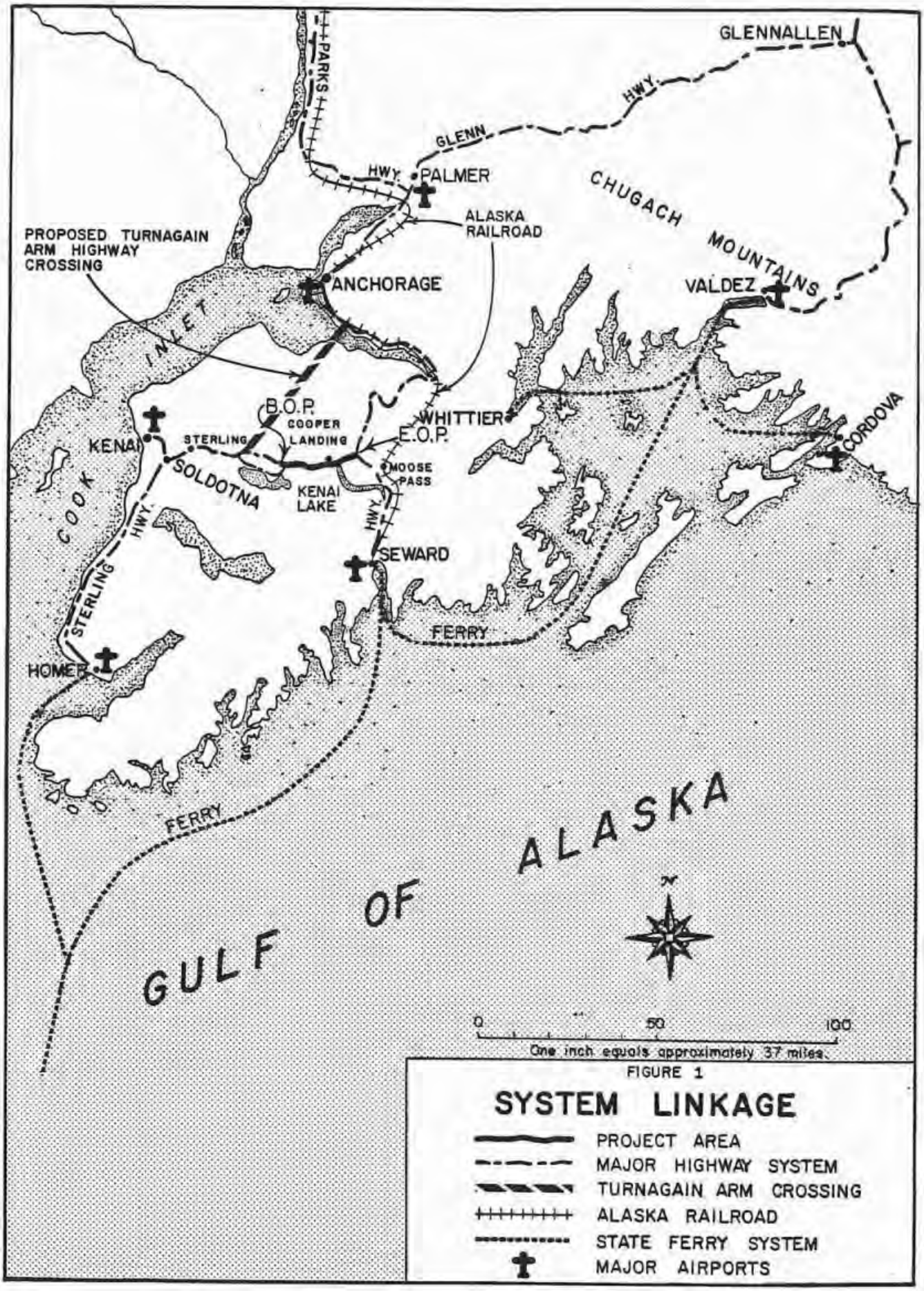
I. PURPOSE AND NEED

This project is proposed to improve the primary highway route serving the lower Kenai Peninsula by making this segment of the route safer, more convenient, and time saving for highway users. At the same time, the project is intended to serve residents, commerce, and recreational users of adjacent lands and waters without undue impacts on those activities or their expansion.

The Capital Improvement Program of the Department of Transportation and Public Facilities (DOT/PF) includes Project RF-021-2(15), Sterling Highway, M.P. 37-60. The highway's function within the Cooper Landing community is addressed in the Kenai Peninsula Borough Comprehensive Planning Program Recommendations, 1970, a report by the Alaska State Housing Authority. Planning was focused on the highway corridor, and included recognition of the need "to conserve the usefulness of this vital artery..." (The community land use plan is included as Fig. 8 in the Affected Environment Section). The route is also part of an arterial road plan currently being prepared by the Borough Planning Office.

Sterling Highway is the sole land link in the transportation system between the Seward Highway and western peninsula communities such as Kenai, Soldotna, and Homer (Fig. 1). The significance of the route is particularly evident during the summer when it is heavily used by recreationists traveling from Anchorage to fishing and camping sites on Kenai Lake, along Kenai River, and on the western side of the Peninsula.


GLENNALLEN
HWY.
PARKS
GLENN
HWY.
PALMER
CHUGACH
MOUNTAINS
ALASKA
RAILROAD
PROPOSED TURNAGAIN
ARM HIGHWAY
CROSSING
ANCHORAGE
VALDEZ
INLET
B.O.P.
COOPER
LANDING
WHITTIER
E.O.P.
CORDOVA
KENAI
STERLING
SOLDOTNA
KENAI
LAKE
MOOSE
PASS
COOK
HWY.
SEWARD
STERLING
HWY.
FERRY
HOMER
FERRY
GULF OF ALASKA
N
0
50
100
One inch equals approximately 37 miles.
FIGURE 1
SYSTEM LINKAGE
PROJECT AREA
MAJOR HIGHWAY SYSTEM
TURNAGAIN ARM CROSSING
ALASKA RAILROAD
STATE FERRY SYSTEM
MAJOR AIRPORTS

Summertime also sees an increase of truck traffic on the route. From an annual average of 150-200 trips per week, trucks increase to 400-500 trips per week during the commercial fishing season. Past and anticipated growth in the Anchorage and western Peninsula regions is the generator of traffic which contributes to the present need for the highway improvement.

The railroad and air transportation modes interface with the highway in a limited fashion. There is a station of the Alaska Railroad at Moose Pass, eight miles east of the Seward Wye from which some rail carried goods (there is no passenger service) are transferred by truck to other points on the Kenai Peninsula. A gravel airstrip on the delta of Quartz Creek by Kenai Lake is used by light private or chartered aircraft, and there is some commercial float plane activity on the Kenai River at Cooper Landing.

With existing traffic conditions on the Sterling Highway, there are safety and congestion problems which cannot be resolved without highway improvements. Future increases in traffic volume will magnify the need for improvements to reduce accidents and provide reasonable convenience for road users.

Average Daily Traffic (ADT) between Seward Wye and Skilak Lake Road Mileposts 37 - 60 (Fig. 3), was approximately 1,650 vehicles per day in 1979. Traffic volume dropped in the Cooper Landing section between 1978 and 1979 due to a decline in summer season travel. Travelers were

evidently influenced by higher gasoline prices, fear of fuel scarcity, and construction on the Seward Highway near Anchorage which interrupted Peninsula-bound traffic. By the year 2004, it is predicted that traffic will be up to 6,400 vehicles per day, whether the highway is improved or not.

Although the 1979 accident rate on the project (1.60 per million vehicle miles) was not as high as the statewide average for two-lane rural roads (2.34 per million vehicle miles), conditions exist which could lead to more accidents in the future. Past statistics illustrate the accident potential.

Accidents on this segment of road killed nine persons and injured 107 more during 1973-1978. Other accidents and near-accidents, many involving pedestrians, go unreported and untabulated. Cooper Landing residents attribute the hazards of traffic in the area to two factors: excessive speed and poor road conditions such as dangerous curves and lack of shoulders. These impressions are corroborated by Police Accident Reports. The cause of 40 to 50 percent of the injury/fatal accidents was reported to be alcohol abuse and/or excessive speed. Roadway conditions tabulated as contributors to these accidents included sharp curves, slippery pavement, and narrow roadway. In some of the injury/ fatal accidents reported to State Troopers, icy road surface was a factor; and slippery roads contributed in many other less traumatic accidents. The initiation of school bus service for the area in 1979 was cited as being justified solely on the basis of the hazardous walking route children must take along the highway.

Aside from requirements to meet current State and Federal Highway design criteria, much of the present need for improvement is manifested in the physical condition of the roadway. Alaska's highways are evaluated on a scale from 0 to 100 in each of three categories: road surface conditions, traffic servicability, and accident (safety) value (see 1980 Paved Highway Performance Evaluation, App. C-5). A single composite value is derived from the three highway performance values as a relative indicator of the highway's performance capability. The Milepost 37 - 60 section of the Sterling Highway was rated at 28 in 1980. The Sterling Highway to the west rated a 72 composite value, and Seward Highway at the Wye rated 61 on the Seward side and a 25 rating toward Anchorage. The project section rates lower in pavement condition than in the other values, and is ranked among the worst in the State, with 87 percent of all paved roads being in better condition.

Surface condition was a major factor in determination of the location for the western terminus of the project. The Sterling Highway immediately west of the project has a 40-foot top, including eight-foot paved shoulders, and is in near-new condition. The reconstructed highway has a surface rating of 74 on the evaluation scale described above, compared to an average of 24 on the project sections of the roadway.

Road surface maintenance costs are a consideration in the question of whether or not to rebuild a highway. Maintenance of the M.P. 37-60 section of the Sterling Highway cost 14 percent more in 1979 than the

new 22-mile section immediately to the west. The M.P. 60-83 section includes portions that were reconstructed just prior to 1979 and which have had serious maintenance problems (including major roadbed failure and fissuring of the new surface), requiring greater than normal expenditures for maintenance of a new highway. This comparison reveals the relatively greater expense necessary to maintain an older deteriorated roadway.

Fulfillment of the needs outlined above would be met to a certain extent by the action alternatives calling for basic roadway widening alone. Different alignments (described in the next section on "Alternatives"), with varying degrees of curvature reduction, would further satisfy the requirements of safety and traffic demand. Specific hazard mitigation measures on all alternatives would include removal of roadside obstructions to reduce off-road collision; and edge striping and paved shoulders for safer night time driving, emergency parking, additional maneuvering space, and space for bicycles and occasional pedestrians on the roadway. (Specific accommodations for bicyclists and pedestrians are discussed under Social Impacts, p. 64). Guardrails would be placed at some locations, and skid-resistant paving surface could be used in areas that tend to become icy. Left-turn lanes are proposed in sections of the highway where recreational and business activity causes congestion and traffic hazards. Junctions with all authorized roads and driveways would be retained for access.

II. ALTERNATIVES

The proposed action for an improved highway facility has no competing modes of transportation that could reasonably be considered as alternatives. Railroad and air transportation could not reasonably serve the needs of travelers or of the community within the highway corridor. Rail is not as flexible for routing, and air travel is not as dependable as highways in this mountainous terrain; nor can scheduled runs replace the convenience and freedom of choice currently enjoyed by highway users.

In this environmentally sensitive corridor, every effort was made to avoid adverse impacts by adhering to the existing alignment and right-of-way as a basic approach. New alignments were explored only if the 60-mile per hour design speed could not be maintained on the existing alignment, or if the proposed wider (40-foot top) roadway directly impacted streams or wetlands, or centerline shifts to avoid such impacts caused excessive excavation.

Several alternative highway routes were studied at the reconnaissance stage. Some routes were eliminated from further study for engineering and environmental reasons, primarily involving extensive cuts and steep grades. The selected alternatives are functionally comparable with those that were rejected, but have fewer engineering, safety, and environmental constraints (Fig. 2).

Alternative "D" west of Bean Creek was found to present too much of an engineering problem to get from the top of the bluff at Camp Reserrection down to the existing Sterling Highway near Milepost 50.

Alternative "E", although feasible from an engineering standpoint, did not serve a useful purpose for the community. Through traffic would be accomodated very well, but the route was too high above the existing road to make safe connections to the community. Connecting roads would be steep and particularly difficult to navigate in the winter.

A highway from Anchorage, across Turnagain Arm and the Chickaloon Flats, was considered as an alternative. The most recent (1969) of several studies of a Turnagain Arm highway crossing (Ref. 10) estimated costs for a causeway (considering inflation to date) at $200 million. A 40-mile-long highway connection to the Sterling Highway through the Kenai National Wildlife Refuge is estimated at about $100 million. Assuming that all engineering and environmental obstacles could eventually be overcome, construction would then require at least seven years to complete. It was concluded that a Turnagain Arm causeway/highway link is an inadequate alternative to the proposed action because of the highway cost and the impossibility of providing such a route to meet the needs of the public and community in a timely manner.

A tunnel, in lieu of the Juneau Creek Alternative or reconstruction on the existing alignment at M.P. 50 may be possible from an engineering standpoint, but is far from reasonable from a cost standpoint.

Tunnels, in addition to being the most expensive type of road construction, also present problems of safety and maintenance that rule out tunnels as alternatives to bridge and new highway construction. Environmental impacts of the surface alternatives are not regarded as severe enough to warrant detailed study of an underground solution.

As an alternative to construction of a roadway for all vehicular traffic, a bikepath would be totally inadequate. Accommodation of bicyclists with a well-designed facility, whether on a widened roadway or on a separate pathway, could contribute to energy conservation, bike commuter convenience and safety, and encourage recreational use of bicycles. Bicycle facilities should be provided as supplemental to the major need for a safer all-vehicle facility (p. 64 and App. C-27).

The "No Action" alternative involves only maintenance of the existing roadway, with no new construction. It would save on capital costs, but would result in rising costs to road users (vehicle drivers, passengers, pedestrians, bicyclists) in terms of accident-caused deaths, injuries, property damage and lost time due to increasing traffic volumes on a substandard, deteriorating roadway. Maintenance would continue to be provided on the existing roadway, but at a higher cost per mile as more and more vehicles caused faster deterioration.

