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Federal Environmental
Assessment Review Office

Alaska Highway Gas Pipeline

Yukon Hearings
(March—April 1979)

Report of
the Environmental
Assessment Panel



Government
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PANEL REPORTS

TO THE MINISTER OF THE ENVIRONMENT ON PANEL PROJECTS

1. Nuclear Power Station at Point Lepreau, New Brunswick.
(May 1975)
2. Hydro Electric Power Project, Wreck Cove, Cape Breton Island,
Nova Scotia. (August 1976)
3. Alaska Highway Gas Pipeline Project, Yukon Territory.
(Interim report, August 1977)
4. Eldorado Uranium Refinery Proposal, Port Granby, Ontario.
(May 1978)
5. Shawk Highway Project, Yukon Territory - British Columbia.
(June 1978)
6. Eastern Arctic Offshore Drilling - South Davis Strait Project.
(November 1978)
7. Lancaster Sound Offshore Drilling Project
(February, 1979)
8. Eldorado Hexafluoride Uranium Refinery, Ontario (February, 1979)
9. Roberts Bank Port Expansion, British Columbia (March, 1979)

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Yukon Public Hearings
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the Environmental
Assessment Panel

August, 1979



Government
of Canada

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Environmental
Assessment Review

Examen des évaluations
environnementales

Ottawa, Ontario
K1A 0H3

The Honourable John Fraser, P.C., M.P.
Minister of the Environment
Ottawa, Ontario
K1A 0H3

Dear Minister:

In accordance with the Federal Environmental Assessment and Review Process, the Alaska Highway Gas Pipeline Environmental Assessment Panel has reviewed a proposal by Foothills Pipe Lines (South Yukon) Limited to construct the Yukon section of a large-diameter gas pipeline which will deliver natural gas from Alaska to the lower 48 states of the U.S.A.

The Panel examined the Environmental Impact Statement (EIS) and supporting documents submitted by the Proponent, received and reviewed many briefs and comments from the public and from Government review agencies, in the course of public hearings held in Yukon communities. Even though a great deal of vital and useful information was brought before the Panel, the Panel was unable to complete the review of the project because important information was missing on engineering design, and environmental and natural resource issues. This report outlines these information deficiencies.

The Panel recommends that the Proponent prepare a revised Environmental Impact Statement taking into account the contents of this report. Public hearings under the Environmental Assessment and Review Process will be reconvened once the Proponent has submitted this documentation.

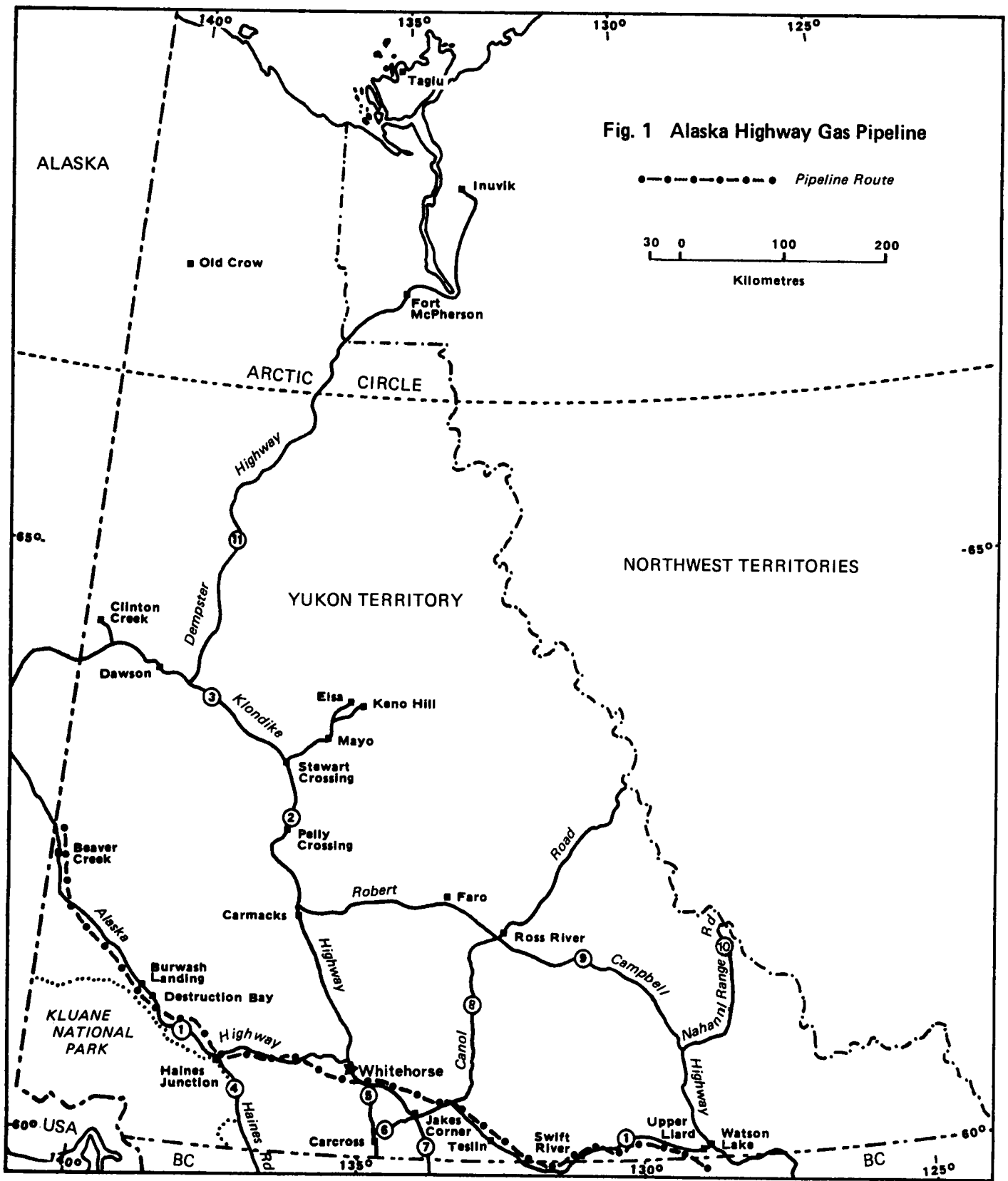
Respectfully yours,

F.G. Hurtubise
Chairman
Environmental Assessment Panel
Alaska Highway Gas Pipeline Project

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A REPORT OF THE ENVIRONMENTAL ASSESSMENT PANEL ON THE YUKON PUBLIC HEARINGS

ALASKA HIGHWAY GAS PIPELINE PROJECT

I. INTRODUCTION

THE PROJECT PROPOSAL

The Alaska Highway Gas Pipeline Project, a proposal by Foothills Pipe Lines (South Yukon) Limited, involves the construction of a large-diameter, buried, gas transmission pipeline and ancillary structures in southern Yukon. The pipeline is part of a larger system intended to carry natural gas from Alaska to the lower 48 States. The Canadian portion of the system would pass through Yukon, British Columbia, Alberta and Saskatchewan.

The proposed route is approximately 818 km long and parallels the Alaska Highway from Beaver Creek (Yukon-Alaska border) in the north, to Watson Lake (Yukon-British Columbia border) in the south (Figure 1).

