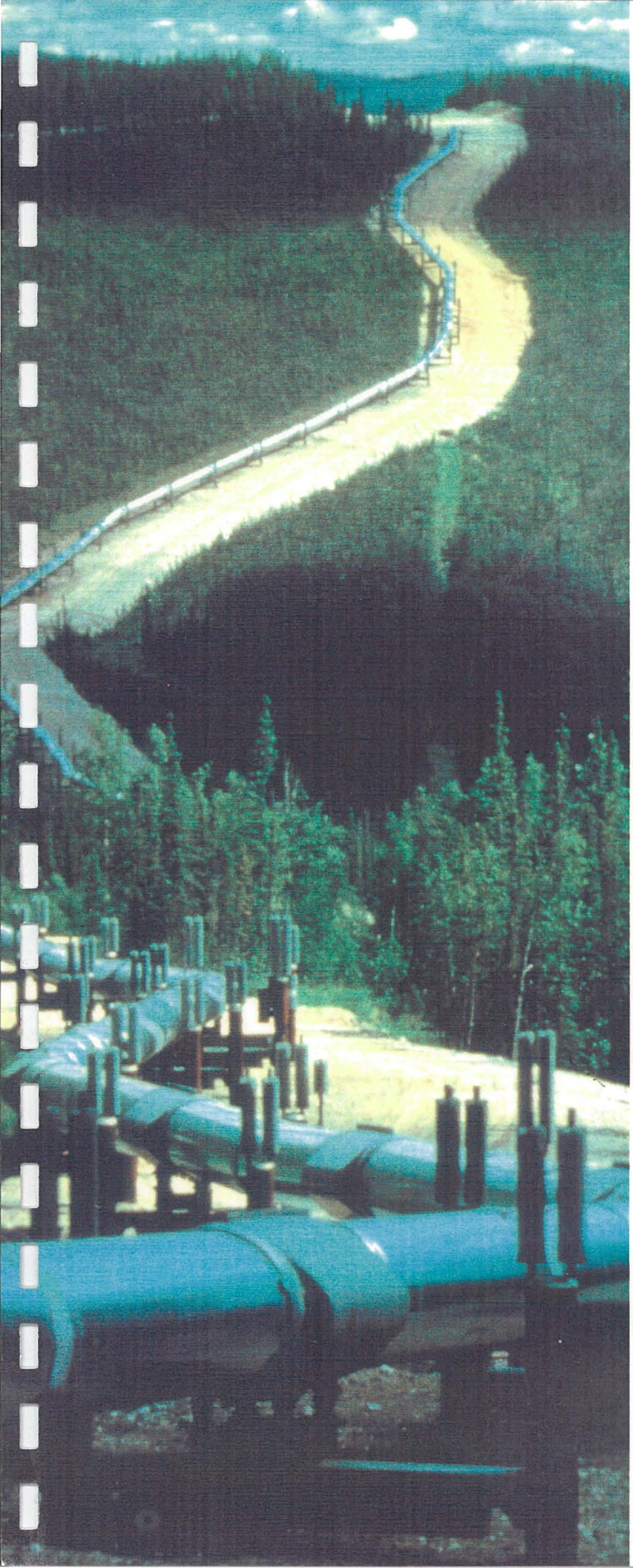

TransAlaska Pipeline Right-of-Way Co-Use Feasibility Report

January 2009

Prepared for:

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1.0 INTRODUCTION

1.1 Project Purpose

The Alaska Natural Gas Development Authority (ANGDA) is public corporation established by the State of Alaska focused on getting North Slope natural gas to Alaskan communities as well as identifying feasible liquefied natural gas (LNG) opportunities for the State of Alaska.

In September 2005, URS Corporation prepared a report entitled "Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment" under contract to ANGDA. This study provided a preliminary cost estimate and engineering feasibility evaluation of gas pipeline construction in close proximity to the Trans Alaska Pipeline System (TAPS), owned and operated by Alyeska Pipeline Service Company (Alyeska), with a conclusion that such construction would be feasible from an engineering perspective. It was recognized that the TAPS operator would likely have concerns related to the potential for future ANGDA gas pipeline construction and operation to cause damage to the TAPS facilities or impair operations and maintenance activities along the TAPS.

In conjunction with the continuing work of ANGDA to bring North Slope natural gas to market in Alaska, the proposed scope of work for this current task would further evaluate the feasibility of co-use of the TAPS right-of-way (ROW) for placement and operation of a high-pressure natural gas pipeline by opening a dialogue with Alyeska, the major owners of Alyeska (Conoco Phillips, ExxonMobil, BP), and the Joint Pipeline Office (JPO) to determine where ANGDA and Alyeska can potentially work together.

1.2 Scope of work

The Scope of Work for this project was identified by ANGDA in the request for proposals, and contained the following items:

1. Review TAPS right of way (ROW) lease documents including Federal Grants AA-5847 and FF-12505; State of Alaska ADL-63574; and other associated case files.
2. Determine the non-exclusive right-of-way clauses within aforementioned lease documents.
3. Form a Memorandum of Understanding (MOU) with Alyeska to develop solutions to their concerns related to co-use of the TAPS ROW.
4. Determine where ANGDA and Alyeska can work together:
   a. Common right-of-way.
   b. Shared work pad.
   c. Joint use material sites.
   d. Identification of common access duties, responsibilities and protocols.
   e. Identification of construction and operation concerns.
   f. Share power generated from electric "gensets" with Alyeska.
   g. Possible shared activities including regular training programs with Alyeska and native villages for:
      - first-aid

- maintenance
- fire watch
    1. security
    2. emergencies

h. Segregate radio usages and requirements; and set-up a common emergency notification and response system.

5. Determine how the ANGDA natural gas pipeline can cross rivers and highways, and if existing bridges and cable bridges may be utilized.
6. Obtain protocol from Alyeska regarding the use of TAPS ROW during pre-construction activities, including staging.
7. Identify current concerns and develop a vehicle/methodology to handle future concerns and operational issues.
8. Determine how ANGDA can successfully work with Alyeska before, during, and after construction.
9. Obtain 1) explosion hazard information, and 2) develop evaluation of explosion impact on adjacent pipeline(s).
10. Develop mitigation factors to maximize safety to people, equipment, and facilities while constructing and operating the ANGDA natural gas pipeline.

To address the ANGDA objectives of the co-use of TAPS right of way evaluation, URS proposed a work program consisting of four major tasks:

- **Task 1: Summarize Co-Use Issues** through review of previous URS reports for ANGDA; review of the extensive base of literature associated with NEPA compliance, construction, operations, and recertification of the TAPS; and interviews with Joint Pipeline Office, and the State Pipeline Coordinators Office personnel.
- **Task 2: Summarize ROW Grant and Lease Conditions** through review of previous URS reports for ANGDA; review of the extensive base of literature associated with NEPA compliance, construction, operations, and recertification of the TAPS; review of TAPS ROW agreements, lease, and grant documents; and interviews with Joint Pipeline Office, and the State Pipeline Coordinators Office personnel.
- **Task 3: Identify and Present Initial Issues and Co-Use Discussion Strategy to ANGDA** for initiating co-use discussions with Alyeska and representatives of the owner companies.
- **Task 4: Conduct Co-Use Issues Meetings with Owner Companies and Alyeska** to identify their concerns and outline potential solutions that would be acceptable for joint use of the TAPS right-of-way by ANGDA.

2.0 TAPS ROW CO-USE ISSUES

2.1 Literature reviewed

URS staff reviewed 27documents to identify both issues associated with co-use of the TAPS right-of-way, and conditions for use of the TAPS right-of-way as outlined in agreement, grant, and lease documents. Table 2-1 lists the references for literature reviewed.

Table 2-1. Literature Reviewed

Agreement and Grant of Right-of-way for Trans-Alaska Pipeline between the United States of America and Amerada Hess Corporation, ARCO Pipe Line Company, Exxon Pipeline Company, Mobil Alaska Pipeline Company, Phillips Petroleum Company, Sohio Pipe Line Company, and Union Alaska Pipeline Company. January 23, 1974.
Right-of-way Lease for Trans-Alaska Pipeline between the United States of America and Amerada Hess Corporation, ARCO Pipe Line Company, Exxon Pipeline Company, Mobil Alaska Pipeline Company, Phillips Petroleum Company, Sohio Pipe Line Company, and Union Alaska Pipeline Company, ADL 63574. May 3, 1974.
Conditional Right-of-way Lease for the Trans-Alaska Gas System, ADL 413342. Yukon Pacific Corporation and State of Alaska Department of Natural Resources Division of Land and Water Management State Pipeline Office. December 1988.
Letter – *Renewal of the Conditional ROW Lease for the Trans-Alaska Gas System (TAGS),* ADL 413342. December 11, 1998.
Letter - *Amendment of the Conditional ROW Lease for the Trans-Alaska Gas System (TAGS,)* ADL 413342. June 3, 1993
Renewal of the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline and Related Facilities between The United States of America and Amerada Hess Pipeline Corporation, BP Pipelines (Alaska) Inc., ExxonMobil Pipeline Company, Phillips Transportation Alaska, Inc., Unocal Pipeline Company, and Williams Alaska Pipeline Company, LLC. January 8, 2003.
Amendment of Conditional Right-of-way lease for the Trans-Alaska Gas System between the State of Alaska and Yukon Pacific Corp, ADL 4213342. June 2, 1993.
Trans-Alaska Gas System Final EIS. U.S.Department of Interior, Bureau of Land Management. BLM-AK-PT-88-003-1792-910. June 1988.
A Review of Yukon Pacific Corporation Trans-Alaska Gas System Permits. Prepared for ANGDA by ASRC. August 30, 2004.
Amended Application for Development of a Contract Under AS [Alaska Statute] *43.82. The Alaska Stranded Gas Development Act.* By BP, ConocoPhillips, and ExxonMobil. January 20, 2004.
Right of Way Lease for the Alaska Natural Gas Transportation System by and between the State of Alaska and The TransCanada Alaska Company, LLC and the Alaskan Northwest Natural Gas Transportation Company. Undated (assumed 2004)
Application of Enbridge, Inc. to the Alaska Department of Revenue Pursuant to AS 43.82.120 for Approvals Under the Alaska Stranded Gas Development Act. April 30, 2004. Northern Gas Pipeline Development, *http://www.enbridge.com/about/enbridgeCompanies/gasPipelines/northern-development.php*

Table 2-1. Literature Reviewed (Continued)

