4.4 Impacts of No-Action Alternative

Section 4.4 discusses the impacts of the non-action alternative, i.e., expiration of the TAPS Federal Grant and State Lease and DR&R of the system (see Section 2.2 of this Environmental Report for a description of DR&R). Cumulative effects are discussed in Section 4.5.

This section is divided into three main subsections:

- Physical Characteristics
- Biological Resources
- Social Systems

4.4.1 Physical Characteristics

This subsection covers the direct and indirect impacts of the no-action alternative on the physical characteristics of the TAPS region, including the terrestrial environment, water resources, and the atmospheric environment.

4.4.1.1 Terrestrial Environment

By R. Dugan

If operation of the pipeline is terminated, potential short-term impacts to the terrestrial environment may be caused by construction associated with DR&R, by those items left in place, or by modifications to the terrain that occurred during original construction and continue to have an effect. For DR&R, as defined by the state/federal grant and lease agreement, the pipeline system must be removed, but many elements would remain, such as buried pipe that is not adjacent to river training structures, the embedded portion of VSMs, and other buried facilities deeper than 1 foot below grade. All above ground facilities would be removed and the surface stabilized to minimize erosion.

Geology and Physiography

The impacts of TAPS removal to geology and physiography are expected to be localized to the work pad, access roads, and their immediate margins. The impacts will likely be limited to temporary soil erosion and drainage modification during DR&R due to construction equipment activity on the surface and numerous excavations to remove culverts, bridges, and other buried or embedded elements. There is essentially no direct impact to the bedrock or topography except for final grading of reclaimed surfaces.

Over the long term, river channel migration may locally erode the workpad and cause downstream sedimentation once river-bank protection is no longer maintained. Figure 4.4-1 shows a typical example of changes over a 10-year period along a protected stream bank. Impacts from modifications to stream channels and the permafrost regime are addressed later.

Paleontological Resources

DR&R of TAPS would likely have no impact on paleontological resources. If vertebrate fossils are present, they could be damaged during reclamation of material sites or by spills of hydrocarbons that could possibly occur during purging of the pipe.

Soils and Permafrost

Potential DR&R impacts to the soils and permafrost are generally related to modifications of the thermal regime. South of Fairbanks, where the permafrost is discontinuous and relatively warm, the permafrost table under the ROW has not reached equilibrium and will likely continue to be lowered because of the unavoidable damage to the insulating vegetative cover that occurred during construction. The rate of lowering will decrease with time because the increasing thickness of the overlying thawed soil will help insulate the deeper frozen soils. In addition, periodic brushing of the workpad and access roads by maintenance crews will be stopped and revegetation enhanced. The increased vegetation will provide more shading and a superficial organic layer to reduce absorption of radiant heat into the subsurface. Figure 4.4-2 shows an example of a revegetated embankment.

Settlement caused by the continued thawing of excess ice in the soils may locally cause depressions and some alteration of surface drainage. This is expected to be very minor since the permafrost soils that will thaw under the embankments in the future are relatively deep and generally have significantly less excess ice than soils near the surface.

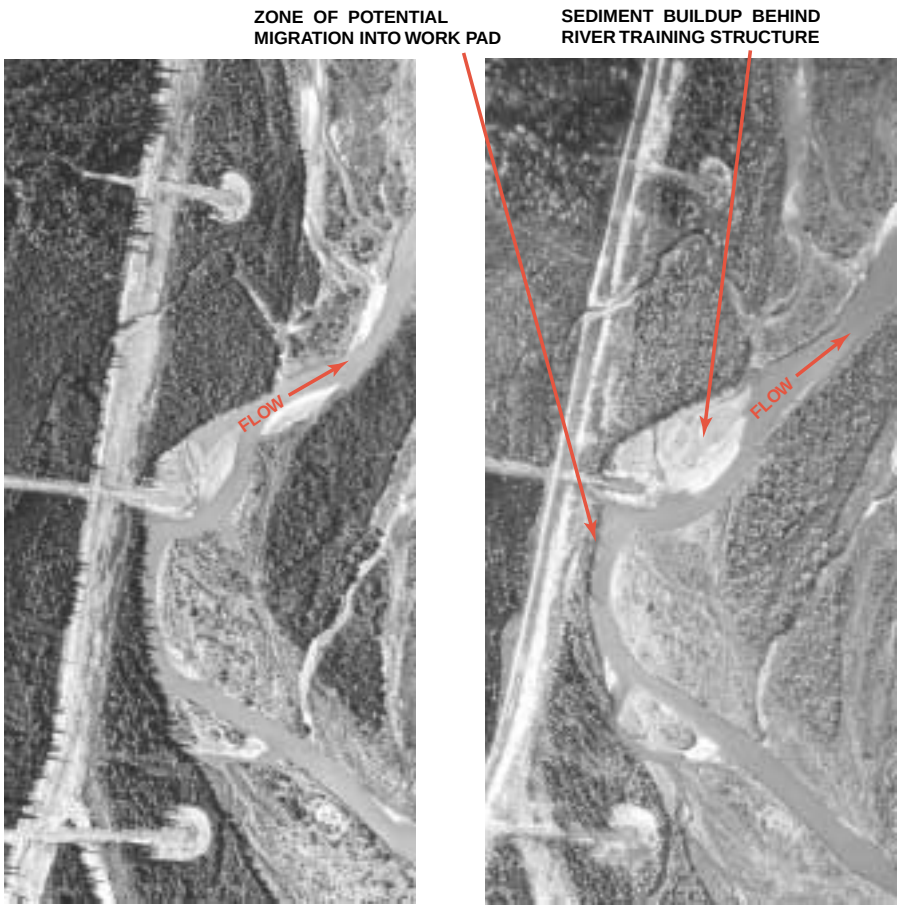


Figure 4.4-1. *Channel migration along workpad (photos by AeroMap U.S.).*

Sand, Gravel and Rock

Some sand, gravel, and quarry rock will likely be needed during DR&R. These materials will generally be used to provide a minimum of 2 feet of cover over abandoned facilities, to construct low-water crossings where culverts are removed, to cover fine-grained soils to prevent erosion, to fill depressions, and to create berms to block access to abandoned facilities. The materials can likely be obtained from existing stockpiles in Alyeska's permitted material sites and from the embankments being abandoned. There will likely be little or no additional extraction of these resources from undisturbed areas.

River and Floodplain

By W. Veldman

As a result of DR&R, the impacts on the behavior of the river and floodplain segments will be as follows, assuming the buried line is left in place. The impact on the rivers is expected to be minimal.

- The existing river training structures, bank protection works, guidebanks or revetments will remain as is. The continuing impact on the behavior of the rivers will be comparable to the impact to date (Section 4.3.1). If any structures require breaching to remove any facilities, they will be restored to a pre-DR&R condition as a partial breach could result in local rivers changes.
- Upon completion of DR&R, maintenance of the river training structures will cease. Thus, any erosion of the structures would not be mitigated. Structures integral to the Dalton Highway (e.g., guidebanks upstream of the road bridges) would be maintained by ADOT or other stakeholders, as necessary. If structures are believed to potentially have a long-term detrimental effects on adjacent stakeholders (e.g., a spur, deflecting flow), they will be removed.
- Workpads adjacent to or in the river crossings and floodplains would be removed, if necessary, to reduce sediment impacts into the river. Therefore, a pad con-

structed of natural river gravel would not be removed if the adjacent stream had comparable materials, whereas fine-grained material in a pad adjacent to a stream would be removed if erosion of the pad material would lead to significant sediment concerns.

Seismicity

By D. Nyman

If DR&R occurs, the seismic hazards relating to an operating pipeline system would be eliminated. For a relatively brief time after shutdown, the pipeline would be exposed to seismic hazards while containing crude oil or cleaning solvents. However, since the pipeline would be under low pressure, failure due to a seismic event would be even less likely than during normal operations. Furthermore, if a breach in the pressure boundary did occur, the spill volume should be much less than for an operating condition. Therefore, the pipeline seismic risk is minimal during dismantling.

As with any construction project, there is small risk of a seismic event occurring while a structure is partially complete, or in the case of DR&R, in a partial state of demolition. This poses some risk to personnel safety, but it is a level of risk commonplace in the industry.

4.4.1.2 Water Resources

By B. Jokela

Water Use and Discharges for Operations

Cessation of operation of TAPS will require continued use of water resources along the ROW to support DR&R. Wastewaters will be produced at accelerated rates by virtue of the intensive labor effort involved. Freshwater receiving environments will have increased potential for adverse impacts from the large camp populations and extensive earth moving activities involved in DR&R.

Injection of wastewater plant effluents into stacks at Pump Stations 1, 3, and 4 requires sufficient stack temperatures to ensure vaporization, volatilization, and disinfection. Elimination of turbine-powered crude-oil pumping systems will preclude the use of pump engine exhaust stacks for wastewater disposal, necessitating alternative means for wastewater disposal during DR&R.

Secondary biological sewage treatment and effluent disposal to tundra wetlands is expected to continue for the MCCFs and Pump Stations 5 and 6. Discharges are expected to increase at each site to the design capacity (up to 14,000 gallons per day, depending on the specific facility) during periods of extensive DR&R field effort. These discharges are expected to be assimilated by local water re-

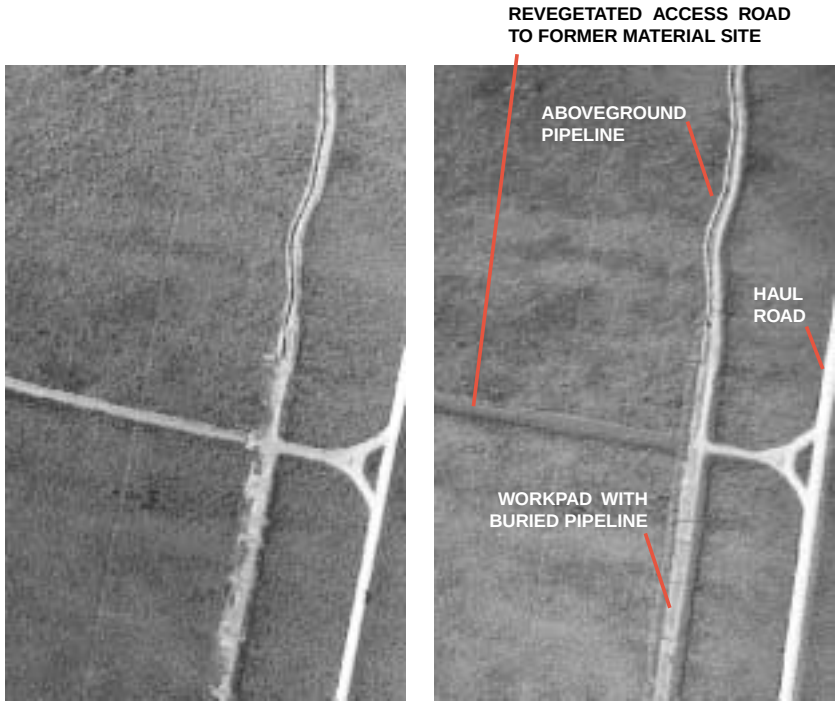


Figure 4.4-2. *Revegetation example of abandoned access road.*

sources with no significant effect on productivity or viability of aquatic ecosystems.

Enhancement of existing sanitary treatment facilities at the VMT may be needed to accommodate increased staffing and facility use during DR&R. Leachfield replacement or use of package sewage treatment plants may be necessary to accommodate DR&R labor crews.

Water Use and Discharges to Support Maintenance Activities

In addition to pump station and camp domestic water supply needs, water will continue to be used for a variety of industrial activities. Discharges will continue from dewatering of excavations, particularly in capping and decommissioning of buried pipe.

Excavations typically take place in winter to minimize the potential for groundwater handling. To the extent practicable, dewatering discharges will be to vegetated areas or dry channel beds to avoid impacts to surface water bodies. The effects of discharge on nearby surface waters depend on the rate and temperature of the discharge; slope and roughness of the receiving surface; permeability, temperature, and moisture content of the receiving surface; and presence of ice and snow. Water discharged onto a snowy surface in winter will freeze readily if atomized as in a snow-making operation or if allowed to spread out over a broad area. Assuming that water is allowed to freeze as a sheet of ice one inch thick over existing frozen ground, one million gallons of water will cover approximately 40 acres.

Currently only 11 of the many material sites identified along TAPS are subject to coverage under the MSGP for industrial stormwater discharge. New sites or expansions of existing sites may be located and/or developed in response to particular DR&R project needs. Mining or quarrying of new material during DR&R is likely to be minimal. No major new earthfill is envisioned in removing existing facilities. Designing a mining or quarrying plan for each site will require submittal of a stormwater pollution prevention plan to EPA and will entail development only in conjunction with implementation of best management practices for stormwater pollution prevention. Effects of stormwater runoff into waters along the TAPS route will not be significant.

Discharges to Port Valdez

Marine waters of Port Valdez will continue to be used to assimilate discharges from the VMT during DR&R. Although ballast water will cease to be collected, treated, and discharged from the tankers, sanitary wastewater from administrative facilities at the VMT will be generated, as well as industrial wastewater from operations of the VMT during shutdown. The BWTF will be used to treat oily seawater used to rinse the pipeline prior to dismantling. Up to 400 million gallons (the volume capacity of the 800-mile long pipeline) will be delivered to the BWTF for treatment and discharge to Port Valdez during the cleaning operation.

When oil shipments stop, no tanker ballast water is expected to be delivered to the BWTF. The BWTF would be grossly oversized and inefficient to handle the discharges provided only by the VMT Industrial Wastewater Sewer System. The plant may require adjustment to provide for treatment of pipeline cleaning flows and VMT industrial discharges during DR&R.

4.4.1.3 Atmospheric Environment

By E. Haas

After DR&R, all TAPS-related air emissions would cease. For most facilities, the direct ambient impact levels would revert to pre-construction levels.

Impacts on Ambient Air Quality

Ambient monitoring data collected at Prudhoe Bay monitoring sites show statistically no degradation of the ambient air quality over a 10+ year period. The levels are significantly below the limits set by the Alaska Ambient Air Quality Standards. However, the question arises as to how low the monitored data actually would be if all TAPS operations and emission sources ceased. In the North Slope oil fields, elimination of Pump Station 1 alone would not likely make a significant difference for the existing monitoring stations.

No monitoring data prior to 1986 are available for the pipeline route or the North Slope. Natural background data can be estimated by selecting the lowest values from the monitoring stations with the least impacts and wind directions indicate air flow from non-impacted areas. Summaries of estimated background values are shown in Table 4.4-1 for Prudhoe Bay and Table 4.4-2 for Valdez. The natural background levels should not be confused with the regulatory background levels, which are discrete ambient values on the specific date the baseline was set for each air quality control region (18 AAC 55, Table 2, Baseline Dates). The tables show that the current impact levels are substantially lower than the ambient standards and not much above the natural background values. A substantial change in existing air quality impacts would not result if TAPS operations cease.

Table 4.4-1. *Prudhoe Bay area annual background levels (ug/m³).*

Pollutant	Background	Impact	NAAQS
NO_2	2	19	100
SO_2	< ND	4	80
CO	115	950 (a)	10,000
Ozone	44	~ 50 –100 (b)	235 (c)
PM10	< 5	6 - 12	50

(a) 8-hour value
(b) High variability depending on atmospheric conditions
(c) 1-hour standard

Table 4.4-2. *Valdez area background levels (ug/m³) (a).*

Pollutant	Background	Impact	NAAQS
NO_2	5.7	17	100
SO_2	3.2	10	80
CO	-	1,100 (b)	10,000
Ozone	20-88	112	235 (c)
PM10	6.6	15	50

(a) Fluor and TRC (1995). Values are based on highest observed background concentrations.
(b) 8-hour value
(c) 1-hour standard

Fugitive Emission Impacts

During DR&R, fugitive dust emissions may substantially increase due to increased traffic on the Dalton Highway and use of heavy equipment. The additional impacts of dust on vegetation, of higher engine emissions, and of increased noise levels would temporarily raise the stress on wildlife beyond levels discussed in Section 3.1.3. Some open burning of construction and demolition materials may temporarily raise ambient particulate levels locally. Open burning is controlled by ADEC regulations. Any crude or chemical spills may need to be in-situ burned, which would add to the ambient particulate levels. After completion of DR&R, the level of fugitive dust emissions from the Dalton Highway should be significantly reduced beyond current levels since traffic related to TAPS and oil and gas activity will cease on the highway. Only occasional recreational traffic will remain.

4.4.1.4 Global Climate Change

DR&R of TAPS will have no adverse effect on global warming. However, the increase of air temperature associated with global warming will have an impact on soil temperatures and thus may effect soils in permafrost terrain disturbed by TAPS as discussed in Section 4.4.1.1.

4.4.2 Biological Resources

As in the proposed action, the effects of the no-action alternative on fish and wildlife were grouped into five general categories: (1) obstructions to movement, (2) disturbance and/or displacement, (3) habitat alteration or enhancement, (4) mortality, and (5) harvest- and recreation-related effects. The following assumptions apply to the discussion of potential impacts on fish and wildlife:

- Removal of the above-ground sections of pipeline likely would be scheduled in winter to reduce impacts to the ground surface from heavy machinery.
- Many workers would be housed initially at pump stations to reduce the need for, or size of, field camps;
- Removal of pipelines, dismantling of facilities, and backhauling of scrap would take 3 years.
- Gravel pads and access roads would be revegetated following removal of facilities, and revegetation efforts may require several years before acceptable standards are met for approval by the Authorized Officer and State Pipeline Coordinator.
- After the pipeline and facilities have been removed and restoration undertaken, vehicular traffic on the Dalton Highway would decline, particularly in winter when the State of Alaska may not maintain the road north of Atigun Pass.

Section 2.3 describes the activities anticipated for the no-action alternative. DR&R would greatly increase the number of people working along the TAPS ROW during the 3 years of activity. The magnitude of impacts may approach the level of TAPS construction. In particular, harvest pressure on game and fish resources along the ROW could increase substantially during DR&R if workers are hunting and fishing.

4.4.2.1 Special Areas and Special Management Zones, and Zones of Restricted Activity

By H. Whitlaw, R. Ritchie, and J. McKendrick

Evaluation of environmental consequences associated with the no-action alternative in special areas and special SASMZs was based principally on an understanding of the historical impacts of TAPS construction, operation, and maintenance on fish and wildlife resources. Impact evaluation was also based on a review of state and federal mitigation and environmental compliance regulations that apply to activities in SASMZs.

SASMZs near the pipeline include (APSC, 1993):

- *Zones of restricted activity* created and implemented

under Stipulation 2.5.3.1 in the Federal Grant, and restrict activities during all fish and falcon breeding, nesting, spawning, and migration periods.

- *Areas of critical ecological concern (ACEC)* proposed in BLM (1989) and established with BLM (1991), and pertain to critical and sensitive terrestrial mammal and falcon habitats.
- *Long-term vegetation monitoring and restoration sites* established for monitoring willows, revegetation efforts, and vegetation response to oil spills.

ZRAs are currently based on TAPS operating stipulations in the Federal Grant. Implementation of the no-action alternative would presumably eliminate these areas.

Vegetation

Ground-impacting activities would take place in the vicinity of vegetation SASMZs. These areas may be adversely affected; however, compliance with current restrictions (APSC, 1993) would likely reduce impacts. After completion of DR&R activities, continued opportunities to monitor revegetation efforts and vegetation response to disturbance in long-term SASMZs may be reduced. Implementation of the no-action alternative would have minimal impact in vegetation SASMZs.

Fish

DR&R activities would take place in watersheds, wetlands, riparian areas, and streams. These activities may obstruct fish movement, alter habitat, and/or increase mortality. Work in ZRAs (i.e., all fish-bearing streams crossed by the pipeline and its facilities) is currently restricted during all breeding, spawning, and migration periods. The no-action alternative would presumably eliminate these areas; however, compliance with current ZRA restrictions during active DR&R would likely reduce impacts.

In addition to restrictions imposed by ZRA stipulations, activities that may impact fish resources are reviewed under the ADF&G Title 16 and Fish Habitat permit processes, and the U.S. Army Corps of Engineers Section 404 (Clean Water Act) permit process for jurisdictional waters (SPCO, 1993, 1995). After active DR&R, state and federal permit review processes would continue to be applicable. Assuming compliance with ZRA stipulations and with state and federal regulatory permits, the no-action alternative will likely have minimal impacts on fish resources.

Terrestrial Mammals

During active DR&R, ground-impacting activities would occur within, and in the vicinity of, BLM-designated ACECs (APSC, 1993; BLM, 1989). ACEC restrictions are not related to Federal Grant stipulations and would presumably remain in effect both during and after active DR&R. In these special management areas, activities are restricted to meet designated sensitive-habitat and management objectives (BLM, 1989, 1991). ACECs primarily contain Dall sheep lambing areas and mineral licks near the Brooks Range. Through the continued and effective protection provided to terrestrial mammal habitats through ACEC activity restrictions, the no-action alternative would likely have minimal impacts on these resources.

Threatened and Endangered Species

Two species listed as threatened under the federal Endangered Species Act (Spectacled Eider and Steller's Eider), and two delisted subspecies of Peregrine Falcon (the *tundrius* and *anatum* races) would potentially be affected by activities associated with the no-action alternative. Occupied Peregrine Falcon nests, as designated by the FWS through the Authorized Officer, constitute a ZRA. The no-action alternative would presumably eliminate these areas; however, compliance with current ZRA restrictions during active DR&R would likely reduce impacts. Activities in ZRAs are now restricted during breeding and nesting periods. In addition, FWS Section 7 permits under the Endangered Species Act are required for some activities that may affect threatened and endangered species. After active DR&R, federal permit review processes would continue to be applicable. Assuming compliance with ZRA stipulations and federal regulatory permits, implementation of the no-action alternative would likely have minimal impacts on threatened and endangered species.

4.4.2.2 Vegetation and Wetlands

By J. McKendrick, D. Funk, T. Jorgenson, and J. Kidd

Habitat Loss, Alteration, and Enhancement

Wetlands. Impact to wetlands from DR&R should be minimal, although impoundments associated with workpads are likely to persist unless efforts to breach them are made. Since culverts will be converted to low-water crossings, any sedimentation or erosion should be minimized. It is possible that permafrost areas covered with fine-grained soils could be restored to wetlands over the long term through thermokarst, but the process would likely take several decades.

Dust. Relatively large amounts of dust from increased traffic along the ROW would be expected during DR&R. These impacts would be short-term, and vegetation along the ROW would probably recover quickly. Access roads and the pipeline route would no longer be regularly traveled

for ROW surveillance and maintenance. Public access probably would be limited because river crossings would be decommissioned and access roads not maintained.

Off-Road Use. The removal of above-ground structures is likely to increase ORV use of the ROW, but the impacts probably will not be much greater than those described for ROW renewal. Damage to plant communities adjacent to the ROW actually may be lessened as ORV users restrict more of their travel to the ROW.

