Environmental Report
ANGDA
Glennallen to Palmer Spur Gas Pipeline

Prepared for:

Alaska Natural Gas Development Authority
411 West 4th Avenue, Suite 2
Anchorage, Alaska 99501

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Prepared by

ASRC Energy Services
Lynx Enterprises, Inc.

3900 C Street, Suite 601
Anchorage, Alaska 99503

Table of Contents

Section **Page**

Tables

Appendices

Acronyms

All Terrain Vehicle	ATV
Alaska Coastal Management Program	ACMP
AHTNA, Inc.	AHTNA
Alaska Department of Environmental Conservation	ADEC
Alaska Department of Fish and Game	ADF&G
Alaska Department of Natural Resources	ADNR
Alaska Department of Transportation/Public Facilities	ADOT/PF
Alaska Heritage Resource Survey	AHRS
Alaska Natural Gas Development Authority	ANGDA
Coastal Zone Management Act	CZMA
Clean Water Act	CWA
Code of Federal Regulations	CFR
Division of Mining, Land, and Water	DMLW
Federal Communications Commission	FCC
Horizontal Directional Drilling	HDD
National Environmental Policy Act	NEPA
National Wetlands Inventory	NWI
Office of Habitat Management and Permitting	OHMP
State Historic Preservation Office	SHPO
Trans Alaska Pipeline System	TAPS
U.S. Army Corps of Engineers	USACE
U.S. Environmental Protection Agency	EPA
U.S. Fish and Wildlife Service	USFWS

1.0 Project Introduction

South Central Alaska is the largest consumer of natural gas within Alaska. Projections estimate that Anchorage and the surrounding areas will be facing a shortage of natural gas within the next ten (10) years. In an effort to assist in alleviating this projected shortage, the Alaska Natural Gas Development Authority (ANGDA) has proposed to construct a high pressure natural gas pipe line that will be connected to the proposed natural gas line transporting natural gas from Prudhoe Bay to other destinations.

The ANGDA will submit an application to the State of Alaska (State) for a common carrier "Conditional" Right-Of-Way Lease in April, 2005. Common carrier gas pipelines are subject to Alaska Statute 38.35. The right-of-way lease for the buried spur gas pipeline would be on state and some private lands from Glennallen to Palmer. The project is located between longitudes 145° 30'W - 149° 18' W and latitudes 61°33'N - 62°9'N. Communities near the pipeline right-of-way corridor include Glennallen, Lake Louise, Gunsight Mountain, Wiener Lake, Long Lake, Chickaloon, Sutton, and Palmer.

1.1 Origin and General Route Description – Glennallen

The approximate 148-mile high pressure spur gas pipeline route will originate approximately 2-miles north of Glennallen, west of the Trans-Alaska Pipeline System (TAPS) at TAPS Milepost 689.5. The compressor station and the first 15-miles of the buried pipeline would be located on privately owned AHTNA, Inc. (AHTNA) lands.

Upon leaving AHTNA lands, the pipeline right-of-way corridor would transition onto state owned lands. The route will be within the Alaska Department of Transportation and Public Facilities (ADOT&PF) Glenn Highway right-of-way (ROW) for approximately 50-miles and will then follow an RS2477 route into the Squaw and Caribou Creek drainages, cross Chitna Pass into the Boulder Creek drainage and enter the area near Chickaloon. The route will be within an existing Matanuska Electric Association route across state and private lands from Chickaloon to Palmer. The pipeline will terminate south of the Glenn and Parks Highway interchange and tie into the existing ENSTAR Natural Gas Company's (ENSTAR) 20-inch low-pressure pipeline on the west side of the Glenn Highway.

1.2 Terminus – Palmer

The pipeline would cross beneath the Parks Highway and would terminate on state lands in the proximity of the ENSTAR Natural Gas Company facility at Hay Flats, west of the junction of the Glenn and Parks Highway Junction. The highway-related construction activities would be coordinated with the ADOT/PF. The ADNR and ADOT/PF Commissioners and ANGDA are implementing a Memorandum of Agreement that will prevent inefficiencies. A Traffic Control Plan and subsequent permitting conditions will be developed for this project that will address timing construction activities to avoid peak-use hours. Safety will be fully addressed. The public will be informed prior to any traffic disruptions or detours.

1.3 Topography

The pipeline will be buried in existing corridors in south central Alaska from Glennallen to Palmer within an area of broad valleys, forests, and mountains. There are numerous lakes,

rivers, streams and wetlands along the route. The elevation ranges from approximately 500 feet to over 4,000 feet. Vegetation species change with altitude, temperatures and precipitation. See Appendix A for a list of common plant species.

1.4 Climate

Depending upon the elevation, distinct weather changes can be anticipated along the pipeline route. The pipeline will traverse two climatic zones. (1) The pipeline corridor's origin will be within the Continental Climatic Zone with more extreme temperatures and moderate to high amounts of rainfall in higher elevations. (2) The Transitional Climatic zone is influenced by Cook Inlet and typically experiences moderate winters and cool summers with significant cloudiness and rainfall.

2.0 Right-of-Way Construction

Acquisition of the conditional right-of-way lease and the corresponding federal and state permits and authorizations will take place in a scheduled and timely proactive manner. The pipeline right-of-way corridor width will vary depending on activities, topography and construction mode. The standard construction right-of-way is 300 feet wide. Additional width may be required at river and stream crossings and valve sites. Foreseeable activities include field studies including archaeological and cultural resources inventory, streams and wetlands assessments, survey activities, brushing and clearing, dredge and fill activities, pipeline construction, cathodic protection, hydrotest, pipeline burial, regrade and restore the disturbed areas.

The rivers and streams will be crossed by trenching or directional slick boring. The methods and timing chosen to cross the rivers and streams will be determined by the level of potential impacts. Ground clearing will include removal of obstacles such as trees, brush, and boulders. A raised embankment work pad may be required in some areas. Grading will ensure the stability of cut and fill slopes under normal static conditions, work pads under normal working conditions, seismic loading, and erosion control. (Sec. 5.1 Rivers and Streams Crossings)

Dust will be minimized by backfilling the trench with temporary ground cover and reseeding or mulching as soon as practical.

Residents may be temporarily impacted by noise, construction activities, and possible temporary traffic rerouting. Snow machine and ATV activity exists and is not expected to change significantly as a result of this project. Impacts to local residents will be minimized by timing activities to avoid affecting traffic and businesses to the extent possible.

A Traffic Control Plan will be developed for the project activities that have the potential to affect traffic patterns. Adjoining property owners will be notified prior to construction activities. Construction will generally be conducted during the waking hours in residential areas. (See 3.0: Operations and Maintenance)

2.1 Logistics

Materials, equipment, and crews transported to the project construction sites will use existing infrastructure, including the Glenn Highway and other public roads. Temporary access points will likely be required during construction but long-term transport will not be developed. Existing roads, airstrips, ports, and other transportation facilities in Anchorage, Pt. Mackenzie, Fairbanks, Delta, Glennallen and Palmer will be used to support the pipeline construction and operation. Existing commercial and private borrow sites may be used to dispose of excavation spoils and backfill. Pipeline construction equipment will include hydroaxes, bulldozers, graders, ditching machines, backhoes, and pipe lowering side booms, etc. Materials will be removed for the construction areas and will likely be disposed at existing sites.

2.1.1 Local Housing

ANGDA will maintain strong interaction with the communities and is developing plans for implementing local hire. About 620 employees will be required during the pipeline construction. Local hiring practices will eliminate the need for construction camps except for

small maintenance camps. Generally, personnel associated with the pipeline project will be transported to the construction sites on shuttle busses although commercial lodging will be required for some project personnel. Utilizing the local workforce will prevent an influx of non-resident pipeline workers from negatively impacting the communities.

The pipeline will be designed of robust materials to withstand environmental influences. Therefore, a minimal staff will be required to operate the pipeline as it is unlikely significant pipeline maintenance will be required. The Caribou Creek area will be monitored by two full time employees using helicopter, four-wheeler, or snow machine, as appropriate. See *Engineering Report*.

The project will utilize existing airstrips, heliports, float planes facilities, and communications facilities. The majority of activities will last only during pipeline construction. New permanent access roads are not planned to be constructed.

2.1.2 Health Care Facilities: Medical Care and Emergency Response

ANGDA intends to develop and equip minor emergency medical facilities, including vehicles, at various locations along the route for use during pipeline construction. In addition, ANGDA plans to train and staff the facilities. At the end of construction, the minor emergency facilities will become the responsibility of the respective communities for use by the residents.

Contractors will be required to provide onsite health care to respond to minor medical needs. Each construction crew will have trained medical staff to handle routine and emergency response. Illness or injuries requiring advanced medical care will be treated in the new minor emergency medical facilities, existing clinics along the Glenn Highway (mile 187), and hospitals located in Palmer and Anchorage. A Medical Response Program that will be developed for this project will consider specific construction activities and the proximity and obstacles to medical assistance for emergency conditions along each pipeline segment.

2.1.3 Material and Equipment Storage

With the ADNR Commissioner's written approval machinery, equipment, tools, materials, structures, mainline pipe, other materials, and construction equipment will be stored on the right-of-way or in areas leased from landowners along the route.

2.2 Access and Security

Access will generally remain unobstructed during pipeline operations although access into the backcountry for hunting, recreation, timber, coal mining and settlement may be temporarily interrupted. ANGDA does not intend to promote access onto privately owned lands.

Temporary access controls, in compliance with federal and state regulations, will be used to protect the pipeline and construction operations from vandalism, theft, and other inappropriate activities. Site specific plans will be developed to optimize site security while allowing normal access to the construction right-of-way. Gates may be constructed at access points and fencing may be required around portions of the pipeline. The plans will be flexible to accommodate changes during construction activities. For public safety and security for the pipeline, equipment, and materials, signs, warning tape, construction

barricades, equipment and/or material will be placed at access points to the right-of-way corridor during activities such as excavation, welding, and backfill.

The temporary work pad may or may not be removed based on a decision by the state. The ANGDA project will neither facilitate nor limit future road construction. Access to recreational areas will not be an operational concern.

2.2.1 Coordination

ANGDA, ADNR and ADOT/PF are working cooperatively to ensure coordination and to prevent disruptions to current, planned, or future activities. The ADOT/PF is working on preliminary engineering and environmental assessments to upgrade and realign the Glenn Highway. The ADOT/PF has planned transportation improvements that includes short access roads for settlement, public recreation and timber harvests in the Moose Range, areas around Kings River, Long Lake, and Nelchina settlements.

2.2.2 Driveway and Road Crossings

Driveways and unpaved roads will be crossed with open trenching. Traffic will be controlled while half of the road is closed for pipeline installation and may temporarily interrupt traffic. The pipeline will not cross the Glenn Highway on its surface but may be crossed with road-boring.

2.3 Quality Control Program

A Quality Program that includes Quality Assurance/Quality Control will be developed and submitted with the permanent right-of-way lease application. The Quality Program will provide controls over construction contractors and subcontractors through contractual agreements mandated for compliance with the permitting and authorization conditions and stipulations. The Program will ensure development and defining:

- Designs, plans, procedures and schedules that incorporate stipulations.
- Designs, plans, procedures and schedules in specifications, drawings and requirements.
- Specifications, drawings and requirements that are attached to contracts.
- Documentation showing compliance of inspecting and monitoring.

For further information regarding programs that will be developed prior to submitting an application for a permanent right-of-way lease, see *Plans and Programs*, Section 10.

3.0 Operations and Maintenance

An Operation Plan and a Maintenance Plan will be submitted as part of the permanent right-of-way lease application. Pipeline design, construction, operations, monitoring, and maintenance activities will comply with federal and state regulations to ensure pipeline integrity and safety. The numbers of employees will be sufficient for responsible surveillance, monitoring, and initial emergency response. Staffing would be increased for pipeline repairs and special maintenance.

4.0 Physical Environment

4.1 Geologic Hazards

Portions of the pipeline right-of-way corridor are within seismic zones that require structures (including pipelines) to meet or exceed the Uniform Building Code requirements for earthquakes.

4.1.1 Seismic Hazards

Recognition of active faults is critical to assessing the earthquake hazards in a specific area. A fault is generally considered to be "active" if it has evidence for movement within Holocene time (past 11,000 years; Yeats and others, 1997). The Castle Mountain fault is the only structure in the project area with convincing Holocene surface faulting and related historical seismicity (Haeussler and others, 1998, 2000). The proposed spur line intersects the Castle Mountain Fault at multiple points. The route parallels the fault in some locations. Fault movement, which likely generated earthquakes to magnitude 7, have occurred several times in the past 4100 years along the Castle Mountain fault (Detterman and others, 1974; Haeussler and others, 2000).

The spur line route is adjacent to the mapped trace of the Border Ranges fault zone, a significant regional structure bounding the southeast side of the upper Cook Inlet basin. Although there is no surface expression of the fault, it forms the contact between older basement rocks of the Chugach Terrane and the Tertiary basin fill of Cook Inlet. Based on a lack of Holocene surface faulting, and the lack of historic seismicity, the Border Ranges fault cannot be considered "active", and therefore does not pose an obvious hazard to the project area (Haeussler and others, 2000).

An additional factor when considering seismic-related hazards in the project area is the susceptibility to earthquake-induced ground failure. The 1964 great Alaska earthquake caused numerous ground displacements in southcentral Alaska, which were initiated predominantly by sensitive-clay failures (Seed and Wilson, 1967, Updike and others, 1984). Although detailed ground-failure susceptibility maps and seismic soil-type maps do not exist for the spur line route, existing surficial geologic mapping in the area suggest a low to moderate ground failure susceptibility. In order to adequately address ground-failure susceptibility along the route geotechnical studies are necessary.

Project studies will consider the soil characteristics, slopes, geological features, surface and sub-surface drainage, water tables, and floodplains in the area. The results of the studies will be used for the final pipeline design and alignment. The Conceptual Pipeline configuration and Alignment will be submitted for review and approval along with the application for a permanent right-of-way lease. Refer to Section 10.0 for lists of reports related to seismic hazards. (See *Engineering Report* and *Alignment/Lands Report*)

4.1.2 Volcanic Hazards

Mount Wrangell is a 14,163 ft. high volcano, located approximately 49 miles east of the eastern end of proposed spur line. Mt. Wrangell is considered to be historically active, based on three reported minor eruptions (1784, 1884-85, and 1900; Richter and others, 1995). No major eruptions or lava flows, however, have been confirmed (Miller and others, 1988).