Letter From Alyeska Pipeline Service Company (APSC) Jordan Jacobsen, General Counsel to Kenton Taylo,r Acting Gas Pipeline Coordinator, Alaska Department of Natural Resources (ADNR), Re: ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.
Letter From ConocoPhillips, Joe Marushack, VP Alaska North Slope Gas Development, to Kenton Taylor, Acting Gas Pipeline Coordinator, ADNR, Re: ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.
Letter From Enbridge Inc., John Carruthers, VP Gas Development, to Kenton Taylor Acting Gas Pipeline Coordinator, ADNR, Re: ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.
Letter From ExxonMobil to Kenton Taylor, Acting Gas Pipeline Coordinator, ADNR, Re: ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.
Letter From Golden Valley Electric Association (GVEA), Kate Kennedy ROW Agent, GVEA Transmission and Distribution, to Kenton Taylor, Acting Gas Pipeline Coordinator, ADNR, Re: ADL 403427 Request for Comments (TransCanada lease). December 9, 2004.
Letter from Albert N Bolea to Harold Heinze. January 25, 2006.
Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline. February 2, 2006.
Delta Junction to Glennallen Natural Gas Pipeline, Engineering Feasibility and Cost Assessment. URS Corporation for ANGDA. September 2005.
Order Granting Emergency Request for Temporary Operating Authority. State of Alaska Regulatory Commission, U-98-11. March 7, 2000.
Order Granting Transfer of Assets to APSC Subject to Conditions. State of Alaska Regulatory Commission, U-04-28. August 4, 2004.
Memorandum from Vic Manikian to Harold Hines, ANGDA. July 10, 2007.
Alaska Natural Gas Transportation System Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96. Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.
Amendment of Conditional Right-of-way lease for the Trans-Alaska Gas System between the State of Alaska and Yukon Pacific Corp, ADL 4213342. June 2, 1993. .
Alaskan Gas Pipeline Status Report on Feasibility of Utilizing the Alyeska Work Pad and/or the Alyeska – State Haul Road. El Paso Company. Undated.
Memorandum from ADNR State Pipeline Coordinator's Office, Vic Manikian to Greg Swant, Deputy Coordinator of Engineering for Yukon Pacific Corp, Trans-Alaska Gas System Thermal Analysis Requirements. November 13, 1992.

2.2 Parties Contacted

After reviewing pertinent documents to compile an initial list of issues, URS staff held informal discussions with knowledgeable parties concerning issues associated with TAPS ROW co-use issues and construction of a natural gas pipeline in close proximity to the operating oil pipeline. These discussions included staff from the Joint Pipeline Office (JPO) and State Pipeline Coordinators Office (SPCO). During the meeting with representatives from JPO, a list of gas pipeline concerns that had been prepared for Drue Pearce, Federal Coordinator, Office of the Federal Coordinator, for Alaska Natural Gas Transportation Projects, was obtained. The following meetings were held:

- **September 26, 2007** - Meeting with the Joint Pipeline Office (JPO) regarding issues for joint use of the Trans-Alaska Pipeline System right-of-way.
- **December 5, 2007** - Meeting with State Pipeline Coordinators' Office (SPCO) regarding issues for joint use of the Trans-Alaska Pipeline System right-of-way.APS ROW

2.3 TAPS ROW Co-Use Issues

Initial co-use issues for discussion identified by URS and ANGDA included:

- Safety, construction, and operational concerns for a natural gas pipeline in proximity to the elevated and buried segments of TAPS.
- Protocols for shared use of the non-exclusive ROW.
- Opportunities for shared services and facilities (security, emergency response, access roads, workpads, communication, electric power, maintenance).
- Shared activities including training programs with Alyeska and Native villages (first-aid, maintenance, fire watch and suppression, security, emergencies).
- Shared electric power sources for ANGDA compressor stations and other facilities.
- Segregated radio usage and development of a common emergency communications system.
- Opportunities for use of TAPS bridge structures for gas pipeline crossings of streams and rivers.
- Response protocol and system for emergencies.
- Shared use of gravel resources from material sites.
- Common access duties, responsibilities, and protocols.

Following the literature review and informal discussions with JPO and SPCO, a checklist of joint use of right-of-way issues that could be anticipated during five definable phases of the ANGDA gas pipeline project development was compiled (Appendix A). For discussion purposes, the five project phases included:

1) Planning and alignment identification;
2) Permitting and ROW lease/grant approval;
3) Construction;
4) Operations and maintenance; and
5) Dismantling, removal and restoration.

To further identify at what point in project development specific co-use issues could arise, Appendix A considered individual co-use issue topics under five subject categories: environmental; safety and security; engineering and constructability; operations and maintenance; and regulatory and permitting.

3.0 SUMMARY OF RIGHT-OF-WAY LEASE CONDITIONS AND JOINT USE ISSUES

Review of the reference documents listed in Table 2-1 identified several specific requirements and conditions associated with use of the TAPS ROW. The right-of-way co-use issue discussions conducted with JPO and SPCO helped refine the joint use topics, and placed them in context for the Topic/Issue/Reference presentation in Appendix B.

Appendix B is organized by issue topics that are associated with specific activities or conditions (left column), identified co-use issues and relevant conditions that could apply to collocation of the ANGDA gas pipeline in the TAPS ROW (middle column), and the source of the specific reference (right column). Many of the co-use issues identified for further discussion and resolution in Appendix B considered the potential construction and operation of a chilled natural gas pipeline which might be constructed in proximity to the warm TAPS oil pipeline. However, many of the same co-use issues could be expected to apply to any other pipeline that proposes to co-locate within or adjacent to the TAPS ROW.

4.0 INITIAL ROW CO-USE STRATEGIES

Although the original intent of this project was to approach Alyeska Pipeline Service Company and the TAPS owners to discuss co-use issues and strategies for co-use, events associated with major natural gas pipeline proposals took precedent with the owner companies. Initial contacts were made with Alyeska to arrange discussion meetings, but they were not prepared to discuss co-use issues at this time. Subsequently, ANGDA announced its intent to proceed with preparation of an Environmental Impact Statement for the Beluga to Fairbanks natural gas pipeline project and determined that the best course of action was to conclude this co-use study.

APPENDIX A

APPENDIX A

ANGDA PIPELINE IN PROXIMITY TO TRANS-ALASKA PIPELINE SYSTEM, DELTA JUNCTION TO GLENNALLEN: JOINT USE ISSUES SUMMARY BY PROJECT PHASES

APPENDIX A: ANGDA PIPELINE IN PROXIMITY TO TRANS-ALASKA PIPELINE SYSTEM, DELTA JUNCTION TO GLENNALLEN: JOINT USE ISSUES SUMMARY BY PROJECT PHASES*

GASLINE SPUR PROJECT PHASES					
	PLANNING/ ALIGNMENT	*PERMITTING & ROW LEASE/GRANT*	*CONSTRUCTION*	*OPERATIONS & MAINTENANCE*	*DISMANTLING, REMOVAL, & RESTORATION*
JOINT USE TOPICS/ ISSUES					
ENVIRONMENTAL					
- Geology & soils	X	X	X	X	X
- Construction of river and stream crossings	X	X	X	X	X
- Work pad drainage structures	X	X	X	X	X
- Groundwater	X	X	X	X	X
- Viewshed	X	X	X		
- Wildlife passage	X	X	X	X	X
- Cultural resources	X	X	X		
- Sensitive areas	X	X	X	X	X
- Streams & rivers (proximity)	X	X	X	X	X
- Vegetation removal	X	X	X	X	X
- Revegetation and restoration	X	X	X	X	X
SAFETY AND SECURITY					
- Standoff separation between pipelines	X	X	X	X	X
- Protection of TAPS facilities	X	X	X	X	X
- Federal safety requirements	X	X	X	X	X
- Accidents		X	X	X	X
- Sabotage	X	X	X	X	
- Access control	X	X	X	X	X
- Spill response	X	X	X	X	X
- Explosion hazards		X	X	X	X
- Emergency response		X	X	X	X

APPENDIX A: ANGDA PIPELINE IN PROXIMITY TO TRANS-ALASKA PIPELINE SYSTEM, DELTA JUNCTION TO GLENNALLEN: JOINT USE ISSUES SUMMARY BY PROJECT PHASES*

GASLINE SPUR PROJECT PHASES					
	PLANNING/ ALIGNMENT	*PERMITTING & ROW LEASE/GRANT*	*CONSTRUCTION*	*OPERATIONS & MAINTENANCE*	*DISMANTLING, REMOVAL, & RESTORATION*
JOINT USE TOPICS/ ISSUES					
- Homeland security	X	X	X	X	X
ENGINEERING & CONSTRUCTABILITY					
- Use of TAPS work pad	X	X	X	X	X
- Fault crossing	X	X	X	X	
- Seismic hazards	X	X	X	X	
- River/stream crossings	X	X	X	X	X
- River scour	X	X	X	X	
- Aufeis	X		X	X	
- Soil thermal regime	X	X	X	X	X
- Maintaining VSM integrity	X	X	X	X	X
- Construction blasting		X	X		
- Road crossings	X	X	X	X	X
- Pipeline crossings	X	X	X	X	X
- Cathodic protection		X	X	X	
- Protection of TAPS facilities	X	X	X	X	X
- Maintenance of access for TAPS	X	X	X	X	X
- Incompatible joint uses	X	X	X	X	X
OPERATIONS AND MAINTENANCE					
- Facility co-use	X	X	X	X	X
- Utility co-use	X	X	X	X	X

APPENDIX A: ANGDA PIPELINE IN PROXIMITY TO TRANS-ALASKA PIPELINE SYSTEM, DELTA JUNCTION TO GLENNALLEN: JOINT USE ISSUES SUMMARY BY PROJECT PHASES*

GASLINE SPUR PROJECT PHASES					
	PLANNING/ ALIGNMENT	*PERMITTING & ROW LEASE/GRANT*	*CONSTRUCTION*	*OPERATIONS & MAINTENANCE*	*DISMANTLING, REMOVAL, & RESTORATION*
JOINT USE TOPICS/ ISSUES					
- Joint surveillance		X	X	X	X
- Shared training		X	X	X	
- Shared material sites	X	X	X	X	
- Shared ROW maintenance		X	X	X	X
- Shared communications		X	X	X	X
- Shared bridge and crossing structures	X	X	X	X	
- Cathodic protection		X	X	X	
- ANGDA construction Oversight by TAPS		X	X		
- TAPS agreements for shared use and shared costs	X	X	X	X	X
REGULATORY & PERMITTING					
- Non-exclusive ROW	X	X	X	X	X
- ANGDA ROW lease conditions	X	X	X	X	X
- ROW lease conditions for other pipelines	X	X	X	X	X
- ROW lease conditions for fiber optic	X	X	X	X	X
- GVEA existing ROW	X	X	X	X	X
- ROW standoff	X	X	X	X	
- Highway indemnification	X	X	X		
- Federal & ASME design standards	X	X	X	X	

APPENDIX A: ANGDA PIPELINE IN PROXIMITY TO TRANS-ALASKA PIPELINE SYSTEM, DELTA JUNCTION TO GLENNALLEN: JOINT USE ISSUES SUMMARY BY PROJECT PHASES*

GASLINE SPUR PROJECT PHASES					
	PLANNING/ ALIGNMENT	*PERMITTING & ROW LEASE/GRANT*	*CONSTRUCTION*	*OPERATIONS & MAINTENANCE*	*DISMANTLING, REMOVAL, & RESTORATION*
JOINT USE TOPICS/ ISSUES					
- Legal liabilities & responsibilities	X	X	X	X	X

*Summary of ANGDA project phases in which currently identified joint use issues may occur; see "DRAFT Co-Use Issues Table" companion document for details and sources for identifying potential joint use issues.

