Appendix 4-3

Field Reconnaissance Reports

Alaska Spur Gas Pipeline Study

Fairbanks Route Verification Field Trip

30 March, 2006

Richard Dunning, Vin Robinson, Mark Slaughter, Manny Lopez

Results of Field Trip

- A route was found that minimizes the construction and operations impact on Fairbanks by staying to the north and west edge of populated Fairbanks.
- The route starts at the assumed main gas line alignment south of Chatanika Creek where a process plant can be located. From there the route would follow the Elliot Highway south to Old Murphy Dome Road. Thence west along Old Murphy Dome Road or the 138 KVA transmission line ROW to a section line at the east end of a subdivision around 3 miles from the intersection of Old and New Murphy Dome Roads. Thence south along a section line down the hill from the ridge across Spinach Creek, New Murphy Dome Road, the Alaska Railroad and Goldstream Creek. Thence still along the section line over several ridges and valleys on the west slope of Ester Dome to the Old Parks Highway. Thence along the Old Parks Highway to the New Parks Highway and thence south to Nenana.
- Brent Sheets, Manager of the Arctic Energy Office in Fairbanks was contacted. Due to time constraints of both parties a face to face meeting was not possible.

Verification Steps

1. Reviewed possible routes on aerial photography and set up GPS digital camera.
2. Traveled Miller Hill Road possible alignment to north end of maintained road. Found reasonable soils but many houses, driveways, graveyard, etc.
3. Drove Goldstream Road from Miller Hill intersection to Old Steese Highway. Found many sections of poor, permafrost soils, stream crossings, and housing/business encroachment on wide ROW.
4. Traveled Elliott Highway to Chatanika River. Many possible locations for main line takeoff and processing plant, depending on main line alignment.
5. Unable to visit north end of ANGDA alignment due to lack of public access.
6. Traveled east end of Old Murphy Dome Road, 7 miles west to end of maintained road at last and only housing subdivision. Continuation is an unplowed trail cleared approx. 20’ wide. Road follows the ridge with the 138 KVA overhead transmission line to Fort Knox gold mine also along the road. The power line follows a straighter route then the road. Soils are good, there is minimal housing, and there are no stream crossings or encroachments on the ROW.
7. Traveled east end of Goldstream Road to New Murphy Dome Road on to end of paved New Murphy Dome Road. Alignment along road has several stream crossings and road cuts, fewer houses than Goldstream Road and better soils.
8. Found alignment from Old Murphy Dome Road south along section line under Railroad and Goldstream Creek and over west side of Ester Dome.

9. Looked at alignment just to the east of Ester Dome summit on north side. Similar to alignment further west.
10. Unable to get to top of Ester Dome due to slick road.
11. Traveled to west end of Old/New Parks Highway intersection. Old Parks follows the ridge with good soils and light to moderate housing concentration.
12. Looked over ridges at west Ester Dome alignment. A few ridges and valleys but minimal housing concentration.
13. Traveled further east on Old Parks to look at south end of Ester Dome summit alignment. Significant housing concentration occurs on the south and east side of Ester Dome. This alignment also encounters more side hills than the western Ester Dome route.

Project Note

Project: DOE Alaska Spur Gas Pipeline	**Project No:** 107115
To: Team	**Project Note No:** 107115-PN-MBJ-001
From: Vin Robinson	**Date:** 7/10/06
Subject: Moody Creek Helicopter Flight – 6/20/06	

On June 20th a field trip was taken by the team working on the Alaska Spur Gas Pipeline Study for the DOE with the purpose of comparing the feasibility of a possible gas pipeline route over Moody Creek versus a route through the Nenana River Gorge along the Parks Highway. Due to the remoteness of the location, particularly over Moody Creek, a helicopter chartered from ERA Aviation was used for transportation during this trip.

The objective of the trip was to fly north from Anchorage, previewing the southern portion of the Fairbanks Spur route along the way. Upon arriving in the area of the Moody Creek route the trip would first follow the intertie route up Montana Creek, over a pass and into the Moody Creek drainage and follow this drainage down into Healy. From Healy the flight would then follow a route option passing through the Nenana River Gorge and past the Glitter Gulch and McKinley Park development.

The trip began with an early morning departure from the ERA Aviation Hanger at Anchorage International Airport. The initial flight crew consisted of Langdon (ERA Pilot), Ed McCuistion (Baker), John Lau (ENSTAR), Wes Watkins (Baker) and Vin Robinson (Baker). After leaving the Anchorage area the flight followed along the anticipated Fairbanks Spur route from near the MP39 facilities (see Figure 1) of the ENSTAR pipeline (where the proposed tie in with the spur route would occur).

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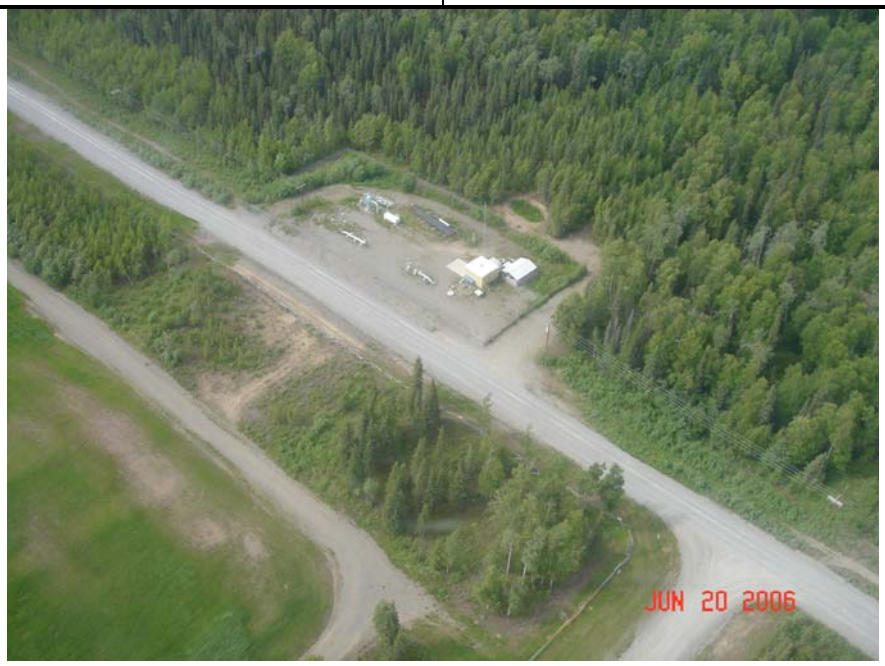

Figure 1 – MP 39 of the ENSTAR 20-inch Gas Pipeline

Heading North from the ENSTAR line the pipeline route crosses swamps and forested wilderness having very minimal impact with private properties in the area. This route continues cross-country approximately 25-miles before reaching a back road west of Willow and following it until crossing the highway and following remote land, but keeping a parallel course to the nearby intertie power line and generally parallel to the Parks Highway.

