible presence of nesting American peregrine falcons along the realignment. These and other raptors are extremely sensitive to disturbance during most of the summer nesting season.

The Fortymile caribou herd in its present debilitated condition may be very sensitive to any disturbance to its migration routes and winter and summer habitats along the Taylor Highway route. The effect of a possible raised berm left above a backfilled pipeline trench might be to alter migration patterns. Similar effects might be caused by the presence of any work pad that might be required. Studies associated with the Alyeska project, especially on the North Slope, have indicated that a haul road can alter caribou migration patterns. A summer construction schedule such as that proposed by Alcan for the prime route would probably not interfere with the periods of annual migration, nor would the critical calving grounds be affected. One would expect less impact to caribou along the prime route than along the realignment, and much less impact from construction of the pipeline along the Taylor Highway than from the upgrading of the highway itself. This latter conclusion is based on the supposition that upgrading the road would require the construction of steep-sided cut-and-fill areas across hills and depressions, thus creating more tangible barriers to migration than a low pipeline berm. The sight and sound of the proposed compressor stations, one of which would be constructed within the range of the Fortymile herd, would also have some influence on the distribution of the caribou.

There are fewer moose and less moose habitat near the Taylor Highway realignment than near the prime route, but impacts may be relatively more severe along the realignment because the moose population there is presently under severe stress. Destruction of riparian winter habitat may be critical along this route.

Grizzlies are more prevalent along the realignment and, coupled with the ubiquitons black bears, would probably create a human-bear interaction problem during construction. Experience with the Alyeska pipeline has shown that bears readily become nuisances, frequently to their detriment, around pipeline camps. Denning areas have yet to be identified, and gravel extraction may prove to conflict with denning locations.

The operation of the pipeline along the Taylor Highway realignment would have a greater impact on wildlife than the operation of the pipeline on the prime route because the former route would require an additional compressor station. The impacts associated with compressor noise, waste treatment facility effluent and aerial overflights would therefore be greater along the Taylor Highway realignment.

Wildlife (Canada)

Because more migratory fish habitats would be crossed or paralleled by the realignment, the potential for impact to species such as grayling, whitefish, and salmon is greater along the realignment than along the prime route.

The additional length of the realignment and the requirement for two more compressor stations would appear to increase the potential impact to birds and mammals compared to the prime route. However, until at least as much environmental data are acquired for the realignment as Alcan has amassed for the prime route, particularly with regard to sensitive habitats and the location of rare and endangered species, it is impossible to state with any degree of certainty which route might be built and operated with less impact to Canadian wildlife. Envirocon summarized the results of its reconnaissance-level comparison of the routes in this fashion: "It is our conclusion that a meaningful ranking of these alternate corridors cannot be made by integrating all environmental components."

7. Land Use, Recreation, and Aesthetics (Alaska)

The construction of a gas pipeline along the Taylor Highway realignment would not significantly change the existing or proposed land use status of the area. The primary impact would be the conversion of a strip of land from its existing character to that of a maintained right-of-way. No structures would be allowed to be built on the right-of-way, and activities such as mining would be prohibited within the right-of-way for the life of the project. Clearing the area for pipeline installation would destroy a swath of trees which would not be allowed to revegetate for the life of the project.

The presence of a maintained right-of-way through this area would possibly invite the use of off-road vehicles, leading to the use and possible abuse of areas which would otherwise be left unimpacted.

Increased activity because of construction would probably have a temporary detrimental effect upon the animal-carrying capacity of the area, thus decreasing the subsistence value of the land. This should probably only be a short-term impact.

Although the direct impact to land use would probably not be significant, the relative impact would be greater along the Taylor Highway realignment than along the prime route.

Use of the Taylor Highway as a haul road for the pipeline project would seriously impede its use for other purposes.

The Taylor Highway would be upgraded by the Alaska Highway Department over the next decade in several sections from Tetlin Junction to Boundary. Since the pipeline project would require some upgrading of the highway, there is a potential for needless duplication and prolonged impact to the environment. Ideally, Alcan and the Alaska Department of Highways would coordinate their respective projects to minimize the impact. Coordination of the projects could result in highway upgrading above the level proposed by the Department of Highways, earlier completion of the highway project, less environmental impact, and all at less cost to the state but increased cost to the applicant.

The proposed Taylor Highway realignment would probably not change the proposed classifications of the streams to be crossed in the Fortymile River Basin, provided all crossings of these streams were buried and located close to the existing highway bridges.