Traffic management improvements could be implemented without a new road being built, but they are not usually in themselves sufficient to

resolve the basic need for an improved facility. Such measures could include reduced speed limits, more strict enforcement of traffic laws, and additional traffic control signs.

The reasonable alternatives considered in this environmental statement, with the exception of "No Action", all involve new construction and additional right-of-way in varying amounts, depending on the routing. The action alternatives all include improvement of the roadway with a paved 40-foot top; one 12-foot lane in each direction, and eight-foot shoulders. Bridges will be widened to the same dimensions. A left-turn lane and a hill-climbing lane will be added at specific locations.

Two alternatives apply to the entire length of the project: No Action and the basic reconstruction proposal, Alternative "B", which includes minor realignments, mostly within the existing right of way, but in some cases requiring additional right of way. Other alternatives involve only segments of the project, constituting major route changes, or variations of the basic reconstruction proposal. Specific physical constraints at some points on the existing route caused Reconnaissance Engineers to look for routes completely outside of the existing right of way. These major route changes are in three different locations along the project corridor: Juneau Creek Alternative, Bean Creek Alternative, and Quartz Creek Alternative. Locations of these "reasonable alternatives" are shown in relation to each other in Fig. 3. Fig. 4 depicts the Seward Wye. Details of all alignments are shown in App. C-59.

A 60-mile-per-hour design speed is the goal of all the action alternatives. In most all cases that speed is achievable. The exceptions are two curves on Alternative "B" (Mileposts 50 and 49½) where the river and the valley walls converge, limiting options for road alignment and restricting design speed to a maximum of 50 mph. Alternative B-1 offers a 60 mph option at Milepost 49½ (p.24-D).

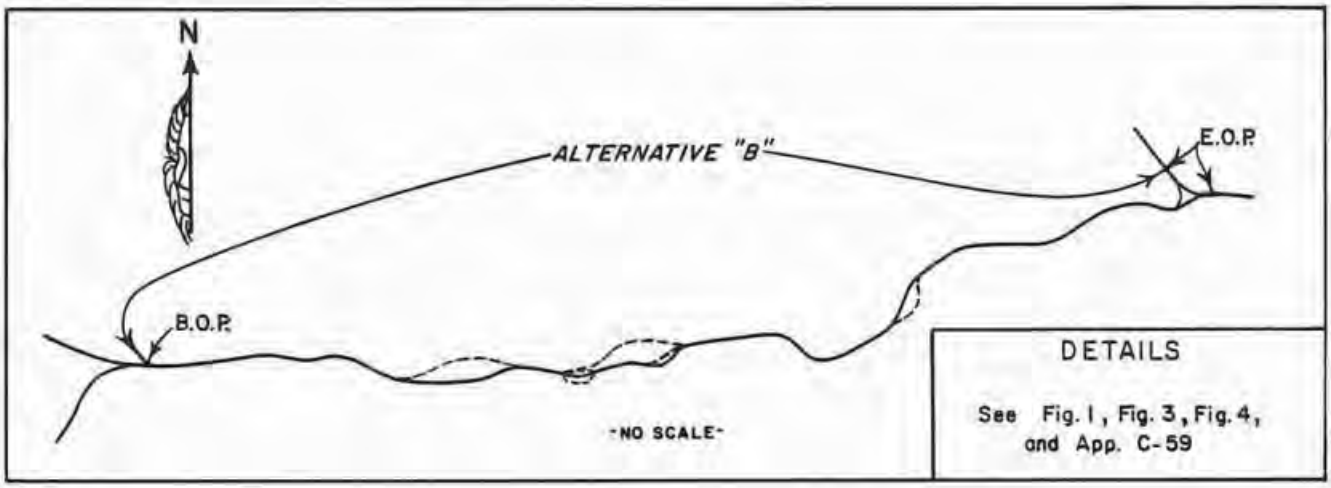
The capacity of the existing roadway, at 1,500 vehicles per hour (VPH), is far in excess of current levels of traffic volume (App. C-4, Traffic Data). The 1979 volume of 215 VPH resulted in a level-of-service "B" or above at most locations on the project (App. C-4, Level of Service). Traffic increases by the year of completion (1984) and design year (2004) are not expected to degrade the project design goal for level-of-service "C" on any of the construction alternatives or No Action.

Grades on the project range from flat to 7 percent, although nearly 90 percent of the length of the project is on grades of 2 percent or less. The longest of the steeper grades occur between Mileposts 45 and 47 (one 4 percent grade for nearly one-half mile, and a 5 percent grade for less than one-quarter mile), and at the Seward Wye, where the steepest grade on the project occurs (7 percent for nearly one-half mile, with transition grades over 4 percent for a few hundred feet on either side). The Sterling/Anchorage leg of the Seward Wye is the only steep section where the length of critical grade (4 percent) is exceeded

to an extent that an uphill lane will be added for slow moving vehicles. The effect of grades on fuel economy is discussed under "Energy" in the Natural Resources Impacts Section.

References in the narrative to rock cuts, unstable areas, and wetland or water fills are illustrated in Fig. 3, "Physiographic Constraints to Construction".

Alternative "B"--Basic Reconstruction Proposal

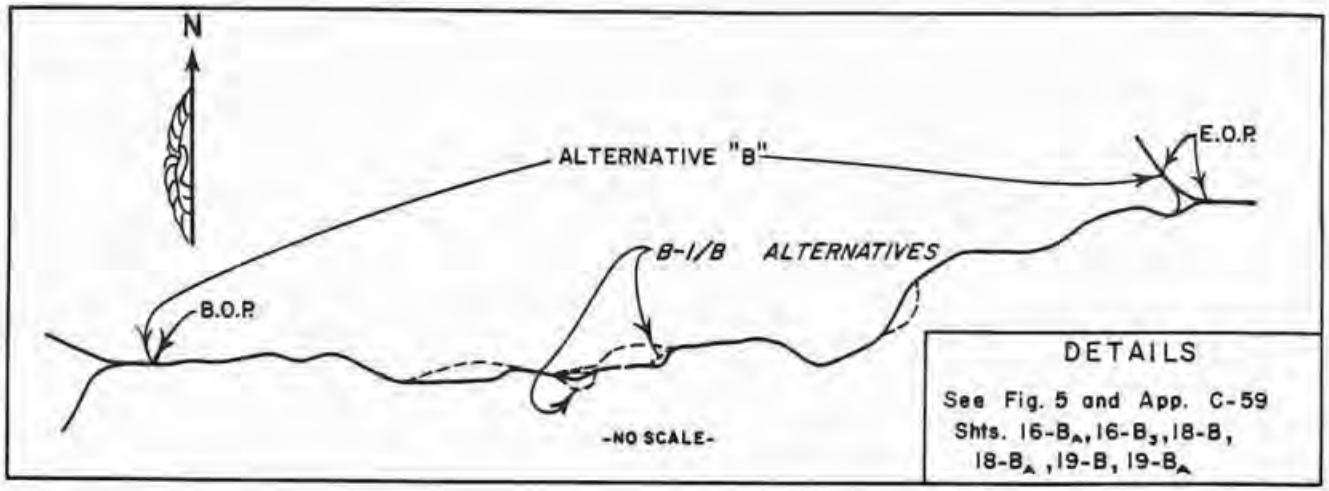


The beginning of the project (B.O.P.), and of Alternative "B", is the western end about one-half mile east of the Skilak Lake Road junction. The project has two eastern end points at its junction with the Seward Highway, called "The Wye". On the north, or Anchorage, leg of the Wye, the Sterling is proposed to merge with the Seward Highway 21.63 miles from the beginning of the project. The Sterling contacts the Seward Highway along the southern, or Seward, leg of the Wye 21.33 miles from the beginning. These distances are predicated on the Alternative "B" alignment.

The first major realignment on this alternative is just east of Sportsman's Lodge, near M.P. 54.75. A relatively short cut section and an extensive fill section on a new line 100 feet north of the existing road will require acquisition of more right-of-way.

Four miles farther up the river, near M.P. 50, the alignment east of Cooper Creek crowds between the mountainside and the river. Widening the roadway will require very substantial cuts into the unstable face of the bluff. The unstable area will be as much as 1,600 feet in length and 240 feet above the river (Fig. 3 and App. C-59, sheet 14-B_3). The proposed 50 mph curve would require considerably more right-of-way, and fill into the river as well, compared to "No Action". Bridging the river as proposed with the Juneau Creek Alternative, is the only other "action" alternative considered.

The sharp bend in the existing roadway at mile 49½ is flattened significantly by the proposal (Fig. 5). This calls for a maximum centerline off-set of about 80 feet to achieve a 60 mph curve (Alternative B-1). The cut oppposite Milepost 49½ is over 200 feet high and 800 feet long on the B-1 line; slightly less extensive on the B line (50 mph curve). Either of these alignments would require a fill into the shallows of Kenai River (Fig. 3 and App. C-59, sheets 16-B_A and 16-B_3). A 200-foot departure from the existing roadway would put the new highway uphill from the Petersen cabin, near M.P. 49 (Fig. 5) on either the B-1 or B alignments.



The existing narrow (30 feet wide), ice-damaged bridge at the Kenai Lake outlet must be widened and repaired or completely rebuilt. With bridge repairs, some curve reduction is proposed on Alternative "B" (Fig.5), but Alternative "B-1" proposes 100 feet or more of offset with a new bridge. The existing bridge would serve as a detour during construction of the new one, after which it would be removed and the approach roadway obliterated and revegetated.

Where the proposed highway traverses the mountainside above Kenai Lake, it departs from the existing roadway at four locations with offsets from 50 to nearly 150 feet (Fig. 3). These realignments are located at M.P. 47.25, M.P. 46, M.P. 44.8, and near M.P. 45. Cut slopes for the widened roadway require new right-of-way at several locations between Milepost 47 and Sunrise Inn. Rock cuts are substantial at three points in this section, and there would be nearly a mile of grades exceeding four percent.

Four significant realignments on the "B" line are proposed in the vicinity of the cliffs above Quartz Creek near M.P. 43 (Fig. 3 and App.

C-59, sheets 26-B, 27-B, 28-B). Rock cuts, and possibly special retaining walls and drainage structures, will be important considerations in the design and construction of this segment. These realignments will need additional right-of-way to accommodate new slope limits.

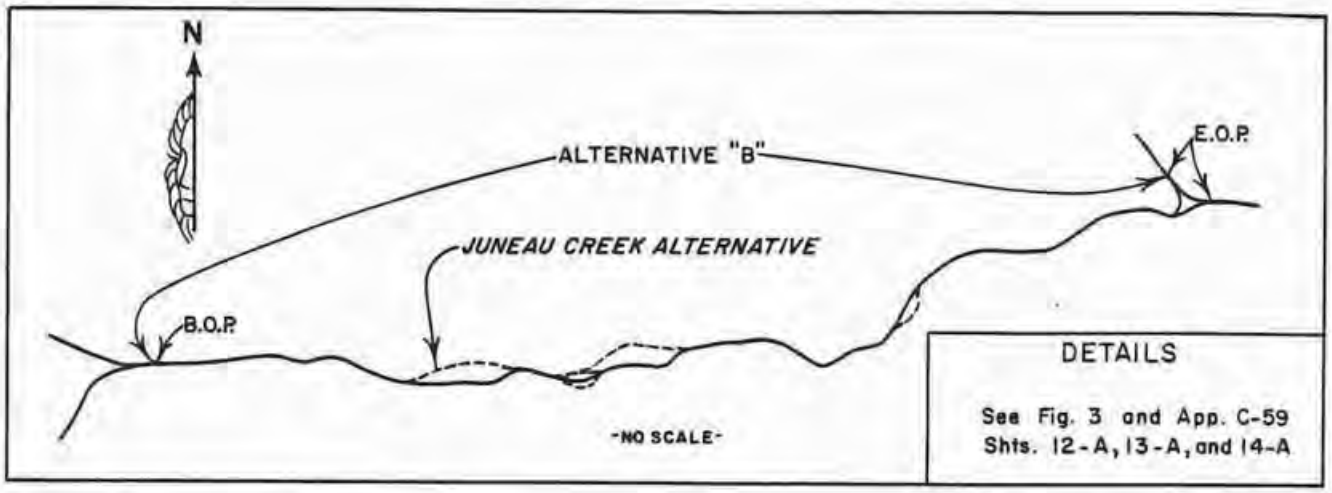
A realignment in the vicinity of Milepost 39! involves a broader crossing of Dave's Creek and rock cuts which will require new right-of-way and a longer, modified culvert.

The Seward Wye geometry entails major realignments as well as some new roadway (Fig. 4). Massive cuts into bedrock will be involved with the Sterling/Anchorage leg of the Wye. There will be some encroachment onto wetlands on both Sterling/Anchorage and Sterling/Seward legs. A significant amount of new right-of-way is needed for these improvements.

The Sterling/Anchorage two-way leg of the Wye will be constructed concurrently with a one-way southbound Anchorage/Seward section, which will cross over the Sterling/Anchorage leg on a bridge. A climbing lane for slower trucks, included with the Sterling/Anchorage leg, will facilitate smooth, safer traffic flow on the uphill grade.

Juneau Creek Alternative

The Juneau Creek Alternative offers the option of a smoothly aligned, 1.72 mile long route on the north side of the Kenai River, away from the constricted situation of the existing road between the bluff and the river from Cooper Creek to Milepost 50.