Just south of the Parks Highway junction with the Talkeetna Spur Road the pipeline route rejoins the highway ROW. From the Talkeetna Spur to Hurricane Gulch the pipeline will be constructed in a generally wide and flat ROW along the highway. However, this ROW will require clearing along most areas and crosses occasional wetlands that may require winter construction. Also of note in this segment are the crossings of the Susitna and Chulitna Rivers (see Figure 2).

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Figure 2 – Looking south along Chulitna River and Parks Highway (towards location of highway and potential pipeline crossing)

The Susitna and Chulitna Rivers will provide some special consideration during future crossings. Based on field observations it is likely that both of these crossings may be crossed using directional drilling.

North of the Chulitna crossing about 35-miles is the Hurricane Gulch crossing which also presents somewhat of a challenge for crossing. At Hurricane Gulch the proposed route will stray east, and uphill, of the highway to avoid crossing at a deep section of the ravine. Higher up where the proposed crossing is located the ravine is much smaller and has gentler side slopes thus enabling a simplified construction. If the pipeline were to cross near the location of either the highway or the railroad a bridge would likely be required. The terrain at Hurricane Gulch is shown in Figure 3 and Figure 4 below.

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Figure 3 – Looking up Hurricane Gulch from near the RR Bridge (Parks Highway Bridge is visible in the picture)

Figure 4 – Looking up Hurricane Gulch towards site of Proposed Pipeline Crossing

Just a few miles north of Hurricane Gulch the route also encounters the Honolulu Creek drainage which presents similar problems for crossing as the Hurricane crossing but on a lesser scale.

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Therefore it was verified that the pipeline route should stay high against the hill (as far east as possible) until Honolulu Creek has also been crossed.

North from Honolulu Creek the route would return to the Parks Highway ROW and remain within it until north of Cantwell. Past Cantwell there are a couple of areas where the highway ROW becomes restricted by the Nenana River on the west and a steep hillside to the east (see Figure 5). In both cases it appears that the route could simply veer away from the highway and follow a higher line above the road until getting clear of the constricted area. Some side hill cuts may be required but the lengths of these constricting segments are not significant.

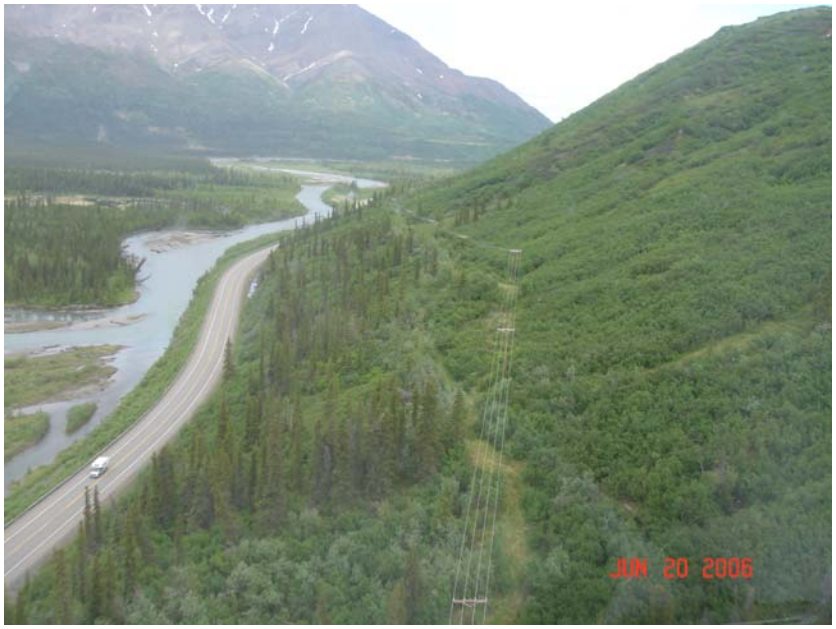

Figure 5 - Parks Highway and Intertie (Nenana River to west of road) approximately 8-10 miles north of Cantwell

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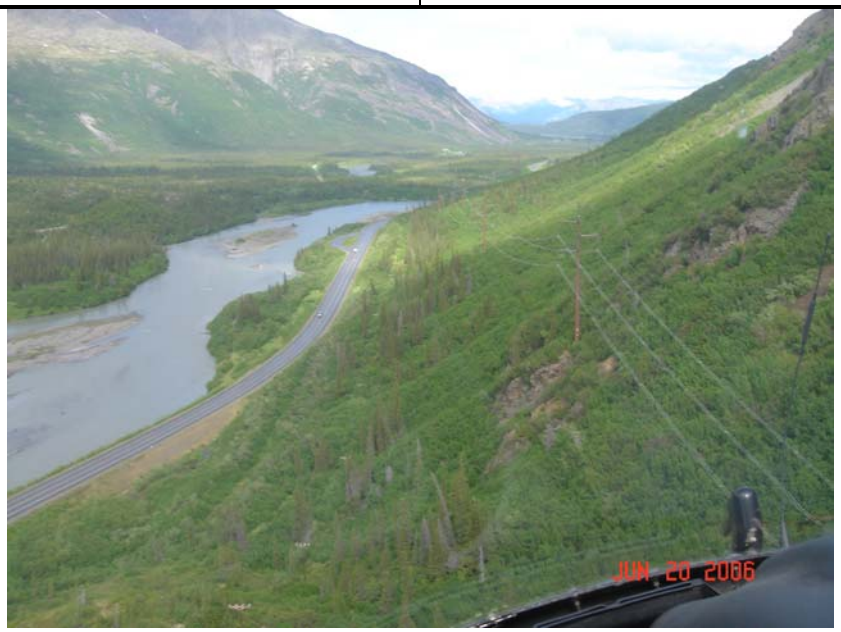

Figure 6 - Parks Highway and Intertie (Nenana River to west of road) approximately 12-13 miles north of Cantwell

Just north of this last constricted area the trip deviated away from the Parks Highway and followed the intertie power line route towards Moody Creek to the east. The first few miles are excellent ROW where the power line has been kept clear and the terrain is rather flat (see Figure 7) and wide open. After approximately 7 to 8 miles the route crosses the Yanert River and begins a very steep and rocky ascent of a small ridge before dropping over the ridge and entering the Montana Creek drainage (see Figure 8). For the next 3 to 4 miles construction of a pipeline along this route would be very difficult as the power line spans over very rugged and rocky terrain. Access to this area would be difficult and significant work would be required to establish a work pad capable of carrying materials, construction equipment and labor to this site.