Drainage and Water Flow Issues

Drainage and water flow impacts associated with DR&R would be similar to those described for ROW renewal with a few minor differences. Because the workpad would remain in place, impacts associated with adjacent impoundments would persist, particularly on the Arctic Coastal Plain. Establishing breaches or low-water crossings in impoundment areas could minimize this impact. Conversion of culverts to low-water crossings would greatly reduce erosion and scouring associated with cross-drainage. Elimination of culverts would greatly reduce icing problems. Because river-training structures will remain in place, sedimentation in slackwater areas behind dikes would continue and would provide habitat for riverine willows and other early successional species. Erosion of the unmaintained structures is also likely, but its limited extent and the low failure frequency of the structures would make this a minor impact.

Thermokarst

Thermokarst associated with leaving the workpad in place would have little additional effect on adjacent areas. Thermokarst from impoundments would persist and continue developing in place. Thermokarst underneath the workpad would continue and probably become widespread, but ecological effects on adjacent vegetation would be negligible. Thermokarst of the workpad probably would enhance revegetation because it would increase soil moisture and create a diversity of microsites (Jorgenson and Joyce, 1994; Kidd and Rossow, 1998; Bishop et al., 1999).

Oil, Fuel, and Chemical Spills

Oil spills will not be of consequence following DR&R, but crude oil spills and fuel spills can occur during active DR&R. Impacts from spills were discussed in detail for the proposed action. Revegetation of spill-affected areas will not be an issue for the no-action alternative, except for spills that occur during removal of the pipe. Revegetation of spill-affected areas was also discussed previously in sections dealing with the proposed action.

Revegetation

If grass seed and fertilizers are used to artificially revegetate the ROW, temporary attractive grazing areas will be created in the northern Brooks Range for Dall sheep and caribou, and for geese north of the Brooks Range. In 5 to 10 years, palatability of seeded grasses will diminish. In the boreal zone, browse development can be thwarted for 20 or more years if grasses are successfully established as revegetation.

Adding seed and fertilizer will increase risk of introducing weeds. During TAPS construction, most inadvertently introduced broad-leaved weeds (except for *Trifolium hybridum* and *Taraxacum officinale*) failed to persist throughout much of the route. In contrast, several seeded grass species have remained in all regions of the route.

Leaving the workpad in place after facilities are removed will temporarily increase vegetation for wildlife. Browse, which is currently mowed on the workpad, will be released and produce a temporary increase in habitat for moose and hare. Removing the workpad will expose vegetated soils to erosion and temporarily decrease wildlife habitat and aesthetics along the ROW.

4.4.2.3 Fish

By R. Fechhlem and L. Moulton

DR&R of TAPS has the potential to impact fish populations and habitats in a manner similar to that documented for TAPS construction. Removal of the pipeline will be a major construction action, with substantial vehicle movement along the workpad. Culverts, pipes in road casings, and buried pipe adjacent to river training structures will be removed, thus creating the potential for increased sediment load, habitat alteration, and migration blockage.

Obstructions to Movement

Barriers to fish movement may be caused by increased traffic across low-water crossings and during removal of culverts and road casings. Increased traffic can lead to severe rutting that can create ridges and spread flow, thus creating barriers to fish movement at low flows. Low-water crossings will need more frequent maintenance during the removal period to ensure that fish passage is maintained. Removal of culverts and road casings will need to be planned and monitored to ensure proper erosion control methods are used and the final streambed is consistent with the natural configuration. Impacts can be mitigated by not

scheduling DR&R activities during sensitive times for fish.

Habitat Alteration or Loss

Construction activities in the active floodplain can alter habitat through removal of cover or increased sedimentation and erosion. Removal of cover can substantially reduce the carrying capacity of the altered stream reach by making the area unsuitable for refuge from predators (Woodward-Clyde Consultants, 1980). South of the Brooks Range, large woody debris in streams provides important cover for many fish species. Cut banks and boulders provide additional cover. North of the Brooks Range, large woody debris is scarce, and cover is provided primarily by cut banks and boulders. Activities in and around the active channel should avoid loss of these cover features.

Mortality

As with maintenance activities, pipeline removal operations need to avoid disturbing, dewatering, or degrading overwintering areas. The potential for increased fish mortality would be high during DR&R operations. The potential for fuel and crude oil spills during DR&R activity would also increase substantially from that of normal pipeline operations. However, these impacts would be relatively brief, and fish populations would be expected to recover from impacts once DR&R was completed.

Overharvest

Overharvest is not likely to be a concern since active DR&R will have a relatively short duration and will not create new access, although localized fishing by DR&R workers during the 3 years of activity may be heavy in some areas. After TAPS operations cease and DR&R is complete, a potentially important impact on fish is increased harvests from a variety of sources (i.e., legal, illegal, sport, subsistence, and commercial). The end of operations of the oil industry in the ANS oil fields, TAPS, and the VMT will be accompanied by significant reductions in statewide employment and incomes. This may increase pressure on fish (e.g., sport, commercial, and subsistence fishing) if residents use wild foods to compensate for the loss of income. If decreased state revenue results in less enforcement of fish regulations, this impact could be intensified. However, it is also possible that the human population (and fish harvests) will decrease in response to the economic decline. In addition, removal of some bridges and water crossings will probably reduce access through time, thereby reducing harvest of fish in some areas. The reduction in access may allow some populations to recover from excessive harvest pressure. Regulation and monitoring by the appropriate agencies will be needed to manage this potential impact.

4.4.2.4 Birds

By B. Anderson, R. Day, S. Johnson, R. Ritchie, and D. Troy

Obstructions to Movements

DR&R activities at TAPS facilities would probably increase disturbance and limit movements of birds in the immediate vicinity during periods of high activity. However, the flight capability of birds substantially reduces the possible obstructions to movements by activities along the TAPS ROW. During their flightless molting and brood-rearing periods, birds (primarily waterfowl) are more likely to have their movements affected by human disturbance and facilities. Temporary DR&R camps would present local barriers to movements of brood-rearing/molting waterfowl. This effect could be mitigated by siting camps away from important brood-rearing areas and scheduling decommissioning activities in important bird areas to occur in winter or other times outside the breeding season.

The greater amounts of traffic on the Dalton Highway during the initial phases of DR&R would limit the ability of some brood-rearing waterfowl to cross the road. High traffic levels (usually >10 vehicles/hr) and the presence of larger, heavier, and unusual-profile vehicles such as boom cranes resulted in greater disturbance to brood-rearing waterfowl in the oil fields than did less traffic and light-vehicle traffic (Burgess and Ritchie, 1987, 1990, 1991; Murphy and Anderson, 1993). Removal of elevated pipelines during winter would have little effect on movements of birds because fewer bird species are present. Once pipelines and facilities are removed, bird movements along TAPS would no longer be affected.

Disturbance and Displacement

Equipment noise, vehicles, pedestrians, aircraft operations, and other activities associated with DR&R would cause increased disturbance of birds near facilities and activities such as pipe removal. Scheduling of pipeline removal during winter would minimize disturbance and mitigate most impacts on birds. Most bird species are not residents along the ROW and are not present in winter. Exceptions include resident Gyrfalcons near traditional nesting sites.

Disturbance caused by dismantling pump stations would probably be greater than the disturbance effects noted for birds during oil field operations. Oil field impacts are well documented (Woodward-Clyde Consultants, 1985; Hampton and Joyce, 1985; Anderson et al., 1992; Burgess and

Rose, 1993; Murphy and Anderson, 1993; Troy, 1993; TERA, 1993b). The most comparable studies are those conducted during major oil-field construction activities (Endicott Development Project: Burgess and Ritchie, 1987, 1990, 1991; Lisburne Development: Murphy and Anderson, 1993; GHX expansion: Anderson et al., 1992). During those studies, greater disturbance to birds occurred during the initial construction period than after operations began. Disturbance of birds would be greater during the 3-year DR&R along TAPS than during normal operation. Disturbance would be reduced below operational levels after all facilities were removed and restoration underway.

As described for the proposed action, the relative severity of disturbance to birds varies with the human activity. Humans on foot and natural predators (foxes or gulls) cause stronger reactions than vehicular activity (Ritchie, 1987; Murphy and Anderson, 1993). The numbers of humans on foot around pump stations would be greater during DR&R than during normal operations. Restricting foot traffic to gravel pads could mitigate impacts caused by humans on foot. This restriction would provide a buffer for birds using adjacent tundra habitats. For vehicular traffic, the level of disturbance to waterfowl generally increases as traffic rate and the number of large, noisy vehicles increases, and as the distance to disturbance such as the Dalton Highway and pump stations decreases (<500 to 700 ft [150 to 210 m]) (Murphy and Anderson, 1993). Scheduling major activities requiring large, noisy trucks during periods when birds are not flightless would reduce disturbance impacts.

Some level of aircraft activity would be associated with DR&R. Most studies of aircraft disturbance in the Arctic have focused on low-flying helicopters (LGL, 1974; Barry and Spencer, 1976; Simpson et al., 1982; Ritchie, 1987; Derksen et al., 1992). Some waterfowl species, such as Brant and Snow Geese, appear to be more sensitive to disturbance by helicopters, particularly at flight elevations below 800 ft (240 m), than are other geese (Canada and Greater White-fronted Geese) and other birds species groups (LGL, 1974; Derksen et al., 1992; Murphy and Anderson, 1993; Ward et al., 1994). Raptors may be most sensitive during arrival, courtship, laying and incubation, and early nestling periods of their breeding (Roseneau et al., 1981). However, all species continue to nest in close proximity to air traffic routes associated with TAPS. Visual and auditory impacts of helicopter overflights on birds inhabiting the forested portions of the TAPS ROW are probably mitigated by the visual and sound barrier provided by surrounding vegetation. In general, flight restrictions to limit low-flying aircraft during the more sensitive periods for birds (nesting, brood-rearing) during DR&R could mitigate the magnitude of these impacts on birds. In the long term, after closure of the pipeline and pump stations and elimination of surveillance flights along TAPS, disturbance to birds would be greatly reduced.

The indirect effects of disturbance associated with DR&R would cause the habitats adjacent to facilities such as the pump stations to become temporarily less attractive to birds. Because facilities along TAPS have operated for over 20 years, it is likely that birds have become habituated to some extent to the constant sources of noise, but the activities associated with DR&R would increase noise levels. However, unlike the proposed action, where facility noise could cause long-term reduction of bird use in areas experiencing constant disturbance, the displacement associated with DR&R would be relatively short term (3 years or less for the entire pipeline removal), and noise sources would be eliminated once facilities were removed.

Habitat Loss, Alteration, or Enhancement

DR&R activities along TAPS would result in either permanent (revegetation) or temporary (initial alterations with pipeline removal) changes in bird habitats. Habitat along the ROW and work pad would be disturbed during removal of above-ground sections of the pipeline, and effects of long-standing habitat modification would continue until revegetation and restoration were successfully accomplished. Gravel fill has a relatively small but notable impact on wildlife habitats in the Arctic because the disturbance may be long term and vegetation recovery may be slow (Johnson, L., 1987; Walker, Webber et al., 1987; Jorgenson and Cater, 1991).

Although revegetation efforts in the oil fields have been moderately successful at restoring gravel pads or disturbed tundra, only a few studies have evaluated the use of these disturbed habitats by wildlife (Troy, 1991; Rodrigues, 1992; Truett et al., 1994). The magnitude of use of restored sites by birds depends on the nature of the site after reclamation. Areas with gravel-based (old exploration pads; Rodrigues, 1992) or disturbed-tundra (“peat roads”; Troy, 1991) substrates receive considerable bird use — often more use than undisturbed tundra. Nest densities are lower on gravel-rich sites than undisturbed tundra, but higher on peat substrates. The nature and magnitude of bird use appear to be a function of the degree of local (microsite) heterogeneity and the presence of ponding in addition to the establishment of vegetation. In more southerly sections of the ROW, revegetation and restoration efforts at facilities would likely be more successful at restoring natural vegetation, and bird use of these sites would increase over time as the habitat progresses through a mosaic of grassland, then

shrubs, and eventually forested lands on reclaimed facility sites.

Along the northern end of TAPS, bird use of habitats adjacent to the Dalton Highway and pump stations has been affected by habitat alteration from dust fallout, gravel spray, persistent snowdrifts, impoundments, thermokarst, contaminants, and water withdrawal. With completion of DR&R, some of these impacts would be greatly reduced or eliminated. Following DR&R, traffic levels on the Dalton Highway likely would decline substantially, particularly during winter months (depending on the level of road maintenance), reducing dust fallout and the correspondingly advanced snowmelt (up to two weeks early) in the dust shadow adjacent to roads and pads. The loss of the spring dust shadow and its associated open water and tundra would affect the distribution and movements of birds along the road. Without the dust shadow and its snow-free habitats, the movements of birds northward along TAPS in spring would be restricted to naturally occurring snow-free zones along the Sagavanirktok River and Franklin Bluffs. This change would cause short-term detrimental effects on species that forage in snow-free areas.

Water impounded by gravel roads and pads along the northern end of TAPS both displaces and attracts birds, depending on the species (Kertell and Howard, 1992; Kertell, 1993, 1994; Troy, 1993; Noel et al., 1996). Impoundments can be temporary, disappearing by mid-June, or can persist through the summer. Temporary impoundments preclude nesting (Walker, Webber et al., 1987) but also attract some birds. The effect of DR&R on the occurrence of impoundments is difficult to predict. If maintenance of the Dalton Highway were reduced and maintenance of the TAPS workpad ceased, culvert efficiency could decrease forming more impoundments. Gravel pads would remain in place and cause some snowdrifting and water impoundment along the workpad. Persistent snow drifts or impoundments would reduce habitat availability during early summer and probably reduce breeding near roads and pads. Planned removal of culverts along access roads would help restore natural cross-drainage.

For several bird species, the TAPS ROW and associated facilities enhanced habitat by providing structures for nests, perching, and resting sites. With the removal of the above-ground sections of the pipeline and dismantling of facilities during DR&R, those artificial nesting structures would be eliminated, reducing nesting opportunities for some species (Gyrfalcons, Common Ravens, swallows, Snow Buntings). Cessation of brush removal along the TAPS ROW would allow natural succession and an eventual return to the vegetation found in surrounding areas. These changes in vegetation would affect the bird community using the ROW, but the changes would be long-term and would resemble the normal changes encountered by these species when habitats are naturally disturbed by such events as fires.

Mortality

With the removal of the above-ground sections of the pipeline and pump station facilities, the potential for bird collisions with these structures would be eliminated. The largest identified source of indirect bird mortality associated with the TAPS route — road kills along the Dalton Highway — would increase during DR&R because of higher traffic levels during this action, particularly during late spring when most birds are attracted to the dust shadow along the road. Ptarmigan, grouse, and passerines are the primary species groups killed by vehicle collisions. Raptors have infrequently been identified as collision victims along the Dalton Highway, especially in the northern portion. Species that hunt along the road and its dust shadow, including Rough-legged Hawks, Northern Harriers, and Short-eared Owls, would be most susceptible to collision with vehicles. Following DR&R, vehicle-associated mortality in the northern section of the ROW would decline due to decreased traffic volume and the corresponding reduction in the dust shadow along the Dalton Highway.

Mortality due to early fledging of young raptors or increased predation due to human disturbance of raptor nests has not been reported along TAPS. Careful scheduling of the removal of above-ground pipeline sections in winter would minimize disturbance and potential mortalities. However, recreational parties associated with the Sagavanirktok River may interrupt some nesting raptors and may cause abandonment or premature fledging or attract predators. These types of activities would likely increase after DR&R is completed if the ROW were completely opened to recreational use.

During DR&R, small oil spills and contaminant releases are likely to occur, causing minor mortality of birds. The relative impact should be reduced by rapid cleanup response. Small spills that affect habitats, particularly tundra habitats, may have short-term effects, such as reduced breeding in the summer after cleanup, even after cleanup has been completed (Burgess, Cater et al., 1995; Burgess, Jorgenson et al., 1995). Exposure to and ingestion of contaminants (including minor incidents of fouling and oiling) in the North Slope oil fields occasionally have caused injury and mortality to small numbers of animals (Amstrup et al., 1989; ABR, Inc., unpubl. data).

Increased predation on birds from increases in predator

populations caused by artificial food sources has been documented as an impact in existing North Slope oil fields (Day, 1998). Levels of impact are inferred from the higher number of foxes and increased density of fox dens (Eberhardt et al., 1982; Burgess and Banyas, 1993; Burgess, Rose et al., 1993) and higher numbers of bears (Shideler and Hechtel, 1995), gulls (Murphy et al., 1987), and ravens in the oil fields compared to undeveloped areas. Gulls and ravens prey on bird eggs and young, foxes prey on birds and small mammals, and bears prey on caribou, muskoxen, ground squirrels, and some birds, primarily waterfowl.

During DR&R when work camps are established at various locations along the TAPS ROW, the potential for temporarily increasing predator populations through artificial feeding is high. This possibility could be mitigated by adherence to proper garbage handling and strict enforcement of existing prohibitions on feeding of wildlife, which would limit the attraction of predators to DR&R work zones and activities. Following removal of the pump stations and pipeline, predator populations would stabilize or decline as human sources of garbage were eliminated, although some garbage dumping or feeding by recreational users would be likely if recreational use of the TAPS route increased after DR&R were completed.

Harvest and Recreational Effects of Humans

Changes in harvest of game bird species associated with the TAPS ROW have not been well-documented, but access by hunters has increased along the route since construction. With the opening of the entire ROW following DR&R, the level of harvest would be expected to increase further, particularly by hunters previously deterred by Alyeska's requirements for accessing the ROW. After TAPS operations cease and DR&R is complete, a potentially important impact on birds is increased harvests from a variety of sources (i.e., legal, illegal, sport, and subsistence). The end of operations of the oil industry in the ANS oil fields, TAPS, and the VMT will be accompanied by significant reductions in statewide employment and incomes. This may increase pressure on birds (e.g., sport and subsistence hunting) if residents use wild foods to compensate for the loss of income. If decreased state revenue results in less enforcement of game regulations, this impact could be intensified. However, it is also possible that the human population (and bird harvests) will decrease in response to the economic decline. Regulation and monitoring by the appropriate agencies will be needed to manage this potential impact.

The primary species likely to be affected by increased hunting effort would be Spruce, Ruffed, and Sharp-tailed grouse and Willow, Rock, and White-tailed ptarmigan. Increased access would also affect sport harvest of waterfowl, particularly between Fairbanks and Thompson Pass, where the route crosses waterfowl habitats. Although the northern end of TAPS crosses waterfowl habitat, birds leave the area relatively early for fall migration, thus limiting the potential for increased harvest by humans.

Increased recreational use of the areas along the TAPS ROW has occurred, particularly since the opening of the Dalton Highway to the public. The level of use likely would increase after opening of the TAPS ROW following DR&R. To variable extents, wildlife tours, birding groups, and individual recreationists all use the Dalton Highway to access habitats adjacent to the TAPS ROW. Although these activities are considered non-consumptive, they are not entirely benign in their impacts on the animal resources. For most bird species, the impacts of recreational activities are probably minor, but for rare birds, such as the Bluethroat, increased access to their nesting habitats near Pump Station 2 may have detrimental effects, although the magnitude is unknown. Falconry permits from the State of Alaska allow for the taking of Arctic Peregrine Falcons and Gyrfalcons along TAPS. Gyrfalcons, although nesting close to the ROW north of the Brooks Range and along the Sagavanirktok River, have not been taken in this region (Wright, 1999, pers. comm.).

4.4.2.5 Terrestrial Mammals

By W. Ballard, H. Whitlaw, B. Burgess, and M. Cronin

Issues and potential environmental consequences of the no-action alternative on terrestrial mammals were identified from review of the original TAPS EIS (BLM, 1972) and of scientific literature and unpublished reports. Much progress has been made in understanding the effects of human activities on wildlife populations and in mitigating potential adverse effects. Although it is unlikely that impacts related to TAPS construction will be duplicated with DR&R, the following evaluation was based in part on the reported impacts of TAPS construction.

Environmental consequences of the no-action alternative were evaluated at the population level. Although impacts to individuals were also considered, management is generally conducted at the population level and therefore evaluations are also at this level (Cronin et al., 1997; Cronin, Ballard et al., 1998).

Obstructions to Movements

Pipeline. Elevated pipeline sections were predicted to

create barriers or obstructions to movements, restricting free passage of terrestrial mammals (BLM, 1972). Available evidence suggests that TAPS has not been a barrier to movements of terrestrial mammals (Ballard et al., 1987; Carruthers and Jakimchuk, 1987; Eide et al., 1986; Sopuck and Vernam, 1986a, b; Gasaway et al., 1983; Kiker and Fielder, 1980; Van Ballenberghe, 1978).

Caribou, moose, muskoxen, and bison encounter the TAPS pipeline during seasonal migrations and as components of their annual home range. During TAPS construction, elevated sections of pipe were built as designated big-game crossings along sections of the TAPS pipeline to ensure free passage and movement of big game animals (JSFFWAT, 1977). They were located at sites "known to be regularly used by bison, moose and/or caribou as well as those sites with a high probability of utilization based on tradition or habitat characteristics" (JSFFWAT, 1977, p. 1). In addition, buried sections (i.e., sagbend crossings) were built to accommodate caribou movement. Research on designated big-game crossings in the Copper River Basin and Interior Alaska indicated that they were not selectively used by moose or caribou; pipeline crossing locations were primarily dependent on traditional use, topography, terrain, and vegetation (Carruthers and Jakimchuk, 1987; Eide et al., 1986; Sopuck and Vernam, 1986a, b; Van Ballenberghe, 1978).

The no-action alternative would result in removal of all above-ground pipe and VSMs, while buried sections would remain in place. Although available research does not support the prediction of obstructed movements due to the pipeline, removal of above-ground sections of pipe would ensure free passage of terrestrial mammals after completion of DR&R. While dismantling above-ground sections, care should be take to avoid piling pipes on the ground in areas known to be regularly used for movement of terrestrial mammals. Morgantini (1985) reported that pipe — either lying on the ground or welded and lying on skids — acted as a visual and physical barrier to the free movement of moose and deer.

Roads and Traffic. Roads and associated traffic were predicted to create barriers or obstructions to movements of terrestrial mammals (BLM, 1972). In the vicinity of the TAPS ROW, caribou, moose, bison, muskoxen, Dall sheep, mountain goats, bears, and wolves encounter roadways (i.e., Dalton and Richardson Highways, rural two-lane roads, and pipeline access roads) during seasonal migrations and as components of their annual home range.

Road crossing success along TAPS is primarily a factor of traffic volume (Lawhead, 1997; Cronin et al., 1994), and environmental factors such as insect harassment, predation threat, disturbances, and snow depth. Cameron et al. (1985) reported that crossings of the Dalton Highway by CAH caribou were predominately by bulls, with calves composing only 3 percent of the caribou in crossing groups during spring and summer 1977-82. They concluded that maternal cows were sensitive to human activities. In contrast, Jakimchuk et al. (1987) proposed that cows with calves avoided riparian habitats, not TAPS, as a predator avoidance strategy.