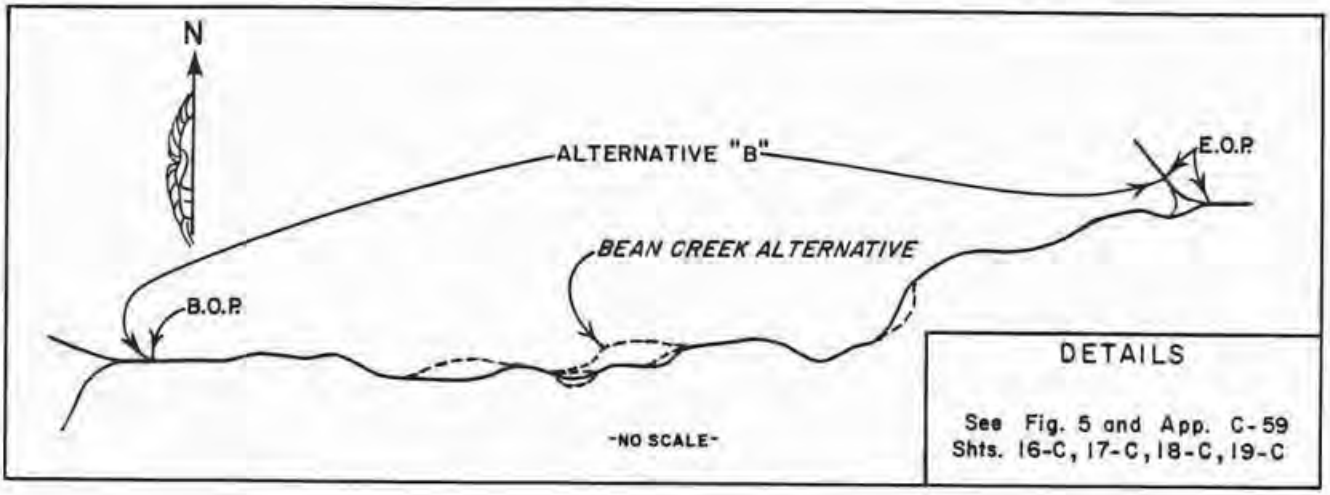


This alternative begins near Gwinn's Lodge at M.P. 52, and ends near Milepost 50 (Fig. 3). Its major design features include three bridges: two spanning the Kenai River and one across Juneau Creek. The route traverses undeveloped and forested areas of floodplain and uplands on both sides of the river west of milepost 50. Ninety percent of the alternative would be on fill up to 15 feet higher than the existing ground. The remaining 10 percent of the roadway would be a single 18-foot deep cut. Grades would be no steeper than two percent.

Access to the new highway from Cooper Creek Campground and private properties on the creek, would be located near Station 1610 east of Gwinn's, where the old highway would intercept the Juneau Creek Alternative (App. C-59, sheet 12-A). The old highway would function as a driveway to the campground area. Through highway traffic would be eliminated, and traffic noise reduced by distance, enhancing the quality of the camping experience and providing more privacy for all users of the area. The existing roadway west of the new river bridge near Milepost 50 to the driveway on the east side of Cooper Creek would be

obliterated and revegetated (App. C-59, sheets 14-A, 14-B_3). The existing Cooper Creek bridge could remain in service with minimal improvement upon removal of the mainline traffic.

Bean Creek Alternative



This route is a by-pass of the mid-community portion of Cooper Landing. As such, it has meaningful effects on the neighborhood and the community which are discussed in detail in other sections of the report. Other important elements of the Bean Creek Alternative include partial control of access, displacement and reconstruction of part of Slaughter Creek Road and Bean Creek Road, and three crossings of the Kenai River. No grades would exceed two percent.

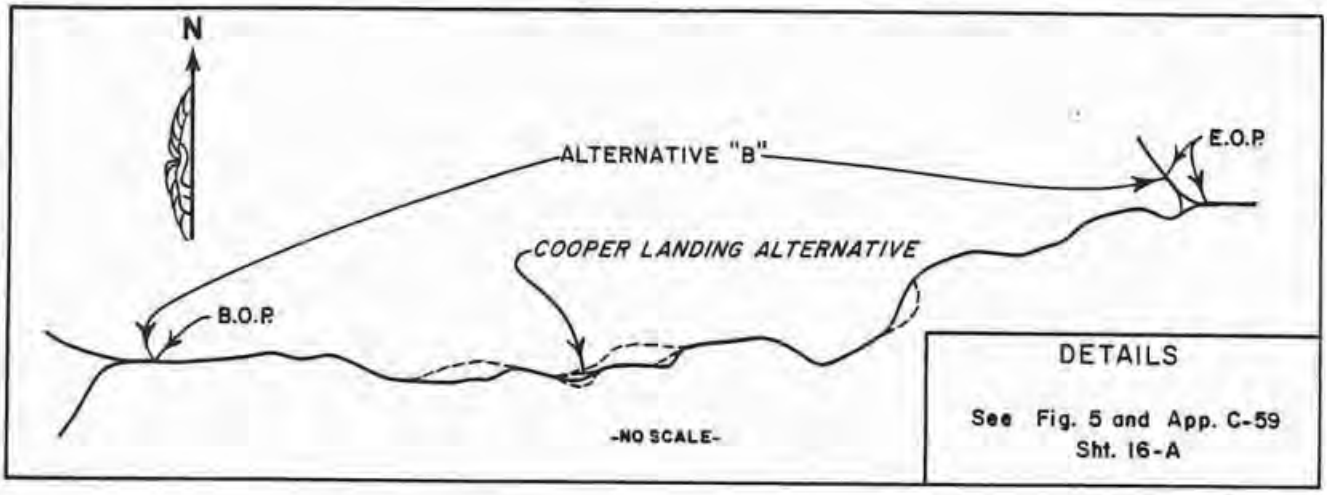
The alternative begins one-quarter mile east of Milepost 50, and ends about one-quarter mile east of the Kenai River Bridge, a distance of 2.20 miles (Fig. 5). The proposal crosses two bends of the Kenai River on three bridges within half a mile. It then climbs through a cut in the river bluff that averages 26 feet deep over a length of 900 feet

and daylights on the terrace above Bean Creek. An approach is proposed from the new highway to Bean Creek Road via the west side of the creek and a new creek bridge. The creek must be realigned through a straight culvert beneath a 50 foot fill on the main line (App. C-59, sheet 17-C).

East of Bean Creek, the route skirts the edge of the skeet range and contours the valley wall above Slaughter Creek Road, except where it severs the existing road in filling across Bean Creek valley. An approach opposite the skeet range would connect with Slaughter Creek Road east of the creek. The route follows the Slaughter Creek Road alignment for a thousand feet west of the Elementary School, cuts across the curve of the Sterling Highway on the north approach to the Kenai River Bridge, and matches the Sterling centerline a thousand feet farther east.

Slaughter Creek Road between the skeet range and the Elementary School would be connected to the highway in a way compatible with the needs of property owners and the school, which are now located on Slaughter Creek Road. Partial control of access would limit the number of locations a vehicle could enter or leave the highway, and individual driveways would be connected by portions of the old Slaughter Creek Road or a specially constructed service road. Major intersections would be constructed to link the new highway with the existing Sterling to maintain traffic circulation through the commercial core of Cooper Landing.

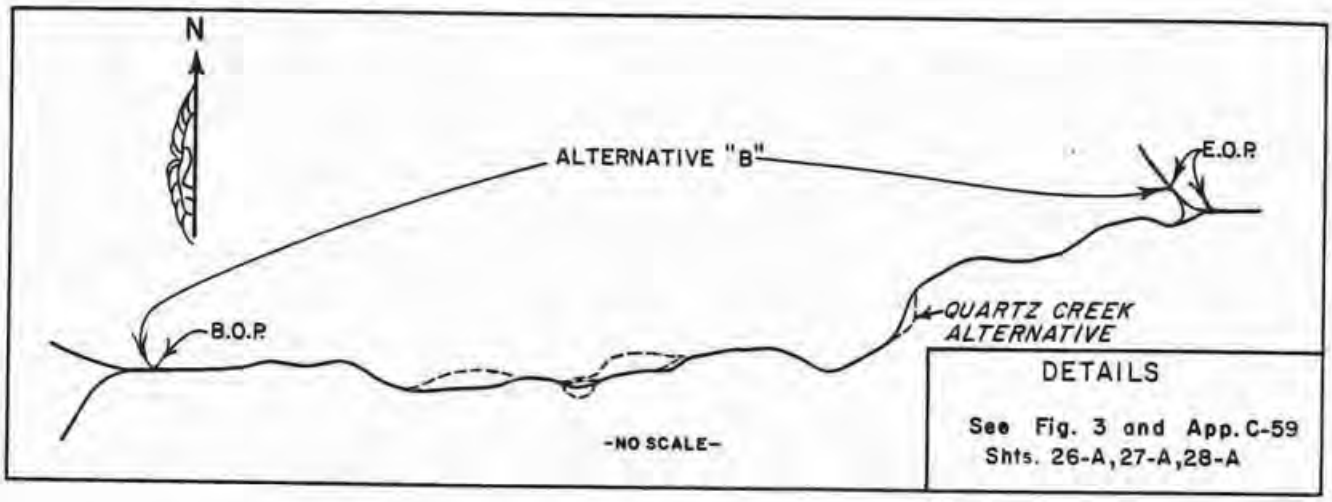
Cooper Landing Alternative



This alternative begins at the same point as the Bean Creek Alternative, east of Milepost 50. Moving east, like Bean Creek, it crosses the bend of the Kenai River opposite M.P. 49½ on two bridges. Then, instead of crossing to the north side of the river, it merges with the "B" alignment for a continuation of the existing route through Cooper Landing and across the bridge at the lake outlet (Fig. 5).

A comparative analysis of the four mid-community alternatives, "B-1", "B", "Bean Creek", and "Cooper Landing", is made in Table 1-B, (Environmental Consequences Section) p. 45, using significant factors of design, environmental impacts and costs that are relevant to this segment of the project corridor.

Quartz Creek Alternative



This alternative provides choices for highway alignment and construction in the Quartz Creek Valley. It avoids the constriction between the creek and the rock face, as well as some of the slope slippage and mud flow problems on the existing highway, by swinging away from the bedrock wall of the valley to the south side of the creek and back again. The alternative begins about three-quarters of a mile east of Sunrise Inn. From there it curves right to a bridge crossing of Quartz Creek, within 100 yards of the Crescent Creek Campground. A long curve to the left then takes it across the sparsely wooded and marshy floodplain of the creek, bridging the creek again before it climbs a maximum 2½ percent grade to reconnect with the existing highway at Milepost 42 (Fig. 3 and App. C-59, 26-A, 27-A, 28-A).

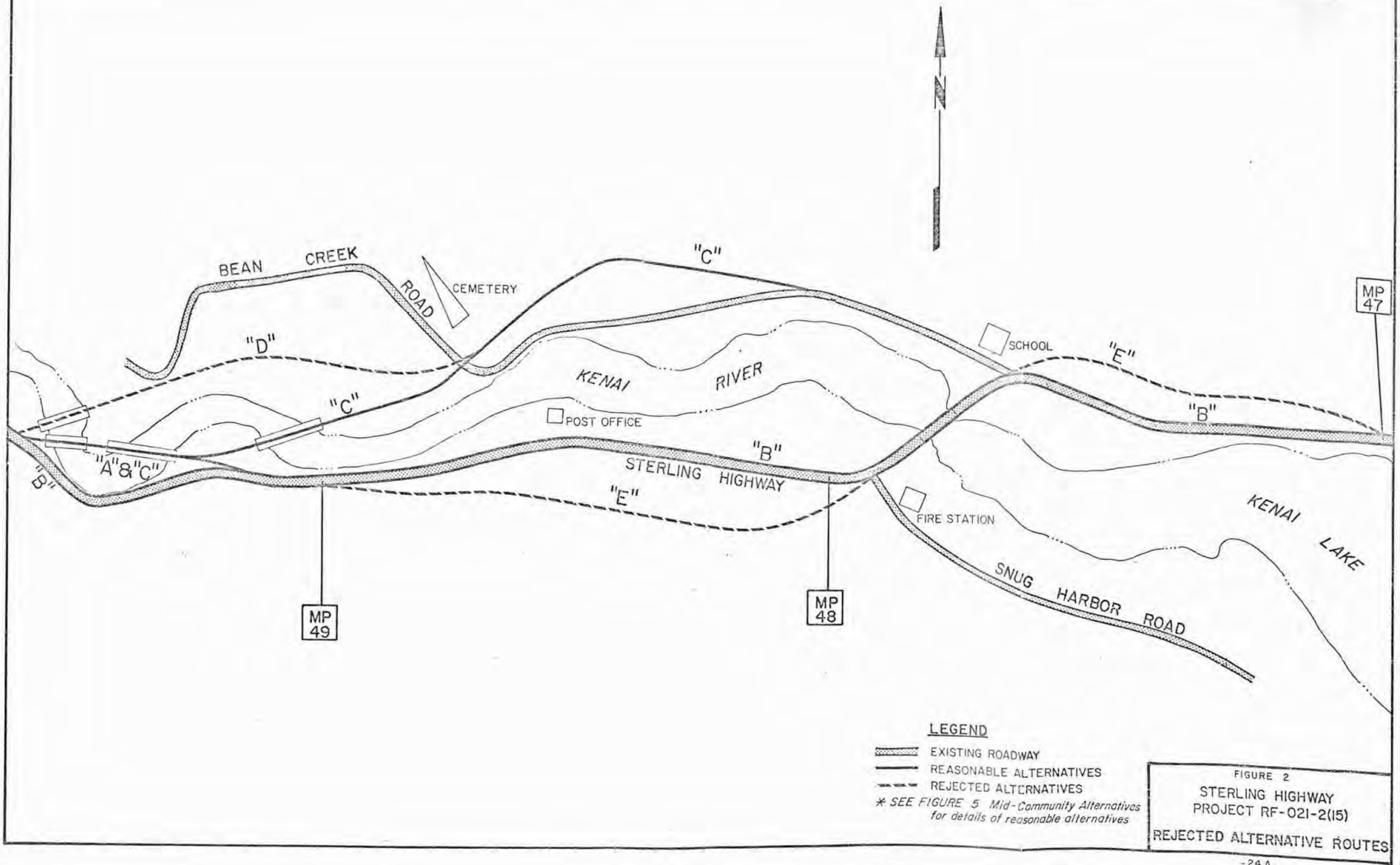
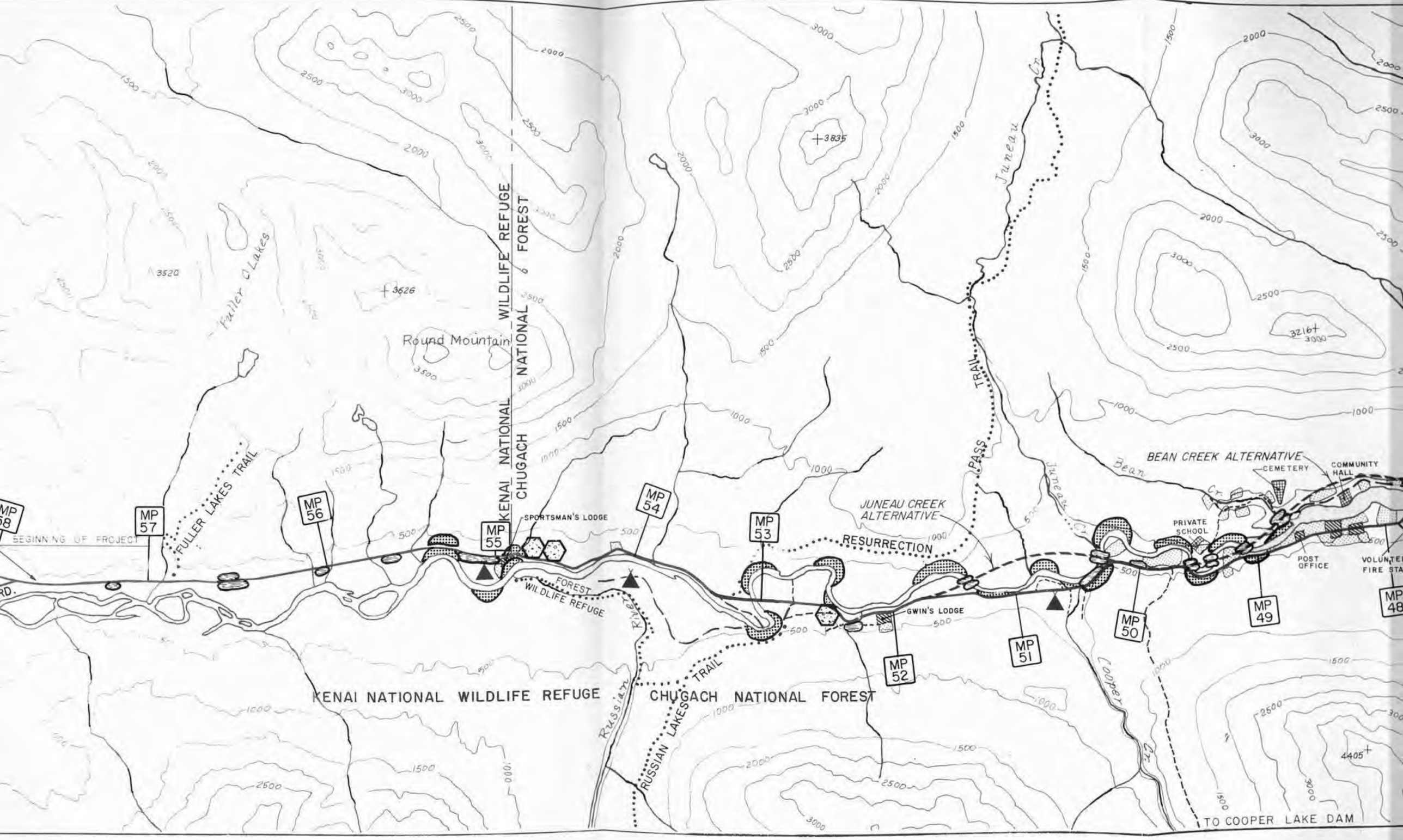


