

rec'd. 08/16/79

*Howard*



# United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

JUN 13 1979

Mr. Edwin Kuhn  
Director, Government and  
Environmental Affairs  
Northwest Alaskan Pipeline Company  
1801 K Street, N. W.  
Washington, D. C. 20006

Dear Mr. Kuhn:

On December 18, 1978, you requested that the Department grant provisional approval of your proposed alignment for the Alaska gas pipeline authorized by the Alaska Natural Gas Transportation Act of 1976. Because no process exists for granting provisional approval, I established a technical review process intended to "expedite as firm and complete a statement as possible regarding the proposed alignment" as outlined in my letter to you of March 20, 1979. Your letter of April 30, 1979, which was part of the information exchange in the technical review, further clarified both the needs of your company and the nature of your request. This letter is intended to respond to your earlier letters, and carry out the terms of my March 20 response to you.

Since the March 20 letter, the Department, in cooperation with the State of Alaska, assembled a technical working group with pipeline experience in Alaska arctic and subarctic regions. This working group reviewed and evaluated the material supplied by Northwest Alaskan Pipeline Company (NAPLINE), including the material furnished subsequent to March 23, and by the owners of the Trans-Alaska Pipeline System (TAPS). Meetings and consultations involving your company, the TAPS owners, the State, and the Department were held to increase understanding of the proposed route and the supporting technical information. The working group chairman's report memorandum is included as Enclosure A.

These joint efforts were useful and productive, although the working group was seriously limited by the lack of technical information in many specific areas. As a result, a number of important working group assumptions and conclusions (Enclosure B) were made before the Department could provide this statement on the proposed alignment; and the statements which follow must necessarily be qualified by the degree to which those assumptions and conclusions are ultimately validated by additional information and analysis.

1. Subject to the assumptions of the working group, the proposed alignment is regarded as a valid basis for further planning, field work and design. Since the assumptions and conclusions stated in this letter may be modified by additional technical information, it should be brought to the Department's attention promptly.

2. With regard to the proposed route, those specific technical issues which will require resolution prior to a final right-of-way issuance are enumerated in Enclosure C. The technical questions, which must be answered prior to a final decision, can be further detailed through consultation between the Department and NAPLINE, but the expectation is that they will be resolved as further field work and design progress.

3. With regard to all parts of the proposed route except the alternatives specified in Enclosure D, the Department intends to issue a right-of-way in general conformance with that proposed by NAPLINE. The actual issuance will follow the schedule set out herein, assuming the satisfaction of the technical issues set out in point #2, and the conditions set in point #1.

With regard to those excepted areas set out in Enclosure D, the Department believes that the alternatives are superior to the proposed route and requires that these be fully considered by NAPLINE prior to any final right-of-way decision. At this time, the Department is neither mandating the alternatives, nor rejecting the proposed route; however, should NAPLINE reject the suggested alternatives, a thoroughly documented justification for rejecting the alternatives will be necessary before the right-of-way grant can be issued. The documentation will include cost, environmental, and technical comparisons.

4. Several specific points regarding the Department's intended right-of-way follow:

a. Proximity to Trans-Alaska Pipeline System

Where the gas pipeline is routed along the oil pipeline, the minimum separation distance between the two pipeline centerlines shall be 80 feet unless special circumstances dictate otherwise. The 80-foot distance includes a 15-foot safety zone along the line of the pipe and around designated related facilities of the Trans-Alaska Pipeline System.

- b. Where the gas pipeline is routed along the Yukon River to Prudhoe Bay State Highway the minimum separation distance between the gas pipeline centerline and the highway centerline shall be nominally 44 feet. There shall be no above-ground permanent structure or appurtenance within 30 feet of the edge of the highway shoulder.

c. Use of Snow Roads and Snow Pads

The Department will not require the exclusive use of snow roads and snow pads. Nevertheless, for economic, environmental, and scheduling reasons, snow roads and snow pads are reasonable alternatives to gravel roads and pads and shall be used where necessary and practicable.

d. Full-Width Gravel Work Pad

The Department does not agree that gravel work pads adjacent to the gas pipeline are required along the entire route but, where allowed, the use of a full-width gravel work pad is approved.