Pipeline installation in a streambed would cause siltation problems, but they would generally be short-term. The impact would probably not be as severe as that resulting from many of the placer mining operations carried on in the past. Scars on the streambanks would be noticeable until natural revegetation took place. Revegetation in this interior Alaska area would probably take a prolonged period of time.

It is quite probable that special screening efforts would be required of the pipeline company to hide the pipeline right-of-way from view. Techniques such as properly angling the right-of-way to the streambank as well as planting trees along the bank would minimize the visual impact of a pipeline stream crossing. In addition, if the pipeline were installed

close to the highway bridges, the main focus of the boater's attention would be on the bridge and not the pipeline right-of-way. In areas along Logging Cabin Creek and Wade Creek where the pipeline would parallel these streams for a long distance, the visual impact could be extensive.

The following BLM-maintained primitive recreational facilities and campgrounds along the Taylor Highway would be directly impacted by pipeline construction: Six Mile Wayside (MP 6), West Fork Campground (MP 49), South Fork Landing (MP 75), and Walker Fork Campground (MP 82).

Recreational activities could be severely impacted by the construction of the Taylor Highway realignment. Tourist traffic would be impacted by associated road construction and by traffic congestion during pipeline construction. Campground facilities would be saturated by visitors associated with the construction spread, and extensive policing of the areas would be required. Recreational mining and sightseeing would be similarly impacted. River float trips would be affected by any project-related deterioration in water quality and by overuse and overcrowding of the streams. Increased activity in the area might cause increased destruction and vandalism of historic and abandoned structures and artifacts. The mere presence of machinery, workers, noise, and dust associated with pipeline construction would severely impact the recreational experience of those people coming to the Taylor Highway area "just to get away from it all."

Long-term recreational impacts of the pipeline project and road upgrading would include increased use, and possible overuse, of facilities; a decrease in low-density recreation sites; and increased deterioration of historic and abandoned structures and artifacts.

The impact of the Taylor Highway realignment on recreational facilities would be relatively greater than that along the Alaska Highway route because of the more undeveloped nature of the area and the primitive and limited nature of the recreation facilities of the Taylor Highway area. Although increased recreational activity is predicted in the area, installation of a pipeline along the Taylor Highway would undoubtedly accelerate development in the region, with a resultant decrease in the existing quality of the undeveloped natural recreational values of the area.

Assuming the pipeline along the Taylor Highway would be buried in a right-of-way adjacent to or within sight of the existing highway, a significant visual impact would occur. The right-of-way would be visible from many points along the highway. Because a right-of-way must be kept clear of trees

to allow surveillance and repair of the pipeline, it would stand out from the surrounding forest. In alpine tundra areas, the slow revegetation process would leave the right-of-way highly visible for many years. Such an artificial disturbance to this relatively undeveloped area would detract from the aesthetic value of the area.

There would also be a short-term aesthetic impact resulting from the presence of stockpiles of pipe and other materials evident along the route during construction. A long-term aesthetic impact would result from the presence of two compressor stations in an area known and enjoyed for its undeveloped nature. The use of upland material borrow sites, if not properly located, screened, and/or properly revegetated, would also have a major long-term aesthetic impact on the area.

In general, if the realignment required a right-of-way physically separated from the highway right-of-way, the aesthetic impact along the Taylor Highway realignment would be relatively greater than that along the Alaskan Highway route because of the less developed nature of the area.

Land Use, Recreation, and Aesthetics (Canada)

The construction of a gas pipeline along the realignment in the Yukon would probably not significantly change the existing land uses of the area. The primary impact would be the conversion of a strip of land from its existing character to that of a maintained right-of-way. No structures would be allowed to be built on the right-of-way, and activities such as mining would be prohibited within the right-of-way for the life of the project. Clearing the area for pipeline installation would destroy a swath of trees which would not be allowed to revegetate for the life of the project.

If the pipeline were installed adjacent to or within the existing Klondike Highway right-of-way, the impact to land use would be minimal and would not be significantly different than that which would occur along the prime route in the Yukon. However, two additional compressor stations along the Klondike Highway realignment would remove approximately 80 additional acres of land from other uses for the life of the project.

The use of the Klondike Highway as a haul road for pipeline construction would probably temporarily seriously impede traffic along the route, but the impact would probably not be significantly different than that which would occur along the prime route.