Major departures from the Alaska Highway occur in the Kluane Lake area, at the Ibex Pass near Whitehorse, the Mt. Michie-Squanga area east of Whitehorse, and the Rancheria Valley. From the Alaska border to approximately Whitehorse (375 km), the pipe will have an outside diameter of 1219 mm (48 inches). For the remainder of the route, the pipe will have an outside diameter of 1422 mm (56 inches) to eventually accommodate a planned tie-in with a gas pipeline from the Mackenzie Delta (the "Dempster Lateral Pipeline"). It is proposed that the most northerly 46 km of the Alaska Highway Gas Pipeline in Yukon will carry gas chilled below 0° C.

On August 30, 1976, Foothills Pipe Lines (Yukon) Limited applied to the National Energy Board for a Certificate of Public Convenience and Necessity to construct the pipeline system as described. The Board studied the application and the route as well as the proposed Mackenzie Valley Pipeline routes and issued its report on July 4, 1977. It approved the Foothills proposal conditional upon the filing of an application by July 1, 1979 for a Dempster Lateral Pipeline to transport Mackenzie Delta gas to the Alaska Highway Gas Pipeline, connecting near Whitehorse.

Also on August 30, 1976, Foothills Pipe Lines (Yukon) Limited applied to the Minister of Indian Affairs and Northern Development for a grant of interests in lands in Yukon for a right-of-way on which to build the proposed Alaska Highway Gas Pipeline.

THE ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS

The bulk of the Yukon portion of the proposed route passes through federal lands which, under the Territorial Lands Act, are administered by the Minister of Indian Affairs and Northern Development. Because the project requires the granting of a right-of-way through federally administered lands, and because the project has the potential for a significant environmental impact, it was referred to the Minister of the Environment by the Minister of Indian Affairs and Northern Development on March 21, 1977 for an assessment of the environmental impact. Shortly thereafter, an Environmental Assessment Panel was established under the chairmanship of Dr. H.M. Hill.

Because of major decisions facing government on competing pipeline proposals in the fall of 1977, the Panel was not able to undertake a normal review of the environmental implications of the project at that time. Instead, the Panel reviewed existing data, sought public and professional opinion through hearings held in Yukon and submitted an Interim Report on July 27, 1977. It was understood that, if the Alaska Highway Gas Pipeline Project was still a contender after decisions on competing proposals were made, the formal environmental assessment and review procedure would apply.

In its Interim Report, the Panel concluded that "the proposed pipeline can be constructed and operated in an environmentally acceptable manner" subject to certain specified conditions related to environmental planning, routing around sensitive areas and development of mitigative measures to solve environmental problems associated with ice-rich permafrost. It was noted that an elevated mode, which was not addressed at the hearings, might provide an alternative to burying a pipeline in ice-rich permafrost areas. Furthermore, the Panel recommended that an Environmental Impact Statement (EIS) for the proposed Yukon pipeline route be completed based upon guidelines to be issued by the Panel.

In September, 1977, the Governments of Canada and the United States of America decided to proceed with the project. Following this decision by government to authorize construction of the pipeline, the Panel issued in December, 1977, Guidelines for the Preparation of an Environmental Impact Statement. These Guidelines were submitted to Foothills Pipe Lines (South Yukon) Limited. The Guidelines specified that the organization, content and completeness of the EIS are the responsibility of the Proponent. Furthermore, in preparing the EIS, the Proponent was asked to take into consideration the information deficiencies identified during the hearings and in the 1977 Interim Report to the Minister of the Environment.

In late 1978, the Initiating Department role for this project was transferred from the Department of Indian Affairs and Northern Development to the Northern Pipeline Agency as a result of the transfer of regulatory responsibilities. In January, 1979, the EIS was submitted by the Proponent to the Environmental Assessment Panel. The members of the Panel are:

Mr. F.G. Hurtubise, Chairman*

Mr. C.E. Wykes, Vice-Chairman

Dr. R.G. Morrison**

Dr. D.S. Lacate

Dr. O.L. Hughes

Mr. L.B. Chambers

* replacing Dr. H.M. Hill

** replacing Mr. B.J. Trevor

II. PANEL PROCEDURES

REVIEW OF THE ENVIRONMENTAL IMPACT STATEMENT

Although the submission of an Interim Report by the Panel represented a departure from normal panel operations, the issuance of the Guidelines in December, 1977, marked the beginning of the usual sequence of events in the preparation and evaluation of an EIS.

Following the submission of the EIS by the Proponent in January, 1979, Panel staff and technical advisers commenced a detailed review of the document with a view to identifying deficiencies in scope or content. Concurrently, copies of the EIS were made available to the general public and interested intervenors through the following distribution program:

Public Libraries	- settlements along the proposed route
	- Vancouver, Calgary, Edmonton
	- Library of Parliament, Ottawa
University Libraries	- Vancouver, Edmonton, Calgary
Offices of the Proponent	- Whitehorse, Calgary, Ottawa
Technical Intervenors	- Federal Government Departments
	- Yukon Territorial Government,
	Whitehorse.

Public Interest Groups - all groups and individuals which had
and Individuals expressed an interest in previous
 hearings or responded to a mail-out
 enquiry by Panel staff

The technical complexity of the subject material addressed in the EIS required the Panel to retain a number of professional advisers from government and private consulting firms. It was the role of these advisers to review specific aspects of the EIS and supporting documentation and to provide the Panel with an appraisal of the information presented in comparison with that requested in the Interim Report and the Guidelines. The Panel Secretariat issued lists of deficiencies found in the EIS to the Proponent on March 6 and 14, and on April 2, 1979. Specific information and/or clarification was requested. The lists of deficiencies were also made available to the public before and during the public hearings.

To the extent possible, the Proponent's responses to the deficiency lists were considered during the Public Hearings. Responses received after the Hearings were considered by the Panel in preparing this report.

PUBLIC HEARINGS

The Yukon Public Hearings were held to receive comments from individuals and organizations on the Environmental Impact Statement of Foothills Pipe Lines (South Yukon) Limited, the Socio-Economic and Environmental Terms and Conditions prepared in draft form by the Northern Pipeline Agency, and on other pipeline related matters brought before the hearings. In order to hold one set of public hearings on these matters it was decided that joint public hearings be held. These public hearings were co-chaired by Mr. Fernand Hurtubise of the Environmental Assessment Panel and Mr. Kenneth McKinnon of Whitehorse representing the Northern Pipeline Agency. Mr. John Ferbey (Yukon Territorial Government) and Mr. Robert Green (Indian Affairs and Northern Development) as well as Mr. McKinnon, were asked to review the draft Terms and Conditions documents. Thus, the Yukon Public Hearings Panel was comprised of a total of nine members, six from the Environmental Assessment Panel and three Northern Pipeline Agency appointees. Mr. Hurtubise and Mr. McKinnon served as co-chairmen at the hearings except for those at Faro and Dawson City, which were co-chaired by Messrs. McKinnon and Wykes.

The Panel conducted public hearings at seven enroute communities as follows:

March 19, 20	- Whitehorse
March 26	- Beaver Creek
March 27	- Destruction Bay
March 28, 29	- Haines Junction
April 2, 3	- Watson Lake
April 3	- Upper Liard
April 4	- Teslin

In addition, public hearings were held at two off-route communities, Faro (March 21, 22) and Dawson City (April 5).

Technical hearings were held at Whitehorse from April 23 - 28, 1979. For these sessions, a scheduled agenda of issues to be addressed at the hearings was circulated before the hearings (Appendix I). This permitted the appropriate technical intervenors to be present at the time that specific issues were to be discussed.