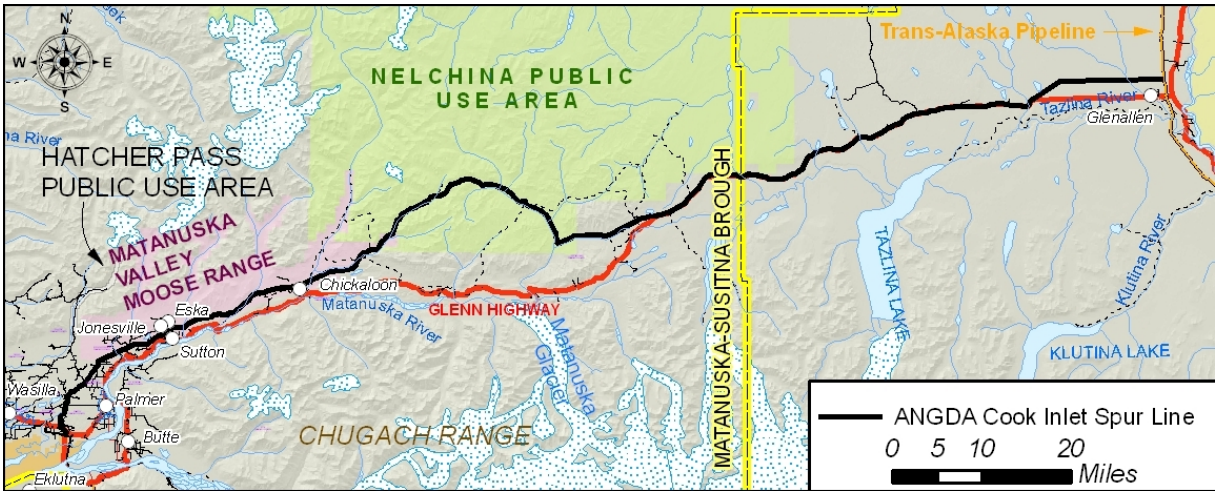
Mount Spurr is a recently active, 11,070 ft. high, volcano located approximately 99 miles west of the spur line route. Two notable historical eruptions occurred at the Crater Peak vent of Mount Spurr in 1953 and 1992 (Miller and others, 1988). The 1992 eruption occurred over a three month period and included three explosive events, producing ash plumes up to 11 mi high. Ash fall from these various events included: up to 3mm of sand-sized ash in the Anchorage area; at least 1mm of ash in the Glennallen area (217 mi east); 2mm of ash in Denali Park (161 mi north); and light dustings in Burwash Landing YT (435 mi east) and Alaska coastal communities as far away as 746 mi to the southeast (Miller and others, 1988).

4.2 Permafrost

Sporadic and discontinuous permafrost are prevalent throughout this area of the pipeline right-of-way corridor. Arctic regions engineering and expertise are used to design pipelines that are in use extensively in Alaska. Buried pipelines are feasible as long as the integrity of the frozen soils is maintained. Permafrost will be considered in the final Pipeline Design.

5.0 Environmental Overview

An environmental review will be researched, developed, and reported specifically to evaluate the pipeline activities related to the right-of-way corridor and the effects of the anticipated activities on the communities and the wildlife and habitat, prior to the issuance of a permanent right-of-way lease. The potential pipeline effects will be evaluated from its origin in Glennallen to the termination point in Palmer. The pipeline route, a total length of approximately 148 miles, is shown in the following figure.



5.1 River and Stream Crossings

Title 16 of Alaska Statutes regulates all activities that may affect anadromous fish streams or that may result in blockage of fish passage. Preliminary river, stream, wetlands and drainage crossings have been identified and the pipeline location will be located to minimize known impacts along the pipeline route. The crossings are summarized in Appendix B.

Anadromous rivers and streams along the right-of-way corridor may be crossed with open cut or horizontal directional drilling techniques. Anadromous fish hatch, rear, migrate as smolt from freshwater to the ocean, and return as spawn from the ocean. Results of the summer studies may result in minor route changes.

Open cut, fluming, or dam-and-pump techniques will be used to cross other drainages. The determination of which crossing will be with HDD will be in consultation with the ADNR, Office of Habitat Management and Permitting (OHMP). The decisions will depend on site conditions and other factors. Removal of water from fish bearing rivers, streams, and natural lakes shall be subject to prior written approval by DMLW and ADF&G. Stream work will comply with stipulations that will regulate the water intake pipes design to prevent harm to fish. Use of explosives is prohibited in open water areas of fish bearing streams and lakes

All activities will be in accordance with applicable federal and state regulations. Excavated soils may be replaced in the streams to restore the original streambed conditions. Equipment crossings will be in compliance with ADNR/OHMP regulations.

Water pump suction will be screened to protect aquatic life and energy dissipation techniques will be used on all discharge points to prevent erosion and sedimentation. Dam

construction will be tailored to the size, geology, and local environmental constraints at each location. During dam-and-pump (isolated) crossing, water quality will be monitored. Turbidity and total suspended solids can be used to monitor water quality to impacts on fish habitat. Allowable water quality parameters will be set depending on the type of fish present, time of year, and characteristics of the stream.

5.2 Vegetation

Within the pipeline right-of-way corridor, trees and shrubs have the potential to live 75 to 200 years but few areas escape the wildfires that occur about once every 100 years (Copper River Best Interest Finding, 1999). Selkregg (1974) indicates severe climate, repeated fires, discontinuous permafrost and braided drainage systems created complex vegetation patterns. The area supports upland spruce hardwood forests, moist tundra, low bush bog and muskeg and high brush. The lowland spruce-hardwood forests are dominated by black spruce with some balsam poplar, quaking aspen and paper birch. The understory is comprised of dense brush of green alder, thin-leaf alder, willows, prickly rose, Labrador tea, bunchberry, grasses, forbs and mosses are common on the forest floor. Disturbed areas would be reseeded in accordance with ADNR recommendations to minimize erosion and siltation. (See Appendix A.)

5.3 Wetlands

5.3.1 Wetland Crossings

Preliminary wetlands delineation was conducted for the project using the U. S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). Wetlands classification used by the USFWS follows Corwardin et al. 1979P and defines wetlands as "transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports hydrophytes, (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.")

Approximately 13 miles of wetlands have been identified along the pipeline corridor. Of the remaining approximate 135 miles, no NWI data is available for a section that is approximately 10 miles long. The remainder is classified in the NWI as uplands. More detailed wetland delineation will be compiled during summer studies and with the use of current aerial photography. The wetlands vegetation data are summarized in Appendix C.

5.3.2 Flooding

The buried pipeline will not be subject to surface flooding effects. The top of pipe will be buried approximately 4 feet below the ground surface. Low points in wetland areas will not be graded or filled. Construction mats will be used in wetlands, as seasonally required, to avoid changes in the natural grade and slopes and to minimize impacts to vegetation.

5.4 Erosion Control

5.4.1 Trenching/Construction

Erosion control along the right-of-way corridor is important to determine the pipeline design and construction techniques. With proper design and control, the surface water and groundwater flow patterns will remain the same as before construction. Drainage will be controlled in accordance with state and federal regulations.

Hydrotest water will be discharged in accordance with applicable permits to avoid sedimentation and erosion. Pipeline burial along slopes would be designed to minimize erosion potential.

5.4.2 Bank Stabilization

State-of-the-art construction techniques will be used to stabilize rivers and stream banks. Bank stabilization will comply with federal and state regulations to prevent erosion and sedimentation. (See Section 10 and *Engineering Report*)

5.5 Right-of-Way Restoration

The pipeline right-of-way corridor will be graded, cleaned, seeded and fertilized following pipeline construction. Streams and wetlands will be restored as well as practical to their original condition. Impacts to streams from cutting and horizontal directional drilling will be minimal.

5.6 Water Sources

5.6.1 Hydrology

Rivers and stream crossings in the study area are shown in Appendix B. Currently, the right-of-way corridor will cross 81 rivers and streams and a few unmarked drainages. As the pipeline design progresses and more definitive ground data becomes available, other steam crossings may be added or they may be removed.

Fresh water for hydrostatic testing and for mixing HDD drilling fluids will be taken from nearby water sources along the route. Project specific water requirements will be established as the pipeline design matures. Water use will be approved and in full compliance with strict federal and state regulations.

5.6.2 Impacts to Waterbodies

The proposed route is primarily within existing rights-of-way corridors and lasting impacts to waterbodies are not anticipated. Construction activities will be conducted in full compliance with federal and state regulations to minimize the potential effects to local drainage patterns, stream diversion or impacts to wildlife or habitats.

5.6.3 Water Quality

Summer studies will determine water bodies that may be affected by pipeline construction or operations. The pipeline route and construction techniques will avoid altering drainage patterns. Permits and authorizations will carry stipulations to ensure the project is in compliance with environmental safeguards.

Project water-related activities include trench dewatering, drilling mud mixing, and hydrostatic testing will be in compliance with federal and state regulations. The groundwater regime will not be significantly affected as a result of excavation dewatering. No water wells will be impacted.

After construction, the likelihood of spills and leaks will be low because operational activities along the pipeline will be minimal. Water quality is protected by federal and state statutes and regulations. (Section 8.4.3)

5.7 Spill or Leak Prevention

The pipeline design and construction techniques will be in strict compliance with 49 CFR Part 192. Thick wall pipe manufactured with high-strength steel will resist internal and external loads and minimize the potential to effect water quality. Additional safeguards include external protective coatings (i.e.: cathodic protection, sacrificial anodes), valve stations, remote sensing, non destructive examination of pipeline welds (i.e., radiography and/or ultrasonic), hydrostatic testing, and even heavier wall pipe at stream and wetlands crossings.

A majority of the pipeline will be above the water table and will not contact groundwater. The only segments that will be placed below the water table will be in wetland areas and stream crossings. A leak prevention and detection program will be developed for this project. (See *Engineering Report*)

The entire pipeline will be hydrostatically tested before commissioning. Water withdrawal for testing will be from the river or stream being crossed or imported from other approved sources in accordance with applicable regulations and permit stipulations that minimize adverse affects on aquatic habitats and biota. Discharge of hydrotest water will be in accordance with state and federal laws to avoid sedimentation and erosion. The discharge locations and discharge volumes are shown in the *Engineering Report*. Discharges to dry stream channels, upland areas, or to a constructed settling pond or ponds will be monitored to limit damage, erosion, sedimentation, and/or floating debris.

5.8 Fish and Wildlife

5.8.1 Mammals

Mammals known to frequent the right-of-way corridor include caribou, moose, brown bear, black bear, furbearers and other small mammals. Wolves, wolverines, lynx, red fox, and marten are generally in remote areas. Mammals that may occur in the gas spur pipeline corridor as shown in Table 5.8.1-1.

Caribou in the Lake Louise Flats and Slide Mountain-Little Nelchina River areas are a considerable distance from the proposed right-of-way corridor. Calving is generally between May 15 and June 10 in the Talkeetna Mountains (ADF&G, 1985a).

Moose may be present in the vicinity of the proposed right-of-way corridor. Moose occupy a variety of habitats making seasonal movements for calving, rutting and wintering. Moose concentrate in the sub-alpine Moose Lake area and winter in the Little Nelchina River drainage and land to the north of Slide Mountain (Alaska, 1982). Avoiding important salmon streams when fish are present would minimize the displacement of bears from this critical habitat.

Bears are in the area and can be attracted to construction sites. Before construction activities begin, locations of known and occupied bear dens will be obtained from ADF&G, Division of Wildlife Conservation. If clearing and grubbing are planned from November 15 through March 31, ADF &G and the Commissioner will require mitigation to minimize disturbances. A Bear Interaction Plan will be developed for this project. Reports of unidentified dens will be made within 24 hours to ADF&G, Division of Wildlife Conservation. Construction impacts will be minimized by using covered garbage containers, prohibiting storage of food materials, waste handling, sediment controls, and minimizing the extent of disturbance.

Road development is the greatest concern regarding bear populations (ADOT, 1997). Road development increases bear-human interactions and reduces the bear habitat value. New roads increase mortality rates through increased bear/human encounters and increase human access to bear habitat for both legal and illegal hunting (ADF&G, 1998). The ANGDA project will not introduce new roads.

Visual monitoring will detect construction activities that may adversely impact fish or wildlife. The project will be maintained to avoid significant alteration of large mammal movement patterns. The buried pipeline design and construction techniques will minimize the environmental consequences. Noise, vibrations, equipment movement, and human presence may disturb temporarily disturb animals and may alter their travel patterns during construction. (See Table 5.8.1-1)

TABLE 5.8.1-1
Mammals In the Pipeline Area

Common Name	Scientific Name
Common Shrew	Sorex cinereus
Dusky Shrew	Sorex monticolus
Little Brown Bat	Myotis lucifigus
Little Weasel	Mustela nivalis
Short-tailed Weasel (Ermine)	Mustela erminea
Mink	Mustela vison
Marten	Martes Americana
River Otter	Lontra Canadensis
Arctic Ground Squirrel	Spermophilus parryii
Red Squirrel	Tamiasciurus hundsonicus
Northern Flying Squirrel	Glaucomys sabrinus
Beaver	Castor Canadensis
Northern Redbacked Vole	Cleithrionmys rutilus
Meadow Vole	Microtus pennsylvanicus
Muskrat	Ondatra zibethicus
Porcupine	Erethizon dorsatum
Snowshoe Hare	Lepus americanus
Wolverine	Gulo gulo
Wolf	Canis lupus
Coyote	Canis latrans
Lynx	Lynx canadensis
Red Fox	Vulpes vulpes
Black Bear	Ursus americanus
Brown Bear	Ursus arctos
Caribou	Rangifer tarandus
Moose	Alces alces
Mountain Goat	Oreamnos americanus
Dall Sheep	Ovis dalli dalli

5.8.2 Avian Species

Much of the project area is in proximity to trumpeter swan nesting areas. The Copper River basin supports the largest nesting populations of trumpeter swans in Alaska. In 1995 surveys, 3,577 adult trumpeter swans were observed in the region. There are areas of high nesting concentration in the Lake Louise vicinity and in wetlands to the north (Conant et al., 1996). Trumpeter swans are believed to be sensitive to human disturbance on their breeding grounds. Intrusions by humans on nesting grounds have caused temporary and permanent abandonment and movement from breeding or staging areas (Banko, 1960; Bangs et al., 1982; Belanger and Bedard, 1989). Henson and Grant (1991) studied the effects of human disturbance on Trumpeter Swans in the Copper River basin. Trumpeter Swans leave the area in mid-September to early October and concentrate through mid-November in staging areas at Old Man, Crosswind, and Ewan Lakes prior to the fall migration (Alaska, 1982; ADF&G, 1985b; Westlund-Pers., 1999). ANGDA will work in cooperation with the USFWS to avoid disrupting nesting Trumpeter Swans.