APPENDIX B

APPENDIX B

ALASKA NATURAL GAS DEVELOPMENT AUTHORITY
POTENTIAL ISSUES ASSOCIATED WITH JOINT USE OF TRANS-ALASKA PIPELINE RIGHTS-OF-WAY

APPENDIX B: ALASKA NATURAL GAS DEVELOPMENT AUTHORITY
POTENTIAL ISSUES ASSOCIATED WITH JOINT USE OF TRANS-ALASKA PIPELINE RIGHTS-OF-WAY

Topics	Issues	References
	ENVIRONMENTAL	
Geology and Soils Materials Water Quality Spills Access for Trans-Alaska Pipeline System (TAPS) Maintenance & Operations Aesthetics & Viewshed	Reasonably Foreseeable Future Action – Oil and gas transportation – Natural Gas Pipeline. Cumulative Effects of Oil and Gas Transportation are: 1) soil and permafrost disturbance from construction and vehicular traffic, 2) sand, gravel, and stone resource use during construction (use for maintenance/operations not discussed), 3) surface water sedimentation, channel/flow changes, and introduction of pollutants during construction, bank/shore modifications, and petroleum spills 4) groundwater pollutant introduction from petroleum spills, 5) land use conflicts during construction and operation and fire response, 6) aesthetics, visible effects of construction and operation and petroleum spills or fire.	Final Environmental Impact Statement Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. U.S. Department of the Interior, Bureau of Land Management. BLM/AK/PT-03/005+2880+990. November 2002.
River and Stream Crossings	There are 49 river and stream crossings (39 minor, 10 major) on the proposed route. Most are on steep gradient streams and many occur on alluvial fans. 6 streams do not contain fish. 8 have anadromous fish, and 22 have critical fish periods. Gulkana River is a designated Wild and Scenic River. Minor Crossings: most on alluvial fans. Major Crossings: Jarvis Creek (high gradient, rock cobbles), Delta River (wide, braided), Phelan Creek (braided), Gulkana River. Timing is important for construction of stream crossings. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for Alaska Natural Gas Development Authority (ANGDA). September 2005.
River Crossing Impacts to Fish	Installation of pipe at crossings done by open-cut trenching. Gulkana River – horizontal directional drilling. To reduce sediment and avoid fish impacts – installation occurs in the winter months.[1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Surface Water Thermal Scour	Alteration of surface water drainage patterns. Impacts on surface water from frost bulbs at stream crossings. Could block groundwater under the stream and lead to formation of an ice anchor across the stream which would restrict surface flow. In winter, groundwater and stream flow could be forced onto the ice causing icing and dewatering of the stream. Forming a surface ice dam could redirect surface drainage patterns, creating stream channel modification, enhancing ice scour, and stream bank stability.	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.
River Crossings Impacts to Fish	Alaska Department of Fish and Game (ADF&G) recommends a standard minimum structural setback from all streams at 100 feet from Ordinary High Water. Protect fish and wildlife resources and habitats and ensure future access and recreational opportunities by protecting river and trail corridors. Incorporate buffers, easements, and setbacks.	Final Environmental Impact Statement Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. U.S. Department of the Interior, Bureau of Land Management. BLM/AK/PT-03/005+2880+990. November 2002. Comments from the John Kerigan, State Pipeline Coordinator's Office, ADF&G. August 19, 2002.

APPENDIX B: ALASKA NATURAL GAS DEVELOPMENT AUTHORITY
POTENTIAL ISSUES ASSOCIATED WITH JOINT USE OF TRANS-ALASKA PIPELINE RIGHTS-OF-WAY

Topics	Issues	References
Impacts to Wetlands Impacts to Fish	Locate structures away from riparian and wetland areas (when practical). Case-by-case approval for oil and gas facilities within 500 feet of fish bearing waterbodies and within 100 feet of non-fish bearing waterbodies.	*East Alaska Resource Management Plan Record of Decision Approved Plan.* U.S. Department of Interior, Bureau of Land Management, Glennallen Field Office. July 2007.
SAFETY AND SECURITY		
Safety	Safety concerns.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline, to Harold Heinze, ANGDA. February 2, 2006.
Protection of Trans-Alaska Pipeline System (TAPS) Facilities	Additional hardening of TAPS facilities, extraordinary supervision and surveillance of construction activities, and coordination between two pipeline operators. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Federal Safety Requirements	Block valves and blowdown valves are required along pipeline. Federal Gas Pipeline Regulations (49 CFR 192.179) require all locations along pipeline in a Class 1 location (all ANGDA line in a Class 1 location) must be within 10 miles of a block valve; therefore, valve spacing every 20 miles. A blowdown valve is required between each pair of block valves. (i.e. 7 block valves, 7 blowdown valves). Estimated pipe wall thickness of 24-inch API5LX80 pipe (based on Federal Safety Standards 49 CFR 192 – 0.53-inch for all general Class 1 locations and incased roadway crossings; 0.63-inch incased roadway crossings; and 0.76-inch compressor stations). [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Federal and ASME Pipeline Design Standards	Adequate for safety: Design and construction in accordance with ASME B31,9-1975 (or latest) "Gas Transmission and Distribution Piping Systems" and DOT 49 CFR 192, "Transmission of Natural and Other Gas by Pipelines". Special conditions may require use of good engineering practices to accommodate additional stresses. Example – Class 4 locations (superimposed traffic leads are heavy or numerous other utility lines are in proximity to TAPS). Use ANSI A841 and DOT 192.105 as guidelines for design pressure and nominal wall thickness for steel gas pipelines.	Memorandum from Vic Manikian to Harold Heinze, ANGDA. July 10, 2007.
Federal Design Standards	Surrounding land uses and population densities are incorporated in some existing regulations of pipeline operations. For example, 49 CFR 192, which applies to natural gas pipelines, defines area classifications on the basis of population density in the vicinity of a natural gas pipeline and specifies more rigorous requirements as human population density increases. A class location unit is defined as an area that extends 220 yards, or 1/8 mile, on either side of the centerline of any continuous 1-mile length of natural gas pipeline (49 CFR 192.5). Class locations are categorized by the extent and type of development within the boundaries— the more dense the development, the more stringent the requirements. There are four area classifications: Class 1. Locations with 10 or fewer buildings intended for human occupancy; Class 2. Locations with more than 10 but fewer than 46 buildings intended for human occupancy; Class 3. Locations with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building or small, well-defined outside area occupied by 20 or more people during normal use; and	*Transmission Pipelines and Land Use: A Risk-Informed Approach* – Special Report 281 Committee for Pipelines and Public Safety: Scoping Study on the Feasibility of Developing Risk-Informed Land Use Guidance Near Existing and Future Transmission Pipelines, Transportation Research Board of the National Academies. Washington, D.C. 2004 (Available at http://books.nap.edu/openbook.php?record_id=11046&page=43. Accessed on October 18, 2007).

APPENDIX B: ALASKA NATURAL GAS DEVELOPMENT AUTHORITY
POTENTIAL ISSUES ASSOCIATED WITH JOINT USE OF TRANS-ALASKA PIPELINE RIGHTS-OF-WAY

Topics	Issues	References
Federal Design Standards *(Continued)*	Class 4. Locations where buildings with four or more stories above-ground are prevalent. Natural gas pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil or 18 inches in consolidated rock; pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in soil or 24 inches in consolidated rock. Pipelines in Class 2, 3, and 4 locations must be installed with a minimum depth of cover of 36 inches in normal soil or 24 inches in consolidated rock. In addition, pipe wall thickness, pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, valve spacing, frequency of inspection and testing of welds, and frequency of pipeline patrols and leak surveys must conform to higher standards in more populated areas. According to API (2004), 48-inch cover over pipelines is required where a vehicle crossing is to be made for axle loads up to 15,000 pounds; 72-inch cover is required for railroads. However, ground cover is not to exceed 72 inches unless approved by the pipeline operator. Liquids pipelines do have depth of cover requirements based on the nature of the area, but class locations are not part of the liquids pipeline safety regulations.	
Explosion, Fire, Spill	Explosion, Fire, and Spill issues.	TAPS & Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
Homeland Security Blasting/Explosions Accidents	Homeland security concerns – co-use of key related facilities that may be high risk. Blast zone of gas pipeline impact on related TAPS facilities. Undesirable events due to explosions, fires, spills or loss of life.	Gas Pipeline Concerns. JPO September 26, 2007.
Homeland Security Sabotage Explosions	Homeland security concerns– There are no regulations as yet for pipelines; only security plans for 55 to 60-inch pipelines nationwide, TAPS has a Formal Plan; JPO works with the ATF. Fuel gas line is a risk to TAPS. Risk of intentional damage to facilities– armoring has to be examined at vulnerable locations (aboveground river crossings). Ruptures, explosions, and crack arrestors will be an issue. Under CFR, extra attention for recognized risk areas. Work with Homeland Security to get TAPS risk plans.	Comments by Jerry Brossia, JPO. September 26, 2007.
Protection of TAPS Facilities Shared Use of Rights-of-way (ROW) Shared Use of Resources & Services	Construction and operational safety concerns for a natural gas pipeline in proximity to the elevated and buried segments of TAPS. Protocols for shared use of non-exclusive ROW. Opportunities for shared services and facilities (security, emergency response, access roads, workpads, communication, electric power, maintenance). Shared activities including training programs with Alyeska Pipeline Service Company (APSC) and Native villages (first-aid, maintenance, fire watch and suppression, security, emergencies). Segregated radio usage and development of a common emergency communications system. Response protocol and system for emergencies.	Memorandum from Vic Manikian to Harold Heinze, ANGDA. June 24, 2007.
Blasting	Blasting through permafrost areas and solid rock may be hazardous to the oil pipeline. Minimal distances from the TAPS line will be established based on terrain and soil characteristics, covering the line with shields. Review plans with Alyeska and get their concurrence.	*Alaskan Gas Pipeline Status Report on Feasibility of Utilizing the Alyeska Work Pad and/or the Alyeska – State Haul Road.* El Paso Company. Undated.