FIGURE 2
STERLING HIGHWAY
PROJECT RF-021-2(15)
REJECTED ALTERNATIVE ROUTES


WILDLIFE REFUGE
NATIONAL
FOREST
KENAI NATIONAL
CHUGACH
Fuller Lakes
3520
+3626
Round Mountain
3500
FULLER LAKES TRAIL
MP 57
MP 56
MP 55
MP 54
MP 53
MP 52
MP 51
MP 50
MP 49
SPORTSMAN'S LODGE
FOREST
WILDLIFE REFUGE
Russian R.
RUSSIAN LAKES TRAIL
KENAI NATIONAL WILDLIFE REFUGE
CHUGACH NATIONAL FOREST
+3835
Juneau Cr.
TRAIL
PASS
JUNEAU CREEK
ALTERNATIVE
RESURRECTION
GWIN'S LODGE
BEAN CREEK ALTERNATIVE
CEMETERY
COMMUNITY
HALL
PRIVATE
SCHOOL
POST
OFFICE
Bean
Juneau Cr.
Cooper
3216+
4405+
TO COOPER LAKE DAM

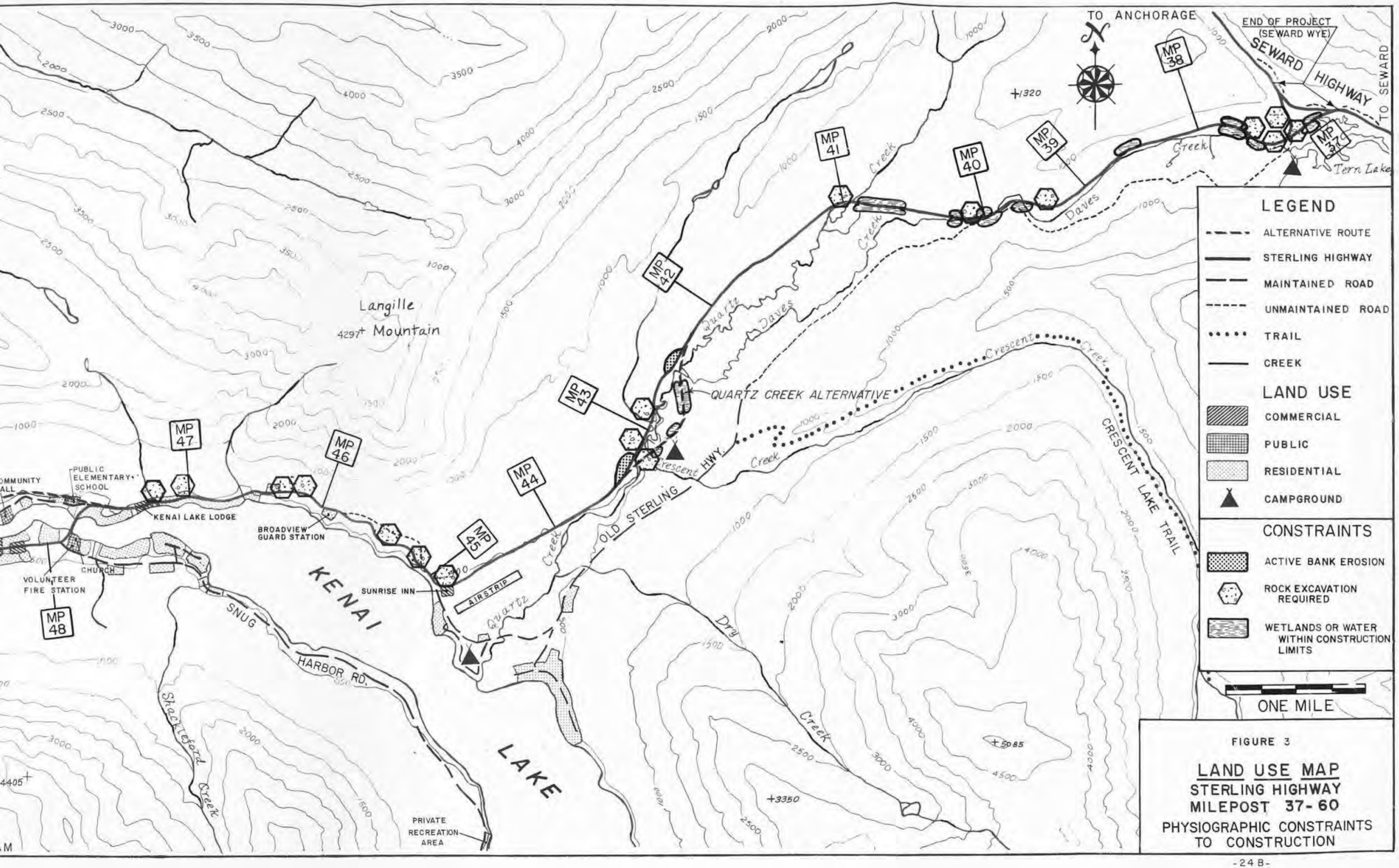


FIGURE 3

LAND USE MAP
STERLING HIGHWAY
MILEPOST 37-60
PHYSIOGRAPHIC CONSTRAINTS TO CONSTRUCTION

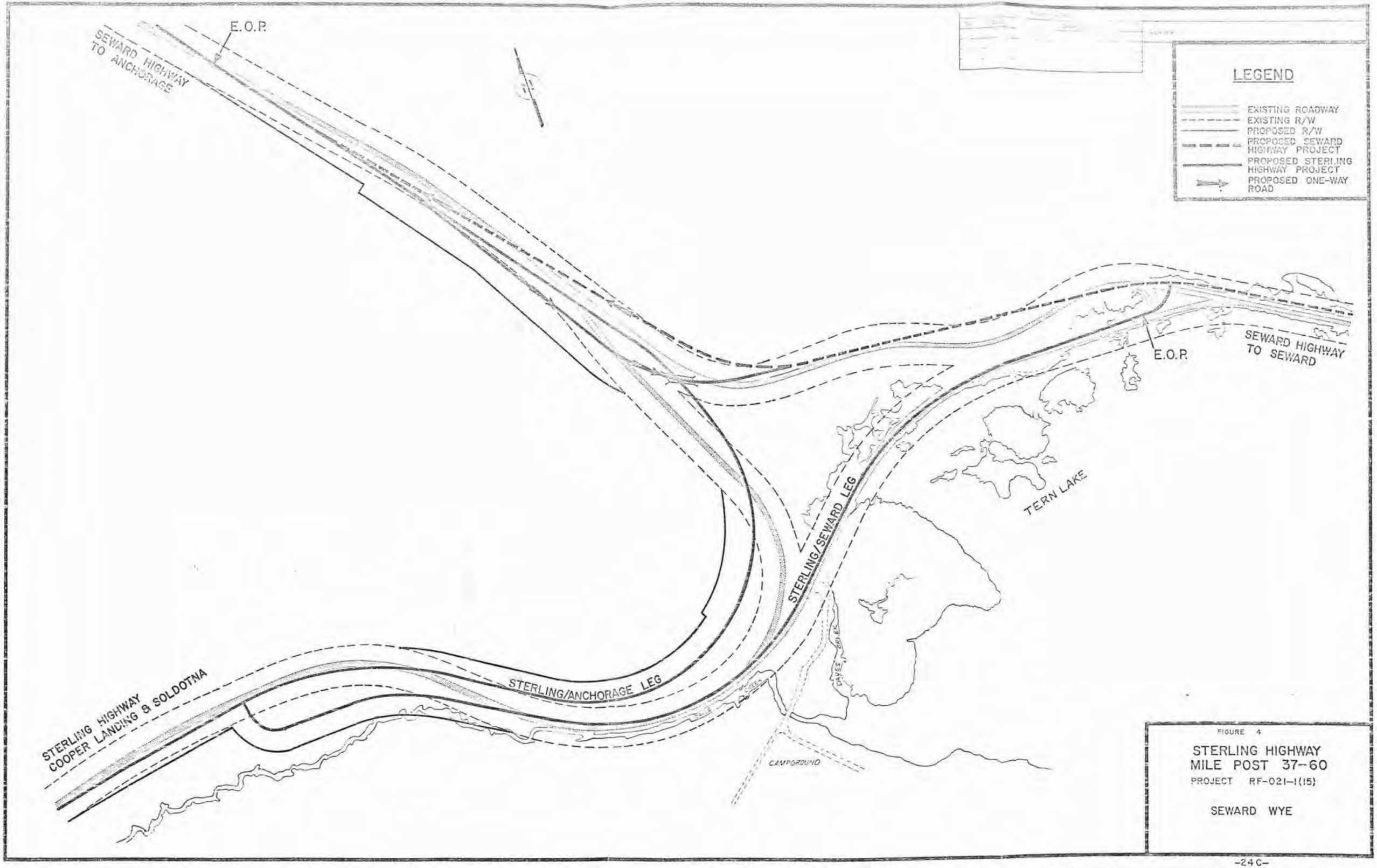


FIGURE 4

STERLING HIGHWAY
MILE POST 37–60

PROJECT RF-021-1(15)

SEWARD WYE

USS 1442

BEAN CREEK

JUNEAU ROAD

CEMETERY

BEAN CREEK ROAD

SKEET RANGE

SLAUGHTER CREEK

COMM HALL

Camp Resurrection

Cooper Landing Resort & POST OFFICE

Hamilton's Place

The Shrews Nest

BEAN CREEK Alternative

KENAI RIVER

STERLING HIGHWAY

COOPER LANDING Alternative

B-(50mph)

B-1(60mph)

