ENVIRONMENTAL OVERVIEW

of the

ALASKA SEGMENT

of the

ALASKA NATURAL GAS TRANSPORTATION SYSTEM

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ABSTRACT

A general overview is provided of the environmental issues which have been identified, addressed and incorporated into the design criteria, plans and specifications for the Alaska Segment of the Alaska Natural Gas Transportation System. The steps which have been taken to mitigate their impacts are outlined. Also discussed is the approach used to satisfy regulatory requirements and the proposed environmental monitoring organization.

OVERVIEW (Decision and Report to Congress on the Alaska Natural Gas Transportation System 1977)

The largest petroleum reserve on the North American Continent was struck in Alaska by a wildcat rig drilling Prudhoe Bay State Well No. 1 in the winter of 1967-68. The Prudhoe Bay field as it is now known contains over 20 trillion cubic feet of saleable natural gas and more than 9 billion barrels of recoverable oil. This gas represents approximately 10 percent of the known gas reserves in the United States.

In 1969, the State of Alaska held a lease sale and received almost $1 billion in lease bonuses. Shortly thereafter, three major leaseholders in the Prudhoe Bay Oil Pool announced their intention to build an oil pipeline through Alaska from Prudhoe Bay to a site on the Gulf of Alaska. After an initial flurry of activity the Trans-Alaskan Pipe Line System (TAPS) became entangled in a legal dispute concerning the necessity of an environmental impact statement until November of 1973, when the Congress and President finally approved the system. Construction was started immediately thereafter and the first flow of oil through the pipeline commenced on June 20, 1977.

Other studies begun in 1969 eventually resulted in applications to the Federal Power Commission (FPC) in the U.S. and the National Energy Board in Canada in March 1974 for a certificate to construct a pipeline to move the Prudhoe Bay and MacKenzie Delta gas to United

States and Canadian markets, along the Arctic coast and MacKenzie Valley, by Arctic Gas.

In September 1974, El Paso Alaska Company filed an application to transport Prudhoe Bay gas by a pipeline adjacent to TAPS to the Gulf of Alaska, liquify it, and ship it to California by LNG tanker. There the LNG would be regasified and provided to its purchasers either directly or by displacement through existing pipeline facilities.

On July 9, 1976, Alcan Pipeline Company filed the third application with the FPC for a certificate to transport Alaskan gas. The Alcan plan, as modified in March 1977, calls for a pipeline following existing utility corridors overland from Prudhoe Bay along the Alcan Highway through Canada to U.S. markets.

This application later became part of a joint U.S.-Canadian project to deliver natural gas from the Prudhoe Bay area of the North Slope of Alaska to markets in Canada and the lower 48 states through two "lower leg" gas pipelines which commence at the U.S.-Canadian border and distribute gas to the west and east. (Figure 1) The Alcan Supplement to the Final Environmental Impact Statement for this proposal was completed in September 1976.

On October 22, 1976, Congress passed the Alaska Natural Gas Transportation Act of 1976 (ANGTA), which established a method to review the three alternate gas transportation systems (Arctic Gas, El Paso and Alcan) and to select the most beneficial system.

