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SECTION 4C-2 DIRECT AND INDIRECT IMPACTS – SUB-ALTERNATIVE C-2

4C-2.1 INTRODUCTION

Sub-Alternative C-2 includes alternate road routes and bridge locations from those proposed by the applicant. All production pads would be accessed by gravel roads and would be sited in the same locations as under Alternative A. Roads to CD-3 and CD-4 would connect to Alpine. Roads to CD-5, CD-6, and CD-7 would connect to existing oil fields east of the Colville River, using the state's proposed Colville River Road, which would also connect to Nuiqsut. The Colville River Road is proposed by the State of Alaska and is not a proposed component of Alternative C-2. For Alternative C-2 to be practicable, the Colville River Road would need to be constructed and operational by late 2009, as currently proposed by the State of Alaska. Section 4G.4.5 includes additional information regarding the proposed Colville River Road.

A road bypassing Nuiqsut would be constructed to the production pad road. A 2-acre production pad would be added along the bypass, and primarily used for vehicle storage. Powerlines would be hung from power poles. No new airstrips would be constructed under Sub-Alternative C-2. Aboveground pipelines would be supported on VSMs and would be at elevations of at least 7 feet above the tundra, as measured at each VSM location. Use of roads on BLM lands would be unrestricted; all other roads would be open to industry, local residents, and government only. Residents of the village of Nuiqsut could access the project roads via the state road and Nuiqsut Bypass. Project-related vehicle and air traffic levels would be approximately the same as under Alternative A. The number of trips would be divided approximately equally between Alpine (to CD-3 and CD-4), and Nuiqsut (to CD-5, CD-6, and CD-7). Sub-Alternative C-2 would require the same exceptions to the BLM's stipulations as Alternative A; however, Sub-Alternative C-2 would also require that the BLM modify Stipulation 48 to allow connection of roads on BLM-managed lands with the state's proposed road. The USACE would have to determine that roads to CD-3 and CD-4 met the intent of Special Condition 10 of its 1998 permit which authorized the placement of fill associated with the construction of the Alpine facilities.

Sub-Alternative C-1 (see Section 2.4.3) is consistent with the theme of Sub-Alternative C-2: alternative access routes. Since the impacts of FFD are similar for both sub-alternatives, a specific FFD Scenario for Sub-Alternative C-2 has not been developed, and thus a FDD analysis is not included in this section.

4C-2.2 PHYSICAL CHARACTERISTICS

4C-2.2.1 Terrestrial Environment

4C-2.2.1.1 Physiography

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON PHYSIOGRAPHY

CONSTRUCTION PERIOD

The effects on physiography would result from changes to landforms by construction of roads, production pads, and gravel mines. The impacts are therefore similar to those discussed in Section 4C-1.2.1.1 for Sub-Alternative C-1. This alternative would include the construction of a 2-acre gravel pad for a vehicle storage facility alongside a bypass road to connect the proposed Colville River Road and Bureau of Indian Affairs (BIA) Extension Road to the ASDP road system. This alternative would also differ from Sub-Alternative C-1 in that it would not include construction of an access road connecting Alpine with CD-5, CD-6, and CD-7, and the spur road connecting Nuiqsut to the ASDP road within the National Petroleum Reserve-Alaska would be eliminated. Nuiqsut would be connected to the bypass road via the BIA Extension.

Areas that would experience direct physiographic effects from gravel mining operations include approximately 86 acres of gravel mine sites (see Section 4C-2.2.1.4). Areas that would experience direct physiographic impacts from placement of gravel on tundra include 324 acres (see Tables 2.4.3-6 and 2.4.3-7).

OPERATION PERIOD

Impacts during the operation period would be similar to those under Sub-Alternative C-1.

ABANDONMENT AND REHABILITATION

Like Sub-Alternative C-1, Sub-Alternative C-2 would create impacts similar in type to those under Alternative A. The impacts, whether from leaving roads and pads in place or removing them, will affect lands closer to Nuiqsut. Because the roads west of the Colville River will be connected to a road system not dependent on activities at Alpine Field, it may be more likely that roads and pads, particularly the 2-acre pad adjacent to the Nuiqsut Bypass, will be maintained for future uses.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON PHYSIOGRAPHY

Impacts to physiography would occur primarily during the construction phase, and result from changes to landforms by construction of roads, production pads, airstrips, and mine sites. If not properly designed and constructed, these landform changes can adversely affect the thermal stability of the tundra, and hydrology through thermokarsting and increased ponding.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR PHYSIOGRAPHY

No measures have been identified to mitigate impacts to physiography under Sub-Alternative C-2.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR TERRESTRIAL VEGETATION AND WETLANDS

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.1.2 Geology

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON GEOLOGY

Plan Area geology is comprised of marine limestones and marine and deltaic sands and shales of Mississippian to mid-Cretaceous age (Gyrc 1985b), mantled largely by Quaternary-aged fluvial and glaciofluvial sediments (Rawlinson 1993). Oil production efforts within the Plan Area target a Jurassic sandstone reservoir located in the Beaufortian Sequence (BLM 2003b).

CONSTRUCTION PERIOD

Direct Effects

Drilling oil production wells at the five pads (CD-3 through CD-7) would directly impact the physical integrity of reservoir and overlying bedrock by pulverization and fracture. The only surface bedrock identified within the Plan Area outcrops at the bend in the lower Colville River, upstream of Ocean Point (Mayfield et al. 1988). Sub-Alternative C-2 does not propose excavation activities in this area and would, therefore, not directly impact surface bedrock. The volume of rock impacted by drilling is insignificant compared to the total volume of bedrock within the Plan Area. Direct impacts to Plan Area bedrock during construction would produce no measurable effect and are considered negligible under Sub-Alternative C-2.

Indirect Effects

No indirect effects are recognized for the construction period.

OPERATION PERIOD**Direct Effects**

Annular disposal or injection of Class I and II wastes would directly impact the receiving bedrock via possible propagation of existing fractures, increase of pore space pressure, and alteration of pore space composition within an approximately 0.25-mile radius of the well (40 CFR 146.69 (b)). The volume of rock impacted by waste disposal is insignificant compared to the total volume of bedrock within the Plan Area. Direct impacts to Plan Area bedrock during operation would produce no measurable effect and are considered negligible under Sub-Alternative C-2.

Production of petroleum hydrocarbons from subsurface reservoirs constitutes an irreversible and irretrievable commitment of resources. Direct impacts to petroleum hydrocarbon resources within the Plan Area would be major under Sub-Alternative C-2.

Indirect Effects

No indirect effects are recognized for the operation period.

ABANDONMENT AND REHABILITATION

Geological resources would not be impacted by abandonment activities.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON GEOLOGY

Under Sub-Alternative C-2, the irreversible and irretrievable commitment of petroleum hydrocarbon resources constitutes a major impact, however petroleum hydrocarbon production is the purpose of the applicant's proposed action. Impacts to bedrock would be negligible.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR GEOLOGY

No measures have been identified to mitigate effects to geologic resources under Sub-Alternative C-2.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR GEOLOGY

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.1.3 Soils and Permafrost**SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON SOILS AND PERMAFROST**

Construction and operation of Sub-Alternative C-2 would involve impacts similar in type, but different in magnitude, to those under Alternative A (see Section 4A.2.1.3). Compared to Alternative A, Sub-Alternative C-2 would involve more road construction, due to an alternate road alignment, and road connections between all production pads, APF-1 and the Nuiqsut road system. Sub-Alternative C-2 also proposes construction of an overhead powerline between all pads. Except where noted, assumptions involved in the following calculations of soil and permafrost impacts do not differ from those presented in Section 4A.2.1.3.

CONSTRUCTION PERIOD

Relative to Alternative A, Sub-Alternative C-2 adds road connections between CD-1 and CD-3, eliminates the road connection between CD-2 and CD-5, and routes the primary road alignment to CD-7 via the State's proposed Colville River Road and a bypass around Nuiqsut. Under Sub-Alternative C-2, 2.2 million cy of fill would overlie approximately 324 acres of tundra. This footprint would be 83 acres more than that proposed under Alternative A. Extraction of the gravel required for construction of Sub-Alternative C-2 would impact a total of 86 acres of tundra and would require a total of 89 acres of ice pad for stockpiling overburden. Temporary ice roads and adjacent ice pads would cover approximately 1,566 acres of tundra over six winter seasons; this area is 407 acres greater than that estimated under Alternative A. Elimination of the road connection from CD-2 and CD-5 across the Nigliq Channel, and rerouting the primary road alignment away from the Fish Creek Drainage, would decrease the number of bridges required for Sub-Alternative C-2 to six, and the area of ice pads associated with bridge construction to 176 acres. Installation of 440 culverts, 659 power poles, and 4,059 VSMs under Sub-Alternative C-2 would disturb approximately 9,100; 1,190; and 14,500 cy of soil, respectively. Because power cable can be carried in a tray supported by pipeline VSMs, the construction of a separate overhead powerline would represent an additional impact. Construction period impacts associated with water discharges to the tundra and tundra travel are assumed to be of the same magnitude as those under Alternative A.

OPERATION PERIOD

Additional miles of road would increase the indirect impacts associated with road travel and maintenance. Greater dust fallout and accumulations of plowed snow and sprayed gravel would enlarge the area of thermal impacts to active layer soils and permafrost. The area of thermal impact calculated for Sub-Alternative C-2 is 1,726 acres; 574 acres more than that calculated for Alternative A. Impacts associated with tundra travel, transmission of warm reservoir fluids, sub-permafrost injection of waste, and accidental oil spills are assumed to be of the same magnitude as those under Alternative A.

ABANDONMENT AND REHABILITATION

Like Sub-Alternative C-1, Sub-Alternative C-2 would create impacts similar in type, but potentially greater than those under Alternative A. Because the roads west of the Colville River will be connected to a road system not dependent on activities at Alpine Field, it may be more likely that roads and pads, particularly the 2-acre pad adjacent to the Nuiqsut Bypass, would be considered worth maintaining for future uses. Thus, there would be less likelihood that removal of gravel cover would be considered appropriate.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON SOILS AND PERMAFROST

Impacts on soil and permafrost from construction and operation of Sub-Alternative C-2 are approximately equal to those estimated for Sub-Alternative C-1. The impacts on soil and permafrost associated with either Sub-Alternatives C-1 or C-2 are greater than any other alternative. Under Sub-Alternative C-2, 1,979 acres and 2.2 million cy of soil would be directly impacted, compared to 1,757 acres and 2 million cy of soil estimated for Alternative A. The percent of the total Plan Area impacted by construction of Sub-Alternative C-2 is 0.2 percent. Under Sub-Alternative C-2, placement of fill on the tundra represents the greatest direct impact to soil and permafrost; the thermal impacts associated with placement of fill on the tundra represent the greatest indirect impact.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR SOILS AND PERMAFROST

Soil and permafrost systems could recover to their pre-impact state but not without appropriate mitigation. Because impacts to soil and permafrost are generally unavoidable, mitigation aims to minimize the degree and magnitude of the impacts. Mitigation measures proposed under Sub-Alternative C-2 are the same as those identified for Alternative A (see Section 4A.2.1.3). A recommendation specific to Sub-Alternative C-2 is to run

power cable in a tray supported by pipeline VSMs to avoid the construction of a separate overhead line, and to reduce the degree and magnitude of impacts to soil and permafrost.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR SOILS AND PERMAFROST

The effectiveness of the protective measures would be similar to Alternative A except that a specific recommendation to place the power line in VSM supported cable trays would further reduce impacts by lessening disturbance to the soils and permafrost.

4C-2.2.1.4 Sand and Gravel

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON SAND AND GRAVEL

CONSTRUCTION PERIOD

The estimated gravel volume under Sub-Alternative C-2 is 2.24 million cy, as shown in Tables 2.4.3-6 and 2.4.3-7. Sub-Alternative C-2 impacts to sand and gravel resources would be similar in type and magnitude to those under Sub-Alternative C-1.

OPERATION PERIOD

During the operation period, relatively small amounts of gravel are expected to be extracted from existing permitted mine sites for repair of road or pad embankments.

ABANDONMENT AND REHABILITATION

Sand and gravel impacts would be similar to those under Alternative A and Sub-Alternative C-2, although if the road connection to the existing road network makes maintaining the roads and pads built by the applicant for future use more feasible, less of the sand and gravel from these pads would be available for alternative uses.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON SAND AND GRAVEL

Once used, sand and gravel resources utilized for construction of roads, production pads, or airstrips could only be available for re-use upon abandonment. Removal of gravel fill is not currently a scheduled phase of abandonment.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR SAND AND GRAVEL

No measures have been identified to mitigate effects on sand and gravel resources under Sub-Alternative C-2.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR SAND AND GRAVEL

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.1.5 Paleontological Resources

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON PALEONTOLOGICAL RESOURCES

Under Sub-Alternative C-2, the impacts to paleontological resources would be very similar to those under Sub-Alternative C-1. Impacts will differ in that the road segment and bridge connecting Alpine to CD-5, CD-6, and CD-7 would not be built, but a bypass road would be constructed to connect the state road to the project road

system. Impacts to paleontological resources from excavation of sand and gravel, drilling, the placement of gravel pads, VSMs, and powerline poles and the construction of bridges would be very similar to those under Sub-Alternative C-1.

ABANDONMENT AND REHABILITATION

Paleontological resources would not be impacted by abandonment activities.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON PALEONTOLOGICAL RESOURCES

Surface activities such as construction of pad, road, and airfield embankments are not likely to affect paleontological resources. Impacts could result from activities involving subsurface disturbance, such as production well drilling, sand and gravel mining, and installation of VSMs, power poles, and bridge piles. Excavation of sand and gravel under approximately 86 acres constitutes the greatest risk to paleontological resources under Sub-Alternative C-2. This “greatest risk” represents inconsequential impact potential to paleontological resources.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR PALEONTOLOGICAL RESOURCES

No potential measures have been identified to mitigate impacts to paleontological resources under Sub-Alternative C-2.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR PALEONTOLOGICAL RESOURCES

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.2 Aquatic Environment

4C-2.2.2.1 Water Resources

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON WATER RESOURCES

Sub-Alternative C-2 offers different road routes than Sub-Alternative C-1 does, due to the incorporation of the proposed Colville River Road into production pad access routes. Specifically, the bridge would cross the Colville River; bypass and access roads would connect Nuiqsut and the western production pads to Colville River Road; and the gravel road segment and vehicle bridge connecting Alpine to CD-5, CD-6, and CD-7 would be eliminated. A pile-supported pipeline bridge would be constructed across the Nigliq Channel instead. In addition to the altered road design, a vehicle storage facility is planned.

GENERAL IMPACTS

Other than a few local disturbances, Sub-Alternative C-2 would have very similar impacts to the same water resources as Sub-Alternative C-1 (i.e. subsurface waters, lakes, creeks, rivers, and the nearshore environment). Quantitative hydrologic analyses of Sub-Alternative C-2 have not been made, so analyses are qualitatively-based on the Alternative A analysis. Tables 4C-2.2.2-1 and 4C-2.2.2-2 provide summaries of potential construction and operation impacts to water resources under Sub-Alternative C-1, in the general vicinities surrounding CD-3, CD-4, CD-5, CD-6, and CD-7, including the roads and pipelines that connect them (see Section 4A.2.2.1).

CONSTRUCTION IMPACTS

Construction of the State's proposed Colville River Road, a permanent gravel road, would replace an ice road that is built every winter. Accordingly, the surface water supply demand would decrease in lakes south and east of Nuiqsut. Ice roads might be built in the winter to connect CD-4 to Nuiqsut and to the western production pads. If these ice roads were built, the amount of local surface water withdrawal would increase relative to the amount under Sub-Alternative C-1.

The pipeline bridge across the Nigliq Channel would result in less impacts to hydrology and channel features than a vehicle bridge, and these impacts would be negligible. Indirect effects on erosion and sedimentation from construction of Colville River Road and the vehicle storage area are probable. Soil disturbed during construction could be mobilized during spring break-up and deposited in the Delta. Overall, more erosion and sedimentation would be expected under Sub-Alternative C-2 than under Sub-Alternative C-1, because of its proposed larger surface area of newly constructed, permanent structures. Local recharge potential would also be expected to change under Sub-Alternative C-2. The larger impervious surface area would likely decrease infiltration potential.

OPERATION IMPACTS

By replacing an ice road with the permanent Colville River Road, operational demands on lake water to maintain ice roads would be less than those under Sub-Alternative C-1.

Although not specifically a proposed action under Sub-Alternative C-2, the alternative assumes an active operation of the State Colville River Road. This road would disrupt natural drainage patterns less than a bridge within the Delta would. A bridge, however, would have to be much larger than the proposed bridges under any of the other alternatives, because there is only one channel at its location and all Colville River flow must be conveyed under it (rather than split into distributary channels on the Delta). Bridge and culvert sizes and locations for all the roads under Sub-Alternative C-2 have only been conceptually planned and there are no final designs. Thus, it is conservatively assumed that water surface elevations would be somewhat affected by the road connecting to CD-3 and CD-4 during major flood events. Altered drainage patterns would cause scour and increase sedimentation across the Delta. This effect is expected to be somewhat less than that under Sub-Alternative C-2, because there would be no bridge crossing the Nigliq Channel. The impact of the pipeline-only bridge is not expected to be significant, although local scour and bank erosion can be expected during major floods. The impacts of the Colville River Bridge on channel scour, streamflow velocity, and sedimentation during flood events are expected to be similar to the impacts of the Nigliq Channel Bridge proposed under Sub-Alternative C-1.

The vehicle storage facility would store wastewater onsite and it would be hauled it to Nuiqsut or Kuparuk for disposal at approved wastewater treatment and disposal facilities. Under current NPDES permits, Nuiqsut can dispose of 25,000 gpd of wastewater to the tundra. The vehicle storage facility may increase the amount of wastewater treated in these villages, but the volume is not expected to exceed the current NPDES disposal limits.