- e. Nothing in the Department of the Interior's PLO 5653 will change the alignment proposed in your December 18, 1978, letter or the alternatives set out in Enclosure B.

5. The Department's schedule for issuing a final right-of-way grant necessarily depends upon NAPLINE providing the information discussed in this letter and sufficient documentation for the Secretary's findings required by the Mineral Leasing Act of 1920. The Department has initiated preparation of the granting document and will be prepared to issue it no later than 90 days after receipt of sufficient information and documentation acceptable to the Department.

We believe this response fulfills the commitments made in the Department's March 20 letter. Given the need for further technical information and the known fact that changes will be made in the final right-of-way document, in final design and in the field, this represents a complete statement on the general route the Department intends to approve, the assumptions basic to that statement, and the questions and informational requirements that must be addressed before the final grant.

We have one additional concern. The Department continues to regard the liability issue related to joint use of the right-of-way to be of high priority. While these issues are the responsibility of NAPLINE and the TAPS owners, we believe an early resolution is essential.

Finally, it is our intention to continue to provide NAPLINE any assistance or consultation necessary to ensure that our concerns or differences are rapidly defined and resolved. We will also provide the TAPS owners the opportunity to review and comment on the gas pipeline route before final approval.

We look forward to your continued cooperation.

Sincerely,

A handwritten signature in black ink, appearing to read "Guy P. Moet". The signature is fluid and cursive, with a long horizontal stroke at the end.

Assistant Secretary  
Land and Water Resources

Enclosures



# United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

Mr. J. F. McPhail  
Manager, ANGTS Task Force  
Exon Pipeline Company  
P.O. Box 2220  
Houston, Texas 77001

Dear Mr. McPhail:

This is to notify you, pursuant to Section 11C. of the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline System, of the Department's response to the Northwest Alaskan Pipeline Company's requests (December 18, 1978, and April 30, 1979) regarding provisional decisions on their proposed gas pipeline alignment. A detailed response to those requests is attached which sets out the Department's basic assumptions, conclusions and conditions; the remaining issues which must be resolved before a grant of right-of-way will be issued; a statement on the general route the Department intends to act on; and a schedule for issuing the grant of right-of-way given resolution of the technical issues.

Much of the gas pipeline right-of-way route described in the Department's response will be on or adjacent to the lands subject to the Trans-Alaska Pipeline System right-of-way. The final location of the gas pipeline is subject to changes as a result of subsequent technical information, further design and field studies. Any change in location will be reflected in the grant of right-of-way in the final design, and in the as-built drawings. You will be given opportunity to review and comment on the information as it becomes available.

We would draw your attention to those elements of the NAPLINE letter which relate to the need for resolution of liability issues, to the need for expedited decisions on this important energy project, and our willingness to continue working with all parties to resolve remaining differences.

We appreciate the time and effort of the representatives of the Trans-Alaska Pipeline System Owners during the past several weeks as the Department considered NAPLINE's request and are looking forward to continued cooperation in reaching final approval.

Sincerely,

Assistant Secretary  
Land and Water Resources

Enclosure



# United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

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ALASKA PIPELINE OFFICE  
701 C Street Box 30  
ANCHORAGE, ALASKA 99513

JUN 7 1979

## Memorandum

To: Assistant Secretary - Land and Water Resources

From: Chairman, Working Group - ANGTS

Subject: Report and Recommendations on Northwest's Request for Provisional Approval of the Alaska Gas Pipeline Alignment

During April and May 1979, the technical Working Group reviewed Northwest Alaskan Pipeline Company's (NAPLINE) and Trans-Alaska Pipeline System (TAPS) owners' technical information submitted to the Department upon its request. This review was conducted on an individual and group basis, including a week-long meeting in Salt Lake City, Utah, May 14-18, where we had the opportunity to discuss our concerns with technical people from NAPLINE and TAPS. This phase of the Working Group's efforts was concluded in Anchorage during the week of May 21-25. The State of Alaska was represented in all group meetings.

As one would expect, the reaction to the alignment request among the various disciplines was varied. The Working Group evaluated NAPLINE's request for provisional alignment (route) approval from a technical standpoint only (not legal or political). The review was based on NAPLINE's stated design and construction intent, as we understand them. We also considered the TAPS Owners' expressed concerns, as we analyzed NAPLINE's route request from a feasibility standpoint. With the limited technical data available from NAPLINE, this type of evaluation was possible only because of the technical expertise of the Working Group members who are, by and large, experienced in the arctic and on the TAPS line.