Other swans, geese, ducks, and other waterfowl may nest within portions of right-of-way corridor during the summer (ADF&G, 1985b). Migration begins during late September and early October.

Bald eagles occur seasonally in the Copper River Basin. Noise and disturbance can affect the nesting success of bald eagles. A bald eagle nest survey will be conducted prior to pipeline construction activities. Minimum distances will be maintained and project activities will comply with the Bald and Golden Eagle Protection Act.

The USFWS listed songbirds that may occur in the area as Migratory Nongame Birds of Management Concern. The State of Alaska designated the olive-sided flycatcher (Contopus cooperii), grey-cheeked thrush (Caltharus minimus), Townsend's warbler (Dendroica townsendi), and blackpoll warbler) as Species of Special Concern. (Andres – Pers. Comm., 1999). Birds known to be in proximity to the pipeline right-of-way corridor are listed in Appendix D.

5.8.3 Threatened and Endangered Species

ANGDA will cooperate with the U.S. Fish and Wildlife Service although no known threatened and endangered species are known to inhabit the area.

5.8.4 Fish

There will be no in-water work in streams where fish are known to be spawning from spring to early fall.

Fish species in the rivers and streams along the right-of-way corridor include Chinook, coho, chum, sockeye and pink salmon. Salmonids in the rivers and streams and lakes include rainbow trout, Dolly Varden, lake trout, suckers, burbot, whitefish, sculpin and Arctic grayling. Northern Pike may be present. Nine-spine and three-spine stickleback are in the Matanuska Moose Range water bodies.

Rivers and streams would be crossed at times and under the conditions that will be stipulated by the Alaska Department of Natural Resources AS 38.35 Right-of-Way Lease, the Office of Habitat Management and Permitting, Mining, Land and Water, Temporary Water Use Permits and the Bureau of Land Management Grant of Right-of-Way. No adverse

impacts are anticipated to fish or their habitat within or adjacent to the right-of-way corridor or as the result of the construction or maintenance of the buried pipeline. See Section 8 for a listing of state, federal and local permits associated with the ANGDA pipeline. Table 5.8.4-1 and Table 5.8.4-2 list fish that may be affected by the pipeline.

TABLE 5.8.4-1
Commonly Harvested Subsistence and Sport Fish

Species	Subsistence	Sport
Pink Salmon	X	X
Chum Salmon	X	X
Coho Salmon	X	X
Sockeye Salmon	X	X
Chinook Salmon	X	X
Rainbow and Steelhead Trout		X
Dolly Varden Char		X

Source: ADF&G, Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes. 1992.

Catalogued anadromous streams that may be crossed by the pipeline are listed in the following table.

TABLE 5.8.4-2
Potential Anadromous Fish Streams that may be Crossed or Affected by the Pipeline Corridor

Stream Name	ADF&G Stream Number
Matanuska River	247-50-10220
Eska Creek	247-50-10220-2095
Tributary of S. Matanuska River	247-50-10220-2098
Tributary of S. Matanuska River	247-50-10220-3015
Granite Creek	247-50-10220-2105
Little Granite Creek	247-50-10220-2341
Tributary of N. Matanuska River	247-50-10220-3012
Kings River	247-50-10220-2115
Chickaloon River	247-50-10220-2171
Moose Creek	247-50-10220-2085
Caribou Creek	247-50-10220-2341
Carnegie Creek	247-50-10260-2019-3076
Mendeltna Creek	212-20-10080-2431-3142
Mendeltna Creek	212-20-10080-2431-3122
Tolsona Creek	212-20-10080-2431-3082
Tazlina River	212-20-10080-2431-2431
Durham Creek	212-20-10080-2431-3075
Spring Creek	247-50-10260-2019-3020
Woods Creek	212-20-10080-2431-3122-4010

Source: ADF&G Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes. 1992.

Rivers and streams that may be crossed by pipeline corridor are listed in Appendix B.

5.9 Historical and Archaeological Preservation

ANGDA researchers consulted the Alaska Heritage Resource Survey (AHRS) to locate cultural resource sites in the proximity right-of-way corridor. A preliminary survey identified historical and archaeological sites and cultural resources within the area of the right-of-way corridor. ANGDA is committed to complying with state and federal laws that protect these resources.

A cultural resource field survey of the area will be conducted prior to applying for a permanent right-of-way lease. The right-of-way lease will carry stipulations to ensure historical and archaeological sites and cultural resources are protected and preserved. Employees will be trained to avoid damaging biological and archaeological resources. Contractors will provide training for employees about the land, its people, their environment and social and cultural values.

Cultural resources include prehistoric and historic artifacts, structures, sites, and places on the landscape. Researchers currently recognize several periods of human cultural and historical development that begin with the Paleoarctic Tradition (8,000 to 10,000 years ago) and continue until the present. Prehistoric and historic cultural resource sites were identified in the vicinity. Cultural resource survey will be conducted prior to construction activities.

In the event cultural resources are discovered during, all activities will be stopped immediately and the State Historic Preservation Officer (SHPO) will be contacted. The site will be evaluated for eligibility for the National Register of Historic Places. Following Section 106 consultation with the SHPO, a decision will be made to avoid, protect, or remove the resource. If the site is adversely affected, ANGDA will develop a mitigation plan in consultation with the SHPO for approval by the Commissioner of Natural Resources.

5.10 Socioeconomics

The area was settled and developed for its fisheries, gas, timber, tourism, agriculture, wildlife, and minerals. Residents generally enjoy a strong economy based on resource development, tourism, subsistence use, and recreation. Abundant and affordable natural gas is important to communities within the pipeline right-of-way and to all of south central Alaska. Individuals, companies and facilities in the area and region depend on a reliable supply of natural gas. Depletion of existing gas fields raise concerns about gas supplies. Adding a reliable source of natural gas to market will benefit the local and regional economy. Employment opportunities would remain stable. The majority of the proposed right-of-way corridor will be within existing utilidors and corridors except for Caribou Creek area. Legal descriptions of lands are shown in the *Engineering Report* and *Lands Report*.

5.11 Land Use

The area along the Glenn Highway has abundant resources including scenery, and mineral and energy resources development. The proposed pipeline will not minimize recreation opportunities or diminish visual or habitat values. Publicly owned land along the highway, Caribou Creek and corridors along the Chickaloon and Nelchina Trails will be retained in public ownership to protect habitat, provide personal use timber, and ensure existing access to recreational opportunities, subsistence uses and sport hunting and fishing. Impacts to undeveloped land will be minimal.

The state owns the majority of the land in the Susitna area, but much accessible and developable land is in private or native ownership. (Susitna Area Plan, 1985). Approximately 70 percent of the land is state-owned or selected. Native corporations own or have selected approximately 10 percent of the land. Most of the Native land west of the Matanuska Glacier has been patented or has interim conveyance.

Land uses in the area are residential, subsistence related, commercial, Native-owned, parks, refuges, sanctuaries, public trails and recreation. The road right-of-way is a transportation corridor for vehicles, ATV s, snow machine use, and pedestrians. ANGDA will neither improve nor limit access to existing rights-of-ways.

All public lands in Palmer and Sutton are available for oil and gas leasing (Susitna Area Plan, Management Unit 1 – Palmer-Sutton-Butte, June 1985). The Kepler-Bradley State Park is within this area.

The vicinity of the Kings River contains forested land. Recreation access for skiing, snow-machining, and fishing is in this area. The Chickaloon Trail begins in this area. The impacts to the Chickaloon Trail from construction activities will be minimal and temporary.

The Matanuska River is popular with commercial and private river runners from approximately the Chickaloon River to the Kings River.

The Palmer Hay Flats State Game Refuge was set aside by the legislature as a hunting and wildlife habitat protection area (AS 16.20.032) (WILLOW SUB-BASIN AREA PLAN, A Land Use Plan For Public Lands, October, 1982, Alaska Department of Natural Resources, Matanuska-Susitna Borough, Alaska Department of Fish and Game with the assistance of Soil Conservation Service, USDA). The winter construction of the buried gas pipeline would have minimal impact to habitats or wildlife.

The Matanuska Valley Moose Range along the southern edge of the Talkeetna Mountains north of Palmer and Sutton, was created in 1984 to protect and enhance moose habitat while permitting other land uses. AS 16.20.340 designated management of Moose Range "…to maintain, improve and enhance moose populations and habitat and other wildlife resources of the area and to perpetuate multiple use of the area, including…mineral and coal entry and development and other forms of public uses compatible with these purposes." The primary uses are designated for fish and wildlife. Secondary uses include forestry and grazing (SUSITNA AREA PLAN, June 1985, Alaska Department of Natural Resources, Alaska Department of Fish and Game with the assistance of Soil Conservation Service, United States Department of Agriculture).

Bonnie Lake, in the vicinity of the Chickaloon River is a popular hiking and fishing area. The area has high scenic and public recreation values. (Susitna Area Plan, June 1985). Part of the area is accessible by road.

The Purinton and Cascade Creeks areas provide opportunities for public recreation and personal timber use. The area offers winter recreation activities including snow machine use and cross-country skiing. A sheep mineral lick is in the area and a branch of the Chickaloon Trail runs through the area. All public lands are open to oil and gas development.

The Coal Creek area is across from the Chickaloon and Kings River area. The area has potential for settlement, coal development, recreation opportunities and personal use forestry. Timber harvests will be managed to protect the views seen from the Glenn Highway.

The Matanuska Glacier is a popular tourist attraction. Recreational use cabins are in this area, as well as a school and several lodges. A sheep mineral lick is within the area.

Opportunities for sheep and goat hunting, personal timber use, visual resources, public recreation, hiking, winter recreation and wildlife habitat are in this area. The majority of the area where the buried pipeline will be located is used for hunting and fishing.

The annual moose harvest is typically one of the largest in the state. Moose are present throughout the area. Calving and wintering habitat are considered particularly critical. Lowlands support relatively high concentrations of calving moose, and riparian habitat along river drainages constitute essential moose wintering range. Vegetation clearing of the right-of-way corridor could result in a direct loss of some moose habitat. Loss of winter

habitat along riparian habitats would be the most important to local moose populations. Some habitat loss may occur from the displacement of animals due to noise and activity.

Sport hunting and fishing throughout the Copper River region is the primary use of fish and wildlife resources because of the wide variety of fish and wildlife resources and proximity to a large population center. Hunting and fishing is controlled by the Alaska Department of Fish and Game (ADF&G). The lakes and streams are fished by thousands of anglers. Grayling and lake trout are the primary species caught during the open water season and burbot are harvested during the winter. Lake Louise-Susitna Lake system, Crosswind Lake, Gulkana, Klutina, and Tonsina Rivers, and Mendeltna Creek are popular fishing rivers

Black and brown bears are harvested throughout the area. Furbearer trapping and pelt marketing is the major commercial use of wildlife populations in the area. Beaver, wolverine, lynx, land otter wolf, marten, mink, and muskrat are trapped. Hunting and fishing guiding services are a source of significant income to local residents.

The Game Management Units are shown in Tables 5.11-1 and 5.11-2. More information is provided in the *Recreation Users Report*.

TABLE 5.11-1
Susitna Game Management Units in the Susitna Area in Proximity of the ANGDA Gas Spur Pipeline Corridor

Management Unit Number	Management Unit Name	Primary Land Use Designation	Secondary Land Use Designation	Other Comments
6	Matanuska Valley Moose Range	6a:C,F,PR,WH 6b:PL	6a:G 6b:N/A	Legislatively Designated Area; Mineral Licks
7	Bonnie Lake	7a:PR,S,WH	7a:F	
8	Purinton	8a:PR,WH	8a:f	Mineral Licks
10	Matanuska Glacier	10f:PR,WH	10f:F	Mineral Licks
11	Gunsight Mountain	11b:PR WH 11c:PL 11d:PL 11e:PR,WH	11b:F 11c:N/A 11d:N/A 11e:N/A	Legislatively Designated Area (Nelchina Public Use Area)
12	Alpine Areas	12a:PR,WH 12b:PR,WH	12a:/N/A 12b:N/A	12a and 12b: Mineral Licks 12b: Legislatively Designated Area (Nelchina Pubic Use Area)

Source: ADNR, Susitna Area Plan, 1985
C = Coal
F = Forestry
G = Grazing
PL = Private Lands
PR = Public Recreation
S = Settlement
WH = Wildlife Habitat
N/A = Not applicable

TABLE 5.11-2
Copper River Basin Game Management Unit in Proximity to the ANGDA Gas Spur Pipeline Corridor

Management Unit Number	Management Unit Name	Primary Land Use Designation	Secondary Land Use Designation	Other Comments
3	North of Tazlina	3c:Forestry, Wildlife Habitat	3c:Public Recreation	
4	North of Glenn Hwy Near Snowshoe Lake	4a:Wildlife Habitat	4a:Forestry, Public Recreation	
5	Lake Louise Road Area	5c:Public Recreation	5c: Wildlife Habitat	5c:Proposed Legislative Designation Kettlehole Lakes – Mendeltna Creek Area
		5d: Settlement	5d: Forestry, Water Resources, Wildlife Habitat	
		5f:Public Recreation, Wildlife Habitat	5f: Forestry	
		5g:Settlement	5g: Wildlife Habitat	
		5h:Wildlife Habitat	5h:Forestry, Public Recreation	

Source: ADNR and ADF&G, Copper River Basin Area Plan, 1986

5.12 Mineral Licks

Mineral licks are legislatively designated to be protected. Mineral (salt) licks will be identified and protected throughout the pipeline right-of-way corridor.

5.13 Trails

The right-of-way corridor will not permanently block nor enhance access to any of the numerous trails that exist from Glennallen to the Palmer pipeline terminus. Trails are listed in Table 5.13-1.