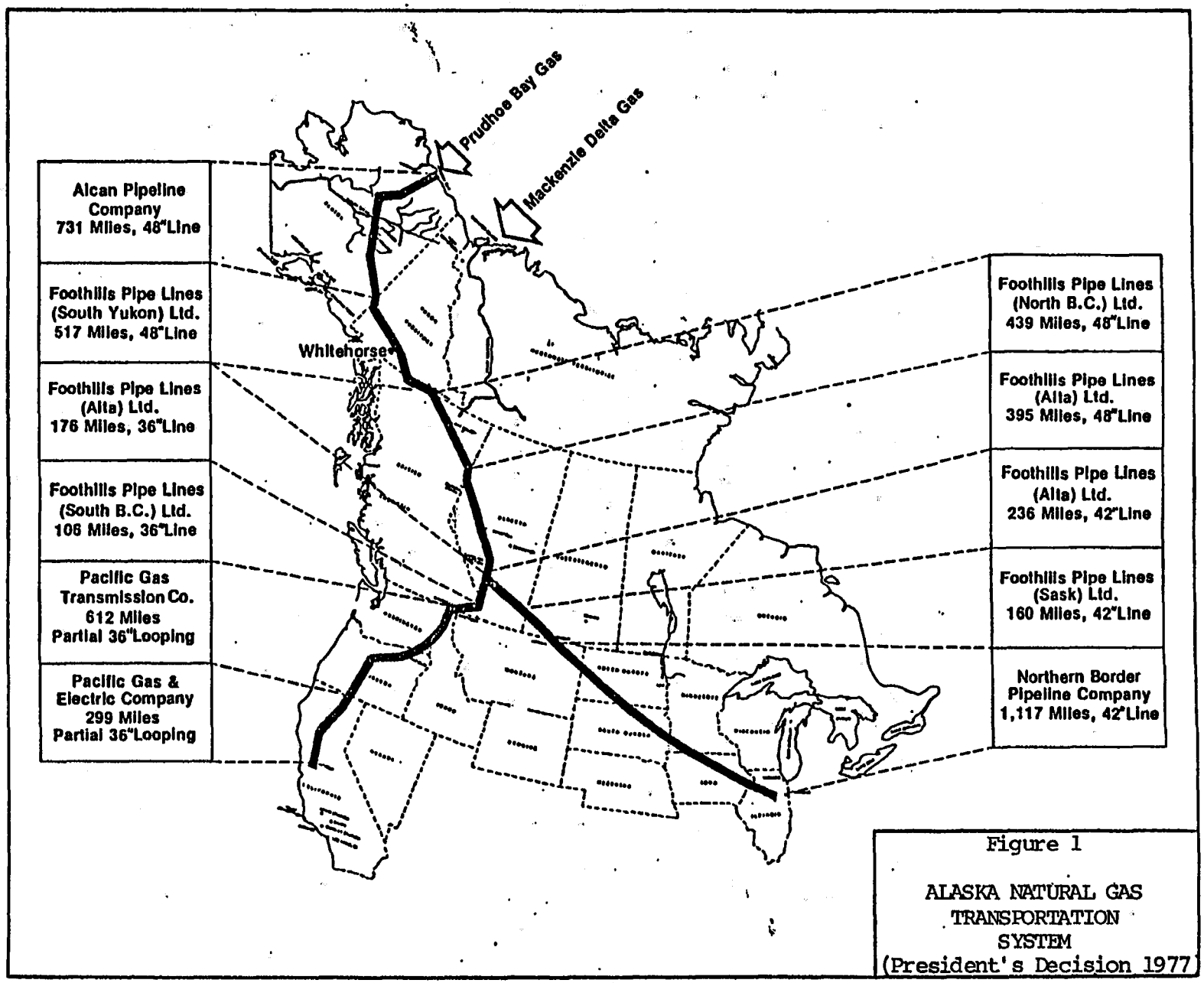

Figure 1

ALASKA NATURAL GAS TRANSPORTATION SYSTEM (President's Decision 1977

This review and selection process was concluded in the President's "Decision and Report to Congress on the Alaska Natural Gas Transportation System", issued in September 1977. The Alcan system was selected, and is now known as the Alaska Natural Gas Transportation System (ANGTS). This selection was based on the "Application of Alcan Pipeline Company at Docket No. CP76-433 for Certificate of Public Convenience and Necessity" filed with the FPC in July 1976.

On October 1, 1977, the Department of Energy (DOE) was created to consolidate energy functions of other government agencies, including the FPC. The Federal Energy Regulatory Commission (FERC) was established within DOE to assume the former responsibilities of the FPC. FERC has final certification authority for the ANGTS project, under the Natural Gas Act.