ABANDONMENT AND REHABILITATION

Impacts to water resources from abandonment and rehabilitation would be similar to those under Sub-Alternative C-1. There would be fewer impacts from removing the pipeline-only bridge over the Nigliq Channel than from removing a road and pipeline bridge at that location. The long-term utility of the state's proposed road would likely mean that abandonment of pads would not result in abandonment and removal of the state's bridge.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON WATER RESOURCES

Sub-Alternative C-2 would reduce impacts from water withdrawals relative to Sub-Alternative C-1 due to fewer ice road needs, but a greater potential exists for impacts associated with ice jams and flood events (e.g. scour, water surface elevation, stream velocity) as a result of the State's Colville River Road. However, there should be less Delta impacts related to erosion and sedimentation processes and associated ice jams than under Sub-Alternative C-1. The localized effects of the Nigliq Bridge (Sub-Alternative C-1) on water surface elevation, channel velocity, and channel scour would also occur at the Colville River Bridge (Sub-Alternative C-2), but the magnitude of the effects may increase due to the altered flood flow regime around the Colville River Road.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR WATER RESOURCES

All data needs and mitigation measures recommended under Alternative A would also be applicable here.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR WATER RESOURCES

The effectiveness of the protective measures would be similar to Alternative A.

**TABLE 4C-2.2.2-1 SUB-ALTERNATIVE C-2 – POTENTIAL CONSTRUCTION IMPACTS TO WATER RESOURCES
SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN**

	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS					ESTUARIES & NEARSHORE ENVIRONMENT	
CD-3 and Vicinity											
	Shallow Ground water	Deep Ground water	Small Shallow Lakes and Ponds	Large Deep Lakes	Ulamigiq Channel	Tamayyak Channel	Sakoonang Channel	Colville River	Minor Streams	Colville River Delta	Harrison Bay
Gravel Road Segment: CD-1 to CD-3	8	NI	5	5	3,4,5,6,7	3,4,5,6,7	3,4,5,6,7	NI	3,4,5,6,7	6,7	6
Pipeline Segment: CD-1 to CD-3	NI	NI	NI	NI	2,7	2,7	2,7	NI	2,7	6	NI
Bridges/Culverts	NI	NI	NI	NI	1,2,3,4,5,6,7	1,2,3,4,5,6,7	1,2,3,4,5,6,7	NI	NI	6	6
Production Pad	8	NI	NI	8	2,3	2,3	2,3	NI	1,2,3	6	6
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI	NI	NI	NI
CD-4 and Vicinity											
	Shallow Ground water	Deep Ground water	Small Shallow Lakes and Ponds	Large Deep Lakes	Colville River Delta including the Nigliq Channel	Minor Streams			Harrison Bay		
Gravel Road Segment from CD-1 to CD-4	8	NI	2	NI	1,2,3,4,5,6,7	NI			6		
Bridges	NI	NI	1,2	1,2	NI	NI			NI		
Pipeline Segment from CD-1 to CD-4	NI	NI	NI	NI	NI	2,7			NI		
Production Pad	8	NI	8	NI	NI	1,2,3,4,5,6			NI		
Groundwater Wells	9	9	NI	NI	NI	NI			NI		
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI			NI		

TABLE 4C-2.2.2-1 SUB-ALTERNATIVE C-2 – POTENTIAL CONSTRUCTION IMPACTS TO WATER RESOURCES (CONT'D)

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
CD-5 and Vicinity								
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel		Minor Streams	Harrison Bay
Ice Road from CD-4 to Intersection with CD-5	8	NI	10	10	2,3		2,3	NI
Pipeline Segment from CD-4 to Intersection with CD-5	NI	NI	NI	NI	2,7		2,7	NI
Production Pad	8	NI	8	NI	NI		2	NI
Bridges/Culverts	NI	NI	NI	NI	2,3,4,5,6,7		2,3,4,5,6,7	NI
Groundwater Wells	9	9	NI	NI	NI		NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI		NI	NI
CD-6 and Vicinity								
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Ublutuoch River Basin	Minor Streams	Harrison Bay
Gravel Road Segment from CD-5 to CD-6	8	NI	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7	NI
Pipeline Segment from CD-5 to CD-6	NI	NI	NI	NI	NI	2, 7	2, 7	NI
Production Pad	8	NI	8	NI	NI	NI	2	NI
Bridges/Culverts	NI	NI	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

TABLE 4C-2.2.2-1 SUB-ALTERNATIVE C-2 – POTENTIAL CONSTRUCTION IMPACTS TO WATER RESOURCES (CONT'D)

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Colville River and Delta	Minor Streams		Harrison Bay
CD-7 and Vicinity								
Gravel Road Segment from CD-6 to CD-7	8	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7		NI
Pipeline Segment from CD-6 to CD-7	NI	NI	NI	NI	2,7	2, 7		NI
Production Pad	8	NI	8	NI	NI	2		NI
Bridges/Culverts	NI	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7		NI
Groundwater Wells	9	9	NI	NI	NI	NI		
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI		
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Colville River and Delta	Nigliq Channel	Minor Streams	Harrison Bay
Nuiqsit and Vicinity								
Colville River Road	8	NI	1,2,5,6	1,2,5,6	2,3,4,5,6,7	NI	2,3,4,5,6,7	NI
Bridges/ Culverts	NI	NI	NI	NI	2,3,4,5,6,7	NI	2,3,4,5,6,7	NI
Ice Roads from CD-4 to Nuiqsut	8	NI	10	10	2	NI	2	NI
Vehicle Storage Facility	8	NI	2,5,6	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

Notes:

1 = Shoreline disturbance & thermokarsting

2 = Blockage of natural channel drainage

3 = Increased stages & velocities of floodwater

4 = Increased channel scour

5 = Increased bank erosion

6 = Increased sedimentation

7 = Increased potential for over banking (due to inundation or wind-generated wave run-up)

8 = Removal /compaction of surface soils/gravel and changes in recharge potential

9 = Underground disposal of non-hazardous wastes

10 = Water supply demand

NI = No Impact

TABLE 4C-2.2.2-2 SUB-ALTERNATIVE C-2 – POTENTIAL OPERATIONAL IMPACTS TO WATER RESOURCES

Sub-Alternative C-2 – CPAI Development Plan											
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS					ESTUARIES & NEARSHORE ENVIRONMENT	
CD-3 and Vicinity											
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Ulamnigraq Channel	Tamayayak Channel	Sakoonang Channel	Colville River	Minor Streams	Colville River Delta	Harrison Bay
Gravel Road Segment from CD-1 to CD-3	8	NI	NI	5	6	6	6	NI	6	7	6
Pipeline Segment from CD-1 to CD-3	NI	NI	NI	NI	2,7	2,7	2,7	NI	2,7	6	NI
Production Pad	8	NI	NI	8	2,3	2,3	2,3	NI	2,3	6	6
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI	NI	NI	NI
CD-4 and Vicinity											
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Colville River Delta including the Nigliq Channel	Minor Streams			Harrison Bay		
Gravel Road Segment from CD-1 to CD-4	8	NI	NI	NI	NI	2,3,4,5,6			6		
Bridges	NI	NI	1	1	NI	2,7			6		
Pipeline Segment from CD-1 to CD-4	NI	NI	NI	NI	NI	2,7			NI		
Production Pad	8	NI	8	NI	NI	2,3,4,5,6			6		
Groundwater Wells	9	9	NI	NI	NI	NI			NI		
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI			NI		

TABLE 4C-2.2.2-2 SUB-ALTERNATIVE C-2 – POTENTIAL OPERATIONAL IMPACTS TO WATER RESOURCES (CONT'D)

Sub-Alternative C-2 – CPAI Development Plan								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
CD-5 and Vicinity								
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Nigliq Channel		Minor Streams	Harrison Bay
Ice Road from CD-4 to Intersection with CD-5	8	NI	10	10	2,3,5		2,3,5	NI
Pipeline Segment from CD-4 to Intersection with CD-5	NI	NI	NI	NI	2,7		2,7	NI
Production Pad	8	NI	8	NI	NI		2	NI
Bridges/Culverts	NI	NI	NI	NI	2,3,4,5,6,7		2,3,4,5,6,7	NI
Groundwater Wells	9	9	NI	NI	NI		NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI		NI	NI
CD-6 and Vicinity								
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Ublutuoch River Basin	Minor Streams	Harrison Bay
Gravel Road Segment from CD-5 to CD-6	8	NI	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7	NI
Pipeline Segment from CD-5 to CD-6	NI	NI	NI	NI	NI	2,7	2,7	NI
Production Pad	8	NI	8	NI	NI	NI	NI	NI
Bridges/Culverts	NI	NI	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7	NI
Groundwater Wells	9	9	NI	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

TABLE 4C-2.2.2-2 SUB-ALTERNATIVE C-2 – POTENTIAL OPERATIONAL IMPACTS TO WATER RESOURCES (CONT'D)

Sub-Alternative C-2 – CPAI Development Plan								
	GROUNDWATER		LAKES		MAJOR & MINOR STREAM CROSSINGS			ESTUARIES & NEARSHORE ENVIRONMENT
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Fish-Judy Creek Basin	Minor Streams		Harrison Bay
CD-7 and Vicinity								
Gravel Road Segment from CD-6 to CD-7	8	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7		NI
Pipeline Segment from CD-6 to CD-7	NI	NI	NI	NI	2,7	2,7		NI
Production Pad	8	NI	1,7,8	NI	NI	NI		NI
Bridges/Culverts	NI	NI	NI	NI	2,3,4,5,6,7	2,3,4,5,6,7		NI
Groundwater Wells	9	9	NI	NI	NI	NI		NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI		NI
	Shallow Groundwater	Deep Groundwater	Small Shallow Lakes and Ponds	Large Deep Lakes	Colville River and Delta	Nigliq Channel	Minor Streams	Harrison Bay
Nuiqsut and Vicinity								
Colville River Road	8	NI	1,2,5,6	1,2,5,6	2,3,4,5,6,7	NI	2,3,4,5,6,7	NI
Bridges/Culverts	NI	NI	NI	NI	2,3,4,5,6,7	NI	2,3,4,5,6,7	NI
Ice Road from CD-4 to Nuiqsut	8	NI	10	10	2,3	2,3	2,3	NI
Vehicle Storage Facility	8	NI	6	NI	NI	NI	NI	NI
Surface water extraction for potable and construction use	NI	NI	10	10	NI	NI	NI	NI

Notes:

1 = Shoreline disturbance & thermokarsting

2 = Blockage of natural channel drainage

3 = Increased stages & velocities of floodwater

4 = Increased channel scour

5 = Increased bank erosion

6 = Increased sedimentation

7 = Increased potential for over banking (due to inundation or wind-generated wave run-up)

8 = Removal /compaction of surface soils/gravel and changes in recharge potential

9 = Underground disposal of non-hazardous wastes

10 = Water supply demand

NI = No Impact

4C-2.2.2.2 Surface Water Quality**SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON SURFACE WATER QUALITY****CONSTRUCTION PERIOD**

Total water withdrawal volumes required for ice road construction would be approximately the same under Sub-Alternative C-2 as under Sub-Alternative C-1 during the 5-year construction phase of the project. The chance that ice roads would be routed across lakes, potentially leading to lower incidences of reductions in dissolved oxygen concentrations, would be about the same as under Sub-Alternative C-1. The estimated miles of ice roads required each year during construction would vary from a minimum of 51 to a maximum of 81 (see Table 2.4.3-8).

The elimination of the vehicle bridges across the Nigliq Channel under Sub-Alternative C-2 would reduce the likelihood of project structures potentially causing flooding and erosion compared to Sub-Alternative C-1. Less chance of flooding and erosion would decrease the chance for impacts occurring from increased turbidity to river water quality.

OPERATION PERIOD

Dust fallout from roads would be nearly the same for this Sub-Alternative as compared to Sub-Alternative C-1 because the total miles of roads are nearly the same.

ABANDONMENT AND REHABILITATION

Impacts to water quality from abandonment and rehabilitation would be similar to those under Sub-Alternative C-1. There would be fewer impacts from removing the pipeline-only bridge over the Nigliq Channel than from removing a road and pipeline bridge at that location. The long-term utility of the state's proposed road would likely mean that abandonment of pads would not result in abandonment and removal of the state's bridge.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON SURFACE WATER QUALITY

In comparison with Sub-Alternative C-1, this alternative would have similar potential impacts to surface water quality because of the similar gravel placement for roads and pads. The elimination of the Nigliq Channel road bridge would reduce the potential for water quality impacts in the channel compared to Sub-Alternative C-1, however, it is likely that similar impacts would occur at, or near the State's proposed Colville River Road Bridge.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR SURFACE WATER QUALITY

No mitigation measures are identified for Sub-Alternative C-2.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR SURFACE WATER QUALITY

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.3 Atmospheric Environment

4C-2.2.3.1 Climate and Meteorology

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON CLIMATE AND METEOROLOGY

CONSTRUCTION PERIOD

Direct Effects

The direct construction effects on climate and meteorology are the same as those under Sub-Alternative C-1.

Indirect Effects

No indirect operation effects on climate and meteorology have been identified for Sub-Alternative C-2.

OPERATION PERIOD

Direct Effects

Impacts from GHG emissions would be similar to those under Sub-Alternative C-1.

The impacts to climate and meteorology are the same as those under Sub-Alternative C-1, which differs from Alternative A in that there would be no airstrips in the lower Colville River Delta. This would not change the overall impact from GHG emissions.

Indirect Effects

No indirect operation effects on climate and meteorology have been identified for Sub-Alternative C-2.

ABANDONMENT AND REHABILITATION

Abandonment and rehabilitation activity impacts under this alternative would be similar to those under Alternative A and Sub-Alternative C-1.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON CLIMATE AND METEOROLOGY

The impacts are the same as those under Sub-Alternative C-1.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR CLIMATE AND METEOROLOGY

No mitigation measures have been identified.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR CLIMATE AND METEOROLOGY

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.3.2 Air Quality

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON AIR QUALITY

CONSTRUCTION PERIOD

Direct Effects

The amount of fugitive dust could be less than that produced under Sub-Alternative C-1 because of the construction of fewer roads.

Indirect Effects

No indirect operation effects on air quality have been identified for Sub-Alternative C-2.

OPERATION PERIOD

The air quality environmental consequences would be about the same under this alternative as under Sub-Alternative C-1, which differs from Alternative A under which emissions would be from vehicles instead of aircraft trips to CD-3.

Direct Effects

Air impacts from aircraft and road vehicles would be similar to those under Sub-Alternative C-1.

Indirect Effects

No indirect operation effects on air quality have been identified for Sub-Alternative C-2.

ABANDONMENT AND REHABILITATION

Impacts from abandonment and rehabilitation would be similar to those under Alternative A—short-term and transient.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON AIR QUALITY

The impacts would be roughly the same as those under Sub-Alternative C-1, including emissions from aircraft traffic.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES 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. Dust may be reduced by utilizing sealing agents and chip-seal on pads and heavily utilized portions of the road system. Watering of dust-prone areas would also reduce dust associated with the project.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR AIR QUALITY

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.2.3.3 Noise

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN NOISE IMPACTS

CONSTRUCTION PERIOD

Direct Effects

Noise impacts under this alternative are about the same as those under Sub-Alternative C-1.

Indirect Effects

No indirect operation effects on noise quality have been identified for Sub-Alternative C-2.

OPERATION PERIOD

Direct Effects

Operation period noise impacts under Sub-Alternative C-2 are about the same as those under Sub-Alternative C-1, which differs from Alternative A under which noise sources would be vehicles instead of aircraft trips to CD-3.

The noise impacts would be similar to those described for Alternative A and Sub-Alternative C-1, except that under Sub-Alternative C-2 there would be noise from aircraft flights at two airstrips, and none of these would be in the Lower Colville River Delta. Instead, roads would access pads in two clusters, and air and road traffic would be split between Nuiqsut and Alpine, and between the clusters, respectively. Additional flights into Nuiqsut would result in additional noise. Noise levels near the airport would not be affected, but the frequency of noise events may increase as a result of additional flights.

Indirect Effects

No indirect operation period effects on noise quality have been identified under Sub-Alternative C-2.

ABANDONMENT AND REHABILITATION

Noise impacts would be similar to those associated with construction (minus drilling noise) under Sub-Alternative C-1.

SUB-ALTERNATIVE C-2 – SUMMARY OF NOISE IMPACTS

The impacts under Sub-Alternative C-2 would be similar to those under Sub-Alternative C-1. The major difference would be that the air and road traffic would consist of a similar volume, but would be split between more airstrips and roads, possibly resulting in an overall reduction in noise. Noise frequency could increase at the Nuiqsut Airport as a result of increased takeoffs and landings.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR NOISE

No potential mitigation measures have been identified for Sub-Alternative C-2.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR NOISE

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.3 BIOLOGICAL RESOURCES

4C-2.3.1 Terrestrial Vegetation and Wetlands

4C-2.3.1.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Terrestrial Vegetation and Wetlands

Figure 4C-1.3.1.1-1 and Figure 4C-1.3.1.1-2 show the vegetation and habitats affected, and Table 4C-2.3.1-1 summarizes the area of vegetation types affected under CPAI Development Plan Sub-Alternative C-2. Habitat types were not individually assessed for Sub-Alternative C-2 because habitat mapping does not cover the portion of the Plan Area where the bypass road connects to the State Road. Refer to Sub-Alternative C-1 for an analysis of habitat types. Terrestrial vegetation and wetlands impact calculation methods for CPAI's Alternatives A through F are described in Section 4A.3.1.1.

CONSTRUCTION PERIOD

The construction period includes gravel placement, grading of the gravel surface, placement of all facilities, and initial drilling.

GRAVEL PADS, ROADS, AND AIRSTRIPS

Under Sub-Alternative C-2, a total of approximately 324 acres of vegetation would be covered with gravel fill for the construction of well pads and a vehicle storage pad (48 acres) and approximately 42 miles of primary and spur roads (274 acres). Included in the impacts from roads and pads, about 1.5 acres of tundra vegetation would be lost for the construction of a boat launch ramp and an access road at CD-4 and a floating dock and an access road at CD-3 as described in Section 2.3.8. Vegetation classes lost under Sub-Alternative C-2 due to gravel placement are summarized in Table 4C-2.3.1-1.