While the route was viewed based on NAPLINE's request (sixty to eighty feet from the TAPS pipeline or seventy feet from the highway centerline), we question the technical and environmental desirability of that route selection in many locations. For example:

1. From a geotechnical, erosion control, and revegetation standpoint, it appears to be highly undesirable to bury the gas pipeline adjacent to the oil pipeline or state highway in sloping terrain with thaw-unstable soils.

Should joint use of the TAPS workpad be allowed in these areas, a possible alternative to NAPLINE's construction proposal of conventional burial may be an elevated gas pipeline or stabilized treatment of the buried line.

For example, if the gas line is constructed adjacent to the Yukon to Prudhoe Bay Highway (similar concern on the oil line), possibly the best location technically and environmentally is thirty feet from the highway shoulder (nominal 44 feet centerline highway to centerline of the pipeline, not 70 feet as NAPLINE requests). Preferably, such construction should be done in winter when snowpads can be used both for equipment support and for ditch spoil storage. The disturbance over the ditch should be stabilized with a layer of insulation over the ditch and then an overlayment of gravel which would extend to the highway shoulder. In the areas north of the Brooks Range, we believe that burying a gas pipeline in thaw-unstable soils can be controlled with that design and construction concept. Additionally, traffic could be controlled at these short construction areas (two to five miles) during the construction period as was done during construction of the TAPS fuel gas pipeline and as is done during routine construction or maintenance along existing highway systems. We do not believe that this concept poses a safety problem to either the highway or to the public. In this situation in the arctic, the ground temperatures over the pipe will be less than 32 degrees F. (In other words, frozen ground will protect the pipe from possible upset conditions from the highway). Also, we feel that the economics of this alternative more than outweigh any future expansion or flexibility lost by the State Department of Transportation, including costs to the State (since the State would be the recipient of revenues from gas line operations).

2. Another concern is the risk factor in building an oil pipeline and gas pipeline in close proximity to one another. To our knowledge no risk analysis has been made to date. Without the benefit of such an analysis, no conclusions can be reached, but the initial opinion of the technicians is that construction of the gas line in close proximity to the oil line would probably create a considerable risk.

Route variances identified by the Working Group were for the technical and environmental reasons noted on the mile-by-mile review (Enclosure D), not withstanding the questions/concerns expressed in Enclosure C. The latter concerns must be addressed during preliminary and final design review stages (e.g., buried versus elevated gasline, concerns of slope stability, erosion control, riparian habitat, etc.) when sufficient design information is presented by NAPLINE to justify their design concept, which, while accepted for this exercise, was questioned by all members of the Working Group.

It should be understood that the alternative route suggested by the Working Group for NAPLINE consideration is a suggestion and not a requirement. In other words, as we view the gasline route versus non-proliferation of rights-of-way, utilizing our knowledge of terrain, including judgment concepts used in evaluating TAPS and the highway route, we have provided concepts which NAPLINE may choose or not choose, as it pursues its project design (engineering and biological effects), project funding, and request for right-of-way grant.

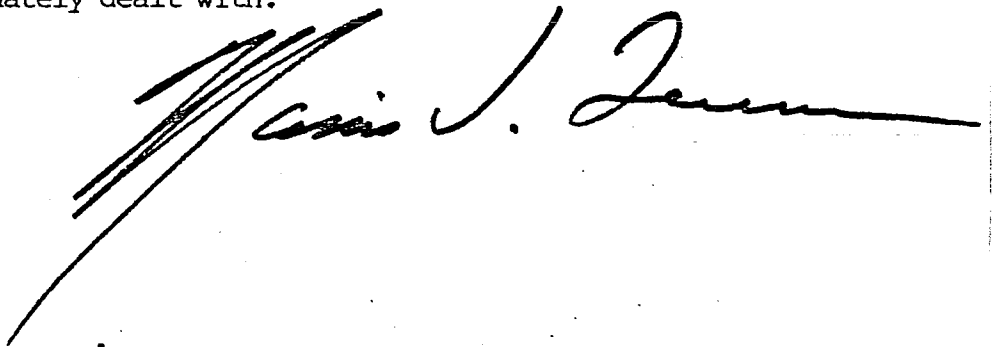
The intent in our evaluation was to be as constructive and helpful as possible. The suggestions for alternative routes are subject to reconsideration and changes, based on preliminary and final design reviews. This route evaluation effort by the Government must be considered as a preliminary effort. If, however, we review NAPLINE's request as was previously done in March 1979, we find that by using their stated assumptions as modified by our assumptions and conclusions (Enclosure B), much of the proposed alignment is compatible with TAPS (see Enclosure D for exceptions). We also believe that construction timing and overall costs would not be affected seriously by the suggested route variances noted.