APPENDIX B: ALASKA NATURAL GAS DEVELOPMENT AUTHORITY
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ENGINEERING & CONSTRUCTABILITY		
Standoff (Setback distance)	Contact APSC about operator concerns including standoff and proximity restrictions during construction and operation.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA, January 25, 2006.
Protection of TAPS Facilities	Specify enhancements and agreements to protect TAPS facilities and operations. Provide funding for APSC participation in joint engineering and feasibility studies to ensure TAPS safety, operations, and environmental concerns are identified and resolved.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline, to Harold Heinze, ANGDA. February 2, 2006.
Cathodic Protection	Cathodic protection required for both pipelines Interface – either electrical isolation or interconnected cathodic protection. Type of cathodic protection depends on soil type, coating efficiency, chemical properties of backfill and native soil, life cycle and costs (likely galvanic and impressed current types.[1]).	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Geology and Soils	Typical soils – construction trencher or track excavator. Soft rock – track excavator. Hard rock – drilling and blasting in addition to track excavator. Winter – Open-cut trenching. Work pads – gravel and snow/ice – 2-foot typical thickness to support heavy equipment; in some areas need thermal protection of 4-inches of board insulation below gravel pad. Regrade existing work pads, construct new work pads with imported gravel (some insulated).[1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Shared Use of Resources and Services	Protocols for shared use of non-exclusive ROW. Opportunities for shared services and facilities (security, emergency response, access roads, workpads, communication, electric power, maintenance). Shared activities including training programs with APSC and Native villages (first-aid, maintenance, fire watch and suppression, security, emergencies). Shared electrical power sources for ANGDA compressor stations and other facilities. Segregated radio usage and development of a common emergency communications system. Opportunities for use of TAPS bridge structures for gas pipeline crossings. Shared use of gravel resources from material sites. Common access duties, responsibilities, and protocols.	Memorandum from Vic Manikian to Harold Heinze, ANGDA. June 24, 2007.
Cathodic Protection	Cathodic protection issues.	TAPS & Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
Shared Use of Resources & Services Standoff Geotechnical and Soils Pipeline Design Cathodic Protection/Corrosion Buried/Elevated Mode Pipeline Crossings Geotechnical/Soil Stability Incompatible Uses *(Continued)*	Use decommissioned APSC pump station pads, airstrips, and related facilities. Separation of oil and gas pipelines in areas of high consequence; e.g. Fairbanks area. Pipeline surveillance, maintenance, and monitoring. Request APSC soils and geotechnical database information. Conduct reliability centered maintenance analysis of critical gas pipeline systems. Conduct new science and technology studies for design and construction; consider a Blue Ribbon Technical Advisory Panel for independent engineering review (include operation and maintenance component). Cathodic protection and corrosion issues.	Gas Pipeline Concerns. JPO. September 26, 2007.

[1] Assumptions made for costing purposes.

	Construction mode issues – aboveground versus below ground. Pipeline crossing in aboveground and belowground, road, river and fault crossings. Permafrost, soils, frost heaving, subsidence, soil liquefaction, and earthquake issues on both aboveground and belowground designs. Incompatible uses, e.g. security of TAPS, communication sites, work pad, etc.	
Materials Protection of TAPS Facilities Access for TAPS Maintenance & Operations Pipeline Crossings TAPS Approvals Standoff Shared Resources and Services	APSC will continue to coordinate with Alaska Natural Gas Transportation System (ANGTS) and Trans-Alaska Gas System (TAGS). TAPS present and long-term requirements for mineral materials (sand and gravel) must be recognized and provided for according to BLM and State of Alaska. Access roads and pipeline ROW must be kept open without interruption for TAPS operations and oil spill response. Above and below ground crossings of TAPS by TAGS must be approved by and coordinated with APSC. All areas where TAGS is within 200 feet of TAPS must require detailed review and coordination of construction design and activities with APSC. To the extent joint use may be appropriate for TAPS-related facilities, such as access roads or mineral material sites. APSC will require advance agreement to uses and sharing of costs. Written testimony from the State of Alaska, Office of the Governor, Office of Management and Budget, Division of Governmental Coordination to Jules Tileston BLM. Mitigation measures previously required of TAPS may be affected by new pipeline construction.	*Trans-Alaska Gas System Final EIS*, USDOI, BLM. BLM-AK-PT-88-003-1792-910. June 1988. Written testimony from Alfred T. Smith, General Council for Alyeska Pipeline Service Company to Jules V. Tileston USDOI, BLM - comments on the DEIS.
Protection of TAPS Facilities	Additional hardening of TAPS facilities, extraordinary supervision, and surveillance of construction activities, and coordination between two pipeline operators. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Fault Crossings & Seismic Hazards	Fault crossing and seismic hazard issues.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline, February 2, 2006.
Seismic	Denali Fault Zone Main Fault (TAPS designed 20' lateral/5' vertical; 2002 earthquake 19' lateral/4' vertical; maximum 29' lateral SEW portion of rupture zone); Donnelly Dome-Granite Mountain Fault (designed 3' horizontal/10'vertical), Denali Fault Zone: McGinnis Glacier splay (designed 8'horizontal/6'vertical); Broxson Gulch-McCallum Creek Fault (designed 2' horizontal/2'vertical – minor potential faults along TAPS), and Wrangell Wadati-Benioff Zone (unlikely). [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Seismic Geology and Soils	Liquefaction potential – loose, cohesionless sandy and silty soils may acquire viscous liquid flow characteristics during an earthquake. Pipeline buried in these soils tend to float or sink depending on buoyancy. Areas of high liquefaction potential include alluvium within braided river channels, and older alluvium with potentially shallow groundwater. Coarse glacial deposits and clayey lacustrine/peat deposits have low susceptibility to liquefaction.	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Seismic Geology and Soils *(Continued)*	7.9 magnitude Denali Fault earthquake in 2002 caused liquefaction in several buried segments of TAPS in the Delta River and Phelan Creek areas (MP 590.7-591.1; 592.7-592.9; 500.4-599.6; 606.4-606.8). Ground cracking occurred parallel to the sides of the original pipeline ditch where backfill surrounds the pipe. All liquefaction events occurred in relatively flat areas with less than 2% grade. [1]	
Seismic	According to the 2004 TAPS annual report from APSC, there are no active slopes between Delta	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost*

Slope Stability	and Glennallen. During the 7.9 Denali earthquake in 2002, there were a number of significant landslides and rockfalls several miles west of TAPS, but not in the ROW itself. [1]	*Assessment*, URS Corporation for ANGDA. September 2005.
Seismic (Fault Crossings)	Pipeline constructed above ground at fault crossings.[1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Seismic (Design Considerations)	Pipe designed to withstand all seismic hazards. Ground shaking –Assume all pipes are bonded to the surrounding soil with no slippage between soil and pipe; select suitable pipe wall thickness to accommodate all anticipated seismic, earth, internal pressure, and thermal loads. Liquefaction – TAPS designed through soils susceptible to liquefaction by burial below liquefiable layers; removal and replacement of liquefiable soils – both performed adequately through Denali Fault Earthquake. For ANGDA pipe- both approaches above are feasible and economical. Fault Crossings Design: Place pipe on aboveground supports; place pipe in aboveground berm constructed of low-strength soil; place pipe in oversized ditch surround by low-strength crushable material; encase pipe within buried oversized culverts. TAPS was constructed on aboveground supports and performed well in Denali Fault earthquake. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Seismic	Above-ground facilities (compressor stations, block valves) would be susceptible to seismically-induced landslides and rockfalls. Choice of location could eliminate the problem.	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.
Seismic Geology and Soils	Permittee shall identify and delineate all recognizable and reasonably inferred faults or fault zones along the alignment and address risk of leakage resulting from fault movement and ground deformation. Evaluation should address geologic, geomorphic, geodetic, seismic, and other appropriate scientific evidence of past or present fault behavior. No storage tank or pump shall be located in a fault zone. Pipeline resists leakage from 2-foot vertical/horizontal displacement. Annual monitoring where pipeline crosses a fault or lies within a fault zone for crustal deformation including annual geodetic observation or permanent reference marks established on stable ground. If annual slip on a fault exceeds 0.10 feet for two successive years, shall install recording and telemetering slip meters.	Amendment of Conditional Right-of-way Lease for the Trans-Alaska Gas System ADL 4213342. June 2, 1993. Between the State of Alaska and Yukon Pacific Corp.

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Topics	Issues	References
Seismic	Seismic hazards should be based on 1974 USGS data and earthquake design criteria developed by Dr. William Hall and used for TAPS. Design and stresses generated should be simple to absorb. Crossing of major faults should be aboveground similar to TAPS design of concrete beam support system.	Memorandum from Vic Manikian to Harold Heinze, ANGDA. July 10, 2007.
Fault Crossings	Fault crossing issues.	TAPS & Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
Road Crossings	Use jack and bore technology for road crossings. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Highway Indemnification	Highway indemnification and other road and access road related issues.	Gas Pipeline Concerns. JPO. September 26, 2007.
River Crossings	River crossings (2 difficult) and stream crossings (19 difficult) within Delta Junction to Glennallen segment.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline to Harold Heinze, ANGDA. February 2, 2006.
River Crossings	Use of horizontal directional drilling (HDD) at Gulkana River Crossing. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
River Crossings Scour	Pipelines shall cross streams underground unless approved. The depth of channel scour shall be established by field investigations and theoretical calculations using water velocity and depth. At a point of maximum scour, the pipe cover shall be at least 20% of computed scour, but not less than 4 feet. Overhead crossings shall be protected from scour, channel migration, undercutting, ice forces and degradation of permafrost. Trench excavation shall stop an adequate distance from the water crossing to leave a protected plug of unexcavated material at each bank. Plugs will be left in place until pipe laying operations begins. Trenches will be backfilled with stable material as soon as pipe is laid. Slopes of cuts in stream banks will be designed to minimize erosion and prevent slides. Erosion control procedures shall accommodate maximum rainfall rate and snow melt rate combination.	Amendment of Conditional Right-of-way lease for the Trans-Alaska Gas System ADL 4213342. June 2, 1993. Between the State of Alaska and Yukon Pacific Corp.
River Crossings	River crossings should be based on field surveys and TAPS scour calculation methods. Gulkana River crossing could be elevated 400-foot wide suspension bridge design similar to TAPS Tanana River crossing design as opposed to HDD technique (costly).	Memorandum from Vic Manikian to Harold Heinze, ANGDA. July 10, 2007.
River Crossings	River crossing issues.	TAPS & Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
River Crossings	Stay out of rivers and minimize riprap. See the BLM East Management Plan for rationale.	Comments by Joe Dygas, JPO, September 26, 2007.
Crossings of TAPS	TAPS crossing issues.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline to Harold Heinze, ANGDA. February 2, 2006.