Prior to the commencement of the Yukon Public Hearings, the Council of Yukon Indians announced that it would not participate in the hearings, pending land claims settlement. It should be noted that the subject of native land claims was outside the mandate of the Yukon Public Hearings. At the request of the Champagne-Aishihik Band and the Upper Liard Band, hearings were held in the Band Halls at Haines Junction and Upper Liard.

III. GENERAL CONCERNS

The Environmental Impact Statement (EIS) covers a major project which has some complex features. A considerable amount of important information was presented in the EIS and this permitted much useful discussion of issues at the Yukon Public Hearings. However the EIS is deficient in a number of areas as described in this report and a major deficiency is the difficulty of relating predicted environmental impacts to specific aspects of the proposal. Guidelines issued by the Environmental Assessment Panel requested that the EIS include the following information:

1. a rapid focus on items of concern
2. a clear description of the project so that predicted impacts can be readily related to specific features in the proposal
3. a description of the environment which serves as a background against which environmental impacts can be considered
4. a description of impacts likely to cause major environmental disruption
5. a description of mitigation measures which deal explicitly with the impacts
6. a description of residual impacts and data gaps so that the need for further work can be determined.

There is an abundance of relevant technical information in the annexes to the EIS, although certain subjects were not adequately covered for purposes of the review. Much of this information is not carried into the EIS. As a result, the EIS is lacking in specificity when compared to the information and recommendations in the annexes.

The EIS prepared by the Proponent was reviewed thoroughly in the course of the Yukon Public Hearings. The Panel and many of the intervenors found the EIS to be deficient in providing information on certain important subjects, such as problems of frost heave and thaw settlement.

Other examples are:

1. It was not clear where different pipeline modes, i.e., buried mode or embankment mode, would be used for sections of this project nor were the environmental impacts and mitigation measures associated with different modes addressed.
2. The route location for the Ibex Pass section contained inadequate information on the evaluation of alternative routes.
3. Alternatives to the proposed construction schedule were not developed as a mitigative measure.

The Panel guidelines require that, in the description of the environment, emphasis be placed on site specific, unique or sensitive features of particular importance, such as areas critical to wildlife. In several instances, information is missing or is incomplete to the point that a full appreciation of the environmental setting is not possible. The description of the environment must relate to the assessment of environmental impact on the right-of-way and adjacent areas potentially affected. Thus inadequate information in the environmental description makes it difficult to draw conclusions on potential environmental impact. In addition, the data deficiencies are such as to preclude the quantitative estimation of impact.

The description of environmental impacts must take into account deficiencies in the data base and should indicate where knowledge gaps exist. Few references to such deficiencies are identified in the EIS.

The mitigation section of the EIS should have developed options available to mitigate or to avoid impacts resulting from the construction and operation of the pipeline. The guidelines called for explicit plans of mitigation. Instead the Proponent presented a project plan which anticipated the mitigation effects resulting from design features and alternatives. This left the Panel in the

difficult situation of not having information on specific mitigation measures to remove or minimize negative impacts on the project. Without a full description of the environment and the project and without a listing of the predicted impacts with attendant mitigation measures, the Panel had insufficient information to judge the adequacy of the Proponent's mitigation plans.

In the EIS and in the responses to the deficiency statements the Proponent was unable to provide certain important information, since according to the Proponent, such information will only become available when the planning is more advanced or at the final design stage. Examples of such information deficiencies are: access road layout, borrow pit locations and the hydrostatic testing of the pipeline. The Panel emphasizes that, contrary to the Proponent's view, an EIS is not based on a final engineering design. Rather it is based on a clear description of the proposed project including all ancillary facilities so that predicted impacts can readily be related to specific features of the proposal. If the EIS were to be based on final design then there would be very little room for design modification to mitigate potentially harmful impacts or to enhance positive ones.

The information needs described in the 1977 Panel Report still remain, as do many of the deficiencies identified at the recent Yukon Public Hearings. Since so many issues still remain unresolved today, it is extremely difficult for the Panel to prepare a report which is materially different from the 1977 Interim Report.

Having reached this conclusion, the Environmental Assessment Panel has prepared this report outlining the requirements for the completion of the assessment of the project. Furthermore, in the view of the Panel, the completion of the assessment is a prerequisite to the detailed environmental planning that will be required at a later date as the project proceeds.

In order to complete the review of the Environmental Impact Statement, the Technical Hearings will reconvene after the Proponent has supplied the Environmental Assessment Panel with the required information. The Panel will then prepare its report to the Minister of the Environment.

IV. INFORMATION REQUIRED FOR COMPLETION OF THE PANEL REVIEW

The Panel recommends that the Proponent prepare a revised Environmental Impact Statement based on the Guidelines issued by the Panel in December, 1977. The Guidelines are to be used to structure the EIS and to determine the subject matter to be included. In addition the Panel requires that the EIS be prepared by the Proponent according to the following framework:

- (a) a full appreciation of the proposed project and its alternative configurations and construction schedules and the operational procedures;
- (b) a full appreciation of the physical and biological environment in the project area;
- (c) a thorough discussion of predicted environmental impacts;
- (d) a thorough discussion of mitigative measures, representing a commitment on the part of the Proponent to minimize the negative impacts and enhance the positive ones, and
- (e) the identification of the residual unmitigated impacts and the further studies aimed at solving the problems inherent in these impacts.

PHYSICAL AND ENGINEERING CONCERNS

Geotechnical Aspects and Pipeline Integrity

Permafrost

In the 1977 Interim Report (page 14) one of the Panel conclusions was as follows:

"that a pipeline could only be constructed across ice-rich permafrost areas of the proposed Alaska Highway route if extensive and detailed soils information was first obtained, if adequate mitigative measures could be developed and strictly applied, and if an elevated mode was utilized where adequate mitigative measures could not be developed. Such mitigative measures would have to prevent significant changes in drainage patterns, significant increases in erosion or significant aesthetic impacts".

The Panel was informed that there is a lack of information on the actual extent of permafrost on the route, particularly in the eastern half of the route in Yukon. Important design decisions will depend on knowledge of the distribution of permafrost. More field work is required to better establish the frequency of permafrost occurrences.

The Panel requires a statement of procedures for permafrost surveying and the results of a survey program over the entire route, including the Ilex Pass, Cassiar Mountains, and other locations in the eastern half of the route.

The Panel Guidelines of 1977 (pages 3,4) require details on "typical designs to overcome problems associated with a chilled pipe in frozen and unfrozen ground and a warm pipe in frozen and unfrozen ground. Specific attention should be addressed to design and construction timing on ice-rich permafrost and to subsequent problems of frost heave and/or thaw settlement" and "permafrost (continuous and discontinuous) distribution and temperatures, ice content, characteristics of active layer development, and the extent and character of permafrost degradation problems" (page 7).

The Panel was informed that adequate designs have not been prepared, and insufficient information has been given on soils and permafrost conditions.

The most crucial issue raised in 1977 and again at the 1979 Yukon Public Hearings was the concern associated with a buried gas pipeline passing through areas containing permafrost. Because the pipeline route lies in a zone of continuous and discontinuous permafrost, the design, installation, and

operation of the pipeline in the buried mode presents unique and special geotechnical problems. The Panel was informed that there is little past experience with other large diameter gas pipelines built in permafrost.

The Panel wishes to be informed on the operation of any previous or existing pipeline in permafrost.

The Proponent should take the opportunity to demonstrate from precedents, if such precedents exist, the feasibility of large diameter pipelines in permafrost.