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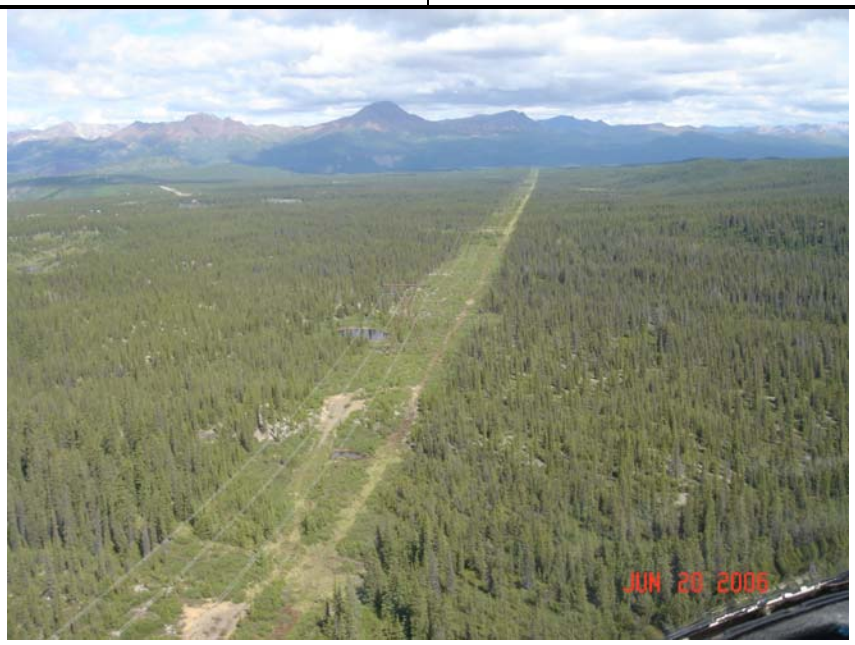

Figure 7 - Intertie power line ROW south of the Yanert River crossing

Figure 8 - Intertie Route along Montana Creek (heading up towards Moody Creek)

Beyond the Montana Creek area the Intertie traverses along a few miles of relatively gentle terrain (see Figure 9) before dropping down towards Moody Creek. As seen in Figure 10 Moody Creek

starts out rather gentle terrain. However, downstream the terrain becomes much more challenging for pipeline construction (see Figure 11 and Figure 12). For approximately 6 or 7 miles finding a place to locate the pipeline is very difficult. Along the side hills of the valley (where the intertie is located) it is difficult because of the steepness of the slope, the extensive presence of bedrock, and because of the numerous ravines that would need to be crossed by the pipeline and construction access roads. Along the creek bottom the pipeline would need to be constructed within the creek which, in places is within a narrow canyon not large enough to operate (or even allow access) construction equipment.

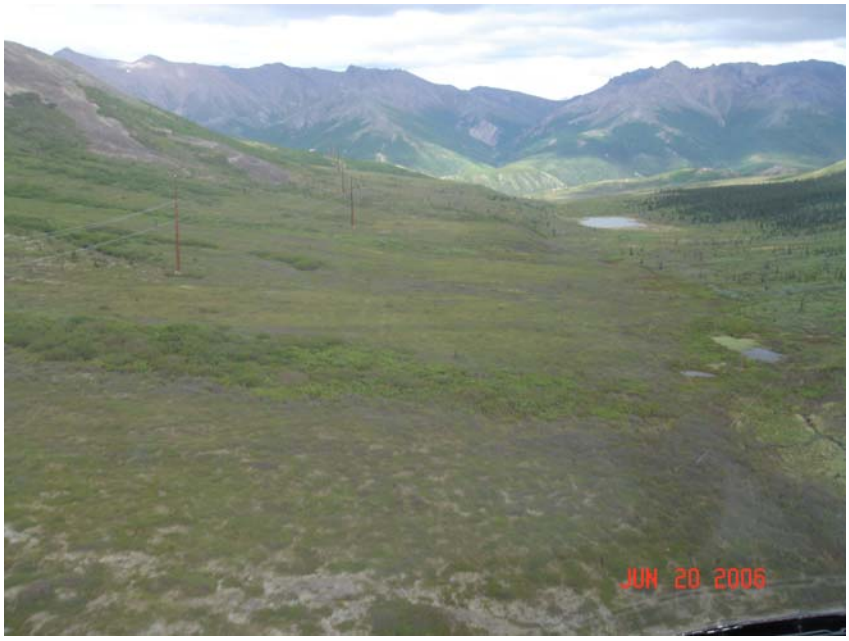

Figure 9 - Intertie cresting pass prior to entering Moody Creek drainage

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Figure 10 - Upper end of Moody Creek (intertie visible to southwest)

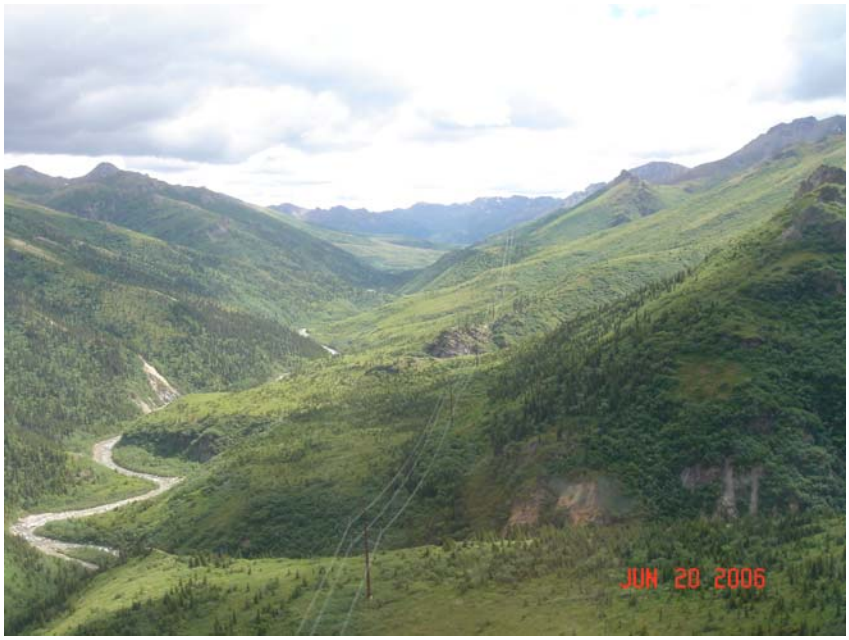

Figure 11 - Moody Creek (a few miles downstream of last figure; intertie now located on northeast side of creek)