Recreational activities would be severely impacted during construction. Tourist traffic would be impeded. Campground and tourist accommodations, which are presently booked up during peak summer use, would probably be overtaxed by the added visitors associated with the construction spreads. However, without accurate data on the locations and accommodations of these tourist facilities in the Yukon, it is impossible to accurately predict which route (the prime route or the realignment) would create the greater impact to the territory's recreational resources. It is probable that increased activity along the Klondike Highway would cause increased destruction and vandalism of the historic structures and artifacts in the Dawson area. This impact would be minimized if the pipeline followed the prime route.

As in Alaska, the mere presence of machinery, workers, noise, and dust associated with pipeline construction would temporarily severely impact the recreational experience of those people coming to the Klondike Highway area to escape the mechanized world.

There would also be a short-term aesthetic impact from stockpiles of pipe and other materials evident along the route during construction. A long-term aesthetic impact would result from the presence of compressor stations in a basically rural setting. The use of upland material borrow sites, if needed and if not properly located, screened, and/or properly revegetated, would also have a major long-term aesthetic impact on the area.

It would appear that because the Klondike Highway is apparently better maintained than the Taylor Highway, because there is apparently greater mining activity in the Klondike Highway area than the Taylor Highway area, and because there are more and larger towns along the Klondike Highway, the realignment in the Yukon would cause relatively less impact to the local area than would the realignment along the Taylor Highway in Alaska.

8. Socioeconomics (Alaska)

The impact to the lifestyle of the people living in the Taylor Highway area would be significant during construction. However, the Taylor Highway realignment would not substantially change the Alcan project's effects on Alaskan Natives. The Taylor Highway route would not directly encounter any Native

villages that would not have been encountered along the Alaska Highway. Both pipeline routes would pass close to the Native village of Tetlin. Eagle would be indirectly impacted if the route were installed along the Taylor Highway, while Northway would suffer impact if the pipeline were to be routed along the Alaska Highway. However, scattered Native homesites located along the Taylor Highway would also be impacted. Perhaps the impact along the realignment would be relatively greater because the people along the Taylor Highway have received fewer previous intrusions and developments than have occurred along the Alaska Highway. In any case, the type of impacts would be similar.

Alaskan Natives would be affected by the construction and operation of the gas pipeline in much the same ways as other Alaskans who live along the Alaska and Taylor Highways. Some would find lucrative employment during construction. Others would suffer from the stress on existing facilities in the area, as well as a probable increase in prices for consumer goods. All would be affected by the short-term changes in their basically subsistence lifestyles during construction. In the long-term, the pipeline project would somewhat accelerate the changes taking place in the eastern Alaskan interior from a chiefly subsistence lifestyle to increasing dependence on the cash economy.

The mere presence of large numbers of people from construction activity would have major impacts on the settlements of Chicken and Boundary. These communities do not have facilities to accommodate sightseers and tourists. Eagle has only limited visitor facilities which would be greatly overtaxed by the influx of visitors from the construction spread.

Construction activity would provide employment for some of those in the immediate area, but local people would not comprise a significant part of the labor force on the construction crew. The construction project would inject substantial cash into the local economy on a short-term basis, both through direct employment and related services. This would enable residents in the local area to acquire goods which they otherwise could not, but the increase in local prices and pressure on services would have a significant negative impact on those unable to participate in the "boom." This would include a substantial part of the population in the immediate area--those who are young, elderly, and/or unskilled.

The influx of both construction workers with assigned jobs and those coming to the area in hopes of finding high-paying jobs would have major impacts on the limited facilities of the immediate area. Like Chicken, Boundary, and Eagle, the

Tanacross-Tok-Tetlin area has a definite shortage of housing. For construction, support, or maintenance activity, the pipeline company would have to provide housing for workers and dependents.

Following construction, a small increase in population from compressor station personnel would be expected, but it is assumed that they would have little negative impact on local facilities.

If the pipeline realignment resulted in an accelerated program of highway upgrading, it would undoubtedly lead to an earlier increased use of the Klondike Loop by tourists. With this increased use would come an accelerated increase in the conflicts between the present lifestyle and that which outsiders bring with them.

Again, the relative impact to socioeconomics and existing lifestyles would probably be greater along the Taylor Highway realignment than along the more developed Alaska Highway.