Information is lacking on the frequency with which transitions between frozen and unfrozen ground occur along the proposed route, and on other discontinuities of soil or thermal conditions which could lead to deformation and disruption of the pipe by frost heave or thaw settlement. Thus there is little indication of the number of problem sites. Information available on transitions is in a very preliminary stage, and details of pipeline designs for problem sites will be determined only after further studies are completed. The fact that the Proponent's designs, as presently proposed, are not satisfactory stems largely from a lack of information on the terrain and on thermal conditions. The Panel recognizes that the geotechnical problems associated with a buried gas pipeline in permafrost are complex and that solution to these problems may take

several years to obtain.

The Panel was informed that solutions to these problems will require very substantial research and development initiatives and programs, which may require collaboration between industry, government and specialists in cold regions research and engineering. Present forecasts are that meaningful results from current research programs are not expected to be available until 1981 or 1982. The Panel recognizes that the environmental review of the project should be completed earlier than 1981 if present construction schedules remain unchanged.

The Panel requires, therefore, that the Proponent submit a description of the proposed geotechnical study program aimed at solving the complex problems of frost heave and thaw settlement of the pipe. This program should extend to many aspects of soil thermal and moisture conditions in cold regions, including the effects of climatic change. The freezing and thawing of soils are also the cause of special problems of slope stability, and of drainage modifications, fundamentally important to the pipe, its ancillary structures, and its surroundings. In order that the Panel and reviewers have time to study the program proposals, the Proponent will be required to provide the description well in advance of

further technical (public) hearings on the project under the Federal Environmental Assessment and Review Process. Once the description of the program is reviewed for its environmental implications, the Panel will refer matters needing further attention to the Northern Pipeline Agency.

The Panel will require knowledge on the extent of available terrain information and detailed examples of solutions for specific problem sections to be identified by the Proponent, but including the section from Mirror Creek to Snag Creek. The examples will provide a basis for discussion of design problems associated with the terrain and soil conditions.

The Panel will specifically require detailed information on terrain types and typical design concepts and construction practices for a number of problem areas along the alignment identified by the Proponent but including segments which cover numerous transitions from frozen to unfrozen ground.

Frost Heave and Thaw Settlement

The Panel was advised that information was lacking as to the mechanism for limiting frost heave of the pipe to an acceptable amount. Information was also found to be deficient on the acceptable limits of pipe deformation due to frost heaving.

These limits were shown to be inadequately defined and discussed. The pipeline foundation designs proposed in the EIS appeared unlikely to function satisfactorily because of the heterogeneity of soil and/or thermal conditions, and the associated risk of disruptive frost heave or thaw settlement.

The Panel will require details on the insulation and other techniques to be used to restrict frost heave or thaw settlement of the pipe. Information is required on the relative lengths of pipe for which different techniques or modes are used as well as their dimensional variations. The designs should be presented in both cross and longitudinal sections.

The Panel will require information on the distances over which the specified amount of differential heave is tolerable. The Panel will also require a description of the acceptable maximum curvature of the pipe acceptable for either settlement or heave, especially in relation to the metallurgical properties of the pipe.

The Proponent should present convincing documentation with regard to the integrity of the pipe when exposed to deformation and the associated stresses and show that frost heave will not overstress the pipe.

Calculations relating to frost heave and thaw settlement were inadequately addressed and the analysis of error with respect to these calculations was unsatisfactory. Furthermore the designs for the pipeline have not been defined, and the pipe stress analysis has not been satisfactorily completed. For this reason it is not known exactly what accuracy of geothermal calculation is required. The degree of accuracy discussed by the Proponent was found to be unrealistic. It is likely that the margin of error is greater than that which is permissible with respect to suggested designs.

The Panel will require the results of an error analysis conducted with respect to the geothermal calculations.

The Problem of Subsidence Along the Route after Abandonment

The foundation design modes for the pipeline are not yet established for this project. Because the validity of geothermal calculations and subsequent designs used will have a bearing on post-abandonment changes to the right-of-way, an assessment can only be made after detailed planning of the project has advanced to the point where foundation design modes are decided upon.

The Panel will require information on impacts associated with subsidence following abandonment of the project.

Slope Stability

The Panel was informed that the Proponent has given little information on the procedures which will be applied in this project to ensure slope stability. Information on freezing and thawing and related instability effects especially need to be considered. The problems of frost heave and thaw settlement induced by the pipe itself are particularly complex where the line crosses slopes. There is a risk of slope instability arising because of blockage of natural drainage in the chilled sections, and of erosion or thaw-induced instability in the warm sections. Further detailed information will be required once the pipeline foundation designs are established.

The Panel will require information on the methods of ensuring slope stability for different designs, particularly in areas of permafrost. This should include details on pipeline mode, foundation design and slope stability implications.

Possible Effects of Climatic or Microclimatic Change

Possible effects of climatic or microclimatic change on the permafrost bodies along the pipeline route were inadequately addressed by the Proponent.

The impact of the pipeline will be to change the thermal regime from the natural condition. The thermal regime induced will be a combination of the effects of the pipeline and the natural thermal

conditions, including climatic change. When climatic change takes place, the thermal regime may show highly significant effects in some situations. For instance, the depth of thaw may be greatly increased or, conversely, the depths of freezing and subsequent frost heave may be increased.

The Panel will require information on the proposed plans to deal with the potential effects of climatic change on the permafrost bodies along the route.

The Integrity of the Pipeline in the Event of Seismic Activity

The pipeline corridor is located in a region of relatively high seismic activity. The integrity of the pipeline could be threatened in the event of earthquake activity. The assessment of risks due to earthquakes requires a detailed discussion, as well as appropriate designs to mitigate the effects of earthquakes. A specific part of this problem is the potential for the sediments on the bottom of Kluane Lake to liquefy and slide during seismic activity. Disturbance of lake sediments could lead to pipe failure unless adequate design and mitigative measures are taken. These issues were not adequately addressed in the EIS.

The Panel requires a description of the risks to the pipeline due to earthquakes and the appropriate designs to mitigate the effects of such activity.

The Panel requires information on the sediments of Kluane Lake and the potential for the sediments to liquefy under cyclic seismic loading.

Hydrology and Water Crossings

Design Flow Criteria

The Panel was advised that the Proponent has adopted the 100-year instantaneous flood peak in the design of stream crossings and that the computation of 100-year flood peaks from short stream flow records may give unreliable results. Results for longer return periods might be even more unreliable. Nevertheless intervenors recommended that longer return periods should be adopted by the Proponent (or an appropriate safety factor applied) to arrive at conservative design floods for streams. This requirement was given additional significance in view of the potential increase in service life of the project from 30 to 50 years and the potential use of an above-ground construction mode along part of the route.

The Panel requires detailed information on the methods used by the Proponent in determining project design flows for streams to be crossed by the pipeline and access roads including an analysis of the risks of exceeding them. The project design flow should be analyzed for a 30 and 50 year service life.

Small Stream Hydrology

The Panel was informed that project design flows for small drainage basins for which few or no stream-flow records are available will

be derived by the Proponent through various empirical methods. Such design flows are needed for proper design of pipeline and access road crossings and stream training works, and for drainage and erosion control structures within the right-of-way, at borrow sites, and other project locations. The Proponent did not present supporting data on the various hydrologic processes (e.g. rainfall intensity, snow melt rates, etc.) and on hydrologic basin parameters necessary for the application of the Proponent's proposed methods.