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Figure 12 - Moody Creek (a few miles downstream of last figure, Healy visible in background)

Construction along the Moody Creek route is much simpler for the intertie than it is for the pipeline because the power line can easily traverse the side hills and span the ravines that it crosses along the way. Construction of the intertie also did not require the large construction crews that would be required during pipeline construction thus simplifying access for labor and equipment. A pipeline through this drainage would require some very heavy duty construction, probably some aerial crossings of the ravines, and definite logistical challenges caused by such a large scale construction project being located in such a remote location. The length of very technical terrain within the Moody Creek route is approximately 10 to 11-miles (counting the Montana Creek and Yanert River area).

Upon crossing the Nenana River and the town of Healy the trip turned to the south to travel through the Nenana River Gorge. The 5-mile section of this route that is within the canyon makes up the difficult portion of this route alternate. Difficulties provided by the gorge are simply finding a place to locate the pipeline while within the same canyon as the Nenana River, the Parks Highway, and the Alaska Railroad, all while confined within canyon walls that provide the path for the Nenana River to pass through the last stretch of the Alaska Range on its journey north to the confluence at the Tanana River.

Entering the canyon from the north it can be seen that the route will need to immediately cross the Nenana River (see Figure 13 and Figure 14). During an earlier field visit a route that stayed to the west side of the river through the canyon (in the railroad ROW) was explored, but deemed not

feasible due to limited space (see Figure 15).

Figure 13 - North Entrance to Nenana River Gorge

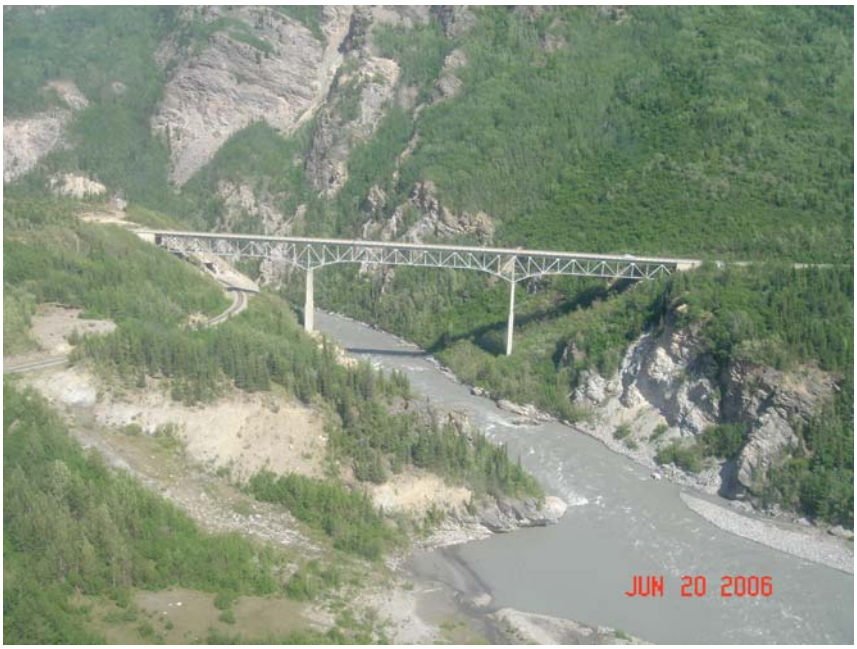

Figure 14 - Parks Highway Bridge over Nenana River (pipeline route crosses railroad and river in foreground)

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Figure 15 - Alaska Railroad along west side of Nenana Canyon (at north end of canyon)

The remainder of this route crosses back and forth across the Nenana River occupying whichever side of the river provides available space for construction of a pipeline. The crossing locations are shown in the following Figure 16 through Figure 20. The final crossing, at the south end of the canyon, better qualifies as two crossings as the route would need to cross the main channel twice and be installed within the minor channel (probably cased in concrete, or some means of protecting the pipeline) between the two crossing locations (see Figure 20).

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Figure 16 - Nenana Canyon (at location of 2nd river crossing)

Figure 17 - Nenana Canyon (at location of 3rd river crossing)

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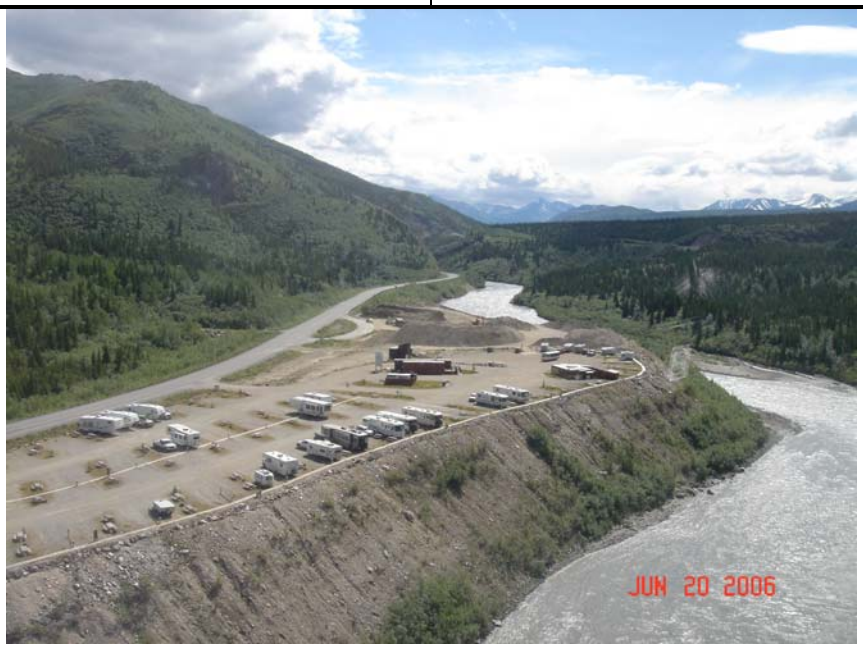