A conditional Certificate of Public Convenience and Necessity to construct and operate the Alaskan segment was issued by FERC in December 1977.

In January 1978, Alaska Northwest Natural Gas Transportation Company, (ANNGTC) a partnership, was formed as successor in interest to the Alcan Pipeline Company for the purpose of constructing and operating the Alaskan segment of the Alaska Natural Gas Transportation System. Northwest Alaskan Pipeline Company (NWA), a partner in ANNGTC is the agent and operator for the partnership. As such, NWA is responsible for the design, construction and operation of the

Alaskan segment.

On July 1, 1980, the Partnership filed an application with FERC for a final, unconditional certificate for the Alaskan segment. This filing was supplemented in October 1980. Concurrent filing was made to the Department of the Interior (DOI) for a Grant of Right-of-Way (GROW) over some 430 miles of Federal land for the pipeline in Alaska. The Grant, which established general, environmental and technical stipulations and conditions under which the Alaskan segment will be constructed on Federal land, was issued on December 1, 1980.

On April 15, 1981, NWA filed an application for a State Right-of-Way Lease for a pipeline right-of-way over some 235 miles of State land for the pipeline in Alaska. Issuance of a State Right-of-Way Lease is pending.

The cost of the Alaskan segment of ANGTS, as contained in the Applicant's July 1, 1980, filing with FERC (as amended in October, 1980), is estimated at $8.178 billion in 1980 dollars, exclusive of financing charges. Approximately 25% of this is expected to be equity funds and the balance debt. Approximately $3.8 billion is for the cost of materials. The total cost does not include the gas conditioning facility nor the costs attributable to construction of the Canadian segment or "lower legs".

The estimated annual cost for operations and maintenance is $35.1 million (in 1980 dollars) per year.

Design and engineering of the mega-project continues with a hopeful completion date during the winter of 1989-90. The estimated construction time is approximately 3 years for major facilities including compressor stations, the Alaska Gas Conditioning Facility and installation of the main line 48 inch pipe.

Market forces and other outside factors could influence financing and construction start-up in either direction. The Alaskan and Canadian segments will be constructed simultaneously. Construction of the lower 48 legs which are also part of the system have already been completed.

Delays in financing have renewed some interest in exploring the viability of Pacific Rim markets and as a consequence the option of shipping gas by pipeline to an Alaskan tidewater port is being reconsidered. Such a course, however, would require Congressional action to overcome existing export restrictions and the rigorous process that resulted in selection of the Alcan route.

PROJECT DESCRIPTION

The Alaska Segment of the Alaska Natural Gas Transportation System consists of a 48-inch diameter gas pipeline from Prudhoe Bay to the Canadian Border. The route as proposed by Northwest Alaskan Pipeline Company (NWA) basically follows the Trans-Alaska Oil Pipe-

line from Prudhoe Bay to Delta Junction, Alaska and the Alaskan Highway from Delta Junction to the Canadian Border. Basic design concepts include the installation of a chilled-buried pipeline with 15 compressor stations and a gas conditioning facility at Prudhoe Bay. The pipe is to be constructed from a gravel workpad with construction personnel located in 17 camps along the pipeline right-of-way.

The total length of the Alaska segment is approximately 743 miles including the right-of-way over some 78 miles of private or contested lands. The maximum allowable operating pressure will be 1260 PSIG with an initial average daily capacity of 2,000 million standard cubic feet per day (MMSCFD). Two metering stations will be provided. The pipeline will cross some 400 streams, 24 of which are major streams requiring special construction considerations and 220 of which support fish. Approximately 380 material sites and 28 million cubic yards of gravel will be needed, as well as 350-400 additional sites for disposal of spoil and overburden. Solid waste sites to be developed total 15. The alignment crosses 130 miles of wetlands and is in close proximity to numerous sensitive biological resources. Development of additional related facilities-- some 400 access roads, airfields, storage yards, and communications sites—is also necessary. There will be approximately 100 crossings of existing public highways and 20 crossings of the existing TAPS line. The gas pipeline will be in close proximity to some 275 miles of state highways and 100 miles of the fuel gas line serving the first four pump stations for the TAPS line.