Information is also lacking on the potential occurrence of project-induced icings which, by plugging culverts and blocking stream channels, could significantly increase risks from erosion and siltation at relatively low flows. This problem could become acute where an embankment mode of pipeline construction is employed and culverts are used at stream crossings. Culvert blockage by icing could cause ponding and ice build-up which could lead to failure of the granular embankment.

The Panel requires information on the determination of design flows for small drainage basins and for right-of-way drainage, where runoff data are inadequate. This should include the type of data needed, and data gaps and plans for collecting the required data. Special attention should be given to the effect of stream icings in the design of small stream crossings.

Streams on Alluvial Fans; Mud Flows and Debris Torrents

The Panel was advised of potential pipeline-integrity problems that may be caused by high-energy streams on alluvial fans. The Proponent has not indicated how he would deal with shifting stream channels (avulsions), debris torrents and mud flows and channel degradation that may occur from time to time on high-energy streams on alluvial fans.

The Proponent has failed to indicate how the interactions between the Alaska Highway and the pipeline are to be managed, in situations where the present stream channel position is tenuous due to past channel maintenance by Alaska Highway maintenance staff.

The Panel requires information on the incidence of avulsions, mud flows, debris torrents and channel degradation on alluvial fans, on the design measures to be employed to prevent adverse effects on pipeline integrity, on the co-ordination of the Proponent's work with the Yukon Department of Highways and Public Works, and on the environmental impact to be expected from such measures.

Risk of Flooding Resulting From Glacier-Dammed Lakes

The Panel was advised that the Proponent is aware of the problem of glacial-dammed lakes. Project designs for river crossings do take into account outburst-flood peak-flow estimates but not the potential

effects of changes in highway-crossing designs by the Department of Public Works for streams that may be so affected.

The Panel requires up-dated river-crossing designs taking into account both out-burst peak-flow estimates and potential changes in Alaska Highway crossing designs.

Water Crossing Designs

The Panel was advised that the Proponent has not provided the required detailed quantitative data that would allow a full assessment of the adequacy of water crossing designs for a chilled pipe and a warm pipe in frozen ground, in unfrozen ground and across transitions between frozen and unfrozen ground. In particular, information is required on subsurface water flows (gradients, levels or pressures, and temperatures) encountered at stream crossings, which could affect trenching operations and slope stability and which could interact with frost-bulb formation and lead to project-induced icings.

The Panel requires the following information:

- 1. Detailed design of special problem areas at river and lake crossings and approaches, for which special crossing crews would be employed; each such design should be supported by detailed quantitative geo-technical, hydrologic, meteorologic and other relevant technical data.*

2. *Typical designs for stream and lake crossings for which mainline crews would be employed; for each such typical design, detailed quantitative geotechnical, hydrologic, meteorologic, and other relevant technical data should be provided for a representative crossing at which the design would be employed.*
3. *Channel scour estimates for detailed design and typical design for water crossings including analysis of safety margins, discussion on data gaps and knowledge deficiencies, identification of crossings especially susceptible to scouring, and evidence of co-ordination between the pipeline and the Shakkwak project in the design of close parallel crossings.*

Evaluation of scour estimates reliability, pipeline safety in relation to scour and environmental consequences of construction and repairs at the water crossings. This information should include a description of the necessary field and/or lab work to be implemented before starting the final design of crossings.

4. *In particular, information is required on the locations, origin, and magnitude of natural icing within the proposed pipeline right-of-way and information on subsurface water flows (gradients, levels or pressures, temperatures and quality) encountered at stream crossings, which could affect trenching operations and slope stability and which could interact with frost-bulb formation and lead to project-induced icings.*

Disruption of Ground Water Flow by a Chilled Pipeline

The Panel was advised that the development of a frost-bulb around a chilled pipeline may form a partial or complete barrier to the movement of subsurface water. This can result in ponding of water and possible development of thermokarst in ice-rich soils up-slope from the pipeline and possible formation of project-induced icings. Where the icings occur in streams, water may be stored which would normally keep downstream areas ice-free and this could have an adverse effect on fish-overwintering success.

The Panel requires data on groundwater flow and temperatures needed for the prediction of the potential occurrence of project-induced icings. These data should include information on upward movement of groundwater and on the potential for significant pressure build-up, as well as on the effects of insulation of the pipeline.

Information is required on plans to identify locations where potential icings could occur, to describe the expected magnitude of induced icings, and to propose mitigation measures to minimize or remove harmful environmental impacts to fisheries and hazards to pipeline integrity.

Revegetation and Erosion Control

The 1977 Interim Report recognized the importance of controlling surface erosion on the right-of-way, access roads and other disturbed

areas associated with the gas pipeline project and stated that "a complete plan for revegetation is required". This requirement to control erosion on the right-of-way through the effective use of vegetation was further described in the Guidelines for the Preparation of an Environmental Impact Statement issued in December, 1977.

At the Yukon Public Hearings, the Panel was advised that the EIS lacked specific information on such a revegetation plan although a satisfactory plan outline was provided by the Proponent.

The Panel requires a comprehensive revegetation and erosion control plan. This plan should include the results of the Proponent's revegetation research program, a description of the revegetation management program to be undertaken (including the long term requirement for vegetation management and control on the right-of-way), identification of problem areas and special revegetation methods to be used, and a description of the potential effects of forest fires on the long-term success of the revegetation program.

Related Structures and Activities

Access Roads

The Proponent has not provided an adequate level of information on permanent and temporary access roads to facility and construction sites and has not addressed the potential impacts and mitigative measures. It was noted in the 1977 Interim Report, "if improperly

located, these access roads could have negative environmental impacts on sensitive or unique terrain, wildlife populations and their habitat, as well as on water courses and fish habitat. Such roads could also provide public access to wilderness areas thus increasing pressures on fish and wildlife".

The Panel requires information on the location and standards and scheduling of temporary and permanent access roads including culvert designs and installation plans, methods of road construction and plans for abandonment for the following four sections where there is a major deviation from the Alaska Highway: the east shore of Kluane Lake, Ibex Pass and alternatives, the Mount Michie-Squanga Lake section, and the Rancheria River section. In addition the predicted potential environmental impacts of access road construction, operation and abandonment are required together with details on mitigative measures proposed to minimize these impacts.

Should the use of snow roads be contemplated for winter construction spreads, then the methods of snow road construction and their impacts should be evaluated.

Granular Materials

The Panel was advised that the possibility of competition for granular materials exists between the pipeline project and the Shakhwak highway improvement project, with Alaska Highway maintenance programs, and with other future industrial/community requirements. Also, in the

western portion of the project, potential supplies of granular material are located on the flood plains and in the channel zones of large rivers. The total granular material requirement is dependent in large part on the mode of construction, especially in areas of permafrost and discontinuous permafrost.

The Panel requires information on total volumes of granular materials to be used as well as typical plans for location, operation and rehabilitation of granular extraction sites, including a channel zone and a flood plain for one of the White, Donjek or Duke Rivers.

Compressor Stations, Construction Camps, Material Storage Areas and Cement Fabrication Plants

The Panel was informed of information gaps and deficiencies in the rationale for site selection for ancillary facilities. In addition, information is lacking on the methods of operation of compressor stations, including venting of gas, prospects of ice-fog formation, and impacts on recreation areas. A more definite plan is also required for the location of construction camps, material storage areas and cement fabrication plants.

The Panel requires information on the criteria and methodology, predicted impacts and mitigation measures considered in the siting of compressor stations, construction camps, material storage areas and cement fabrication plants.