Socioeconomics (Canada)

The Mackenzie Valley Pipeline Assessment, issued under the authority of the Minister of Indian Affairs and Northern Development of Canada in 1974, indicated that from a socioeconomic point of view, it would appear that local residents of the Yukon would not have difficulty in coping with the presence of such a major project either along the prime route (Alaska Highway) or a realignment (Klondike Highway). Mineral, highway, and hydroelectric developments, pipelines, and airfields have accustomed the people of the southern Yukon to the impact of large-scale developments. However, serious labor shortages could arise if a pipeline project were to attract labor from the limited local force upon which both industry and government depend.

The temporary impact of pipeline construction on the socioeconomics of the area would most probably be significant. Pipeline construction would bring to the area a type of work in which the area residents, particularly the Yukon Natives, are not presently skilled. In fact, the Lysyk Alaska Highway Pipeline Inquiry stated that there are requests that no pipeline project be allowed to be installed in the Yukon until the Natives have had enough time for the vocational training they would need to compete for the skilled jobs being offered by the pipeline project. The local residents feel that if they are going to suffer the inconveniences and changes to their lifestyles accompanying the project, they should at least be allowed to benefit from good-paying jobs.

Construction would inject substantial cash into the local economy on a short-term basis, both through direct employment and related services. This would enable residents in the local area to acquire goods which they otherwise could not, but the increase in local prices and pressures on services would have a significant negative impact on those unable to participate in the "boom."

The influx of both construction workers with assigned jobs and those coming to the area in hopes of finding high-paying jobs would probably tax the existing facilities (housing, etc.) of the area.

Following construction, a small increase in population from compressor station personnel would be expected, but it is assumed that they would have little negative impact on local facilities.

It would appear that the socioeconomic impact along the Klondike Highway realignment would not be significantly different than that which would occur along the prime route. However, without a detailed socioeconomic study for the Klondike Highway, a valid comparison is not possible. It would seem that the socioeconomic impact of a Taylor Highway realignment in Alaska would be relatively greater in Alaska than would a Klondike Highway realignment in the Yukon.

9. Archaeological and Historical Resources (Alaska)

Construction activities along the Taylor Highway would have a negative impact upon all cultural values, both directly and indirectly. Sites already identified indicate that additional finds are likely. Detailed study of the realignment route would be necessary to minimize impact to cultural resources and to minimize construction delays resulting from the need to excavate particularly valuable finds. The potential for this type of impact is much greater for the realignment than for the prime route.

Indirect impact would result from vandalism related to the influx of people associated with construction. The major indirect effects would result from highway upgrading and the expected increase in recreation-related use of the area and would occur regardless of the pipeline project.

A need exists for more detailed research of archaeological and historical features in this area prior to construction. The fact that a number of sites have already been discovered indicates that the Fortymile area may have the potential for many more, as it has become apparent that the area has long held important values to prehistoric and historic man. Because this area was largely ice-free during the last glaciations, it may prove to be very important in establishing the date of man's arrival in the Western Hemisphere. Equally important is the potential information this area holds for our understanding of prehistoric cultural sequences and trade patterns of interior Alaska.

Archaeological and Historical Resources (Canada)

Archaeological and historical resource impact along the Canadian route segments would be similar to that described for Alaska.

10. Air and Noise (Alaska)

The impact of pipeline and compressor station construction on air and noise quality would occur throughout the entire construction period, but would be temporary. At times, the impact might be locally severe, but would be limited to the immediate vicinity of the construction spread, compressor station sites, material sites, or access roads.

Emissions associated with the construction program would be generated primarily from the operation of internal combustion engines and propagation of construction-generated dust. Vehicle emissions are considered to be a short-term phenomena which would cause no air or noise quality standard to be exceeded because of the use of appropriate mufflers and other control devices.

Compressor station operations would exert a long-term, continuous impact on noise and emission levels near their respective sites. The emission of carbon monoxide, nitrogen oxides, hydrocarbons, and particulates from gas-fired turbine engines are low and would conform to state and local standards. Additionally, compressor stations would be equipped, as required, with appropriate noise attenuation devices in order to minimize the long-term propagation of nuisance noise.

Impacts from air and noise emissions resulting from construction and operation of the proposed Taylor Highway realignment would not be significant. However, the impact would be relatively greater than that which would occur along the prime route. The realignment would be 23.6 miles longer than the prime route, and the realignment would require the installation of two compressor stations between Tetlin Junction and the border, whereas the route from Tetlin Junction to the border along the Alaska Highway would require only one compressor station.