Preconstruction activities, initiated in 1978, have included the installation of frost heave test sites, drilling to determine subsurface soil conditions, construction of four fly camps to support field activities, studies on fish and wildlife resources, investigations of the hydrology of numerous river systems, survey of the pipeline centerline and access routes, evaluation of alternative alignments, and collection of climatic data. Basic design criteria covering the civil and engineering aspects of the project have been developed for the pipeline, compressor stations, and the Alaska Gas Conditioning Facility. Currently, the project has been delayed pending the development of a financial plan. However, work continues on the finalization of basic design criteria, plans, and design of the AGCF.

PROJECT ENVIRONMENTAL REQUIREMENTS

The President's Decision noted that appropriate terms and conditions would have to be developed and included in governmental authorizations for the construction and operation of the pipeline system to ensure protection of the environment and fish and wildlife resources. The Alaska Natural Gas Transportation Act of 1976 required that a joint monitoring and surveillance agreement be established between the State and the Federal government to ensure that terms and conditions established in the various governmental permits and authorizations were implemented. These two basic legal requirements establish the base for the mitigation of adverse environmental

impacts associated with the proposed gas pipeline project.

The DOI GROW was developed, negotiated, and finalized via an interdisciplinary team of engineers, lawyers, and biologists from both State and Federal agencies and the sponsors of ANGTS. Terms and conditions established in the right-of-way agreement define the standards to be met by the gas pipeline company in order to achieve protection of the environment and fish and wildlife resources within the State of Alaska. The State of Alaska Right-of-Way Lease, which has not yet been completed, contains in draft form terms and conditions similar to those for the DOI GROW.

Project environmental constraints for the gas pipeline project also include an array of other State, local, and Federal permits and authorizations. Many of these constraints are summarized and outlined in a series of environmental plans required by the DOI GROW. The plans, as identified below are intended to fulfill a variety of functions, such as provide the basis for facility design, support for permit applications, and a basis for development of field workplans employing best management practices on a site-specific basis. The environmental plans include:

(1) Air Quality
(2) Blasting
(3) Camps
(4) Clearing
(5) Corrosion Control
(6) Cultural Resources Preservation

(7) Environmental Briefings
(8) Erosion and Sedimentation Control
(9) Fire Control
(10) Liquid Waste Management
(11) Material Exploration and Extraction
(12) Oil and Hazardous Substances Control, Cleanup and Disposal
(13) Overburden and Excess Material Disposal
(14) Pesticides, Herbicides, Chemicals
(15) Pipeline Contingency
(16) Quality Assurance/Quality Control
(17) Restoration
(18) River Training Structures
(19) Solid Waste Management
(20) Stream, River and Floodplain Crossings
(21) Surveillance and Maintenance
(22) Visual Resources
(23) Wetland Construction
(24) Seismic
(25) Human-Carnivore Interaction

(U.S. Department of the Interior 1980:7)

The concept of requiring environmental plans for specific topics evolved during the drafting of the DOI GROW stipulations. The model document used was the federal Grant of Right-of-Way for the Alyeska TAPS oil project. The environmental stipulations in this document were carefully scrutinized and their efficacy on the TAPS project was reviewed. For the most part, there was a general consensus of sponsors and government representatives that the environmental stipulations for TAPS afforded an adequate level of protection for the gas line project. They were, therefore, left largely intact for the ANGTS GROW, with the exception of requiring environmental plans for the aforementioned topics.

The purpose of these plans is to provide the procedures and

methods of action by which particular subject areas will be addressed by the project sponsor during design, construction, operation, and termination. Each plan is to contain all information, criteria, procedures, methods, best management practices and construction techniques pertinent to a particular topic. The plans are to include identification of all codes, regulations, stipulations and permits, required of the project.