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Pipeline Crossing	Segments that include pipeline crossings: Alaska Highway to North side of Donnelly Dome – 5 crossings Delta River Floodplain – Taps Pump Station 10 Delta River Floodplain/Phelan Creek Crossing – crossing of a spur field Phelan Creek Drainage – crossing a spur field Summit to Sourdough – 2 TAPS special bury sections Copper River Valley – TAPS Special Bury Section #3. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Pipeline Crossing	Crossings necessary because of changes in topography, ground conditions and hazards, location of work pad and maintenance road alternate from one side of TAPS pipeline to the other several times between Delta Junction and Glennallen. To share these facilities, ANGDA pipeline must cross TAPS. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Pipeline Crossing	When TAPS is aboveground, ANGDA crossing underground or at ground surface midway between vertical support members. Where soils at crossing locations are thaw unstable, design would accommodate mitigation. When TAPS buried, ANGDA crossing under, with sufficient vertical clearance between pipes, or install at ground surface. Soils likely thaw stable based on TAPS design criteria. Adequate vertical separation and recommend insulating ANGDA line. Assume ANGDA pipe insulated at all crossing locations. All bends in ANGDA line to have a radius of no less than 3 times the diameter of the pipe to allow passage of pigs. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Access	TAPS is sometimes a barrier to access of public land resources. APSC worked with the Kenny Lake Soil and Conservation District and the Alaska Association of Conservation Districts to create access to state lands west of TAPS MP 704.2. The project involved construction of approach roads and a bridge over a segment of below ground pipe. APSC worked with the team on bridge design and performed a substantial amount of bridge installation.	Final Environmental Impact Statement Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. U.S. Department of the Interior, Bureau of Land Management. BLM/AK/PT-03/005+2880+990. November 2002. Comment from DNR, Natural Resource Conservation and Development Board.
Standoff	Standoff and Proximity Restriction issues.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA. January 25, 2006.
Standoff	Standoff distances for other gas lines routes is a minimum of 200 feet.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline to Harold Heinze, ANGDA. February 2, 2006.
Shared Use of Resources and Services	TAPS work pad used by ANGDA as a primary work pad for construction, operation, and maintenance presents safety and operational concerns.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline to Harold Heinze, ANGDA. February 2, 2006.
Standoff\ Shared Use of Resources and Services	Below ground construction is preferable because of pipeline protection and safety, except will need above ground crossings necessary for fault crossings. Construction of a 24-inch diameter buried gas pipeline will require a working surface of 27 feet in width with a passing lane width of 13 feet for a minimum work pad width of 40 feet. For most of the length of the route, material quantities can be reduced by construction of the working surface adjacent to the existing TAPS maintenance road which would be used as a passing lane for ANGDA construction. The passing lane would not be blocked by construction equipment and would cause minimal impact to TAPS operations. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Standoff Protection of TAPS Facilities *(Continued)*	Most serious concern is damage to TAPS during construction. Operations and maintenance of TAPS could be impaired by gas line construction and operations.	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.

Topics	Issues	References
	Possible mitigation: extraordinary supervision and surveillance of construction activities; hardening of TAPS facilities with headache bars, barricades, berms, and coordination of construction, operations, and maintenance with ROW. [1]	
Shared Use of Resources & Services Protection of TAPS Facilities Blasting Geology and Soils Stream Crossings Thermal	A mile-by-mile analysis will investigate the availability of work space, possibility of damages to either pipeline, possibility of interference between the pipelines, costs and economic feasibility; compatibility with the environment, and approvals by Alyeska and the governmental agencies. Estimate 40 to 50% of the alignment might be along the Alyeska work pad or the haul road. Alignment was designed at the same time TAPS was working on their design (field reconnaissance summer 1973). 350 feet was left between the two alignments (based on TAPS project description) to avoid interference with ROW, compounding surface damage, and to eliminate thermal interference (at the time this was written, TAPS was under construction). Adequate work space must be available on the work pads. On level ground this will not be a serious problem where oil pipeline is buried. If above ground, the width of the work pad is critical to avoid damage to the oil line which will be difficult in mountainous terrain, along narrow ridges and valleys, river floodplains and side slopes. Construction damage – Alyeska controlled construction damage on TAPS, and no reason to believe the gas pipeline can not do the same. Blasting necessary to ditch for the gas pipeline through permafrost areas and solid rock which may be hazardous to the oil pipeline. Minimal distances from the TAPS line will be established based on terrain and soil characteristics, covering the line with shields. Review plans with Alyeska and get their concurrence. In areas where TAPS is aboveground, gas line should be constructed in the winter to minimize thawing to control slope failure and differential settlement that can stress pipe. Slope stability problems will exist where the 2 pipelines are close together on steep side slopes, narrow ridges, or at stream crossings. Stream crossings – doubtful the 2 lines or the gas line and the haul road could be constructed close enough to use the TAPS work pad. Cuts will be deep and ditches excavated across the streams will be deep and require a wider work space. Gas pipeline excavations could affect the stability of the bridge. Thermal influence of the hot oil pipeline and the chilled gas line would not be compatible. The oil pipeline has a thaw bulb (below ground portions). The chilled line will have a frost bulb. Neither bulb will be uniform. Ice dams could form underground and cause disruption to surface and subsurface drainage patterns; therefore, incompatible with co-location in floodplain areas. Mile 589 to 673 (south of the Delta River Floodplains): It might be possible to use almost all of the work pad in this section except at stream crossings (estimated 80 miles).	*Alaskan Gas Pipeline Status Report on Feasibility of Utilizing the Alyeska Work Pad and/or the Alyeska – State Haul Road.* El Paso Company. Undated.
Standoff	Work zone width and construction proximity.	TAPS & Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
Standoff	Work zone width, construction proximity, and conflicts.	Gas Pipeline Concerns. JPO. September 26, 2007.
Thermal	Feasibility of constructing a chilled gas pipeline in close proximity to a hot oil pipeline. TAPS 48-inch line carries warm crude oil (between 80°F at Delta Junction to 70°F at Glennallen)	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.

Topics	Issues	References
	through discontinuous permafrost. The alignment was selected because of the maximum length of non-permafrost areas and permafrost with low ice content. TAPS includes aboveground and belowground modes to accommodate unstable, ice rich, permafrost conditions, and ice rich seasonal frost conditions. Some pipe was buried with specially insulated refrigerated systems to keep the pipe foundation frozen in areas of animal crossings. The pipeline was buried in areas of competent bedrock or soils naturally devoid of permafrost, seasonal frost, or thaw stable permafrost. [1]	
Thermal	No significant long-term permafrost degradation is anticipated in above ground and refrigerated buried portions of the TAPS pipeline. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Thermal	ANDGA pipeline thermal impacts depend on: Temperature of the gas in the line (a design variable); Volume of gas transported (target is 1.2 billion standard cubic feet per day (bscfd) at a maximum Operating pressure of 2500 psi); Ground thermal conditions along the pipeline route and its variations over time. Challenge for the buried pipe through discontinuous permafrost region is to keep the frozen ground frozen and the thawed ground thawed. If gas is chilled to keep the operating temperature below 32°F, permafrost will be protected, but when it traverses thawed ground, the ground could be subjected to a freeze bulb and aufeis formation could be precipitated by the chilled line and may be a concern for TAPS. However, the ANGDA line will be below TAPS, on the cross slope, which will minimize aufeis interference. Solutions: Insulate pipe to control heat transfer between pipe and soil; Replace thaw unstable soil around pipe within freeze bulb and seasonal frost; Freeze thawed soil with vertical thermopipes; All these methods have been employed by TAPS. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Thermal	Chilled gas pipeline could impact shallow groundwater in thawed soils causing disruption of subsurface drainage, ice formation, and buildup (aufeis), frost heave, and thaw settlement. Potential mitigation: buried pipe in non-frost susceptible materials; insulate pipe; bury pipe deeper; construct pipe aboveground.	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.

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Thermal	Any construction will impact permafrost brought on by compaction or removal of surficial material, changes in water regime (standing or flowing over it), and climate, and will have long-term effects. Thawing of the permafrost can cause subsidence of surface soils, slope failure, solifluction (slow, downhill movement of soil or other material in areas typically underlain by frozen ground), gullying and establishment of new drainage patterns, and slow revegetation. Natural disturbances of permafrost (climate, lake drainage, stream channel migration, fire, solifluction) especially prior to gas flow, could result in loss of pipeline support or floating of the pipeline. Chilling the gas would prevent long-term degradation of the permafrost, but would cause an ice bulb to form. The size of the ice bulb would depend on the temperature of the gas, the permeability and porosity of the soil, and the water content of the soil. The effect of the frost bulb and creation of permafrost in formerly unfrozen soils under streams and across subsurface drainage zones would be significant. In permafrost regions, after construction, but prior to introduction of chilled gas, the pipeline could be lifted out of the ground during the winter by frost heaving. It would also be susceptible to thermal melting or thermal erosion during the intervening thaw period. The pipe trench could become water filled and reduce the strength of the bedding materials. On slopes, the trench could divert and capture local drainage, causing erosion and removal of the bedding material. Frost heave could uncover the pipe.	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.
Thermal	Subsurface drainage would be impacted by frost bulb. It would form a dam to subsurface water. Subsurface water would be ponded on the upslope side of the frost bulb which would accelerate thawing of the adjacent permafrost and prolong revegetation. In fine grained saturated silty soil, frost bulb formation could induce formation of ground ice creating frost heaves.	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.
Thermal	Frost Heave: Input to thermal design should include ground temperature data from field thermistor installations for structural analysis of pipeline. Identify time dependency of the frozen/thawed soil state over design life of the pipeline. Mitigation – use dense, non-frost susceptible material in the frozen soil/pipeline composite (SPC) zone to minimize or eliminate ice lens formation. Thaw protection – insulation over pipe to ensure SPC integrity; soil weight added to pipeline (overlaying material) may retard frost heave. Concept suggests that frost heave could be bridged by SPC structural segment.	Memorandum from DNR State Pipeline Coordinator's Office, Vic Manikian to Greg Swank Deputy Coordinator of Engineering for Yukon Pacific Corp, Trans-Alaska Gas System Thermal Analysis Requirements. November 13, 1992.
Thermal *(Continued)*	Pipeline placement in constructed embankments could be desirable where groundwater table is high. Pipe ovaling from heave needs to be addressed. Conventional foundation design approach involves restriction of freezing front advancement using insulation, induced heat, embedment to a depth sufficient for resisting frost heaves. Redirection of freezing front by use of heat pipes has the potential to minimize vertical frost heave effects. Use of mechanical refrigeration devices more costly.	
Thermal	Elevate/above ground the pipe on T-head bents at 50-foot intervals for the 86 miles of silty soils in	Memorandum from Vic Manikian to Harold Heinze, ANGDA. July 10, 2007.