TABLE 5.13-1
Matanuska-Susitna Borough -Trails Crossed by the ANGDA Gas Spur Pipeline Corridor

Trail Name
Kings River Trail*
Chickaloon-Knik-Nelchina Trail*
Chickaloon River Trail*
Ninety-eight Trail
Castle Mountain Trail
Puritan Trail
Boulder Creek Trail
Muddy Creek Trail
Pinochle Trail (Hicks Creek)*
Dan Creek Trail
Caribou Creek Trail*
Squaw Creek Trail*
Alfred Creek Trail
Belanger Pass Trail*
Startup Lakes Trail*
Old Man Creek Trail*
Crooked Creek Trail*
Copper Center – Nelchina Trail*
Ewan Cabin Lake Trail*
Lost Cabin Lake Train*
Slide Mountain Trail*

*Names marked with * indicate RS-2477 Trails

5.14 Visual Resources

The GLENN HIGHWAY SCENIC BYWAY 2003 Visitors Map lists some of the visual resources from Palmer to Glennallen that include historical, cultural, and recreation areas, scenic overlooks, trailheads, lodges, roadhouses, a Paleontologic Interpretive Wayside and the raptor viewing site. None of the resources will be impacted by the buried pipeline. The buried pipeline will be within existing rights-of-way corridors and RS 2477 trails and will not detract from the visual resources along the Glenn Highway and Caribou Creek area.

6.0 Project Coordination

ANGDA has worked closely with federal, state, and local agencies, communities and individuals as an integral part of planning this project. Coordination has included meetings with agency representatives, agency pre-application meetings, and follow-up meetings to discuss project plans, present information. There has been extensive coverage by the media, mailings of project information to residents, and meetings with interest groups. Comments on project scope, environmental concerns, permitting requirements, and data gaps have been actively sought. Meetings and other coordination will continue as the project progresses.

6.1 Subsistence, Recreation, and Sport Hunting

The ADNR commissioner determined it is necessary to prevent unreasonable conflicts with local subsistence harvests. Restrictions to prevent unreasonable conflicts can include alternative site selection, requiring directional drilling, and seasonal drilling restrictions. A Subsistence Study Plan will be prepared as part of the permanent right-of-way lease application using current data for resources and harvests. The Plan will outline Socioeconomic Protection and will be coordinated with Public Outreach and Community Relations Programs, as well as state and federal agencies responsible for subsistence harvesting in Alaska.

The subsistence way of life and associated values of sharing food and its influence on the extended family and traditional knowledge, is considered an integral part of being a Copper River area resident (Ahtna, Inc., 1973). In addition to this cultural component, subsistence is a direct source of economic well being for area residents. Subsistence resources enter into household income as a food source that does not have to be purchased. A loss of subsistence resources would represent a loss of income. Hunting and trapping occur year-round and are significant to social and cultural meaning, food, and income to area residents. Salmon, moose, and caribou dominate the subsistence resource and accounted for almost 85 percent of the resources harvested (Cuccarese and McMillan, 1988). Subsistence harvest includes berries, sour dock and roots, and cottongrass seedlings. Wood is used for fuel and building. Resources are usually harvested near trails, local roads, and major highways.

6.2 Potential Affects to Subsistence Users

Athapaskan Indians from the Tatlatan and Ahtna groups were the Copper River basin's earliest inhabitants. The Ahtna, Athapaskan-speaking people, likely inhabited the Copper River basin for at least the last thousand years (Workman, 1976). The Russian fur trade and mining influenced the local populations and some culture and technology from the Russian fur trade were incorporated into Ahtna life (Reckord, 1979). The gold rush to the Yukon River in1898 introduced a mining related population into the region and eventually, trapping replaced mining the area. Commercial trapping dwindled and state, federal and local governments provided economic stability in the region. Many families had to cease commercial trapping when they moved from small villages to communities with schools. (Reckord, 1979; 1983b). The Trans-Alaska Pipeline brought economic development to Copper River basin between 1973 and 1977 as some employment opportunities in the maintenance of the pipeline and right-of-way remained (Reckord, 1979). New transportation and construction of new roads opened the Copper River basin (Reckord, 1983b).

6.3 Recreation

The Matanuska-Susitna area and Copper River Basin offer year-round outdoor recreation for local residents and income from tourism. Rivers, streams, lakes, valleys, mountains, and trails are used for hiking, dog mushing, fishing, hunting, sightseeing, cross-country skiing, snow-machine use, rafting, boating, camping, and other private and commercial recreational activities.

State parks and recreation areas located in or near the pipeline corridor include Lake Louise, Little Nelchina State Recreation Area, Long Lake and Moose Creek, Weiner Lake, Matanuska Valley Moose Range, Kings Mountain State Recreation Site, Coyote Lake, 17 Mile Lake, Alpine Historical Park as well as scenic overlooks, trail heads and other viewing areas. The Matanuska Glacier State Recreation Site offers trails along the bluff for excellent views of glacier.

6.4 Alpine Areas

The Alpine areas are important for hunting Dall sheep, moose, bear, caribou and other species. The area contains mineral resources including gold, silver, copper other metallic minerals and limestone. Mineral licks in the area will be protected. Access to trails and to sheep mineral licks will not be blocked. Existing mining claims will not be impacted. The area will remain in public ownership for wildlife protection, hunting and recreation opportunities. See Nelchina Public Use Area below.

6.5 Caribou Creek

Low densities of waterfowl are present in the vicinity of Caribou Creek (Alaska Regional Profiles, Southcentral Region, Lidia L. Selkregg, July 1974). There are populations of moose, caribou, wolverine, porcupine, mountain goat, Dall sheep, wolves, and brown and black bear.

6.6 Chickaloon

The Chickaloon Village Traditional Council, in collaboration with other agencies and the local community worked to restore fish passage and to improve the habit on Moose Creek. (http:///www.chickaloon.org). The Chickaloon area offers lakes and variety of fish and other wildlife. A portion of the area is in the Matanuska Valley Moose Range. (Chickaloon Community Plan, Amended April, 1995)

6.7 Glacier View

Recreation related businesses are along the Glen Highway. Glacier View includes a relatively pristine and scenic area with heavily used trails and tourism. Historic sites within the Glacier View-Nelchina area include two prehistoric sites. Historic sites include the Eureka Lodge, Tahona Pass and Sheep Mountain White Alice communications systems sites, Hitchcock homestead, and Meekin hunting camp as well as a Coal exploration site, a wayside site and Pinochle Hill lookout. (Glacier View Comprehensive Plan, 1994)

6.8 Glennallen

The pipeline right-of-way will begin in the Glennallen area on AHTNA-owned lands. Glennallen is known as the "hub" to hunting, fishing and recreation opportunities.

6.9 Gun Sight Mountain

The Gun Sight Mountain area is the transition point from interior to coastal Alaska. The significant visual resources seen from the Glenn Highway will not be impacted by the buried gas pipeline.

6.10 Lake Louise

The Lake Louise State Recreation area is known for lake trout fishing and recreation opportunities. (http://www.travelto Alaska.com/Lake_Louise.html). Lake Louise is connected by road to the Glenn Highway. The Lake Louise Road provides additional highway access to the northern portion of the area. Several all-terrain vehicle (ATV) trails provide informal access off of the Glenn Highway, and extensive snow machine access occurs during the winter when snow cover is adequate.

The Lake Louise area has been a winter feeding ground for Nelchina Caribou herds for the last several hundred years. (Lake Louise Comprehensive Plan, November 1998 and Ecology of the Caribou (Rangifer tarandus granti) in Alaska, Richard Skoog Research, 1968). A large percentage of the total annual Nelchina Caribou Herd is taken from the Lake Louise area. Caribou cross roads and highways, even when subject to heavy hunting pressure and increased noise associated with hunting (MMS, 1995a). The buried pipeline will not introduce any physical barrier that will affect caribou migration or access to the area. No new transportation corridors will be introduced that may cause increased access to the Nelchina Caribou Herd vehicle accidents and caribou stress and mortality.

6.11 Nelchina Public Use Area

The Nelchina State Recreation Area includes Squaw Creek. There are one-day skiing or hiking opportunities from the Glenn Highway trailheads. The buried pipeline will not impact recreation opportunities in this area.

6.12 Matanuska-Susitna Valley

Communities within the Matanuska-Susitna Valley that may be affected by the ANGDA spur gas pipeline project include Palmer, Chickaloon, Glacier View, and Sutton.

6.13 Palmer

Palmer has an existing system of trails and plans to add to the trail system with a separated pathway along the east side of the Glenn Highway from commercially developed properties to the Palmer-Wasilla Highway intersection. A new hospital is being constructed near the Trunk Road overpass. (CITY OF PALMER COMPREHENSIVE PLAN, CITY OF PALMER PLANNING & ZONING ADVISORY COMMISSION, JUNE 1999)

6.14 Sutton

Sutton offers scenery and recreation opportunities that includes access to trail heads. Trails and access points will not be impacted by the buried pipeline. (See Section 2.2 Access) This project does not include reclamation efforts related to earlier mining activities. (Sutton Comprehensive Plan, April 2000).

7.0 Public Outreach Program

ANGDA developed a Public Outreach Program in preparation to applying for the right-of-way lease application. ANGDA and its consultants met with individuals, communities, utilities, government agencies, recreation groups and other special interests groups to inform the stakeholders of the project and asked for input.

Following is a consolidation of comments and questions from those meetings that relate to this *Environmental Report.* The meetings are documented and attached as Appendices to the "conditional" right-of-way lease application.

7.1 Recreation

The comments listed below are addressed in the *Recreation Users Report and* the *Public Outreach Report.*

- Traffic is already heavy up through Boulder Creek with snow machines and 4-wheelers and camp sites and cabins. A truck could be driven up there and putting in the pipeline will not cause any more damage.
- Taking all of the necessary equipment to lay the pipe into the Boulder and Caribou Creek area would require that a road be built. How can we prevent the area from being opened up to a greater number of snow machines and four wheelers?
- Small trees throughout the Caribou Creek valley keep snow-machine traffic out of the area.
- The Caribou Creek and Boulder Creek areas are popular for berry picking.
- A conservation corridor near Squaw Creek, close to Gunsight Pass, is used to view and count migrating raptors.
- Gun Sight Pass drum site area is being cleaned up and Martin Road is closed.
- The Sutton and Chickaloon coalmine cleanup activities added unwelcome access roads, damaged existing trails and increased traffic.
- The Moose Range area is a very sensitive with swamps and very important "mineral licks". What measures will be taken to not disturb the Moose Range?
- Will trees be replaced after removal from forested areas?
- Will the project change foot-access only into the Moose Range?
- Will ANGDA replant and rehabilitate at the time of construction?

7.2 Community Concerns:

How will workers be hired for the project? A Project Labor Agreement will be in-place prior to construction that would designate local resident hiring. "Local Hire" construction crews would be bussed to and from their home areas or assembly points.

Does ANGDA plan on bringing in a man-camp or use the facilities of the communities? ANGDA will not build construction camps for this project. Existing facilities along the route will provide accommodations for the personnel.

Would there be permanent employment for maintenance and compressor stations? Only 1-2 people will be required during the buried pipeline operations to provide maintenance, surveillance, and monitoring for 1 to 2 times per month throughout the year.

The communities do not have the infrastructure for a large influx of people. Existing permitted, private, or commercial facilities along the alignment will support the project. Examples of existing facilities include the Gulkana Airport, Gunsight Mountain Landing Strip, Glenn Highway, Palmer Airport, Tazlina Strip, and utility easements.

ANGDA plans to fund, develop, equip, train and staff , minor emergency medical facilities in select communities for the pipeline construction project. The facilities and equipment will remain at the respective locations for use by the area residents. Funding, support, equipment maintenance and personnel training will be the communities' responsibility after construction is completed.

Medical facilities exist in both Glennallen and Palmer. Contractors will be required to provide onsite health care to respond to minor medical needs. Emergency support services facilities, communication, equipment and training will be provided at multiple locations during construction. As discussed previously, ANGDA plans to develop, equip, train and staff new minor emergency medical facilities.

How long will traffic be backed up during the excavation? A Traffic Control Program will be developed in coordination with the ADOT/PF to minimize traffic congestion and delays.

The following comments brought forward from the Public Outreach Report are discussed in the Engineering Report.

- Why not build the pipeline down through the river?
- How will ANGDA address the safety issues of a pipeline being so close to communities**?**
- How will you deal with the permafrost pushing the line out of the ground
- The telephone company has fiber cables running along the ADOT/PF ROW.
- Will the natural gas be available to Copper Valley Electric?
- What type of facility will be built in Glennallen?
- Is there a connection between this pipeline and the Nelchina natural gas exploration well? Will this line be able to tie into the well if they are successful?
- How will the Nelchina basin area affect the pipeline and its construction?
  - The route will encounter several strand faults (tributary faults that radiate out from the main fault).
  - The route between Sutton to Boulder Creek is at least 1/3 bed rock terrain

- Portions of the route are in permafrost areas: (Chitna Pass and Squaw Creek through the Copper River Basin). The permafrost is thermally sensitive with lakebed deposits that insulate the permafrost. Disturbance of the top layer will create instability.
- Formal public hearings will be conducted by the Alaska Department of Natural Resources (ADNR) in compliance regulations for common carrier right-of-way leasing. ANGDA is committed to working with State representatives to ensure synchronization, expected outcomes, deliverables and timelines for the public hearings.

7.3 Public Outreach Program Summary

ANGDA's Public Outreach Program will continue with information provided through web pages, e-mail communications, power point presentations, a display booth, fact sheets, detailed routing maps, brochures, to communicate with the various entities that may be affected by the project. All components of the outreach program will be recorded and tracked to ensure issues and concerns are addressed. The results will be documented and provided to the State for use in the public hearings.

The Public Outreach Program will include communities, state and federal agencies, AHTNA, Inc., the Matanuska-Sustitna Coastal District, local governments, non-government organizations and individuals.

The Public Outreach Program team members include:

Harold Heinze, Chief Executive Officer, ANGDA

O. D. Odsather, Project Coordinator

Tom Arminski, Bristol Environmental and Engineering Services

Ruth Adams, RL&A Consultant

Marvin Swink, ASRC Energy Services, Lynx Enterprises, Inc.