The no-action alternative would result in contouring and hydroseeding of TAPS access roads, and the Dalton Highway would remain in place. During the 3 years of active DR&R, traffic volumes along the Dalton Highway would likely be greater than those currently experienced. During the calving season, this increase may affect the movement of maternal cow and calf caribou across the highway. Traffic volumes could be restricted during calving as mitigation. It is presumed that traffic along the Dalton Highway would be reduced from current levels after completion of DR&R, although public use for recreation and tourism would likely increase (BLM, 1998; Jeffrey, 1993). Adverse effects of traffic along the Dalton Highway on terrestrial mammals movements are expected to be minimal.

Disturbance and Displacement

Aircraft and Vehicle. Terrestrial mammals would encounter various types and levels of disturbance during active DR&R. Aircraft disturbance would include helicopter and light fixed-wing aircraft flights at presumably irregular intervals along various sections of the route. Disturbances would also include use of light-aircraft landing strips, and the use of airports at Deadhorse and Prudhoe Bay by helicopters and commercial and light fixed-wing aircraft. Vehicle disturbances would likely include heavy machinery, passenger vehicles, foot-traffic, and perhaps snowmobiles and off-road vehicles. These disturbances would occur along the Dalton and Richardson Highways, and TAPS access roads and work pads.

After DR&R, aircraft and vehicle disturbance would probably be reduced. Aircraft flights and vehicle traffic on the Dalton Highway would likely be recreational and therefore not regulated by current TAPS-related mitigation measures. These mitigation measures include temporal and spatial specifications for aircraft disturbance, with respect to work within the ROW.

The effects of aircraft overflights on wildlife vary among species, populations, environmental variables, levels of habituation, and habitat type (McKechnie and Gladwin, 1993; Miller, F.L., and Gunn, 1984). In addition, aircraft disturbance responses depend on aircraft type and flight al-

titude, with helicopters and low-flying military jet aircraft being generally more disturbing to terrestrial mammals than light fixed-wing aircraft (Maier et al., 1998; Côte, 1996; Bleich et al., 1994; McKechnie and Gladwin, 1993; Davis et al., 1984; Valkenburg and Davis, 1984; Fancy, 1982.). Animals that range near airports or other continuous sources of aircraft disturbance may be exceptions to this pattern and appear to become habituated to them (Maier et al., 1998; McKechnie and Gladwin, 1993; Davis et al., 1984; Valkenburg and Davis, 1984).

Aircraft disturbance associated with the no-action alternative would not likely affect terrestrial mammal populations in the vicinity of the TAPS ROW, assuming that flights are in compliance with lease stipulations. Short-term aircraft disturbance to individuals may occur. Short-term disturbances from vehicles may adversely affect individuals in the vicinity of the ROW. These impacts are likely to result from the operation of heavy equipment and from increased traffic volumes. However, these impacts could be mitigated through compliance with lease stipulations in sensitive areas (APSC, 1993). In addition, disturbance is probable as the work force during DR&R increases; wildlife in the vicinity of the active DR&R areas could be harassed or hazed by humans. These impacts could also be mitigated by compliance with lease stipulations.

Animal Feeding. The intentional feeding of wildlife and/or the use and habituation of some species to anthropogenic food sources such as garbage were common problems during TAPS construction, particularly in camps and at pump stations (Schmidt, 1999, pers comm.; Stephenson, 1999, pers. comm.; Hunter, 1999, pers. comm.; Follmann and Hechtel, 1990; Milke, 1977). During this time, active feeding of animals such as bears, wolves, foxes, squirrels, gulls, and ravens by pipeline workers, in addition to improper garbage handling and disposal, resulted in "large numbers" of animals being attracted to camps and areas of human activity (Milke, 1977, p. 1). Milke (1977) reported that animal feeding problems continued during the operation phase of TAPS, although the frequency and magnitude had decreased. Current Alyeska policy mandates that employees be disciplined and/or fired for intentionally feeding wildlife. Nuisance animals are hazed by trained Alyeska personnel, and may be translocated or killed if problems persist. There is general consensus among state and Alyeska biologists and environmental personnel that animal feeding by Alyeska personnel is no longer a problem along TAPS (Stephenson, 1999, pers. comm.; Schmidt, 1999, pers. comm.). However, animal-feeding problems associated with public and commercial use of the Dalton Highway may still occur (Brown, D., 1999, pers. comm.).

During active DR&R, the potential exists that animal feeding and nuisance animal issues may again be problematic because of increased numbers of workers who may have less training in environmental aspects of the project, and have a shorter-term view of the consequences of their actions. However, continued enforcement of Alyeska policy on garbage management and intentional animal feeding, in addition to education of DR&R workers regarding the adverse effects of feeding wildlife, should reduce impacts. After DR&R, animal-feeding problems associated with public use of the Dalton Highway may occur. Public awareness and education programs could be implemented for hunters, tourists, and recreationists using the Dalton Highway corridor.

Displacement. BLM (1972) predicted that terrestrial mammals would be displaced as a result of activities associated with TAPS construction. The no-action alternative in the short term could displace animals as a result of disturbances and/or habitat change. Potential effects of displacement could be realized at the individual and/or population levels and may include displacement to adjacent habitats, increased mortality, increased activity budgets, and/or changes in group composition.

Roby (1978) and Cameron et al. (1979, 1985) reported that caribou groups with calves during summer were sensitive to activities and traffic along the Dalton Highway north of Pump Station 4. They suggested that this was a group response to vehicular traffic and construction activity. In contrast, Carruthers et al. (1984) investigated factors besides human activity which may affect the distribution of cows and calves adjacent to TAPS. Their 1981-83 survey results indicated that cows with calves avoided river valleys and riparian habitats (whereas bulls preferred riparian habitats), and that the habitats preferred by females were not associated with the TAPS ROW. They concluded that variables such as habitat and sexual segregation influenced the distribution of caribou adjacent to the TAPS ROW. Jakimchuk et al. (1987) further proposed that cows with calves avoided riparian habitats, not TAPS, as a predator avoidance strategy.

There is no evidence that other caribou herds in the vicinity of the ROW (i.e., NCH, DCH) were displaced as a result of TAPS construction (Valkenburg, 1999; Carruthers and Jakimchuk, 1987; Eide et al., 1986; Gasaway et al., 1983). Caribou south of the Brooks Range have maintained traditional migratory routes and in some cases have expanded their ranges to now encounter TAPS.

There is no evidence that populations of Dall sheep, muskoxen, bison, or moose were displaced as a result of TAPS construction (DuBois and Rogers, 1999; Reynolds,

P., 1998; Eide et al., 1986; Jakimchuk et al., 1987). Aircraft and vehicle disturbances have been reported to elicit behavioral and physiological responses in individual ungulates, but they are generally short-term and are not reflected at the population level.

Brown bears have been locally displaced from roads in British Columbia, Montana, Alaska, and Yellowstone National Park, Wyoming (McLellan and Shackleton, 1989; Mattson, 1988; McLellan, 1988; Archibald et al., 1987; Harting, 1987 and references therein; Miller, S., and Ballard, 1982). In most cases, individual bears avoided areas within 1 km of roads, but no population-level effects were reported. McLellan and Shackleton (1989) reported that predictable human activities might displace bears; strongest responses were to the presence of humans on foot in open areas of low human use. S. Miller and Ballard (1982) reported that following translocation, three sows with cubs were delayed or deflected by the Glenn Highway.

During active DR&R, traffic volumes along the Dalton Highway would likely be greater than those currently experienced. This relatively short-term disturbance may affect movements of caribou cows and calves across the highway during the calving season. Traffic volumes could be restricted during the caribou calving period as mitigation for potential displacement effects.

Traffic along the Dalton Highway would probably be reduced following DR&R, although public use for recreation and tourism would likely increase (BLM, 1998; Jeffrey, 1993). Public awareness and education programs could be implemented to reduce the likelihood of displacing terrestrial mammals from the Dalton Highway corridor. Adverse effects of traffic along the Dalton Highway on terrestrial mammals movements should be minimal.

Habitat Loss, Alteration, or Enhancement

Impacts of the no-action alternative on terrestrial mammal habitat will likely be similar to those that occurred during construction, although much progress has been made in understanding of the effects of human activities on wildlife populations and in mitigating potential adverse effects. Habitat alteration and loss issues associated with the no-action alternative are related to wetlands and riparian areas, oil spills, fire suppression, habitat loss and reclamation, and species-specific sensitive areas (McKendrick, 1999a, b; Cronin and Bickham, 1998; Bridges et al., 1997; Dominske, 1997; Doucet and Garant, 1997; Hurst, 1997; Macks et al., 1997; Duffy et al., 1996; Cameron et al., 1995; Armentrout and Boyd, 1994; Jorgenson and Joyce, 1994; Truett et al., 1994; Garant and Doucet, 1993; Maki, 1992; Walker and Walker, 1991; Gasaway et al., 1989; Senner, 1989; MacCallum, 1988; Morgantini and Bruns, 1988; Morgantini and Worbets, 1988; Walker, Cate et al., 1987; Gasaway and DuBois, 1985; Hartley et al., 1984; BLM, 1981; Kavanagh and Townsend, 1977; BLM, 1972).

Wetlands and Riparian Areas. Wetlands, especially riparian areas, provide habitat in the form of food, travel corridors, cover, and shelter for many terrestrial mammal species (Senner, 1989). Concern has been expressed over the role of wetlands in limiting wildlife, primarily in arctic regions (Senner, 1989). The TAPS ROW and the Dalton Highway accounts for an estimated 69 percent of wetland losses related to petroleum development in Alaska — an estimated 0.02 percent of Alaska's wetlands (Pamplin, 1979).

During active DR&R, work in wetlands and riparian areas would be monitored through state and federal regulations designed to reduce impacts to fish and wildlife habitat. Assuming compliance with these regulations, active DR&R would not adversely affect terrestrial mammal habitats associated with wetlands and riparian areas. Following completion of DR&R, there would be minimal disturbance in wetlands and riparian areas in the vicinity of TAPS, except for use by recreationists, hunters, and fishermen.

Oil Spills. Oil spills were common during TAPS construction (Kavanagh and Townsend, 1977). Since then, spill contingency plans have been prepared for the pipeline, spill reporting and consistency have improved, employee training and education have been enhanced, and spill regulations are strictly enforced.

Crude oil spills will not occur under the no-action alternative. During DR&R, some fuel spills could occur, but these would generally be confined to gravel roads and facilities. The probability of exposure of terrestrial mammals to spills is small and would be limited to a few individuals. Minimal impacts to terrestrial mammals are likely to occur from oil spills.

Wildfire. Wildfire is a natural occurrence in Alaskan ecosystems and is a primary agent of change in the boreal forest. Periodic fire creates or improves habitat for browsing and grazing species such as moose and bison (BLM, 1981). Moose populations may increase following fire due to increased browse production, unless they are limited by factors other than habitat — i.e., predation, hunting. This is the case for many of the moose populations in the vicinity of the TAPS ROW, although seasonal and opportunistic use of burned areas may increase (Gasaway et al., 1989; Gasaway and DuBois, 1985). Wildfires are also beneficial to bison because fire stimulates new growth of grasses and forbs (DuBois and Rogers, 1999; BLM, 1981). Caribou may be adversely affected by fire in the short-term; how-

ever, long-term benefits include rejuvenation of stands of lichen with declining production (BLM, 1981).

During active DR&R, fire suppression efforts would likely be maintained at the current levels. After completion of DR&R, protection would likely be decreased in areas where fire would not threaten human life or infrastructure (ADNR, 1999b). Levels of fire suppression associated with the no-action alternative would not adversely affect terrestrial mammal populations and may benefit those that are limited by food availability.

Habitat Loss and Reclamation. Some terrestrial mammal habitat was directly lost as a result of TAPS construction (Jorgenson and Joyce, 1994; Truett et al., 1994; Pamplin, 1979). Many disturbed areas have since been revegetated to restore wildlife habitat and are used by a variety of species (McKendrick, 1999b; Jorgenson and Joyce, 1994; Senner, 1989; MacCallum, 1988; Morgantini and Bruns, 1988; BLM and USACE, 1988; Jorgenson and Joyce, 1994). Habitat loss from active DR&R would likely be less than that realized during TAPS construction. Because buried pipe would remain in place, direct ground disturbance would be reduced. Also, gravel pads and access roads would be hydroseeded, potentially improving available forage (Kraeger, 1976). Habitat loss and alteration would be negligible after active DR&R. Presuming the end of ROW maintenance, native patterns and processes would likely be restored in the long term.

Species-Specific Sensitive Habitats. Losses or alteration of species-specific sensitive habitats are potential impacts associated with DR&R. Calving areas and mineral licks have been identified as critical areas for caribou, moose, and bison along the ROW. Many of these sensitive habitats have been protected through the implementation of BLM-designated ACECs (BLM, 1989). Activities in all identified sensitive habitats for terrestrial mammals in the vicinity of TAPS are regulated by federal and state mitigation stipulations, which are in place to minimize adverse impacts on wildlife. Assuming that all stipulations and mitigation measures currently in place will continue during active DR&R, the no-action alternative would not adversely impact sensitive species-specific habitats.

Mortality

Terrestrial mammal mortality was predicted to be a potential consequence of TAPS construction (BLM, 1972). TAPS-related mortalities during construction included vehicle collisions, increased non-hunting kills (i.e., defense of life and property, and nuisance animals) (Follmann and Hechtel, 1990), and mortality from oil spills.

Vehicle Collisions. Vehicle collisions with terrestrial mammals, particularly moose, are an issue of public safety, as well as a notable source of wildlife mortality. In 1996, the ADOT identified rural two-lane highway segments with the highest moose-vehicle accident reports (ADOT, 1996) and concluded that most accidents occurred on rural highways surrounding major cities and towns. None of the identified segments was on the Richardson or Dalton Highways (ADOT, 1996). Mitigation measures employed by ADOT to reduce moose-vehicle collisions on high-accident segments include moose fencing and underpasses, one-way gates, continuous illumination, and increased public awareness (ADOT, 1996; Del Frate and Spraker, 1991; McDonald, 1991).

In Alaska, moose/vehicle collisions averaged 630 per year between 1995 and 1997 (ADOT, 1997). In comparison, a minimum of 1,200 moose — a number that is approximately 10 percent of the annual allowable harvest — are killed each year on highways and railways in British Columbia (Child et al., 1991). In GMU 13, which is bisected by the TAPS ROW and the Glenn Highway, approximately 50 moose are killed a year (1994-98) from collisions with motor vehicles (Sinnott, 1999, pers. comm.). A small proportion of the annual number of moose killed in collisions annually occurs in the vicinity of the TAPS ROW (Sinnott, 1999, pers. comm.; Martin, P., 1999, pers. comm.; Billbe, 1999, pers. comm.). Vehicles kill fewer than 10 Delta bison annually (Kiker and Fielder, 1980). Numbers of other terrestrial mammals killed in vehicle collisions are unknown. Whitten (1999, pers. comm.) indicated that vehicle collisions with wildlife are rare. None of the terrestrial mammal populations examined in this review is limited by vehicle collision mortality. Numbers are dictated primarily by predation, severe weather, and hunting; and population management objectives are being met.

Wildlife-vehicle collision rates increase as a result of increased traffic volumes and the proximity of wildlife to roadways. Attraction to roadways occurs as a result of roadside maintenance procedures, road-salt accumulation creating man-made mineral licks, and the presence of roads in concentration areas and travel corridors. The above-mentioned mitigation measures are designed to reduce the number of collisions based on these wildlife attractants. However, increased traffic volumes are a result of increased human population numbers and improved access. As the Dalton Highway increases in recreational value and its use is advertised and encouraged (BLM, 1998), traffic levels may increase.

It is probable that increased human activity during active DR&R could result in increased wildlife/vehicle collisions. It is not likely that these mortalities would adversely affect

terrestrial mammal populations. After DR&R, recreational use of the Dalton Highway could increase (BLM, 1998), but industrial traffic would decline dramatically.

Mortality — Non-Sport. Several wildlife species such as brown and black bears and wolves may become habituated or attracted to human activities, often leading to conflicts with people (Whittaker and Knight, 1998; McCarthy and Seavoy, 1994; Mattson et al., 1992; Follmann and Hechtel, 1990; Follmann, 1989; McLellan, 1989; Miller, S., and Chihuly, 1987). During TAPS construction, the intentional feeding of wildlife was a major concern (Follmann and Hechtel, 1990; Kavanagh and Townsend, 1977).

Follmann and Hechtel (1990) reviewed the history of nuisance bear problems and TAPS between 1971 and 1979. They reported that 71 percent of problems with bears occurred north of the Yukon River, where inadequate garbage disposal and widespread animal feeding created dangerous situations. Of the 192 officially reported bear problems associated with TAPS, 65 percent involved the presence of bears in camps or dumps, while remaining problems were associated with the feeding of bears on garbage or handouts (13 percent), property damage or economic loss (10 percent), bears in and under buildings (7 percent), and charges by bears (5 percent). Control measures for nuisance bears included hazing, relocations, and/or shooting; 25 black bears and 13 brown bears were shot between 1971 and 1979 (Follmann and Hechtel, 1990).

S. Miller and Chihuly (1987) examined the circumstances during which non-hunting (i.e., other than sport or subsistence hunting) brown bear deaths occurred in Alaska between 1970 and 1985. They reported that of 224 persons who reported killing bears, 72 percent of the bears were shot to avoid perceived danger, 21 percent to protect property, and 7 percent to eliminate nuisances. Non-hunting bear kills increased during the study period, with 40 percent being reported from coastal areas near Juneau, Kodiak Island, and the Alaska Peninsula. S. Miller and Chihuly (1987) concluded that non-hunting kills were most prevalent when humans were in bear habitat (i.e., hunting and fishing) and that areas with highest human densities (Anchorage, Kenai Peninsula, Matanuska Valley) had the highest ratio of non-hunting to sport harvests. Human activities associated with TAPS operation and maintenance were not addressed in S. Miller and Chihuly (1987).

It is probable that increased human activity during active DR&R could result in increased mortality of nuisance wildlife. However, it is unlikely to be the major problem documented during TAPS construction. Alyeska policy prohibits intentional feeding of wildlife, improvements in garbage management have been implemented, and public awareness has been increased on the danger of animal feeding. Presuming compliance with all garbage-handling regulations by all DR&R workers, it is expected that increases in nuisance wildlife mortality would be minimal during active DR&R. It is not likely that these non-hunting mortalities of individuals would adversely affect populations.

After completion of active DR&R, it is expected that increased recreational use of the TAPS ROW could occur (BLM, 1998), and it is likely that non-hunting mortalities of brown bears may increase. Public awareness and education programs could be implemented to reduce the likelihood of increased non-hunting mortality of nuisance animals within the TAPS ROW. Implementation of the no-action alternative may adversely affect some individuals, but population-level effects are unlikely.

Oil Spills. The effects of land-based oil spills on terrestrial wildlife populations have not been thoroughly investigated. No reported terrestrial-mammal mortalities due to land-based oil spills were identified, and available evidence does not indicate that this is a major source of mortality at the population level (Stephenson, 1999, pers. comm.; Hunter, 1999, pers. comm.). Deer, mountain goats, and brown bears in the vicinity of Prince William Sound were potentially exposed to the *Exxon Valdez* oil spill; an unknown level of deer mortality occurred (Nowlin, 1993a, b, 1994, 1995a, b). Based on available evidence, there were no population-level impacts on terrestrial mammals as a result of the *Exxon Valdez* oil spill.

During active DR&R, there is a risk of land-based oil spills. It is possible that exposed terrestrial mammals would be adversely affected, including the likelihood of mortality. It is presumed that oil spill prevention and response measures will be in place and complied with during active DR&R. However, the effects of a land-based spill on mortality of terrestrial mammals depends on spill type, size, location, season, and response effectiveness.

Harvest by Humans

Concerns have been raised about potential impacts of harvest by humans on terrestrial mammals related to impacts in previously undisturbed wilderness areas that are now accessed by the Dalton Highway. Issues are related to management and population objectives (i.e., harvest numbers, hunting pressure, animal wounding), compliance with regulations (i.e., Dalton Highway Corridor Management Area, firearms, monitoring and enforcement effort), and access. These issues are not unique to the TAPS ROW, and have been addressed in other areas of North America (James and Stuart-Smith, 2000; Hay and Mohrman, 1993; Ricard and Doucet, 1993). Section 3.2.5 contains back-

ground information and data on particular species, as well as population and harvest trends and status.

South of the Yukon River, relatively few concerns have been identified with respect to the TAPS ROW and harvest by humans. The Richardson Highway was in place before construction of the pipeline and ROW, and therefore the issue of access into a previously undisturbed large area is not relevant. However, public access has been created with trespass permission on Alyeska property (Schmidt, 1999, pers. comm.; Lawlor, 1999, pers. comm.; Shoulders, 1999, pers. comm.). In these cases, although hunting is not allowed from or within the ROW, the hunting and recreating public may travel within and across the ROW to previously isolated areas.

North of the Yukon River, the Dalton Highway has provided access into a previously remote and isolated area. There is concern that this increased access has adversely affected moose, caribou, wolf, and bear populations as a result of increased harvests (Yokel, 1999, pers. comm.) and the wounding of animals. However, Smith (1999) concluded that although use of the DHC has increased since 1991, populations of moose, caribou, brown bears and wolves have not been adversely impacted. Monitoring and enforcement of regulations along the Dalton Highway have been variable (Smith, W., 1999).

Beginning in 1980, summer traffic on the Dalton Highway was allowed as far north as Dietrich Camp, and starting in 1984 year-round access was permitted. Travel was restricted to commercial vehicles north of Dietrich Camp (Smith, W., 1999). In 1991, the Dalton Highway was opened to public traffic along its entire length, but shortly thereafter was officially closed north of Dietrich Camp as a result of court challenges. The highway's entire length was reopened by administrative order in December, 1994 (Smith, W., 1999). According to W. Smith (1999, p. 1), "Although the northern section of the Dalton Highway was officially closed (between 1991 and 1994), the prohibition was largely ignored, and there was extensive hunting from the road. State policy dictated that the closure was not enforced as a primary statute, but was placed on a secondary status, similar to Alaska's seatbelt law. This meant violations of the road permit regulation were only cited in association with other violations."

Current hunting regulations north of the Yukon River include the DHCMA in addition to regulations for each GMU. DHCMA boundaries extend 8 km (5 miles) from each side of the Dalton Highway, including the highway's drivable surface, from the Yukon River to the Prudhoe Bay Closed Area. Management objectives of the DHCMA were developed to discourage behavioral reinforcement of summer avoidance of facilities by caribou cows with calves (Whitten, 1999, pers. comm.). Restrictions in the DHCMA include the following:

- The DHCMA is closed to hunting with firearms, but big game may be taken by bow and arrow;
- No motorized vehicles, except aircraft, boats, and licensed highway vehicles, may be used to transport game or hunters within the DHCMA; and
- Any hunter traveling on the Dalton Highway must stop at any check station operated by ADF&G in the DHCMA (ADF&G, 1999g).