PETERSEN CABIN

MP 49.5

MP 49

USS 1188

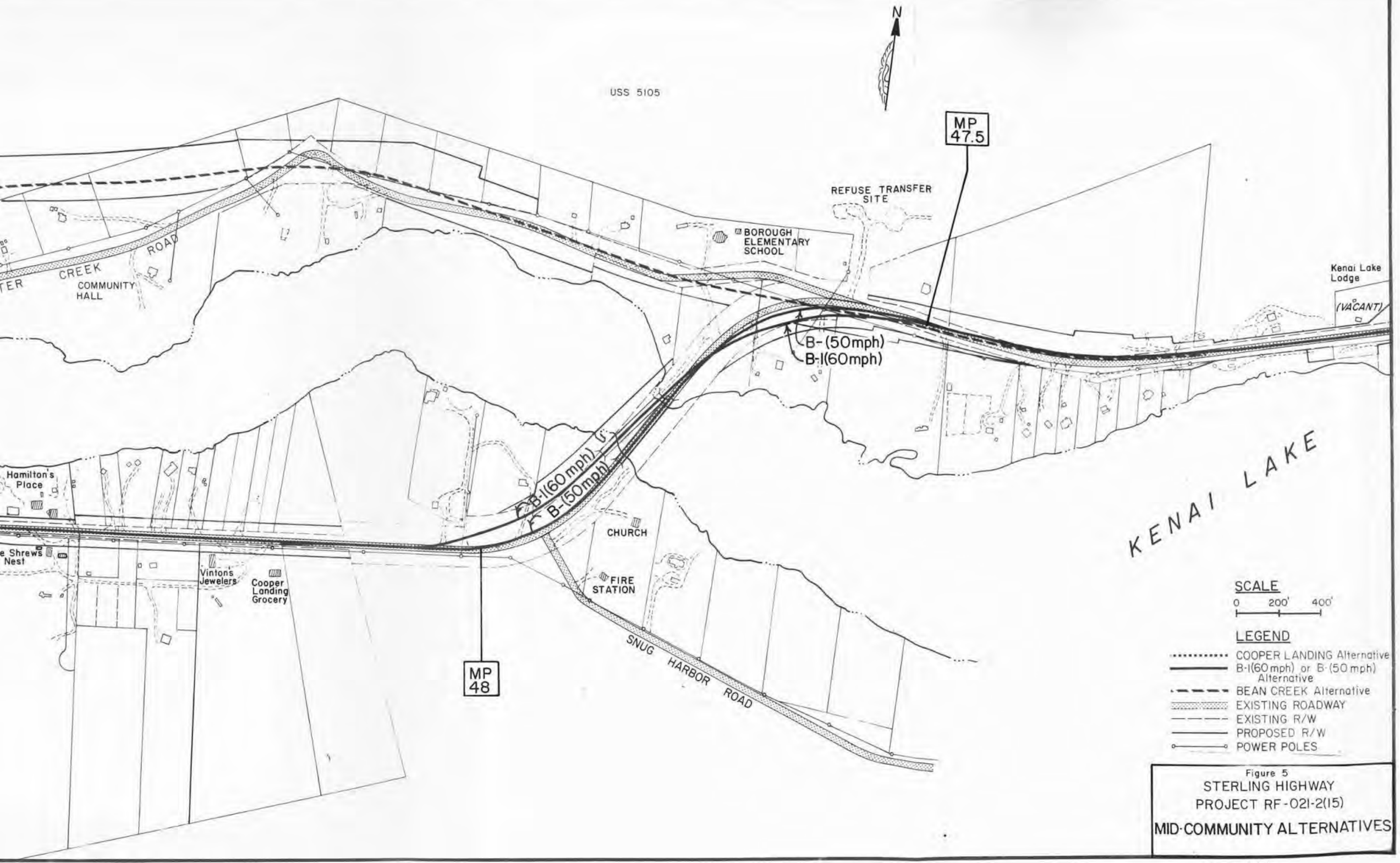


Figure 5
STERLING HIGHWAY
PROJECT RF-021-2(15)
MID-COMMUNITY ALTERNATIVES

For the most part, this route is on fill that varies from one to eight feet above existing ground. At one point, it would fill an old gravel pit that is 12 feet deep. A 250 foot long cut at the western end of the route would eliminate the small hill there.

The existing highway would be obliterated and revegetated.

No Action Alternative

The "No Action" alternative would result in greater hazards as traffic volumes increase, and maintenance costs would grow, but "No Action" would avoid the cost of new construction.

Environmental impacts of the "No Action" Alternative are compared with those of the "Build" or Action Alternatives in Table 1-d, p. 48, to disclose the consequences of doing nothing versus constructing the project.

Summary

The action alternatives would mitigate most of the traffic safety and capacity problems directly or indirectly, allowing greater numbers of vehicles to travel this route more safely. Combinations of the Juneau Creek and Bean Creek Alternatives would offer the safest and fastest routing and alignment as well as new access in the segment immediately north and west of Cooper Landing. The less extensive

Quartz Creek proposal would have similar effects in the vicinity of the Crescent Creek Campground. Except at the 50-mile-per-hour curve at Milepost 50, Alternative "B", with mininal alignment changes and wider pavement, would also provide the full desired traffic improvement. It would present significant improvements from the standpoint of safety and efficiency without changing the access situation.

None of the reasonable alternatives presented in this report is preferred above the others. All alternatives are under consideration, including the "No Action" alternative. Selection of one as the alternative preferred for the proposed action will be made only after the public hearing transcript and comments on the draft EIS have been evaluated.

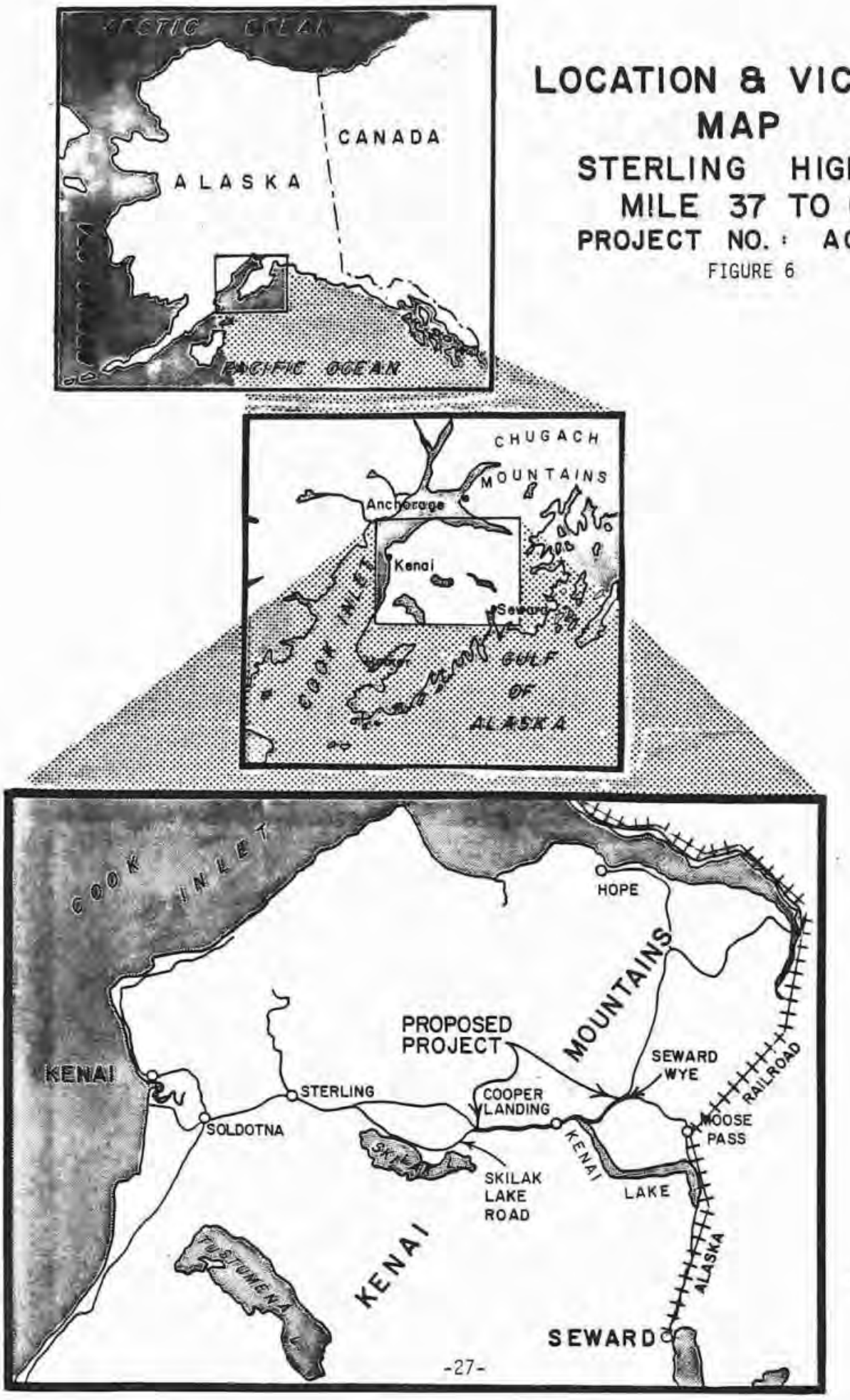
III. AFFECTED ENVIRONMENT

Sterling Highway, Milepost 37-60, is located on the Kenai Peninsula in Southcentral Alaska (See Location and Vicinity Map, Fig. 6). Cutting through rugged mountain terrain, the proposal traces two of the narrow valleys of the Kenai River system. After departing the Seward Highway Junction, the highway follows the valley of the southerly flowing Quartz Creek until it drains into Kenai Lake, three miles above the lake outlet. After traversing the mountain flank above the lake, the facility then parallels and occasionally crosses the westerly flowing Kenai River as it drains Kenai Lake, carrying the melt waters of the Kenai Mountain glaciers toward Cook Inlet.

LOCATION & VICINITY MAP

STERLING HIGHWAY
MILE 37 TO 60
PROJECT NO.: A09812

FIGURE 6



The highway corridor is in a limited continental climatic area separated from the maritime coastal zone by a narrow transitional zone. This climatic pocket in the Kenai Mountains is drier than the surrounding regions because most of the precipitation occurs at the higher elevations that rim the area. Runoff from the mountains keeps streams and lakes brimming. Overcast or cloudy skies associated with the general weather systems are common.

Precipitation exceeds 25 inches a year, (Ref. 40) much of which occurs in the form of winter snow and abundant rains in spring and fall. Snow cover in the valleys usually lasts from mid-October through April (Ref. 49) Exceptionally heavy rainfall and/or glacial lake-dumping occasionally result in flooding along the Kenai River. Quality of both surface and groundwaters is considered to be excellent (see Water Quality Impacts, p. 85).

Summer temperatures are moderate, averaging 56 degrees (Ref. 49), and occasionally rising into the 80s. Winter temperatures may dip to 20 below zero, but usually range from 11 to 42 degrees. Surface winds in the area are generally light compared to those on the coast, but winds over Kenai Lake are notoriously quick to reach velocities hazardous to boaters. The air is of exceptionally high quality the year around, and pollutant content is insignificant.

Forests of both coniferous and deciduous trees occupy the valley bottoms up to an elevation of 1,500 feet. Black spruce bogs and stands

of willow and cottonwood occupy wetland areas, while white spruce, birch, and aspen flourish in well-drained sites. Thick alder stands cover the steeper mountain slopes at elevations of from 1,000 to 2,500 feet. Above 2,500 feet, the dominant vegetation is grasses, forbs, and mosses in alpine meadows, interrupted by barren rock outcrops to summits ranging upward of 4,000 feet. The ridges and peaks bordering the highway corridor do not sustain permanent snow or ice (Ref. 53).

The exceptional variety and contrast of the natural landscape provide scenery that is valued highly by residents and tourists alike. These forests, mountains, streams and lakes are the habitat of a flourishing fish and wildlife community which attracts thousands of human visitors to the area every year for sightseeing, hunting, and fishing. Wildlife populations in the Kenai Mountains include seven big game species, a variety of waterfowl and non-game birds, furbearers, and smaller animals (Ref. 49). Many of these are regularly seen by highway travelers. Salmon and trout abound in the Kenai River and its tributaries, comprising one of the most significant and accessible sport-fisheries in the state (App. C-6). Recreationists come to camp, canoe, hike, climb, ski, snowmachine and boat as well.

The long, steep-walled mountainsides, the bowl-shaped cirques beneath the peaks, and fiord-like Kenai Lake are part of the legacy of the last ice age. The Kenai River has channelled through old glacier out wash and lake deposits to form the bench lands above the river floodplain. The existing roadway slices through these unstable materials at several locations along the Kenai River. Rock cuts have been made at different points throughout the length of the project corridor.

Man's alteration of the landscape has been relatively slight since the first goldseekers came into the country in the mid-1800s. The most obvious evidence of human development along the mountainous eastern segment of the Sterling Highway is the roadway system itself, and the thin string of homes and businesses that comprise the Cooper Landing community. Mining activity was never strong in this vicinity, but relics (cabins) remaining from early settlement days are still evident; some are being preserved by local residents, while others are protected by State and Federal laws. U.S. Forest Service and Alaska Division of Parks surveys have revealed many historic and prehistoric sites along the highway route. The density of cultural features suggests that this area could contribute significantly to the overall cultural history of the Kenai Peninsula.

There is no record of what year the portion of the Sterling Highway from Skilak Lake Road (Fig. 6) to the junction with the Russian River was built. The portion from the Russian River to Cooper Landing was build in 1921 to a 10-foot width. In 1936 the portion of road from Cooper Landing to the Seward Wye was constructed to a 10-foot width, thus connecting the Kenai Peninsula to the Seward Highway. In this year, the Kenai River Bridge at Cooper Landing was built along with the bridge at Quartz Creek and Daves Creek.

Between 1950 and 1955 the entire route was reconstructed to a 24-foot gravel surface. Some realignment was accomplished during this reconstruction. All the work up to this point was accomplished by the Alaska Road Commisison.

In 1957 the Bureau of Public Roads surfaced this portion of the road with 2 inches of hot bituminous pavement after placing 4 inches of crushed aggregate base. The width of the paved surface was 22 feet, which to date has not been changed on most of the highway affected by this project.

After the earthquake in 1964, the Department of Highways did some spot reconstruction work to repair the earthquake damage. In these areas the roadway was widened and repaved to a 24-foot width.

The Cooper Landing community was credited with a population of 238 persons in a special July 1978 census conducted by the U.S. Bureau of Census (App. C-20). By comparison, the population was about 165 in 1970, amounting to a 44 percent increase over the eight-year period. (The 1980 Census, indicating 203 residents within an area larger than the 1978 Cooper Landing Precinct, has not been officially adopted as of this writing). Minority races are not represented in Cooper Landing according to the census. Many residents are seasonal construction workers or retirees.

Community facilities include a volunteer fire department with equipment in the fire station on Snug Harbor Road near the Sterling Highway. Police protection is provided by the Alaska State Troopers, with the nearest officer stationed near the airstrip on the Quartz Creek summer home road. The Community Hall is maintained by residents as a

meeting place at its new location on Slaughter Creek Road. Solid waste is deposited in dumpsters by residents at a refuse transfer site near the school. From there it is regularly trucked to a Soldotna landfill. Telephone communications are handled by Interior Telephone Company, which is connected to the ALASCOM long distance system. Through the efforts of the Cooper Landing Community Club, television is currently provided through a terrestrial signal translator by a commercial broadcaster (Pers. Comm. Wayne Morgan, Herb Holeman). Public TV will become available upon completion of the installation of an earth satellite antenna that will be licensed in the name of the Lions Club (Pers. Comm. Vinton Edwards and Paul Davis). Electric power is distributed by the Chugach Electric Association.