Figure 18 - Nenana Canyon (at location of 4th river crossing)

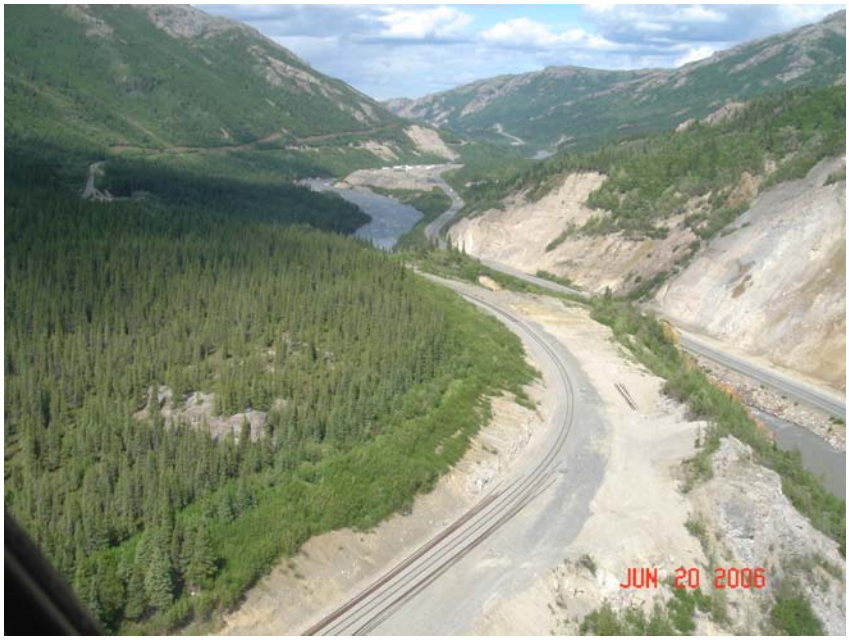

Figure 19 - Nenana River (looking north towards 4th river crossing)

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Figure 20 - Nenana River and McKinley Village (location of 5th river crossing to right within small river channel)

From a strictly technical standpoint this portion of the trip was meant to verify that a route was possible through the canyon. Earlier trips to this area had determined that a route following only the east side of the river (outside of the national park land) was not technically feasible due to constricting areas where a steep vertical cliff and the Nenana River border the roadway so closely that construction of a pipeline would not be possible.

Most of the construction through the canyon is not technical. However, the 5 crossings of the Nenana River will undoubtedly require quite a sizable effort. Based on visible rock within the canyon it appears that much of the bedrock in the area is fragmented thus reducing the possibility of using horizontal directional drilling technology for the crossings. However, construction of these crossings may be completed during the winter months and using an open cut trench crossing technique.

Following the flight through Nenana Canyon a second group consisting of Richard Dunning (ACI), Amanda Henry (ACI), Manny Lopez (ENSTAR), and Mark Slaughter (ENSTAR) changed out with the first crew and flew the same route.

Additional Distribution:	Attachments:

Project Note

Project: DOE Alaska Spur Gas Pipeline	**Project No:** 107115
To: Team	**Project Note No:** 107115-PN-MBJ-002
From: Vin Robinson	**Date:** 7/7/06

Subject: Chitna Pass Helicopter Flight – 6/27/06

On June 27th a field trip with the purpose of comparing the feasibility of a possible gas pipeline route over Chitna Pass versus a route along the Glenn Highway was taken by the team working on the Alaska Spur Gas Pipeline Study for the DOE. Due to the remoteness of the location, particularly over Chitna Pass, a helicopter chartered from ERA Aviation was used for transportation during this trip.

The objective of the trip was to fly northeast from Anchorage and preview a possible highway route from near King River along the Glenn Highway to Tahneta Lake (just west of Eureka Roadhouse), a stretch that encompasses the points outside of which both route options would return to a common alignment. Upon reaching Tahneta Lake the flight would head northwest along Squaw and Caribou Creeks before crossing over the Talkeetna Mountains near Chitna Pass and descending the Boulder Creek drainage. After the Boulder Creek drainage the route investigated crosses the Chickaloon River, passes north of the community of Chickaloon, and skirts the edge of Castle Mountain before crossing the King River (near the Chickaloon Trail) and rejoining the common route for both alternatives.

The trip began with an early morning departure from the ERA Aviation Hanger at Anchorage International Airport. The initial flight crew consisted of Langdon (ERA Pilot), Ed McCuistion (Baker), John Lau (ENSTAR), Richard Dunning (ACI) and Vin Robinson (Baker). After leaving the Anchorage area the flight followed along the anticipated Delta Junction Spur route from near the Glenn/Parks Highway interchange. The selected route from Palmer to King River was previewed while enroute and was considered to be an adequate route with the exception of a couple of locations where future route refinement and/or design would likely be required during more advanced engineering stages of the project (i.e., following soils and geotechnical data collection, etc). Probably the most notable technical challenge along this segment is that of the crossing at Moose Creek (see Figure 1) northeast of Palmer where the steep banks on either side of the creek drainage would make a bored river crossing difficult.

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Figure 1 - Proposed Crossing Location of Moose Creek

A reasonable crossing location of Moose Creek appears to be in the vicinity of where the highway crosses the creek (see Figure 2) An alternate route may be considered in the future that would allow the pipeline crossing of Moose Creek to occur at a location closer to that of the highway's crossing location.

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Figure 2 – Glenn Highway Crossing of Moose Creek

After reaching the King River the flight followed what was considered to be the best routing along the highway (as determined during previous field visits). Between King River and the Chickaloon River many sections of highway ROW were confirmed as not ideal for pipeline construction due to steep cross slopes and/or cliffs along the north side of the road and the proximity of the Matanuska River on the south side of the road. Figure 3 illustrates one such location where construction within the highway ROW is not considered to be realistic. It was determined that in these cases the pipeline routing could possibly follow a nearby ridge that parallels the highway to the north along this section. However, several apparent private properties were noted along this ridge and will need to be verified and routed accordingly.