Proposed gravel sources would be the same as those described under Alternative A. Gravel extraction for the construction of Sub-Alternative C-2 would result in a permanent loss of approximately 86 acres of tundra habitat while the mine sites are active and an alteration from tundra to aquatic habitat when the gravel sites are reclaimed (Appendix O).

DUST FALLOUT FROM ROADS

Under Sub-Alternative C-2, potential indirect impacts from dust fallout, gravel spray, snow accumulation, impoundments, and thermokarst would result in alteration of about 1,726 acres of tundra vegetation, assuming that these impacts occur within 164 feet (50 meters) of gravel facilities, as described under the CPAI Development Plan Alternative A. Table 4C-2.3.1-1 summarizes the surface area by vegetation classes within this impact area.

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

Under Sub-Alternative C-2, a total of about 323 miles of temporary ice roads would be constructed over the life of the project for construction-related activities, resulting in a maximum of approximately 1,566 acres of vegetation disturbed. This is a maximum-case scenario that assumes the ice roads would be built in a different location each year as required by existing stipulations on BLM-administered land. The actual surface area disturbed would likely be much less, especially if ice roads are overlapped in subsequent years to minimize the aerial extent of impacts.

In addition to ice roads, ice pads would be used as staging areas during pipeline construction. Surface area impacts from ice pad staging areas for the construction of the pipeline would be the same as Sub-Alternative C-1 (approximately 86 acres). Ice pads may also be used to stockpile overburden material associated with the ASRC Mine Site and Clover. Impacts from these ice pads would be the same as those described under CPAI

Development Plan Alternative A. Ice pads also would be constructed at each end of each proposed bridge to stage equipment. These ice pads used as staging areas would vary with the size of the bridge installation and equipment needs. Given the number of road bridges proposed under CPAI Development Plan Sub-Alternative C-2 and assuming the maximum pad size would be 800 feet by 800 feet surrounding the abutment structure at each end of a bridge (Section 2.3.9), then a maximum of 176 acres of vegetation would be affected by ice pads for bridge construction.

Impacts associated with snow accumulation and stockpiling would be the same as Sub-Alternative C-1.

OFF-ROAD TUNDRA TRAVEL

Impacts of off-road travel would be the same as Sub-Alternative C-1.

IMPOUNDMENTS AND THERMOKARST

Indirect impacts from dust and changes to moisture or thermal regimes associated with roads, pads, and airstrips are expected to occur within 164 feet (50 meters) of gravel facilities, as described under CPAI's Development Plan Alternative A. Table 4C-1.3.1-1 summarizes the surface area of disturbance by vegetation classes within this impact area.

CROSS-DRAINAGE AND WATER FLOW

Indirect impacts from the disruption of cross-drainage and interception of sheet flow would be the same as Sub-Alternative C-1.

AIR POLLUTION

Air pollution impacts would be the same as Sub-Alternative C-1.

PIPELINES

Impacts from pipeline VSM borings would be the same as Sub-Alternative C-1 (about 0.6 acre).

POWER LINES

Impacts to vegetation from power line borings for suspended power lines would be the same as Sub-Alternative C-1 (approximately 338 square yards).

OPERATION PERIOD

The operation period includes continued drilling and day-to-day operations and maintenance once production has begun.

GRAVEL PADS, ROADS, AND AIRSTRIPS

Additional vegetation losses, following construction, could occur during the operational period during maintenance of gravel roads (such as snow removal) or if flood events wash out portions of roads or pads and deposit gravel on tundra.

DUST FALLOUT FROM ROADS

During the operation period, effects of dust from roads, pads, and airstrips are expected to be realized within the 164-foot impact zone. The effects of dust on vegetation were described above in the Construction Period section. Table 4C-2.3.1-1 summarizes the surface area of disturbance by vegetation and type within this impact area.

TABLE 4C-2.3.1-1 CPAI SUB-ALTERNATIVE C-2 – SUMMARY OF SURFACE AREA (ACRES) OF VEGETATION CLASSES AFFECTED

Vegetation Classes	Colville River Delta					The NPR-A (Western Beaufort Coastal Plain)					Totals for Sub-Alternative C-2
	DIRECT IMPACTS			INDIRECT IMPACTS	Totals for Delta	DIRECT IMPACTS			INDIRECT IMPACTS	Totals for the NPR-A	
	Primary Roads	Well Pads	Boat Launches, Dock, & Access Roads	Dust, Moisture Regime, & Thermal		Primary Roads	Spur Roads	Well Pads ^a	Dust, Moisture Regime, & Thermal		
Water	2.5		<0.1	29.8	32.3	<0.1	<0.1		3.6	3.6	35.9
Riverine Complex							0.3		2.4	2.7	2.7
Fresh Grass Marsh				1.6	1.6						1.6
Fresh Sedge Marsh						0.5	0.1		7.6	8.2	8.2
Deep Polygon Complex	0.9			4.8	5.7	0.8			10.1	10.9	16.6
Young Basin Wetland Complex						2.1		2.5	14.5	19.1	19.1
Old Basin Wetland Complex						1.7	5.3		50.3	57.3	57.3
Wet Sedge Meadow Tundra	42.0	18.4	0.2	261.1	321.7	3.6	7.6	6.2	89.3	106.7	428.4
Salt-killed Wet Meadow											
Halophytic Sedge Wet Meadow	1.5			12.4	13.9						13.9
Halophytic Grass Wet Meadow				1.6	1.6						1.6
Moist Sedge-Shrub Tundra	9.1			61.3	70.4	26.8	20.0	0.8	292.3	339.9	410.3
Tussock Tundra						109.1	28.4	19.1	817.2	973.8	973.8
Dryas Dwarf Shrub Tundra	1.3			7.8	9.1						9.1
Cassiope Dwarf Shrub Tundra						0.3			1.7	2.0	2.0
Halophytic Willow Dwarf Shrub Tundra											
Open and Closed Low Willow Shrub	9.2		1.2	37.8	48.2	0.5		0.7	5.4	6.6	58.4

TABLE 4C-2.3.1-1 CPAI SUB-ALTERNATIVE C-2 – SUMMARY OF SURFACE AREA (ACRES) OF VEGETATION CLASSES AFFECTED (CONT'D)

Vegetation Classes	Colville River Delta					The NPR-A (Western Beaufort Coastal Plain)					Totals for Sub-Alternative C-2
	DIRECT IMPACTS			INDIRECT IMPACTS	Totals for Delta	DIRECT IMPACTS			INDIRECT IMPACTS	Totals for the NPR-A	
	Primary Roads	Well Pads	Boat Launches, Dock, & Access Roads	Dust, Moisture Regime, & Thermal		Primary Roads	Spur Roads	Well Pads ^a	Dust, Moisture Regime, & Thermal		
Open and Closed Tall Willow Shrub											
Dune Complex											
Partially Vegetated	0.1		0.2	9.7	10.0						10.0
Barrens	0.6			3.6	4.2						4.2
Total Area	67.2	18.4	1.5	431.5	518.6	145.4	61.7	29.4	1294.5	1531.0	2049.6

Notes:

Spur Roads are airstrip and/or well pad access roads that branch off of the primary road.

Calculation methods are described in text in Section 4A.3.1.1.

Columns may not sum to exact numbers in the total row because of rounding, particularly when vegetation classes have impacts of <0.1.

^a Includes a 2-acre vehicle storage pad

ICE ROADS, ICE PADS, AND SNOW STOCKPILES

In addition to ice roads required for construction-related activities, approximately 29 miles of ice roads would be required under Sub-Alternative C-2 for facility operations, resulting in 141 acres of vegetation disturbed over the life of the project. This is a maximum-case scenario that assumes the ice roads would be built in a different location each year as required by existing stipulations on BLM-administered land. The actual surface area disturbed would likely be much less, especially if ice roads are overlapped in subsequent years to minimize the aerial extent of impacts. Ice pads would not likely be needed during the operational period under Sub-Alternative C-2 because all production pads would be accessible by roads.

As during the construction period, snowdrifts or plowed snow would accumulate on tundra adjacent to roads, well pads, and airstrips. Impacts would be similar to those discussed above in the Construction Period section.

OFF-ROAD TUNDRA TRAVEL

Off-road tundra travel impacts during operations would be the same as Sub-Alternative C-1.

IMPOUNDMENTS AND THERMOKARST

Some habitat loss and alteration would continue to occur from thermokarst and impoundments during the project operation. These impacts are more likely to be initiated during construction.

CROSS-DRAINAGE AND WATER FLOW

Impacts from the disruption of cross-drainage and interception of water flow may continue to cause impacts to vegetation during the operational phase of this project. These impacts are initiated during the construction period and are discussed above.

AIR POLLUTION

Air pollution impacts during the operational period would be the same as Sub-Alternative C-1.

PIPELINES

Pipeline operation would not cause additional vegetation losses or alteration. However, indirect impacts discussed above in the Construction Period section, associated with snow drifting and shading, would continue to occur during the operation period.

POWER LINES

No additional impacts to vegetation would occur from power lines during the operational period.

ABANDONMENT AND REHABILITATION

Impacts of abandonment to vegetation and wetlands under Sub-Alternative C-2 may be similar to that under Sub-Alternative C-1. However, because the roads west of the Colville River will be connected to a road system not dependent on the life of the Alpine field, it may be more likely that roads and pads, particularly the 2-acre pad adjacent to the Nuiqsut bypass, will be considered worth maintaining for future uses. If this were the case, CPAI's abandonment of the development would not lead to revegetation on the pads that remain. The wetlands filled by gravel at construction would remain filled indefinitely.

4C-2.3.1.2 Sub-Alternative C-2 – Summary of Impacts on Terrestrial Vegetation and Wetlands

Impacts of CPAI Development Plan Sub-Alternative C-2 to vegetation types are summarized in Table 4C-2.3.1-1

Vegetation maps cover the entire Plan Area (Figure 4C-1.3.1-2). Habitat types were not separately assessed for Sub-Alternative C-2 because habitat mapping does not cover the portion of the Plan Area where the bypass road connects to the State Road. Refer to Sub-Alternative C-1 for an analysis of habitat types and Table 3.3.1-3 for a comparison of vegetation types and wildlife habitat types.

Under CPAI Sub-Alternative C-2, approximately 410 acres of tundra vegetation would be lost by gravel fill and extraction associated with roads, pads, airstrips, and gravel mines; and 3,695 acres would be altered or disturbed by ice roads and pads, dust, snow-drifts, and changes to thermal or moisture regimes; combined representing less than one percent of the Plan Area (Table 4C-2.3.1-1).

The highest surface area impacts are to Tussock Tundra (974 acres lost or altered; 0.5 percent), Wet Sedge Meadow Tundra (428 acres lost or altered; 0.2 percent), and Moist Sedge Shrub Tundra (410 acres lost or altered; 0.9 percent) in the Plan Area (Table 4C-2.3.1-1).

4C-2.3.1.3 Sub-Alternative C-2 – Potential Mitigation Measures for Terrestrial Vegetation and Wetlands

Potential mitigation measures would be the same as those identified for CPAI Development Plan Alternative A (Section 4A.3.1).

4C-2.3.1.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Terrestrial Vegetation and Wetlands

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.3.2 Fish

Sub-Alternative C-2 (Figure 2.4.3.2-1) provides an alternative road configuration similar to Sub-Alternative C-1. The principal fish-related differences from Sub-Alternative C-1 are that under Sub-Alternative C-2 the road segment and bridge connecting Alpine to CD-5, CD-6 and CD-7 access roads would be eliminated and the bridge across the Nigliq Channel would be a pipeline-only bridge.

As in Sub-Alternative C-1, the primary concern in the Plan Area is maintaining winter habitat. Also of concern are maintaining suitable feeding and spawning areas and access to these areas because those areas are often in different geographic locations; subject to water withdrawal, alteration of flow patterns, release of contaminants during the life of the project, and the impacts of oil spills.

Impacts of and measures to prevent, control, and mitigate spills are not addressed in this section, but can be found in Section 4.3. Further, that section includes an assessment of the project effects on marine fish and habitats. Normal construction and operation impacts for this alternative would not be expected to have measurable impacts on Harrison Bay and nearshore Beaufort Sea environments and biota.

4C-2.3.2.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Fish

The impacts of Sub-Alternative C-2 are largely the same as those of Sub-Alternative C-1. Major differences from Alternative A are addressed in the following text.

CONSTRUCTION PERIOD

WATER WITHDRAWAL

The main potential impacts of Sub-Alternative C-2 would be related to winter water withdrawal (e.g., for ice roads) from fish-bearing lakes, as described in Section 4C-1.3.2. Impacts are not expected if withdrawals are conducted in compliance with permit requirements. The necessary water withdrawals would be monitored to ensure that the volume of water removed from any lake does not exceed permitted amounts.

Potential water demand during the construction phase for Sub-Alternative C-2 (Table 2.4.4-8) would be greater than for Sub-Alternative C-1 (Table 2.4.3-4) during both construction and operations. Water sources for ice roads would be the same as those for Sub-Alternative C-1 (Table 4A.3.2-1 and Table 4C-1.3.2-1).

GRAVEL MINING

The effects of gravel mining in Sub-Alternative C-2 are expected to be similar to Sub-Alternative C-1 because of the similarity in total gravel requirements between these alternatives.

PIPELINES

Impacts of pipeline installation would be generally the same as those for Sub-Alternative C-1 (Section 4C-1.3.2).

PADS AND AIRSTRIPS

The effects of constructing the pads under Sub-Alternative C-2 would be generally the same as described for Sub-Alternative C-1 (Section 4C-1.3.2).

BRIDGES AND ROADS

The impacts of bridge construction would generally be the same as described for Sub-Alternative C-1 except for the bridge across the Nigliq Channel. Under Sub-Alternative C-2, the pipeline-only bridge would not require gravel roadway approaches, instead relying on VSMs. This bridge would require fewer piers to suspend the pipe resulting in a concomitant decrease in disturbance due to winter construction. Impacts to fish in this area would be of a similar nature/or the same as described in Sub-Alternative C-1, however, the scope of any effects would decrease in conjunction with reduced disturbance.

CULVERTS

Impacts of culverts, if installed, would be as described in Section 4A.3.2.

BOAT RAMPS AND DOCKS

Construction of boat ramps and docks, should any be needed for spill response purposes, may have instream impacts similar to those of bridge construction.

POWER LINES

Because power lines would be installed in winter, no adverse direct impacts to fish populations would be expected. See Water Withdrawal (above) for a discussion of potential impacts of ice roads that would be needed for winter installation of power poles.

HUMAN ACCESS

The availability of the ice roads during winter construction would increase human access to the Ublutuoch River, the Fish Creek drainage, and the Colville River Delta. There would be a direct connection to Nuiqsut; local residents would use these roads and increased fishing pressure could result.

OPERATION PERIOD

ROADS AND PIPELINES

Operation of airstrips, production pads, and roads in Sub-Alternative C-2 would be similar to those described for Sub-Alternative C-1 with the exception that the road connecting Alpine to the CD-5, CD-6, and CD-7 access roads would be eliminated.

The connection of the road network to Nuiqsut would increase human use of the Ublutuoch River and the Fish Creek drainage. Use of the Colville River Delta would not increase in summer due to the elimination of the Nigliq Channel bridge southwest of CD-4. However, access to the Colville Delta would be available during winter via construction of ice roads that will be used to provision the Alpine, CD-3, and CD-4 facilities. Use and impacts to accessible areas are generally the same as described under Sub-Alternative C-1.

PADS

The effects from the five production pads in Sub-Alternative C-2 would be the same as described under Sub-Alternative C-1.

BRIDGES

Impacts associated with the bridges proposed under Sub-Alternative C-2 would be the same as described for Sub-Alternative C-1. The major exception is the pipeline-only bridge over the Nigliq Channel. Because the pipeline to this bridge will be supported by VSMS, no solid gravel approaches will extend into the floodplain terraces. During flooding, VSMS on the floodplain terrace would cause slight flow alteration but nothing approaching the potential effects of solid gravel approaches. It is unlikely that the impacts discussed for the Sub-Alternative C-1 roadway bridge would occur at the pipeline-only bridge proposed for Sub-Alternative C-2.

CULVERTS

Culverts, should they be installed, would be designed to maintain adequate water flow and fish passage. The nature of the potential impacts of installed culverts would be as described in Section 4A.3.2. Because there will be less roadway under Sub-Alternative C-2, there potentially would be fewer culverts, and thus a lower potential for impacts compared with Sub-Alternative C-1.

HUMAN ACCESS

Under Sub-Alternative C-2, human access to the Ublutuoch River, the Fish Creek drainage, and the Colville River Delta would be less than that under Sub-Alternative C-1. Eliminating the roadway bridge across the Nigliq Channel and the roadway connecting Alpine to the CD-5, CD-6, CD-7 access roads would isolate the CD-3 and CD-4 area of the Colville Delta from direct access from Nuiqsut. The use of the roads that are available under Sub-Alternative C-2 would be unrestricted in BLM-administered lands, and both industry and local residents could use the other segments of the road system. This could result in increased fishing pressure. CPAI's no-fishing policy would restrict use of fish resources by non-resident employees.

ABANDONMENT AND REHABILITATION

The impacts of abandonment and rehabilitation under Sub-Alternative C-2 would be similar to those for Sub-Alternative C-1, though there would be less impact to fish in the Nigliq Channel because no road bridge would have to be removed from that channel.

4C-2.3.2.2 Sub-Alternative C-2 – Summary of Impacts on Fish

The summary of potential impacts is generally the same as described under Sub-Alternative C-1. The major difference is the elimination of any potential impacts associated with the construction and operation of the roadway that under Sub-Alternative C-1 would connect Alpine with the CD-5, CD-6, and CD-7 access roads. In particular, impacts associated with the construction and operation of the pipeline-only bridge over the Nigliq Channel would be far less severe than those that might occur with the road and pipeline-bridge proposed under Sub-Alternative C-1. In addition, water demands due to ice road construction would be greater than for Sub-Alternative C-1, both in the construction and operations phases.