Wes Watkins, Michael Baker

John Lau, ENSTAR

8.0 Project Authorizations and Permits

This section addresses the requirements set out in Part IV and Part V of the right-of-way lease application. The buried pipeline project is subject to strict state and federal laws that provide safeguards for persons, property, the public and the environment. Critical permits and authorizations required for this project are the State of Alaska AS 38.35 common carrier right-of-way lease; Clean Water Act (CWA) Section 404 permits from the U.S. Army Corps of Engineers; and CWA Section 401 permits from the Alaska Department of Environmental Conservation; Coastal Zone Management Act (CZMA) Alaska Coastal Management Plan (ACMP) public review and final consistency determination in support of the Section 404 permits. In addition, project specific permits and authorizations required under state and federal laws for pipeline construction, operation, maintenance, and termination will support the issuance of the right-of-way lease.

The buried pipeline will be regulated by numerous statutes, regulations and authorizations that were promulgated to protect the public health, safety, well-being, fish and wildlife and their habitats, and subsistence related concerns, among others. Following is a listing of permits and authorizations that will apply to this project. Other permits may be identified during the state and federal review process. The following lists permits and authorizations that are applicable to this project.

8.1 Federal Permits and Authorizations

- National Environmental Policy Act (NEPA)
- Environmental Evaluation Document or Environmental Assessment
- U.S. Army Corps of Engineers
  - Clean Water Act, Section 404 Certification
- U.S. Environmental Protection Agency (EPA)
  - National Pollutant Discharge Elimination System (NPDES) Permit for Trench Dewatering and Hydrostatic Test Water Discharges, Notice of Intent for Storm Water Discharges Associated with Construction Activity Under an NPDES Permit
- U.S. Fish and Wildlife Service
  - Bald Eagle Nest Tree Survey (Bald Eagle Protection Act)
- Federal Communications Commission (FCC)
  - Radio License and Permit to Operate Radio Equipment

8.2 State Permits and Authorizations

- Alaska Department of Transportation/Public Facilities
- Alaska Department of Natural Resources
  - Alaska Coastal Management Program (ACMP) Consistency Review & Determination
  - Temporary Water Use Permit

  - Office of Habitat Management and Permitting Title 16 Fish Habitat Permit
  - AS 38.35 Common Carrier Pipeline Right-of-Way Lease
  - National Historic Preservation Officer Section 106 Consultation (SHPO) and Cultural Survey and Clearance
  - Timber Removal Approval (Division of Forestry)
- Alaska Department of Fish and Game
  - Bear Interaction Plan
- Alaska Department of Environmental Conservation
  - State of Alaska, Section 401 Water Quality Certification of Section 404 Permit
  - Air Quality Construction and Operations Permits
  - Spill Prevention and Response
  - Notice of Wastewater Disposal from Excavation Dewatering, General Permit
  - Notice of Disposal of Wastewater from Hydrostatic Test Dewatering, General Permit
  - Temporary Waste Storage

8.2 Local Governments Permits and Authorizations

- Matanuska-Susitna Borough
  - Land Use Permits and Utility Permits: Sutton, Chickaloon, and Glacier View are regulated by the Matanuska-Susitna Borough.
  - Conditional Use Permits
  - Chickaloon Special Land Use District and Glacier View area.
  - Temporary Waste Storage

8.3 OTHER:

Copper Valley Electric, Matanuska Electric Authority, ENSTAR Natural Gas, Water, cable television and other potential utility permits may be required for this project.

8.4 Alaska Statutes and Administrative Code Sections: Oil and Gas Activities

AS 38.05.027	Legislatively designated state game refuges and critical habitat areas management responsibility: ADF&G (AS 16.20.050-060). Both ADNR and ADF&G will have permitting responsibility.
AS 38.35.010-260	The ADNR Commissioner has the authority to execute the conditional and permanent right-of-way leases.
AS 38.05.127	Reserves easements to ensure navigable or public water access.
11 AAC 53.330	Implementing regulations to reserve easements to ensure navigable or public water access. (AS 38.05.127)
11 AAC 83.158(a)	A plan of operations must be approved by the ADNR commissioner when (1) state owns all or a part of the surface estate, (2) lease reserves a net profit share to the state, (3) state owns all or part of the mineral estate, but surface estate is owned by a party other than the state, and surface owner requests such a plan.
11 AAC 96.010	Operational required permits include use of explosives and explosive devices except firearms.
11 AAC 96.140	Land use activities are subject to general stipulations that minimize surface damage and/or disturbance of drainage systems, vegetation, or fish and wildlife resources.
ADNR/DO&G	
AS 38.05.035(a)(9)(C)	Geological and geophysical data confidentiality.
AS 38.05.130	DO&G director authorized to approve oil and gas exploration and development activities where the surface estate is not held by the state or is subject to third party interests if the director determines adequate compensation was made to surface estate holder for damages caused by lease activities.
AS 38.05.180	Establishes oil and gas leasing program for orderly exploration and development of State of Alaska owned petroleum resources.
11 AAC 96.010-150	Geophysical Exploration Permit controls activities on state lands to minimize adverse activities
ADNR/MLW AS 38.05.075	Establishes leasing procedures for public auction including tide and submerged lands, bidding qualifications, and competitive or non-competitive bidding.

(Continued)

AS 38.05.850	Director authorized to issue permits, rights-of-way or easements on state land for mineral recovery from adjacent land under valid lease.
11 AAC 80.005-055	Pipeline Right-of-Way Leasing Regulations.
11 AAC 93.040-130	Water Rights Permit to appropriate state waters.
11 AAC 96.010-140	Land use permit activities not permitted by a multiple land use permit or lease operations approval.
ADNR/ MLW 11 AAC 93.210-220	Temporary water use permits application procedures.
ADNR/DF AS 41.17.082	Alaska Forest Resources Practices Act requires forest clearing operations and silvicultural systems design to reduce increased forest insect infestation and disease infections.
11 AAC 95.195	Disposal methods or treatment of downed spruce trees to minimize bark beetle spread and to reduce wildfire risk.
11 AAC 95.220	Requires the lessee to file a detailed plan of operations with the state forester.

8.4.1 OHMP

AS 16.05.840	Fish passage permit is required prior to construction.
AS 16.05.870	Protects anadromous fish and game,from project related activities in the beds of specified water bodies and commissioner approval of plans to divert, obstruct, change, or pollute water bodies.
AS 16.20	Legislatively designated game refuges and critical habitat areas management.
AS 16.20.060	Commissioner may require plans for anticipated use, construction work, and fish and game protection. Requires written approval.
5 AAC 95.010-990	Fish and Game Habitat Authority.
5 AAC 95.420-430	Special Area Permit requires certain activities within a state game refuge, state game sanctuary, or a state fish and game critical habitat area.

8.4.2 Alaska Oil and Gas Conservation Commission

AS 31.05.005	Establishes the Alaska Oil and Gas Conservation Commission.

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AS 31.05.030(d)(9)	Oil and gas operator required to file and obtain approval of a plan of development and operation.
AS 46.03.900(35)	Waters definition.
AS 46.03.100	Standards and limitations for accumulation, storage, transportation and disposal of solid or liquid waste.
20 AAC 25.005-570	Permit required maintaining regulatory control over well drilling and completion activities.

8.4.3 ADEC

AS 46.03	Environmental conservation controls include water and air pollution, radiation and hazardous waste protection.
AS 46.03.100	Solid waste disposal requirement.
AS 46.03.900(35)	"Waters" definition.
AS 46.04.010-900	Oil and Hazardous Substance Pollution Control Act prohibits discharge of oil or other hazardous substances unless specifically authorized by permit; requires those responsible for spills to undertake cleanup operations; violators liable for unlimited cleanup costs and damages, and civil and criminal penalties.
AS 46.04.030	Requires oil discharge prevention and contingency plans (C-plans). Regulates above-ground storage facilities with over 5,000 bbl of crude oil or 10,000 bbl of non-crude oil.
AS 46.04.050	Above-ground storage facilities exemption under 5,000 bbl of crude oil or 10,000 of non-crude oil.
18 AAC 15	Certificate of Reasonable Assurance (Water Quality Certification) to protect state waters from pollution. Certifies Federal Water Quality permit will not conflict with Alaska's Water Quality Standards.
18 AAC 50	Air quality control permits requirements, review criteria, and regulation compliance criteria.
18 AAC 50.300	Establishes air quality standards: construction, operation, or modification.
18 AAC 60.220-240	Solid Waste Disposal Permit to control or eliminate detrimental health, environmental, and nuisance effects of improper solid waste disposal practices.
18 AAC 60.520	Drilling wastes containment structures for disposal.

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18 AAC 72	Wastewater Disposal Permit Plan required to prevent water pollution (and public health problems) due to unsafe wastewater disposal systems and practices.
18 AAC 75	Oil and hazardous substance pollution control including oil discharge contingency plan (18 AAC 75.305-.395).
18 AAC 75.065-075	Oil storage tanks requirement.

8.4.4 ADNR/OPMP

AS 44.19.155	Establishes and empowers the Alaska Coastal Policy Council.
AS 46.40	Alaska Coastal Management Program.
6 AAC 50	Requires projects to be consistent with the ACMP and the coastal district policies.
6 AAC 80.070(b)(3)	Requires facilities consolidation to the extent feasible and prudent.
6 AAC 80.070(b)(10)	Requires facilities be sited where development needs minimal site clearing, dredging, and construction to the extent feasible and prudent.
6 AAC 80.070(b)(11)and(12)	Requires facilities be sited to allow free passage and movement of fish and wildlife to the extent feasible and prudent
6 AAC 80.130(c)(3)	Wetlands and tideflats management to assure adequate water flow, avoid adverse effects on natural drainage patterns, and destruction of important habitat.
6 AAC 85	Guidelines for district coastal management programs.
AS 26.23.195	State Emergency Response Commission.
AS 39.50.20	State Emergency Response Commission's, Hazardous Substance Spill Technology Review Council for research, testing spill technologies, and clearinghouse service for containment and cleanup technology.
AS 24.20.600	Citizens Oversight Council "watchdog" for state and federal agencies responsibile to prevent/response to oil spills; help ensure compliance with environmental laws and regulations

8.5 Federal Statutes

- U. S. Army Corps of Engineers (USACE), Clean Water Act (CWA) - 33 U.S.C. §§ 1251-1387 § 1343 – Permit is required to excavate, fill, alter, or modify the course or condition of navigable or U. S. waters.§ 1344 - Discharge of Dredge and Fill
- Oil Spill and Hazardous Substances Pollution Contingency Plan - 40 C.F.R. § 300
- Environmental Protection Agency (EPA) Regulations - 40 C.F.R. § 109 - Criteria for Oil Removal Contingency Plans § 110 - Discharge of Oil § 112 - Oil Pollution Prevention. 112.7 - Guidelines for implementation of SPCC plan § 113 § 114 - Civil Penalties for Violation of Oil Pollution Regulations § 116 - Designation of Hazardous Substances § 117 - Determination of Reportable Quantities for Hazardous Substances
- Environmental Protection Agency (EPA) Regulations Water Quality Regulations - 40 C.F.R., § 121 - State Certification of Activities Requiring a Federal Permit
  § 136 - Test Procedures for Analysis of Pollutants
- Environmental Protection Agency (EPA) NPDES Permit System: EPA Regulations - 40 C.F.R. § 122 - NPDES Permit Regulations
- Environmental Protection Agency (EPA) Regulations - 40 C.F.R.
  § 231 - Disposal Site Determination
- U.S. Fish and Wildlife Coordination Act - 16 U.S.C. §§ 661-666(c)
  Allows comment on § 404 permit applications by USF&WS, NMFS, and EPA.
  Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 42 U.S.C. §§ 9601-9675
- EPA Plans - 40 C.F.R.
  § 300 - National Oil and Hazardous Substances Pollution Contingency Plan
  Safe Drinking Water Act - 42 U.S.C. § 300
  EPA Regulations - 40 C.F.R.
  § 144 - Permit Regulations for the Underground Injection Control Program § 146 - Criteria and Standards for Underground Injection Control Program, § 147 - State Underground Injection Control Program, Coastal Zone Management Act (CZMA) - 16 U.S.C. §§ 1451-1464
- Solid Waste Disposal Act, as amended by Resource Conservation and Recovery Act (RCRA) -42 U.S.C., §§ 6901-6991
- Clean Air Act (CAA) - 42 U.S.C. §§ 740l-7642
- Toxic Substances Control Act - 15 U.S.C. §§ 2601-
- National Environmental Policy Act (NEPA) - 42 U.S.C. §§ 4321-4347
  Council on Environmental Quality (CEQ) Regulations - 40 C.F.R.
  §§ 1500-1508 - Implementing NEPA Procedures
- Fish and Wildlife Coordination Act - 16 U.S.C. §§ 661-666(c)
- Migratory Bird Treaty Act - 16 U.S.C. §§ 703-711

- National Historic Preservation Act - 16 U.S.C. § 470
- Leases and Permits on Restricted Properties - 25 C.F.R. § 162

9.0 Programs and Plans

ANGDA will develop project specific programs and plans, referenced previously in this report that will supplement the permanent right-of-way lease application. The programs will be developed to manage the project with data acquired through field studies and investigations. Project-specific plans that will be required to safeguard the public and private property include:

- Quality Control Program
- Public Information Program
- Pipeline Design Basis Leak Detection Program
- Contingency Plan and Pipeline Inspection Program
- Pipeline Construction Program
- Construction Rehabilitation
- Operations Plan and Maintenance Plan
- Brushing and Clearing the Corridor Plan
- Drainage, Erosion and Siltation Control Plan
- Health and Safety Program
- Environmental Protection Program
- Air and Water Resources Quality Protection Program
- Waste Minimization and Management Program
- Employee Briefings, Orientation, and Education
- Fish and Wildlife Protection, Monitoring, and Inspection Program
- Noise Abatement and Control Program
- Subsistence Resources and Use Protection Plan
- Bear Interaction Plan

10.0 Water and Geologic Hazards Studies

Water quality issues including wetlands and associated habitats are important to this project. The effects of activities on water quality have been the subject of numerous studies.