ADF&G has maintained a hunter check station on the Dalton Highway since 1991 to monitor hunting pressure, and to provide information to hunters within the DHC and in GMUs adjacent to the road (Smith, 1999). More than half of all hunters registering at the check station are making their first trip up the Dalton Highway. Most (75 percent) hunters are Alaskan residents, 69 percent of whom reported home addresses in the areas of Fairbanks, northern Interior, Anchorage, Chugiak or Eagle River. Approximately one-fourth of hunters using the DHC are on active military duty (Smith, W., 1999).

W. Smith (1999) reported that in any year, several factors combine to influence the number of hunters using the DHC. Factors that encourage hunter use of the corridor include good weather, good road conditions, early (early August) influx of caribou near the road in GMU 26B, reduced availability of Tier 1 permits for the Nelchina caribou herd, lowered bag limits for other registration hunts, and State promotion of tourism to Alaska. The State does not specifically promote use of DHC (unlike BLM-Dalton Unit, see BLM, 1998); however, promotion of tourism is likely to increase use of the DHC (Smith, W., 1999). Factors that discourage hunter use of the DHC include the 5-mile walk for rifle hunters, closure of moose and nonresident brown bear hunts in GMU 26B, reduced numbers of caribou near the road after August 15, lack of facilities between Coldfoot and Prudhoe Bay, and lack of paving (Smith, W., 1999).

The following is a excerpt from W. Smith (1999, pp. 7-8) regarding harvests of these populations:

> "The number of hunters for the 4 major big game species increased substantially in 1998, but harvest remained similar to previous years. As in the past few years, most caribou were taken in August near Toolik Lake, probably from eastward excursions of the large Western Arctic Herd (ca. 460,000) to the Dalton Highway. Consequently, the resident Central Arctic Herd in Unit 26B remains lightly harvested and, with current firearms restrictions with the DHC, should not

be much affected by increased hunting pressure. Since the closure of Unit 26 to moose hunting, hunters using boats for access have shifted to waterways south of the Brooks Range such as the Koyukuk River and Bonanza Creek. This, along with increasing number of hunters using the road for access, resulted in the highest take of moose in Units 20F and 24 since 1991. Although hunting pressure has been localized along the road and the few navigable waterways off the Dalton Highway, moose harvest should be monitored in these units. Sheep brought through the check station represent only a small proportion of sheep harvested in units adjacent to the Dalton Highway. Since most successful sheep hunters use aircraft, increased hunting pressure from the road and by boat will have only minimal effects on sheep harvest. Changing the Unit 26B brown bear regulations caused a significant decrease in brown bear harvest to below the harvest quota. The increased harvest in Unit 24 was not caused by incidental take by higher numbers of hunters using the road or boats, but by an increased take by hunters using aircraft. However, similar to moose, brown bear harvest in Unit 24 should continue to be monitored carefully for increased incidental harvest."

The increase in Alaska's human population since TAPS construction has undoubtedly increased the hunting pressure on the state's wildlife. ADF&G has responded to this pressure where necessary by restricting seasons and bag limits. Many moose and caribou populations in the state are limited by predation, and ADF&G has implemented predator-control programs to increase the number of ungulates available to hunt. Although these programs have been controversial at times, ADF&G management objectives include direction to provide recreational harvest opportunities, which requires management for productive moose and caribou populations.

In addition, changes in land ownership and land uses (i.e., access for hunting and fishing) in the early 1980s redistributed hunting pressure in the entire state. Areas that had previously been available for hunting were restricted due to federal land use regulations for National Park Service lands (e.g., Wrangell-St. Elias National Park and Preserve, Gates of the Arctic National Park) (Mumford, 1999, pers comm.; Heimer, 1980). Thus, hunting pressure in those areas not taken over by the federal government increased concurrently with TAPS-related increases in population.

Hunting pressure and harvests have increased for most wildlife species. However, ADF&G management objectives are being met for most wildlife populations. Bag limits and seasons have been adjusted to allow for maximum sport-hunting opportunities without adversely impacting the population. Many populations are successfully managed (i.e., numbers regulated) through hunting. Increases in harvest and hunting pressure have not produced adverse population-level effects. The increased workforce associated with active DR&R may increase hunting pressure on terrestrial mammals in the vicinity of the ROW and across the state.

After TAPS operations cease and DR&R is complete, a potentially important impact on terrestrial wildlife is increased harvests from a variety of sources (i.e., legal, illegal, sport, and subsistence). The end of operations of the oil industry in the ANS oil fields, TAPS, and the VMT will be accompanied by significant reductions in statewide employment and incomes. This may increase pressure on wildlife (e.g., sport and subsistence hunting) if residents use wild foods to compensate for the loss of income. If decreased state revenue results in less enforcement of game regulations, this impact could be intensified. However, it is also possible that the human population (and wildlife harvests) will decrease in response to the economic decline. Regulation and monitoring by the appropriate agencies will be needed to manage this potential impact.

Furbearers and Small Mammals

Obstructions to Movements. Localized obstruction to movement of furbearers and small mammals would occur in areas of heavy activity during DR&R as elevated pipe, culverts, and pump stations were being removed. Heavy equipment operations and high levels of human activity would create localized barrier effects for furbearers and small mammals. Such effects would last less than 3 years over approximately half of the TAPS route.

Disturbance and Displacement. The human presence and activities associated with DR&R activities would disturb individual animals that reside in areas where such activities or human presence has been uncommon. Such disturbance would be substantially greater than under normal operation and maintenance, although the effects generally would be localized and temporary, and thus unlikely to have significant consequences for the disturbed animals, except in the case of denning foxes, coyotes, river otter, wolverine, or lynx. Animals habituated to human presence or regularly subject to human disturbance unrelated to TAPS activities, such as near population centers or areas of major activity, would be less affected by DR&R activities.

Small accidental spills could occur during DR&R, although large spills would presumably be much less likely than during operation of the pipeline. Spill cleanup activi-

ties could disturb small numbers of resident furbearers and small mammals. It is unlikely that disturbance associated with spill response would have population-level impacts on furbearers or small mammals.

Deliberate displacement of problem animals in protection of life and property, either through hazing or live-trapping and releasing, could increase during DR&R. The creation of problem animals through garbage mishandling or deliberate feeding could increase during DR&R (as it did during TAPS construction) due to the large numbers of workers operating in remote locations where food-handling regulations and animal feeding prohibitions are more difficult to enforce. Beavers could continue to cause flooding near camps and work sites and would need to be displaced as long as drainage patterns through culverts were maintained. Although nuisance animals would be a threat to human health, it is unlikely that deliberate displacement of problem animals would have population-level consequences for furbearers or small mammals.

After abandonment, former access roads and pads would provide attractive campsites for tourists, hunters, and other recreationists, which would disturb and possibly displace furbearers. Additionally, the use of those sites and of the TAPS ROW as a travel corridors for snowmachines and ATVs could increase substantially after abandonment and the termination of access restrictions. All species would be affected by increased human use, particularly by vehicle disturbance, but the consequences of such disturbance would likely be minor for most furbearer species, except foxes, coyotes, lynx, river otter, and wolverine, which actively avoid humans and are susceptible to disturbance during denning (Olliff et al., 1999).

Habitat Alteration/Enhancement. During DR&R, habitat alteration would result from (1) ground disturbance, such as VSM and pipe removal and other earthwork during DR&R, (2) dust fallout from increased traffic associated with DR&R activities along unpaved portions of the highway (particularly the Elliot and Dalton Highways north of Fairbanks), and (3) waste discharges and accidental spills. Following DR&R, habitat alteration would result from regrowth of shrubs and trees in the ROW. Cessation of vegetation management along TAPS would result in decreases of early successional (grassland) habitats and small mammals relying on such habitats, and an increase in late successional (shrub and forest) habitats and associated species of furbearers and small mammals (e.g., red squirrels, red-backed voles, and marten). The net effect eventually would be to return about half of the TAPS ROW to a state more comparable to that existing before construction, depending on the success of revegetation on the gravel workpad, pump station pads, and access roads.

Ground disturbance and to a lesser extent, waste discharges and spills, would affect relatively large areas of the TAPS ROW during DR&R, but would likely affect only those small mammals (voles, lemmings, and squirrels) resident in the immediate vicinity. Early thaw and green-up from dust fallout along unpaved roads would attract many herbivorous animals and, consequently, their predators (Thompson, 1999, pers. comm.; Shoulders, 1999, pers. comm.; Martin, P., 1999, pers. comm.; Bright, 1999, pers. comm.; McIntosh, 1999, pers. comm.). The magnitude of dust fallout would increase during DR&R because of the higher traffic volume. Such effects would continue after DR&R due to tourist and other traffic, but would not be direct impacts of the project.

Another form of habitat alteration would be the attraction of predators and scavengers by food and garbage scent or by handouts in areas of human activity. DR&R would mimic the impacts that occurred during TAPS construction (Milke, 1977; Follmann et al., 1980), although improvements in garbage management practices, worker education, state law, and stricter enforcement since the construction period would help to minimize such problems. However, incidents of property damage, inadvertent or deliberate feeding, and animal control measures, including shooting offending animals, have continued at low levels during operation. The large increase in number of people working in remote areas during DR&R would undoubtedly result in an increase in animal feeding problems. Of the furbearers and small mammals, the species most likely to become nuisance animals due to the availability of human foods are arctic and red foxes, coyotes, wolverines, and red and ground squirrels. Although nuisance animals would be a threat to human health, the effects during DR&R would be temporary, and significant population-level consequences would be unlikely.

Mortality. Increased traffic levels during DR&R would result in increased roadkills, especially in the northern portion of the ROW. As previously mentioned, concentrations of wildlife near unpaved highways occur during the period of spring snowmelt, and increased roadkills are observed during that period. All species of furbearer and small mammals would be affected, but arctic and red foxes, ground squirrels, and porcupines would be most susceptible. However, this mortality source probably would not cause significant population-level consequences for furbearers and small mammals.

Accidental oil or chemical spills and waste discharges would cause mortality in the spill areas, potentially affecting small numbers of all species present. Aquatic or semi-

aquatic mammals would be most vulnerable, including beaver, muskrat, mink, and river otter. Population-level effects for furbearers and small mammals are unlikely to result from small spills; the size of the spill and required response would determine the population consequences.

Mortality of furbearers or small mammals would result from deliberate action taken against problem animals (Brown, D., 1999, pers. comm.; Shoulders, 1999, pers. comm.; Preston, 1999, pers. comm.). As previously mentioned, the creation of nuisance animals would be likely to increase during DR&R. Foxes and other animals exhibiting symptoms of rabies are shot and their heads sent to the University of Alaska for testing (APSC, 1998e). Furbearers and small mammals that would most likely be killed to prevent disease transmission or property damage include arctic and red foxes, coyotes, ground squirrels, and voles and mice. Beavers would cause flooding near camps and work areas during DR&R and would need to be trapped, moved, or shot as long as culvert maintenance was important. Although problem animals would be a serious legal risk and threat to human health, it is unlikely that there would be population-level consequences by the killing of nuisance furbearers or small mammals.

Increased densities of predators/scavengers attracted to areas of human activity would result in increased predation pressure on prey populations. Although the attraction of predators and scavengers to DR&R camps and work sites would be greater than during operation (as described above), the overall effects would be temporary during DR&R and not chronic as during the operational phase. Long-term depression of prey populations would therefore be unlikely, and the impact would be minor.

Similarly, increased densities of predators and scavengers would increase the occurrence and rate of transmission of enzootic diseases, including rabies (Follmann et al., 1988). The primary reservoir of rabies in the arctic is arctic foxes, whereas south of the Brooks Range, red foxes and other carnivores are a greater concern (Winkler, 1975). Although the risk of transmission of rabies (and other diseases) to humans would increase, the effects on wildlife populations susceptible to rabies would be temporary and the impact would likely be minor.

Harvest by Humans. Improved access and campsites provided by the abandoned right-of-way, access roads, and pads would result in increased legal and illegal harvest of all furbearer species. It is unknown what regulations would be promulgated by the state, BLM, or ADF&G after abandonment of the right-of-way, particularly whether the state would continue to prohibit the use of firearms and motorized vehicles by hunters within the Dalton Highway corridor north of Livengood. Trapping and hunting regulations would be adjusted accordingly to protect and manage wildlife populations. It is unlikely, however, that illegal take would decrease or that monies for enforcement would increase after TAPS use were terminated. As with the proposed action, improved access provided by the TAPS ROW and access roads to hunters and trappers would likely be the greatest single impact on furbearers after DR&R.

4.4.2.6 Threatened and Endangered Species

By R. Ritchie, D. Troy, and J. Kidd

Birds

Two species listed as threatened under the federal Endangered Species Act (Spectacled Eider and Steller's Eider) and two delisted subspecies of Peregrine Falcon (the *tundrius* and *anatum* races) would potentially be affected by activities associated with the no-action alternative. The endangered Eskimo Curlew evidently no longer occurs in Alaska. No listed terrestrial mammals or plants occur within the ROW. Because of similarities among the remaining listed species, the discussions of environmental consequences have been combined for both eider species and for both peregrine subspecies.

Spectacled and Steller's Eiders

DR&R likely would have negligible effect on the two threatened species of eiders. No records of Steller's Eider within the TAPS ROW are known, indicating its rarity; thus, deleterious impacts are unlikely. Spectacled Eiders occur regularly in low numbers in the vicinity of the northern portion of TAPS; however, records near the area of operations or facilities are few. Compared to routine operations, human activity and the potential for disturbance will be higher during the process of dismantling the pipeline and Pump Station 1. Given the limited overlap among the distributions of these species and TAPS facilities, scheduling activities to occur outside the period when eiders are present on the tundra would effectively eliminate disturbance impacts. Summer activities along the TAPS ROW and at Pump Station 1 could probably occur with little or no disturbance of Spectacled Eiders; however, if the Deadhorse and northern Dalton Highway infrastructure were used to any great extent for storage, transport, and staging, incremental disturbance of eiders would likely occur. Following decommissioning of TAPS, overall disturbance would be reduced and some minor changes in habitat availability would ensue. Early melt zones along the Dalton Highway would diminish as traffic on the highway and workpad decreased, whereas persistent snowdrifts adjacent

to the above-ground pipeline would diminish.

Obstructions to Movements. Roads and pipelines do not appear to be major barriers to eider movements. The greatest potential for obstruction of movements would occur during the brood-rearing period of the nesting cycle, when flightless Spectacled Eider with broods cross roads in the Prudhoe Bay oil field (TERA, 1995, 1996b). Increased activity on the TAPS workpad and the Dalton Highway during DR&R would hinder attempts to cross either structure. Removal of the pipeline and TAPS facilities would eliminate them as a source of obstruction to eiders, and would lead to diminished traffic on the Dalton Highway.

Disturbance and Displacement. The evidence for sensitivity of Spectacled Eiders to disturbance is mixed, as was explained for the proposed action. DR&R initially would increase disturbance (for 1 to 3 years, unless scheduling permits all decommissioning to occur during the winter) but would decrease disturbance in the long-term following complete removal of facilities.

Habitat Alteration and Enhancement. Spectacled Eiders use roadside impoundments in the Prudhoe Bay and Kuparuk oil fields (Warnock and Troy, 1992; Anderson et al., 1996). Thus, the habitat modifications along the TAPS workpad and Dalton Highway may have enhanced these areas for Spectacled Eiders. Use of TAPS or Dalton Highway impoundments away from Deadhorse has not been documented. DR&R would not eliminate impoundments entirely, because the Dalton Highway and TAPS workpad would not be removed. Changes in snowmelt may alter the availability of these areas to Spectacled Eiders, however. Reduced traffic after DR&R would diminish the early melt zone along the Dalton Highway. The opposite effect of earlier melt would occur along the workpad after removal of the above-ground pipeline and attendant snow-fence effect.

Mortality. No mortality of Spectacled Eiders due to TAPS infrastructure has been documented. Use of roadside impoundments poses a limited risk for traffic-associated mortality, especially near Deadhorse, although no records of such mortality have been located. This risk would increase due to increased traffic during DR&R and then would decrease following removal. To the extent that predator populations may be augmented by TAPS activities, Spectacled Eider nest success could be depressed to a minor degree. After removal of TAPS, predator populations would be expected to decline. Oil spills would be a risk factor; however, the low use of areas adjacent to TAPS makes this a small risk. The process of dismantling the pipeline likely would increase the incidence of small spills.

Harvest by Humans. Hunting of Spectacled and Steller's eiders is prohibited throughout the state, and permits are not issued to collect any eider eggs in Alaska for captive propagation by private breeders. Thus, it is presumed that no harvest of these eiders occurs. DR&R would not be expected to affect the harvest of either species.

Peregrine Falcon

DR&R likely would have negligible long-term effects on both *anatum* and *tundrius* subspecies of Peregrine Falcon along TAPS. Temporary losses in productivity and displacement at some nesting areas might be increased by the greater levels of disturbance associated with DR&R activities. In addition, some man-modified habitats (e.g., VSM perches) would be removed, influencing some behaviors and habitat use by peregrines; survival would not be affected adversely by removal of facilities.

Obstructions to Movements. Activities associated with DR&R of TAPS would not be likely to pose obstructions of movements by Peregrine Falcons within the TAPS ROW.

Disturbance and Displacement. Potentially disturbing activities associated with DR&R would include increased helicopter and fixed-wing aircraft traffic near nesting areas, heavy-equipment operations and associated loud noise, and activity by ground parties. Impacts would include temporary disturbance and possibly avoidance of some nesting sites in high-activity areas. However, standard mitigation stipulations would reduce or eliminate those impacts.

Habitat Alteration and Enhancement. DR&R activities along TAPS would result in both permanent and temporary changes in nesting and foraging habitats of Peregrine Falcons. Most DR&R activities affecting habitats (e.g., gravel removal, reclamation of borrow sites) would occur at sites already heavily modified or altered; the emphasis of restoration would be to return habitats to as natural a state as possible. Therefore, traditional nesting and foraging habitats for Peregrine Falcons likely would not be impacted negatively by DR&R actions.

The removal of buildings and elevated portions of the pipeline would eliminate some artificial substrates used for resting and perching by peregrines. Their removal would not result in population-level impacts, but would simply cause the birds to shift to other perch locations.

Mortality. As described for the proposed action, direct or indirect mortality of Peregrine Falcons related to pipeline activities has been rare. White et al. (1977) concluded that no demonstrable negative impacts were attributable to TAPS construction activity. In at least one nesting area along TAPS (Sagwon Bluffs on the Sagavanirktok River), however, productivity was low to nil during the years of major TAPS construction (Roseneau et al., 1981). Although contamination with DDT is now generally considered to be

the major reason for low productivity in Alaska peregrines during that period, the possibility that some pipeline-related activities (e.g., Haul Road construction) affected productivity cannot be eliminated (Roseneau et al., 1981). Productivity on the Sagavanirktok River was lowest during pipeline and road construction years 1974-76 (Roseneau et al., 1981). Therefore, it is possible that pipeline removal operations would cause temporary, but important, disturbances that might temporarily reduce the productivity of the Sagavanirktok population by causing nest desertion and egg and nestling loss. Appropriate mitigation strategies, such as seasonal restrictions on activities near nest sites, would mitigate the negative impacts of DR&R activities.

Harvest by Humans. Falconry uses of Peregrine Falcons would be similar to those described for the proposed action. No other uses of the species would be affected by DR&R actions.

Plants

No threatened or endangered plants occur along the TAPS route. Therefore, no effects are discussed.

Terrestrial Mammals

No threatened or endangered terrestrial mammals occur in Alaska. Therefore, no effects are discussed.

4.4.3 Social Systems

4.4.3.1 Economy

By O.S. Goldsmith, L.D. Maxim, and R. Niebo

This section provides estimates of the combined direct, indirect, and cumulative economic effects of the no-action alternative for the pipeline, ANS oil fields, marine transportation link, and other industries in Alaska. (See also the cumulative effects discussion in Section 4.5.) The economic methodology used requires that these effects be considered together. Other social impacts of the no-action alternative could be separated largely based on geography, so that only direct impacts of the pipeline are addressed here. Cumulative social effects are included in Section 4.5.

The economic effects are significant, wide-ranging, and have not been addressed in any previous EIS or EA.[1] Brief summaries are included at various points in the text for the reader interested in an overview.

Since completion of the economic analysis summarized here, oil prices increased substantially above the $16 per bbl used in the model (>$30 per bbl in October 2000). It is not feasible to replicate this analysis in response to every crude-oil price movement. However, an upward shift in oil prices will magnify the economic impacts presented here. First-order impacts of this change include substantial (factor of two) increases in revenues to various levels of government. To the extent that higher prices persist, the economics of marginal fields and other oil and gas developments become more attractive. Development of these fields would increase future ANS production and pipeline throughput and, therefore, revenues. In turn, greater revenues result in "ripple" (multiplier) effects throughout the Alaskan economy. Although some effects would be adverse — such as higher prices for gasoline, diesel fuel, heating oil — most are beneficial for oil-producing regions. The differences between the impacts of the proposed and no-action alternatives are likewise affected. Therefore, the adverse economic impacts of the no-action alternative estimated here are understated at present crude oil prices.

Key Economic Assumptions: Pipeline Termination

- **Pipeline Operation:** The last crude oil flowing through TAPS arrives at Valdez at the beginning of 2004 (i.e., the production and throughput profile given in Appendix A drops to essentially zero).[2] All employment associated with pipeline operation, including contractor employment and special projects, terminates at the beginning of 2004. At shutdown, the full-time-equivalent (FTE) employment directly associated with the pipeline is 1,828 — 700 in operations, 800 working under contract, and 328 associated with special projects. Workers are concentrated in Fairbanks and Valdez, with a small number in Anchorage (Table 4.4-3).
- **Pipeline DR&R:** Activities related to DR&R will commence in 2002 and continue for six years, ending in 2007. Tasks in the two years before the pipeline is shut down include planning, mobilization, and preparatory construction. Actual DR&R (cleaning and purging the pipeline; dismantling the pipeline, pump stations, and VMT; and scrap disposals) start in 2004 and continues for three years. The final year consists of demobilization. The time required for DR&R is consistent with available information. The particular

[1]The no-action alternative is addressed in each of the North Slope EISs, but they do not discuss the total effects of a cessation of oil and gas operations on the ANS. Nearly all of the material contained in Section 4.4.3.1 is original. The source for all tables and figures in Section 4.4.3.1 is original analysis by section authors.

[2]Production from the Kenai Peninsula continues; however, this is small in comparison to ANS production.

schedule for DR&R is an assumption. In reality, it is unlikely that DR&R planning and mobilization would be initiated in 2002 while the ROW renewal process is underway. However, this assumption recognized the extensive planning efforts that will be required before actual on-ground DR&R begins. Overall impacts will be essentially the same if DR&R planning is postponed several years.

FTE employment associated with DR&R (Table 4.4-4) is estimated based on expenditures projected from existing studies of the cost of DR&R (Fluor, 1983). The 1983 Fluor study estimated the cost of DR&R in 1982 dollars to be $1.553 billion plus $159 million for post-commissioning facilities ($1.0125 billion in 1977 dollars). The cost converted to 2004 dollars using the Anchorage Consumer Price Index for Wage Earners is $2.6305 billion.