The potential impacts described above, should they occur, are likely to be localized and temporary and thus have no significant effects on fish populations within and adjacent to the Plan Area. Given the total amount of construction proposed, the collective effects of development and production will have some effect on fish and fish habitats in the region. Whether those effects are measurable and distinguishable from naturally occurring population perturbations is uncertain. Minor shifts in habitat or population integrity, especially if they are of a temporary nature, could reasonably be absorbed by the ecosystem. Furthermore, careful planning, appropriate engineering specification and design, and rigorous safety measures should minimize impacts and ensure the reproductive sustainability of stocks overall. Localized impacts could pose a more serious threat to localized (e.g., within a single drainage) stocks if they were to occur in or near prime spawning, nursery, or overwintering sites. Continued monitoring of fisheries resources is vital for evaluating the long-term stability of the region. Monitoring and mitigation plans should be finalized and ready to address any signs that development may be having a truly detrimental effect on local fish populations.

ESSENTIAL FISH HABITAT

The impacts of this alternative on salmon EFH would be essentially the same as those for Sub-Alternative C-1. As is the case with the previous alternatives, because the Plan Area represents marginal habitat for salmon populations, the probability of affecting EFH from a species and commercial perspective is minimal under Sub-Alternative C-2.

4C-2.3.2.3 Sub-Alternative C-2 – Potential Mitigation Measures for Fish

Potential mitigation measures would be the same as those identified for Sub-Alternative C-1 (Section 4C-1.3.2).

4C-2.3.2.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Fish

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.3.3 Birds

See discussions of impacts by bird group presented in Section 4A.3.3 Birds for additional descriptions of impact mechanisms and for description of impact calculation assumptions and methods.

4C-2.3.3.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Birds

Table 4C-2.3.3-1 presents the estimated number of nests displaced as a result of habitat loss, alteration and disturbance for CPAI Development Plan Sub-Alternative C-2 by bird species and species group. Sub-Alternative C-2 differs from Sub-Alternative C-1 by elimination of the road connection from CD-4 to CD-5 and

inclusion of the State's proposed Colville River Road connecting CD-5, CD-6, and CD-7 to the road system to the Kuparuk Oilfield. The State Colville River Road is not expected to be completed until construction of CD-5, CD-6 and CD-7 is nearly completed, but could be used for access during the operation phase for Sub-Alternative C-2.

WATERFOWL AND LOONS

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Habitat loss due to gravel placement would be reduced from Sub-Alternative C-1 in the Colville River Delta with removal of the connecting road from CD-4 to CD-5. This would reduce impacts to Riverine or Upland Shrub and Wet Meadow habitats in the Colville River Delta. The additional spur road and staging pad connecting to the State's Proposed Colville River Road would increase impacts primarily for Moist Tussock Tundra habitats in the National Petroleum Reserve-Alaska. These changes (Table 4C-2.3.3-1) would affect an additional estimated 2.7 waterfowl nests and 0.2 loon nests compared to Sub-Alternative C-1 (Table 4C-1.3.3-1). The types of effects on waterfowl and loons associated with gravel placement in Sub-Alternative C-2 would be the same as those described under Alternative A.

Disturbance and Displacement

Disturbances from vehicle traffic would be decreased in Sub-Alternative C-2 compared to Sub-Alternative C-1 in the Colville River Delta due to the elimination of the road connection between CD-5, CD-6, and CD-7 with the APF-1 and CD-4. Disturbance due to vehicle traffic would not be expected to increase in the National Petroleum Reserve-Alaska during construction. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1. Connection to Kuparuk and Nuiqsut could lead to additional industry and local traffic, but this road would not be in use before nearly all of the construction has been completed.

Obstructions to Movement

The disconnected road system in Sub-Alternative C-2 compared to Sub-Alternative C-1 in the Colville River Delta would reduce obstructions to brood movements especially in the vicinity of the Nigliq Channel. The road system in the National Petroleum Reserve-Alaska portion of the Plan Area would probably remain disconnected during the construction period and would be similar to Sub-Alternative C-1, although traffic from APF-1 would be reduced.

TABLE 4C-2.3.3-1 CPAI SUB-ALTERNATIVE C-2 – ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE

Species	Colville River Delta					The National Petroleum Reserve-Alaska Area					Grand Total ^a
	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	
Waterfowl											
Greater white-fronted goose	3.0	6.4	1.5	0.0	9.9	6.8	30.2	4.1	0.0	41.1	51.0
Snow goose	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada goose	0.0	0.2	0.0	0.0	0.2	1.7	7.3	1.0	0.0	10.0	10.2
Brant	0.3	0.4	0.1	0.0	0.8	0.8	3.1	0.4	0.0	4.3	5.1
Tundra swan	0.1	0.7	0.2	0.0	1.0	0.1	0.1	0.0	0.0	0.2	1.2
Mallard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern shoveler	0.0	0.2	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.1	0.3
Northern pintail	0.2	0.9	0.2	0.0	1.3	0.3	0.6	0.1	0.0	1.0	2.3
Green-winged teal	0.0	0.2	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.2	0.4
Greater scaup	0.0	0.2	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.1	0.3
Lesser scaup	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
King eider	0.0	0.0	0.0	0.0	0.0	0.5	3.6	0.5	0.0	4.6	4.6
Long-tailed duck	0.3	0.7	0.2	0.0	1.2	0.6	2.1	0.3	0.0	3.0	4.2
Waterfowl Total^b	4.1	9.9	2.3	0.0	16.3	11.0	47.1	6.4	0.0	64.5	80.8
Loons											
Red-throated loon	0.2	0.4	0.1	0.0	0.7	0.1	0.5	0.1	0.0	0.7	1.4
Pacific loon	0.2	0.9	0.2	0.0	1.3	0.9	4.7	0.6	0.0	6.2	7.5
Yellow-billed loon	0.1	0.2	0.0	0.0	0.3	0.1	0.5	0.1	0.0	0.7	1.0
Loon Total^b	0.5	1.5	0.4	0.0	2.4	1.1	5.7	0.8	0.0	7.6	10.0
Ptarmigan											
Willow ptarmigan	0.3	1.2	0.3	0.0	1.8	0.8	2.1	0.3	0.0	3.2	5.0
Rock ptarmigan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ptarmigan Total^b	0.3	1.3	0.3	0.0	1.9	0.8	2.1	0.3	0.0	3.2	5.1
Seabirds											
Parasitic jaeger	0.0	0.2	0.0	0.0	0.2	0.1	1.0	0.1	0.0	1.2	1.4
Long-tailed jaeger	0.0	0.2	0.0	0.0	0.2	0.1	0.5	0.1	0.0	0.7	0.9
Glaucous gull	0.1	0.2	0.0	0.0	0.3	0.6	3.6	0.5	0.0	4.7	5.0
Sabine's gull	0.1	0.0	0.0	0.0	0.1	0.2	1.0	0.1	0.0	1.3	1.4
Arctic tern	0.2	0.7	0.2	0.0	1.1	0.5	3.6	0.5	0.0	4.6	5.7
Seabird Total^b	0.5	1.3	0.3	0.0	2.1	1.6	9.8	1.4	0.0	12.8	14.9
Shorebirds											
Black-bellied plover	0.6	3.0	0.7	0.0	4.3	1.2	10.3	1.4	0.0	17.2	21.5
American golden-plover	0.7	3.7	0.9	0.0	5.3	1.3	6.7	0.9	0.0	8.9	14.2
Bar-tailed godwit	0.1	0.7	0.2	0.0	1.0	0.5	2.6	0.4	0.0	3.5	4.5
Semipalmated sandpiper	6.9	34.2	8.6	0.0	49.7	7.4	58.5	8.1	0.0	74.0	123.7
Baird's sandpiper	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.6	0.6
Pectoral sandpiper	13.1	64.8	16.2	0.0	94.1	12.5	56.1	7.6	0.0	76.7	170.3
Dunlin	0.5	2.3	0.6	0.0	3.4	1.4	8.2	1.1	0.0	10.7	14.1
Stilt sandpiper	0.6	3.0	0.7	0.0	4.3	1.6	9.3	1.3	0.0	12.2	16.5

TABLE 4C-2.3.3-1 CPAI SUB-ALTERNATIVE C-2 – ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION AND DISTURBANCE (CONT'D)

Species	Colville River Delta					The National Petroleum Reserve-Alaska Area					Grand Total ^a
	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total	
Buff-breasted sandpiper	0.0	0.0	0.0	0.0	0.0	0.3	4.1	0.6	0.0	5.0	5.0
Long-billed dowitcher	1.0	5.1	1.3	0.0	7.4	4.6	26.4	3.6	0.0	34.6	42.0
Red-necked phalarope	3.2	16.1	4.0	0.0	23.3	6.7	28.5	3.9	0.0	39.1	62.4
Red phalarope	2.2	11.0	2.8	0.0	16.0	2.7	15.0	2.1	0.0	19.8	35.8
Shorebird Total^b	29.0	143.7	36.0	0.0	208.7	40.2	226.2	31.1	0.0	297.5	506.2
Passerines											
Yellow wagtail	0.1	0.7	0.2	0.0	1.0	0.1	1.5	0.2	0.0	1.8	2.8
Savannah sparrow	0.7	3.7	0.9	0.0	5.3	1.7	9.9	1.4	0.0	13.0	18.3
Lapland longspur	13.2	65.5	16.4	0.0	95.1	28.9	130.2	17.9	0.0	177.0	272.1
Common redpoll	0.1	0.7	0.2	0.0	1.0	1.0	7.2	1.0	0.0	9.2	10.2
Passerine Total^b	14.3	70.5	17.7	0.0	102.5	26.7	148.8	20.5	0.0	196.0	298.5

Notes:

^a See Section 4A.3.3 Birds for analysis method^b Totals rounded to include birds with <0.1 nests/km²

Mortality

Potential mortality resulting from collisions with vehicles would be reduced in Sub-Alternative C-2 compared to Sub-Alternative C-1 with the disconnection of road access to CD-5, CD-6, and CD-7 to APF-1. The potential mortality from collisions with aircraft would be the same as Sub-Alternative C-1. Any increase in predator populations attracted to the development areas would result in decreased reproductive success for waterfowl and loons. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as long-tailed ducks (Mallek et al. 2003) and red-throated loons (Larned et al. 2003b); and to colonial nesting species which concentrate in specific locations such as brant and snow geese. Placement of all power lines on poles instead of VSMS would potentially increase nest and gosling or duckling depredation from raptors and ravens in Sub-Alternative C-2, compared to Alternative A.

OPERATION PERIOD

Habitat Loss, Alteration, and Enhancement

Some habitat loss or alteration from snowdrifts, gravel spray, dust fallout, thermokarst, and ponding would continue during project operation. Habitat loss and alteration are similar to Sub-Alternative C-1.

Disturbance and Displacement

Disturbance from vehicle traffic would be increased in the National Petroleum Reserve-Alaska portion of the Plan Area in Sub-Alternative C-2 compared to Sub-Alternative C-1 following completion of the State Colville River Road. Completion of this road would allow access to Kuparuk via the road system. This connection

would also reduce the amount of air traffic and associated disturbance at APF-1 required to support operations at CD-5, CD-6 and CD-7 in the National Petroleum Reserve-Alaska compared to Sub-Alternative C-1.

Obstructions to Movement

Obstructions to movements of waterfowl and loon broods across roads would continue during project operation. This potential obstruction would be increased in the National Petroleum Reserve-Alaska portion of the Plan Area with connection to the State Colville River Road compared to Sub-Alternative C-1.

Mortality

Potential mortality from collisions with vehicles would be higher in Sub-Alternative C-2 compared to Sub-Alternative C-1 because of the connection to the Spine Road and Kuparuk. Increased traffic resulting from local access would also potentially increase mortality from collisions with vehicles. Mortality from subsistence harvest may increase if residents use the road system for access; however, the lack of connection between the Colville River Delta facilities would not cause increased local access to the Delta. Alternatively, subsistence related mortality may decrease if hunters avoid areas with developments. Mortality from collisions with aircraft would be the same as in Sub-Alternative C-1. Mortality due to collisions with power lines would be the same as in Sub-Alternative C-1. Nest and duckling or gosling mortality due to depredation by raptors or ravens would be increased by the presence of power lines on poles which can be used for perching by raptors and ravens. Potential mortality from depredation by seabirds may also be the same as in Sub-Alternative C-1.

Any increase in predator populations attracted to the development would result in decreased reproductive success for waterfowl and loons. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as long-tailed ducks (Mallek et al. 2003) and red-throated loons (Larned et al. 2003b); and to colonial nesting species which concentrate in specific locations providing an abundant and predictable protein source.

PTARMIGAN

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Habitat loss and alteration from gravel fill and ice roads would result in similar estimated numbers of ptarmigan nests displaced in Sub-Alternative C-2 (Table 4C-2.3.3-1) compared to Sub-Alternative C-1 (Table 4C-1.3.3-1). The area of Patterned Wet Meadow and Moist Sedge-Shrub Meadow habitats used by ptarmigan for nesting and brood-rearing affected by gravel fill in Sub-Alternative C-2 would be decreased by 9 to 15 percent from Sub-Alternative C-1.

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta area compared to Sub-Alternative C-1 due to the lack of connectivity to the National Petroleum Reserve-Alaska sites. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstruction to Movement

Potential obstructions to ptarmigan movements would be reduced somewhat in Sub-Alternative C-2 compared to Sub-Alternative C-1. The State Spine Road connection may not be completed before construction of the National Petroleum Reserve-Alaska sites CD-5, CD-6, and CD-7 are completed. Obstructions to brood

movements in the Colville River Delta would be reduced from Sub-Alternative C-1 due to the elimination of road connections with the National Petroleum Reserve-Alaska sites.

Mortality

Potential mortality resulting from collisions with vehicles would decrease in Sub-Alternative C-2 compared to Sub-Alternative C-1 because of the disconnection of the road system in the Colville River Delta and reduced access for local traffic. Any increase in predator populations attracted to the development would result in increased adult mortality and decreased reproductive success for ptarmigan. The magnitude and extent of decreased productivity have not been quantified. Mortality from increased depredation of adults, eggs, and chicks would be higher in Sub-Alternative C-2 and would be the same as Sub-Alternative C-1 because of the placement of all power lines on poles, which increases avian predator efficiency by providing perches.

OPERATION PERIOD

During the operation period under Sub-Alternative C-2, the potential types of impacts to ptarmigan from habitat loss and alteration, disturbance, obstructions to movements, and mortality would generally be the same as those described previously for the construction period. Completion of the State Colville River Road would increase vehicle traffic in the National Petroleum Reserve-Alaska to CD-5, CD-6, and CD-7, but may lead to decreased disturbance due to air traffic at APF-1.

RAPTORS AND OWLS

Raptors are generally uncommon visitors and occasional nesters in the Plan Area. Habitat loss resulting from the proposed development in Sub-Alternative C-2 are unlikely to affect raptors because of the low numbers of birds reported in the Plan Area. Gravel roads, buildings, pipelines, and bridges would not obstruct raptor movements. Perches provided by communication towers, power poles, buildings, and pipelines at 7 feet could increase the ability of raptors to prey on other waterfowl, loons, seabirds, shorebirds, passerines, and ptarmigan. Raptors may collide with the power lines on poles, especially along the 3-mile Fish Creek buffer. The small numbers of raptors and owls that occur in the Plan Area are unlikely to suffer any mortality from collisions with vehicular traffic, buildings, bridges, or pipelines. Elimination of the airstrip at CD-3 would reduce disturbance to peregrine falcons foraging on juvenile and staging shorebirds in the lower Colville River Delta.

SHOREBIRDS

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Habitat loss and alteration would affect an estimated 18.8 fewer shorebird nests in Sub-Alternative C-2 compared to Sub-Alternative C-1 because of reduced gravel fill. Vegetation classes used by shorebirds that would be most affected by gravel fill in Sub-Alternative C-2 are Wet Sedge Meadow Tundra, Moist Sedge-Shrub Tundra, and Tussock Tundra (Table 4C-2.3.1-1).

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta compared to Sub-Alternative C-1 because of the elimination of the connection of the road system with CD-4 and APF-1. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstructions to Movements

Potential obstructions to movements of shorebird broods would be decreased in Sub-Alternative C-2 in the Colville River Delta compared to Sub-Alternative C-1 because of the disconnection of CD-4 and APF-1 to the National Petroleum Reserve-Alaska sites. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Mortality

Potential mortality resulting from collisions with vehicles would be fewer in Sub-Alternative C-2 than in Sub-Alternative C-1 because of the disconnection of the road system with the National Petroleum Reserve-Alaska sites and Nuiqsut. Mortality due to collisions with power lines on poles would be the same as in Sub-Alternative C-1. Any increase in predator populations attracted to development areas would result in decreased reproductive success for shorebirds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as buff-breasted sandpipers and dunlin. Mortality from depredation of adults, nests, and chicks would be the same as Sub-Alternative C-1 because placement of all power lines on poles and increased pipeline elevation from 5 feet to 7 feet would increase perching habitat and improve vantage points for raptors, gulls, and ravens.

OPERATION PERIOD**Habitat Loss, Alteration, or Enhancement**

Impacts to shorebirds from habitat loss and alteration would continue during project operations and would be slightly less than Sub-Alternative C-1.

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta area compared to Sub-Alternative C-1 due to the lack of connectivity to the National Petroleum Reserve-Alaska sites. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstructions to Movements

Obstruction to movements of shorebird broods would continue during project operation and would be decreased in Sub-Alternative C-2 compared to Sub-Alternative C-1 due to the disconnection of CD-4 and APF-1 to the National Petroleum Reserve-Alaska sites. Obstructions to brood movements would be increased at the National Petroleum Reserve-Alaska by increased traffic from Kuparuk via the State Colville River Road.

Mortality

Mortality from collisions with vehicles would be lower in Sub-Alternative C-2 in the Colville River Delta but higher at the National Petroleum Reserve-Alaska sites than Sub-Alternative C-1 because of the connection with the State Colville River Road and resulting traffic to the area from Kuparuk. Mortality due to collisions with power lines would be increased by the placement of power lines on poles, and would be the same as Sub-Alternative C-1. Any increase in predators attracted to development areas would result in decreased reproductive success for shorebirds. The magnitude and extent of this potential decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as buff-breasted sandpipers and dunlin. Mortality from depredation of adults, nests, and chicks would be similar to Sub-Alternative C-1 because placement of all power lines on poles and increased pipeline elevation from 5 feet to 7 feet would increase perching habitat and improve vantage points for raptors, gulls and ravens.

