Alpine Satellite Development Plan
Final Environmental Impact Statement

Appendix G

Potential Mitigation Measures for the Agency Preferred Alternative (Alternative F)

The following potential mitigation measures have been identified for Alternative F, the Agency Preferred Alternative. These mitigation measures are presented in the discussion of environmental consequences for elements of the physical, biological, and socio-cultural environment in Sections 4F of this FEIS.

Potential Mitigation Measures for Physiography

No measures have been identified to mitigate impacts on physiography under Alternative F. Adverse impacts on the physiography from gravel mines can be indirectly mitigated by rehabilitation of the mine site to produce a net positive to the project area by providing either fish or waterfowl habitat.

Potential Mitigation Measures for Geology

Mitigation of impacts on petroleum hydrocarbons would be in conflict with the purpose of the proposed action. Therefore no measures have been identified to mitigate impacts on geological resources under Alternative F.

Potential Mitigation Measures for Soils and Permafrost

Soil and permafrost systems could recover to their previous state, but not without appropriate mitigation. Because impacts on soil and permafrost are generally unavoidable, mitigation aims to minimize the degree and magnitude of the action.

- Sequential mining with the replacement of overburden in previously excavated areas is recommended to rectify impacts to local soil and permafrost (Meehan 1988).

- Revegetation of gravel mine sites restores the insulative capacity of the active layer and allows reaggradation of permafrost where melt has occurred. Rehabilitation measures could include topsoil application, gravel removal (for areas of fill only), surface manipulation for moisture enhancement, nutrient addition, and/or plant cultivation (Jorgenson 1997).

- Impacts on soil and permafrost associated with the construction and operation of roads can be minimized by placing a sufficient thickness of fill, carefully considering road alignment, culverting, dust control, and snow blowing.

- Impacts resulting from water discharge onto the tundra would be avoided if the water generated by temporary camps is hauled to the APF-1 for treatment or disposed of onsite by injection. Onsite injection of hydrostatic pipeline test water would also be permissible if sea water was used instead of fresh water. If wastewater and hydrostatic test water are released to the tundra, impact to soil and permafrost would be minimized by targeting terrain that is sloped enough to allow drainage of water, but is not so steep that soils are eroded. Controlling discharge flow and protecting the tundra surface would further minimize erosion.

- To avoid impacts of tundra travel on soil and permafrost it is best to restrict travel to winter months, when impacts extend to the vegetative mat only. If summer travel is necessary, measures to minimize impacts include limiting traffic, avoiding tight turns, using different paths to disperse disturbance, and following the shortest path from origin to destination (Jorgenson et al. 1996).

Further details and discussion of these mitigation measures is presented in Section 4A.2.1.3.

Potential Mitigation Measures for Sand and Gravel

No measures have been identified to mitigate impacts on sand and gravel resources under Alternative F.

Potential Mitigation Measures for Paleontological Resources

No additional measures have been identified to mitigate impacts on paleontological resources under Alternative F.

Potential Data Needs and/or Mitigation Measures for Water Resources

Subsurface Waters

- The USEPA has not determined whether the aquifers in the vicinity of the satellite wells meet the other elements of the USDW definition. For each proposed disposal well, the USEPA (the primary agency responsible for granting aquifer exemption) will make the appropriate decision, in consultation with the AOGCC.

Surface Water – Lakes

- Prior to lake withdrawals, lake monitoring studies are recommended for each lake where withdrawals are proposed to evaluate the possibility of affecting lake habitat and recharge potential, and to verify the prediction that the lakes are fully recharged annually during break-up.
- It is also recommended that water monitoring programs should be further developed for representative areas within the Plan area where withdrawals are anticipated. These programs would measure lake water levels over time, provide estimates of recharge and surplus volumes, and document any observed changes of water quality parameters over time as an assessment of impacts on lake habitats. Data from such monitoring and other future studies would be integrated with assessments of impacts to lake habitat to determine if modifications of permit stipulations are necessary (e.g., changes in water withdrawal limitations, additional water quality monitoring, or changes to existing lake observation programs, etc.).