The most significant concern is the lack of definitive information on how NAPLINE will be able to handle, in a technically and environmentally sound way, the problems associated with building and operating a gas pipeline in thaw-unstable soils in a buried mode, especially on a sloping terrain. We are very concerned with slope stability, mass wasting, thermal-induced and water-induced erosion in these areas, which may occur to the point where the TAPS line integrity may be jeopardized. Additionally, we believe, there are too many crossings of the TAPS pipeline. Each time the TAPS pipeline is crossed, the risk of construction damage is increased and construction costs may also be increased because of the special designs required and the direction of the pipeline lay changes.



Probably the most important aspect of our technical review was the formulation of a series of questions and concerns (Enclosure C) which must be addressed by NAPLINE in the preliminary and final design review stages.

The general conclusion to be drawn from the route evaluation process is that the route proposed by NAPLINE is an appropriate basis for design of the pipeline. It appears that construction of the gas pipeline along much of that route is feasible, at least theoretically, postulated on the assumptions made by NAPLINE and provided that certain conditions are adequately dealt with.

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SUMMARY OF WORKING GROUP ASSUMPTIONS AND CONCLUSIONS

May 24, 1979

ASSUMPTIONS:

1. The Pipeline will be a cold buried line (chilled below 32°F).
2. Outstanding environmental and technical concerns will be resolved prior to construction in accordance with the DOI and State of Alaska R/W Grant requirements and procedures.
3. Stipulations will be complied with, which preclude adverse effects on fish passage and wildlife movement.
4. Environmental and technical standards for the Northwest project will be compatible with the standards for TAPS.

CONCLUSIONS:

1. A nominal 80-foot Centerline (CL) of oil line to CL of gas line spacing is acceptable. A nominal 70-foot CL Highway to CL of gas line is acceptable; however, there shall be no aboveground structure or appurtenance within 30 feet of the highway shoulder. Workpad requirements and construction modes within Enclosure No. 2 to Northwest Alaskan Pipeline Company letter dated April 30, 1979, to Guy R. Martin are acceptable, with the exception that the spacing on the M9 and M10 drawings should be increased to 80 feet and M1 and M2 drawing spacing should be decreased to 44 feet.
2. Joint use of R/W is compatible with a 15-foot safety zone adjacent to all related facilities. No activities will occur within the safety zone.
3. Use of the existing workpad in preference to the haul road may not result in:
  - (a) Lower cost of construction.
  - (b) Increased potential for environmental protection unless construction mode alternative from Northwest's proposal is used.
  - (c) Reduction in commitment of natural resources (land, gravel, energy).

However, a judicious route selection using both the haul road and workpad has advantages and complies with Sec. 28.P. of Mineral Leasing Act.

4. TAPS workpad will require extensive upgrading and widening to support the construction effort.
5. Surface drainage can be accommodated by proper design and location.
6. Winter construction from snow pads is a viable alternative and is expected to be used where desirable from environmental and construction scheduling standpoint.
7. Other than the Yukon River Bridge, the pipeline will not be installed on highway bridges.
8. Traffic can be controlled to use part of the Haul Road traffic surface for construction (e.g., TAPS Fuel Gas Line).
9. Alignment as proposed and those recommended considerations for realignment are within the constraints of the Presidential Decision, Alaska Natural Gas Transportation System, Federal Land Policy Management Act and the Mineral Leasing Act of 1920, as amended.
10. Controlled blasting will not adversely affect TAPS, but there are special cases where additional analysis is required. (For example, proximity to adfreeze VSM's, thawed and different geologic conditions were not considered in the specific study case.)
11. Requirements of 49 CFR 192 have been incorporated into these conclusions and/or assumptions.
12. The Northwest proposal will not adversely affect the Fuel Gas Line.
13. There are several generic site-specific conditions where there are insufficient data to determine compatibility between the gas line and other man-made structures. Minimum separation distances cannot be determined until compatibility is resolved. In these cases, the applicant must demonstrate their proposal is compatible. For example, the closer the gas pipeline is to the highway (minimum 44' separation centerline highway to centerline gas pipeline) the better environmentally and technically.