Topics	Issues	References
	5 segments along the Delta to Glennallen segment. (Segments 2 – TAPS MP 553-571, 4 – MP 588 to 589, 6 – MP- 593 to 599, 8 - MP 615 to 638, 10 – MP 647 to 685). Geotechnical investigation of buried segments will be done during detailed design. Design of TAPS pipeline in Delta Junction to Glennallen segment is based on geotechnical investigations, which established the thaw stability of the ground. Selection of construction mode (elevated or buried pipeline was based on these investigations. Five areas have been identified where frost heave may be a problem: Segment 2 - TAPS MP 553-571 (18 miles); Segment 4 - TAPS MP 588-589 (1 mile); Segment 6 - TAPS MP 593-599 (6 miles); Segment 8 - TAPS MP 615-638 (23 miles); and Segment 10 - TAPS MP 647-685 (38 miles). Different design solutions for buried or chilled pipelines will be considered during the detail design of the pipeline, which will include use of insulation and/or use of soil weight. The added weight to the pipeline (overlaying material) may be of such a magnitude that at least a portion of any possible heave movement would be retarded.	
Thermal	Conventional burial pipeline design does not address heat transfer problems in seasonally frozen discontinuous permafrost or frost heaving of chilled pipeline. Estimate of pipeline temperature profile should be determined. Frost heave is most determinate parameter for considering alternate designs.	Memorandum from Vic Manikian to Harold Heinze, ANGDA. July 10, 2007.
Thermal	A 2-mile long buried section of pipe near the Gulkana River, north of Glennallen requires mechanical refrigeration to ensure soils remain frozen. Lack of adequate refrigeration caused soils to thaw beneath the pipe and settlement and curvature of the pipe. It is not considered a significant issue if 1) curvature remains constant or decreases, 2) oil temperatures does not increase significantly and 3) pipe wall wrinkling does not occur. Thermistor string (to monitor temperature) and monitoring rods (to monitor curvature) were placed in the ground. New permanent refrigeration plants were constructed and are now in operation.	*Comprehensive Monitoring Program Report. A Look at Alyeska Pipeline Service Company's Operation of the Trans-Alaska Pipeline System 1999.2000.* Joint Pipeline Office. February 2001.

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Thermal	(NOTE: Not in the ANGDA spurline area, but observations may be pertinent to some areas further north near the Gulkana River). Discontinuous permafrost in the Copper River Basin, specifically on two slopes approaching Squirrel Creek have caused problems with VSM settlement and heave without appearing to adversely impact the integrity of the aboveground pipeline system. Much of the route is underlain by overconsolidated glacial clay and silt formations. Other considerations included slope steepness that was addressed by cuts to slopes to no more than 27% in the Copper River basin formations. Research revealed that VSMs were settling, leaning, and heaving because there was an ice lens below the depth of the VSM bottoms. The thaw front had reached the upper part of the ice lens, although, there was still a frost bulb around the VSM. It was concluded that the wide zone of vegetation clearing in the area coupled with a south facing slope resulted in the development of a deep thaw bulb.	*Performance of the Squirrel Creek Slopes Steep Slopes on Discontinuous Permafrost.* Rupert G. Tart Jr. and John E. Ferrell. Date Unknown (later than 2001).
Thermal	75% of pipeline passes through permafrost terrain. Design solutions include: 1) aboveground pipe elevated on pilings where thaw-unstable permafrost is encountered; (420 miles of TAPS pipeline is elevated to protect permafrost.) 2) below-ground pipeline, conventional burial where either unfrozen or thaw stable permafrost is encountered with no special provisions for permafrost; 3) below-ground pipeline, special burial where thaw-unstable permafrost is encountered with ground refrigeration systems along with pipe insulation. 2-inch heat pipes containing pure ammonia are used to cool the ground. The ammonia vaporizes below ground and rises, drawing heat out of the ground. The ammonia condenses at the top of the pipe and returns to the bottom.	Alyeska Pipeline Service Company Website, Permafrost. Available at http://www.alyeska-pipe.com/Environmental/permafrost.html. Viewed on October 11, 2007.
Thermal	Thermal design and potential interactions warm and chilled pipelines.	TAPS & Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
Thermal	Thermal design considerations and potential interactions.	Gas Pipeline Concerns. JPO. September 26, 2007.
Thermal	Ice lens thawing at Squirrel Creek increased VSM to 50 feet rather than 35. OD Odsather pointed out that the vegetation was removed, and the exposed ground acted as a heat sink to accelerated thaw.	Comments by Jerry Brossia, JPO. September 26, 2007.
Explosions	Explosion Hazard – address TAPS concerns and DOT codes for natural gas characteristics and internal pressures.	Memorandum to Harold Heinze, ANGDA from Vic Manikian, ANGDA. URS Proposed SOW, Engaging APSC and 3 owner companies to evaluate the feasibility of the co-use of the TAPS ROW for a 24-inch natural gas pipeline between Delta Junction and Glennallen. June 24, 2007.
OPERATIONS AND MAINTENANCE		
Geology and Soils Materials Spills Access for TAPS Operations View Shed	Reasonably Foreseeable Future Action – Oil and gas transportation – Natural Gas Pipeline. Cumulative Effects of Oil and Gas Transportation are 1) soil and permafrost disturbance from construction and vehicular traffic, 2) sand, gravel, and stone resource use during construction (use for maintenance/operations not discussed),	Final Environmental Impact Statement Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. U.S. Department of the Interior, Bureau of Land Management. BLM/AK/PT-03/005+2880+990. November 2002.

APPENDIX B: ALASKA NATURAL GAS DEVELOPMENT AUTHORITY
POTENTIAL ISSUES ASSOCIATED WITH JOINT USE OF TRANS-ALASKA PIPELINE RIGHTS-OF-WAY

Topics	Issues	References
Geology and Soils Materials Spills Access for TAPS Operations View Shed *(Continued)*	3) surface water sedimentation, channel/flow changes, and introduction of pollutants during construction, bank/shore modifications, and petroleum spills 4) groundwater pollutant introduction from petroleum spills, 5) land use conflicts during construction and operation and fire response, 6) aesthetics, visible effects of construction and operation and petroleum spills or fire.	
Materials Access for TAPS operations Pipeline Crossings TAPS Approvals Joint Use Standoff	APSC will continue to coordinate with ANGTSs and TAGS. TAPS present & long-term requirements for mineral materials (sand and gravel) must be recognized and provided for according to BLM. Access roads and pipeline ROW must be kept open without interruption for TAPS operations and oil spill response. Above and below ground crossings of TAPS by TAGS must be approved by and coordinated with Alyeska Pipeline Service Company (APSC). All areas where TAGS is within 200 feet of TAPS must require detailed review and coordination of construction design and activities with APSC. To the extent joint use may be appropriate for TAPS related facilities, such as access roads or mineral material sites, APSC will require advance agreement to uses and sharing of costs. Written testimony from the State of Alaska, Office of the Governor, Office of Management and Budget, Division of Governmental Coordination to Jules Tileston BLM – Construction of other pipeline may affect mitigation measures previously required of TAPS.	*Trans-Alaska Gas System Final EIS*, USDOI, BLM. BLM-AK-PT-88-003-1792-910. June 1988. Written testimony from Alfred T. Smith, General Council for Alyeska Pipeline Service Company to Jules V. Tileston USDOI, BLM - comments on the DEIS.
Protection of TAPS Facilities Shared Use of Resources and Services	Safety, construction, and operational concerns for a natural gas pipeline in proximity to the elevated and buried segments of TAPS. Protocols for shared use of non-exclusive ROW. Opportunities for shared services and facilities (security, emergency response, access roads, workpads, communication, electric power, and maintenance). Shared activities including training programs with APSC and Native villages (first-aid, maintenance, fire watch and suppression, security, emergencies). Shared electrical power sources for ANGDA compressor stations and other facilities. Segregated radio usage and development of a common emergency communications system. Opportunities for use of TAPS bridge structures for gas pipeline crossings. Response protocol and system for emergencies. Shared use of gravel resources from material sites. Common access duties, responsibilities, and protocols.	Memorandum from Vic Manikian to Harold Heinze, ANGDA. June 24, 2007.
Standoff	Contact APSC about operator concerns including standoff and proximity restrictions during construction and operation.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA, January 25, 2006.
Protection of TAPS Facilities	Need to specify enhancements and agreements to protect TAPS facilities and operations.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline, to Harold Heinze, ANGDA. February 2, 2006.

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Seismic	Above-ground facilities (compression stations, block valves) would be susceptible to landslides and rockfalls. Choice of location could eliminate the problem.	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976
Shared Use of Resources and Services	TAPS work pad used as a primary work pad for construction, operating, and maintenance presents safety and operational concerns.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline to Harold Heinze, ANGDA. February 2, 2006.
Protection of TAPS Facilities	Most serious concern is damage to TAPS during construction. Operations and maintenance of TAPS could be impaired by gas line construction and operations. Possible mitigation: extraordinary supervision and surveillance of construction activities; hardening of TAPS facilities with headache bars, barricades, berms, and coordination of construction, operations, and maintenance. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Thermal	Maintaining operating gas temperature depends on the following: Gas supply temperature after conditioning at the compressor station; Ground temperature along the pipeline route; Volume rate of gas flow; Frictional energy developed at the pipe wall; Insulation. At colder temperatures, there are no concerns. At warmer temperatures, ground will add thermal energy to the gas and increase the temperature. Chilling at the compressor stations will be required (likely 2 between Delta and Glennallen approximately 75 miles apart). Within warm permafrost region with no insulation, a temperature change of 2° to 4°F is anticipated. Within thawed region with no insulation, a potential temperature change of up to 17°F is anticipated; with 4 inches of insulation, the change is 3°F. [1]	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Thermal	Construction will impact permafrost by compaction or removal of surficial material, and changes in water regime (standing or flowing over it), and climate; and will have long-term effects. Thawing of the permafrost can cause subsidence of surface soils, slope failure, solifluction (slow, downhill movement of soil or other material in areas typically underlain by frozen ground), gulling and establishment of new drainage patterns, and slow revegetation. Natural disturbances of permafrost (climate, lake drainage, stream channel migration, fire, solifluction) especially prior to gas flow, could result in loss of pipeline support or floating of the pipeline. Chilling the gas would prevent long-term degradation of the permafrost, but would cause an ice bulb to form. The size of the ice bulb would depend on the temperature of the gas, the permeability	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.