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Figure 3 - Glenn Highway Between King River and Chickaloon

One benefit to the highway route lies in its proximity to what probably is the easiest crossing location of the Chickaloon River. However, this is only based on the level terrain around the river and not the soils which would require future study to determine the best crossing design. East of the Chickaloon River crossing similar steep side hill areas are present where more desirable and feasible routing occurs along a power line that generally follows a ridge to the north of the highway (see Figure 4) until just prior to Long Lake where the best route would cross to the south side of the highway and follow the power line route that skirts along the south side of Long and Wiener Lakes (see Figure 5) before rejoining the highway ROW further east. The highway stays to the north of Long and Wiener Lakes through this area, but traverses along steep side hills that are not reasonable for construction of a buried pipeline.

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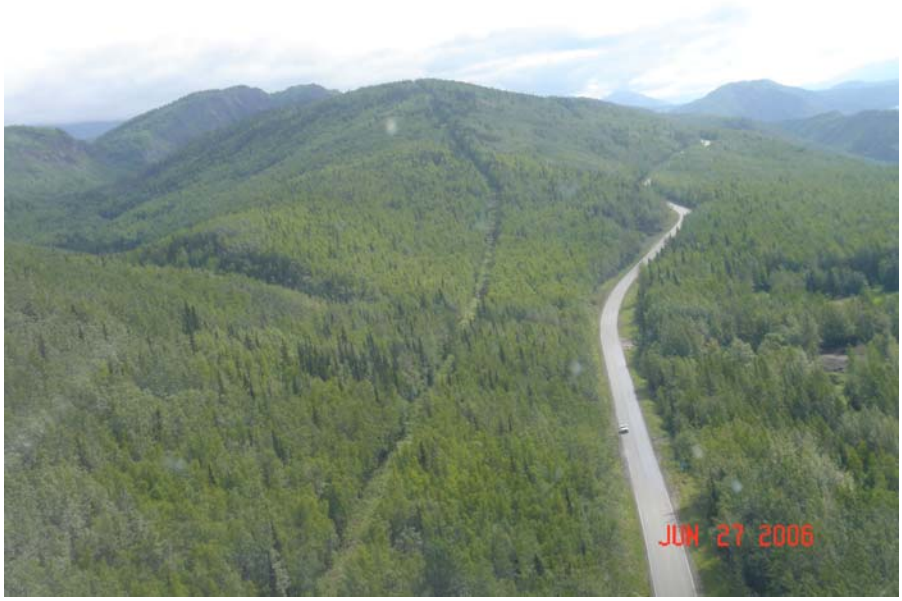

Figure 4 - Power Line adjacent to Glenn Hwy (south of Chickaloon)

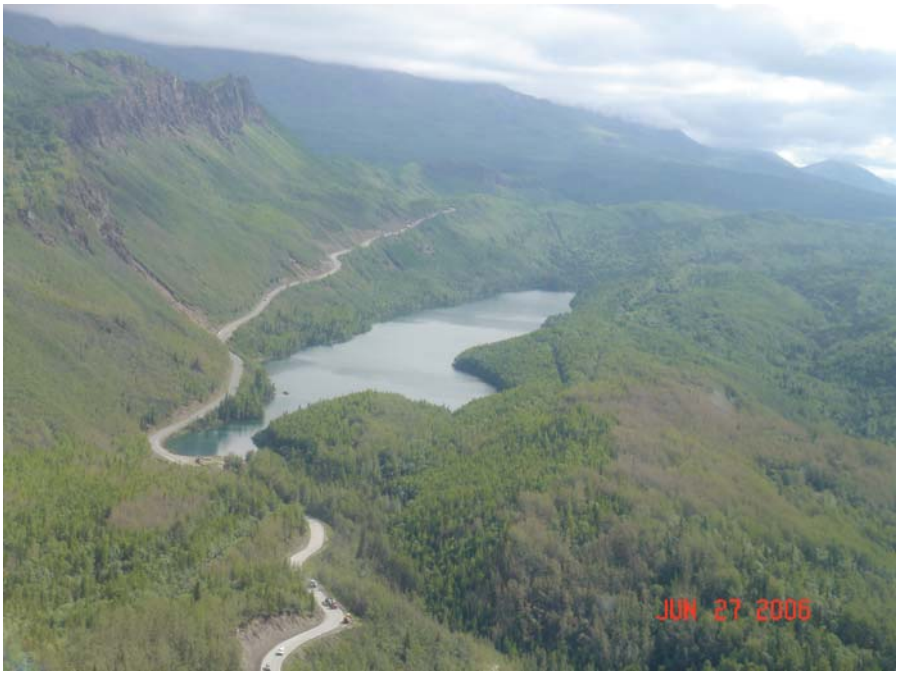

Figure 5 - Long Lake (Glenn Hwy to west and power line to east of lake)

For the next few miles the highway ROW presents a fairly nice work pad for the pipeline and in one mile long section could occupy a section of old road bed. However, just east of this old road bed the

route will need to branch northeast along the access road to Victory Bible Camp and traverse to the south side of the lake that separates the camp from the highway. From the east end of this lake the route would follow an old trail back down to the highway, near a lodge at Hicks Creek, cross the highway, and continue up a steep hill behind the lodge before rejoining the highway ROW again. This section presents some difficult construction challenges, but pales in comparison to the difficulty of constructing the other alternative which is following the highway ROW which traverses along a cliff perched above the Matanuska River (see Figure 6). There will likely be some difficulty finding a route through this area that does not affect the private properties in the area. However, a route along the highway in this area does not appear technically feasible.

Figure 6 - Glenn Hwy (traversing steep face south of Victory Bible Camp)

East of Hicks Creek the route remains within the highway ROW until just after Lion's Head where the preferable alignment continues straight (instead of following the sharp left that the highway makes enroute to its Caribou Creek crossing) and descends a ridge down to Caribou Creek. The surrounding floodplain along Caribou Creek appears to supply ample space for construction of an open cut trenched creek crossing (or possibly an directional bore) after which the route would ascend a steep rib back up into the highway ROW again on the east side of Caribou Creek.