## WORKING GROUP QUESTIONS/CONCERNS

May 24, 1979

After reviewing the information available to the Department to date, certain questions and concerns have been raised with respect to compatibility of the gas pipeline with the oil pipeline. These will need to be addressed during the preliminary and final design review stages before a final decision on the compatibility of the two pipelines can be made. The questions/concerns are as follows:

1. Frost heave design must be studied to permit timely resolution of this design feature. Although steps have been taken in the area of frost heave, there was little in the way of definitive information available for review by the Department as it considered the alignment question.
2. Solutions for ground water problems such as thaw plug stability, liquefaction, freezebulb as it affects aquifers and other erosion problems must be provided.
3. The geotechnical issues include the potential alteration of the thermal conditions of the TAPS work pad, the haul road and the fuel gas line during the construction and operation of the proposed chilled gas pipeline. Of particular concern was the thawing during the dormant period after burying a large diameter pipe in the ice-rich permafrost which TAPS avoided by using an elevated mode. The sensitivity of the TAPS workpad and haul road, when aggravated by additional adjacent construction, will require a detailed mile by mile analysis to avoid damage from liquefaction, thaw plug instability and erosion.
4. Northwest must determine what effect, if any, blasting will have on the oil pipeline with respect to short-term and long-term stability of the TAPS fully restrained pipeline, the adfreeze strength of the VSMS supports, and blast effects in conglomerate materials.
5. Northwest needs to provide a risk analysis concerning the impacts of the gas pipeline on the oil pipeline (and vice versa) with respect to construction activities and pipeline explosions. Northwest should consider using the Alberta blast tests to evaluate burial depth and separation distance, since damage to the oil pipeline in the event of a explosion of the gas pipeline will likely be from a direct hit of flying debris.
6. The chilled gas pipeline with its surrounding frost bulb, in certain conditions, is subject to potential rupture from seismic shaking, faulting and seismically induced ground

Enclosure D

Mile-by-Mile route statement

motion and seismically induced ground failure such as liquefaction and slope failure. The design criteria should locate and analyze active faults and should include appropriate values for ground motion and duration of seismic shaking of such earthquakes.

7. The elevated TAPS pipeline is used in areas of fine-grained soils that are known to be excessively ice rich and contain large masses of ground ice. Alyeska has avoided ditching in these areas by their use of the elevated pipeline. Therefore, no factual data exists as to the stability of these materials in relation to trenching. In those areas of ice rich overburden in which the TAPS line was buried in underlying thaw stable sediments, the ditch walls in the overburden were so unstable that many delays and extra costs were incurred during construction. These same sensitive buried areas have required considerable maintenance since construction. (e.g., miles 10-14 along the TAPS alignment.)

Longitudinal thaw ponds have formed along the outer margin of some sections of the TAPS workpad, particularly north of the Brooks Range. It is in just this area that Northwest plans to extend the TAPS workpad and to construct their ditch. The excess water from such ponds will affect the constructability and trafficability of the new workpad, compound the problem of water in the trench, accelerate thawing of permafrost in the Northwest ditch during and after construction, create more ground settlement in the first four years, and will result in more intensive frost action during freeze back around the chilled gas line.

8. The gas pipeline alignment should be reviewed to minimize TAPS and Yukon-River-to-Prudhoe Bay Highway crossings.
9. River crossings are site-specific considerations which must be reviewed individually through the preliminary and final design review process.
10. NAPLINE must demonstrate how they intend to mitigate impacts to fish and wildlife habitats; for example, riparian and wet and moist tundra (wetlands).
11. NAPLINE must demonstrate how they intend to mitigate impacts to fish and wildlife populations; for example, construction timing which avoids impacts to sensitive fish streams.
12. NAPLINE must demonstrate that erosion control and vegetation practices are integral parts of the pipeline and that the ones proposed are the best state of the art.

ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
24 - 62	<p>Consider relocation to Haul Road Preferred location on downslope side of roadway</p> <p>Recommended winter construction where feasible</p>	<p>(1) Avoids 10 crossings of Ghost Creek</p> <p>(2) Avoids 14 crossings of Extension-Wood Creek complex</p> <p>(3) Avoids crossing Short Creek at confluence with a Sagavanirktok River side channel</p> <p>(4) Avoids 4 crossings of Sagavanirktok River side channels</p> <p>(5) Avoids crossing 18 spur dikes</p> <p>(6) Avoids approximately 6 miles of active floodplain of the Sagavanirktok River</p> <p>(7) Avoids riparian habitat and wet and moist tundra (wetlands)</p>	<p>(1) Avoids construction through 18 river training structures</p> <p>(2) Avoids deep burial and flotation control problems associated with location in the Sagavanirktok River floodplain</p> <p>(3) Minimizes potential hazards of freeze bulb interference with natural aquifers</p> <p>(4) Allows for scheduling of continuous con- struction spread assembly-line techniques for approximately 50 miles</p> <p>(5) Minimizes problem of thermal interaction with hot oil line and cold gas line</p> <p>(6) Minimizes problem of water migration along pipe</p> <p>(7) Minimizes channelization and drainage concerns</p>
<p>1/ A total of 173.5 miles of alternative routes are recommended</p> <p>2/ These concerns do not acknowledge land ownership. For example, approximately 100 miles are on State lands.</p> <p>3/ Term "consider relocating to Haul Road" means approximately 30' from shoulder. With stabilization over distur- areas, otherwise other alternative routes may not be preferable.</p> <p>4/ Suggestion to consider relocating to Haul road mile post 24-62 and 74-81.5 provides for haul road alternate including Northwest stated use of Haul road continually from mile post 24 thru 81.5.</p> <p>" would also minimize proliferation of Right-of-Way.</p>			

ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
74 - 81.5	Consider relocation to Haul Road (see comments for MP 24 - 62)	<ul style="list-style-type: none"> <li>(1) Avoids 6 crossings of Sagavanirktok River side channels</li> <li>(2) Avoids riparian habitat and wet and moist tundra (wetlands)</li> </ul>	<ul style="list-style-type: none"> <li>(1) This routing will allow for scheduling continuous spread assembly-line techniques for approximately 15 more miles</li> </ul>
90 - 98	Consider relocation to Haul Road (see comments for MP 24 - 62)	<ul style="list-style-type: none"> <li>(1) Avoids construction through Clark's Lake, a known fish overwintering area</li> </ul>	<ul style="list-style-type: none"> <li>(1) Continue same Haul Road construction techniques, as above, for an additional 8 miles</li> <li>(2) Avoids hazards of construction adjacent to elevated TAPS pipeline</li> <li>(3) Avoids steep, ice-rich, unstable slopes at MP 97</li> </ul>



ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
107 - 114	Consider relocation to Haul Road (see comments for MP 24-62)	<ul style="list-style-type: none"> <li>(1) Avoids crossing Rudy Creek</li> <li>(2) Avoids crossing an active side channel of Oksrukuyik Creek</li> <li>(3) Avoids important riparian habitat and wetlands associated with Oksrukuyik Creek, particularly Margaret's Marsh</li> <li>(4) Avoids disturbance of new terrain</li> <li>(5) Minimizes erosion control and revegetation concerns of <u>new</u> route</li> </ul>	<ul style="list-style-type: none"> <li>(1) Minimizes potential hazards of freeze-bulb interference with natural aquifers</li> <li>(2) Avoids potential frost heave problems</li> <li>(3) Minimizes gravel requirements in an area where it is in short supply</li> </ul>

**ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)**

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
124 - 131	Consider relocation to Haul Road (see comments for MP 24-62)	(1) Avoids Alyeska Snowpad Test Area (2) Minimizes disturbance of new terrain	(1) Avoids area being used to evaluate long- and short-term significance of undisturbed versus gravel work pads (2) Avoids construction of new work pad
148 - 153	Consider relocation to Haul Road	(1) Avoids Tee Lake Inlet (2) Avoids wetlands associated with Tee Lake Inlet	(1) Avoids construction of new work pad south of Pump Station #4 from the Haul Road to the oil line (2) Eliminates double-width pad (new) requirement where gas line is not on work-pad side of oil line (3) Avoids hazards of construction around elevated pipeline

ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
180.5 - 182	Between these mileposts, consider site-specific relocations to Haul Road	(1) Avoid northernmost stand of white spruce	
195.5 - 201.5	Consider relocation to Haul Road	(1) Avoids the Dietrich River floodplain and riparian habitat	(1) Avoids new alignment (2) Minimizes the disturbance of new terrain (3) Because of severe erosion potential along an upland route, conventional construction methods may not be appropriate (MP 196-198)
208 - 219	Consider relocation to Haul Road and relocation to uphill side of Haul Road from MP 214-219	(1) Avoids floodplains, riparian habitat, and associated wetlands, particularly between MP 213-214.2 (2) Avoids at least 3 crossings of Alignment Slough	(1) Avoids Middle Fork of Koyukuk River floodplain (2) Minimizes disturbance of new terrain (3) Avoids thaw-unstable slopes and highly erodible slope between existing oil line and Haul Road (4) Avoids route between Haul Road and oil line

ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
224 - 226	Consider relocation to east side of Haul Road	(1) Minimizes disturbance of new terrain	(1) Avoids floodplain and river-training structures
11 232 -242	Consider relocation to Haul Road	(1) Avoids crossing of Organo and Equisetum Creeks (2) Avoids riparian habitat and wetlands associated with the Middle Fork of the Koyukuk River and its tributaries	(1) Avoids floodplain and river training structures. (2) Avoids new alignment, in part, between Haul Road and TAPS line (3) Avoids 4 crossings of TAPS line
12 249-250.5	Consider relocation to east side of Haul Road		(1) Avoids 1 crossing of TAPS line (2) Avoids 2 crossings of the Haul Road (3) Avoids construction in floodplain (4) Avoids 4 river training structures

**ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)**

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
270 - 277	Consider reroute to east	<ul style="list-style-type: none"> <li>(1) Avoids crossing Dee Creek</li> <li>(2) Avoids crossing Douglas Creek in an area of extensive aufeis</li> <li>(3) Avoids two crossings of Jim River side channels</li> <li>(4) Avoids crossing Gas Bubble Slough</li> <li>(5) Avoids riparian habitat and wetlands associated with the Jim River floodplain</li> </ul>	<ul style="list-style-type: none"> <li>(1) Avoids difficult aufeis area of Douglas Creek</li> <li>(2) Minimizes potential hazards of freeze bulb interference with natural aquifers</li> <li>(3) Avoids construction in floodplains</li> <li>(4) Avoids proximity problems with Pump Station #5</li> </ul>
<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">14</span> 468 - 470	Consider relocation adjacent to TAPS	<ul style="list-style-type: none"> <li>(1) Avoids conflict with archaeological site</li> </ul>	

ADVANTAGES OF THE SUGGESTED ALTERNATE ROUTE(S)

MILEPOST	ALTERNATE ROUTE(S)	ENVIRONMENTAL	TECHNICAL
470 - 530	Consider relocation to Haines POL Right-of-Way	<ul style="list-style-type: none"> <li>(1) Avoids 2 crossings of Moose Creek</li> <li>(2) Avoids 6 crossing of French Creek</li> <li>(3) Avoids 4 crossings of Million Dollar Creek</li> <li>(4) Avoids one crossing of Knokanpeover Creek</li> <li>(5) Avoids one crossing of Kanpeover Creek</li> <li>(6) Avoids 2 sloughs of Salcha River</li> <li>(7) Avoids Salcha River crossing in one of the key chinook salmon spawning areas</li> <li>(8) Avoids one crossing of Redmond Creek</li> <li>(9) Avoids the area of Goldrun Creek, and the south and north forks of Minton Creek</li> <li>(10) Avoids one crossing of Keystone Creek</li> <li>(11) Avoids crossing Rosa Creek</li> <li>(12) Avoids Tanana River crossing in the chum salmon spawning area</li> </ul>	