Work in the field is seasonal and requires remote camps for dismantling the above-ground portions of the pipeline and the pump stations. Pipe and other material from the northern part of the line are taken to the North Slope to be moved by sea lift for ultimate disposal. Fairbanks is the staging area for the central portion of the pipeline with material transported to Seward or Whittier by truck or train. Valdez is the staging area for the southern portion of the pipeline and the terminal. Because of the seasonality of work in the field, the peak summer employment exceeds the FTE annual employment level by about one-third. Because of the small size of the Alaska labor force [construction employment in 1997 was 13,134 (ADOL, 1988a)], a portion of the labor required for DR&R is provided by nonresidents who commute seasonally, as occurred during pipeline construction. Most of the equipment and supplies are also imported from outside the state due to the small relative size of Alaska's construction industry.

The nature and scope of this DR&R project are unique, and so estimates of employment are suggestive of the general level, timing, and composition of employment that would actually be required. Specific requirements and available technology will determine the actual level of effort.

- **Government and Other Oversight:** With cessation of pipeline operations, JPO activities associated with TAPS and the oil pipelines on the North Slope are no longer necessary. The Prince William Sound Regional Citizens' Advisory Council also ceases operation at the end of pipeline DR&R. Some state and federal workers not associated with these agencies are also no longer required for pipeline oversight. The annual employment associated with this activity is estimated to be 100, divided among federal and state government.
- **Pipeline Total:** Table 4.4-5 shows the total direct pipeline employment effect of the no-action alternative. The employment loss from terminating pipeline operations and government oversight and the employment gain from DR&R of the pipeline create a boom-and-bust pattern. In the main DR&R years of 2004 and 2005, employment jumps, primarily in construction and closely related industries. Subsequently, employment is lower by 1,816 compared to the proposed alternative, primarily due to loss of employment associated with pipeline operations. Because of the size of the Alaska economy, this employment cycle could be absorbed without significant negative consequences during either the boom or bust phases, particularly if a large share of the DR&R workers were not from Alaska. However, localized impacts, particularly at Valdez and Fairbanks, could be severe.

Table 4.4-3. *No-action alternative impact on direct annual average employment of pipeline operations including special projects.*

Year	Total	Fairbanks	Anchorage	Valdez/ Cordova
2004	(1,828)	(934)	(222)	(671)
2005	(1,743)	(858)	(204)	(681)
2006	(1,734)	(853)	(203)	(677)
2007	(1,725)	(848)	(202)	(674)
2008	(1,716)	(843)	(202)	(671)
2009	(1,716)	(843)	(202)	(671)
2010	(1,716)	(843)	(202)	(671)
CONSTANT AFTER 2010				

Table 4.4-4. *No-action alternative impact on direct annual average employment of pipeline DR&R.*

Year	Total	Construc-tion	Transporta-tion	Services
2002	232	116	0	116
2003	553	415	0	138
2004	5,219	3,653	783	783
2005	3,350	2,345	502	502
2006	1,922	1,345	288	288
2007	561	393	84	84
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0

Table 4.4-5. *No-action alternative impact on direct annual average employment of total pipeline-related activity.*

Year	Total	Pipeline Operations	Pipeline DR&R	Pipeline Oversight
2002	232	0	232	0
2003	553	0	553	0
2004	3,391	(1,828)	5,219	0
2005	1,606	(1,743)	3,350	0
2006	188	(1,734)	1,922	0
2007	(1,264)	(1,725)	561	(100)
2008	(1,816)	(1,716)	0	(100)
2009	(1,816)	(1,716)	0	(100)
2010	(1,816)	(1,716)	0	(100)
CONSTANT AFTER 2010				

Table 4.4-6. *No-action alternative impact on North Slope oil field construction and operations direct annual average employment.*

Year	Total	North Slope	Fairbanks	Anchorage
2004	(7,539)	(4,006)	(322)	(3,211)
2005	(7,728)	(4,107)	(330)	(3,291)
2006	(7,918)	(4,207)	(339)	(3,372)
2007	(7,918)	(4,207)	(339)	(3,372)
2008	(7,918)	(4,207)	(339)	(3,372)
2009	(7,918)	(4,207)	(339)	(3,372)
2010	(7,918)	(4,207)	(339)	(3,372)

Note: Does not include indirect job losses.

Key Economic Assumptions:
Termination of North Slope Oil-Related Activity

- **North Slope Exploration and Development:** Without TAPS, North Slope oil production ceases since there would be no viable transportation alternative. A small amount of gas production continues for gas and electric utilities of some North Slope communities. Exploration for new resources also stops, as does development of discovered but not yet producing reserves. Petroleum activity in the Cook Inlet region in Southcentral Alaska is not affected by the shutdown of the pipeline.

  Oil company, oil field services, and construction employment on the North Slope, and in Anchorage and Fairbanks is eliminated by 2010 by termination of North Slope activities (Table 4.4-6). An unspecified number of jobs in business services, transportation, construction, and wholesale trade also terminate. Most of the workers on the North Slope commute from other locations. Many of these workers are not Alaska residents, but the majority live in Southcentral Alaska (including Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough) and in Fairbanks in the Interior.
- **North Slope DR&R:** The North Slope leases, most of which are on state land, require that production facilities be dismantled and removed and the land restored to the satisfaction of the lessor after operations cease. There is no history of North Slope oil field DR&R on which to base an estimate of the cost and manpower requirements for DR&R of the entire North Slope. DR&R of exploration activity on the National Petroleum Reserve 4, west of the present North Slope facilities, took place in the early 1990s, but the limited scope of this activity makes it inappropriate as a basis for estimating the cost of DR&R of the main North Slope facilities (BLM and USGS, 1992). Most of the current information on DR&R of oil and gas facilities concerns offshore oil and gas platforms, where most DR&R is occurring (Kemp and Stephan, 1997).

  The cumulative dollar value of capital investment in oil and gas facilities on the North Slope is about $20.6 billion in 1977 dollars (Deakin, 1989; BP Annual), or $53.6 billion estimated in 2004 dollars adjusted by the Anchorage Consumer Price Index for Wage Earners. The estimated cost of DR&R for the pipeline is about 11 percent of the original construction cost (estimated at $9 billion in 1977 dollars). The DR&R cost for the North Slope facilities will probably be a smaller percentage of the value of facilities in place because the facilities are geographically more concentrated so that logistics will be less challenging. Using an estimate of 5 percent of the value of North Slope facilities as the cost of DR&R yields an estimate of $2.681 billion, approximately equal to the cost of DR&R for the pipeline. Table 4.4-7 shows FTE employment for North Slope DR&R, based on the same distribution of effort by time and industry as the pipeline DR&R.
- **Module Construction:** Fabrication of the larger modules used at North Slope production facilities, originally done in the Lower 48, began in Alaska in the mid-1990s. Smaller-module construction, as well as fabrication of other components, has been occurring in-state for much longer. This construction activity is intermittent, dependent on the characteristics and timing of new field development. Annual average

construction employment in Anchorage, Fairbanks, and on the Kenai Peninsula is estimated at 500 jobs, which are eliminated with the termination of North Slope oil activity (Table 4.4-8).

- **Refining:** Two refineries at Fairbanks and one at Valdez have been built to take advantage of the availability of North Slope crude (ADNR, 1999c). The output of these refineries — primarily gasoline, diesel, and jet fuel — is marketed in Alaska. Upon termination of North Slope production, these refineries cease operations because they lose their crude supply. The next best alternative for them is to import crude from outside the state (Cook Inlet oil production is insufficient to supply these refineries). However, they are configured to use only the lighter portion of the crude they receive from the pipeline, returning the heavier components to the pipeline. They would incur large capital investments to be able to use the entire barrel. Employment at the refineries in Fairbanks is 160 and at Valdez 55, a total of 215 workers (Table 4.4-8).

  A refinery on the Kenai Peninsula predates construction of the pipeline and does not currently rely on North Slope crude for throughput. It continues to operate and serve the Railbelt markets using Cook Inlet and imported crude oil.
- **Air Cargo:** International air cargo activities — primarily at Anchorage International Airport with some activity at Fairbanks International Airport — are dependent on many factors, including competitively priced and locally produced jet fuel. Termination of North Slope production and the subsequent closure of the refineries in Fairbanks and Valdez make it more difficult to supply the airports with competitively priced jet fuel. As a consequence, the airports face greater competition for the international air cargo business from airports in other locations. International air cargo operations directly account for about 2,000 workers in Anchorage (Goldsmith, 1995a, 1998), and their numbers are growing rapidly. With termination of pipeline operations, that growth slows as the competitive position of Anchorage erodes (Table 4.4-8).
- **Other Industries:** High prices for petroleum products impact most Alaska industries and households. In particular, diesel fuel costs are important in the fishing industry. Most smaller Alaska communities without hydroelectric power or natural gas rely on diesel fuel for space heating and electricity. Closing the Fairbanks and Valdez refineries could result in higher petroleum product prices generally, but no analyses have documented either the likelihood of this occurring or its impacts.
- **Shipping:** Closing the Fairbanks and Valdez refiner-

Table 4.4-7. *No-action alternative impact on direct annual average employment of North Slope oil facilities.*

Year	Total	Construction	Transportation	Services
2002	236	118	0	118
2003	564	423	0	141
2004	5,320	3,724	798	798
2005	3,414	2,390	512	512
2006	1,959	1,371	294	294
2007	572	400	86	86
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0

Table 4.4-8. *No-action alternative impact on direct annual average employment of North Slope oil-related activity.*

Year	Total	North Slope Oil Field Operations	North Slope Oil Field Construction	Oil Field DR&R	Oil Field Oversight	Module Construction	Refining	Air Cargo
2002	236	0	0	236	0	0	0	0
2003	564	0	0	564	0	0	0	0
2004	(2,934)	(6,052)	(1,487)	5,320	0	(500)	(215)	0
2005	(5,230)	(6,204)	(1,525)	3,414	0	(500)	(215)	(200)
2006	(7,074)	(6,356)	(1,562)	1,959	0	(500)	(215)	(400)
2007	(8,986)	(6,356)	(1,562)	572	(325)	(500)	(215)	(600)
2008	(9,758)	(6,356)	(1,562)	0	(325)	(500)	(215)	(800)
2009	(9,958)	(6,356)	(1,562)	0	(325)	(500)	(215)	(1,000)
2010	(9,958)	(6,356)	(1,562)	0	(325)	(500)	(215)	(1,000)
CONSTANT AFTER 2010								

ies requires importation of petroleum products to replace a portion of the lost production, dependent on the change in demand for jet fuel for the international air cargo industry. This results in changes in the distribution pattern for petroleum products. Petroleum products moving into Southcentral Alaska by tanker would increase, and products would move north from Anchorage to Fairbanks by railroad. Currently, product moves south along the railroad from Fairbanks to Anchorage. This change could impact the Alaska Railroad. No specific estimates of the employment effect of these changes are available.

- **Government Oversight:** The annual cost to the State of Alaska for management, oversight, and regulation of the oil and gas industry is $44 million (Gladziszewski, 1996). A large portion of this expense would be unnecessary with the termination of oil-related activity on the North Slope. In addition, several federal government agencies devote resources to oversight of North Slope oil and gas activity. The annual employment associated with these activities is 325, mostly in state government (Table 4.4-8).
- **North Slope Oil Total:** A large reduction in employment occurs starting in 2004 because of the employment loss from terminating North Slope oil and gas production, government oversight, and module construction; from refinery closure; and from downsizing of the international air cargo industry with the employment increase from DR&R of the North Slope facilities. In the early years, the loss in the oil and gas industry is partially offset by the increase in construction and other sectors associated with DR&R. Because many of the workers who lose their jobs in the oil and gas sector will not be employed in DR&R, there will be a turnover of workers during this period that is not reflected in the net change in employment. Subsequent to DR&R, North Slope employment is lower by 9,958 compared to the proposed action, primarily due to loss of employment associated with oil activities (Table 4.4-8).

Figure 4.4-3 shows the combined (i.e., pipeline, ANS, oversight, module construction, refineries, DR&R, and air cargo) direct effects of employment gains and losses from 2002 to 2010. DR&R activities both for the pipeline and ANS fields offset other employment losses in the early years. However, losses in operations and construction (both for the pipeline and ANS fields), oversight, and other related industries (modules, refining, and air cargo) combine to create aggregate losses of nearly 12,000 jobs by the year 2009 — losses that are never recovered.

National and State Economic Effects

Compared to the proposed action, closure of the North Slope/TAPS is expected to have very substantial and adverse economic effects at the regional, state, and national levels. The overall level of economic activity drops, employment decreases in many industries as does personal income per capita, although DR&R activities create some short-lived employment opportunities. Federal, state, and local revenues also decrease sharply, which makes it difficult to maintain services and/or to cushion these adverse impacts. DR&R activities create some short-lived employment opportunities, one of the few positive elements in an otherwise bleak economic landscape. Domestic crude production decreases sharply, the trade deficit worsens, and U.S. shipyards lose business because double-hull tankers to serve the Alaskan trade are not required. An abrupt shutdown of nearly all of the Alaskan petroleum industry forecloses opportunities for a smooth transition from a petroleum-based to a more diversified Alaskan economy. Closure and dismantling of TAPS and ANS production infrastructure increase the difficulty of commercializing ANS gas in the future because any such development must pay for developing the infrastructure and a new pipeline. Adverse impacts in a national context include an abrupt decrease in domestic crude production, an increased balance-of-trade deficit, and adverse impacts on domestic shipyards and employment opportunities for U.S. seafarers (Section 4.3.3.1).

Impacts on the State of Alaska are proportionately more significant, amounting to a severe and prolonged economic

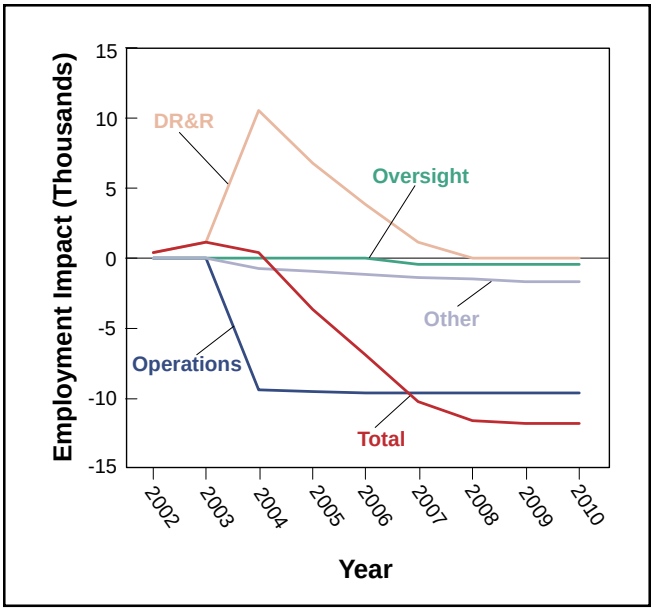


Figure 4.4-3. *Direct annual employment impact of the no-action alternative, 2002 to 2010.*

contraction. State impacts are calculated using a model developed by ISER and described in Section 4.3.3. This model integrates the economic effects of the entire production and transportation system, and thus includes direct, indirect, and cumulative effects.

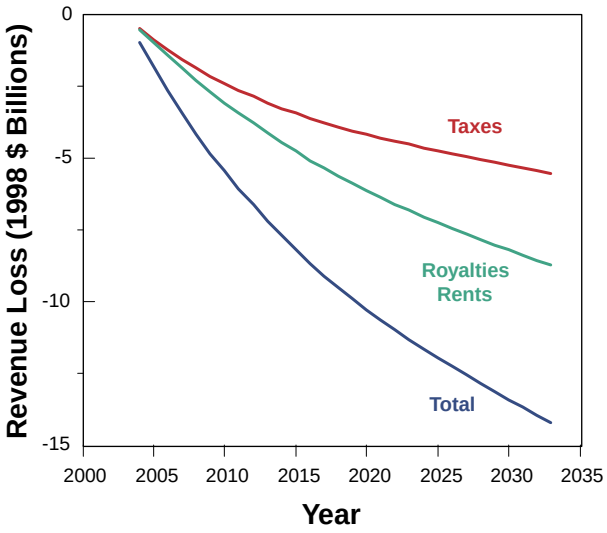
Direct Impacts to State Economy. The combined effect of terminating pipeline operations and North Slope oil production-related activities and start of DR&R is a slight initial increase in employment over the proposed action (peaking at 1,118 in 2003). Two years later, employment drops below projected employment for the proposed action by 3,623 in 2005, 6,886 in 2006, 10,250 in 2007, and 11,575 by 2008. By 2010, employment is projected to stabilize at 11,775 below the proposed action (Figure 4.4-3).

After 2010, no further increase appears in the difference between direct employment levels for the no-action alternative and the proposed action because of the uncertainty associated with projecting specific activities and levels beyond that point in time.

The intensity of the boom and bust associated with the no-action alternative depends on how long DR&R lasts and how abruptly employment associated with North Slope oil production is eliminated.

Although the direct employment loss of 11,775 is only about 3 percent of total wage and salary employment in the state in 2010 (314,000), the loss of economic activity represented by these job cuts is much more significant for several reasons. First, the wage rates in the impacted industries are the highest in the economy, and consequently the proportionate loss of wages is much greater than indicated by the number of jobs lost. High wage jobs are more likely to support a household and contribute more purchasing power to the economy, resulting in a high economic multiplier.

Second, the termination of pipeline and North Slope oil operations directly eliminates a large share of state revenues, as well as local taxes for the North Slope Borough, Fairbanks North Star Borough, the City of Valdez, and to a lesser extent, Anchorage. Based on a $16/bbl oil market price in 2004 (1998 dollars) and production declining at 4.1 percent per year through 2020 and remaining constant thereafter, the loss of revenue to the state from termination of the pipeline and North Slope operations compared to the proposed action would total $14.209 billion (1998 dollars) from 2004 to 2034 (Figure 4.4-4). This includes royalties ($8.402 billion), rents and bonuses ($310 million), severance tax ($3.394 billion), state property tax ($430 million), and corporate income tax ($1.673 billion, including corporate taxes on the pipeline paid by the owner companies). Most of this revenue goes into the state General Fund. In 2004, North Slope oil and pipeline revenues are estimated



Note: Taxes" include property tax, corporate income tax, and severance tax. "Royalties/Rents" include royalties, and rents and bonuses. "Total" includes all these elements.

Figure 4.4-4. *Cumulative lost revenues associated with the no-action alternative, 2004 to 2034.*

to account for 65 percent of state General Fund revenues. In addition, the portion of royalties paid to the Alaska Permanent Fund is eliminated.

This revenue loss is particularly significant because of the relatively larger size of the public sector in Alaska necessitated by the large area, dispersed population, and special needs of Alaska, such as a disproportionately large school-aged population. Public employment (state and local government combined) per capita is 41 percent above the national average, while state and local government spending, adjusted for the cost of living, is 87 percent above the national average (Goldsmith, 2000a). Replacing the lost public-sector purchasing power represented by this loss of tax revenue requires fiscal measures that adversely impact all sectors of the economy.

Several local governments depend on property taxes on North Slope oil production and pipeline facilities to support public services. The loss of revenues to local government from this source is $2.098 billion in 1998 dollars (Figure 4.4-5). The losses are greatest for the North Slope Borough ($1.896 billion) and much smaller (but still significant) for Valdez ($126 million), Fairbanks ($51 million), and Anchorage ($25 million).

Other tax revenues that are not directly identified with oil and gas production and transportation also will decline. Reductions will occur in general local property taxes and the state general corporate income tax as a result of the re-

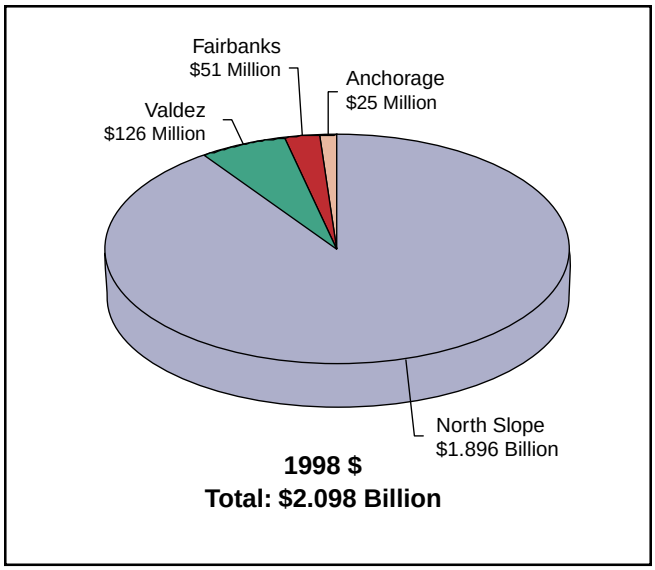


Figure 4.4-5. *Cumulative loss of property tax revenues (1998 $) for the no-action alternative, 2004 to 2033.*

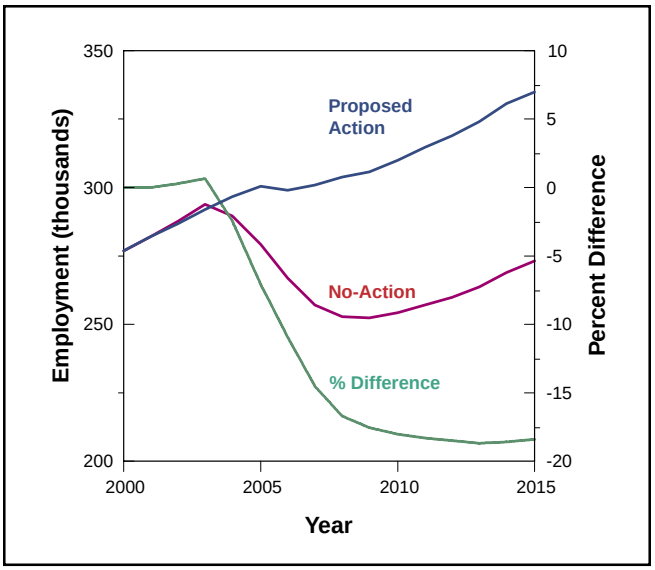


Figure 4.4-6. *Projected statewide employment (thousands) for proposed and no-action alternatives and percent difference, 2000 to 2015.*

finery closures, reduction in international air cargo activity, and the value of oil company headquarters property.

Gross State Product Changes. GSP measures the importance of different activities to the economy and includes not only wages paid to workers and taxes paid to government, but investment in new equipment and profits. Because of the level of investment in oil-related facilities and the profitability of oil, the share of GSP directly attributable to oil production, transportation, and processing is much larger than the oil industry's share of total employment. During the 1990s the share of GSP from oil varied from 46 percent to 19 percent, depending on the price of oil and production (Goldsmith, 1999a). With oil at $16/bbl (1998 dollars), GSP will directly fall by about 30 percent with the no-action alternative compared to the proposed action.