10.1 Water Quality Studies

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Appendix A

Common Plant Species in the ANGDA Spur Gas Pipeline Corridor

Common Plant Species in the ANGDA Buried Spur Gas Pipeline Corridor

Vegetation Type	Common Name	Scientific Name
Trees and shrubs	Paper birch	Betula papyrifera
	Shrub birch	Betula gladulosa
	Dwarf birch	Betula nana
	Black spruce	Picea mariana
	White spruce	Picea flauca
	Black cottonwood	Populus tridchocarpa
	Balsam poplar	P. balsamifera
	Quaking aspen	Populus tremuloides
	Thinleaf alder	Alnus tenuifolia
	Sitka alder	Alnus sinuate
	Green alder	Alnus crispa
	Willows	Salix spp.
	Labrador tea	Ledum spp.
	Highbush cranberry	Viburnum edule
	Lowbush cranberry	Vaccinium vitis-idaea
	Bog blueberry	Vaccinium uliginosum
	Black crowberry	Empetrum nigrum
	Shrubby cinquefoil	Potentilla fruticosa
	Sweetgale	Myrica gale
	Bog rosemary	Andromeda polifolia
	Devil's club	Echinopanax horridum
	Prickly rose	Rosa accicularis
	False azalea	Menziesia ferruginea
	Red elder	Sambucus callicarpa
	Red current	Ribes triste
	Red raspberry	Rubus idaeus
	Cloudberry	Rubus chamaemorus

Common Plant Species in the ANGDA Buried Spur Gas Pipeline Corridor

Vegetation Type	Common Name	Scientific Name
	Tamarack	Larix laricina
	Bunchberry	Cornus Canadensis
Grasses and Forbs	Bluejoint reedgrass	Calamagrostis Canadensis
	Fireweed	Epilobium angustifolium
	Twinflower	Trientalis europaea
	Wintergreen	Pyrola spp.
	Oak fern	Gymnocarpium dryopteris
	Lady fern	Athyrium filix-femina
	Bunchberry	Cordnus Canadensis
	Meadow horsetail	Equisetum arvense
	Woodland horsetail	Eqisetum silvaticum
	Cow parsnip	Heracleum lanatum
	Cattails	Typha latifolia
Aquatiac Plants	Yellow pond lily	Nuphar polsepalum
	White water lily	Nymphaea tetragona
	Mare's tail	Hippuris spp.
	Pondweeds	Potomageton spp.
	Sedges	Carex spp.
	Water sedge	Carex aquatilis

Sources: Viereck and Little, 1972; Hulten, 1968; Selkregg, 1974

Appendix B

Preliminary Stream Crossings Report

ANGDA - STREAM CROSSINGS REPORT (Preliminary)

Crossing_ID	MP	Name	Fish	Anadromous		Species	Stocked	Width(ft)	Depth_(In)	RT Bank (ft)	LT_Bank (ft)	Braided	Navigability	Notes
SC-010	0.61	Unnamed Tributary to Moose Creek	Unk	No			No	0.00	0.00					Need Info
SC-020	0.93	EF Moose Creek	Yes	No		AG	No	0.00	0.00					ADF&G 1 and 2
SC-030	1.66	Unnamed	Unk	No			No	0.00	0.00					Need Info
SC-040	3.85	Moose Creek	Yes	No		AG	No	0.00	0.00					ADF&G 3
SC-050	15.95	Tolsona Creek	Yes	Yes	212-20-10080-2431-3082	AG, K, S	No	0.00	0.00					ADF&G 4
SC-060	20.09	Little Woods Creek	Yes	No		AG		0.00	0.00					ADF&G 6
SC-070	23.90	Atlasta Creek	Yes	No		AG	No	0.00	0.00					ADF&G 7
SC-080	26.76	Tex Smith Lake Drainage (Near Trapper's Den)	Yes	No		RT	Yes	0.00	0.00					ADF&G 8
SC-090	27.62	Unnamed	Unk	No			No	0.00	0.00					Need Info
SC-100	28.10	Unnamed	Unk	No				0.00	0.00					ADF&G 9- Possibly AG
SC-110	28.60	Unnamed	Unk	No				0.00	0.00					ADF&G 10- Possibly AG
SC-120	34.51	Woods Creek	Yes	Yes	212-20-10080-2431-3122-4010	K, CO	No	0.00	0.00					ADF&G 14
SC-130	35.80	Mendeltna Creek	Yes	Yes	212-20-10080-2431-3122	S, CO, K, AG	No	0.00	0.00					ADF&G 15
SC-140	41.22	Cache Creek	Yes	No		AG	No	0.00	0.00					ADF&G 16
SC-150	41.63	Unnamed	Unk	No			No	0.00	0.00					Need Info
SC-160	45.24	Unnamed Creek	Unk	No			No	0.00	0.00					ADF&G 19- Possibly AG
SC-170	45.71	Unnamed Creek	Unk	No			No	0.00	0.00					ADF&G 20- Possibly AG
SC-180	46.57	Unnamed Creek	Unk	No			No	0.00	0.00					ADF&G 21- Possibly AG
SC-190	48.65	Unnamed Tributari to Little Nelchina River	Unk	No			No	0.00	0.00					ADF&G 22- Possibly AG
SC-200	49.16	Unnamed Tributari to Little Nelchina River	Unk	No			No	0.00	0.00					ADF&G 23- Possibly AG
SC-210	49.73	Unnamed Tributari to Little Nelchina River	Unk	No			No	0.00	0.00					ADF&G 24- Possibly AG
SC-220	49.80	Unnamed Tributari to Little Nelchina River	Unk	No			No	0.00	0.00					ADF&G 25- Possibly AG

AG= Arctic grayling, CH= Chum Salmon, CO= Coho salmon, DB= Dolly Varden, K= King Salmon MP=Mile Post (Pipeline Route Version 2/17/05)

ANGDA - STREAM CROSSINGS REPORT (Preliminary)

Crossing_ID	MP	Name	Fish	Anadromous	Species	Stocked	Width(ft)	Depth_(In)	RT Bank (ft)	LT_Bank (ft)	Braided	Navigability	Notes
SC-230	50.86	Little Nelchina River	Unk	No		No	0.00	0.00					ADF&G 26- Possibly AG
SC-240	53.02	Unnamed Tributari to Little Nelchina River	Unk	No		No	0.00	0.00					ADF&G 27- Possibly AG
SC-250	53.45	Unnamed	Unk	No		No	0.00	0.00					
SC-260	61.63	Old Man Creek	Unk	No		No	0.00	0.00					ADF&G 28
SC-270	64.77	Startup Creek	Yes	No	AG	No	0.00	0.00					ADF&G 29
SC-280	65.25	Unnamed	Unk	No		No	0.00	0.00					Need Info
SC-290	65.61	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					ADF&G 32- Possibly AG
SC-300	66.34	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					ADF&G 33- Possibly AG
SC-310	67.60	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					ADF&G 34- Possibly AG
SC-320	68.70	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					ADF&G 35- Possible AG
SC-330	69.71	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-340	70.03	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-350	70.64	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-360	71.14	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-370	71.24	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-380	72.75	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-390	72.94	Unnamed Tributary to Squaw Creek	Unk	No		No	0.00	0.00					Need Info
SC-400	75.49	Unnamed Tributary to Caribou Creek	Unk	No		No	0.00	0.00					
SC-410	75.68	Caribou Creek	Unk	No		No	0.00	0.00					ADG&G 42- Possibly Grayling
SC-420	75.84	Unnamed Tributary to Caribou Creek	Unk	No		No	0.00	0.00					ADF&G 43- Possibly Grayling
SC-430	76.41	Unnamed Tributary to Caribou Creek	Unk	No		No	0.00	0.00					ADF&G 44
SC-440	79.27	Unnamed Tributary to Caribou Creek	Unk	No		No	0.00	0.00					ADG&G 46- Possibly AG

AG= Arctic grayling, CH= Chum Salmon, CO= Coho salmon, DB= Dolly Varden, K= King Salmon MP=Mile Post (Pipeline Route Version 2/17/05)

ANGDA - STREAM CROSSINGS REPORT (Preliminary)

Crossing_ID	MP	Name	Fish	Anadromous		Species	Stocked	Width(ft)	Depth_(In)	RT Bank (ft)	LT_Bank (ft)	Braided	Navigability	Notes
SC-450	79.38	Unnamed Tributary to Caribou Creek	Unk	No			No	0.00	0.00					ADG&G 47- Possibly AG
SC-460	80.12	Unnamed Tributary to Caribou Creek	Unk	No			No	0.00	0.00					ADF&G 48- Possibly AG
SC-470	80.41	Unnamed Tributary to Caribou Creek	Unk	No			No	0.00	0.00					
SC-480	80.97	Divide Creek	Unk	No			No	0.00	0.00					ADG&G 49- Possibly AG
SC-490	83.72	Unnamed Tributary to Caribou Creek	Unk	No			No	0.00	0.00					ADF&G 50- Possibly AG
SC-500	83.97	Unnamed Tributary to Caribou Creek	Unk	No			No	0.00	0.00					ADF&G 51- Possibly AG
SC-510	85.07	Chitna Creek	Unk	No			No	0.00	0.00					
SC-520	87.57	Unnamend Tributary to Chitna Creek	Unk	No			No	0.00	0.00					ADG&G 53- Possibly AG
SC-530	90.20	Unnamend Tributary to Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 53- Possilby AG
SC-540	90.75	Unnamend Tributary to Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 53- Possilby AG
SC-550	92.30	Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 55- Possibly AG
SC-560	93.23	Unnamend Tributary to Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 56- Possibly AG
SC-570	93.37	Boulder Creek	Unk	No			No	0.00	0.00					ADG&G 55- Possibly AG
SC-580	99.93	Boulder Creek	Unk	No			No	0.00	0.00					ADG&G 55- Possibly AG
SC-590	100.09	Unnamend Tributary to Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 63- Possibly AG
SC-600	101.05	Unnamend Tributary to Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 64- Possibly AG
SC-610	102.91	Unnamend Tributary to Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 65- Possibly AG
SC-620	103.39	Blackshale Creek	Unk	No			No	0.00	0.00					
SC-630	104.60	Boulder Creek	Unk	No			No	0.00	0.00					ADF&G 67- Possibly AG
SC-640	110.50	Chickaloon River	Yes	Yes	247-50-10220-2171	CH, AG, DV	No	0.00	0.00					ADF&G 68
SC-650	112.27	California Creek	Unk	No			No	0.00	0.00					ADF&G 69- Possibly AG
SC-660	114.25	Unnamed	Unk	No			No	0.00	0.00					ADF&G 70

AG= Arctic grayling, CH= Chum Salmon, CO= Coho salmon, DB= Dolly Varden, K= King Salmon MP=Mile Post (Pipeline Route Version 2/17/05)

ANGDA - STREAM CROSSINGS REPORT (Preliminary)

Crossing_ID	MP	Name	Fish	Anadromous		Species	Stocked	Width(ft)	Depth_(In)	RT Bank (ft)	LT_Bank (ft)	Braided	Navigability	Notes
SC-670	117.94	Kings River	Yes	Yes	247-50-10220-2115	CH,CO,	No	0.00	0.00					ADF&G 71
SC-680	121.70	Young Creek	Unk	No			No	0.00	0.00					ADF&G 72- Possibly AG
SC-690	124.29	Little Granite Creek	Unk	No			No	0.00	0.00					ADF&G 73- Possible CO
SC-700	126.01	Granite Creek	Yes	Yes	247-50-10220-2105	K,CO, CH		0.00	0.00					ADF&G 74
SC-710	128.01	Eska Creek	Yes	Yes	247-50-10220-2095	CH, CO	No	0.00	0.00					ADF&G 75
SC-720	134.32	Moose Creek	Yes	Yes	247-50-10220-2085	K, DV, CO	No	0.00	0.00					ADF&G 77
SC-730	138.53	Carnegie Creek	Yes	Yes	247-50-10260-2019-3076	K, DV, CO	No	0.00	0.00					
SC-740	140.31	Carnegie Creek	Yes	Yes	247-50-10260-2019-3076	K, DV, CO	No	0.00	0.00					
SC-750	141.73	Wasilla Creek	Yes	Yes	247-50-10260-2019	K, DV, CO	No	0.00	0.00					
SC-760	143.10	Wasilla Creek	Yes	Yes	247-50-10260-2019	K, DV, CO	No	0.00	0.00					
SC-770	143.28	Wasilla Creek	Yes	Yes	247-50-10260-2019	K, DV, CO	No	0.00	0.00					
SC-780	144.39	Wasilla Creek	Yes	Yes	247-50-10260-2019	K, DV, CO	No	0.00	0.00					
SC-790	147.24	Spring Creek	Yes	Yes	247-50-10260-2019-3020	CO	No	0.00	0.00					
SC-800	147.36	Spring Creek	Yes	Yes	247-50-10260-2019-3020	CO	No	0.00	0.00					
SC-810	147.38	Spring Creek	Yes	Yes	247-50-10260-2019-3020	CO	No	0.00	0.00					

Count of Stream Crossings= **81**

AG= Arctic grayling, CH= Chum Salmon, CO= Coho salmon, DB= Dolly Varden, K= King Salmon MP=Mile Post (Pipeline Route Version 2/17/05)