SEABIRDS (GULLS, JAEGER, TERNS)**CONSTRUCTION PERIOD****Habitat Loss, Alteration, or Enhancement**

Habitat loss and alteration resulting from gravel placement would be decreased in Sub-Alternative C-2 compared to Sub-Alternative C-1, resulting in displacement of an estimated 0.7 fewer seabird nests (Table 4C-2.3.3-1 and Table 4C-1.3.3-1). Gravel fill would affect Old Basin Wetland Complex, Wet Sedge Meadow, and Deep Polygon Complex vegetation classes used by nesting and brood-rearing seabirds in Sub-Alternative C-2 (Table 4C-2.3.1-1). Increasing the elevation of the pipeline from 5 feet to 7 feet may provide perching habitat that would enhance foraging efficiency of seabirds.

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta compared to Sub-Alternative C-1 because of the elimination of the connection of the road system with CD-4 and APF-1. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstructions to Movement

Potential obstructions to movements of seabird broods would be decreased in Sub-Alternative C-2 in the Colville River Delta compared to Sub-Alternative C-1 because of the disconnection of CD-4 and APF-1 to the National Petroleum Reserve-Alaska sites. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Mortality

Potential mortality resulting from collisions with vehicles would be decreased in Sub-Alternative C-2 than in Sub-Alternative C-1 because of the disconnection of the road system with the National Petroleum Reserve-Alaska sites and Nuiqsut. Mortality due to collisions with power lines on poles would be the same as in Sub-Alternative C-1. Any increase in predator populations attracted to the development could result in decreased reproductive success for seabirds. The magnitude and extent of this decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as jaegers and arctic tern (Mallek et al. 2003). Mortality from increased depredation on eggs or young may also be increased by the placement of all power lines on poles and increasing the pipeline height from 5 feet to 7 feet, giving avian predators perching locations and vantage points.

OPERATION PERIOD**Habitat Loss, Alteration, or Enhancement**

Impacts to seabirds from habitat loss and alteration would continue during project operations and would be slightly less than Sub-Alternative C-1.

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta area compared to Sub-Alternative C-1 due to the lack of connectivity to the National Petroleum Reserve-Alaska sites. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstructions to Movement

Obstruction to movements of seabird broods would continue during project operation and would be decreased in Sub-Alternative C-2 compared to Sub-Alternative C-1 due to the disconnection of CD-4 and APF-1 to the National Petroleum Reserve-Alaska sites. Obstructions to brood movements would be increased at the National Petroleum Reserve-Alaska by increased traffic from Kuparuk via the State Colville River Road.

Mortality

Mortality from collisions with vehicles would be lower in Sub-Alternative C-2 in the Colville River Delta but higher at the National Petroleum Reserve-Alaska sites than Sub-Alternative C-1 because of the connection with the State Colville River Road and resulting traffic to the area from Kuparuk. Mortality due to collisions with power lines would be increased by the placement of power lines on poles, and would be the same as Sub-Alternative C-1. Any increase in predator populations attracted to the development could result in decreased reproductive success for seabirds. The magnitude and extent of this decreased productivity have not been quantified, but would be most detrimental to species with populations which may be declining such as jaegers and arctic terns (Mallek et al. 2003). Potential for increased depredation from raptors or common ravens perching on power poles would be the same as Sub-Alternative C-1.

PASSERINES

CONSTRUCTION PERIOD

Habitat Loss, Alteration, or Enhancement

Habitat loss and alteration would be decreased in Sub-Alternative C-2 affecting an estimated 6.3 fewer passerine nests compared to Sub-Alternative C-1 (Table 4C-2.3.3-1 and Table 4C-1.3.3-1). The area of Open and Closed Low Willow Shrub and Moist Sedge-Shrub Tundra vegetation classes affected by gravel placement would be reduced in Sub-Alternative C-2 compared to Sub-Alternative C-1 by the elimination of the road and bridge across the Nigliq Channel in Sub-Alternative C-2. Power poles, communication towers, and buildings would provide perches for common ravens and structures for nesting. VSMs and buildings would provide nesting structures for snow buntings.

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta compared to Sub-Alternative C-1 because of the elimination of the connection of the road system with CD-4 and APF-1. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstructions to Movements

As with Alternatives A and B, road systems and structures would not be anticipated to obstruct passerine movements.

Mortality

Potential mortality resulting from collisions with vehicles would be fewer in Sub-Alternative C-2 than in Sub-Alternative C-1 because of the disconnection of the road system with the National Petroleum Reserve-Alaska sites and Nuiqsut. Mortality due to collisions with power lines on poles would be the same as in Sub-Alternative C-1. Any increase in predator populations attracted to the development could result in increased adult mortality and decreased reproductive success for passerines. The magnitude and extent of this decreased productivity

have not been quantified. Mortality from depredation of adults, nests, and young may be increased by using poles to support power lines which would provide perching habitats for raptors and ravens.

OPERATION PERIOD

Habitat Loss, Alteration, or Enhancement

Impacts to passerines from habitat loss and alteration would continue during project operations and would be slightly less than Sub-Alternative C-1.

Disturbance and Displacement

Disturbance from vehicle traffic would be decreased in Sub-Alternative C-2 in the Colville River Delta area compared to Sub-Alternative C-1 due to the lack of connectivity to the National Petroleum Reserve-Alaska sites. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1.

Obstructions to Movements

As with Alternatives A and B, operational activities would not be anticipated to obstruct passerine movements.

Mortality

Mortality from collisions with vehicles would be lower in Sub-Alternative C-2 in the Colville River Delta but higher at the National Petroleum Reserve-Alaska sites than Sub-Alternative C-1 because of the connection with the State Colville River Road and resulting traffic to the area from Kuparuk. Mortality due to collisions with power lines would be increased by the placement of power lines on poles, and would be the same as Sub-Alternative C-1. Any increase in predator populations attracted to the development could result in increased adult mortality and decreased reproductive success for passerines. The magnitude and extent of this decreased productivity have not been quantified. Placement of power lines on poles in Sub-Alternative C-2 would increase depredation from raptors and common ravens perching on poles.

ABANDONMENT AND REHABILITATION

The impacts of Sub-Alternative C-2 would be similar in type and magnitude to those for Sub-Alternative C-1. Impacts from some road traffic, however, would shift from the road route over the Nigliq Channel to the road route across the Colville River to Kuparuk.

4C-2.3.3.2 Sub-Alternative C-2 – Summary of Impacts (CPAI) on Birds

Impacts to birds associated with construction and operation of the proposed development include habitat loss, alteration, or enhancement; disturbance and displacement; obstructions to movement; and mortality. Additional impacts due to lost productivity are not quantified by this analysis, including impacts due to increased nest depredation caused by increased predator populations. The Project Team estimated the number of nests effected by habitat loss, alteration, or disturbance for each alternative based on site specific nesting densities for bird species and species groups to compare alternative development scenarios. Effects would be localized, and no measureable effects to North Slope populations would be expected. CPAI Sub-Alternative C-2 would reduce nesting by 1 percent for Plan Area waterfowl, loon, and seabird populations and by 1 percent or less for Plan Area shorebird and passerine populations. Habitat loss does not involve the direct loss of active nests due to winter gravel placement, ice road construction, snow dumping, and snow drifting occurrences when nests are not active. Most impacts would be initiated during the construction period, including gravel placement, grading of the gravel surface, placement of all facilities, and initial drilling. The results of effects of these activities on estimated bird production due to loss, alteration, or disturbance of nesting habitat for Sub-Alternative C-2, CPAI Development Plan, are presented in Table 4C-2.3.3-2.

4C-2.3.3.3 Sub-Alternative C-2 – Potential Mitigation Measures for Birds

Potential mitigation measures would be the same as those identified for Alternative A (Section 4A.3.3).

4C-2.3.3.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Birds

The effectiveness of the protective measures would be similar to Alternative A.

TABLE 4C-2.3.3-2 CPAI SUB-ALTERNATIVE C-2 –ESTIMATED NUMBER OF BIRD NESTS POTENTIALLY DISPLACED BY HABITAT LOSS, HABITAT ALTERATION, AND DISTURBANCE

CPAI Sub-Alternative C-2 Totals ^a					
Bird Group	Habitat Loss	Habitat Alteration	Ice Road Habitat Loss	Air Traffic Disturbance	Total
Waterfowl	15	57	9	0	81
Loons	2	7	1	0	10
Ptarmigan	1	3	1	0	5
Seabirds	2	11	2	0	15
Shorebirds	69	370	67	0	506
Passerines	41	219	38	0	298
Total Nests	130	667	118	0	915

Notes:

^a See Section 4A.3.3 Birds for assumptions and calculation methods. Totals from Tables 4C-2.3.3-1.

4C-2.3.4 Mammals

4C-2.3.4.1 Terrestrial Mammals

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON TERRESTRIAL MAMMALS

Important characteristics of Sub-Alternative C-2 with regard to effects on terrestrial mammals include the following. Sub-Alternative C-2 would include 42 miles of road and 42 miles of pipeline (Figure 2.4.3.2-1). This is nearly the same miles of road and pipeline as in Alternative C-1. Most of the pipelines in Sub-Alternative C-2 have an adjacent road, except for the section between CD-4 and CD-5. All of the pipelines in Sub-Alternative C-1 have adjacent roads. Most pipelines in Alternative A have adjacent roads, except the route to CD-3. The area covered by gravel in Sub-Alternative C-2 is nearly the same as in Sub-Alternative C-1. There are no new airstrips in Sub-Alternative C-2, but there is an existing airstrip at CD-1. The total gravel fill (pads, roads, airstrips) for Sub-Alternative C-2 is over 83 acres more than that for Alternative A. The road/pipeline routes in Sub-Alternative C-2 are substantially different from those in Alternative A. Sub-Alternative C-2 differs from Alternative A and Sub-Alternative C-1 in that there is a State Colville River Road connecting the existing oil fields to Nuiqsut and CD-5, CD-6, and CD-7. Unlike Sub-Alternative C-1, in Sub-Alternative C-2 there is no road (only a pipeline) between this road network and CD-1, CD-2, CD-3, and CD-4 in the Colville Delta. This will restrict local road access to the Delta. Like Sub-Alternative C-1 the route of the road/pipelines connecting CD-5, CD-6, and CD-7 is several miles to the south of the road/pipeline routes in Alternatives A, B, and D. In Sub-Alternative C-2 (like Sub-Alternative C-1), pipelines would be elevated to 7 feet, and roads would be by used by industry, local residents, and on BLM lands, the public.

CONSTRUCTION PERIOD**Direct Habitat Loss, Alteration, or Enhancement**

In Sub-Alternative C-2, the amount of area to be covered by gravel would increase by 83 acres compared to Alternative A. See the Operation Period section under Sub-Alternative C-2 for quantification of habitat types lost or altered under gravel fill. The road from Clover to CD-6 and CD-7 might cover one existing inactive (in summer 2002) arctic fox den (Johnson et al. 2003b).

Disturbance and Displacement

In Sub-Alternative C-2, disturbance and displacement effects during winter and summer construction would be similar to those described for Alternative A but impacts would be in the different Sub-Alternative C-2 locations of the road/pipeline corridors. There would be increased construction between CD-1 and CD-3 because of the road included in Alternatives C-1 and C-2 that is not in Alternative A. This could increase the potential for disturbance of denning grizzly bears and polar bears in this area. The road/pipeline routes between CD-5, CD-6, and CD-7 would be farther to the south than those in Alternative A. Construction activity in this area could cause some disturbance and displacement of wintering caribou, muskoxen, moose, and denning grizzly bears as with Alternative A. The potential for disturbance of caribou could be greater in Sub-Alternative C-2 than in Alternative A because past winter distributions of caribou have included the southeast part of the Plan Area. The potential for disturbance of moose may be greater in Sub-Alternative C-2 than in Alternative A because moose tend to occur farther to the south in the winter.

Obstruction to Movements

The access road from CD-5 to CD-6 and CD-7 in Sub-Alternative C-2 would be approximately 5 miles south of that proposed in Alternative A. This could affect the movements of more caribou in winter (BLM and MMS 2003a). As discussed under Alternative A, there would probably be few moose, muskoxen, wolves, or wolverines near construction areas during the winter. Construction in the riparian zones (e.g., along the Ublutuooh River) could obstruct movements of these species in summer or winter. The potential for obstruction of movements to have adverse effects on terrestrial mammals would be greatest if there are energy demands and less forage available because of cold temperatures or heavy snowfall.

Mortality

Mortality associated with construction of Sub-Alternative C-2 would likely be similar to that described for Alternative A. Because the construction of the Sub-Alternative C-2 road from CD-5 to CD-6 and CD-7 would occur in an area that has had more wintering caribou, more vehicle-collisions could occur along this route. The construction activity for Sub-Alternative C-2 may disturb some denning grizzly bears, possibly resulting in mortality from human conflict or exposure of cubs or adults to harsh winter conditions.

OPERATION PERIOD**Direct Habitat Loss, Alteration, or Enhancement**

Direct habitat lost for foraging by terrestrial mammals would be the area covered by gravel fill. This would be restricted to the roads and facility pads because there would be no new airstrips. Sub-Alternative C-2 would have 83 acres more gravel fill than Alternative A. The additional gravel fill in Sub-Alternative C-2 could increase potential insect-relief habitat. The road from CD-4 to CD-3 could provide additional potential insect-relief habitat in the northern part of the Colville River Delta.

The two most important foraging habitat types for caribou in summer are Moist Sedge-Shrub Meadow and Moist Tussock Tundra (Lawhead et al. 2003, Russell et al. 1993, Jorgenson et al. 2003c). The Barrens habitat type primarily provides insect relief to caribou in summer (Jorgenson et al. 2003c). The most important habitat

types for muskoxen include Riverine, Upland Shrub, and Moist Sedge-Shrub Meadow habitat types (PAI 2002a; BLM and MMS 2003a, and references therein). These habitat types, as well as Barrens, are the most important habitat types for grizzly bears (Shideler and Hechtel 2000; Jorgenson et al. 2003c; PAI 2002a, and references therein). The Riverine and Upland Shrub habitat types are also the most important habitat types for moose. These habitat types potentially lost from gravel fill (roads, pads, and airstrips) under Sub-Alternative C-2 are quantified below.

A total of 44,406 acres of Moist Sedge-Shrub Tundra is available in the Plan Area (Table 3.3.1-1). A total of 56.7 acres (9.1 acres in the Colville River Delta, and 47.6 acres in the National Petroleum Reserve-Alaska) of Moist Sedge-Shrub Tundra habitat would be lost as a result of gravel placement (roads, pads, and airstrips) under Sub-Alternative C-2 (Table 4C-2.3.1-1). The potential loss of Moist Sedge-Shrub Tundra from placement of gravel fill is less than 0.1 percent of that available in the Plan Area. In addition to gravel fill, 353.6 acres (61.3 acres in the Colville River Delta, and 292.3 acres in the National Petroleum Reserve-Alaska) of Moist Sedge-Shrub Tundra would be indirectly altered by gravel fill (Table 4C-2.3.1-1 and 4C-2.3.1-1).

The combined area of riverine and upland shrub habitats in the Plan Area is 23,480 acres (Table 3.3.1-1). A total of 13.2 acres (11.7 acres in the Colville River Delta, 1.5 acre in the National Petroleum Reserve-Alaska) of riverine and upland shrub habitats would be lost as a result of gravel placement (roads, pads, and airstrips) under Sub-Alternative C-2. The potential loss of riverine and upland shrub vegetation constitutes less than 0.1 percent of this vegetation in the Plan Area. In addition, 52.7 acres (45.6 acres in the Colville River Delta, and 7.1 acres in the National Petroleum Reserve-Alaska) of riverine and upland shrub vegetation would be indirectly altered by gravel fill related impacts (Table 4C-2.3.1-1).

A total of 208,179 acres of Tussock Tundra vegetation is available in the Plan Area (Table 3.3.1-1). No Tussock Tundra would be lost or altered in the Colville River Delta under Sub-Alternative C-2 (Table 4C-2.3.1-1). A total of 156.6 acres of Tussock Tundra would be lost as a result of gravel placement (roads, pads, and airstrips) in the National Petroleum Reserve-Alaska (Table 4C-2.3.1-1). The potential loss under gravel fill in the Plan Area is less than 0.1 percent of available Tussock Tundra. In addition to gravel fill, 817.2 acres of Tussock Tundra would be indirectly altered by gravel fill (Table 4C-2.3.1-1).

The total area of Barrens habitat type in the Plan Area is 44,009 acres (Table 3.3.1-1). A total of 4.2 acres of Barrens would be lost or altered as a result of gravel placement (roads, pads, and airstrips) in the Plan Area under Sub-Alternative C-2 (Table 4C-2.3.1-1).

Disturbance and Displacement

There would be 16 miles more road in Sub-Alternative C-2 than in Alternative A. Traffic on this additional mileage could increase the amount of disturbance to caribou, muskoxen, moose, and grizzly bears compared to Alternative A. The lack of new airstrips in Sub-Alternative C-2 would result in less disturbance than in Alternative A which has a new airstrip at CD-3. However, there may be increased air traffic into CD-1 because of the lack of road connection between the State Colville River Road and CD-1, CD-2, CD-3, and CD-4 on the Colville Delta. Access by local residents in Sub-Alternative C-2 could disturb and displace terrestrial mammals if hunting is done. This will be mainly on the roads to CD-5, CD-6, and CD-7 because there is no road connecting these sites and Nuiqsut and the northern sites (CD-1, CD-2, CD-3, and CD-4). The road connection from Nuiqsut to the southerly project roads could allow easier access to local residents and increase the disturbance impacts associated with hunting. A high level of hunting could prevent terrestrial mammals from habituating to industry activities and result in displacement away from the roads and facilities. In the National Petroleum Reserve-Alaska portion of the Plan Area (the area around CD-6 and CD-7), unrestricted public access could substantially increase the amount of vehicle traffic and hunting pressure. This could add a considerable amount of disturbance to terrestrial mammals in the Plan Area. However, the access from the State Colville River Road would be limited to industry and local residents, and would not include the general public.