Air and Noise (Canada)

Air quality and noise levels are not expected to be significantly degraded by construction and operation of a pipeline along the realignment. See Section C.10 (Alaska) for a discussion of impacts which would also apply to this Yukon segment of the realignment.

Impact along the Yukon realignment would be relatively greater than that along the Yukon prime route because of the increased number of compressor stations and the increased length of pipeline required. However, the increased impact would not be significant.

D. MEASURES TO ENHANCE THE ENVIRONMENT OR TO AVOID OR MITIGATE ADVERSE ENVIRONMENTAL EFFECTS

Alcan has indicated that it would utilize the same measures it has already proposed for the prime route. (See Pages 329-340 of the Supplement.) The Supplement identifies additional general mitigation measures which the FPC environmental staff believes should be implemented (Pages 353-361).

In light of the possible serious impacts that could occur to moose, caribou, American peregrine falcons, and endangered plants, the staff recommends that if this route were to be certificated, Alcan be required to conduct studies of these species along the Taylor and Klondike Highways preparatory to the development of plans to mitigate such impacts. Similar studies should be required to locate and avoid fish spawning and overwintering areas and bear denning areas.

E. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACT

Pages 362 through 364 of the Supplement are generally applicable to the realignment, with the exception of the discussion of impacts in Washington and Oregon. In addition, it should be noted that the realignment would remove from exploitation certain portions of mineral claims for the life of the project. While this could be a serious impact to the individual claim holder, the excluded resources would not be significant.

F. RELATIONSHIPS BETWEEN SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The discussion on Pages 365-366 of the Supplement is not significantly changed by the realignment.

G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The discussion on Page 367 of the Supplement is not significantly changed by the realignment.

H. ALTERNATIVES TO THE PROPOSED ACTION

The discussion on Pages 368 through 388 of the Supplement is, in general, still applicable. However, certain developments which have taken place since the Supplement was issued warrant some additional comments.

One of the competing proposals, referred to as the Arctic Gas Project, has been declared unacceptable by the National Energy Board of Canada in the same decision which suggested that a rerouting of Alcan's proposed pipeline along the Taylor Highway would be required. Therefore, it may be presumed that the Arctic Gas Project is no longer a viable alternative. As a result, the only proposed alternative project is the LNG tanker project sponsored by the El Paso Alaska Company.

Alcan's 48-inch pipeline proposal of March 8, 1977, modified the original proposal so that it is now virtually identical to the FPC environmental staff's preferred alternative as far as James River (Caroline) Junction, Alberta, Canada. Minor pipeline route modifications are suggested on Pages 373-375 of the Supplement. The Taylor Highway-Klondike Highway routing bypasses the areas of concern identified on Pages 376, 377, and in the last paragraph of Page 375.

Sections 4 and 5, Pages 382 to 385 of the Supplement, no longer apply. The 48-inch system incorporates the desired system operating characteristics, and there does not appear to be a need to require winter construction. Construction scheduling should be tailored to specific segments of the route to limit environmental damage.

I. CONCLUSION

The FPC staff concludes that the environmental impacts of the Taylor Highway realignment are acceptable in Alaska. As for the Klondike Highway realignment in Canada, the staff adopts the conclusions in the environmental assessment prepared by the Environmental Assessment Panel appointed by the Canadian Minister of Indian Affairs and Northern Development and chaired by Dr. H.M. Hill, which states that this route is "potentially acceptable environmentally for construction of a gas pipeline." The realignment would not change the staff's previously stated preference for the Alcan Project over the LNG-tanker proposal of the El Paso Alaska Company. However, the detailed investigation by the DOI and FPC staffs concludes that the original Alcan prime route is environmentally preferable. The advantages of the prime route include the following:

a) The route between Tetlin Junction, Alaska, and Whitehorse, Canada, would be 119.9 miles shorter.

b) An existing utility corridor, which contains a products line and a powerline, could be utilized for almost the entire prime route.

c) The pipeline routing would be more level, requiring less cut-and-fill operations and fewer mountain crossings.

d) It would be adjacent to areas that have previously been impacted and could therefore adjust better to additional pipeline-related socioeconomic impact and changes in lifestyle.

e) The highway would not require upgrading for use as a transportation system for pipeline construction.

f) No major wildlife herds would be impacted.

g) There would be considerably less impact on archaeological and historical artifacts.

h) The aesthetic impacts would be significantly less.

Therefore, when all aspects of the environment are evaluated, it is evident that the prime Alcan route is superior to the Taylor Highway-Klondike Highway realignment suggested by the National Energy Board of Canada.