The DOI GROW also required the development of a set of basic design criteria for the pipeline system. These criteria, by definition, include a preliminary design for the pipeline system.

PROJECT DEVELOPMENT AND
ENVIRONMENTAL REQUIREMENTS

There are five key parts of project development for which environmental input is critical, once the Environmental Impact Statement (EIS) is completed and the route has been awarded. In the case of the ANGTS project, the process for selecting the route began in March of 1974 and was completed in September of 1977 when President Carter selected the Alaska Highway route (Alcan Project) pursuant to ANGTA. The critical project processes include:

1. Pipeline alignment and review
2. Facility siting
3. Design
4. Scheduling
5. Construction

Environmental constraints for the gasline project have been categorized by topic and organized to ensure that environmental input

is considered for appropriate key parts of project development. Major project milestones identified by the project schedule dictate when key events must be completed. Environmental input is made accordingly.

Proper siting of facilities including pipeline alignment has in the past had the most dramatic effect on environmental concerns and is, therefore, the means by which the greatest environmental gains can be made. The first step in this process was taken with the selection of the route for the gas pipeline along the Alaska Highway. Routing was followed by development of a more specific alignment along the generally accepted route. Subsequent refinements and revisions to the alignment are made continuously as updated information on site-specific circumstances warrant. Changes, known as field design changes, may occur throughout construction to accommodate engineering, environmental or construction difficulties.

Design of the pipeline and related facilities is progressive and is the next significant point at which environmental input is made. The approach used on ANGTS has been twofold. First, all environmental problems which could be identified from the TAPS experience were inventoried. Secondly, these problems were analyzed and steps were taken to "design out" to the maximum extent possible those items which resulted in problems. During TAPS construction, for example, over 17,000 minor oil spills (spills less than 10 gallons) were reported. An analysis of the spill reports indicates that the

majority of them could be "designed out" by: (1) installing waste oil collection and bulk storage facilities at camp maintenance shops to handle the enormous volume of waste oil products associated with maintaining a large, heavy-equipment fleet; (2) upgrading the standards for installation of camp fuel distribution systems, (3) providing for controlled runoff from those portions of camp pads subject to frequent equipment trafficking or fueling, (4) providing for bulk storage and transfer of radiographic wastes, and (5) designing structures for temporary storage of spill cleanup materials and debris.

Numerous design improvements have been made in a wide variety of areas with the goal of ultimately reducing construction costs while gaining greater environmental performance. Similar gains are made by providing better information on those environmental parameters which may influence both construction scheduling and construction. Construction activities for example have been scheduled so they will not interfere with populations during sensitive life stages. This requires that the target populations (sheep, grayling, falcons, alevins, etc.) and the times of critical concern (migration, spawning, rearing, nesting, etc.) be identified. Identification of the areas, populations and times must be completed early so that the information can be incorporated at the appropriate points of project development.

ENVIRONMENTAL CONCERNS AND MITIGATION

Environmental concerns for ANGTS fall into three general categories. They include: (1) impacts to biological resources; (2) aqua-

tic and terrestrial habitat disturbances and; (3) pollution. Each of these are discussed in the following paragraphs.

Impacts on biological resources can be minimized if appropriate steps are taken to inventory the resources present and identify the steps that should be taken to protect those resources. Information and studies for ANGTS have been directed toward building and complementing the information available from TAPS, while inventorying the data for that segment not in the TAPS corridor--Delta Junction to the Border. The information and studies have included consideration for wetland birds, waterfowl, sandhill cranes, raptors, upland game birds, small mammals, large mammals (sheep, caribou, bison, moose, bear and wolf), and fisheries. Population inventories, areas of special use (lambing, spawning, rearing, migration, denning, nesting, etc.) have been analyzed and zones of restricted activities, lists of sensitive fish and wildlife areas, critical times, endangered species, effects of blasting on fish, effects of noise from compressor stations, human/carnivore interactions and fish protection strategies developed.