Obstruction to Movements

Sub-Alternative C-2 would include 37 miles of road/pipeline combination (including the road from CD-4 to CD-3) compared to 26 miles in Alternative A. This is 11 miles more road/pipeline than in Alternative A (Figure 2.4.3.2-1 and Figure 2.4.1.1-1). Although roads with elevated pipelines are not barriers to caribou movement, they could deflect or delay crossing (Murphy and Lawhead 2000). It is important to note that the Sub-Alternative C-2 (and Sub-Alternative C-1) pipelines would be elevated to 7 feet (versus 5 feet in Alternative A). Elevating pipelines to at least 5 feet is considered adequate for caribou crossing, although higher elevations might enhance crossing success. Therefore, the potential for obstruction of caribou movement because of the greater amount of road/pipeline combination in Sub-Alternative C-2 would be mitigated by the higher elevation of the pipelines. Also, caribou would be in the vicinity of the roads in winter, and snow could accumulate under or around pipelines. The 7-foot pipelines could allow easier winter movements. In Sub-Alternative C-2, the east-west oriented pipeline from CD-6 and CD-7 past Clover is situated in the lee of the road and generally more parallel to prevailing winds than the pipeline in Alternative A. Thus, this pipeline could cause more snow to accumulate than the pipeline in Alternative A. The higher (7 feet) elevation of the pipeline in Alternatives C-1 and C-2 might mitigate this potential impact.

Also, separating the roads and pipelines by more than 300 feet can enhance crossing success. The road from CD-1 to CD-3 would probably have a limited effect on caribou movements because it would be separated from the pipeline by 0.5 to 1 mile for much of its 6-mile length.

Access to roads by industry and local residents (and the public on BLM lands) could result in traffic that contributes to obstruction of caribou movements. If hunting were to occur from the roads, caribou, moose, muskoxen, and grizzly bears could associate the roads with danger and avoid, rather than cross them.

Mortality

In Sub-Alternative C-2, accidental mortality caused by collisions with vehicles could be greater than in Alternative A because of the longer road system. As with Alternative A, road access by local residents could result in hunting mortality of terrestrial mammals. This impact would potentially occur in Sub-Alternative C-1 in the area between CD-1 and CD-3, but not in Alternatives A or C-2 because of lack of road connections in these Alternatives. Access from Nuiqsut to the road system to CD-5, CD-6, and CD-7 could result in increased harvest by hunters. In the BLM portion of the Plan Area, unrestricted public access could substantially increase the amount of non-local hunting pressure, although access to the general area will be difficult for the general public because the State Colville River Road will not be open to the public. This could add a considerable amount of mortality of terrestrial mammals in the Plan Area.

ABANDONMENT AND REHABILITATION

The impacts of abandonment and rehabilitation on terrestrial mammals will be similar to that for Sub-Alternative C-1. However, if the connection to the rest of the State's road network through the State's Colville River Road makes maintenance of the CPAI-built roads west of the Nigliq Channel more appropriate than under Sub-Alternative C-1, this sub-alternative would have a greater likelihood of providing improved access, and consequently higher hunting pressure upon abandonment by industry.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON TERRESTRIAL MAMMALS

The Sub-Alternative C-2 CPAI Development Plan would cover 324 acres of undeveloped land with gravel fill. This is a small percentage of the land in the Plan Area, but 83 acres more than Alternative A. The amount of habitat types preferred by caribou, muskoxen, and moose affected by this fill is a small proportion of that available in the Plan Area. Sub-Alternative C-2 would result in the largest loss of habitat of the alternatives considered. However, this is a small loss of terrestrial mammal habitat compared to that available in the Plan Area.

Disturbance, obstruction of movements, and mortality impacts of Sub-Alternative C-2 would be similar to those of Alternative A and Sub-Alternative C-1. However, these impacts would be of greater magnitude in Alternatives C-2 and C-1 than in Alternative A because of the larger amount of road/pipeline combinations and associated higher levels of vehicle traffic. The obstruction of movements would be mitigated somewhat by elevation of pipelines to 7 feet. Alternatives C-1 and C-2 include access by industry and local residents and unrestricted access on BLM lands. Access by local residents and other members of the public could result in disturbance and hunting mortality. The potential positive and negative aspects of hunting mortality described for Alternative A would occur to a greater extent in Alternatives C-1 and C-2 because of the unrestricted public access. Sub-Alternative C-2 would include the State Colville River Road from existing oil fields to the east, but no road connecting CD-5, CD-6, and CD-7 and Nuiqsut with the northern CD-1, CD-2, CD-3, and CD-4 sites. This would result in less disturbance and hunting impact in the northern CD sites than in Sub-Alternative C-1. There may be increased air traffic to the CD-1 site because of the lack of road access from the State Colville River Road there. This could result in increased disturbance to mammals around the airstrip.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR TERRESTRIAL MAMMALS

Potential mitigation measures for Sub-Alternative C-2 would be essentially the same as those described for Alternatives A and Sub-Alternative C-1. The road access to local residents and the public on BLM lands could make communication among stakeholders regarding activities in the Plan Area, including hunting by local residents, especially relevant. Also, the pipeline/road combinations between the southern production sites might make buried sections of pipeline more important than in the other alternatives. However, the elevation of pipelines to 7 feet in Sub-Alternative C-2 could reduce the need for buried sections of pipeline.

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR TERRESTRIAL MAMMALS

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.3.4.2 Marine Mammals

SUB-ALTERNATIVE C-2– CPAI DEVELOPMENT PLAN IMPACTS ON MARINE MAMMALS

A characteristic of Sub-Alternative C-2 that could affect marine mammals differently from Alternative A and Sub-Alternative C-1 is the pipeline-only (i.e., no road) crossing of the Nigliq Channel in Sub-Alternative C-2. This could result in less construction activity and disturbance impacts to marine mammals in the channel. In addition, Sub-Alternative C-2 has no new airstrips, which would remove some of the potential for aircraft noise disturbance discussed for Alternative A. However, the lack of a road connection from the proposed State Colville River Road and CD-5, CD-6, and CD-7 to CD-1, CD-2, CD-3, and CD-4 in Sub-Alternative C-2 could result in higher levels of air traffic into the airstrip at CD-1 than in Alternative A and Sub-Alternative C-1. Another difference in potential impacts of Sub-Alternative C-2 from Alternative A is that the more southerly crossing of the Nigliq Channel results in a longer distance from the pipeline crossing the channel to the Beaufort Sea. This could allow response to oil spills farther inland, and reduce the likelihood that oil spills that enter the channel will reach the Beaufort Sea. The lack of a road connection to CD-1, CD-2, CD-3, and CD-4 from Nuiqsut and the remainder of the project would limit local access to the northern Colville Delta areas.

RINGED SEAL AND BEARDED SEAL

Impacts to ringed seals from Sub-Alternative C-2 are not expected to change appreciably compared to Alternative A. During summer, ringed seals are generally not immediately offshore of the Plan Area, and during winter, noise from vehicles and operations is not expected to propagate into ringed seal habitat. However, under Sub-Alternative C-2 there would be no aircraft traffic to CD-3, and thus less disturbance than with Alternative A. In addition, the lack of a road connection to CD-1, CD-2, CD-3, and CD-4 from Nuiqsut and the remainder of the project would limit local access to the northern Colville Delta areas compared to Sub-Alternative C-1.

SPOTTED SEALS

Sub-Alternative C-2 could have fewer disturbance impacts on spotted seals than Alternative A or Sub-Alternative C-1. Sub-Alternative C-2 has a pipeline-only (i.e., no road) crossing of the Nigliq Channel that could result in less disturbance. The crossing site of the Nigliq Channel in Sub-Alternative C-2 is approximately 3 miles south of the crossing site in Alternative A. This could result in little or no disturbance impacts from construction activity and operations on spotted seals in the Nigliq Channel. In addition, Sub-Alternative C-2 has no new airstrips, which would remove the potential for aircraft noise disturbance of spotted seals in the rivers and nearshore Beaufort Sea that was discussed for Alternative A. The lack of aircraft traffic to and from CD-3 would reduce the potential for disturbance to spotted seals hauled out in the Nigliq Channel and main channel of the Colville River. In addition, the lack of a road connection to CD-1, CD-2, CD-3, and CD-4 from Nuiqsut and the remainder of the project would limit local access to the northern Colville Delta areas compared to Sub-Alternative C-1.

POLAR BEARS

The impacts to polar bears expected under Sub-Alternative C-2 would not change appreciably from those that would occur under Alternative A. It is possible that the road construction to CD-3 would result in disturbance to polar bears (including dens) in the Colville River Delta. However, the lack of an airstrip at CD-3 would remove the potential noise impacts in this area. In addition, the lack of a road connection to CD-1, CD-2, CD-3, and CD-4 from Nuiqsut and the remainder of the project would limit local access to the northern Colville Delta areas compared to Sub-Alternative C-1. Because polar bears tend to occur near the coast, the more southerly route of the road/pipeline from CD-4 to CD-5 and CD-6 could reduce the potential for disturbance of denning bears or hunter harvest of active bears.

BELUGA WHALES

Potential impacts on beluga whales under Sub-Alternative C-2 would be like those for spotted seals. Belugas might come into the channels and rivers to some extent. The more southerly crossing of the Nigliq Channel by a pipeline-only bridge, and the lack of an airstrip at CD-3 in Sub-Alternative C-2 could result in less disturbance than with Alternative A or Sub-Alternative C-1.

ABANDONMENT AND REHABILITATION

The impacts of abandonment and rehabilitation under Sub-Alternative C-2 would be similar to those for Sub-Alternative C-1.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON MARINE MAMMALS

Impacts to marine mammals under Sub-Alternative C-2 would be generally similar to those in Alternative A and Sub-Alternative C-1. The pipeline-only bridge over the Nigliq Channel would reduce potential impacts (disturbance and hunter access) compared to Alternative A and Sub-Alternative C-1. The lack of a road connection to CD-1, CD-2, CD-3, and CD-4 from Nuiqsut and the remainder of the project would limit local access to the northern Colville Delta areas compared to Sub-Alternative C-1. The unrestricted access to BLM lands could result in higher mortality of polar bears from road kills and DLP kills.

Potential mitigation measures for Sub-Alternative C-2 would be the same as those identified for Alternative A (Section 4A.3.4).

SUB-ALTERNATIVE C-2 – EFFECTIVENESS OF PROTECTIVE MEASURES FOR MARINE MAMMALS

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.3.5 Threatened and Endangered Species

4C-2.3.5.1 Bowhead Whale

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON BOWHEAD WHALE

No potential impacts of Sub-Alternative C-2 on bowhead whales are expected, as described for Alternative A. A possible difference is that the more southerly crossing of the Nigliq Channel compared to Alternative A would result in a longer distance from the pipeline crossing the channel to the Beaufort Sea. This could allow response to oil spills farther inland, and reduce the likelihood that oil spills that enter the channel will reach the Beaufort Sea.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON BOWHEAD WHALE

No potential impacts from Sub-Alternative C-2 on bowhead whales are expected.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR BOWHEAD WHALE

No potential mitigation measures have been identified.

4C-2.3.5.2 Spectacled Eider

See discussions of impacts to spectacled eiders presented in Section 4A.3.5.2 for additional descriptions of impact mechanisms and for description of impact calculation assumptions and methods.

SUB-ALTERNATIVE C-2 – CPAI DEVELOPMENT PLAN IMPACTS ON SPECTACLED EIDER

Table 4A.3.5-1 presents the estimated number of spectacled eider nests displaced as a result of habitat loss, alteration, and disturbance for CPAI Development Plan Alternatives A-F. Sub-Alternative C-2 differs from Sub-Alternative C-1 by elimination of the road connection from CD-4 to CD-5 and inclusion of the proposed State Colville River Road connecting CD-5, CD-6, and CD-7 to the road system to the Kuparuk Oilfield. The State Colville River Road is not expected to be completed before construction completion of CD-5, CD-6 and CD-7, but could be used for access during the operation phase for Sub-Alternative C-2.

CONSTRUCTION PERIOD

Habitat Loss and Alteration

Habitat loss due to gravel placement would be reduced from Sub-Alternative C-1 in the Colville River Delta with removal of the connecting road from CD-4 to CD-5. This would reduce impacts to Wet Meadow habitats used by nesting and brood-rearing spectacled eiders in the Colville River Delta. Impacts related to habitat loss and alteration would affect an estimated 0.9 spectacled eider nests in Sub-Alternative C-2, similar to Sub-Alternative C-1 (Table 4A.3.5-1). The types of effects on spectacled eiders associated with gravel placement in Sub-Alternative C-2 would be the same as those described under Alternative A. Habitat alteration impacts due to the CD-3 road may be underestimated using the 165-foot impact area if road washouts and flooding effects are common from this road in the lower Colville River Delta. As with Sub-Alternative C-1, habitat impacts for Sub-Alternative C-2 would affect less than 1 percent of habitats available in the Colville River Delta and in the National Petroleum Reserve-Alaska portion of the Plan Area (Table 4A.3.5-2 and Table 4A.3.5-3).

Disturbance and Displacement

Disturbances from vehicle traffic would be decreased in Sub-Alternative C-2 compared to Sub-Alternative C-1 in the Colville River Delta due to the elimination of the road connection between CD-5, CD-6 and CD-7 with APF-1 and CD-4. Disturbance due to vehicle traffic would not be expected to increase in the National

Petroleum Reserve-Alaska during construction. Industry and local use of the access road connecting Nuiqsut to the National Petroleum Reserve-Alaska sites could result in increased levels of vehicular and air traffic from Nuiqsut compared to Sub-Alternative C-1. Connection to Kuparuk and Nuiqsut could lead to additional industry and local traffic, but this road would not be completed before the construction phase concludes.

Obstructions to Movement

The disconnected road system in Sub-Alternative C-2 compared to Sub-Alternative C-1 in the Colville River Delta would reduce obstructions to brood movements especially in the vicinity of the Nigliq Channel. The road system in the National Petroleum Reserve-Alaska portion of the Plan Area would probably remain disconnected during the construction period and would be similar to Sub-Alternative C-1, although traffic from APF-1 would be reduced.

Mortality

Potential mortality resulting from collisions with vehicles would be reduced in Sub-Alternative C-2 compared to Sub-Alternative C-1 with the disconnection of road access to CD-5, CD-6, and CD-7 to APF-1. The potential mortality from collisions with aircraft would be the same as Sub-Alternative C-1. Any increase in predator populations attracted to the development areas would result in decreased reproductive success for spectacled eiders. This is particularly true for increased glaucous gull, common raven, bear and arctic fox populations. The magnitude and extent of decreased productivity have not been quantified, but would be most detrimental to spectacled eiders because they are known to nest in specific locations year after year and have a low total population size. The potential for increased nest and duckling depredation from raptors and ravens would be increased in Sub-Alternative C-2 compared to Alternatives A or B by the placement of all power lines on poles instead of VSMS. Mortality due to subsistence hunting could also increase with development of the road system if hunters use roads for access.

OPERATION PERIOD

Habitat Loss and Alteration

Some habitat loss or alteration from snowdrifts, gravel spray, dust fallout, thermokarst, and ponding would continue during project operation. Habitat alterations from dust fallout and surfacewater flow interruption would be increased in Sub-Alternative C-2 compared to Alternatives A or B because of the more extensive road system and potentially higher traffic levels resulting from local access from Nuiqsut. Habitat alterations from low-ground-pressure vehicles during summer or winter would be reduced in Sub-Alternative C-2 compared to Alternative A or B because of the road access to all facilities.

Disturbance and Displacement

Disturbance from vehicle traffic would be increased in the National Petroleum Reserve-Alaska portion of the Plan Area in Sub-Alternative C-2 compared to Sub-Alternative C-1 following completion of the State Colville River Road. Completion of this road would allow access to Kuparuk via the road system. This connection would also reduce the amount of air traffic and associated disturbance at APF-1 required to support operations at CD-5, CD-6, and CD-7 in the National Petroleum Reserve-Alaska compared to Sub-Alternative C-1.

Obstructions to Movement

Obstructions to movements of spectacled eider broods across roads would continue during project operation. This potential obstruction would be increased in the National Petroleum Reserve-Alaska portion of the Plan Area with connection to the State Colville River Road compared to Sub-Alternative C-1. The greatest potential impact to spectacled eiders would occur along the route of the road connecting CD-3 with CD-1 because of higher spectacled eider densities in this area.

Mortality

Potential mortality from collisions with vehicles would be higher in Sub-Alternative C-2 compared to Sub-Alternative C-1 because of the connection to the Spine Road and Kuparuk. Increased traffic resulting from local access would also potentially increase mortality from collisions with vehicles. Mortality from subsistence harvest may increase if residents use the road system for access; however, the lack of connection between the Colville River Delta facilities would not increase local access to the Delta. Alternatively, subsistence related mortality may decrease if hunters avoid areas with developments. Mortality from collisions with aircraft would be the same as in Sub-Alternative C-1. Mortality due to collisions with power lines would be the same as Sub-Alternative C-1. Nest and duckling or gosling mortality due to depredation by raptors or ravens would be increased by the presence of power lines on poles which can be used for perching by raptors and ravens. Potential mortality from depredation by seabirds may also be the same as in Sub-Alternative C-1.

Any increase in predator populations attracted to the development areas would result in decreased reproductive success for spectacled eiders. The magnitude and extent of decreased productivity have not been quantified. Potential mortality by depredation from raptors or ravens would be increased for nesting spectacled eiders by the presence of power-line poles used for perching by raptors and ravens. Potential mortality by depredation from seabirds may also be increased in Sub-Alternative C-2 compared to Alternatives A or B by the increased vantage from the 7-foot versus the 5-foot elevated pipeline.