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Figure 7 - Glenn Hwy (immediately west of Caribou Creek, Lion's Head to right)

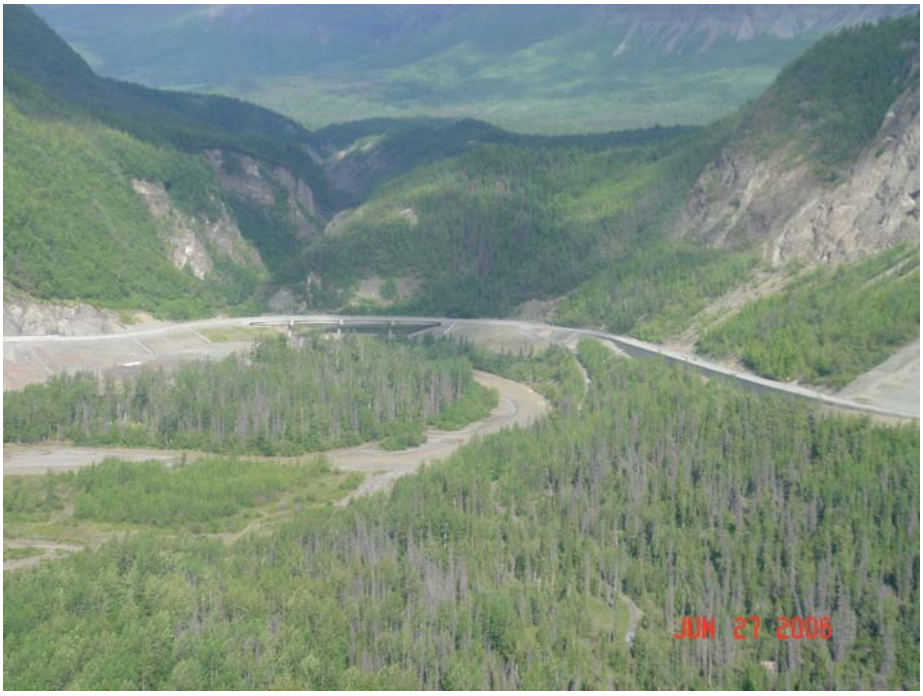

Figure 8 - Glenn Hwy crossing of Caribou Creek (proposed pipeline crossing location is in foreground)

Farther east of Caribou Creek there are a few rocky drainages that would provide difficulties for

construction of the pipeline. However, the majority of the ROW is wide open and relatively flat. Beginning a few miles east of Caribou Creek the forest thins and becomes primarily small and scrawny black spruce trees that are indicative of permafrost. This marks the start of the Copper River Basin as it comes into view to the east. Winter construction will likely be required along this section of road (and probably all the way to Glennallen, and beyond).

Upon reaching Tahneta Lake (a few miles west of Eureka Roadhouse) the flight veered to the north and followed the Squaw Creek valley back towards the northwest and away from the road. This route is the alternate to the highway route and has been chosen by ANGDA as the selected route for their proposed spur line route that travels between Glennallen and Palmer. Squaw Creek travels west and along the north side of Gunsight and Sheep Mountains. No real terrain traps occur along this approximately 8-mile stretch of potential route. However, exposed soil and vegetation (sparsely located black spruce) in this area suggest the presence of ice rich soils indicating that winter construction would likely be required along this stretch of the route.

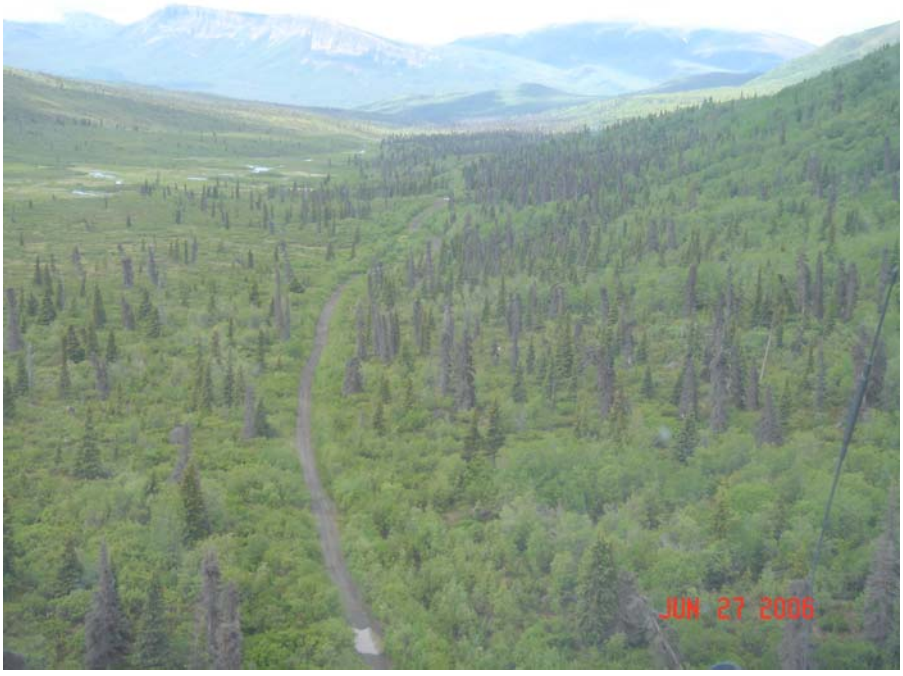

Figure 9 - Squaw Creek Trail

After reaching the Caribou Creek drainage and traveling north/northwest the terrain immediately changes to a rocky/gravel river bed and begins to enter mountainous country (see Figure 11). The first portion of the route along Caribou Creek appears to contain adequate terrain for a buried pipeline with some bedrock and difficult terrain routing possible. However, after the confluence with Billy Creek the selected route heads up the Chitna Creek valley and routing becomes more and more difficult due to the steep cross-slopes and numerous cross drainages entering the valley from the sides.

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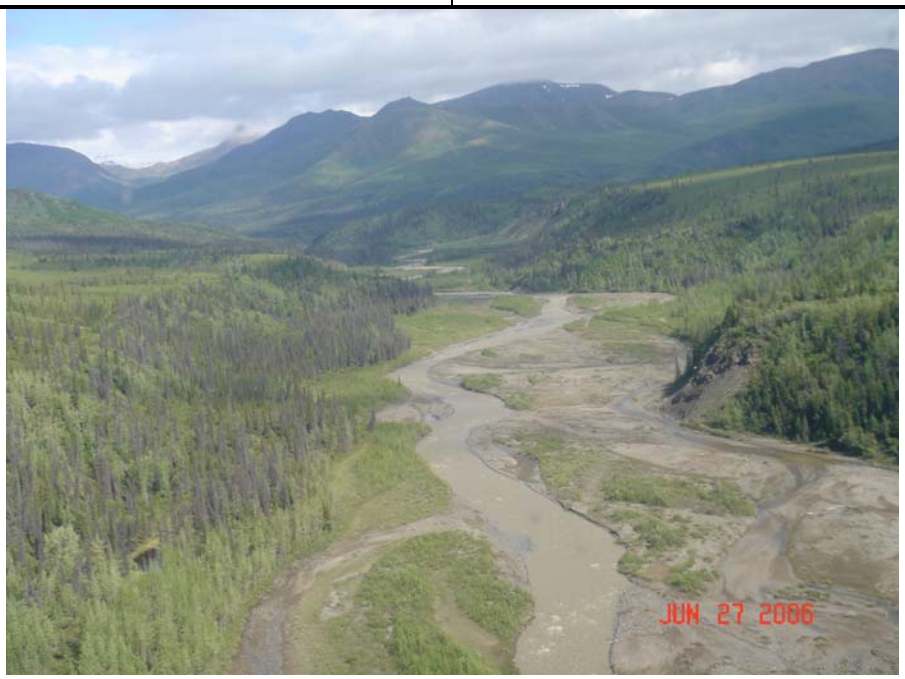