The importance of the oil industry to the Alaskan economy has been documented in a number of studies (Berman et al., 1992; Goldsmith, 1985; Huskey, 1995; Tussing, 1984; McDowell Group, 1999b, 2000). All recognize that its importance is inadequately represented by its share of total state employment. The elimination of oil industry activity puts many Alaska oil field service, environmental, engineering, transportation, construction, and wholesaling firms out of business.

Total (Direct and Indirect) Economic Impact. The direct job loss, wage and other income loss, and state and local government revenue loss will cause additional loss in jobs, income, business activity, population, and government revenues as the purchasing power associated with pipeline and North Slope oil production activity is lost to the economy. Taking into account the multiplier effect of the direct job loss and the loss in government revenues, the pattern of total job loss (wage and salary employment) compared to the proposed action is shown in Figure 4.4-6. Following a small increase in 2002 and 2003 due to DR&R, employment falls rapidly over the next five years to 56,000 (18 percent) below the proposed action by 2010. Unlike the proposed action in which employment increases from 297,000 to 310,000 between 2004 and 2010, employment in the no-action alternative falls to 253,000 in 2009. Although employment begins to rise in 2010, by 2015 it does not return to the level of jobs in 2001. The area between the proposed action and no-action curves in Figure 4.4-6 provides a measure of person-years of employment lost from 2004 to 2015.

The employment loss is shared among almost all sectors of the economy except seafood, timber, mining, and tourism. Trade, services, and finances are particularly heavily impacted — eventually about one in five jobs is lost compared to the proposed action.

The small increase in employment due to DR&R is moderated because some of these workers are not Alaska residents. Since these nonresidents do not live and spend their income in the state, the positive effect of DR&R on the economy is less than if residents worked all these jobs.

The job loss is magnified by the loss of purchasing power from the loss of high-wage jobs. The average annual civilian wage drops to 4 percent below the proposed action case (1998 dollars). Per-capita disposable personal income is further eroded by state government actions to maintain essential government services in spite of the loss of petroleum revenues. Most important is the elimination of the

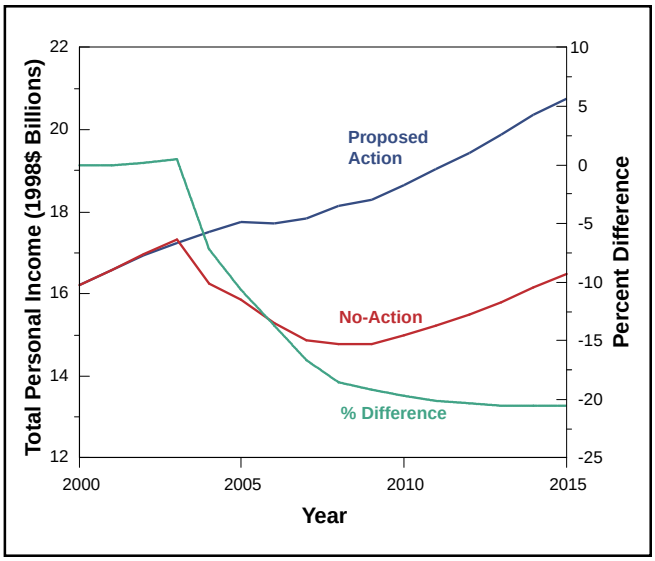


Figure 4.4-7. *Projected state total personal income for the proposed and no-action alternatives and percent difference, 2000 to 2015.*

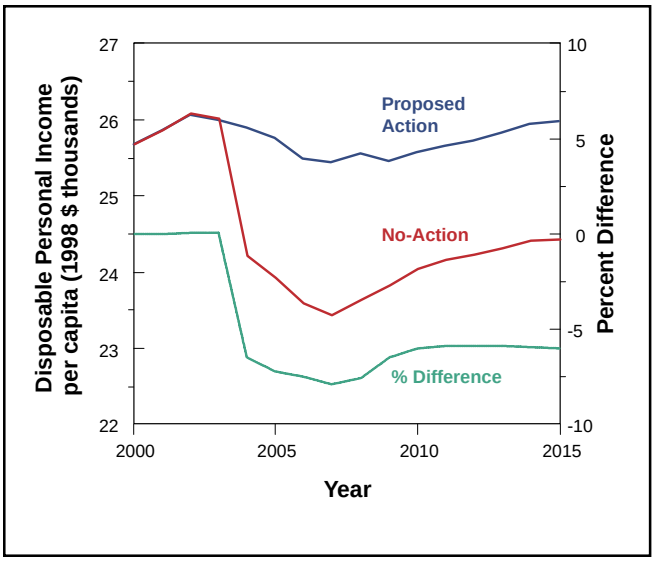


Figure 4.4-8. *Projected disposable personal income for the proposed and no-action alternatives and percent difference, 2000 to 2015.*

Permanent Fund Dividend. Although projected to gradually decline in the proposed action, in the no-action alternative it is immediately eliminated in 2004 in order to fund necessary public services. The loss of the dividend reduces the purchasing power of Alaska households throughout the state. Lower-income households are particularly adversely impacted, while the job loss is concentrated in the urban areas where most of the retail trade and service jobs are located. Total personal income falls below the proposed action by $1.258 billion in 2004 (1998 dollars) and by $3.680 billion (20 percent) in 2010 (Figure 4.4-7).

Disposable income per capita[3] is lower by 6.5 percent in 2004 and 6 percent in 2010 in the no-action alternative (Figure 4.4-8). This is due to the lower average annual wage rate, the early phase-out of the Permanent Fund Dividend, and the loss of nonwage income from the outmigration of higher-income households from the state. Estimates presented in Figure 4.4-8 are annual. Cumulative losses in disposable personal income are represented by the area between the proposed action and no-action curves in Figure 4.4-8.

Non-oil GSP, which is the best measure of the aggregate demand produced by the regional economy, falls below that associated with the proposed action by 16 percent in 2010 (Figure 4.4-9). This decline represents a reduction in the size of the market and with less competition and a loss of business leading to increased bankruptcies.

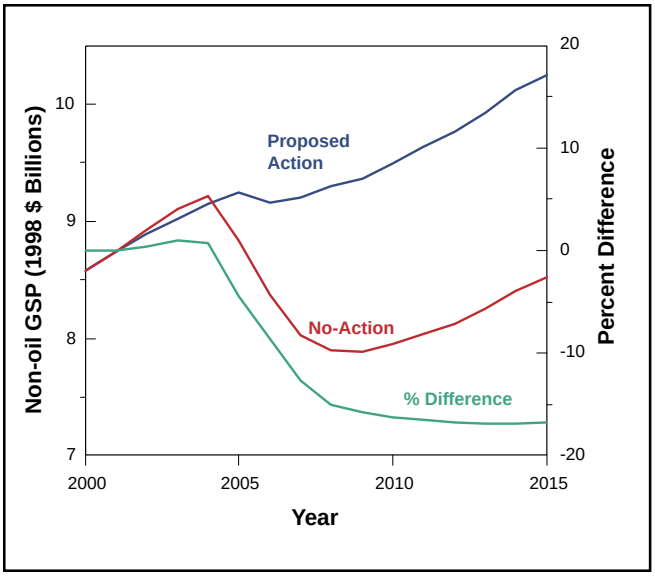


Figure 4.4-9. *Projected non-oil gross state product (GSP) for the proposed and no-action alternatives and percent difference, 2000 to 2015.*

The unemployment rate peaks at nearly 11 percent in 2006 and 2007 compared to 8 percent in the proposed action. This is due to two factors. First, the boom associated with DR&R of the pipeline and North Slope oil facilities draws more workers to Alaska from other states than are required to fill the available jobs. Subsequently, the drop in jobs outstrips the rate at which workers can adjust. Over several years, potential workers drop out of the job market or move to other states. Eventually, in 2014, the unemployment rate reverts to its level in the proposed action.

[3] Disposable income — the amount of current income households or individuals have to spend and/or save — is calculated as personal income minus personal income taxes. Disposable income/capita is disposable income divided by population; it represents the personal income available each person has to spend and/or save.

Net migration is the primary method by which the labor market clears in Alaska. The annual movement of people into and out of the state is large compared to the total population, and when fewer jobs are available in the state, the inflow slows at the same time that the outflow increases. Net in-migration increases slightly during the first stage of DR&R in the no-action alternative but turns negative in 2004. Net outmigration peaks at 20,000 in 2006, and population outmigration continues through 2010.

By 2010, net outmigration causes the population to fall to a level 15 percent below the proposed action. The loss is concentrated in the non-Alaska-Native population. A similar decline occurs in the number of households. The population falls absolutely from a level of 671,000 in 2004 to 621,000 in 2009 and regains the previous peak only in 2015 (Figure 4.4-10).

The decline in population and the number of households results in under-utilization of private and public fixed assets. In the private sector this is most evident in excess vacancy rates in the housing stock and in commercial real estate. Based on experience from four previous slumps in the Alaskan economy, the excess inventory of empty residential units and commercial buildings has four impacts (Goldsmith et al., 1988; ADOL, 1988a):

- The price of real estate falls below replacement cost, and so there is no new construction and the quality of the stock does not improve as it would with normal replacement.
- The fall in the price of the stock puts many property owners "under water" — i.e., the market price of their property is below the outstanding mortgage on the property. This creates an incentive to walk away from the mortgage and default on the loan. Defaults in turn put pressure on the banks.
- The large inventory of vacant real estate invites vandalism and adversely affects the perception, if not the reality, of the quality of life in the community.
- Property tax values and revenues decline.

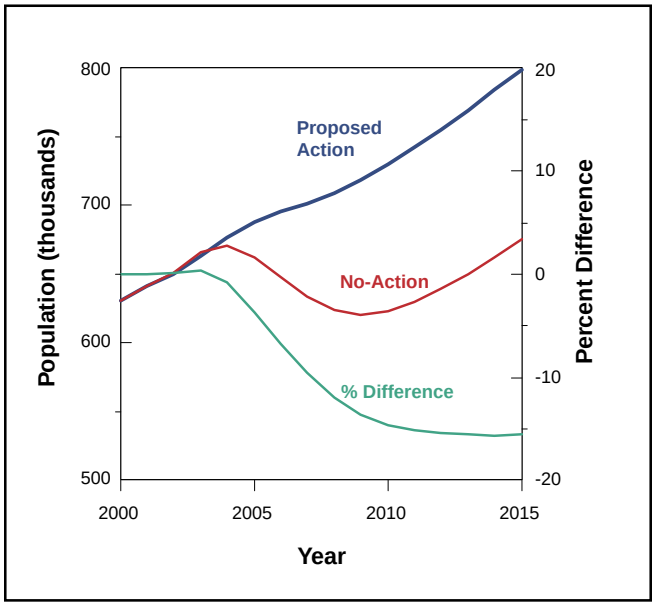


Figure 4.4-10. *Projected state population for the proposed and no-action alternatives and percent difference, 2000 to 2015.*

The population decline will have adverse impacts on other sectors of the economy, such as the utility and health care industries, that have high fixed costs. The unit cost of providing services in these sectors increases because the fixed costs are spread over a smaller number of customers. The same is true in the public sector, where operating and maintenance costs of the fixed stock of capital — schools, roads, office buildings — are shared by a smaller population than had been anticipated at the time it was built.

At the same time, the population decline relieves pressure on fixed assets and resources where congestion detracts from the quality of life. For example, the number of cars on the road decreases, and pressure from sport hunting and fishing demand decreases. Although these are arguably positive impacts, recession and outmigration are not appropriate means to reduce congestion.

The loss of pipeline and North Slope oil revenues sharply reduces the revenues realized by the state and the main communities along the pipeline. Other revenues also decline as the economy and population contract. The state can partially offset the loss in revenue by diverting Permanent Fund earnings from the dividend to the state budget, but the amount available from this source is less than the lost pipeline and oil-related revenues.

Figure 4.4-11 shows the impact of the no-action alternative on the amount and composition of state revenue by year from 2000 to 2015. Some care is necessary in interpreting this graph, which shows the differences in annual revenues for the no-action alternative relative to the proposed action, not absolute levels of revenues for either alternative. For example, oil revenues apparently plummet in 2004 because they go to zero in the no-action alternative when the ROW is terminated, whereas they are large and positive in the proposed action. Therefore, the difference in revenues is negative. In later years, the difference between the alternatives gradually decreases as throughput declines in the proposed action. The difference in Permanent Fund earnings between the two alternatives first increases — not because fund earnings would be higher in the no-action alternative but because the Permanent Fund Dividend is assumed to be eliminated and the funds are retained by the state. Figure 4.4-11 also shows the annual total from these

sources of revenues. This total is negative for each year, indicating that the no-action alternative provides less income to the state even after the Permanent Fund Dividend is eliminated. On a cumulative basis (i.e., summing the annual totals), the state is worse off by approximately $4.1 billion (1998 dollars) at the end of 2015.

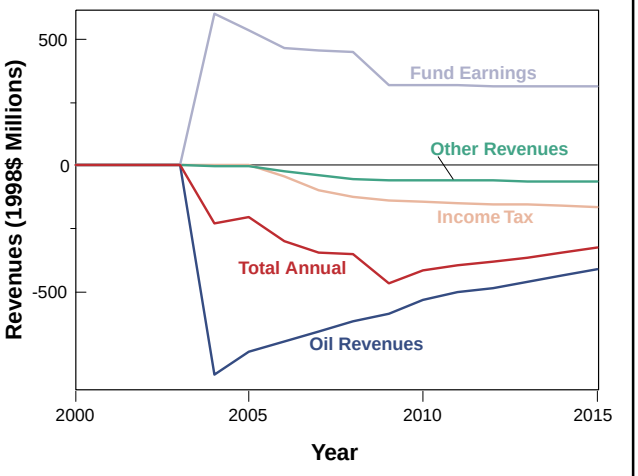
State expenditures per capita are constrained by available revenues and also fall 5 percent below the proposed action. Although terminating pipeline operation and North Slope oil activity reduces staffing needs in the state agencies overseeing those activities, several factors contribute to an increase in the average cost of public-service delivery:

- Outmigration is concentrated among urban workers, leaving a larger share of the population in rural Alaska, where both per-capita public service requirements and the costs of service delivery are higher.
- The dislocations associated with an increased incidence of job and income loss as well as bankruptcies place additional demands on the health and social service agencies.
- The fixed costs of government, such as the maintenance of schools and roads, are shared among a smaller population.

The balance in the Permanent Fund will be lower in the no-action alternative by a smaller percentage due to the termination of new deposits from North Slope oil revenues in 2004 — even though royalties from Cook Inlet oil and gas production continue to be deposited in the fund. The Alaska Constitution allows only the earnings of the fund to be used, and fund earnings are slightly less in the no-action alternative.

As with state government, local government's ability to pay is reduced in the no-action alternative by the loss of property taxes associated with oil production and transportation. Other revenues also decline as the size of the economy and population contract. Figure 4.4-12 shows that the decline in state government's ability to support local governments through transfers is the most important revenue loss to local governments. The decline in nonpetroleum property taxes, other types of taxes, and charges compound the loss. In total, revenues in 2010 fall 24 percent below the proposed action and exceed the percent drop in population, so that the ability of local government to pay for public services is also reduced. Cumulatively, from 2000 to 2015, local revenues are lower by over $6.5 billion (1998 dollars) in the no-action alternative — a very substantial adverse impact.

For a short period there is some upward pressure on the price level due to the demand for labor and equipment associated with DR&R. This quickly is more than offset by a drop in housing prices resulting from the high vacancy rates when population declines. Only after the excess housing stock has been reabsorbed does the price of housing return to the level reflecting its replacement cost. Two other factors will tend to elevate the price level. First is the fixed cost burden shared among a smaller population. Second is the



Note: Graph shows the differences in annual revenues for the no-action alternative relative to the proposed action, not absolute levels of revenues for either alternative.

Figure 4.4-11. *No-action alternative impact on composition of state revenues, 2000 to 2015.*

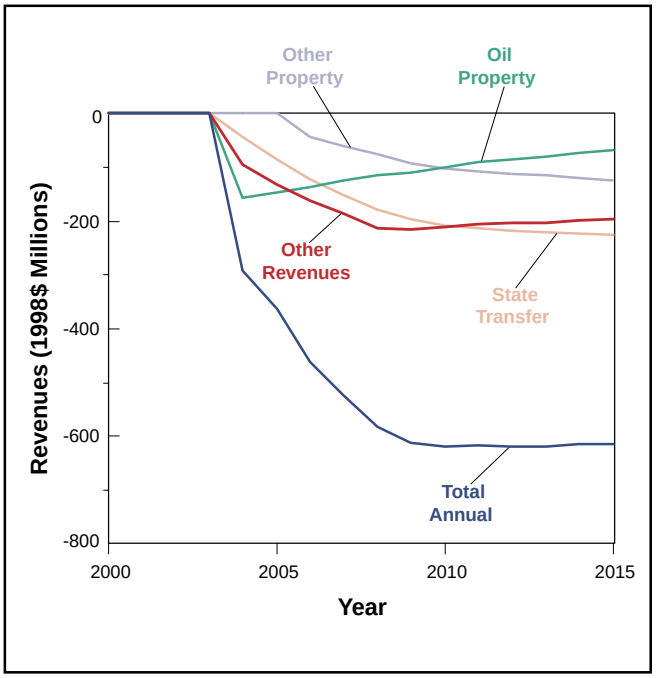


Figure 4.4-12. *No-action alternative impact on composition of local revenues, 2000 to 2015.*

loss of some economies of scale and competitive pressure on prices which are the result of the smaller economy.

Figure 4.4-13 shows the per-capita change from the no-action alternative for several variables. Both private and public income decline.

As indicated by prior Alaska recessions, the long decline in employment and subsequent slow recovery in the no-action alternative undermine consumer and investor confidence in the future of the economy (Foster et al., 1988). This results in reduced consumer spending, less new business activity, and the likelihood of additional outmigration, particularly of those individuals able to take advantage of economic opportunities elsewhere.

The recession that occurred in Alaska from 1986 to 1988 and the earlier slowdown between 1977 and 1979 after construction of the pipeline provide some indication of what economic conditions would be like in Alaska in the no-action alternative. Both of these economic downturns were much less severe than would be the downturn from removing the oil pipeline and North Slope oil activity. The more recent downturn did not involve elimination of a basic industry in the economy, and the earlier one was cushioned by positive expectations and growth from pent-up demand factors. In contrast, the no-action alternative downturn is the result of eliminating an important basic industry in the state, combined with a long period of extremely low consumer and business confidence. Figure 4.4-14 contrasts the projected drop in state employment and the time required to regain the former job level in the no-action alternative with the actual drop and recovery time for the recessions of the 1980s and 1970s. The recession from the no-action alternative is both much deeper and much longer.

The recession of 1986 to 1988 was the result of runaway government spending quickly brought down to earth by a drop in the price of oil in early 1986, combined with a private-sector expectation that the boom had no end. The loss of jobs and income was concentrated in the urban centers and the construction, trade, and finance industries. When the excess capacity in these industries had been shaken out, the economy began to recover because the strength of the basic sectors of the economy was not adversely impacted. By 1989, the economy had bottomed out and was starting its recovery, although not all sectors recovered at the same rate (Goldsmith, 1991).

Anchorage, as the trade and service center of the state, was the hardest hit. Seasonally adjusted wage and salary employment in Anchorage fell 11 percent between July 1985 and March 1988, leading to outmigration of more than 21,000 in 1986. This, in turn, resulted in a vacancy rate for apartments of 25 percent in 1986. The excess capacity resulted in a drop in the number of new housing units authorized from a peak of 9,082 in 1983 to 183 in 1987. New housing only hit the 1980 level of 1,071 again in 1993. No multifamily units were built for three years. Sales and prices of housing fell, contributing to a jump in the number of bankruptcies from 228 in 1983 to 1,094 in 1987. State-

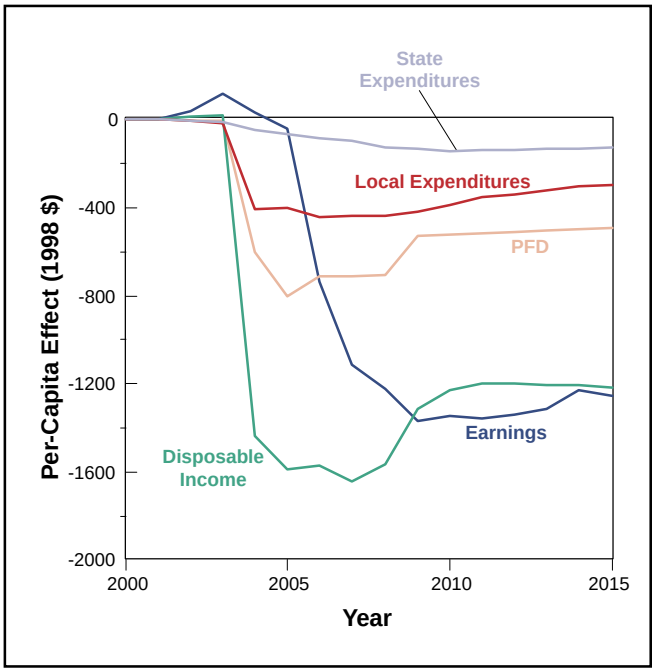


Figure 4.4-13. *Per-capita impact of the no-action alternative, 2000 to 2015.*

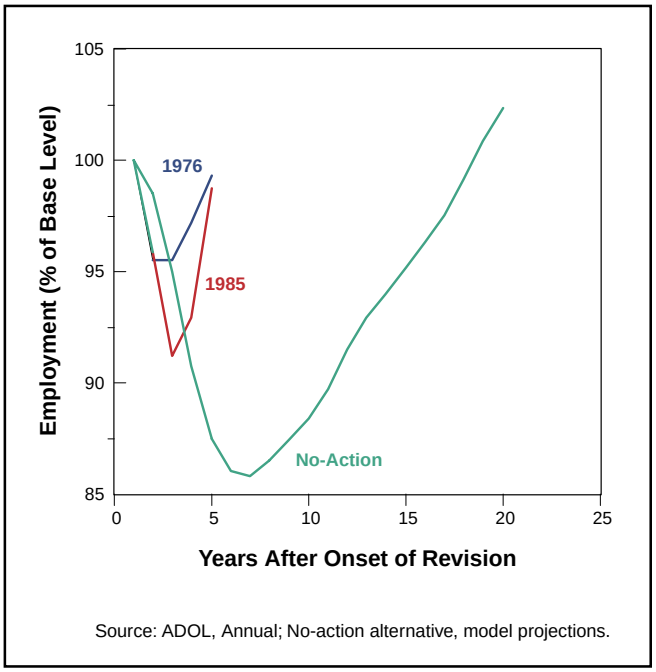


Figure 4.4-14. *Employment projections for the no-action alternative compared with the recessions of 1976 and 1985.*

wide, the number of banks and credit unions fell from 17 in 1983 to eight in 1989. School enrollments in Anchorage fell by 2,106 between 1984 and 1988. The assessed value of property in Anchorage fell from $15.011 billion in 1986 to $8.324 billion in 1989 (Municipality of Anchorage, 1997).