SUB-ALTERNATIVE C-2 – SUMMARY OF IMPACTS ON SPECTACLED EIDER

Impacts to spectacled eiders associated with construction and operation of the proposed development include habitat loss, alteration, or enhancement; disturbance and displacement; obstructions to movement; and mortality. Spectacled eiders occur in greater numbers near proposed developments in the Colville River Delta than in the National Petroleum Reserve-Alaska portion of the Plan Area. Additional impacts due to lost productivity were considered but were not quantified by this analysis, including impacts due to increased nest depredation caused by increased predator populations. The Project Team estimated the number of nests affected by habitat loss, alteration, and disturbance for each alternative based on site specific nesting densities for spectacled eiders to compare alternative development scenarios. Effects would be localized, and no measureable effects to North Slope populations would be expected. CPAI Sub-Alternative C-2 would reduce nesting by 2 percent for Plan Area spectacled eiders. Habitat loss does not involve the direct loss of active nests because winter gravel placement, ice road construction, snow dumping, and snow drifting occurs when nests are not active. Most impacts would be initiated during the construction period, including gravel placement, grading of the gravel surface, placement of all facilities, and initial drilling. The results of effects of these activities on estimated spectacled eider production due to loss, alteration, or disturbance of nesting habitat for Sub-Alternative C-2, CPAI Development Plan is presented in Table 4A.3.5-1. Impacts from CPAI Alternatives A through F on habitats used by spectacled eiders are summarized in Table 4A.3.5-2 and Table 4A.3.5-3.

SUB-ALTERNATIVE C-2 – POTENTIAL MITIGATION MEASURES FOR SPECTACLED EIDER

Potential mitigation measures would be the same as those identified for Alternative A and Sub-Alternative C-1 (Section 4A.3.5.2).

4C-2.3.5.3 Steller's Eider

This section describes the potential impacts of the ASDP on threatened Steller's eiders. Impacts to other bird groups associated with the proposed development are described in Section 4C-2.3.4 and can be referred to for more detailed description of the mechanisms of specific impacts. In general, impacts to Steller's eider are potentially the same as those described for spectacled eider under all of the alternatives. However, the likelihood of impacts occurring to Steller's eider are very small, even under FFD scenarios, because Steller's eiders occur very rarely in the Plan Area. The ASDP would result in a loss of potential Steller's eider habitat. Given the current distribution of Steller's eider in the Plan Area, it is unlikely that any of the project alternatives would have impacts on this species.

4C-2.3.5.4 Abandonment and Rehabilitation

The impacts from abandonment and rehabilitation would be similar to those under Sub-Alternative C-1.

4C-2.3.5.5 Sub-Alternative C-2 – Effectiveness of Protective Measures for Threatened and Endangered Species

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4 SOCIAL SYSTEMS

4C-2.4.1 Socio-Cultural Characteristics

4C-2.4.1.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Socio-Cultural Characteristics

For both the construction and operation period, socio-cultural impacts under Sub-Alternative C-2 would generally be similar to those under Sub-Alternative C-1 with the following differences.

The state's proposed Colville River Road would make available access to Nuiqsut via an extension of the spine road. This would allow for access to Nuiqsut from the greater Prudhoe Bay oilfield development. This increased access would occur independent of the ASDP. Under Sub-Alternative C-2, ASDP workers would have access to Nuiqsut by vehicle and aircraft as some ASDP activities would be staged from Nuiqsut. This direct access may increase contact between non-resident industry workers and members of the village to a greater extent than projected under Sub-Alternative C-1. Increased demand for local services could result in increasing induced employment and local wage and business income to the cash economy. Additional demands could be placed on Nuiqsut's goods, services, and infrastructure.

Changes to subsistence harvest impacts (as described in Section 4C-2.4.3) could result from the addition of road segments near Nuiqsut. To the extent that they occur, changes to subsistence harvest may increase indirect effects on community health and welfare.

ABANDONMENT AND REHABILITATION

Impacts will be similar to those under Sub-Alternative C-1, though the state road will offer greater opportunities for Nuiqsut residents to maintain employment in the oil industry after abandonment of CPAI's satellites.

4C-2.4.1.2 Sub-Alternative C-2 – Summary of Impacts on Socio-Cultural Characteristics

Impacts to socio-cultural characteristics under Sub-Alternative C-2 – CPAI Development Plan are generally expected to be the same as those under Sub-Alternative C-1 – CPAI Development Plan. Exceptions under Sub-Alternative C-2 are the potential for increased local economic activity and increased indirect community health and welfare impacts to the extent that they are caused by the increased presence of outsiders to the village of Nuiqsut and by impacts to the subsistence harvest.

4C-2.4.1.3 Sub-Alternative C-2 – Potential Mitigation Measures for Socio-Cultural Characteristics

Potential mitigation measures would be the same as those identified for Sub-Alternative C-1 (Section 4C-1.4.1.)

4C-2.4.1.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Socio-Cultural Characteristics

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.2 Regional Economy

4C-2.4.2.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Regional Economy

Economic impacts for Sub-Alternative C-2 are similar to those determined for Alternative A and Sub-Alternative C-1. There is no information to lead to the assumption that overall oil production under Sub-Alternative C-2 would vary materially from the estimates given in Section 4A.4.2, Production, that were estimated for Alternative A. Project capital costs would be approximately \$167 million (15.7 percent) more than Alternative A. Because the economic impacts are directly related to oil production, the economic impacts of Sub-Alternative C-2 would be similar to those determined for Alternative A and Sub-Alternative C-1. However, the road connection linking Nuiqsut to all of the production pads and to the existing greater Prudhoe Bay Oilfield development is very likely to increase local employment and local wage and business income. However, it should be recognized that access to the east would occur as a result of the Colville River Road and is not specific to the ASDP.

Sub-Alternative C-2 would require construction of a vehicle access facility located near Nuiqsut on the access road. The vehicle storage yard would be tied to services provided by Nuiqsut and/or Kuparuk. Electricity for the vehicle storage yard would be purchased from Nuiqsut. Water and solid waste disposal for the vehicle storage yard would come from Nuiqsut or Kuparuk. The overall increase in economic activity would provide increased economic opportunities to residents of Nuiqsut. With road access linking Nuiqsut to the ASDP and oil service spine road, increased use of air service through Nuiqsut is likely, also resulting in increased activity within the community economy.

ABANDONMENT AND REHABILITATION

Impacts would be similar to those for Sub-Alternative C-1.

4C-2.4.2.2 Sub-Alternative C-2 – Summary of Impacts on Regional Economy

Overall economic impacts from Sub-Alternative C-2 would be nearly the same as those determined for Alternative A and C-1, though there may be additional economic stimulus to Nuiqsut. Because most economic impacts associated with project development are directly proportional to oil production, the revenue and employment effects of Sub-Alternative C-2 would be nearly the same as for Alternative A.

4C-2.4.2.3 Sub-Alternative C-2 – Potential Mitigation Measures for Regional Economy

Potential mitigation measures would be the same as identified for Alternative A (Section 4A.4.2). However, the increased level of economic activity that would likely result from Sub-Alternative C-2 could provide new jobs and earnings for residents of Nuiqsut and partially reduce the need for mitigation.

4C-2.4.2.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Regional Economy

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.3 Subsistence

4C-2.4.3.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Subsistence

Effects on subsistence for similar components in Sub-Alternatives C-1 and C-2 (e.g., gravel mines, pads, construction/operation schedules, disposition of the roads) would be the same and are not specifically discussed in this section. The Sub-Alternative C-2 discussion focuses on ways in which this alternative differs from Sub-Alternative C-1. These differences include the elimination of the proposed CPAI road segment and bridge connecting the Alpine Field to CD-5, CD-6, and CD-7 access roads and the elimination of the spur road connecting Nuiqsut to the National Petroleum Reserve-Alaska project road.

Sub-Alternative C-2 relies on the construction of the proposed State Colville River Road and bridge connecting the oil industry spine road to Nuiqsut instead of the construction of such a road as proposed under Sub-Alternative C-1. Sub-Alternative C-2 includes the addition of a bypass road extending from south and west of Nuiqsut to connect the proposed State Colville River Road to the National Petroleum Reserve-Alaska project road and a 2-acre vehicle storage facility along the bypass road for storage and maintenance of industry vehicles. While the effects on subsistence from Sub-Alternative C-2 would be similar to Sub-Alternative C-1, these proposed component changes would result in differences in effects on subsistence between Sub-Alternatives C-1 and C-2.

CONSTRUCTION PERIOD

Road and pipeline construction effects on subsistence uses would be the same as for Sub-Alternative C-1 (disturbance to wildlife resources in the vicinity of the roads and adjacent pipelines), but the effects would be decreased because of the elimination of the road segment and bridge connecting the Alpine Facility to CD-5, CD-6, and CD-7 access roads and the elimination of the spur road connecting Nuiqsut to National Petroleum Reserve-Alaska project road. As discussed under Sub-Alternative C-1, the construction of a road from CD-1 to CD-3 would increase sedimentation and change flow patterns, which would reduce available summer and winter fish habitat and decrease the availability of fish for subsistence uses. A bypass road extending from south and west of Nuiqsut to connect the proposed State road to the National Petroleum Reserve-Alaska project road accessing CD-5, CD-6 and CD-7 would be constructed under Sub-Alternative C-2. This construction would increase traffic near the community of Nuiqsut. In addition, this alternative would completely surround the community of Nuiqsut with construction, deflecting caribou from the vicinity, and separating the community from its traditional use areas.

As discussed under Sub-Alternative C-1, availability of subsistence resources, especially caribou, would be reduced along the construction corridors and hunter access would be reduced as hunters avoid hunting and shooting near workers and equipment during pipeline and road construction. Construction of an overhead power line several miles north of the road and pipeline corridor also would reduce wildlife availability and hunter access along this corridor during the construction period. Constructing the power line within the 3-mile Fish and Judy creeks sensitive area would move this effect closer to the subsistence camps in the area.

OPERATION PERIOD

Under Sub-Alternative C-2, the addition of a road from Nuiqsut to development areas (CD-5, CD-6, and CD-7) on the west side of the Nigliq Channel would increase access to subsistence use areas with vehicles. However, increased traffic would deflect terrestrial mammals, reducing availability of these resources in development areas. In addition, increased access would result in increased competition for subsistence resources in the development area as more hunting efforts are focused on the road corridor. Unrestricted access on BLM-administered lands (National Petroleum Reserve-Alaska, including Fish and Judy creeks) would provide increased access for hunters and other people who do not live in the area. The combination of new roads sponsored by various entities would allow extensive travel into formerly inaccessible areas crucial to Nuiqsut subsistence users. As discussed under Sub-Alternative C-1, the increase of the minimum pipeline height to 7 feet would allow for less obstruction to terrestrial mammals and subsistence hunters, especially in the winter. Locating the road and pipeline west of the Nigliq Channel closer to Nuiqsut would bring any activity on the road and corresponding disturbance to wildlife and associated reduced availability closer to Nuiqsut for the life of the applicant's proposed action. The power line located in the Fish Creek sensitive area would affect subsistence after construction if it provided an access corridor during the summer.

ABANDONMENT AND REHABILITATION

Impacts of abandonment and rehabilitation would be similar to Sub-Alternative C-1.

4C-2.4.3.2 Sub-Alternative C-2 – Summary of Impacts on Subsistence

Effects from construction and operation for Sub-Alternative C-2 would be similar to those from Alternative A and Sub-Alternative C-1, with the exception of those effects to subsistence discussed above. Effects from construction and operation for Sub-Alternative C-2 are expected to continue for the life of the development and are expected to be primarily local in context. Construction and operation would affect availability of key subsistence resources because of deflection or displacement of these resources (e.g., by road traffic) from customary harvest locations. Access to subsistence resources would be affected by pipelines, especially in the winter because of snowdrifts (mitigated by 7-foot pipelines that allow for less obstruction to terrestrial mammals and subsistence hunters), hunter and resource avoidance of pads and industrial areas, the perception of regulatory barriers by hunters, the reluctance of hunters to shoot rifles in the vicinity of industrial development, the difficulty of negotiating road berms while hunting in the winter, and a hunter preference for animals not habituated to industrial development. As noted in NRC (2003:156), “Even where access is possible, hunters are often reluctant to enter oilfields for personal, aesthetic, or safety reasons. There is thus a net reduction in the available area, and this reduction continues as the oilfields spread.”

Roads connecting pads to production facilities and a road connecting Nuiqsut to the development area would provide increased vehicle access to subsistence resources and would cause increased competition for subsistence resources if more hunters are focused to the roads. At the same time, vehicular traffic on the roads would result in local deflection and disturbance of terrestrial mammals near the roads and, therefore, would reduce subsistence availability of resources. This impact would be greatest for Sub-Alternatives C-1 and C-2 because these alternatives include plans for the most roads and are the only alternatives that provide a road connection to Nuiqsut.

Unrestricted road access to BLM lands could eventually provide increased access to people who do not live in the area and increase competition for resources. Because no outside road currently provides connection to this area, however, access by people who do not live in the area would not be an immediate effect. The location of the production facility, pads, roads, and pipelines within the Fish and Judy creeks sensitive area would result in bringing the development infrastructure near important subsistence use and locations of cabins and camps.

The road network connecting three of the five proposed drilling and production pads directly to Nuiqsut would provide summer access to areas generally reachable only by boat in the summer and would likely change current subsistence use patterns (harvesters could drive over land to Fish Creek in summer instead of only traveling by boat).

Indirect effects would include hunters going to other areas that would result in harvesting in traditional places less often and increased effort, costs, and risk associated with traveling farther. Sub-Alternative C-2 would occur in seasonal and general use areas for key subsistence resources that are used for multiple seasons each year, have been used for multiple generations, and are used for multiple resources each year. Effects from construction and operation would occur in key geographic areas relative to other areas of subsistence availability and would pertain to individual subsistence users, groups of users, and the overall pattern of Nuiqsut subsistence uses. Competition for certain resources among Nuiqsut, Anaktuvuk Pass, Barrow, and Atqasuk would increase as Nuiqsut hunters avoid traditional subsistence use areas closer to Nuiqsut and travel to farther outlying areas.

4C-2.4.3.3 Sub-Alternative C-2 – Potential Mitigation Measures for Subsistence

Potential mitigation measures would be similar to those identified for Alternative A (Section 4A.4.3), except that pipelines would already be a minimum of 7 feet high.

4C-2.4.3.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Subsistence

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.4 Environmental Justice

4C-2.4.4.1 Introduction

The basis for identifying disproportionate impacts to minority and low-income populations is described in Section 4A.4.4.

4C-2.4.4.2 Sub-Alternative C-2 – Disproportionate Impacts on Environmental Justice

Disproportionate impacts under Sub-Alternative C-2 are expected to be the same as those under Sub-Alternative C-1. Changes in the access to production facilities incorporated in Sub-Alternative C-2 are not expected to change the type or level of impacts identified. Changes in access that would increase access to BLM lands may increase competition for subsistence resources.

4C-2.4.4.3 Sub-Alternative C-2 – Abandonment and Rehabilitation

Like Sub-Alternative C-1, impacts will be similar to Alternative A.

4C-2.4.4.4 Sub-Alternative C-2 – Potential Mitigation Measures for Environmental Justice

Potential mitigation measures to reduce or avoid disproportionate impacts would be the same as those identified for Sub-Alternative C-1.

4C-2.4.4.5 Sub-Alternative C-2 – Effectiveness of Protective Measures for Environmental Justice

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.5 Cultural Resources

4C-2.4.5.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Cultural Resources

Despite the deletion of some road segments and addition of new road segments, the impacts on cultural resources for Sub-Alternative C-2 would be approximately the same as for Sub-Alternative C-1. Under Sub-Alternative C-2, no additional documented cultural resources are in the immediate vicinity of the proposed operational facilities, roads, or pipelines. Section 106 consultations should assure that Sub-Alternative C-2 would have no direct effect and negligible indirect effect on known cultural resources during construction and operation. Additional need for gravel will increase the risk to unknown cultural resources through excavation at mine sites.

ABANDONMENT AND REHABILITATION

It is unlikely that cultural resources would be impacted by abandonment activities.

4C-2.4.5.2 Sub-Alternative C-2 – Summary of Impacts on Cultural Resources

Impacts resulting from implementation of Sub-Alternative C-2 are similar to those of Sub-Alternative C-1. Known cultural resource sites that could be affected under Sub-Alternative C-2 are the same as Sub-Alternative C-1. Because more gravel will be needed, the risk of impacts to unknown cultural resources from extraction will be greater than for Sub-Alternative C-1.

4C-2.4.5.3 Sub-Alternative C-2 – Potential Mitigation Measures for Cultural Resources

Potential mitigation measures would be the same as those identified for Sub-Alternative C-1 (Section 4C-1.4.5).

4C-2.4.5.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Socio-Cultural Characteristics

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.6 Land Uses and Coastal Management

4C-2.4.6.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Land Uses and Coastal Management

LAND OWNERSHIP AND USES

Sub-Alternative C-2 would affect the same landowners as described in Sub-Alternative C-1. Implementation of this development would not change ownership status on lands within the Plan Area. The change in total area developed within the Plan Area would be very similar to Sub-Alternative C-1.

Sub-Alternative C-2 differs from C-1 in that it would not provide road access from the existing Alpine facilities east of Nigliq Channel to the pads west of the channel. Sub-Alternative C-2 provides road access from the pads west of the channel to the state's proposed Colville River Road south of Nuiqsut. Access would be limited to oil industry personnel and Nuiqsut residents on the roads outside the National Petroleum Reserve-Alaska, but would be unrestricted on BLM-managed lands. Indirect effects to subsistence and recreation from increased access in the Plan Area are discussed further in Sections 4C-2.4.3 and 4C-2.4.7. Other permitted uses within the Plan Area, such as scientific studies, communications and navigation-related uses, and overland resupply transport between villages, are not expected to be affected by the proposed development.

Sub-Alternative C-2 is similar to Sub-Alternative C-1 in its conformance with the BLM stipulations developed to protect sensitive resources within the National Petroleum Reserve-Alaska. Exceptions would be required for the facilities proposed within the Fish Creek Buffer area, for facilities within the setback from other water bodies, and for the proposed road connection from oilfields within the National Petroleum Reserve-Alaska to the proposed Colville River Road near Nuiqsut. As with all other alternatives, development within the Colville River Special Area would be required to maximize protection of surface resources in the area, consistent with development of oil resources.

COASTAL MANAGEMENT

Development proposed under Sub-Alternative C-2 differs from Sub-Alternative C-1 by eliminating the road connecting the facilities east of Nigliq Channel to the facilities west of the channel, and by replacing the shorter road to Nuiqsut with a longer road south of Nuiqsut that would connect with the proposed Colville River Road.