If the alternative Taylor Highway-Klondike Highway realignment is the choice of the President and the Congress, it is the FPC staff's further opinion that the discussion of this route and its anticipated environmental impacts has been sufficient to allow a proper decision to be made, provided adequate terms and conditions are adopted to mitigate the various impacts identified.

REFERENCES

Alaska Department of Fish and Game. Annual Report of Survey-Inventory Activities. Parts II and III. Juneau, 1976.

Alaska Department of Fish and Game. Alaska's Wildlife and Habitat. Anchorage, 1973.

Alaska Department of Fish and Game. Status of the Fortymile Caribou Herd. Juneau, Undated.

Alcan Pipeline Company. Environmental Assessment: Dawson Route, with Emphasis on the Taylor Highway in Alaska. Unpublished.

Barry, G.S., and A.J. Freyman. Mineral Endowment of the Canadian Northwest. Mineral Information Bulletin MR105, Department of Energy, Mines and Resources. Ottawa, 1970.

Bell, Wendell and Michael Sullivan. A Cultural Resource Inventory of the Fortymile River. Western Interstate Commission for Higher Education. September 1976.

Berger, Justice Thomas R. Northern Frontier, Northern Homeland: The Report of the Mackenzie Valley Pipeline Inquiry. Vol. 1. Ottawa, 1977.

Bowers, Peter M., et al. Archaeological and Historical Investigations Along the Taylor Highway. Alaska Division of Parks. August 1975.

Canada Department of Agriculture, Soil Research Institute. Soils of Canada. Ottawa, 1972.

Cobb, Edward H. Metallic Mineral Resources Map of the Eagle Quadrangle, Alaska. USGS Map MF-393, 1972.

Department of Indian Affairs and Northern Development, Northern Natural Resources and Environmental Branch. Surface Water Data, Yukon Territory. Ottawa, 1975.

Department of Indian Affairs and Northern Development. North of 60. Ottawa, 1974.

Department of Indian Affairs and Northern Development, Pipeline Application Assessment Group. Mackenzie Valley Pipeline Assessment. Ottawa, 1974.

Department of Indian Affairs and Northern Development, Parks Canada. Wild Rivers: Yukon Territory. Ottawa, 1976.

Douglas, R.J.W., and L.-P. Tremblay, editors. Geologie et Ressources Minerales du Canada. Ottawa, 1975.

Encyclopedia Canadiana. "Yukon River." Toronto, 1975.

Envirocon, Ltd. Routes - An Environmental Comparison of Alternate Pipe Line Corridors in the Yukon Territory. Vancouver, 1977.

Federal Power Commission. Alaska Natural Gas Transportation Systems: Final Environmental Impact Statement. 4 vols. April 1976. Supplement: Alcan Pipeline Project. September 1976.

Foster, Helen L. Geologic Map of the Eagle Quadrangle, Alaska. USGS Miscellaneous Investigations Map I-922. Washington, D.C., 1976.

Foster, Helen L. Reconnaissance Geologic Map of the Tanacross Quadrangle, Alaska. USGS Miscellaneous Geologic Investigations Map I-593. Washington, D.C., 1970.

Foster, Helen L. and Terry E. C. Keith. Geology Along the Taylor Highway, Alaska. USGS Bulletin 1,281. Washington, D.C., 1969.

Glick, Arthur N. and James D. Mertes. Fortymile: A Minimum Personnel Contact Visitor Management Program. Department of Park Administration and Landscape Architecture, Texas Tech University. Lubbock, Texas, May 1976.

Greenfield, Leslie and David Hawley. A Recreation Resource Management Plan for the Washington-Alaska Military Cable and Telegraph System. Western Interstate Commission for Higher Education. 1975.

Haynes, Terry L. They Didn't Come in Four-Wheel Drives: An Introduction to Fortymile History. Western Interstate Commission for Higher Education. September 1976.

Hemming, James E. The Distribution and Movement Patterns of Caribou in Alaska. Alaska Department of Fish and Game Wildlife Technical Bulletin No. 1. Juneau, 1971.

Hill, H.M., C.E. Wykes, B.J. Trevor, D.S. Lacate, O.L. Hughes, and L.B. Chambers. Alaska Highway Pipeline: Interim Report of the Environmental Assessment Panel to the Honourable Romeo Leblanc, Minister of Fisheries and the Environment. Ottawa, 1977.