Surface Water – Flow

- Approaches to both the Nigliq Channel and Ublutuoch River bridges and the road from the existing facility to CD-4 will need to provide for natural water flow to adhere to CWA Section 404(b)(1) guidelines and assure that cross flow maintains the natural hydrologic regime. The bridge approach and road design for the road from CD-2 to CD-5 must demonstrate that cross flow will be adequate to prevent raising the water level on the upstream side of structures by more than 6 inches, compared to that for downstream for more than 1 week after peak discharge. The need for a similar requirement for the CD-4 road may not be necessary because of the nature of flow (parallel to the road as opposed to perpendicular to the road). The bridge approach and road designs must remain sound and not be washed out at all flow levels. Cross flow along the bridge approaches and roads would be allowed using culvert batteries or box culverts.
- Limiting all road, production pad and bridge construction to the winter season would minimize potential impacts to surface waters.
- After construction, continued monitoring of bridges, pipeline VSMs, road embankments, and culvert crossings is recommended to develop adaptive mitigation measures that protect against potential structural failures and improve on subsequent designs. This monitoring should also incorporate breakup observations to decrease the potential impacts from ice conditions.
- Streambank erosion monitoring and nearshore coastal erosion monitoring is recommended for all production pad sites that are relatively close to the coast or channel shorelines (CD-3, CD-4, HP-3, HP-5, HP-12, HP-13 and HP-14). Further, similar monitoring programs including geotechnical investigations are recommended for the proposed bridge/culverts at all stream crossings. An increase in coastal and channel shoreline erosion rates would also hasten the need to conduct even more comprehensive monitoring studies prior to implementing erosion abatement measures. Nearshore

monitoring is recommended for critical areas where pad sites and roads are relatively close to channel shorelines.

- It is recommended that the storm surge analyses be updated using plausible weather and open-water sea conditions that represent conditions that will prevail over the next 20-30 years or for the projected lifespan of the project. Based on recent studies, climate change processes are likely to yield smaller ice packs and more open water, resultant bigger rainfall events and higher magnitude storm surges

- Continued data gathering (including some additional programs that are not currently being undertaken) is recommended and includes: continuous monitoring of water-surface elevations and streamflow throughout break-up, summer and freeze-up periods for all affected streams. The continued monitoring would provide data in support of these models and analyses and support future development in the region. In particular, it is recommended that for those streams with important bridge crossings (the proposed 350-foot bridge on the Ublutuoch River, the 1,650-foot bridge on the Nigliq Channel, the 40-ft bridges on the CD-4 Road, and the 80-foot bridge on the paleochannel) a comprehensive data set will improve the characterization of low-water conditions important for addressing navigation and fish habitat concerns, and improve estimates of flood frequency, flooding processes, channel migration processes, and scour potential.

- Future monitoring of water-level conditions and flow paths in the drained lake basin is needed to minimize the potential risks to the CD-7 pad and downstream waters.

Potential Mitigation Measures (Preferred Alternative) for Surface Water Quality

No mitigation measures have been identified for Alternative F.

Potential Mitigation Measures (Preferred Alternative) for Climate and Meteorology

No mitigation measures have been identified.

Potential Mitigation Measures (Preferred Alternative) for Air Quality

Air quality impacts, including fugitive dust, from the project would be limited through the permitting process, which ensures that no significant new air pollution sources contribute to a deterioration of the ambient air quality. Mitigation measures for limiting fugitive dust would include road watering, vehicle washing, covering of stockpiled material, ceasing construction during wind events, and the use of chemical stabilizers. These measures may vary for the frozen season and non-frozen season.

Potential Mitigation Measures (Preferred Alternative) for Noise

No potential mitigation measures have been identified.

Potential Mitigation Measures (Preferred Alternative) for Terrestrial Vegetation and Wetlands

The following potential mitigation measures would minimize the impacts on terrestrial vegetation and wetlands from the Preferred Alternative.

<u>Gravel Pads, Roads, and Airstrips</u>

- Fill slopes would be stabilized by revetments or soil binders where necessary.
- Impoundments and thermokarst impacts would be mitigated and avoided by locating the road and pad on the highest portions of slopes where possible and maintaining adequate cross-drainage by using culverts. Culverts would be maintained as needed to prevent ice-up.

Dust Fallout from Roads

Impacts from dust would be reduced by scheduling construction and associated traffic in the winter when dust from the road would be less and by watering roads during the summer (a standard North Slope practice) to keep dust down and maintain roadbed integrity. Chip seal could also be used to minimize impacts on vegetation from road dust.

Ice Roads, Ice Pads, and Snow Stockpiles

- The most direct ice road route across the least sensitive habitat types would be taken to minimize disturbance.
- Ice road routes would have slight variations yearly to avoid multi-year impacts on the same alignment.
- Shrub areas would be avoided where possible.

Off-Road Tundra Travel

- The numbers of vehicle passes in an area would be limited.

Tight turns would be avoided.

Potential Mitigation Measures (Preferred Alternative) for Fish

- At project completion, gravel mines should be converted to fish habitat if practicable and consistent with an approved mine rehabilitation plan and the design of the mine.
- Ice roads and airstrips should avoid fish overwintering areas where possible, and in all cases maintain fish passage.
- CPAI should perform fish surveys and hydrologic modeling for water bodies at proposed culvert sites. The results of these surveys and modeling should be incorporated into the site-specific designs of culverts.
- CPAI should install bridges or culverts in roadbeds in low-lying areas to ensure fish passage during high-water conditions.
- CPAI should continue fish monitoring studies in the Plan Area to ensure that the health of regional and locally important fish stocks is maintained. CPAI's mitigation plan should include remedial measures to be taken should monitoring detect adverse impacts from the project.
- CPAI should monitor all culverts on a schedule to be approved by the ADF&G to ensure that they are properly maintained and are ensuring access by fish to critical summer spawning and rearing grounds. CPAI will promptly repair any culverts that are not meeting these intended fish passage goals.
- Intake structures specially designed to eliminate the potential for fish being impinged, entrained, or entrapped during withdrawal of water should be used at all water sources.