Appendix C

Wetlands Report

ANGDA-WETLANDS REPORT

BEGIN MP	END MP	SUMMARY	SYSTEM	ATTRIBUTE	DATA SOURCE	WETLAND RANKING
0.00	0.01	U	U	U	USFWS_NWI	Upland
0.01	0.01	U	U	U	USFWS_NWI	Upland
0.01	0.19	U	U	U	USFWS_NWI	Upland
0.19	0.22	W	P	PFO4B	USFWS_NWI	Wetland
0.22	0.84	U	U	U	USFWS_NWI	Upland
0.84	0.89	W	P	PFO4B	USFWS_NWI	Wetland
0.89	1.02	U	U	U	USFWS_NWI	Upland
1.02	1.11	W	P	PFO4B	USFWS_NWI	Wetland
1.11	1.14	W	P	PEM1C	USFWS_NWI	Wetland
1.14	1.32	W	P	PFO4B	USFWS_NWI	Wetland
1.32	1.35	W	P	PSS4/EM1B	USFWS_NWI	Wetland
1.35	1.54	W	P	PFO4B	USFWS_NWI	Wetland
1.54	1.62	W	P	PEM1/SS4B	USFWS_NWI	Wetland
1.62	1.64	U	U	U	USFWS_NWI	Upland
1.64	1.69	W	P	PUBH	USFWS_NWI	Concern Wetland
1.69	1.82	U	U	U	USFWS_NWI	Upland
1.82	1.87	W	P	PSS4/EM1B	USFWS_NWI	Wetland
1.87	1.99	U	U	U	USFWS_NWI	Upland
1.99	2.21	W	P	PFO4B	USFWS_NWI	Wetland
2.21	2.26	U	U	U	USFWS_NWI	Upland
2.26	2.53	W	P	PFO4B	USFWS_NWI	Wetland
2.53	2.57	U	U	U	USFWS_NWI	Upland
2.57	2.66	W	P	PFO4B	USFWS_NWI	Wetland
2.66	2.80	U	U	U	USFWS_NWI	Upland
2.80	2.85	W	P	PFO4/SS4B	USFWS_NWI	Wetland
2.85	2.88	W	P	PEM1/SS1C	USFWS_NWI	Wetland
2.88	3.14	W	P	PFO4/SS4B	USFWS_NWI	Wetland
3.14	3.21	U	U	U	USFWS_NWI	Upland
3.21	3.57	W	P	PFO4/SS4B	USFWS_NWI	Wetland
3.57	3.84	U	U	U	USFWS_NWI	Upland
3.84	4.06	U	U	U	USFWS_NWI	Upland
4.06	4.09	W	P	PSS4B	USFWS_NWI	Wetland

MP= Mile Post (Pipeline Version 2/17/05)
SUMMARY- W= Wetlands, U= Uplands, No Data= No NWI Data Available
SYSTEM- R= Riverine, P=Palustrine, U= Uplands, N= No NWI Data Available
ATTRIBUTE= For Attribute Definitions See http://www.nwi.fws.gov/mapcodes.htm
NWI= National Wetland Inventory (Data generated by the USFWS)

Summary	Length %
NO DATA	**6.97%**
U	**84.05%**
W	**8.97%**

BEGIN MP	END MP	SUMMARY	SYSTEM	ATTRIBUTE	DATA SOURCE	WETLAND RANKING
4.09	4.23	U	U	U	USFWS_NWI	Upland
4.23	4.26	W	P	PSS4B	USFWS_NWI	Wetland
4.26	4.42	U	U	U	USFWS_NWI	Upland
4.42	4.83	W	P	PSS4/1B	USFWS_NWI	Wetland
4.83	4.84	W	P	PSS1/EM1B	USFWS_NWI	Wetland
4.84	4.93	U	U	U	USFWS_NWI	Upland
4.93	5.12	W	P	PSS1/EM1B	USFWS_NWI	Wetland
5.12	5.14	W	P	PSS1/4B	USFWS_NWI	Wetland
5.14	5.76	U	U	U	USFWS_NWI	Upland
5.76	5.94	W	P	PFO4/SS4B	USFWS_NWI	Wetland
5.94	6.22	U	U	U	USFWS_NWI	Upland
6.22	6.27	W	P	PFO4/SS4B	USFWS_NWI	Wetland
6.27	6.42	U	U	U	USFWS_NWI	Upland
6.42	6.56	W	P	PFO4/SS4B	USFWS_NWI	Wetland
6.56	6.91	U	U	U	USFWS_NWI	Upland
6.91	6.92	W	P	PEM1B	USFWS_NWI	Wetland
6.92	6.99	U	U	U	USFWS_NWI	Upland
6.99	7.01	W	P	PEM1B	USFWS_NWI	Wetland
7.01	7.32	U	U	U	USFWS_NWI	Upland
7.32	7.43	W	P	PSS4/1B	USFWS_NWI	Wetland
7.43	7.95	U	U	U	USFWS_NWI	Upland
7.95	8.00	W	P	PSS4/EM1B	USFWS_NWI	Wetland
8.00	8.51	U	U	U	USFWS_NWI	Upland
8.51	9.83	W	P	PSS4B	USFWS_NWI	Wetland
9.83	10.61	W	P	PSS4/FO4B	USFWS_NWI	Wetland
10.61	10.73	U	U	U	USFWS_NWI	Upland
10.73	10.77	W	P	PEM1C	USFWS_NWI	Wetland
10.77	10.86	U	U	U	USFWS_NWI	Upland
10.86	10.89	W	P	PEM1F	USFWS_NWI	Wetland
10.89	11.12	W	P	PSS4/FO4B	USFWS_NWI	Wetland
11.12	11.22	U	U	U	USFWS_NWI	Upland
11.22	13.22	W	P	PSS4/FO4B	USFWS_NWI	Wetland
13.22	13.25	W	P	PSS4/1B	USFWS_NWI	Wetland
13.25	13.45	W	P	PSS4/FO4B	USFWS_NWI	Wetland

MP= Mile Post (Pipeline Version 2/17/05)
SUMMARY- W= Wetlands, U= Uplands, No Data= No NWI Data Available
SYSTEM- R= Riverine, P=Palustrine, U= Uplands, N= No NWI Data Available
ATTRIBUTE= For Attribute Definitions See http://www.nwi.fws.gov/mapcodes.htm
NWI= National Wetland Inventory (Data generated by the USFWS)

Summary	Length %
NO DATA	**6.97%**
U	**84.05%**
W	**8.97%**

BEGIN MP	END MP	SUMMARY	SYSTEM	ATTRIBUTE	DATA SOURCE	WETLAND RANKING
13.45	13.55	U	U	U	USFWS_NWI	Upland
13.55	13.61	W	P	PEM1F	USFWS_NWI	Wetland
13.61	13.70	W	P	PSS4B	USFWS_NWI	Wetland
13.70	14.43	U	U	U	USFWS_NWI	Upland
14.43	14.49	W	P	PEM1C	USFWS_NWI	Wetland
14.49	14.56	U	U	U	USFWS_NWI	Upland
14.56	14.58	W	P	PUBH	USFWS_NWI	Concern Wetland
14.58	14.64	W	P	PSS1/EM1B	USFWS_NWI	Wetland
14.64	14.67	U	U	U	USFWS_NWI	Upland
14.67	14.73	W	P	PSS1/EM1B	USFWS_NWI	Wetland
14.73	15.10	U	U	U	USFWS_NWI	Upland
15.10	15.27	W	P	PSS4B	USFWS_NWI	Wetland
15.27	15.31	W	P	PUBH	USFWS_NWI	Concern Wetland
15.31	15.33	W	P	PEM1F	USFWS_NWI	Wetland
15.33	15.94	U	U	U	USFWS_NWI	Upland
15.94	17.22	U	U	U	USFWS_NWI	Upland
17.22	21.84	U	U	U	USFWS_NWI	Upland
21.84	21.88	W	P	PFO4B	USFWS_NWI	Wetland
21.88	23.41	U	U	U	USFWS_NWI	Upland
23.41	23.46	W	P	PSS4/1B	USFWS_NWI	Wetland
23.46	27.48	U	U	U	USFWS_NWI	Upland
27.48	27.63	W	P	PSS1B	USFWS_NWI	Wetland
27.63	34.40	U	U	U	USFWS_NWI	Upland
34.40	34.49	U	U	U	USFWS_NWI	Upland
34.49	35.76	U	U	U	USFWS_NWI	Upland
35.76	41.21	U	U	U	USFWS_NWI	Upland
41.21	41.34	W	P	PFO4B	USFWS_NWI	Wetland
41.34	41.40	U	U	U	USFWS_NWI	Upland
41.40	41.91	W	P	PFO4B	USFWS_NWI	Wetland
41.91	43.96	U	U	U	USFWS_NWI	Upland
43.96	52.70	NO DATA	N	No Data	LYNX DIGITIZED	No Data
52.70	56.88	U	U	U	LYNX DIGITIZED	Upland
56.88	56.90	W	P	PEM5F	LYNX DIGITIZED	Wetland
56.90	61.62	U	U	U	LYNX DIGITIZED	Upland

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Summary	Length %
NO DATA	**6.97%**
U	**84.05%**
W	**8.97%**

BEGIN MP	END MP	SUMMARY	SYSTEM	ATTRIBUTE	DATA SOURCE	WETLAND RANKING
61.62	61.64	W	P	PSS1/EM5C	LYNX DIGITIZED	Wetland
61.64	64.84	U	U	U	LYNX DIGITIZED	Upland
64.84	64.90	W	P	PSS1/EM5B	LYNX DIGITIZED	Wetland
64.90	65.11	U	U	U	LYNX DIGITIZED	Upland
65.11	65.15	W	P	PSS1/EM5C	LYNX DIGITIZED	Wetland
65.15	65.16	W	P	POWH	LYNX DIGITIZED	Concern Wetland
65.16	65.31	W	P	PSS1/EM5C	LYNX DIGITIZED	Wetland
65.31	66.01	U	U	U	LYNX DIGITIZED	Upland
66.01	66.06	W	P	POWH	LYNX DIGITIZED	Concern Wetland
66.06	75.73	U	U	U	LYNX DIGITIZED	Upland
75.73	75.78	W	P	PSS1C	LYNX DIGITIZED	Wetland
75.78	75.85	W	R	R3FLC	LYNX DIGITIZED	Concern Wetland
75.85	78.45	U	U	U	LYNX DIGITIZED	Upland
78.45	78.47	W	P	PFO/SS1B	LYNX DIGITIZED	Wetland
78.47	78.57	U	U	U	LYNX DIGITIZED	Upland
78.57	78.60	W	P	PFO1C	LYNX DIGITIZED	Wetland
78.60	92.05	U	U	U	LYNX DIGITIZED	Upland
92.05	92.31	W	P	PSS1C	LYNX DIGITIZED	Wetland
92.31	92.39	W	R	R3SBC	LYNX DIGITIZED	Concern Wetland
92.39	93.32	U	U	U	LYNX DIGITIZED	Upland
93.32	99.94	U	U	U	LYNX DIGITIZED	Upland
99.94	100.03	W	R	R3SBC	LYNX DIGITIZED	Concern Wetland
100.03	100.52	U	U	U	LYNX DIGITIZED	Upland
100.52	100.71	W	P	PFO4/SS1B	LYNX DIGITIZED	Wetland
100.71	100.83	U	U	U	LYNX DIGITIZED	Upland
100.83	101.13	W	P	PFO4/SS1B	LYNX DIGITIZED	Wetland
101.13	102.01	U	U	U	LYNX DIGITIZED	Upland
102.01	102.37	W	P	PFO4/SS1B	LYNX DIGITIZED	Wetland
102.37	103.22	U	U	U	LYNX DIGITIZED	Upland
103.22	103.24	W	P	PSS1B	LYNX DIGITIZED	Wetland
103.24	103.91	U	U	U	LYNX DIGITIZED	Upland
103.91	104.22	W	P	PSS1/EM5B	LYNX DIGITIZED	Wetland
104.22	104.25	W	P	PFO1/4B	LYNX DIGITIZED	Wetland
104.25	104.33	U	U	U	LYNX DIGITIZED	Upland

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Summary	Length %
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W	**8.97%**

BEGIN MP	END MP	SUMMARY	SYSTEM	ATTRIBUTE	DATA SOURCE	WETLAND RANKING
104.33	104.43	W	P	PFO1/4B	LYNX DIGITIZED	Wetland
104.43	104.57	W	P	PSS1/EM5B	LYNX DIGITIZED	Wetland
104.57	106.84	U	U	U	LYNX DIGITIZED	Upland
106.84	106.87	W	P	PEM5B	LYNX DIGITIZED	Wetland
106.87	107.36	U	U	U	LYNX DIGITIZED	Upland
107.36	107.40	W	P	PEM5B	LYNX DIGITIZED	Wetland
107.40	110.55	U	U	U	LYNX DIGITIZED	Upland
110.55	110.58	W	R	R3FLC	LYNX DIGITIZED	Concern Wetland
110.58	110.63	W	P	PFO1/SS1C	LYNX DIGITIZED	Wetland
110.63	110.67	W	R	R3FLC	LYNX DIGITIZED	Concern Wetland
110.67	111.83	U	U	U	LYNX DIGITIZED	Upland
111.83	111.92	W	P	PFOAB	LYNX DIGITIZED	Wetland
111.92	113.89	U	U	U	LYNX DIGITIZED	Upland
113.89	114.01	W	P	PSS1/EM5B	LYNX DIGITIZED	Wetland
114.01	114.35	U	U	U	LYNX DIGITIZED	Upland
114.35	114.43	W	P	PSS1/EM5B	LYNX DIGITIZED	Wetland
114.43	114.45	U	U	U	LYNX DIGITIZED	Upland
114.45	114.55	W	P	PSS1/EM5B	LYNX DIGITIZED	Wetland
114.55	116.07	U	U	U	LYNX DIGITIZED	Upland
116.07	117.65	NO DATA	N	No Data	LYNX DIGITIZED	No Data
117.65	117.86	U	U	U	LYNX DIGITIZED	Upland
117.86	118.00	W	R	R3SBC	LYNX DIGITIZED	Concern Wetland
118.00	124.27	U	U	U	LYNX DIGITIZED	Upland
124.27	124.94	U	U	U	LYXN DIGITIZED	Upland
124.94	125.95	U	U	U	LYNX DIGITIZED	Upland
125.95	126.13	W	R	R3SBC	LYNX DIGITIZED	Concern Wetland
126.13	126.82	U	U	U	LYNX DIGITIZED	Upland
126.82	128.02	U	U	U	USFWS_NWI	Upland
128.02	128.14	U	U	U	USFWS_NWI	Upland
128.14	128.18	W	P	PSS1/4B	USFWS_NWI	Wetland
128.18	133.93	U	U	U	USFWS_NWI	Upland
133.93	133.93	U	U	U	USFWS_NWI	Upland
133.93	133.93	U	U	U	USFWS_NWI	Upland
133.93	134.32	U	U	U	USFWS_NWI	Upland