Similar evaluations have been made of terrestrial and aquatic habitats to minimize disturbance. These evaluations have included identification of unique features, mapping of habitats within the corridor, establishment of buffers, visual impact amelioration, development of detailed plans and approaches for: (1) clearing; (2) material exploration and extraction; (3) wetland construction; (4) stream

and river flood-plain crossings; (5) river training structures; (6) stream diversions and drainage alterations; (7) off-road access; (8) cross-drainage; (9) maintenance of minimum flows; (10) water withdrawals and an approach to a project-wide restoration program. Unique design problems such as frost-heave and cold-pipe effects on subsurface water flow have also been pursued.

Approaches to enhanced pollution control have included evaluations of the impacts of the following activities:

1) Air Emissions: Stationary and mobile sources and their effects on ambient air quality, open burning, fugitive dust, ice fog and impacts to nonattainment areas.

2) Oil Spills: Control cleanup and disposal of oil and hazardous substances, oil discharge contingency planning, spill prevention control and countermeasures, planning and development of field petroleum handling procedures.

3) Wastewater Discharges: Treatment and disposal of all liquid wastewater streams and construction camp sewage, vehicle and equipment washing, hydrostatic test discharges, concrete batch plant washdown, siltation and erosion control and dewatering from construction activities, material washing and fuel containment areas.

4) Overburden and excess material disposal from clearing and pipe ditching.

5) Pesticide and herbicide applications: selection, application, spill response and handling, and storage and disposal of residues and containers.

6) Solid Waste Disposal: Camp wastes, construction debris, equipment components, tires, batteries, vehicles and pipeline construction scrap.

In controlling sources of pollution the anticipated amount of pollutants are estimated and the proper controls or control equipment selected which will restrict a discharge or disposal to within prescribed limits or to a prescribed location. As mentioned earlier the referenced course is to "design out" problems to the maximum extent possible. In this case mitigation is achieved by limiting the degree or magnitude of the action and by specifying certain operational guidelines which must be met during the life of the action, discharge or disposal.

The primary method for mitigating impacts to biological resources or aquatic and terrestrial habitats has been avoidance. For example, a significant effort has been expended in detailed mapping of the habitat types within the corridor. Approximately 130 miles of the pipeline alignment were found to be in wetlands. These wetlands were further prioritized into Category A, B and C wetlands. Mitigation of impacts to Category A and B wetlands (those with the highest habitat value) was avoidance ie; neither the pipeline or any other facilities were to be located in these areas. Siting of facilities in Category C wetlands could occur, if unavoidable, subject to certain stipulations developed for the particular activity. The stipulations are designed to minimize

the impacts by limiting the degree or magnitude of the action and its implementation for that activity.

Compensation is a third form of mitigation which, in general, has not been used in development of the ANGTS project. Compensation is employed only when design review or avoidance will not satisfactorily minimize impacts. For example, if, despite all efforts to the contrary, a salmon run in a particular stream is damaged due to pipeline construction, it would be necessary to re-establish the population. Or if some specific type of habitat for an isolated population of animals is obliterated in one locality it may be necessary to increase the carrying capacity of adjacent habitat through appropriate wildlife management techniques or through establishment of substitute habitat in other disturbed areas. These measures are costly and have not been used as a preferred option in mitigating impacts from the ANGTS project.

Environmental design and mitigation of impacts from the ANGTS project has achieved a greater level of sophistication than that which existed at the same point in time for the TAPS project. Environmental concerns have been pursued to a greater level of detail and also benefit from improved controls and technologies, a larger environmental data base, the experiences gained from TAPS construction and new or changed environmental requirements.

Several fundamental differences exist between the two projects

which in turn has altered the priorities for environmental concerns.