Potential Mitigation Measures (Preferred Alternative) for Birds

Potential mitigation measures would be similar to those for Alternative A.

Obstructions to Movements

- Traffic speeds on roads would be reduced during brood-rearing.

Mortality

- Collisions with power lines could be minimized by marking lines with bird flight diverters.
- Waterfowl and seabirds would be hazed away from active airstrips to prevent collisions with aircraft.

- Ravens could be discouraged from nesting on oilfield structures; if problem birds persist, control may be necessary to reduce depredation on tundra-nesting birds.

Potential Mitigation Measures (Preferred Alternative) for Terrestrial Mammals

Predators

- Communications among CPAI, local residents, the NSB, the State of Alaska, and federal agencies can minimize conflicts and accidents related to activities in the Plan Area, including hunting by local residents.
- A management plan for bears and other predators (for example, foxes, ravens, gulls) should be developed that addresses the proper methods of food and garbage storage at production pads, processing facilities, construction sites, water withdrawal sites, and other operational sites. Bear-proof and fox-proof garbage and food containers and regulations to prohibit careless treatment of garbage and food should be implemented. Site design can incorporate features that reduces the risk of attracting or confining polar bears or grizzly bears and allows effective detection and hazing of bears. A bear safety awareness program for employees and contractors could be implemented.
- Fox denning in culverts and other structures can be discouraged by inspection and removal or structure design.

Herbivores

- Pipelines and roads with traffic should be generally separated by 350 to 1,000 feet (500 feet within the NPR-A, where feasible). This enhances caribou crossing success (PAI 2002a, Murphy and :Lawhead 2000, Curatolo and Reges 1986, Cronin et al. 1994). The success of animals trying to cross pipelines adjacent to roads with more than five vehicles per hour was reduced if the pipelines and roads were separated by less than 328 feet (100 meters) (Curatolo and Reges 1996). These results led to recommendations of separation of roads and pipelines by 400 to 500 feet for efficient crossing success (PAI 2002a, Cronin et al. 1994).
- Sections of pipeline can be buried to enhance crossing success of caribou, muskoxen, and moose. Caribou have shown selection of long, buried pipeline sections (average length 1.1 km) when crossing the trans-Alaska pipeline (Eide et al. 1986, Carruthers and Jakimchuk 1987, Cronin et al. 1994, TAPS Owners 2001). However, moose did not show a preference for long buried sections, and neither caribou nor moose showed a preference for short (less than 18.3 meters) "sagbend" buried sections. Because the Plan Area is used by caribou in the winter, buried sections of pipeline may mitigate the potential barrier effect from snow drifting near pipelines in all of the alternatives. In addition, the observations of large numbers of caribou moving across the area of Fish and Judy creeks and across the Colville River Delta in the summer suggest buried sections between CD-2 and CD-7 might enhance crossing success. Long buried sections of pipeline could be included in Alternative F, but it may be unnecessary because pipelines will be elevated 7 feet. CPAI and management agencies should consult to determine if buried sections of pipeline are necessary and what specific locations and lengths of buried pipeline sections should be used. However, the negative aspects of buried pipelines include high cost, difficulties in identifying and dealing with oils leaks and corrosion problems, and thawing of permafrost.
- Vehicle traffic can be restricted to groups of vehicles traveling in convoys, instead of unrestricted traffic. This may be appropriate during and immediately after calving periods in some areas, although it appeared that convoys were not particularly effective in reducing calving disturbance and displacement at the Meltwater Project, east of the Colville River (Lawhead et al. 2003). Closing roads to all vehicle traffic during the calving period when animals are present could also be an effective mitigation measure. Restrictions of aircraft size and flight frequency and flight paths and altitudes may also mitigate potential impacts on calving caribou, muskoxen, and moose.

- Potential impacts from research and monitoring also warrant consideration. Disturbance or mortality can result from surveys and capture activities (Bart 1977, Götmark 1992, TAPS Owners 2001a). Research should be designed to minimize disturbance and mortality.

Potential Mitigation Measures (Preferred Alternative) for Marine Mammals

- Aircraft altitude restrictions over the nearshore Beaufort Sea could reduce disturbance.
- Surveys for polar bear dens before construction of ice roads or permanent roads and facilities would allow avoidance of the dens by 1 mile.
- Communications among stakeholders with activities in the Plan Area (including hunting by local residents) could help minimize conflicts.