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Topics	Issues	References
Thermal *(Continued)*	and porosity of the soil, and the water content of the soil. The effect of the frost bulb and creation of permafrost in formerly unfrozen soils under streams and across subsurface drainage zones would be significant. In permafrost regions, after construction but prior to introduction of chilled gas, the pipeline could be lifted out of the ground during the winter by frost heaving. It would also be liable to thermal melting or thermal erosion during the intervening thaw period. The pipe trench could become water filled and reduce the strength of the bedding materials. On slopes, the trench could divert and capture local drainage, causing erosion and removal of the bedding material. Frost heave could uncover the pipe.	
Thermal	Chilled gas pipeline could impact shallow groundwater in thawed grounds causing disruption of subsurface drainage, ice formation, and buildup (aufeis), frost heave, and thaw settlement. Potential mitigation: buried pipe in non-frost susceptible materials; insulate pipe; bury pipe deeper; construct pipe aboveground.	*Delta Junction to Glennallen Natural Gas Pipeline Engineering Feasibility and Cost Assessment*, URS Corporation for ANGDA. September 2005.
Thermal	Subsurface drainage would be impacted by frost bulb. It would form a dam to subsurface water. Subsurface water would be ponded on the upslope side of the frost bulb, which would accelerate thawing of the adjacent permafrost and prolong revegetation. In fine grained saturated silty soil, frost bulb formation could induce formation of ground ice creating frost heaves.	*Alaska Natural Gas Transportation Systems Final EIS. Volume II. El Paso Alaska Company. Docket No. CP 75-96.* Federal Power Commission, Washington, DC. U. S. Department of Commerce, National Technical Information Service PB-272 749. April 1976.
Thermal	A 2-mile long buried section of pipe near the Gulkana River, north of Glennallen requires mechanical refrigeration to ensure soils remain frozen. Lack of adequate refrigeration caused soils to thaw beneath the pipe and settlement and curvature of the pipe. It is not considered a significant issue if 1) curvature remains constant or decreases, 2) oil temperatures does not increase significantly and 3) pipe wall wrinkling does not occur. Thermistor string (to monitor temperature) and monitoring rods (to monitor curvature) were placed in the ground. New permanent refrigeration plants were constructed and are now in operation.	*Comprehensive Monitoring Program Report. A Look at Alyeska Pipeline Service Company's Operation of the Trans-Alaska Pipeline System 1999.2000.* Joint Pipeline Office. February 2001.
Thermal	NOTE: Not in the ANGDA spurline area, but observations may be pertinent to some areas further north near the Gulkana River). Wet zones appear on the pad during some periods of the year causing mounds and voids to form. The frost bulb around the VSM and the active frozen layer connect, but the freeze front has not reached the bottom of the permeable workpad. Water is perched on the low permeability silts and clays under the workpad. It flows downslope and is trapped by the freeze fronts from the active layer and the frost bulb around the VSM. Heaving occurs as the water freezes, and there is more expansion at the upslope freeze front.	*Performance of the Squirrel Creek Slopes Steep Slopes on Discontinuous Permafrost.* Rupert G. Tart Jr. and John E. Ferrell. Date Unknown (later than 2001).

Topics	Issues	References
Thermal *(Continued)*	Monitoring programs were established to track the long-term movements of the VSMs, including tracking thermal changes, groundwater conditions, and slope movement. Thermistor strings, piezometers, slope indicator casings, sondex settlement casings, and shoe movement instruments were installed and monitored for more than 12 years. Thermistor strings showed some slight warming, but no significant areas of thermal change. The major change was in the active layer. As the active layer freezes, it heaves the VSM. As the groundwater freezes in the gravelly workpad capping the slope, it loosens the fill. The analysis concluded that clearing the south facing sloped resulted in the development of a deep thaw bulb around and under the VSM. The solution was to install deep heat pipes near the VSMs to prevent further thaw below.	
REGULATORY AND PERMITTING		
Right of Way (ROW)	State ROW after construction equals 50 feet (25 feet either side of the line) plus the ground occupied by the pipeline and facilities and 25 feet around the perimeter of the related facility plus the ground occupied by the facility.	*Right-of-way Lease for Trans-Alaska Pipeline between the United States of America and Amerada Hess Corporation, ARCO Pipe Line Company, Exxon Pipeline Company, Mobil Alaska Pipeline Company, Phillips Petroleum Company, Sohio Pipe Line Company, and Union Alaska Pipeline Company*, ADL 63574, May 3, 1974.
ROW	Excepted from the Grant are all lands selected and approved to the State of Alaska under the Alaska Statehood Act 72 Stat. 339, as amended and all lands withdrawn under Section 11(a)(2) of the Alaska Native Claims Settlement Act 85 Stat. 696, 43 USC 1610. Secretary of the Interior must approve location or construction of another pipeline within the ROW. Permittee shall not allow any person or business entity to use the ROW. Surface ROW width [OPERATIONS] is 50 feet total plus the ground occupied under the pipeline, but may be modified by permittee. ROW becomes 25 feet on either side of pipeline or 25 feet around the perimeter of the related facility. Additional land for ROW is approved by the Authorized Officer. Provide Public Crossing – Stipulation 1.12.3.	*Agreement and Grant of Right-of-way for Trans-Alaska Pipeline between the United States of America and Amerada Hess Corporation, ARCO Pipe Line Company, Exxon Pipeline Company, Mobil Alaska Pipeline Company, Phillips Petroleum Company, Sohio Pipe Line Company, and Union Alaska Pipeline Company*, January 23, 1974.
ROW	ROW lease dated May 3, 1974, with State of Alaska though Commissioner of Natural Resources. Use all practical means to preserve and protect the environment taking into account benefit or detriment to persons or property and environment, environmental, technical, and economic benefits and detriment to proposed course of conduct; use best practicable engineering technology with regard to permafrost and seismic areas. After pipeline commissioning – ROW not exceeding 100 feet in width along length of pipe unless authorized by Commissioner to retain wider ROW. State reserves the right to grant additional permits or easements for ROW or other uses to third parties for compatible uses on or adjacent to lands subject to ROW. Before granting ROWs for compatible use, State will notify Lessees of its intentions and shall consult with Lessees before taking final action (State must comply with AS 38.05.130).	*Right-of-way Lease for Trans-Alaska Pipeline between the United States of America and Amerada Hess Corporation, ARCO Pipe Line Company, Exxon Pipeline Company, Mobil Alaska Pipeline Company, Phillips Petroleum Company, Sohio Pipe Line Company, and Union Alaska Pipeline Company*, ADL 63574, May 3, 1974.
ROW	State reserves the right to grant additional permits, leases, or easements for ROWs or other uses to third parties for compatible uses on or adjacent to the lands subject to the ROW provided that such grants will not unreasonably interfere with the rights under this lease. State will notify lessee prior to granting additional ROW.	*Conditional Right-of-way Lease for the Trans-Alaska Gas System ADL 413342 Yukon Pacific Corporation and State of Alaska Department of Natural Resources Division of Land and Water Management State Pipeline Office*, December 1988.

Topics	Issues	References
ROW *(Continued)*	Submit pipeline and related facility site locations on maps to Commissioner for approval and field stake specific portions of the alignment for submittal to the owners and agents for TAPS, other authorized oil or gas transportation pipelines, or other existing or proposed facilities. Project Plans and Programs or Project Performance Standards coordinated with other agents and owners.	
ROW	Extends Yukon Pacific lease from December 11, 1998 to December 11, 2008.	Letter – *Renewal of the Conditional ROW Lease for the Trans-Alaska Gas System (TAGS) ADL 413342*. Dec 11, 1998.
ROW	Coordination with TAGS (Yukon Pacific has a conditional ROW).	Comment by Jerry Brossia, JPO. September 26, 2007.
ROW	ROW is 500 feet on either side of the pipeline, or related facilities, after survey of installed line is complete.	Letter – *Amendment of the Conditional ROW Lease for the Trans-Alaska Gas System (TAGS) ADL 413342* – Jun 3, 1993.
ROW	Renewed TAPS ROW from January 22, 2004 to January 22, 2034. Grants ROW across all lands including public and acquired lands, lands for National Forests, military purposes, and power development. Grant made without limitation to valid, preexisting rights of the State of Alaska. Width of ROW is 50 feet (25 feet either side of the line) plus the ground occupied by the pipeline and facilities and 25 feet around the perimeter of the related facility plus the ground occupied by the facility. Permittees shall not use the ROW for any other purpose or pipelines. Reserves the right to grant additional permits or easements for ROW to 3rd parties for compatible uses on, or adjacent, to the lands subject to ROW. Before the U.S. Grants an additional ROW or permit for compatible use, U.S. will notify Permittees of intentions and will consult with Permittees before taking final action. Must abide by requirements of DOD relating to military installations and Federal Power Commission relating to power.	*Renewal of the Agreement and Grant of Right-of-Way for the Trans-Alaska Pipeline and Related Facilities between The United States of America and Amerada Hess Pipeline Corporation, BP Pipelines (Alaska) Inc., ExxonMobil Pipeline Company, Phillips Transportation Alaska, Inc., Unocal Pipeline Company, and Williams Alaska Pipeline Company, LLC.* January 8, 2003.
Shared Use of Resources and Services	Co-use of TAPS workpad impacts land rights held by TAPS Owner Companies.	Letter From Kevin M. Hostler, President and CEO of Alyeska Pipeline, February 2, 2006.
ROW Department of Defense (DOD)	On DOD land, crossing of the petroleum, oil and lubricant (POL) line will be coordinated with the affected installation commander and Petroleum Distribution Office. Pipeline shall be buried between Station 8400+70 and 8511+51 and from Stations 85554+00 to 8562+46. Burial depth shall be sufficient to permit surface crossing of the ROW by heavy tracked or wheeled vehicles at existing roads and runways or relocated. May construct aboveground pipeline with permission of the installation commander if it does not interrupt the military mission. Clearance of all military pipelines, conduits, cables, communications lines, utility lines shall be a minimum of 12 inches. The U.S. reserves the right to construct, use, and maintain across, over and or under the ROW, oil, and sewer lines and other facilities without unreasonable interference with the use of the ROW. Cannot construct or operate in such a way that will create ground fog or ice fog conditions.	Amendment of Conditional Right-of-way lease for the Trans-Alaska Gas System ADL 4213342. June 2, 1993. Between the State of Alaska and Yukon Pacific Corp.
ROW Federal	Notes federal ROW regulation 43 CFR 288.1-1 "retains the right to use a ROW and temporary use permit area or authorize the use in any manner not inconsistent with pipeline construction, operation, maintenance, and termination. 43 CFR 2881.1-3 says the federal government reserves the right on federal lands to make, issue, or grant ROWs, temporary use permit, easements, leases, licenses, contracts, patents, permits, and other authorizations to or with third parties for compatible uses on, under, or adjacent to the federal	*Trans-Alaska Gas System Final EIS*, USDOI, BLM. BLM-AK-PT-88-003-1792-910. June 1988.