BIOLOGICAL CONCERNS

Fisheries

The Panel was advised that the pipeline route crosses over 200 water bodies in Yukon, approximately 60 of which show potential to support fish populations. The siltation which will result from pipeline construction across these streams and lakes could degrade numerous fish spawning and nursery areas.

Though a considerable number of potential conflicts between the proposed construction schedule and fish spawning were noted in the EIS, changes in scheduling were proposed for only five stream crossings. In addition, the EIS provided no details of measures to protect stream banks from erosion and to minimize sediment input to water bodies.

Since 1977, the Proponent has carried out year-round investigations on fish utilization of water bodies along the pipeline route. These investigations appear, for the most part, to have provided an adequate base of biological information for developing impact mitigation plans. Exceptions noted by the Panel include sections of the route where the alignment has recently been changed, i.e., the Kluane Lake alternative route and a section along the Rancheria River.

The Proponent's current construction plan has potential for significant impact on Yukon fish populations in the vicinity of the pipeline. The absence of a detailed construction schedule makes it

impossible to determine the extent of impact on fish habitat in the vicinity of the pipeline. Project design has also not progressed to the stage where the Proponent can present satisfactory plans for controlling erosion and siltation at water crossings.

The Panel requires the following additional information:

A detailed construction schedule in text and chart form for a typical summer spread and a winter spread along the route, including a description of the progression of pipelining steps and mitigation measures to protect fisheries. This should include assessments of site-specific impacts on fish species and impact mitigation plans based on the schedule.

An assessment of potential impacts on fish populations due to changes in proposed pipeline routing, including Kluane Lake and the section along the Rancheria River.

Detailed examples of measures which will be taken to prevent erosion of stream banks and approaches to streams, including a representative cross-section of sites along the proposed route.

Plans for inspection and monitoring of erosion and pipeline integrity at water crossings during the operational phase.

Details of pipeline construction methods to be employed in stream crossings, and measures which will be taken to minimize sedimentation. Data on stream discharge and stream bed and sub-bed materials at crossings should be provided to show whether or not the volumes of suspended material, derived from the excavated sub-bed materials, would be significant and whether the proximity of crossings to important fish habitat presents significant problems.

The Panel was informed that culverts will be used on permanent and temporary access roads, as well as along the pipeline right-of-way, especially if the embankment mode is employed. Improper design and/or installation of a culvert could block upstream fish migration, and also lead to washouts and consequent siltation of streams. Though the possible effect of improper culvert installation on the fishery resource is acknowledged in the EIS, no details are provided to indicate how the impacts will be avoided.

The Panel requires typical culvert designs to accommodate fish passage and measures taken to prevent accelerated erosion, including specifications for culvert installation.

The Panel is concerned that the anticipated major influx of people to the Yukon during pipeline construction could result in over-exploitation of certain fish stocks, particularly along the Alaska Highway. The fish stocks involved could take one or two generations to recover, possibly affecting native food fisheries as well as commercial and recreational fisheries. Such over-exploitation of fish

stocks was discussed in the EIS. It was concluded by the Proponent that the increase in fishing pressure during pipeline construction would generally not cause excessive exploitation rates. However, no site-specific assessments of the problem were developed, and the EIS neither discussed nor proposed methods of minimizing the impact on the fish stocks concerned.

The Proponent has taken the position that an assessment, as well as any fishery restrictions required, is the responsibility of a government resource agency. The Panel holds the view that although a resource agency is empowered to impose fishing restrictions, the Proponent has a responsibility in this case to assess the problem, identify the mitigative measures required, and assist the resource agency in their implementation.

The Panel requires the following additional information to complete its review:

A site-by-site assessment of the potential for over-exploitation of fish stocks during pipeline construction, and the measures which would be required to achieve adequate protection. In addition, details of actions the Proponent will undertake to assist the responsible government resource agency in the protection of these resources are required.

Wildlife

A number of unresolved wildlife issues from the 1977 hearings were raised again at the Yukon Public Hearings and certain additional concerns were brought forward by interveners. Foremost is the fact that the incomplete data on wildlife and lack of information on the project precludes the assessment of impact and the development of detailed mitigative measures. Incomplete studies include several important wildlife issues: the Burwash caribou herd, Ibex Valley Dall's sheep, Mt. Mitchie-Squanga Lake caribou herd, moose winter range, access to new areas, over-exploitation and disturbance to wildlife. In addition, intervenors at the hearing identified additional study requirements for raptorial birds and other species such as sharptail grouse, grizzly bears and wolves.

The Panel requires the following additional information:

Maps of all critical wildlife habitat or ranges with an analysis providing details of construction scheduling and alignment and mitigative measures to reduce predicted impacts.

A detailed construction schedule for a typical summer spread and a winter spread along the route, with a description of the progression of pipelining steps and mitigation measures for wildlife in text and chart form, and assessments of site-specific impacts on important wildlife species and impact mitigation plans based on the schedule.

Measures to minimize wildlife disturbance resulting from aircraft use, blasting and other noise sources.

The implications of new access on wildlife, particularly where there are major diversions of the pipeline from the Alaska Highway.

ROUTE ALTERNATIVES

Route alternatives have been proposed at the Pickhandle Lake area, Kluane Lake area, Ibex Pass, Mt. Michie-Squanga Lake and the Rancheria River Valley.

In the case of the alignment near Pickhandle Lake, the Panel agrees that the Proponent's preferred routing immediately upslope (northeast) of the Alaska Highway is preferable to possible alternatives. This is provided that construction activities (particularly blasting) are limited to periods when the Pickhandle Lake complex is not utilized by waterfowl, and that these activities are executed in such a way as to minimize effects on raptors, muskrat and moose in the area.

In addition, adequate separation should be maintained from the proposed realignment of the Alaska Highway (Shakwak Project) so that integrity of the pipe will not be endangered by highway construction.

For the remaining four areas, data provided by the Proponent in the EIS are inadequate to allow the Panel to examine the recommended environmentally preferable routing, or to review the mitigation measures for the recommended routing.

Kluane Lake Area

The Proponent's preferred routing across Kluane Lake avoids serious environmental, engineering and aesthetic problems associated with the

alternative alignment close to the Alaska Highway in the vicinity of Sheep Mountain and Slims River Delta. However, the necessity for a major underwater crossing and intrusion into an area at some distance from the Alaska Highway introduces new concerns. Deleterious effects on fish populations may result from a major leak in the underwater section, particularly during periods of thick ice cover. The Proponent's geotechnical investigations indicate past slumping of soft bottom sediments. If potential exists for further slumping, it may be necessary to bury a significant length of the pipe in the lake bottom, again with possible effects on fish populations. Finally, the southeast side of Kluane Lake is an area of known archaeological significance, and in addition is utilized by natives for hunting, trapping and fishing.

The Panel requires the following information:

An evaluation of environmental impacts and proposed mitigation measures for the area extending from the east end of the Kluane Lake underwater crossing to where the alignment rejoins the Alaska Highway (approx. KP 225 to 250).

A comprehensive statement on the probable extent of burial of the underwater section, the procedures necessary for burial of the pipe, and an analysis of probable effects of the burial procedure, including such factors as turbidity, siltation of spawning areas, physical interference with fish movements, and the probable duration and/or area of extent of such effects.

An analysis of the effects of a major gas leak on aquatic biota of Kluane Lake under worst-case conditions.