Potential Mitigation Measures (Preferred Alternative) for Bowhead Whales

In the event of sealifts to transport material, measures to minimize disturbance of, or strikes to, migrating whales by vessels are appropriate and would require coordination with NOAA Fisheries for compliance with the MMPA.

Potential Mitigation Measures (Preferred Alternative) on Spectacled Eider

Potential mitigation measures would be similar to those described for birds in the Potential Mitigation For Birds Section.

Potential Mitigation Measures (Preferred Alternative) for Socio-Cultural Characteristics

Direct impacts on the socio-cultural characteristics of Nuiqsut, Barrow, Atqasuk, and Anaktuvuk Pass are generally related to changes in subsistence harvest and uses and to economic benefits from revenue streams produced by oil production. Additional revenue is expected to accrue from contracting by North Slope-based Native corporations. Without intervention, employment opportunities for local residents are expected to be minimal. Indirect impacts include potential effects on community health and welfare.

Potential mitigation measures for Alternative F are as follows:

- Mitigation measures to lessen the impacts on subsistence harvest and uses are as discussed in the Potential Mitigation Measures For Subsistence Section.
- No direct and immediate impacts are expected to community social organization, community services, or community health and welfare as a result of direct project impacts. If impacts in these sectors of community life occur as an indirect result of project development, such impacts are likely to occur over a longer time period and incrementally. A number of indicators of overall community welfare have been identified in previous studies prepared for the Kuukpikmuit Subsistence Oversight Panel (CRA 2002). CPAI would assist in continued monitoring of the indicator on a periodic basis to provide additional information to community leaders and appropriate social, health, and law enforcement organizations on overall community welfare. Such information could then be used to prioritize budgeting of community and NSB resources to address selected community welfare issues.

To the extent practicable, appropriate job training and recruiting programs should be implemented to encourage industry employment of local residents to increase wages earned in the local community.

Potential Mitigation Measures (Preferred Alternative) for Regional Economy

Currently, very few residents of the region obtain employment in the oil industry. Additional job training, educational funding, and future employment programs could help to mitigate loss of opportunity for participants in the traditional subsistence lifestyle.

Potential Mitigation Measures (Preferred Alternative) for Subsistence

The following mitigation measures should be considered:

1. To the degree possible, the pipeline should be buried to avoid creating barriers to caribou. In particular, pipeline sections should be buried between CD-2 and CD-7 to increase crossing success. (See potential mitigation measure discussion in Section 4A.3.4.1.)

2. Consider FFD in phases such that development of new pads would occur in concert with decommissioning of early development of CPAI.

Potential Mitigation Measures (Preferred Alternative) for Environmental Justice

Project features, procedures, and potential mitigation measures that have been identified for each resource with potentially disproportionate impacts. To the extent that the application of the identified potential mitigation measures do not reduce or avoid the impacts identified, some disproportionate impacts on minority and low-income populations would occur.

Potential Mitigation Measures (Preferred Alternative) for Cultural Resources

Before construction of ice roads, CPAI would evaluate and assess possible cultural resources in the immediate areas of the proposed ice roads.

CPAI would coordinate with the SHPO to provide a cultural resources management plan for the sites less than 1/4 mile from proposed project components to address the issue of potential site damage as a result of development activities, including inadvertent damage, vandalism, spills, and site monitoring.

If cultural resources are discovered as a result of construction, development, or operation activities under the proposed CPAI plan, activity would be stopped until the SHPO is consulted and an evaluation of the resource can be carried out.

Potential Mitigation Measures (Preferred Alternative) for Land Uses and Coastal Management

No mitigation measures have been identified for Alternative F for land use and coastal management.

Potential Mitigation Measures (Preferred Alternative) for Recreation Resources

No mitigation measures for recreation have been identified.

Potential Mitigation Measures (Preferred Alternative) for Visual Resources

Potential mitigation measures for visual resource impacts would include the following:

All structures would be painted to blend with the natural environment. All colors would be pre-approved by the AO. This includes emergency spill containers located along watercourses. BLM will use computer generated colors to determine the color for structures that blend in best with the background colors of the natural landscape and may do a color test onsite. Self-weathering steel, or best management practice, will be used on all metal structures not otherwise painted, including but not limited to pipelines, communications towers and drill rigs, thus providing a more natural color of brown.

Potential Mitigation Measures (Preferred Alternative) for Transportation

The potential for impacts to river navigation during construction could be mitigated through development of a navigation plan for commonly navigated channels that would be crossed by pipelines or bridges. The navigation plan should be submitted to the USCG for review prior to the start of construction of pipelines or bridges over commonly navigated channels. This could help minimize impacts to river navaigation and help assure reasonable navigation means during construction.