For the most part, residential development is near the highway, within approximately two miles of the bridge across the Kenai Lake outlet. Most homes have direct access to the Sterling Highway, Slaughter Creek Road, or Snug Harbor Road.

There is a concentration of recreational summer homes on the south side of the Quartz Creek Valley near the lake, and along old Sterling Highway toward Crescent Creek. The majority of homes are on large lots where individual wells and septic tanks are used. The rustic, sometimes antiquated, but generally neat appearance of the homes in the project area seems to reflect the independent and self-reliant traits of the residents.

Commercial development is scattered along a 10-mile section of the Sterling Highway from Sportsman's Lodge at M.P. 55 to Sunrise Inn at M.P. 45. In between, the major cluster of businesses is in the vicinity of the Cooper Landing Post Office at M.P. 48.5. These establishments are primarily service oriented, catering to tourists and recreationists visiting the area.

Recreation is the most significant human activity in the immediate vicinity of the Sterling Highway corridor. Cooper Landing businesses derive most of their income from summertime fishermen, campers, and highway travelers visiting the Kenai Peninsula for recreational activities associated with the area's scenic, aquatic, and wildlife attractions.

Six public campgrounds dot the length of the project corridor; vacation homes are numerous in the Kenai Lake-Cooper Landing area. The Forest Service cabin-trail system has three of its trailheads on this section of the Sterling Highway; one trail in the Kenai National Wildlife Refuge is accessible from the highway.

The highest use areas are the campgrounds at Russian River and at Quartz Creek on Kenai Lake, which together accounted for more than 115,000 visitor days in 1979. (A "visitor day" is equivalent to one person spending 12 consecutive hours in an area). Wildlife Refuge management cites a highway counter record of over 1.5 million visitors each year in this section of the wildlife refuge. In 1972, 80 percent

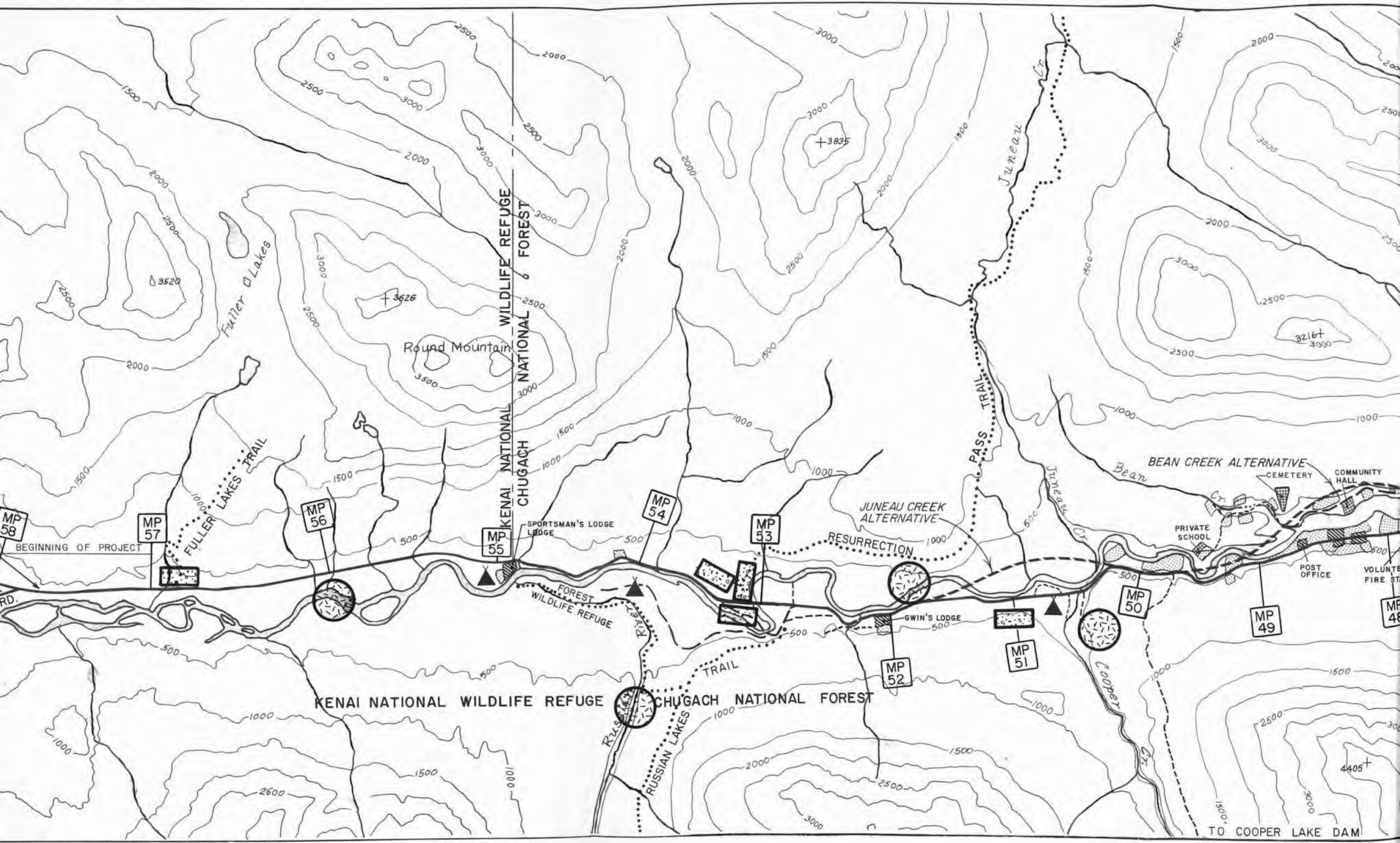
of those visiting the Kenai Peninsula for recreation were Anchorage area residents (Ref. 48), further emphasizing the importance of the Sterling Highway's role in the recreation industry.

Energy intensive industry along the project corridor is limited to some part-time logging and mining. The Forest Service has indentified seven timber types within the highway corridor, three of which are considered to be currently marketable: white spruce, white spruce-hardwood, and cottonwood. Tree size, quality, and volume per acre are low compared to other timber-producing areas in Southeast Alaska or Prince William Sound (Ref. 43).

Several relatively small timber sales (100-300 million-board-feet per year) have been made in recent years to operators who log the better stands of spruce near the highway system (Ref. 43 and Natural Resources Impacts, p. 122).

There are limited mineral deposits in potentially mineable concentrations within the highway corridor (Ref. 50 and Fig. 7). Hardrock as well as placer deposits have been prospected. They include silver-tin-chromium, stibnite, and gold. Production to date has been limited to small amounts of antimony (from the stibnite) and some placer mining of gold from Kenai River tributaries.

Common variety materials of rock, sand and gravel, are obtainable at several places along the highway corridor. Environmental and land


KENAI NATIONAL WILDLIFE REFUGE
CHUGACH NATIONAL FOREST
Fuller Lakes
Round Mountain
3626
3520
3835
3216+
4405+
FULLER LAKES TRAIL
MP 58
MP 57
MP 56
MP 55
MP 54
MP 53
MP 52
MP 51
MP 50
MP 49
BEGINNING OF PROJECT
SPORTSMAN'S LODGE
LODGE
FOREST WILDLIFE REFUGE
Russian River
RUSSIAN LAKES TRAIL
JUNEAU CREEK ALTERNATIVE
RESURRECTION PASS TRAIL
Juneau Cr.
GWIN'S LODGE
BEAN CREEK ALTERNATIVE
CEMETERY
COMMUNITY HALL
PRIVATE SCHOOL
POST OFFICE
Bean Cr.
Cooper Cr.
TO COOPER LAKE DAM

TO ANCHORAGE

TO SEWARD

2.5 Miles

SEWARD HIGHWAY

2.0 Miles

END OF PROJECT (SEWARD WYE)

MP 38

MP 37

MP 39

MP 40

MP 41

MP 42

MP 43

MP 44

MP 45

MP 46

MP 47

MP 48

Langille Mountain 4297+

+1320

Tern Lake

Creek

Quartz Creek

Daves Creek

QUARTZ CREEK ALTERNATIVE

Crescent Creek

CRESCENT LAKE TRAIL

Crescent HWY.

OLD STERLING

Dry Creek

+5085

+3350

4405+

COMMUNITY HALL

PUBLIC ELEMENTARY SCHOOL

KENAI LAKE LODGE

BROADVIEW GUARD STATION

CHURCH

VOLUNTEER FIRE STATION

SUNRISE INN

AIRSTRIP

KENAI LAKE

Shackleford Creek

PRIVATE RECREATION AREA

DAM

LEGEND

- ALTERNATIVE ROUTE
- STERLING HIGHWAY
- MAINTAINED ROAD
- UNMAINTAINED ROAD
- TRAIL
- CREEK

LAND USE

- COMMERCIAL
- PUBLIC
- RESIDENTIAL
- CAMPGROUND

MINERAL

- METALLIFEROUS AND NONMETALLIFEROUS
- GRAVEL

ONE MILE

FIGURE 7

LAND USE MAP
STERLING HIGHWAY
MILEPOST 37-60
DISTRIBUTION OF KNOWN
MINERAL OCCURANCES

use constraints limit the availability of some materials to only a few sites. (Gravel sources for the proposed highway project as well as future needs are detailed in the Construction Impacts Section, p. 133).

There is one extensive, but relatively unobtrusive energy development in the area -- the Cooper Lake Power Project. Although a part of the southcentral Alaska electric power system, most of the Cooper Lake energy is supplied to Soldotna and Homer. The complex involves a penstock tunnel and pipeline which taps Cooper Lake and directs the water down to the powerhouse on the west shore of Kenai Lake. The level of Cooper Lake is raised and controlled by an earth-fill dam.

Carrying current from generator to consumer involves two systems: the transmission, or high voltage lines, and the distribution lines through the community (Fig. 5 and Fig. 8).

Two roads are associated with the system -- the extension of the Snug Harbor Road (Fig. 8) which ends at Cooper Lake, 12 miles from its junction with the Sterling Highway; and a construction road which follows the upper edge of Cooper Creek canyon from Sterling Highway near Cooper Landing to the dam site at Cooper Lake.

The highway project study area lies entirely within the Kenai Peninsula Borough. Public land within the area is managed by the U.S. Fish and Wildlife Service (F&WS) where the Wildlife Refuge covers the western three miles of the highway segment. The remainder of the area,

with the exception of State of Alaska and private holdings in the vicinity of Cooper Landing, is under Forest Service jurisdiction as part of the Chugach National Forest (Fig. 9). The Borough has selected 1,780 acres in the vicinity of Cooper Landing under the Alaska Statehood Act. (See map of Borough Selected Lands, p. C-9). Much of these lands could eventually be converted to private ownership. A 1972 proposal to establish the western portion of the Forest on the Kenai Peninsula as the Seward National Recreation Area has not been passed by Congress.

The Alaska State Housing Authority, in 1970, produced the Comprehensive Planning Program Recommendations under the auspices of the Kenai Peninsula Borough Planning Commission. This report set forth guidelines for growth and development in the Borough communities, including Cooper Landing. Brief economic and population studies of Cooper Landing supported recommendations for future land use, major streets and community facilities. These recommendations are illustrated in Fig. 8, Future Development Plan, Cooper Landing, Alaska.

Several other relevant studies have been made or are being prepared by the Kenai Peninsula Borough Planning Commission, the Borough School District, and the Forest Service. (See References). The Advisory Planning Commission has been formed of active Cooper Landing citizens under the guidance of the Borough.

The above studies will provide further detail on the affected environment in the project area.

FUTURE DEVELOP

PUBLIC ELEMENTARY SCHOOL

SKEET RANGE

CEMETERY

COMMUNITY HALL

WAYSIDE POINT of INTEREST

LONG RANGE PARK & BOAT LAUNCHING AREA

CHURCH

POST OFFICE

VOLUNTEER FIRE STATION

KENAI RIVER

Bean Creek

KENAI NATIONAL WILDLIFE REFUGE & CHUGACH NATIONAL FOREST

FULLER LAKES TRAIL

Fuller Lakes

Round Mountain

3520

3626

MP 58

MP 57

MP 56

MP 55

MP 54

MP 53

MP 52

MP 51

MP 50

MP 49

MP 48

BEGINNING OF PROJECT

SPORTSMAN'S LODGE

FOREST WILDLIFE REFUGE

RESURRECTION PASS TRAIL

GWIN'S LODGE

RUSSIAN LAKES TRAIL

Russian River

Jeanne Ct.

Bean Ct.

Copper Ct.