Ibex Pass Area

During the 1977 and 1979 hearings, concern was expressed for the Dall's sheep and raptor populations in Ibex Pass, and for aesthetic and recreational land use values of the area. The Proponent has identified a number of possible alternatives that were given preliminary evaluation. One route which follows the Alaska Highway, crossing the Yukon River 4 km upstream of the mouth of the Takhini River, and passing north and east of Whitehorse, was examined in greater depth, but found by the Proponent to be less favourable than the Ibex Pass Route on the basis of combined environmental, socio-economic and engineering factors. The Panel seeks further justification for the rejection of this alternative. A high degree of concern was expressed by intervenors in the 1977 and 1979 hearings with respect to alternatives to the Ibex Pass Route. The Panel was advised that all possible alternatives have not been assessed.

The Panel requires that detailed maps at scales of 1:50,000 or 1:100,000 and a report should be prepared by the Proponent showing all the factors likely to bear on route selection. The maps and reports should be used as a basis for a comprehensive description and comparison of the preferred route and potential alternatives, and the probable impact of pipeline construction along those routes. Factors to be considered should

include impact on wildlife populations and their habitat, potential for terrain degradation, visual impact and effect on recreational values.

The maps should show:

- 1) Delineation of the terrain units (determined by air-photo interpretation with such field checking as may be required).*
- 2) Wildlife habitat, in the context of raptors, grizzly bears and Dall's sheep wintering, lambing and rutting range, and mineral licks.*
- 3) The preferred route and other potential routes that are feasible from an engineering standpoint. Such routes should be refined to the degree possible on the basis of terrain mapping suggested in 1) and any environmental, land use or other constraints known to the Proponent.*
- 4) Existing access roads and trails; access roads that would be required for the preferred route and alternatives, including realignment or upgrading of existing roads and trails.*
- 5) Dams, ditches, pipelines and other structures associated with the Yukon Electrical Company development in the Fish Lake-Jackson Lakes-Porter Creek area.*

- 6) *Open pits, tailings disposal sites, mill sites, water supply and sewage disposal facilities and other structures and facilities of Whitehorse Copper mines, particularly where these impose constraints on route selection.*
- 7) *Land ownership and land use where relevant to the preferred and alternate routes.*
- 8) *Recreational use areas, whether officially designated or not.*

Mt. Michie-Squanga Lake Area

Objections to the originally filed Mt. Michie-Squanga Lake route have centred on potential impact on woodland caribou, on a unique race of whitefish, and on raptors that nest near Squanga Lake, together with a general objection to departure from the route of the Alaska Highway. The Proponent's revision of the routing from northeast of to southwest of Squanga Lake has removed concern for the spawning site of the unique whitefish.

Foothills Pipe Lines (Yukon) Limited filed an application in April, 1979, for an oil pipeline that would extend from Skagway, Alaska to Jakes Corner in Yukon and thence eastward following the Alaska Highway to Watson Lake. The implications of having separate pipeline routings in this area raise a new issue.

The Panel requires a comprehensive description and comparison of the preferred route and potential alternatives, together with the implications of building and operating the oil pipeline nearby. Factors to be considered should include impacts on wildlife populations and habitat, potential for terrain degradation, visual impact, and effect on recreational values.

Rancheria Valley

The Alaska Highway lies north of Rancheria River from approximately KP 705 to KP 758 of the pipeline route. As originally filed, the pipeline route lay south of Rancheria River between KP 705 to KP 725. In a recent revision, the Proponent has proposed keeping the route south of the river for an additional 33 km. No rationale has been offered for routing south of rather than north of the river.

In order for the Panel to review the route revision, the following information is required:

The rationale for location of the route south of Rancheria River.

A detailed comparison of terrain conditions on respective sides of the valley, including such factors as prevalence of permafrost, location and extent of intervals of side slopes requiring benching for construction of the pipeline; location and extent of intervals with near-surface bedrock requiring blasting for benching and/or ditching; susceptibility of the terrain to erosion and consequent stream siltation.

The location of access roads and bridges across Rancheria River and its tributaries (if required by construction plans); if bridges are required, enough information on size and manner of installation to permit assessment of possible impact of bridge construction on aquatic biota.

Evaluations and comparison of fisheries values in tributaries crossed by routes on the respective sides of the valley.

A comparison of other environmental factors on the respective sides of the valley, particularly for wildlife impacts and prevalence of raptors, furbearers, moose and caribou ranges, etc.

A comparison of visual impact of location on the respective sides of the valley.

ALTERNATIVE MODES

The Panel was informed that a buried pipeline was the Proponent's preferred mode but that the embankment mode and the placement of the pipeline on piles were the subject of ongoing studies. Such alternative construction modes are being considered where frost heave and thaw settlement problems associated with the buried pipeline have not been resolved. Information was not brought forward at the hearings on the engineering design, scheduling, potential environmental impacts and mitigation measures for the alternative modes.

The Panel requires information on alternative modes of installing the pipeline along the proposed route including the embankment mode and the placement of the pipeline on piles. This information should include details of engineering design, location, materials required, as well as details on potential environmental impacts and appropriate mitigation measures.

SCHEDULING ALTERNATIVES

The Panel was informed that the scheduling of pipeline construction activities is one of the most important aspects of environmental impact mitigation. The information in the EIS has not illustrated the rationale for decisions on summer and winter spreads and their length. Information on environmental impact analysis of major scheduling alternatives was not supplied.

The Panel requires (in addition to those points raised in the Fisheries and Wildlife sections above) an environmental impact analysis of scheduling alternatives including the rationale used in deciding the construction seasons for spreads, as well as the length of the spreads. This analysis should synthesize and accommodate all the environmental concerns to the maximum extent possible. In areas where conflicts exist the analysis should specify the approaches to be taken to resolve conflicts and to minimize the overall environmental impacts.

OTHER ISSUES

Aesthetics

Despite the Panel's recommendations in the 1977 Interim Report referring to the need for a systematic assessment of probable aesthetic impact and a comprehensive approach to the mitigation of such impact, the EIS and the Public Hearings did not provide much more information on this matter.

The Panel requires a systematic assessment of probable aesthetic impacts and a comprehensive approach to mitigation of such impacts. Such an assessment should include not only visual aspects but also noise, odour, construction and operations activity, and air quality. The potential for impact from the following features of the project should also be assessed:

<i>berm mode of construction</i>	<i>borrow pits</i>
<i>sidehill cuts or benching</i>	<i>access roads</i>
<i>gravel crushing and washing</i>	<i>material storage sites</i>
<i>cement plant operations</i>	<i>scheduling of activities</i>

Associated Projects

The EIS did not consider the relationship of the Alaska Highway Gas Pipeline project to other existing or planned projects, including those not controlled by the Proponent. In particular the relationships of the proposal to a Dempster Lateral Pipeline, the proposed Foothills oil pipeline, Northern Canada Power Commission power projects, including transmission facilities, the Shakwak Project and the Alaska Highway reconstruction program were not adequately evaluated.

Where there are interactions between the gas pipeline and such projects as the Dempster Lateral Pipeline, the proposed Foothills oil pipeline, Northern Canada Power Commission power projects, including transmission facilities, the Shakwak Project and Alaska Highway reconstruction, the Panel requires a discussion of potential impacts with particular emphasis on cumulative environmental impacts and suitable mitigation measures.

Recreational Land Use

Most of the campgrounds along the Alaska Highway are located immediately adjacent to the highway, and would suffer from increased noise and dust levels due to increased highway traffic associated with pipeline construction. The pipeline as presently aligned passes in close proximity to several campgrounds. Furthermore, the capacity of existing campgrounds could be severely overtaxed if pipeline construction increased demand for camping facilities. This escalation in the use of existing facilities could result in degradation or even destruction of recreational values.