ALASKA COASTAL MANAGEMENT PROGRAM

The coastal standards are evaluated for Sub-Alternative C-2 below.

Coastal Development (6 AAC 80.040)

Sub-Alternative C-2 has a similar level of road development to Sub-Alternative C-1 and would comply with the same stipulations to protect access to the coastal resources used for subsistence and traditional land uses; therefore, development of these facilities is not expected to displace other important coastal uses. Although Sub-Alternative C-2 requires exceptions from the existing BLM stipulations related to the Fish Creek buffer area, other water body setbacks, and National Petroleum Reserve-Alaska oilfield roads connecting with road systems outside of National Petroleum Reserve-Alaska, compliance with the project specific procedures in Chapter 2, the remaining BLM stipulations, and alternative measures potentially required by the State, are anticipated to result in compliance with the coastal development standard.

Geophysical Hazard Areas (6 AAC 80.050)

Facilities proposed under Sub-Alternative C-2 would meet the same design standards discussed for Sub-Alternative C-1. These design standards are expected to sufficiently address geophysical hazards as required by this coastal standard.

Recreation (6 AAC 80.060)

Development proposed under Sub-Alternative C-2 would result in more road access to areas west of the Nigliq Channel. This alternative does not, however, provide for road access from satellite facilities east of the Nigliq Channel to facilities west of Nigliq Channel. Road access would be limited to industry-related personnel and Nuiqsut residents for the roads accessing facilities east of the Nigliq Channel and on the State road east of National Petroleum Reserve-Alaska. While road access on BLM-managed lands would not be restricted, BLM-managed lands generally are not accessible by non-residents and therefore are not expected to witness increased recreational use. This would increase access to areas within the National Petroleum Reserve-Alaska since people could fly to Nuiqsut and travel by road into areas of the National Petroleum Reserve-Alaska that were previously hard to access. As with Sub-Alternative C-1, this is likely to result in higher activity levels in these areas. Effects on recreation from this increased access are addressed further in the recreation analysis section of this document.

Energy Facilities (6 AAC 80.070)

Sub-Alternative C-2 is similar to Sub-Alternative C-1 in conformance with the energy facility standards.

Transportation and Utilities (6 AAC 80.080)

The development proposed under Sub-Alternative C-2 would be similar to Sub-Alternative C-1 in conformance with the transportation and utilities standard. The proposed roads are primarily inland, but do cross into the Fish Creek buffer area, which was established to protect sensitive fisheries habitat.

Mining and Mineral Processing (6 AAC 80.110)

Development under Sub-Alternative C-2 would have similar gravel requirements to Sub-Alternative C-1. Effects associated with gravel mining and processing could be minimized through permits. Gravel sources for this alternative would be the same as those discussed under Alternative A.

Subsistence (6 AAC 80.120)

The proposed ASDP under Sub-Alternative C-2 would provide new road access from industrial areas east of National Petroleum Reserve-Alaska, but the new road is expected to be limited to industry-related personnel and Nuiqsut residents. Sub-Alternative C-2 differs from C-2 in that it does not provide road access from the satellite facilities east of Nigliq Channel to Nuiqsut. The potential for adverse effects on subsistence from the proposed development are discussed in more detail in the subsistence analysis section of this document. Effects on subsistence would be minimized through the BLM stipulations in Appendix D (with the exceptions noted) and measures potentially required by the State. With these conditions in place, Sub-Alternative C-2 is expected to conform to the subsistence standard.

Habitats (6 AAC 80.130)

Development under Sub-Alternative C-2 would have similar effects on sensitive habitats as those described under Sub-Alternative C-1. However, removal of the road across the Nigliq Channel could reduce habitat impacts in this area. Habitat impacts may increase some south of Nuiqsut, where the road would now be proposed to extend further south to meet the Colville River Road.

Air, Land, and Water Quality (6 AAC 80.140)

As with other alternatives, compliance with ADEC and USEPA regulations, required for acquisition of permits for the development, would result in conformance with this coastal management standard.

Historic, Prehistoric, and Archaeological Resources (6 AAC 80.150)

Sub-Alternative C-2 would require the same process for protection of cultural resources as discussed under previous alternatives. Compliance with Section 106, the project specific procedures in Chapter 2, the BLM stipulations in Appendix D (with the exceptions noted), and alternative measures potentially required by the State, is expected to result in conformance with the cultural resource standard.

NORTH SLOPE BOROUGH COASTAL MANAGEMENT PROGRAM

Compliance with the current NSB *Standards for Development* (NSB CMP 2.4.3) would be similar to Sub-Alternative C-1, because of the location of facilities within buffer areas and water-body setbacks and increased road access to areas used for subsistence.

Compliance with the current NSB *Required Features for Applicable Development* (NSB CMP 2.4.4) would be similar to Sub-Alternative C-1. Overall vehicle use in the area west of Nigliq Channel could increase due to the road connection to the Colville River Road. Access to areas east of the channel would decrease compared to Sub-Alternative C-1.

Development under Sub-Alternative C-2 would address current NSB *Best Effort Policies* (NSB CMP 2.4.5). These policies call for protection of sensitive coastal resources, including subsistence and cultural resources. These issues have been addressed above in the ACMP discussion. Again, Sub-Alternative C-2 would have similar effects to Sub-Alternative C-1, but would result in more road access in areas west of the Nigliq Channel and less road access to areas east of the channel.

The current NSB CMP also contains standards for *Minimization of Negative Impacts* (NSB CMP 2.4.6). Design measures to protect permafrost and to address geophysical hazards would be the same as discussed under Sub-Alternative C-1. This alternative would provide less road access from Nuiqsut to sensitive habitat areas east of the Nigliq Channel.

NORTH SLOPE BOROUGH LAND MANAGEMENT REGULATIONS

Sub-Alternative C-2 would require the same NSB approvals described for Sub-Alternative C-1.

ABANDONMENT AND REHABILITATION

Land ownership, use, and management upon abandonment and rehabilitation would be similar to those for Sub-Alternative C-1. Land ownership would not be affected by abandonment and rehabilitation. Upon completion of abandonment and rehabilitation, land uses and management may return to something similar to the current situation. For discussion of subsistence and recreation use after abandonment and rehabilitation, see sections 4C-2.4.3 and 4C-2.4.7, respectively.

4C-2.4.6.2 Sub-Alternative C-2 – Summary of Impacts on Land Uses and Coastal Management

Impacts resulting from implementation of Sub-Alternative C-2 are similar to those of Sub-Alternative C-1. Exceptions would be required from three BLM stipulations and development within the CRSA would need to provide maximum protection of surface resources, consistent with allowing for oil development. Access to the area east of the Nigliq Channel from Nuiqsut and other areas west of the channel would be reduced compared to Sub-Alternative C-1. Access to the National Petroleum Reserve-Alaska areas west of the channel would be increased through a road connection to the proposed Colville River Road, however, use of the Colville River

Road is expected to be limited to industry-related personnel and local residents. Therefore, indirect effects related to increased access are not expected to be substantially different from Sub-Alternative C-1.

The proposed development under Sub-Alternative C-2, constructed and operated in compliance with the project specific procedures in Chapter 2, all but three of the BLM stipulations for the area (Appendix D), and alternative measures potentially required by the state, is expected to be consistent with state and NSB coastal management policies. As with the other alternatives, implementation would require NSB re-zoning of plan areas east of National Petroleum Reserve-Alaska from “Conservation” to “Resource Development” and permitting of activities through the approval of a master plan. Application of the NSB’s land management regulations to oil and gas activities on federal lands is subject to legal constraints and therefore must be evaluated on a case-by-case basis as particular activities are proposed.

4C-2.4.6.3 Sub-Alternative C-2 – Potential Mitigation Measures for Land Uses and Coastal Management

No mitigation measures have been identified for Sub-Alternative C-2.

4C-2.4.6.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Land Uses and Coastal Management

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.7 Recreation Resources

4C-2.4.7.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Recreation Resources

The impacts of Sub-Alternative C-2 to existing recreation use and opportunities for naturalness, solitude, and a wilderness-type experience would be similar to those for Sub-Alternative C. The current recreational use of the Plan Area is very low, and most recreation occurs directly along the Colville River where activities associated with Nuiqsut already have decreased some of opportunities for solitude and naturalness. The bridge development for the proposed State Colville River Road would create opportunities for increased recreational use from Nuiqsut. Improved river access could result in a slight increase in recreation use. As with Sub-Alternative C-1, recreational opportunities in the Plan Area would remain consistent with the BLM’s SPM classification, resulting in no adverse impact.

ABANDONMENT AND REHABILITATION

Impacts from abandonment and rehabilitation would be less than those for Sub-Alternative C-1 because there would be less infrastructure over the Nigliq Channel to be removed. If the roads are left in place for future use and made available to the public, there would be greater opportunity for access to pads west of the Nigliq Channel through Nuiqsut.

4C-2.4.7.2 Sub-Alternative C-2 – Summary of Impacts on Recreation Resources

Compared to Sub-Alternative C-1, construction and operation of the facilities associated with Sub-Alternative C-2 would slightly increase recreational use by Nuiqsut residents as a result of increased access to the Colville River. This change would have a slight beneficial effect on recreation use in the Plan Area. It should be recognized that increased access to the Colville River would occur as a result of the Colville River Road, and not the ASDP.

4C-2.4.7.3 Sub-Alternative C-2 – Potential Mitigation Measures for Recreation Resources

No mitigation measures have been identified.

4C-2.4.7.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Recreation Resources

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.8 Visual Resources

4C-2.4.8.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Visual Resources

CONSTRUCTION PERIOD

Construction impacts for Sub-Alternative C-2 would be similar to those described for Sub-Alternative C-1. Slight changes in road alignments would not alter construction impacts to visual resources since the sizes and locations of various project features (e.g. production pads) would not change.

OPERATION PERIOD

DIRECT EFFECTS

Under this alternative, road segments and aerial power lines closer to Nuiqsut than those in Sub-Alternative C-1 may result in a minor increase in visual impacts to residents of that community. When viewed from Nuiqsut, the nearby roads would create slightly more contrast with the natural landscape than with Sub-Alternative C-1. Power line placement on poles near the Nuiqsut bypass road would increase visual impacts, when viewed from Nuiqsut from the foreground-middle-ground, since the power poles would add more vertical contrast to the landscape. The Colville River Road that would cross the Colville River south of Nuiqsut would create adverse visual impacts when viewed from less than 1 mile away. This road would contrast with much of the surrounding vegetation colors, but would not dominate views with distances of more than 1 mile, since they would only be 5 to 10 feet higher than the tundra. When viewed from more than 1 mile away, roads (and airstrips) would appear as an elevated horizontal line. It should be noted that the Colville River Road is not a component of the ASDP.

INDIRECT EFFECTS

Indirect effects pertain to light, glare, and movement of fugitive dust. Increased vehicle traffic on roads near Nuiqsut, and aircraft take-offs and landings at Nuiqsut, would be noticeable for short durations primarily from the creation of fugitive dust. Other indirect impacts are similar to Sub-Alternative C-1.

ABANDONMENT AND REHABILITATION

The impacts of abandonment and rehabilitation activities would be similar to those for Sub-Alternative C-1.

4C-2.4.8.2 Sub-Alternative C-2 – Summary of Impacts on Visual Resources

Sub-Alternative C-2 would result in slightly more adverse impacts to visual resources as Sub-Alternative C-1. An increase in roads near Nuiqsut and associated vehicular traffic and fugitive dust, along with the utilization of road side power poles, would result in a slight increase in visual impacts when viewed from the foreground-middle-ground zone as compared to Sub-Alternative C-1.

4C-2.4.8.3 Sub-Alternative C-2 – Potential Mitigation Measures for Visual Resources

Potential mitigation measures would include those identified for Sub-Alternative C-1, as well as burying the power lines most visible from Nuiqsut bypass road.

4C-2.4.8.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Visual Resources

The effectiveness of the protective measures would be similar to Alternative A.

4C-2.4.9 Transportation

4C-2.4.9.1 Sub-Alternative C-2 – CPAI Development Plan Impacts on Transportation

ROADWAYS

Sub-Alternative C-2 would differ from Sub-Alternative C-1 in two ways. The proposed short access road to Nuiqsut in Sub-Alternative C-1 is replaced with a longer road connecting to the proposed state Colville River Road south of Nuiqsut in Sub-Alternative C-2. Since this would result in connecting roads within the National Petroleum Reserve-Alaska to road systems outside the National Petroleum Reserve-Alaska, modification of the National Petroleum Reserve-Alaska IAP/EIS stipulation No. 48 would be required. In addition, in Sub-Alternative C-2, the road connecting CD-4 to CD-5 is eliminated.

CONSTRUCTION PERIOD

Construction activities, phasing, and workforce under Sub-Alternative C-2 would be similar to the other alternatives. The road access from the Colville River Road in Sub-Alternative C-2 would allow for more use of year-round ground transportation of crews and materials during construction of the western cluster of pads (CD-5 through CD-7). Since access on the Colville River Road would be limited to industry-related traffic and Nuiqsut residents, the increased road traffic would not be expected to have any adverse effects on these industry roads. No adverse effects to public roadway systems are anticipated.

OPERATION PERIOD

Operation of the facilities proposed under Sub-Alternative C-2 would result in a greater level of roadway traffic than under other alternatives due to the access of the western area (CD-5 through CD-7) to the state road system via the proposed Colville River Road. As with Sub-Alternative C-1, road access to Nuiqsut would also facilitate more traffic by local residents.

RAILROAD TRANSPORTATION

Rail transport needs and effects during construction and operations would be the same for Sub-Alternative C-2 as for the other alternatives.

MARINE FACILITIES

CONSTRUCTION PERIOD

Marine transportation need and effects for Sub-Alternative C-2 would be the same as discussed for Sub-Alternative C-1.

OPERATION PERIOD

Marine transportation is not typically used during the operations period.

RIVER TRANSPORTATION

CONSTRUCTION PERIOD

Effects on river transportation from construction activities associated with Sub-Alternative C-2 would be similar to those described in Sub-Alternative C-1. There would be less construction activity around the Nigliq Channel near CD-4, since no road would be constructed across the channel in this area. There would be more construction activity south of Nuiqsut associated with the road connection to the proposed Colville River Road.

OPERATIONS PERIOD

Sub-Alternative C-2 has similar effects to river transportation because it includes the pipeline bridge over the Nigliq Channel, the road bridge over the Ublutuoch River, and road bridges over the Sakoonang, Tamayagiaq, and Ulamnigiaq channels. Although the bridges will be designed to minimize effects on river transportation, the addition of road bridges on commonly used channels in the Colville River Delta may be more likely to adversely affect river transportation. Therefore, operation of the facilities proposed under Sub-Alternative C-2 would be similar to Sub-Alternative C-1.

AVIATION FACILITIES

CONSTRUCTION PERIOD

Air transport of the construction workforce to the construction sites would be similar to Sub-Alternative C-1. Although the number of flights would remain the same, under Sub-Alternative C-2, approximately half of the flights would terminate at the Nuiqsut Airport instead of all of the flights using the airstrip at Alpine Field. As discussed under Sub-Alternative C-1, during later phases of construction less aviation support would be required since Sub-Alternative C-2 provides year-round road access to all pads from either the Alpine Field airstrip or Nuiqsut. Demand for air transportation services during construction would not be expected to adversely affect existing air transportation resources.

OPERATION PERIOD

The use of the Nuiqsut airstrip would increase under Sub-Alternative C-2, and aviation support needs associated with travel between APF-1 and Nuiqsut may increase. However, overall demand for aviation support would be even less than under Sub-Alternative C-1 due to the road access to pads and the road access to Deadhorse via the Colville River Road.

As with Sub-Alternative C-1, Sub-Alternative C-2 proposes electric lines on 60-foot poles. As discussed under Sub-Alternative C-1, local aviation interests have expressed concerns that these poles could create a safety hazard for very low-level flight operations during poor visibility conditions. Although aviation support associated with oilfield operations in the area would not be expected to adversely affect air transportation resources within the region, the power poles could increase safety hazards under poor visibility conditions.

PIPELINES

CONSTRUCTION PERIOD

There would be no effect on existing pipelines during the construction phase.

OPERATION PERIOD

As in the other alternatives, production flows will likely be managed to remain within the capacity of the existing sales oil pipeline, and the projected increase in throughput to TAPS is expected to remain well within the capacity of the pipeline.

ABANDONMENT AND REHABILITATION

Impacts during the dismantlement and removal phase would be similar to those associated with Alternative A. If the roads CPAI proposes to build are left in place and maintained, additional transportation infrastructure connected to the Alaska road network would be available.

4C-2.4.9.2 Sub-Alternative C-2 – Summary of Impacts on Transportation

Construction and operation of the facilities proposed under Sub-Alternative C-2 are not expected to result in adverse effects to transportation resources. Existing and proposed roads, airstrips, and pipelines are expected to adequately transport personnel, materials, and product throughout the Plan Area and into statewide transportation systems. Both local and statewide transportation systems are considered to have adequate capacity to accommodate the level of activity anticipated during construction and operation of the facilities.

4C-2.4.9.3 Sub-Alternative C-2 – Potential Mitigation Measures for Transportation

To address the potential safety hazard associated with the electric lines, these poles could be marked according to FAA requirements for structures above 200 feet. This could consist of red lights on the poles and high visibility markers on lines where appropriate.

Most bridge construction activities will be conducted when the impacted waterways are frozen. If not, the applicant should work with local village and other vessel operators in order to facilitate marine navigation during construction. If bridge construction activities requires limiting vessel traffic, the applicant should issue sufficient notification of such closures to reduce conflict with marine navigation activities. A condition of the applicant's Coast Guard Bridge permit will require that construction of falsework, cofferdams or other obstructions, if required, shall be in accordance with plans submitted to approved by the Commandant prior to construction of the bridges. All work shall be so conducted that the free navigation of the waterway is not unreasonably interfered with and the present navigational depths are not impaired. Timely notice of any and all events that may affect navigation shall be given to the District Commander (Seventeenth District) during construction of the bridges.

4C-2.4.9.4 Sub-Alternative C-2 – Effectiveness of Protective Measures for Transportation

The effectiveness of the protective measures would be similar to Alternative A.