Figure 10 - Caribou Creek (just upstream of Squaw Creek)

Figure 11 - Caribou Creek Drainage (east of Chitna Pass)

Both the initial ANGDA route (traversing straight over Chitna Pass and descending a very steep rock face into Boulder Creek drainage) and the revised ANGDA route (diverting north from Chitna

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Pass through a higher 5,000-ft elevation notch in the mountain and ascending another drainage back into Boulder Creek) were flown and both were determined to be extremely challenging for pipeline construction due to the rough terrain and presence of bedrock. The steep rock face selected for ANGDA's original route descending off the west flank of Chitna Pass is extremely steep and unstable. The detour north of Chitna Pass (ANGDA's most recent route) is more feasible than the original route. However, this routing still includes two particularly challenging areas for pipeline construction: (1) the initial ascent north from Chitna Pass where the route is constricted by a rocky canyon (see Figure 12) and (2) the descent down to Boulder Creek on the west end where the route must negotiate rocky drainages and a steep face (see Figure 13).

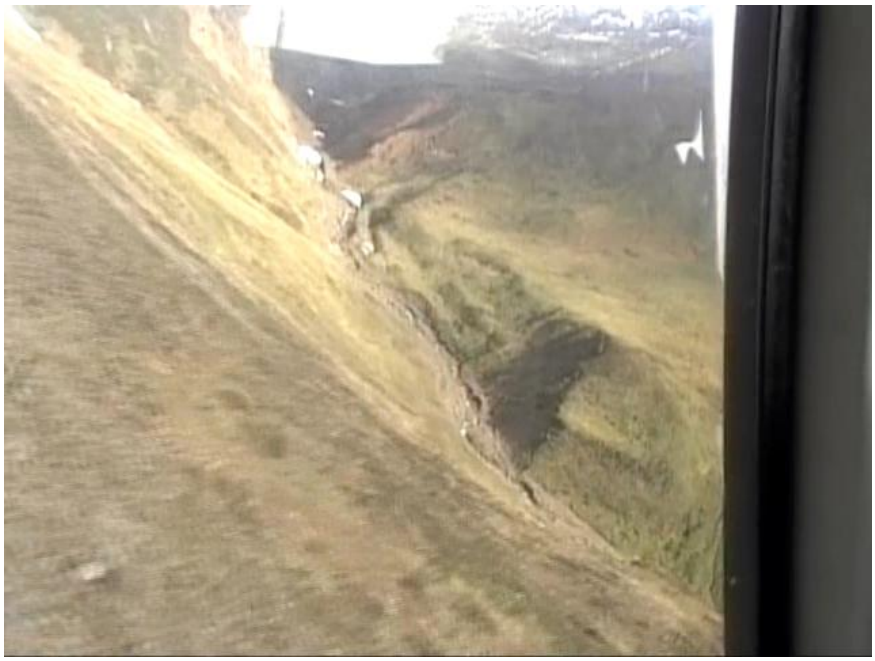

Figure 12 - Looking North from near Chitna Pass where latest ANGDA alignment travels

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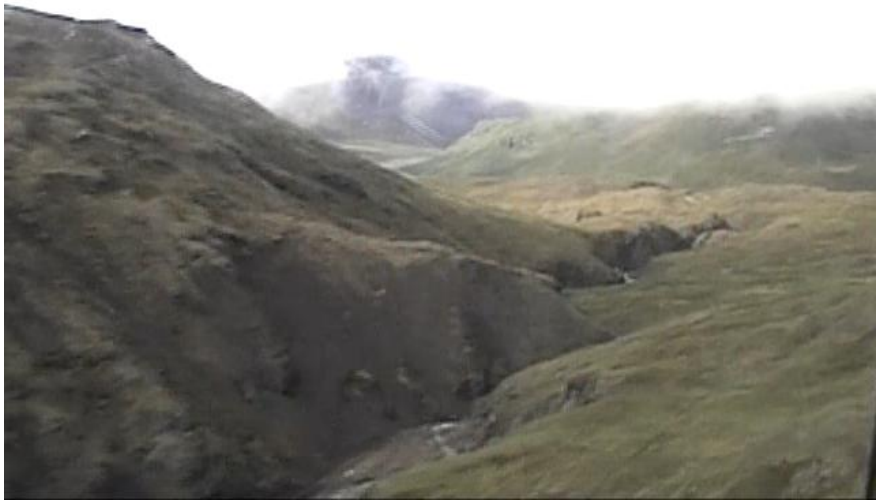

Figure 13 - ANGDA Route decent off Chitna Pass down to Boulder Creek

Exiting the Chitna Pass area to the west the trip followed the Boulder Creek down towards Chickaloon. This is a fairly gentle drainage and provides generally nice wide open terrain (see Figure 14). However, Boulder Creek zigzags across this drainage thus requiring the pipeline to cross the creek numerous times and many large boulders (hence the name Boulder Creek??) litter the creek bed and surrounding terrain. The route eventually crosses Boulder Creek to the north one final time near Simpson's Cabin and departs to follow along the base of the mountains prior to descending and crossing the Chickaloon River.

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Figure 14 – Looking down Boulder Creek (towards Chickaloon)

After crossing the Chickaloon River this route follows relatively level terrain and eventually joins the Chickaloon Trail enroute to the crossing of King River. The proposed routing in this area follows a remote trail that passes through heavy forests and areas where evidence of bedrock is prevalent and is likely to be encountered.

The flight commence in Palmer for refueling where a second crew consisting of Mark Slaughter (ENSTAR), Manny Lopez (ENSTAR), and Amanda Henry (ACI) flew the same route again.