The Panel requires that the Proponent provide a plan to minimize negative impacts on existing or proposed campgrounds.

Noise

The Panel was informed that several types of noise impacts can be expected to occur in the course of project construction and operation. Because of the relatively undeveloped nature of the project route and the wilderness values held by Yukoners and tourists to the area, the potential for noise impacts needs to be more rigorously examined.

Concerns raised during the hearings were:

1. the lack of a systematic analysis of noise impact including the propagation of noise over long distances under favorable atmospheric conditions;
2. the lack of data on current noise levels upon which to base the project noise impact;
3. the mitigation of construction noise, and of compressor station noise, especially during blowdown procedures, even though the necessity for such procedures is small;
4. Muffling of noise at compressor stations, particularly where human habitation or wildlife habitat would be adversely affected by compressor operations or blowdown noise.

The Panel requires:

1. *A systematic analysis of noise impact, using "Guidelines for Preparing an EIS on Noise" published by the U.S. National Research Council, and using suitable criteria for the southern Yukon setting*

to give a clearer picture of the predicted impact of noise from the pipeline on humans and on wildlife.

- 2. Results of sampling of ambient sound levels at proposed compressor stations. Surveys were conducted by the proponent in early 1979. These surveys seem to be adequate to yield this information.*
- 3. A plan to mitigate predicted noise impacts from various project sources such as construction machinery, aircraft, blasting, and road transport.*
- 4. A plan for the mitigation of compressor operation noise and blowdown noise, taking into account the expressed need for noise reduction near human habitation and sensitive wildlife locations. The plan should also take into account revised information on noise propagation by the atmosphere, which was tabled at the hearings.*

Water Use, Waste Water Treatment and Disposal

The Panel was informed that the EIS lacks information on water use for hydrostatic testing and at mainline construction camps, camps at special river crossings, and at compressor station sites. This includes data on sources, quantities, discharge rates and the location of disposal sites.

The Panel lacks specific information on the plans for water use and disposal including potential environmental impacts and mitigation measures.

The Panel requires selection criteria for locating water supply facilities and waste water treatment and disposal installations. Water quantities and treatment levels should also be detailed for representative water-consuming facilities such as construction camps and for hydrostatic pipe testing. In addition potential environmental impacts and mitigation measures should be described.

**Solid Waste Management, Toxic and Hazardous Materials,
Fuels and Contingency Planning**

The Panel was informed of the following concerns during the Yukon Public Hearings:

There is a lack of adequate data on types and quantities of domestic and industrial solid waste, including machinery and ferrous scrap, which will be generated by the project.

The Panel requires information on types and quantities of solid wastes for the Project and a typical plan for the management of such wastes, including the gathering, transportation and methods of disposal.

Information is required on the type, quantity and form of toxic and hazardous materials and fuels to be used in the construction and

operation of the project. In addition a management plan is required for the safe use, storage, transportation and disposal of such materials.

The Panel requires a plan for the management of toxic and hazardous materials and fuels. Such a plan would include details on dykes, berms, records and logs, metering systems, distribution systems and disposal techniques.

The Panel was informed that contingency plans have not been developed for spills of hazardous or contaminating materials, fires, explosions and other environmental emergencies.

The Panel requires a contingency plan for spills of hazardous or contaminating materials, fires, explosions and other environmental emergencies.

V. CONCLUSIONS AND RECOMMENDATIONS

Much useful information was presented in the Environmental Impact Statement and at the Yukon Public Hearings. However many unresolved issues on the environmental assessment of this project remain. The Panel has therefore concluded that it is not possible to complete an environmental impact assessment review at the present time.


The Panel has concluded that information requirements outlined in this report, in the 1977 Interim Report and in the guidelines, should be provided in a revised Environmental Impact Statement to be prepared by the Proponent. This will permit the Panel to complete the environmental review of outstanding issues associated with this project, with the important exception of problems associated with a buried gas pipeline passing through areas containing permafrost. With regard to this last item, the Panel has requested that the Proponent prepare a detailed plan of study of the frost heave and thaw settlement problem, and that this plan be submitted to the Panel well before the technical hearings are reconvened. This plan should detail the Proponent's study program by which the problems of frost heave and thaw settlement are to be solved. Emphasis is to be given to pipeline mode alternatives which may be used and the

potential impacts associated with these alternatives. The Panel has concluded that solutions to these problems will require very substantial research and development initiatives and programs, which will require collaboration between industry, government and specialists in cold regions research and engineering.

The Panel further recommends that the technical hearings be reconvened after the revised Environmental Impact Statement is reviewed. Following the hearings, the Panel will complete its review and prepare a report for the Minister of the Environment.

Environmental Assessment Panel

Alaska Highway Gas Pipeline Project



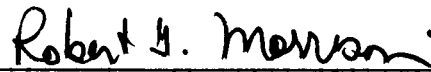
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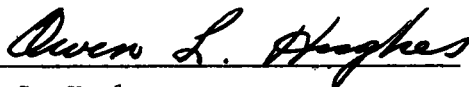
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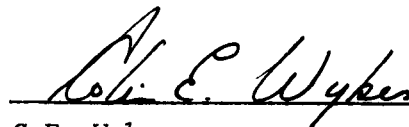
L.B. Chambers



R.G. Morrison



O.L. Hughes



C.E. Wykes

APPENDIX I

TECHNICAL HEARINGS AGENDA

YUKON PUBLIC HEARINGS PANEL

AGENDA FOR WEEK OF APRIL 23, 1979, WHITEHORSE, YUKON

4th Avenue Residence, Recreation Room,

4051 - 4th Avenue, Whitehorse, Phone: 667-4471

MONDAY, APRIL 23, 1979

1400 - 1700 hours Opening session - Introductory briefs from
agencies, groups and individuals.

1930 - 2200 hours Socio-economic terms and conditions.
Environmental terms and conditions.

TUESDAY, APRIL 24, 1979

0900 - 1200 hours Geotechnical issues, including seismicity.

1400 - 1700 hours Geotechnical issues.

1930 - 2200 hours Socio-economic terms and conditions.
Environmental terms and conditions.

WEDNESDAY, APRIL 25, 1979

0900 - 1200 hours Alignment alternatives and access road issues.

1400 - 1700 hours Alignment alternatives and access road issues.

1930 - 2200 hours Hydrology. Stream and water crossing issues.

THURSDAY, APRIL 26, 1979

0900 - 1200 hours Hydrology, Fisheries and aquatic biology issues.

1400 - 1700 hours Fisheries and aquatic biology issues.
Wildlife issues.

1930 - 2200 hours Socio-economic terms and conditions.
Environmental terms and conditions.

FRIDAY, APRIL 27, 1979

0900 - 1200 hours Revegetation and erosion control.
 Land use.

1400 - 1700 hours Noise impacts.

SATURDAY, APRIL 28, 1979

0900 - 1200 hours Noise impacts.
 Borrow material.
 Aesthetics.
 Campgrounds and Recreation.
 Waste management.

1330 - 1600 hours Contingency planning.
 Other issues.
 Closing statements.

Acknowledgements

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Shirley Thorvaldson	Secretarial Support
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Peter Williams	"
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Peter Johnston	"
William Bowes	"
Michael Smith	"
Vladimir Schilder	"
Robert Van Everdingen	"
Rolf Kellerhals	"
Brent Lister	"
Ronald Jakimchuk	"
Joseph Piercy	"
J.G. Moore and Associates	Transcripts of Hearings