PRIVATE SCHOOL

4405

TO COOPER LAKE DAM

VELOPMENT PLAN COOPER LANDING, ALASKA

EMENTARY

FUTURE DELOPMENT PLAN
LEGEND

- OPEN SPACE, RECREATION, PARKS CONSERVATION AREA, WILDLIFE AREA
- RURAL RESIDENTIAL – LOW DENSITY (Maximum of 2 Dwelling Units per Acre)
- CENTRAL BUSINESS COMMERCIAL
- PUBLIC LANDS & INSTITUTIONS
- EXISTING PRIMARY ARTERIAL HIGHWAY
- COLLECTOR & LOCAL ACCESS STREETS
  - EXISTING
  - PROPOSED

LEGEND

- ALTERNATIVE ROUTE
- STERLING HIGHWAY
- MAINTAINED ROAD
- UNMAINTAINED ROAD
- TRAIL
- TRANSMISSION LINE
- CREEK

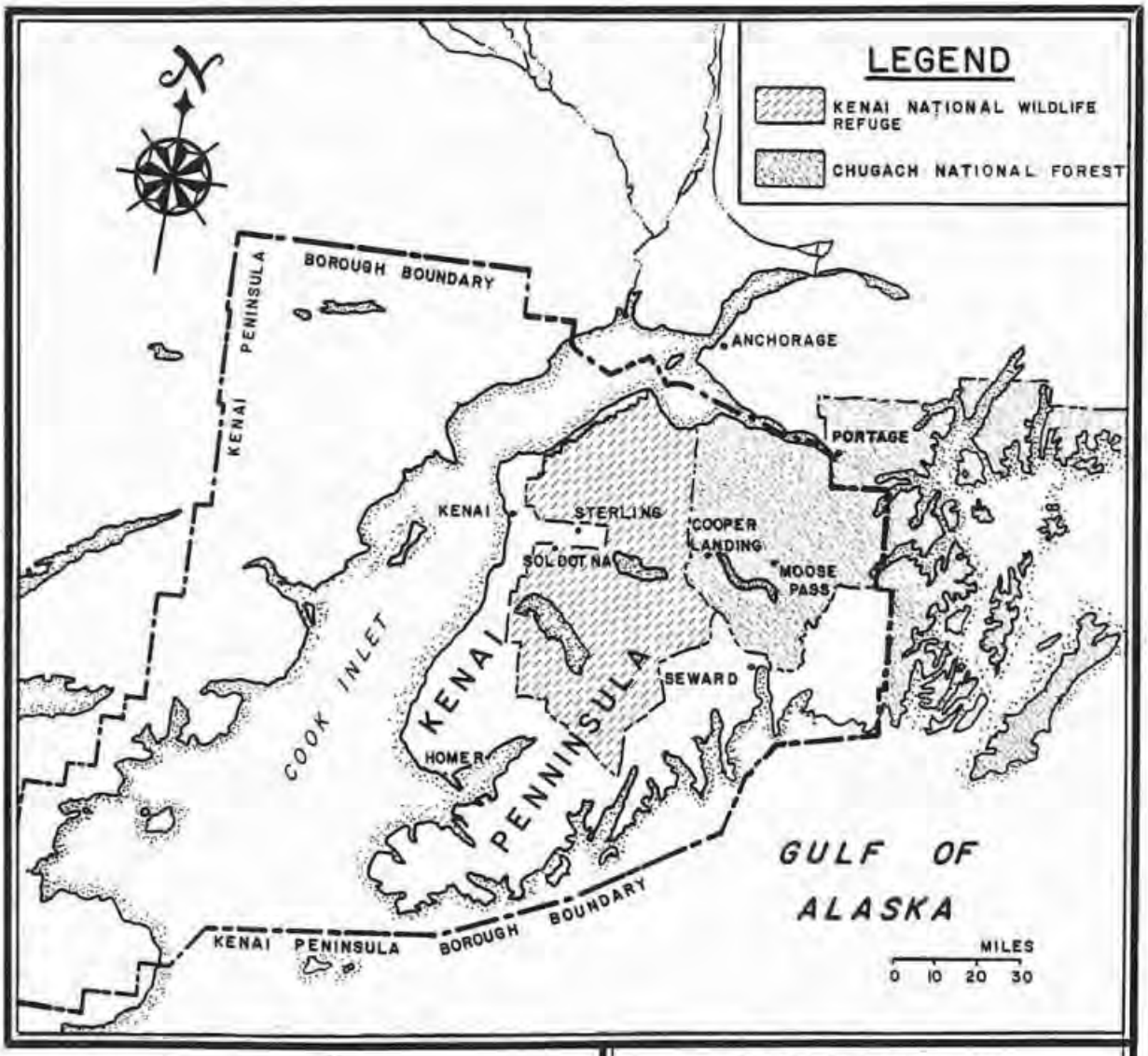
LAND USE

- COMMERCIAL
- PUBLIC
- RESIDENTIAL
- CAMPGROUND

ONE MILE

FIGURE 8

LAND USE MAP
STERLING HIGHWAY
MILEPOST 37-60
EXISTING AND FUTURE DEVELOPMENT



STERLING HIGHWAY
PROJECT RF-021-2(15)
Regional Land Management Jurisdiction in
PROJECT VICINITY

FIGURE 9

IV. ENVIRONMENTAL CONSEQUENCES

To a degree, environmental impacts are unavoidable with implementation of any of the alternatives. There are both temporary and permanent effects, some of which can either be avoided or mitigated in the highway design and construction process. These impacts and some means of mitigating them are described here for each of the alternatives, including No Action.

Beneficial Aspects

All alternatives, with the exception of the No Action will improve safety and convenience for highway users. Sterling Highway's function as the regional road connection (and the Comprehensive Plan Goal to preserve that function) will be enhanced by any road improvement. Access for residents, commercial customers, and recreationists will be safer and more expedient. Traffic movement will be smoother, at higher speeds, and with less hazard. Vehicle operating costs, driver frustration, and air pollution in the project area will decrease as a result of reduced traffic congestion.

Adverse Aspects

Social/Economic impacts and increased traffic noise are significant factors with certain action alternatives. Altered scenery, damaged

habitat, irretrievable losses of wetlands and vegetation, and impacts to cultural sites will result with highway construction.

Mitigation Aspects

Severity of the negative impacts of highway construction can be moderated in many cases.

High noise levels from Sterling Highway are currently experienced only very near the roadway. Noise increases as traffic volume increases. Significant and immediate noise impacts would occur with new route proposals, and any mitigative measures would be delineated after final route selection.

Revegetation of raw cuts and fill slopes would be used to minimize erosion-caused water pollution and soften the visual impact of terrain changes.

To avoid a damming effect with new fills in wetlands, the roadway would be underlain with large rock, with sand blankets and filter cloths, with culverts, or combinations of each treatment. Additional culverts may be required to assure maintenance of natural water levels and flow where the existing roadway is widened (see App. C-33).

Historic/cultural sites would be excavated for relocation or recovery of data and materials, and for documentation of archeological findings.

Summary of Impacts

The environmental consequences of constructing or not constructing the project is discussed on the following pages. A comparison of alternatives, using significant negative impacts and other effects of the alternatives, is given at the conclusion of this section.

Visual impacts occur throughout the project as a result of roadway widening and realignment. Advantages from the standpoint of safety and convenience, stated above, become, in some cases, disadvantages environmentally. Different vistas presented by the new curves; new or deeper cut sections; new bridges; and the new roadway surface itself affect the visual environment on the highway corridor (see Visual Impacts, p. 51).

Roadside wetlands also occur along the length of the project, and will be impacted wherever it is necessary to fill into them for the reconstructed highway. The only reasonable solution for the negative effects of filling is, in many cases, not to improve the highway. However, possibilities for enhancing the wetlands through appropriate project design and operation have been investigated by ADOT/PF with the cooperation of other concerned agencies (See Wetlands Impacts, p. 111).

Water quality, for biotic as well as human communities, is protected from sedimentation by implementing project erosion control plans developed prior to the highway construction phase. Some alterations

have already been made to preliminary design plans, and further mitigative measures will be detailed in final plans. Water quality is specifically discussed for each alternative in the section on that topic that follows on p. 85.

Some chemical contaminants from motor vehicles and fuels are common to all roadways. It is known, however, that all but trace amounts (detectable only by laboratory analysis) of these substances are usually filtered out a short distance from the pavement, preventing any significant surface or ground water pollution (See Water Quality Impacts, p. 98).

Noise impacts from the highway are not currently a significant concern throughout most of the project corridor. However, new areas entered by the highway (i.e., the Bean Creek, Juneau Creek, and Quartz Creek Alternatives) can be expected to receive significant impacts as receptors unaccustomed to traffic impacts are exposed to them. Dwellings and businesses near the existing highway are already impacted to a degree by vehicle noise. These effects will worsen with time and increasing traffic volumes, in some cases to an extent that will exceed FHWA design guidelines for maximum noise levels. Effects will vary only slightly between alternatives where they adhere to the existing route. (See Noise Impacts, p. 74).

Social and economic effects of the highway are important considerations in the Cooper Landing community. Again, significant impacts

would result with the new alignment on Slaughter Creek Road. Noise, visual impacts and altered travel patterns would be the factors most affecting residents north of the river. Reduced exposure to through traffic would mean less income for some businesses on the existing alignment. On the other hand, some businesses would find access for customers improved by reduced traffic congestion, and residents near the existing road would enjoy a quieter neighborhood. (See Social and Economic Impacts, p. 57).

Historic and cultural sites are more in jeopardy from the Bean Creek and Quartz Creek alternatives than from the other routes. The State Historic Preservation Officer lists 21 aboriginal and historic sites (of 43 total sites identified) that would be directly impacted by one alternative or another. Eight of those sites have been submitted for determination of eligibility for the National Register of Historic Places. Secondary impacts such as increased public accessibility, unforeseen erosion problems, etc., are considered to be serious enough to warrant further archeological investigation at six sites prior to highway construction. (See Historic/Cultural Site Impacts, p. 131).

Comparative Analysis

A comparative analysis of alternatives is presented in Tables 1-a, 1-b, 1-c and 1-d. The first three tables compare the action of construction alternatives at each of three locations where significant changes of alighment are proposed. The No Action Alternative is compared with the construction alternatives in Table 1-d.

In the analysis in the first three tables, most factors are negative environmental impacts. The others are social impacts, represented indirectly by "Highway Related Noise" and "Proximity to Campgrounds"; transportation impacts by "Design Speed"; and economic impact, indicated by "Construction Cost".

Although some factors are applied to more than one set of alternatives, factors on each table were chosen for their significance in that particular portion of the project, as well as for the contrast they presented when applied to the alternatives. The comparison of No Action with the construction alternatives (Table 1-d) is made on a broader scope of analysis including almost all impact categories.

Table 1-b compares the alternatives for construction of a new highway through the mid-community area. Existing exposure of residents near the Sterling Highway to highway influences is high, while exposure of residents on the Slaughter Creek Road is low. The magnitude of negative impacts from the highway will be greatest in the area where it introduces elements foreign to the residents' present experience at that location (Slaughter Creek/Bean Creek Road area). Positive impacts to areas where highway influence is reduced (such as reduction of traffic along the existing Sterling Highway) do not counterbalance negative impacts at another location (such as Slaughter Creek Road).

One of the most significant impact factors on Table 1-b is "Highway Related Noise Increase". This represents the impacts experienced when people are close to a highway. (Other, less quantify-able factors include aesthetics, glare, and reduction of privacy).

The loudness or annoyance of noise doubles for each 10 dB increment in noise level. By that criteria, homes along the Slaughter Creek Road will experience traffic noise up to 8 times louder than they do at present, if the Bean Creek Alternative is built. Noise levels in that area will jump from the present 37 dBA nearly to the design guideline level of 67 dBA at a distance of 100 feet from the new highway at the year of completion (1984).

By contrast, traffic noise along the Sterling Highway is presently about 65 decibels (dBA) at 100 feet from the highway. If the perferred alternative continues to send traffic through the mid-community area (Alternative B-1, B, or Cooper Landing), that level could increase to nearly 67 dBA by 1984. The two decibel increase will not be discernable to receptors who have become accustomed to traffic noise.

TABLE 1-a

A COMPARATIVE ANALYSIS OF ALTERNATIVES

(MILEPOST 51.5 - 50)

COMPARATIVE FACTORS	ALTERNATIVES	
	ALTERNATIVE "B"	JUNEAU CREEK ALTERNATIVE
Design Speed	50 mph	60 mph
Bridges	None	3
Cut Slopes (erodible soils)	Extensive	Minor
River Fill	Extensive	Minor
Wildlife Impact Potential	Moderate	Severe (in de facto wilderness)
Construction Cost	$ 2.5 million	$ 5.5 Million

TABLE 1-b

A COMPARATIVE ANALYSIS OF ALTERNATIVES

MID-COMMUNITY ALTERNATIVES

MILEPOST 50 - 47.5

COMPARATIVE FACTORS	"B-1"	"B"	BEAN CREEK	COOPER LANDING
Design Speed	60 mph	50 mph	60 mph	60 mph
Bridges	1 (Replacement)	1 (Replacement)	3 (New)	2/1 (New/Replacement)
Cut Slopes (Erodible soils)	Extensive	Extensive	Extensive	Minor
River Fill	Extensive	Extensive	Minor	Minor
By-Pass*	N.A.	N.A.	Proposed	N.A.
Highway Related Noise Increase** Within 100 Feet	2 dBA	2 dBA	27 dBA	2 dBA
Construction Cost	$ 5 Million	$ 5 Million	$ 10 Million	$ 8 Million

* By-pass effect may be perceived as either positive or negative

** See explanation in text p. 44.

TABLE 1-c

A COMPARATIVE ANALYSIS OF ALTERNATIVES

MILEPOST 43.2 - 42.1

COMPARATIVE FACTORS	ALTERNATIVES	
	ALTERNATIVE "B"	QUARTZ CREEK ALTERNATIVE
Bridges	None	2
Cut Slopes (mostly rock)	Extensive	Minor
Wetland Fill	Minor (0.05 acres)	Extensive (2.36 acres)
Proximity to Crescent Creek Campground (glare, public exposure)	800 Feet	250 Feet
Highway Related Noise at Campground (Design year predictions)	60 dBA max.	65 dBA max.
Construction Cost	$ 1.5 Million	$ 2 Million

TABLE 1-d

A COMPARATIVE ANALYSIS OF ALTERNATIVES

COMPARATIVE FACTORS	ALTERNATIVES	
	NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE
TRANSPORTATION IMPACTS		
Travel time	Increased delays during peak periods	Reduced Delays
Accident rate	More accidents	Fewer accidents
Traffic congestion	Increased during peak periods	Reduced
SOCIAL IMPACTS		
Accessibility for shoppers, social activities	Difficult with congestion	Improved
Fire, police, school service	Less efficient with congestion	More efficient
Safety for motorists, pedestrians and bicyclists	Increased hazard	Safer conditions
Displacement of families, businesses	None	One family possible
Community amenities (Noise, Air, Open space/cultural, Visual)	No enhancement	Enhancement/degradation--effect varies with alternative and location

TABLE 1-d, CONTINUED

COMPARATIVE FACTORS	ALTERNATIVES	
	NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE
ECONOMIC IMPACTS		
Construction costs	None	$39 to $50 Million
Maintenance costs	High	Reduced for design life of project
Accessibility for employees, customers	Difficult with congestion	Improved
Accessibility for business	Difficult with congestion	Improved for most
Property values	No change	Positive effect
Employment	No change	Positive, but limited & temporary
Accident rate (lost time & resources)	Increased losses	Fewer losses

TABLE 1-d, CONTINUED

COMPATATIVE FACTORS	ALTERNATIVES NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE
ENVIRONMENTAL IMPACTS		
Visual quality	No enhancement	Altered views--some temporary degradation--long term enhancement--varies with alternative and location
Air quality	Mild deterioration with congestion	Temporary particulate increase or decrease
Noise	Gradual increase to design levels	Significant local increase or decrease
Water quality & drainage	No change--on-going risks of erosion--improvement	Temporary risks of erosion--long term improvement
Wetlands	No change--no losses	Losses of 15 to 18 acres.
Natural resources & landforms	No change--no losses. No improvement of access to resources	Minor timber losses; cuts & fills. Improved utilization with access to timber.
Vegetation disturbance	None	Temporary losses
Open space & cultural resources (including 4(f) lands)	No change	4(f) property & archeological sites affected

A. Visual Impacts

Of all the scenic areas in Alaska, this part of the Kenai Peninsula is among the most frequently viewed landscapes in the State owing to its proximity to the largest concentration of population in the State. Cooper Landing is situated midway between Anchorage and Homer on the only surface route connecting the State's largest city and popular destinations on the southwestern side of the Peninsula. More than 6,000 viewers pass through the project corridor on an average mid-summer day. (Total viewers is figured on the basis of 2,450 vehicles per day (in July 1979) times 2.6 persons per vehicle for all trip purposes. Vehicle occupancy is 2.9 ppv for recreational trips.)