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ROW Federal *(Continued)*	lands subject to a ROW grant or temporary use permit. Yukon Pacific asserts its intention to keep reasonable distance from the existing TAPS facilities (and unconstructed ANGTS line). The Trans Alaska Gas System (TAGS) application dated 12/5/1986 proposes to use a 200-foot separation from both TAPS an ANGTS except where insufficient room due to topography or environmental constraints. The valid federal rights will be recognized in processing the TAGS project.	
ROW Federal Shared Use of Resources and Services Pipeline Crossings	APSC will continue to coordinate with ANGTSs and TAGS. TAPS present and long-term requirements for mineral materials (sand and gravel) must be recognized and provided for according to BLM. Access roads and pipeline ROW must be kept open without interruption for TAPS operations and oil spill response. Above and below ground crossings of TAPS by TAGS must be approved by and coordinated with Alyeska Pipeline Service Company (APSC). All areas where TAGS is within 200 feet of TAPS must require detailed review and coordination of construction design and activities with APSC. To the extent joint use may be appropriate for TAPS related facilities, such as access roads or mineral material sites, APSC will require advance agreement to uses and sharing of costs. Written testimony from the State of Alaska Office of the Governor, Office of Management and Budget, Division of Governmental Coordination, to Jules Tileston (BLM); – Construction activities may affect mitigation measures previously required of TAPS.	*Trans-Alaska Gas System Final EIS*, USDOI, BLM. BLM-AK-PT-88-003-1792-910. June 1988. Written testimony from Alfred T. Smith, General Council for Alyeska Pipeline Service Company to Jules V. Tileston USDOI, BLM - comments on the DEIS.
ROW Federal Department of Interior (DOI) U.S. Department of Energy (USDOE)	Federal ROW – Other entities have existing ROWs within the pipeline corridor (TAPS, ANGTS, GCI Fiber Optic Cable from Valdez to Prudhoe Bay and others). DOI has a contract agreement with AHTNA for Transportation and Utility Zone on AHTNA lands. Allows federal grantee to enter into ROW agreements with AHTNA. "ANGDA has the right of eminent domain in situations where agreement can't be reached." ADL 413342 extended Yukon Pacific ROW until December 2008. Conditional lease is transferable/assignable to another party with Commissioner's approval. USDOE, Office of Fossil Energy Authorization (License by DOE/OFE Order 350, November 16, 1989) for export of natural gas by Yukon Pacific to Pacific Rim countries. Transferable, but does not authorize shipment to Lower 48 (would have to be amended). DOE turned down ANGTS for a rehearing of Order 350.	*A Review of Yukon Pacific Corporation Trans-Alaska Gas System Permits.* Prepared for ANGDA by ASRC. August 30, 2004.
TransCanada Lease ANGTS	APSC on behalf of owner companies acknowledges the need for construction and operation of ANGTS to be compatible with TAPS safety and integrity. Anticipate addressing compatibility concerns with TransCanada should it request a letter of non-objections for temporary or long-term joint use of or overlapping occupancy of TAPS ROW. Would like an APSC letter of non-objection added to the pre-construction requirements under ANGTS lease Stipulation 3.0.	Letter From APSC Jordan Jacobsen, General Counsel to Kenton Taylor, Acting Gas Pipeline Coordinator, ADNR, Re ADL 403427 Request for Comments. (TransCanada lease) December 15, 2004.
TransCanada Lease ANGTS	ConocoPhillips is 36% owner of the stranded natural gas resource at Prudhoe Bay. ConocoPhillips believes the grant of an unconditional ROW is inconsistent with the terms of the ROW Leasing Act and could impair prospects for development of North Slope gas resources:	Letter From ConocoPhillips Joe Marushack, VP ANS Gas Development, to Kenton Taylor Acting Gas Pipeline Coordinator, ADNR, Re ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.

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TransCanada Lease ANGTS *(Continued)*	1) Applicants have not met the requirements of an unconditional lease because they are not fit, willing, and able to perform the transportation of other acts proposed as require by AS38.35.100. 2) Contrary to State policy of implementing the ROW lease in a manner that promotes competition. 3) Granting of ROW is premature because the project is not sufficiently defined.	
TransCanada Lease ANGTS	Opposes unconditional ROW lease that is not equally available to any project proponent.	Letter From Enbridge Inc., John Carruthers, VP Gas Development, to Kenton Taylor Acting Gas Pipeline Coordinator, ADNR, Re ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.
TransCanada Lease ANGTS	Opposes unconditional ROW lease because TransCanada and Alaska Northwest Gas Transportation Company are not fit, willing, and able to perform the transportation or other acts proposed. They have not secured shipping agreements or financing to construct the project, and gives them an unfair advantage over the competition.	Letter From ExxonMobil to Kenton Taylor, Acting Gas Pipeline Coordinator, ADNR, Re ADL 403427 Request for Comments (TransCanada lease). December 15, 2004.
TransCanada Lease ANGTS Golden Valley Electric Association (GVEA) ROW	Pipeline route will cross or run parallel to GVEA distribution and transmission line facilities in several areas. GVEA is in the process of securing ROW permits for an electric transmission line that will overlap or parallel portions of the gas line route. They are coordinating with TransCanada and DNR to reach an agreement on siting issues and corridor width which is critical to the design and construction processes. Electrical safety measures will be required including adherence with the National Electrical Safety Code and Alaska Statutes. GVEA will coordinate with appropriate parties to achieve safe and reasonable joint use of the easement if necessary.	Letter From GVEA, Kate Kennedy, ROW Agent, GVEA Transmission and Distribution to Kenton Taylor, Acting Gas Pipeline Coordinator, ADNR, Re ADL 403427 Request for Comments (TransCanada lease). December 9, 2004.
GVEA	GVEA has a 100-foot ROW in the Big Delta area that parallels TAPS, and they have a 60-foot ROW that parallels portions of the Richardson Highway. ADOT has a 150-foot wide ROW for the Richardson Highway (Big Delta), along the highway there is a 25-foot telephone ROW, and a 150-foot-ROW from BLM for the Richardson Highway (Big Delta to Paxson). From Pump Station 7 to Paxson - TAPS and Yukon Pacific have ROWs.	Volume II Permitting Compliance of Parks Highway and Glenn Highway Natural Gas Pipeline Rights-of-way. Prepared for ANGDA by Bristol Environmental and Engineering Services Corp. October 2005.
Standoff	Comment from TAPS owner – "If a gasline were run in close proximity to TAPS, the joint use of facilities would be possible. This would include barrack facilities, communication, and power, water and sewer facilities during construction. After the start of gasline operations, the TAPS control room and operators may operate both pipelines simultaneously."	Final Environmental Impact Statement Renewal of the Federal Grant for the Trans-Alaska Pipeline System Right-of-Way. U.S. Department of the Interior, Bureau of Land Management. BLM/AK/PT-03/005+2880+990. November 2002. Comments from W. Steven Jones, TAPS ROW Renewal Project Manager (TAPS Owners) August 20, 2002.
ROW	ROW Ownership and Indemnity issues.	TAPS and Gas Line Co-Use Issues. Harold Heinze, ANGDA. September 26, 2007.
ROW	ROW Ownership and Indemnity issues.	Gas Pipeline Concerns. JPO. September 26, 2007.
Shared Use of Resources and Services	Metropolitan Fiber Optics was the last time co-use issue was addressed.	Comments by Jerry Brossia, JPO, September 26, 2007.
Standoff	JPO coordinates regulatory oversight. Proximity of two lines would raise new regulatory issues to be addressed jointly. Set protocol early to address issues. Primary contacts Jerry Brossia (BLM) and Mike Thompson (ADNR).	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA. January 25, 2006.

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ROW	Regulatory GAP analysis. Socioeconomic impacts on Alaska. Wetland avoidance. Environmentally sensitive areas of high consequence.	Gas Pipeline Concerns. JPO. September 26, 2007.
Shared Use of Resources and Services	Material sales to APSC are non-competitive; with an additional user material sales may become competitive.	Comments by Joe Dygas, JPO, September 26, 2007.
ROW	Will require agreements outlining liabilities and responsibilities of gas pipeline contractors, operators, and owners. APSC will likely have concerns with any construction or operation activities inside TAPS ROW.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA. January 25, 2006.
Shared Use of Resources and Services	Taps owners will consider potential sharing of various services and facilities including security, access roads, communication facilities, and above ground maintenance by commercial agreement.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA. January 25, 2006.
Shared Use of Resources and Services	Explore commercial and operational benefits with studies to determine benefits funded by ANGDA.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA. January 25, 2006.
Shared Use of Resources and Services	Cost Sharing – Maintenance and surveillance; power generation, camps and warehouse; new technology.	TAPS and Gas Line Co-Use. Harold Heinze, ANGDA. September 26, 2007.
Shared Use of Resources and Services	Labor agreements. Legal issues pertaining to past, present and future records.	Gas Pipeline Concerns. JPO. September 26, 2007.
ANGDA ROW	TAPS owners entered into agreements with Native and Private land owners along route. ANGDA would need to secure separate ROWs irrespective of whether lands are coincidental to TAPS ROW.	Letter from Albert N Bolea, BP to Harold Heinze, ANGDA. January 25, 2006.
Standoff ROW Federal	Proximate to TAPS, State highway system, ANGTS project, Haines-Fairbanks Military Pipeline ROW, and major GVEA and CVEA transmission line ROWs. Includes unappropriated BLM lands. Since established in 1974, some of the federal land within the utility corridor has been transferred to State and Native ownership between the Yukon River and Port Valdez. This is not expected to be a problem for TAGS.	*Trans-Alaska Gas System Final Environmental Impact Statement.* USDOI, BLM; USACE, Alaska District. June 1988 (BLM-AK-PT-88-003-1792-910).
ROW	Kanas Telecom, Inc. constructed the telecommunication system along the TAPS ROW to provide telecommunications services to APSC under contract (TAPS/6220). Emergency request to continue providing service to halt APSC attempted termination of contract.	*Order Granting Emergency Request for Temporary Operating Authority.* By the State of Alaska Regulatory Commission. U-98-11. March 7, 2000.
ROW	AT&T Alascom application to transfer TAPS Microwave Telecommunication System Assets to APSC while AT&T still has TAPS ROW access.	*Order Granting Transfer of Assets to APSC Subject to Conditions.* By the State of Alaska Regulatory Commission U-04-28. August 4, 2004.

[1] Assumptions made for costing purposes.