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Summary	Length %
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BEGIN MP	END MP	SUMMARY	SYSTEM	ATTRIBUTE	DATA SOURCE	WETLAND RANKING
134.32	138.25	U	U	U	USFWS_NWI	Upland
138.25	138.28	W	P	PSS1/4B	USFWS_NWI	Wetland
138.28	139.74	U	U	U	USFWS_NWI	Upland
139.74	139.76	W	P	PSS1B	USFWS_NWI	Wetland
139.76	139.79	U	U	U	USFWS_NWI	Upland
139.79	139.82	W	P	PSS1B	USFWS_NWI	Wetland
139.82	139.90	W	P	PEM1/SS1B	USFWS_NWI	Wetland
139.90	140.12	U	U	U	USFWS_NWI	Upland
140.12	140.28	W	P	PEM1/SS1B	USFWS_NWI	Wetland
140.28	141.26	U	U	U	USFWS_NWI	Upland
141.26	141.72	U	U	U	USFWS_NWI	Upland
141.72	142.59	U	U	U	USFWS_NWI	Upland
142.59	142.74	W	P	PSS1/EM1B	USFWS_NWI	Wetland
142.74	143.02	U	U	U	USFWS_NWI	Upland
143.02	143.04	U	U	U	USFWS_NWI	Upland
143.04	143.08	U	U	U	USFWS_NWI	Upland
143.08	143.32	U	U	U	USFWS_NWI	Upland
143.32	143.40	U	U	U	USFWS_NWI	Upland
143.40	147.00	U	U	U	USFWS_NWI	Upland
147.00	147.37	U	U	U	USFWS_NWI	Upland
147.37	147.39	W	P	PEM1/SS1C	USFWS_NWI	Wetland
147.39	147.41	W	P	PEM1F	USFWS_NWI	Wetland
147.41	147.79	U	U	U	USFWS_NWI	Upland
147.79	147.81	W	P	PEM1/SS1Cx	USFWS_NWI	Wetland
147.81	147.85	U	U	U	USFWS_NWI	Upland
147.85	147.87	U	U	U	USFWS_NWI	Upland

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Summary	Length %
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Major Wetland Classes Along Spur Gas Pipeline Right-of-Way Corridor

Wetland System	NWI Class	Wetland Description	Dominant Species
Palustrine	PEM1B	Saturated, persistent emergent marsh generally on peat soils	Cottongrass Sedges Buckbean Sphagnum
	PEM1C	Seasonally flooded, persistent marsh, usually along floodplain of small streams or ponds	Sitka sedge Beaked Sedge Water horsetail
	PEM1F	Semi-permanently flooded persistent marsh usually along ponds or lake margins	Water sedge Pond Lily Water horsetail
	PEM1/SS1A	Temporarily flooded broad-leaf deciduous shrub bog	Bluejoint Sedges Willows Thinleaf alder
	PEM1/SS1B PSS1/EM1B PSS4/EM1B	Saturated broad leaf deciduous shrub bog or stunted black spruce shrub bog with emergent vegetation	Thinleaf alder Dwarf birch Labrador tea Bog blueberry Cloudberry
	PSS1/FO4B PFO4/SS1B PFO4/SS4B	Saturated needle leaf evergreen bog with deciduous shrub or stunted evergreen shrub understory	Black spruce Thinleaf alder Blueberry Cloudberry
	PFO4/SS1A	Temporarily flooded areas on river floodplains with open canopy needle leaf evergreen trees and deciduous shrubs	Black spruce Sweet gale Labrador tea Sedges Marsh cinquefoil Black cottonwood
	PFO4B	Saturated needle leaf evergreen forest often occurring as fringe bordering uplands (islands) in pattern bogs	Black spruce Sweet gale Labrador tea Sedges Marsh Cinquefoil Black cottonwood

Major Wetland Classes Along Spur Gas Pipeline Right-of-Way Corridor

	PFO4/EM1B	Saturated needle leaf evergreen forest with emergent ground layer	Black spruce Sweet gale Sedge Horsetail Marsh Cinquefoil
	PAB3H	Small permanently flooded ponds with rooted vegetation	Water sedge Pond lily
	POWH	Small permanently flooded ponds with unknown bottom type	Not vegetated
Lacustrine	L10WH	Permanently flooded large lake with unknown bottom type	Not vegetated
	L2AB3H	Permanently flooded shallow lake with rooted vascular plants	Water sedge Pond lily
Riverine	R3FLC	Seasonally flooded river flats and bars	Not vegetated or less than 30% shrub cover
	R30WH	Permanently flooded, perennial stream with unknown substrate	Not vegetated (flowing water)
	R3SBC	Seasonally flooded, perennial streambed, braided stream complexes	Not vegetated of less than 30% shrub cover
Source: USFWS (1985) Vierick et al. (1982), Hall (1991)			

Appendix D

Birds Known to be in the ANGDA Spur Gas Pipeline Corridor

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Upland Game Birds	
Willow Ptarmigan	Lagopus lagopus
Rock Ptarmigan	Lagopus mutus
White-tailed Ptarmigan	Lagopus leucurus
Spruce Grouse	Dendragapus canadensis
Sharp-tailed Grouse	Tympanuchus phasianellus
Ruffed Grouse	Bonasa umbellus
Raptors	
Bald Eagle	Haliaeetus leucocephalus
Golden Eagle	Aquila chrysaetos
Osprey	Pandion haliaetus
Northern Goshawk	Accipter gentiles
Sharp-shinned Hawk	Accipter striatus
Red-tailed Hawk	Buteo jamaicensis
Swainson's Hawk	Buteo swainsoni
Rough-legged Hawk	Buteo lagopus
Northern Harrier	Circus cyaneus
Gyrfalcon	Falco rusticolus
Peregrine Falcon	Falco peregrinus
American Kestrel	Falco sparverius
Merlin	Falco columbarius
Great Horned Owl	Bubo virginanus
Snowy Owl	Nyetea scandiaca
Northern Hawk Owl	Surnia ulula
Great Gray Owl	Strix nebulosa
Short-eared Owl	Asio flammeus
Boreal Owl	Aegolius cunereus
Ducks, Geese, Swans	
Trumpeter Swan	Cygnus buccinator
Tundra Swan	Cygnus columbianus
Canada Goose	Branta Canadensis
Dusky Canada Goose	Branta canadensis occidentalis

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Tule White-fronted Goose	Anser albifrons gambelli
Vancouver Canada Goose	Branta canadensis fulva
Snow Goose	Chen caerulescens
Brant	Branta bernicla
Mallard Duck	Anas platyrhynchos
American Black Duck	Anas rubripes
Gadwall Duck	Anas strepera
Northern Pintail	Anas acuta
Green-winged Teal	Anas crecca
Blue-winged Teal	Anas discors
Cinnamon Teal	Anas cyanoptera
Northern Shoveler	Anas clypeata
Eurasian Widgeon	Anas Penelope
American Widgeon	Anas americanus
Canvasback	Aythya valisineria
Redhead Duck	Aythya Americana
Ring-necked Duck	Aythya collaris
Greater Scaup	Aythya marila
Lesser Scaup	Aythya affinis
Common Goldeneye	Bucephala clangula
Barrow's Goldeneye	Bucephala islandica
Bufflehead	Bucephala albeola
Oldsquaw	Clangula hyemalis
Harlequin Duck	Histrionicus histrionicus
White-winged Scoter	Melanitta fusca
Surf Scoter	Melanitta perspicillata
Black Scoter	Melanitta nigra
Ruddy Duck	Oxyura jamaicensis
Hooded Merganser	Lophodytes cucullatus
Red-breasted Merganser	Mergus merganser
Common Merganser	Mergus serrator
Other Waterfowl (waders, loons, herons, gulls, etc.)	

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Common Loon	Gavia immer
Yellow-billed Loon	Gavia adamsii
Arctic Loon	Gavia arctica
Red-throated Loon	Gavia stellata
Red-necked Grebe	Podiceps grisqena
Horned Grebe	Podiceps auritus
Double-crested Cormorant	Phalacrocorax auritus
Great Blue Heron	Ardea herodias
Sora	Porzana Carolina
American Coot	Fulica Americana
Sandhill Crane	Grus Canadensis
Semipalmated Plover	Charadrius semipalmatus
Black-bellied Plover	Pluvialis squatarola
American Golden Plover	Pluvialis dominica
Killdeer	Charadrius vociferous
Hudsonian Godwit	Limosa haemastica
Whimbrel	Numenius phaeopus
Upland Sandpiper	Bartramia longicauda
Greater Yellowlegs	Tringa melanoleuca
Lesser Yellowlegs	Tringa flavipes
Solitary Sandpiper	Tringa solitaria
Spotted Sandpiper	Actitis macularia
Wandering Tattler	Heteroscelus incanus
Ruddy Turnstone	Arenaria interpres
Black Turnstone	Arenaria melanocephala
Wilson's Phalarope	Phalaropus tricolor
Red Phalarope	Phalaropus fulicaria
Red-necked Phalarope	Phalaropus lobatus
Common Snipe	Gallinago gallinago
Long-billed Dowitcher	Limnodromus scolopaceus
Surfbird	Aphriza virgata
Sanderling	Calidris alba

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Semipalmated Sandpiper	Calidris pusilla
Western Sandpiper	Calidris mauri
Least Sandpiper	Calidris minutilla
White-rumped Sandpiper	Calidris fusciollis
Baird's Sandpiper	Calidris bairdii
Pectoral Sandpiper	Calidris melanotos
Dunlin	Calidris alpine
Stilt Sandpiper	Calidris himantopus
Buff-breasted Sandpiper	Tryngites subruficollis
American Black Oystercatcher	Haematopus bachmani
Glaucous Gull	Larus hyperboreus
Glaucous-winged Gull	Larus glaucescens
Herring Gull	Larus argentatus
Ring-billed Gull	Larus delawarensis
Mew Gull	Larus canus
Bonaparte's Gull	Larus Philadelphia
Black-legged Kittiwake	Rissa tridactyla
Sabine's Gull	Rissa brevirostris
Arctic Tern	Sterna paradisaea
Common Murre	Uria aalge
Black Guillemot	Cepphus grille
Other Birds (Passerines, etc.)	
Pomerine Jaeger	Stercorarius pomarinus
Parasitic Jaeger	Stercorarius parasiticus
Long-tailed Jaeger	Stercorarius longicaudus
Rock Dove	Columba livia
Mourning Dove	Zenaida macroura
Common Nighthawk	Chordeiles minor
Rufous Hummingbird	Selasphorus rufus
Belted Kingfisher	Ceryle alcyon
Northern Flicker	Colaptes auratus
Yellow-bellied Sapsucker	Sphyrapicus varius

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Hairy Woodpecker	Picoides villosus
Downy Woodpecker	Picoides pubescens
Black-backed Woodpecker	Picoides arctos
Three-toed Woodpecker	Picoides tridactylus
Eastern Kingbird	Tyrannus tyrannus
Western Kingbird	Tyrannus verticalis
Say's Phoebe	Sayornis saya
Yellow-bellied Flycatcher	Empidonax flaviventris
Alder Flycatcher	Empidonax alnorum
Hammond's Flycatcher	Empidonax hammondi
Western Wood Pewee	Contopus sordidulus
Olive-sided Flycatcher	Contopus borealis
Horned Lark	Eremophila alpestris
Violet-green Swallow	Tachycineta thalassinea
Tree Swallow	Tachycineta bicolor
Bank Swallow	Riparia riparia
Barn Swallow	Hirundo rustica
Purple Martin	Progne subis
Gray Jay	Perisoreus canadensis
Stellers Jay	Cyanocitta stelleri
Northwestern Crow	Corvus caurinus
Black-billed Magpie	Pica pica
Common Raven	Corvus corax
Clark's Nutcracker	Nucifraga Columbiana
Black-capped Chickadee	Parus atricapillus
Boreal Chickadee	Parus hudsonicus
Siberian Tit	Parus cinctus
Red-breasted Nuthatch	Sitta Canadensis
Brown Creeper	Certhia Americana
American Dipper	Cinclus mexicanus
American Robin	Turdus Migratorius
Varied Thrush	Ixoreus naevius

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Hermit Thrush	Catharus guttatus
Swainson's Thrush	Catharus ustulatus
Grey-cheeked Thrush	Catharus minimus
Mountain Bluebird	Sialia currucoides
Northern Wheatear	Oenanthe oenanthe
Townsend's Solitaire	Myadestes townsendi
Arctic Warbler	Phylloscopus borealis
Golden Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
White Wagtail	Motacilla alba
Yellow Wagtail	Motacilla flava
Water Pipit	Anthus spinoletta
Bohemian Waxwing	Bombucilla garrulous
Northern Shrike	Lanius excabitor
European Starling	Sturnus vulgaris
Tennessee Warbler	Vermivora peregina
Orange-crowned Warbler	Vermivora celata
Yellow Warbler	Dendroica petechia
Cape May Warbler	Dendroica tigrina
Yellow-rumped Warbler	Dendroica coronata
Townsend's Warbler	Dendroica townsendi
Blackpoll Warbler	Dendroica striata
Northern Waterthrush	Seiurus noveboracensis
Common Yellowthroat	Geothlypis trichas
Wilson's Warbler	Wilsonia pusilla
American Redstart	Setophaga ruticilla
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Red-winged Blackbird	Agelaius phoeniceus
Rusty Blackbird	Euphagus carolinus
Common Grackle	Quiscalus quiscalus
Brown-headed Cowbird	Molothrus ater
Western Tanager	Piranga ludoviciana

Birds Known to be in the ANGDA Gas Spur Pipeline Corridor

Species Common Name	Species Scientific Name
Eurasian Bullfinch	Pyrrhula pyrrhula
Pine Grosbeak	Pinicola enucleator
Rosy Finch	Leucosticte arctoa
Hoary Redpoll	Carduelis hornemanni
Common Redpoll	Carduelis flammea
Pine Siskin	Carduelis pinus
Red Crossbill	Loxia curvirostra
White-winged Crossbill	Loxia leucopteris
Savannah Sparrow	Passerculus sandwichensis
Dark-eyed Junco	Junco hyemalis
American Tree Sparrow	Spizella arborea
Song Sparrow	Melospiza melodia
Chipping Sparrow	Spizella passerine
White-crowned Sparrow	Zonotrichia leucophrys
Golden-crowned Sparrow	Zonotrichia atricapilla
White-throated Sparrow	Zonotrichia albicollis
Fox Sparrow	Passerella iliaca
Lincoln's Sparrow	Melospiza lincolnii
Lapland Longspur	Calcarius lapponicus
Smith's Longspur	Calcarius pictus
Snow Bunting	Plectrophenax nivalis
Mackay's Bunting	Plectrophenax hyperboreus

Source: Bureau of Land Management, Glennallen, Alaska