The economic slowdown after construction of the pipeline was less than anticipated for several reasons (Section 3.3.1) (ADCED, 1978):

- A large percentage of pipeline construction workers were not Alaska residents. The impact of these transients on the economy during the construction of the pipeline was modest.
- Construction of a gas pipeline from the North Slope was expected to begin within a year or two of completion of the oil pipeline. This moderated the outmigration of construction workers who had moved to the state during the oil-pipeline construction years. It also created an environment of consumer and business confidence conducive to spending and investment.
- A large amount of household and business income earned during pipeline construction was available, and spending of this income augmented the normal consumer spending and investment.
- Oil revenues collected after the pipeline began operation were used to expand state and local government expenditures.

None of these factors would apply if the no-action alternative were implemented.

Removal of the pipeline and the oil-related facilities on the North Slope will reduce the options for subsequent economic development employing the oil and gas resources there. The impacts of the no-action alternative are measured against a relatively conservative projection of oil and gas activity on the North Slope in the proposed alternative. The level of oil and gas activity on the North Slope would likely exceed this level if the pipeline remained operational and the facilities on the North Slope were not removed. Removal of the pipeline and ANS production infrastructure would essentially preclude a gas commercialization project in the foreseeable future. Likewise, oil exploration and development activities would cease.

Removal of the pipeline and cessation of oil-related activity on the North Slope narrow the economic base of the state. Without a viable petroleum industry (except for the small activity in Cook Inlet) and the activities dependent on it, the economic base of the state will consist of federal government spending (including military spending), non-oil resource industries (seafood, timber, and mining), and tourism. This reduces the stability of the economy and increases its seasonality.

The resource industries are particularly vulnerable to commodity cycles that influence prices and demand. The instability this creates in employment and income in these industries is compounded by the great distance of Alaska from market centers. The result is a “last-in and first-out” phenomenon whereby Alaska resource production, employment, and income levels tend to be more sensitive than those of competitors located closer to market centers. Although this is also true for petroleum, the Alaska economy is somewhat insulated from petroleum commodity cycles because of the size of the companies involved in production in Alaska. As a consequence, employment and income levels in the oil industry are more insulated from swings in market price and demand than in industries where the companies are smaller and less able to ride out market swings.

Seafood and tourism are highly seasonal industries, and mining and timber also have some seasonality; direct and indirect employment associated with all these industries is higher in the summer than the winter. In contrast, pipeline and oil activity has little seasonality, and some exploration and development activity increases in the winter months. Consequently, the elimination of pipeline and oil employment increases the seasonality of the overall economy. This in turn impacts the utilization rate for fixed assets, the mix of jobs between residents and nonresidents (nonresidents account for a greater fraction of the workforce in highly seasonal industries), and the stability of the economy. The larger the share of workers that live outside the state and the greater the seasonality of employment, the smaller will be the overall economic activity in the region. This is because support businesses in trade, services, and infrastructure will not be able to depend on a steady flow of business throughout the year.

It must be recognized that the pattern and timing of the economic impacts of the no-action alternative are impossible to project with certainty for several reasons:

- Assumptions about the timing of events may be incorrect. Most importantly, DR&R activities and rampdown of employment on the North Slope could be compressed into a shorter time or extended over more years. This would tend to exacerbate or ameliorate the economic expansion and a subsequent downturn associated with DR&R and termination of pipeline and North Slope operations.
- It is impossible to anticipate the events that would precede selection of the no-action alternative. These events could influence how and when businesses and households respond to the downturn in economic activity.

- Measures taken by state and local governments to make up for the loss in revenues from pipeline and petroleum operations and other sources will determine where and when the impact occurs. In particular, if the state chose to liquidate the Permanent Fund, which is currently protected by the state constitution, the near-term economic impact of the no-action alternative would be reduced, but in the longer term the impact would be increased since the earnings of the fund are an important source of purchasing power in the economy.

Regional Effects of the No-Action Alternative

This section details the economic impacts of the no-action alternative on various regions of the state. These impacts were estimated using the econometric models described in Section 4.3.3. The reader uninterested in the detail in this section may wish to skim the text and examine the various graphs. The following overview may prove helpful.

Implementing the no-action alternative will produce both direct and indirect impacts. In the very short run, while DR&R activities are underway, some of the impacts are slightly positive. However, the longer-term impacts are adverse without exception. Direct impacts include a significant loss in employment, per-capita income, and revenues to state and local governments. In turn, these direct impacts produce ripple effects, affecting government policies and other economic activity throughout the state. The total impacts are much greater than the direct effects alone. This section provides quantitative estimates of direct and indirect effects of the no-action alternative on employment (total and resident), per-capita income, and population by community/region in the state. By any reasonable benchmark, these effects are significant and adverse for the state as a whole and for various communities/regions. The no-action alternative would create a recession both deeper and longer lasting than has been experienced in the state.

Though impacts on all areas are significant, there are material differences in these impacts among the various regions. The rank ordering of these effects depends on the particular measure (e.g., employment, per-capita income, population) used. However, the North Slope, Valdez-Cordova, and Fairbanks would be particularly hard hit if the ROW were not renewed.

North Slope Borough. Because pipeline employment is centered in the communities of Fairbanks, Valdez, and Anchorage and workers at Pump Stations 1 through 4 commute from communities throughout the state, employment and income in the North Slope Borough are only marginally directly impacted by cessation of pipeline operations. Workers involved with removing pipeline facilities located in the borough and engaged in transporting scrap out of the state by barge from the North Slope will be based at remote camp sites and will not directly impact the economies of the local communities.

More serious employment reductions for the North Slope and other communities result from the closure of ANS fields, although these losses would be offset in the short term by DR&R activities. Projected direct employment losses for the North Slope total 4,207 jobs by 2010 (Figure 4.4-15).

The DR&R of North Slope oil and gas facilities results in the direct loss of $1.896 billion (1998 dollars) in property tax revenues (Figure 4.4-5). Since the borough is heavily dependent on this revenue to support local government expenditures, without an alternative source of local revenue, this loss results in a reduction in local government employment below the proposed action.

The loss of state pipeline and oil revenues results in a reduction in state-to-local-government transfers in support of education and other locally delivered public programs. This further reduces local government employment compared to the proposed action. State employment in the borough also falls because of reduced state revenues. The loss of state revenues also leads to elimination of the Permanent Fund Dividend and thus reduces per-capita income and local purchasing power.

By 2015, the multiplier effect of the loss of oil-related and local government-related jobs results in a total employment loss compared to the proposed action in the borough

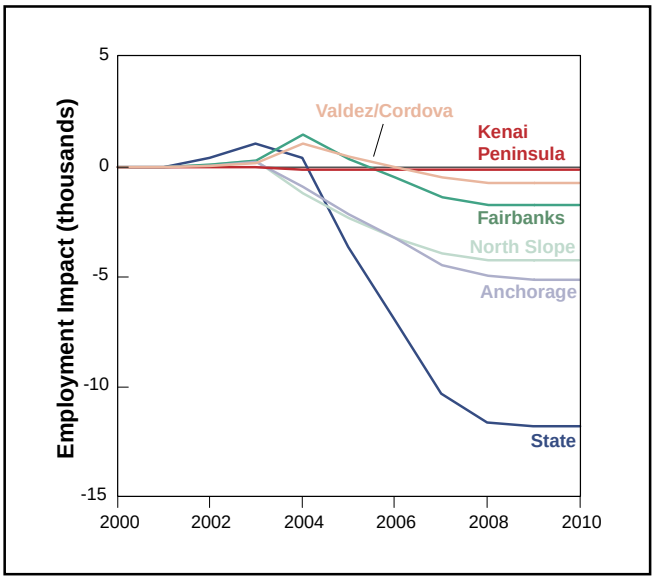
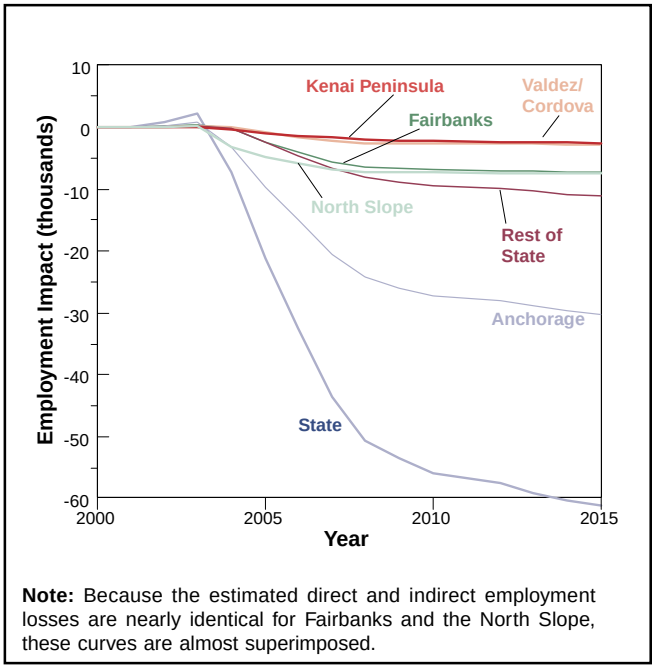


Figure 4.4-15. *Direct employment impacts of the no-action alternative, 2000 to 2010.*

of 7,500 jobs (Figure 4.4-16), or 82 percent of the total (Figure 4.4-17).

After adjusting for the presence of nonresident workers in the borough, North Slope resident employment, mostly in government, trade, and services, will fall by 3,300 in 2015, a 76.1 percent decrease (Figure 4.4-18). Because of the loss of a high percentage of higher-paying jobs in the community and the loss of the Permanent Fund Dividend, real per-capita income falls substantially (Figure 4.4-19). Figure 4.4-20 shows declines in per-capita income by 2015 for the North Slope and other areas. In percentage terms, these impacts are greatest for the North Slope. With the reduction in employment, there is some outmigration and a drop in population. The amount is difficult to project be-



Note: Because the estimated direct and indirect employment losses are nearly identical for Fairbanks and the North Slope, these curves are almost superimposed.

Figure 4.4-16. *Impact of no-action alternative on total wage and salary employment by region, 2000 to 2010.*

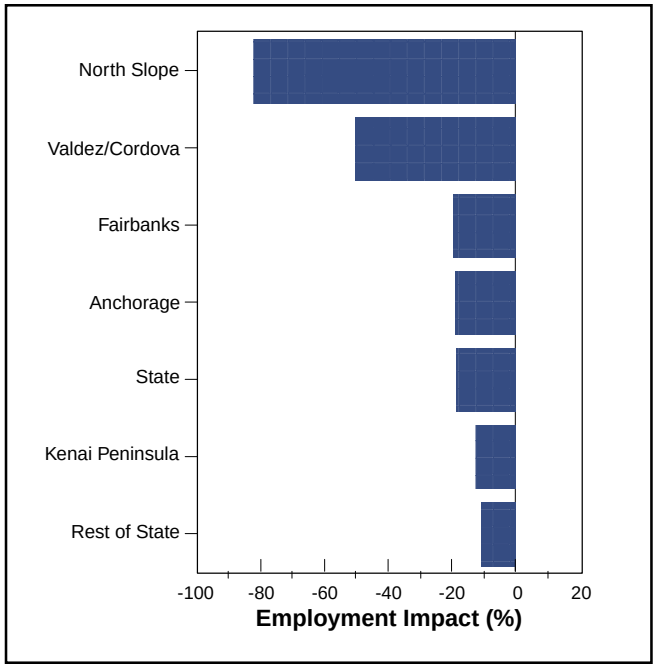


Figure 4.4-17. *Impact of no-action alternative on total wage and salary employment by region in 2015.*

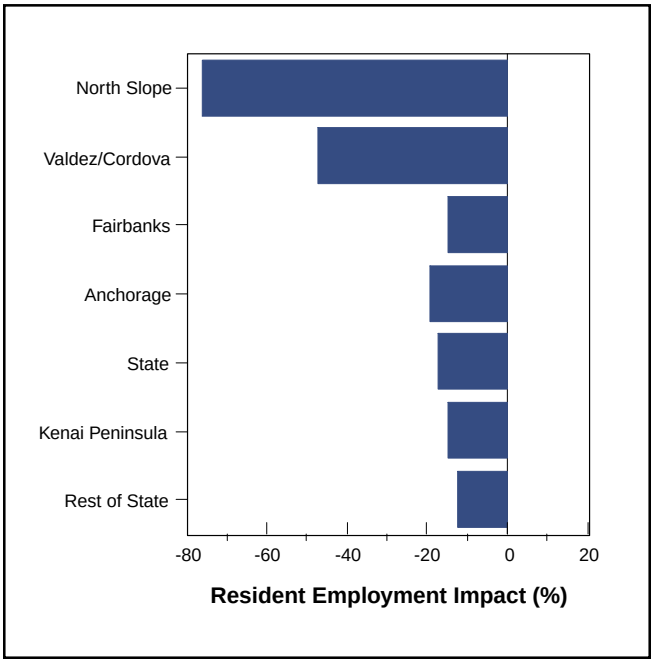


Figure 4.4-18. *Impact of no-action alternative on resident employment by region in 2015.*

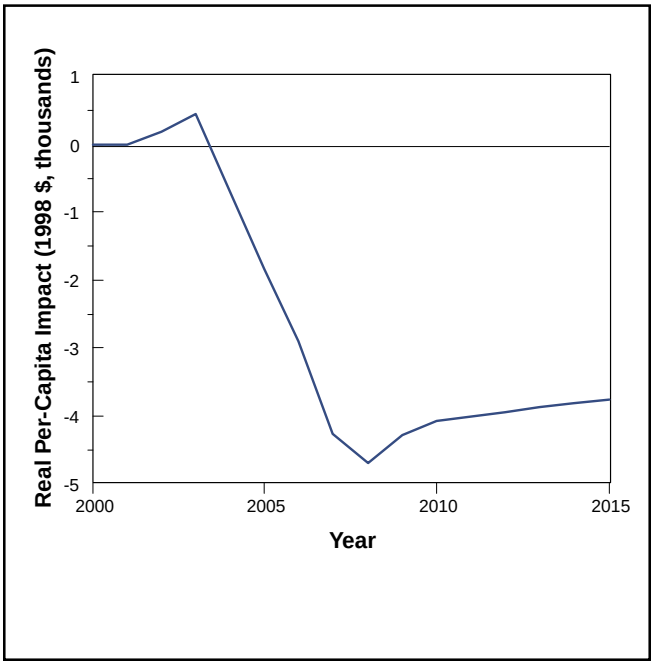


Figure 4.4-19. *Impact of no-action alternative on real per-capita income for North Slope, 2000 to 2015.*

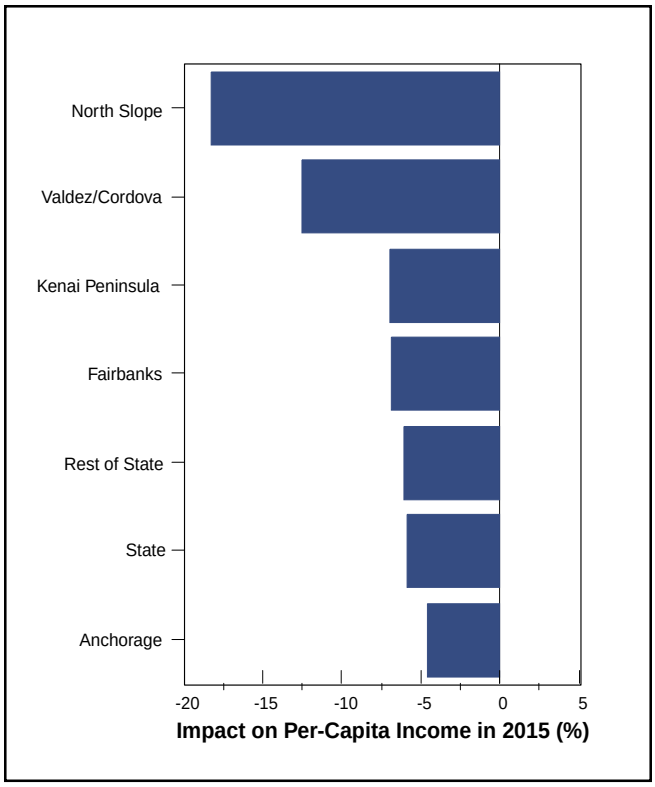


Figure 4.4-20. *Impact of no-action alternative on real per-capita income in 2015 by region.*

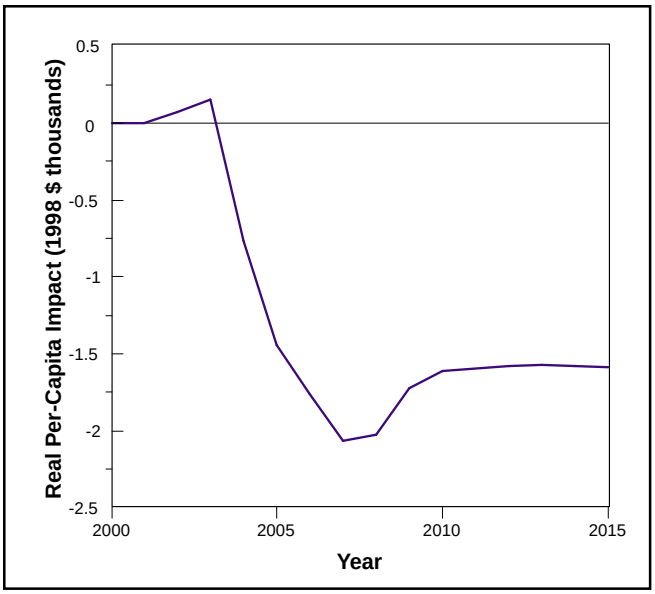


Figure 4.4-21. *Impact of no-action alternative on real per-capita income for Fairbanks, 2000 to 2015.*

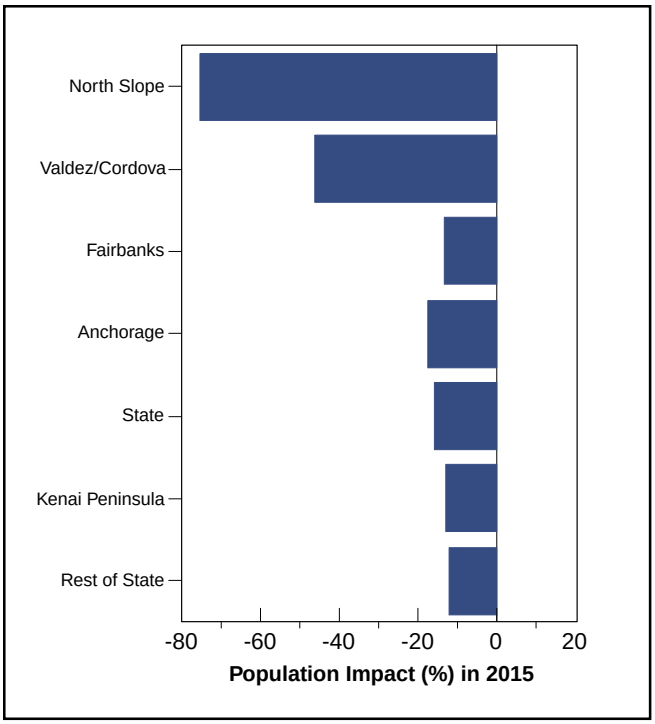


Figure 4.4-22. *Impact of no-action alternative on population by region/community in 2015.*

cause there is no basis for estimating the movement of Alaska Natives in the absence of employment opportunities in their home communities (Figure 4.4-22).

The direct loss of the oil property-tax revenues, combined with the losses in revenues from the contraction of the economy, make it very difficult for the borough to provide public services or to service its outstanding general-fund bonded debt.

Yukon-Koyukuk Census Area. Because pipeline employment is centered in the communities of Fairbanks, Valdez, and Anchorage and workers at Pump Stations 5 through 7 commute from communities throughout the state, employment and income in the Yukon-Koyukuk Census Area are only modestly directly impacted by cessation of pipeline operations. Workers involved with removing pipeline facilities located in the census area and with transporting scrap from DR&R out of the state will be based at remote camp sites and will not directly impact the economies of the local communities in the census area. However, wage employment is scarce in the census area, and the loss of even a small number of pipeline-related jobs by residents of the region would affect the economies of the small communities in the region. This census area is included in the "rest of state" category in Figures 4.4-15, 4.4-16, 4.4-17, 4.4-4.4-18, 4.4-20 and 4.4-22.

Fairbanks North Star Borough (Figures 4.4-15, 4.4-16, 4.4-17, 4.4-18, 4.4-20, and 4.4-22). Pipeline employment is centered in Fairbanks, Pump Station 8 is within the borough, and many workers stationed at the other pump stations reside in the borough. A large share of pipeline DR&R will be coordinated from Fairbanks, and many workers involved in DR&R will be Fairbanks residents or

will temporarily reside there during DR&R. Fairbanks will lose some state and federal workers associated with regulating and overseeing the pipeline.

Fairbanks is a regional headquarters for North Slope oilfield service companies, as well as wholesalers and transport companies dependent on North Slope activity. A portion of the employees of the oil companies, oil service companies, construction firms, and other companies operating on the North Slope reside in Fairbanks. Terminating oil and gas activity on the North Slope impacts all these companies. Fairbanks is also the location of two refineries that cease operation when North Slope crude is no longer available. Furthermore, Fairbanks loses some state and federal workers associated with regulating and overseeing pipeline and North Slope oil activities. The combined direct employment impact of ceasing pipeline and North Slope oil activity is 1,695 jobs by 2010.

DR&R of oil pipeline facilities results in the direct loss of a small share of the revenues of the borough (Figure 4.4-5). Shutdown of the refineries further erodes the property tax base. This leads to some job loss as the borough employs some combination of budget reductions and utilization of new revenues to balance its revenues and expenditures.

The loss of state pipeline and oil revenues results in a reduction in state-to-local-government transfers in support of education and other locally delivered public programs, and this causes a further reduction in local government employment. State employment in the borough also falls because of reduced state revenues. The loss of state revenues also leads to elimination of the Permanent Fund Dividend which reduces per-capita income and local purchasing power.

By 2015, the multiplier effect of the loss of oil-related and local-government-related jobs and income results in a total employment loss in the borough compared to the proposed action of 7,300 jobs, or 20 percent. Fairbanks resident employment falls by 6,100 jobs, or 14 percent, by 2015. Real per-capita income falls $1,586 in 1998 dollars (Figure 4.4-21), or 7 percent, by 2015 because of the loss of a high percent of the higher-paying jobs in the community.

With the reduction in employment, there is some outmigration, and population falls. It does not return to the 2001 level until 2015. Population drops to 13 percent below the proposed action by 2015 (Figure 4.4-22).

The loss of revenues puts pressure on the ability of the borough to service its outstanding general-fund bonded debt.