The most significant is the concern over crude oil spills. This remains as the greatest potential for environmental damage for the TAPS project. The ANGTS project, however, is a buried high pressure, large diameter chilled gas pipeline and although siginificant safety problems exist the potential for contamination of the environment should a break occur is comparably small. Spill contingency planning is, therefore, greatly reduced and focuses on the safety aspects. The greatest spill potential from ANGTS will therefore be present during the construction effort.

Proximity to the TAPS pipeline has also been a concern. Although placement of a chilled gas pipeline opposite from the TAPS pipeline from the same workpad would appear compatible the potential for degradation of thaw unstable soils which could occur during the three year construction time frame prior to operation of the gasline in a chilled state could interfere with the integrity of the TAPS pipeline. As a result of this and the difficulties of operating construction equipment in close proximity to the oil-line the federal and state GROW's require a minimum 200' separation between the two pipelines. This necessitates construction of a second, separate pipeline workpad for ANGTS which in turn creates a demand for gravel resources on a scale similar to TAPS. Material resource extraction and its consequences to habitat remain as a major environmental concern.

Creation of a second pipeline workpad also requires construction of a large number of new access roads along with the additional habitat losses and increased gravel demands.

Unlike TAPS no new haul road will be required. The haul road from Fairbanks to Prudhoe (known now as the Dalton Highway) is now in general use and the lands adjacent to it are managed as a Utility Transportation Corridor for pipelines, vehicular traffic and the like.

Other environmental concerns (endangered species, alterations of ambient air quality, fisheries impact, liquid waste management, overburden and excess material disposal, solid waste disposal and erosion and sedimentation control) are similar in scope and magnitude to TAPS notwithstanding refinements which have been made during the ANGTS design review process.

The approach to restoration of disturbed terrestrial sites has been changed to emphasize reestablishment of native vegetation and control of thermal and hydraulic erosion. This approach limits seeding to purposes of temporary erosion control. Other disturbed areas will go through several seedbed preparation steps followed by a standard N-P-K fertilizer application. Seeding in these areas unlike the approach used for TAPS will be by natural re-invasion.

Problems unique to the gas pipeline include frost-heave and cold pipe effects on surface and subsurface waterflows. Frost heave

is primarily an engineering pipeline integrity problem which can be mitigated by a variety of design modes. The environmental effects of a chilled gas pipeline are caused by frost bulb growth around the pipe which in turn would create ice-damming effects on cross-drainages. The blockage of subsurface or surface flows by a frost bulb around the pipe may result in new or accelerated aufeis problems, disruption to flows which are critical to downstream overwintering fisheries or elimination of downstream open water leads which serve as unique points for wintertime reaeration of arctic and subarctic streams. Evaluation of these effects continues as does the process for determining the best manner of mitigation.

ENVIRONMENTAL MONITORING

A multi-disciplinary approach and staff has been proposed for environmental monitoring of the ANGTS project. This, coupled with an effective quality assurance/quality control organization by the project sponsor, is necessary to ensure that the stipulations and conditions developed during the project design are met during the construction effort.

Implementation of the multi-disciplinary approach was proposed to allow construction to proceed with minimal opportunity for delays while affording maximum environmental protection due to unexpected problems incurred during construction. It is proposed that there will be one joint State/Federal Monitoring Team for each construction spread. Six construction spreads are planned. Each team

will contain both state and federal representatives. The teams will have individuals with backgrounds in the following areas:

Environmental Engineering
Biology
Hydrology
Civil Engineering
Soils
Pipeline Engineering
Specialty Fields (as needed - welding, structural etc.)

The joint team concept has been proposed to satisfy the requirements of ANGTA and the split land ownership nature of the pipeline right-of-way. In addition, it should eliminate some of the duplication and overlap that existed during construction of TAPS and accounts for statutes which mandate monitoring and surveillance regardless of land ownership ie; primarily those programs administered by the United States Environmental Protection Agency. The approach should also ensure greater consistency in authorizations issued under the Department of Interior's GROW and State ROW.

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