Southeast Fairbanks Census Area. Because pipeline employment is centered in Fairbanks, Valdez, and Anchorage and some workers at Pump Stations 9 and 10 commute from communities throughout the state, employment and income in the census area are only marginally directly impacted by cessation of pipeline operations. Workers involved with removing pipeline facilities located in the census area and engaged in transporting scrap from pipeline DR&R out of the state will be based at remote camp sites and will not directly impact the economies of the local communities. However, wage employment is scarce in the census area, and the loss of even a small number of pipeline-related jobs by residents of the region would affect the economies of the small communities in the region.

Valdez-Cordova Census Area (Figures 4.4-15, 4.4-16, 4.4-17, 4.4-18, 4.4-20, and 4.4-22). The pipeline terminal is located in Valdez (the largest community in the census area), and Pump Stations 11 and 12 are in the census area. VMT activities also occur in the census area. A large share of DR&R (dismantling the VMT and removing material from the southern portion of the pipeline) will be conducted in Valdez. Although many of the workers involved in DR&R will be residents of the census area, the labor market is not large enough to supply all the demand for labor anticipated during DR&R.

Valdez employment is directly impacted by termination of North Slope oil activity because of the termination of VMT, SERVS, pipeline, and refinery operations. The combined direct employment impact of the cessation of pipeline and North Slope oil activity is 662 by 2010.

The DR&R of oil pipeline facilities results in the direct loss of a share of the revenues of the city (Figure 4.4-5). Shutdown of the refinery further erodes the property tax base. This leads to some job loss as the city employs some combination of budget reductions and utilization of new revenues to balance its revenues and expenditures.

The loss of state pipeline and oil revenues results in a reduction in state-to-local-government transfers in support of education and other locally delivered public programs, and this causes a further reduction in local government employment. State employment also falls because of reduced state revenues. The loss of state revenues also leads to elimination of the Permanent Fund Dividend which reduces per-capita income and local purchasing power.

By 2015, the multiplier effect of the loss of oil-related and local-government-related jobs results in an employment loss by place of work in the census area compared to the proposed action, centered in the city of Valdez, of 2,800 jobs, or 50 percent. Employment by place of residence falls by 2,800, or 47 percent, by 2015. Real per-capita income falls $3,234 in 1998 dollars (Figure 4.4-23), or 13 percent,

by 2015 because of the loss of a high percentage of the higher-paying jobs in the community. With the reduction in employment, there is outmigration, and population falls from 11,100 to 6,300 and will not have returned to the 2001 level by 2015. Population drops to 46 percent below the proposed action by 2015.

The loss of revenues puts pressure on the ability of Valdez to service its outstanding general-fund bonded debt.

Anchorage (Figures 4.4-15, 4.4-16, 4.4-17, 4.4-18, 4.4-20, and 4.4-22). A portion of pipeline employment is centered in Anchorage, and some workers stationed at the pump stations reside in Anchorage. Portions of pipeline DR&R will be coordinated from Anchorage, and many workers involved in DR&R will be Anchorage residents or temporarily reside there during the DR&R effort.

Anchorage is the regional headquarters for the oil companies operating on the North Slope, as well as for oil-field service companies, construction companies, wholesalers, transport companies, and other businesses dependent on North Slope activity. Many of the employees of these firms are Anchorage residents. The termination of oil activity on the North Slope impacts all these businesses. Employment at Anchorage International Airport falls as the international air cargo industry contracts from lack of locally produced and competitively priced jet fuel. Construction employment associated with fabrication of modules for North Slope operations is eliminated. Anchorage loses some state and federal workers associated with regulating and overseeing the pipeline and North Slope oil activities. The combined direct employment impact of ceasing pipeline and North Slope oil activity would be 5,110 by 2010.

The loss of state pipeline and oil revenues results in a reduction in state-to-local-government transfers in support of education and other locally delivered public programs, and this causes a reduction in local government employment. State employment in Anchorage also falls because of reduced state revenues. The loss of state revenues also leads to elimination of the Permanent Fund Dividend which reduces per-capita income and local purchasing power.

By 2015, the multiplier effect of the loss of oil-related and local-government-related jobs and income results in a total employment loss in Anchorage compared to the proposed action of 30,200 jobs, or 19 percent. The Anchorage economy bears a disproportionate share of the multiplier effect of the no-action alternative because it is the regional center for trade, service, and government activity. The loss of purchasing power in virtually any part of Alaska has an impact on the Anchorage economy. Anchorage resident employment falls by 33,800, or 19 percent, by 2015. Real per-capita income falls $1,406 in 1998 dollars (Figure 4.4-24), or 5 percent, by 2015 because of the loss of a high percentage of the higher-paying jobs in the community. The reduction in employment leads to outmigration, and population declines absolutely from 282,000 to 254,000. The 2001 population level is not regained until 2014. Population falls to 17 percent below the proposed action population by 2015.

Kenai Peninsula Borough (Figures 4.4-15, 4.4-16, 4.4-

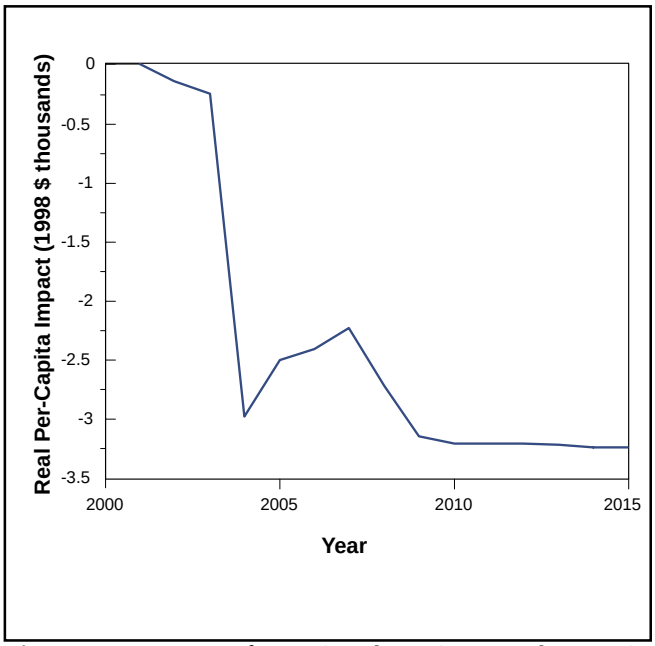


Figure 4.4-23. *Impact of no-action alternative on real per-capita income for Valdez/Cordova, 2000 to 2015.*

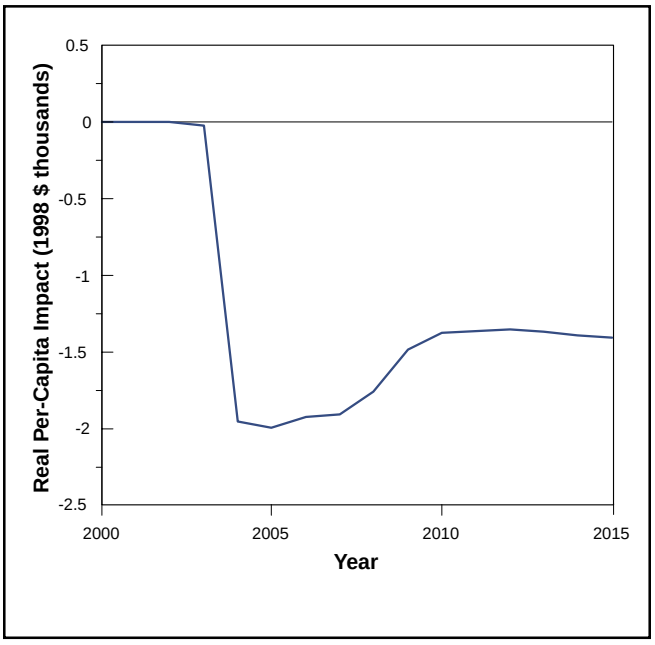


Figure 4.4-24. *Impact of no-action alternative on real per-capita income for Anchorage, 2000 to 2015.*

17, 4.4-18, 4.4-20, and 4.4-22). Employment around the City of Kenai is directly impacted by termination of North Slope oil activity since some construction of modules for North Slope oil facilities occurs at Nikiski near Kenai.

Some North Slope oil workers live in communities on the Kenai Peninsula. The loss of state pipeline and oil revenues results in reduced state-to-local-government transfers in support of education and other locally delivered public programs, and this causes a further reduction in local government employment. State employment in the borough also falls because of reduced state revenues. The loss of state revenues also leads to elimination of the Permanent Fund Dividend which reduces per-capita income and local purchasing power.

By 2015, the multiplier effect of the loss of oil-related jobs and other sources of purchasing power result in a total employment loss compared to the proposed action in the borough (centered in the City of Kenai) of 2,600 jobs, or 12 percent. Kenai resident employment falls by 3,400 jobs, or 15 percent, by 2015. Real per-capita income falls $1,686 in 1998 dollars (Figure 4.4-25), or 7 percent, by 2015 because of the loss of a percentage of the higher-paying jobs in the community. The reduction in employment leads to outmigration, and the population declines absolutely. The 2001 population is regained in 2009. Compared to the proposed action, the population falls 13 percent by 2015.

Rest of the State (Figures 4.4-15, 4.4-16, 4.4-17, 4.4-18, 4.4-20, and 4.4-22). Economic impact on the rest of the state results from several factors:

- Some oil and pipeline employees live in the rest of the state.

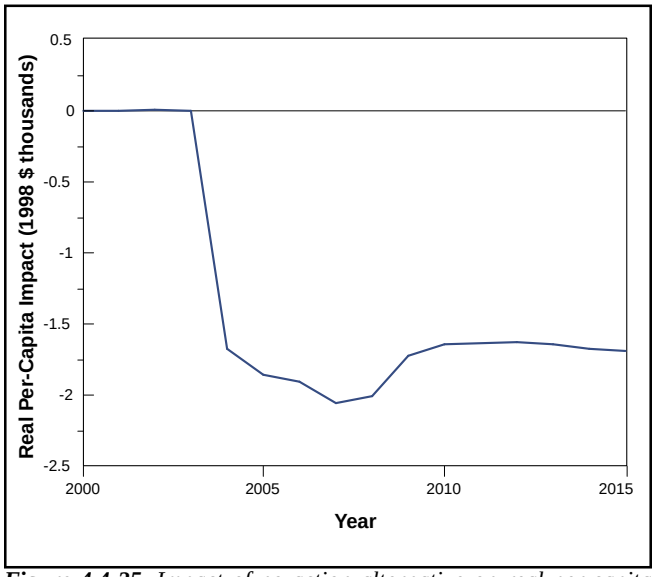


Figure 4.4-25. *Impact of no-action alternative on real per-capita income for Kenai Peninsula Borough, 2000 to 2015.*

- All communities lose state revenue sharing in support of education and other programs.
- Direct state-government spending for program delivery declines because of reduced revenues.
- Elimination of the Permanent Fund Dividend reduces purchasing power in all communities in the state.

By 2015, the multiplier effect from this direct loss of public and private income results in a total employment loss in the rest of the state compared to the proposed action of 11,000 jobs, or 11 percent. Resident employment falls by 14,400, or 12 percent, by 2015. Real per-capita income falls $1,334 in 1998 dollars, or 6 percent, by 2015 because of the loss of a high percentage of the higher-paying jobs in the state. The reduction in employment leads to outmigration and population declines. Population is 12 percent below the proposed action by 2015.

No-Action Alternative Impact on Alaska Natives

Employment. The Alaska Native unemployment rate has remained high while high economic growth in Alaska has rapidly added new jobs to the economy. In the future it will be a challenge to keep that unemployment rate from increasing as the number of new jobs diminishes and the number of young Alaska Natives entering the job market expands. New jobs and high turnover in the job market are necessary to employ a larger percentage of Alaska Natives (McDiarmed et al., 1998).

Alaska Natives are under-represented in virtually all industries, particularly oil and gas, transportation, and construction. In these industries they tend to be in the lower-paid categories. The direct loss of job opportunities in the no-action alternative thus would be relatively modest for Alaska Natives. However, jobs in these industries are particularly important to Alaska Natives because they represent industries with relatively high wages where Alaska Natives, particularly males, have relatively easy access and entry. These high-wage jobs are an important source of income to Alaska Native households and provide access to additional employment opportunities.

Since Alaska Natives are under-represented in urban support sectors of the economy, the loss of other job opportunities due to the multiplier effect will not disproportionately impact Alaska Native workers except to the extent they are concentrated in more vulnerable positions in those industries or are concentrated among workers with short on-the-job tenure.

The decline in the number of jobs, followed by a slow return to job growth, means that the turnover rate of jobs may fall, which would tend to work against Alaska Natives entering the work force.

Alaska Natives are highly represented in the public and nonprofit sectors of the economy. As revenues to state and local governments and nonprofit corporations providing health and other public services to rural and Alaska Native communities shrink, employment in these sectors will fall. This will disproportionately impact Alaska Native employment.

Unemployment. Unemployment of Alaska Natives likely would increase in the no-action alternative because of the decline in total employment combined with a low propensity of Alaska Natives to migrate from the state in response to labor market conditions. The higher unemployment rate is likely to be permanent because the size of the economy will be permanently smaller in the no-action alternative case.

Population. Reductions in employment opportunities in both urban and rural Alaska, along with reduction in the level of public services and infrastructure in both urban and rural Alaska, make it difficult to predict how the distribution of Alaska Native population between rural and urban areas will be affected.

Income. The reduction in the average annual earnings due to the loss of high-wage jobs in oil and gas, transportation, construction, and other sectors — combined with an increase in the unemployment rate — will probably impact Alaska Natives disproportionately. The average household cash income is lower in rural communities than in urban Alaska, and a proportionate loss in income across households would have a disproportionate effect on rural and Alaska Native households.

Further erosion of Alaska Native household income would result from elimination of the Permanent Fund Dividend. Because it is an equal distribution to all Alaskans independent of income, lower-income Alaskans are more heavily impacted when it is terminated. Finally, reduced public spending by state and local government on transfer payments and other programs providing "in kind" income disproportionately to rural and Alaska Native areas of the state would disproportionately impact rural and Alaska Native income.

Public Resources. Outside the pipeline study areas, most of the loss of private jobs and reduction in population and households will occur in the urbanized parts of the state. As a consequence, the entire state will become less urban and more rural. Since a major part of public services in rural Alaska not supported by the federal government is provided by the state through revenue sharing and direct service delivery and the cost of public service delivery per capita is higher in rural areas of the state, the quality of public services will decline throughout the state since per-capita public revenues will decline. The decline in public services in rural Alaska, where the majority of Alaska Natives live, may be disproportionately high, depending on the mechanisms used to deal with the decline in revenue. State expenditures for education, health and human services, community assistance, etc. will be reduced for communities throughout the state.

Communities. Reduction in household income and public income will reduce the ability of small local governments in rural, primarily Alaska Native communities to function and thus will affect the ability of these communities to survive. Reductions in funding for specific programs that lower the cost of electric power in rural areas, and for water and sewer plant construction, school construction, etc., will challenge the ability of these communities to function.

Pressure on Natural Resources. The outmigration in response to the decline in jobs will be concentrated among non-Natives. The civilian non-Native population will be 106,000, or 20 percent, below the proposed action by 2010. This could reduce the pressure on all the natural resources harvested by the Alaska Native community; however, reduced incomes of the remaining non-Native residents could result in increased harvests of natural resources for food. Any net reduction in harvest would be one of the few positive impacts of the no-action alternative.

4.4.3.2 Sociocultural Systems

By M. Galginaitis, C. Gerlach, P. Bowers, and C. Wooley

The major adverse economic impacts of the no-action alternative identified above presage corresponding adverse impacts on the structure and function of the socioeconomic systems of the North Slope, Prince William Sound, and the communities along the pipeline. This section examines the probable consequences of the economic impacts on various segments of the study area. Understanding of sociocultural systems is fundamentally more qualitative than that of economic systems. The projections and estimates in this section are directionally correct, but inherently less precise than those for economic impacts. To avoid repetition, numerous qualifiers are omitted in the material presented below, but these limitations should be borne in mind when reading this section. It should be assumed that estimates of social impacts are more speculative.

Only the effects on the Central TAPS study area can be considered direct effects of the no-action alternative. Impacts associated with closure of the ANS fields and the marine transportation link are indirect and/or cumulative and are discussed in the Section 4.5.

The potential direct and indirect effects of the no-action alternative on communities and areas in the Central TAPS study area vary depending on whether a community is urban, predominately non-Alaska Native, and primarily involved in the wage-labor/cash economy, or rural and dependent on a mixed subsistence/cash economy. The Fairbanks North Star Borough and Delta Junction, in particular, are likely to be directly affected by the individual loss of employment opportunities in the ANS fields, pipeline, or businesses that provide services to these facilities. As noted in the economics section, there will be substantial decreases in resident employment (Figure 4.4-18), real per-capita income (Figure 4.4-20), population (Figure 4.4-22), and petroleum property taxes (Figure 4.4-5). Although these decreases are projected to be proportionately lower than those for the NSB, the effects are significant nonetheless. These adverse economic impacts will alter the regional and community characteristics.

Direct and indirect impacts on rural communities are predictably different than those in more urbanized areas. Rural Interior communities generally are more affected by the overall reduction in state government expenditures resulting from reduced or lost state revenues from pipeline or oil and gas operations than by direct effects. Because state matching funds are also likely to be reduced, federal funds to rural areas would be reduced. Interior rural, primarily Alaska Native communities would be adversely impacted by reduced revenues for regional Native corporations — such as Doyon, Ltd., and Ahtna, Inc. — that provide services to the oil and gas industry. Native corporation dividends paid to shareholders would likely be reduced. The revenue stream that supports government and community services will be considerably reduced. The reduction in Native corporation contract work and employment will not affect the Interior as heavily as it will the North Slope because rural Interior residents are not as directly dependent on TAPS as are the North Slope Iñupiat. Seasonal local employment would be affected by the elimination of TAPS-related jobs, but this effect is expected to be minimal. Tensions between village residents and the oil industry, particularly in Stevens Village and other Interior Alaska Native communities, would be reduced or eliminated, although at a substantial social cost.

4.4.3.3 Subsistence

By M. Galginaitis, C. Gerlach, P. Bowers, and C. Wooley

It is difficult to assess the effects of the no-action alternative on subsistence harvest and activity. Certainly the economic losses will create a powerful incentive for many to attempt to compensate for decreases in their per-capita income by increasing subsistence efforts. Other factors held constant, outmigration will reduce the hunting/fishing pressure, but increased subsistence activity among those who remain acts to increase hunting/fishing pressure. But there is more to it than the population and activities of hunters, because there is a link between the subsistence and cash economies. Wage employment reduces the time available for subsistence pursuits. However, earnings are used to purchase equipment and materials (e.g., fuel, snow machines, ATVs, small boats, outboard motors, guns, ammunition) that make subsistence activities more efficient.

In a post-oil economy, the trend towards using modern hunting/fishing and transportation technology may be reversed. A return to the pre-oil status quo is likely to be difficult, however, because of the cumulative social changes that have occurred in the past 30 years.

DR&R activities could disrupt subsistence activities in localized areas. Once these cease, however, there will be no oil and gas development-related activities in the Central TAPS study area that could impact wildlife populations or subsistence harvests. For example, the threat of a pipeline oil spill would be removed. (Oil now supplied to Alaska from the ANS fields would have to be imported, however, and this transportation link would have the potential for oil spills.)

4.4.3.4 Cultural Resources

By C. Gerlach, P. Bowers, and C. Wooley

DR&R entails ground-impacting activities to dismantle various facilities in the project area (Section 4.1.1). These “deconstruction” activities will have qualitatively similar impacts to those experienced during construction of the pipeline. Increased workers and traffic on the Dalton Highway for the limited duration of DR&R would lead to increased immediate impacts, with decreased long-term impacts. Impacts could result from overland moves of equipment, which could damage surface, above-ground, or shallowly buried sites. Major direct impacts to TAPS-related historic properties should be minimized by compliance with the Stipulations and the Section 106 process.

It is possible that an increased number of DR&R workers may also pose increased indirect impacts on cultural resources. However, this would be partially compensated for by a decrease in the area’s commercial developments and would be of short duration.

Choice of the no-action alternative would eliminate the potential for adverse impacts on cultural resources from operational and accidental crude oil and product spills.

DR&R activities will result in minor product spills (e.g., resulting from vehicle accidents, fueling leaks, etc.) that could adversely impact cultural resources.

4.4.3.5 Land Ownership

By ClearWater Environmental, Inc. staff

The no-action alternative is unlikely to result in significant changes in the pattern of land ownership, with the exception of those few parcels acquired by the permittees for specific facilities such as the Valdez Marine Terminal. Those parcels could be subject to private sale. The ROW itself is an easement on which TAPS and its associated facilities were constructed, and permittees do not own the majority of lands over which the easement is placed.

4.4.3.6 Land Use

By ClearWater Environmental, Inc. staff

DR&R would remove above-ground pipeline and associated facilities; however, the Dalton Highway would not be removed. Therefore, the Dalton Highway would continue to be used as today, with the exception of traffic related to TAPS and North Slope oil and gas operations. This includes tourist and recreational use. Other uses would remain consistent with those described in Section 3.3.5.3.

4.4.3.7 Coastal Management

By ClearWater Environmental, Inc. staff

The no-action alternative would result in cessation of presently permitted uses of lands and waters in the North Slope Borough and Valdez coastal districts for pipelines, the marine terminal, and tanker shipping of crude oil. No new facilities or activities that require changes in the coastal zone management plans would be associated with the no-action alternative.

4.4.3.8 Recreation

By ClearWater Environmental, Inc. staff

Because the Dalton Highway would not be removed as part of DR&R, there would be no impact on present recreational uses.

Some facilities along TAPS are tourist attractions at present. Removal of these facilities would create minor and localized adverse impacts on tourism.

4.4.3.9 Visual Resources

By ClearWater Environmental, Inc. staff

Removing the above-ground portions of the pipeline and facilities would restore those areas to natural environments in which industrial facilities would no longer be visible. The no-action alternative also would result in removal of various pipeline overlooks and visitor centers that are now popular tourist attractions.

4.4.3.10 Wilderness

By ClearWater Environmental, Inc. staff

No wilderness lands are presently included in the TAPS ROW. Since the Dalton Highway is not part of the ROW and would remain after DR&R, no lands presently in the ROW would revert to wilderness status. The no-action alternative would have no effect on presently designated wilderness lands.

4.4.3.11 Transportation

By ClearWater Environmental, Inc. staff

The no-action alternative could result in major impacts on transportation systems:

- Use of the road system for operation and maintenance of North Slope oil and gas facilities and TAPS would be eliminated after heavy use during DR&R.
- Decommissioning TAPS and closing the Valdez Marine Terminal would cause the most extensive crude-oil tanker system on the U.S. West Coast to cease operations. Increased incoming tanker shipments of refined product would be necessary, and would most likely be made through Cook Inlet.
- Because inland waterways are not presently used to support TAPS operations and maintenance, the use of inland waterways would not be affected.
- Decommissioning TAPS would reduce the amount of air freight and passenger traffic through the major airports at Anchorage, Fairbanks, and Deadhorse.