Of primary importance is popular concern for the scenic quality of the landscape, the travel routes, use areas, and water bodies in the project area. The view from individual homes is high on the list of amenities for those who live in the region. The visual variety of landscapes here is outstanding. Rugged mountain backdrops are contrasted with the smoother slopes and flat valley bottoms characteristic of glaciated U-shaped valleys. Tourists and travelers rank sightseeing as a prime objective in visiting the Peninsula, which lends economic overtones to the value of the natural view as a resource.

Geological forms vary from rocky crests and ridges to river cut banks and gravel bars, old river terraces, and wave-washed lake beaches.

Waterforms are a significant part of most scenes in the highway corridor. Tern Lake reflects its mountain surroundings, and Kenai Lake's breadth of color and texture dominates the view from several points. Kenai River, Quartz Creek, and their many tributaries draw the eye with their variety of motion, reflectivity and color. Varigated colors and patterns of many species and ages of vegetation are interwoven with the landform and rockform, accentuating the contrasts in the landscape.

Features which exemplify the area's high quality of visual attractiveness include:

1. Kenai Lake and Kenai River valley from the vicinity of Broadview on the highway (a high point 200 feet above the lake) and from residences in the same vicinity.

2. Background views at the ends of each long tangent on the highway.

3. Near-river views in Cooper Landing and downstream from residences, lodges and campsites on both sides of the river.

4. Tern Lake, approached from the west and the north on the highway.

A rating system that compares areas in the National Forest for landscape management is an indicator of the significance of visual

qualities. The Forest Service has given the Sterling Highway corridor areas the highest ratings, calling for 80 to 100 percent Retention/-Partial Retention. This is a recommendation to limit land use management activities to those which would be least visually evident, or subordinate to the characteristic landscape (See Visual Quality Objectives, Ref. 45).

Effects of the project alternatives would be heaviest in the area of landform modification. Each of the alternatives (except No-Action) will require earthmoving, rock cuts or fills, or some combination of such surface-altering actions. Bridges will also have an important visual effect on streams with most of the alternatives. At least moderate losses of vegetation, due to widened roadway and realignments, will temporarily reduce visual quality with all action alternatives.

Comparison of the No-Action Alternative with the construction alternatives reveals beneficial and adverse visual impacts for each.

No-Action means no changes, including no improvements. Many of the existing roadside foregrounds are non-descript, with no definition of the roadway, and no treatment to integrate it with the natural scene. In some locations, the roadside has a raw, unkempt appearance. Views that could be enjoyed from the highway are hidden by the present road geometry.

Construction alternatives would provide cleaner, more interesting foregrounds, with mitigating measures ultimately improving visual qual-

ity. Views from the roadway would be opened up by clearing and terrain modification. Moderate to heavy landform modification would dominate some middle distance views and backgrounds, temporarily decreasing visual quality, but revegetation and other landscaping techniques as required would eventually mitigate the worst effects. Some residents would experience altered views from their homes, with the new roadway appearing at various distances. Again, mitigation would soften the effects of construction on visual quality.

Alternative B, compared to the Bean Creek, Juneau Creek, and Quartz Creek Alternatives, would involve more land modification in the form of earth and rock cuts. The other three alternatives incorporate bridge crossings and extensive fills. The dominating visual effects in each case are capable of being softened with various mitigative measures.

A comprehensive analysis of visual impacts is contained in App. C-10, "Scoping Visual Impacts".

Mitigation

Many of the potential visual impacts of the reconstruction project can be avoided by special construction techniques. The severity of other effects can be reduced by post-construction applications.

Each stage of the highway development process would have its appropriate mitigation measures. The choice of location will determine

whether, for instance, a bridge or a large cut section will be the dominant visual feature to be mitigated. At the design stage, the degree of slope, angle of bridge approach, or elevation of a fill section can be manipulated to minimize blockage of existing views, to enhance good views from the road, and avoid bad ones. Compatibility with adjacent community development, cultural features, or campgrounds will require careful design. Finally, the timing and implementation of mitigative measures can be done during the construction stage according to the landscape plan which is part of the construction contract.

The landscape plan would control the application of construction techniques to assure not only high visual quality, but also effective erosion control and motorist safety.

Several techniques, integrating good design with effective landscape management principles, will be implemented as required:

1. Selective clearing for softer edges and natural-appearing open areas, and retention of timbered areas for buffer strips.

2. Earthwork which blends cuts and fills with the natural topography as well as satisfying slope stability and balance of material quantities.

3. Rock cut sculpturing to produce natural terrain appearance in addition to achieving stable slopes and balancing material quantities.

4. Revegetation with grasses, native plants and application of other materials for natural appearance and reduction of contrast as well as erosion control.

5. Structural and textural design of bridges and retaining walls to blend with the natural landscape and to minimize disturbance of naturally steep slopes.

6. Attention to placement and colors of guardrails, culverts, retaining walls and signs to assure harmony with the natural landscape.

7. Improvement of some existing turnouts, and development of new ones to direct attention to exceptional views as well as to enhance traveler safety and convenience.

Alternatives and actions to avoid, minimize, or reduce visual impacts of the project are discussed further in "Scoping Visual Impacts", App. C-10.

B. Social and Economic Impacts

Sterling Highway plays an important role in the economy and social makeup of Cooper Landing. Access is the common denominator in this region where the highest socio-economic values are recreation and a rural lifestyle.

Economic Base

Recreation is the mainstay of Cooper Landing's economy. Highway travelers enroute to recreation areas on the Kenai Peninsula stop there for refreshment, fuel, groceries, equipment and lodging. Commercial activity, including headquarters for fly-in hunting and fishing trips, and guided river float trips, is oriented to the highway. Approximately 30 employers and 60 employees are engaged in these various businesses and services (See Cooper Landing Demographic Data, App. C-18).

National Forest and Wildlife Refuge trails, and Forest Service remote cabins, attract a great many hikers and backpackers. Forest and Refuge campgrounds receive heavy summer use, with the reported use of Russian River Campground exceeding its theoretical capacity (See Tabulation of Recreational Use Reported, App. C-24). Sportfishermen account for a large proportion of this campground use, and for the scarcity of roadside parking space during fishing seasion. In 1979, nearly forty percent of sportfishermen statewide fished on the Kenai Peninsula (ADF&G Statewide Harvest Study, M.J. Mills, July 1, 1979 - June 30, 1980).

Two young peoples' recreational camps are in the area, plus numerous weekend homes which draw recreationist owners from Anchorage and cities on the Peninsula. Skiers and snowmobile enthusiasts are frequent winter visitors, but the predominance of summer recreational activity is evident in the significant seasonal fluctuation of the local economy, with a predictable down-turn in business in fall.

The potential for economic growth of Cooper Landing is limited by a scarcity of raw land suitable for development, and by the relatively long distances to major employment centers.

Economic Impacts

Reduced travel times and increased accessibility produced by highway improvements will have local as well as regional economic benefits. Travelers, shippers, and Peninsula residents will experience lower highway user costs. Indirectly, lower transportation costs will benefit consumers in western Kenai Peninsula markets where many Cooper Landing people also shop.

Approximately 10-15 people in Cooper Landing are qualified construction workers who would probably seek jobs on the project. At least two of the lodges in the area have the capability to provide lodging, trailer spaces, and food service for workers, and have done so on a contracted basis (Pers. Comm. Willard Dunham). These wages and service contracts would directly benefit the local economy. Incidental spending

by construction workers will also moderately benefit local businesses and individual incomes. But the dollars spent for the project (Table 2), although amounting to tens of millions, are not likely to be introduced into the local economy of Cooper Landing in proportion to that expected from a similar capital improvement in a large urban area like Anchorage.

Property values in the Cooper Landing area will be enhanced as investors from larger population centers are attracted by the improved accessibility.

While the magnitude of these impacts will not be spectacular, they will definitely be a boost to the area's economy.

In recent years, more people with business in the Kenai-Homer areas have used air services rather than driving from Anchorage (Pers. Comm. Mark Wilson). This has reduced highway travel to an extent, with some negative effect on the roadside business economy.

The rural lifestyle in Cooper Landing, and its orientation to the highway, leave the community sensitive to changes in the highway environment. Changes in traffic volume, access and proximity to the highway can have significant effects on the social and economic experiences of people in the area as well as the travelling public. Social and economic impacts of the proposed project are closely related, particularly where community cohesion and accessibility to facilities and services are concerned.

Under existing highway and traffic conditions, ingress and egress between the roadway and businesses is occasionally hampered, particularly for drivers attempting cross-traffic movements. The proposed roadway, incorporated left-turn lanes, wider pavement, and improved visibility in the most congested commercial areas, will facilitate easier and safer access to businesses. Additional space may have to be created at some roadside business establishments to accommodate parking needs without using the highway right-of-way. Where purchase of right-of-way is involved, the owners will be compensated for losses of property, and any losses of market value to their remaining land.

TABLE 2

PROJECT COST ESTIMATE
From ADOT/PF Location Study Report
Sterling Highway, Milepost 37 to 60, April 29, 1981

	Lowest Cost Alternative	Highest Cost Alternative
Construction Cost Estimate	$ 32,177,000	$ 42,152,000
Construction Engineering (15% of Construction Cost Estimate)	4,827,000	6,323,000
TOTAL CONSTRUCTION COST	$ 37,004,000	$ 48,475,000
Preliminary Engineering (6% of Construction Cost Estimate)	$ 1,931,000	$ 2,529,000
Right-of-way	854,000	1,095,000
Utilities	204,000	217,000
Construction	37,004,00	48,475,000
TOTAL PROJECT COST	$ 39,993,000	$ 52,316,000

Negative economic impacts of the project will be limited mostly to the mid-community area where the by-pass would affect business and land use. These impacts are discussed in more detail under the alternatives.

Social Setting

The core or mid-community area of Cooper Landing is the concentration of development between Mileposts 47 and 48.5 on the Sterling Highway. The Post Office, school, fire station, a church, several businesses and homes, and junctions with Snug Harbor Road and Slaughter Creek Road are within the core area. Lodges and homes along the highway outside of this central area are nonetheless included as part of Cooper Landing.

Residents along the highway, as well as those from Slaughter Creek, Bean Creek, Snug Harbor, and Quartz Creek, frequent the mid-community for mail, shopping, or other business and community affairs. Most drive, but some walk or ride bicycles for a mile or two. Children from these areas attend the Borough Elementary School on Slaughter Creek Road, or the Camp Resurrection private secondary school. Most students are bussed to school. Two churches on Snug Harbor Road are regularly attended. The Cooper Landing Community Center building, recently moved to a new site off Slaughter Creek Road, is also a frequent destination for many residents. Other points visited by residents are the cemetery and the trap range at the west end of Slaughter Creek Road. There is also the usual socializing of friends which accounts for a percentage of

highway travel within the area. The Cooper Landing Community, Lions, and Homemakers Clubs are among the active, local service organizations (Pers. Comm. Larry Olsen, Wayne Morgan, Vinton Edwards). These activities, in conjunction with good systems of intercommunication and travel, are primary elements of the social web that holds the community together.

Social Impacts

The proposed project would create social impacts affecting the cohesiveness of the community, i.e., changes in access to facilities and services, and possible displacement of people. (The term "cohesiveness" as used here refers to a system of linkages between community activities, such as those described in "Social Setting" above, which can be lengthened or terminated by disruptive elements such as a major highway change.) Community amenities including quiet neighborhoods, independent life-styles, and proximity to quality recreation areas, are also at stake in changes the project could bring to Cooper Landing (see Table 1-d).

These social elements are discussed as they would be affected by each of the project alternatives.

Social/Economic Impacts of Alternatives

No Action Alternative

Under the No Action Alternative, the present highway will continue to function much as it does now. Traffic congestion is currently creating a barrier during peak traffic periods. Drivers wishing to enter or exit a stream of vehicles within the business areas are frustrated by the heavy traffic. Traffic volume is projected to rise, and when the existing highway becomes overloaded, the accident rate, travel times and accessibility will worsen, detracting from the appeal of the area for recreationists and tourists. Table 1-d compares impacts of the "No-Action" -vs- "Action" Alternatives.

No solution exists for the negative economic impacts of traffic congestion, except construction of a highway with more traffic capacity, or separating through traffic from local traffic. Traffic management techniques, including speed control and more strict enforcement of traffic laws, would mitigate the accident and congestion problems to a degree. Reduced speeds would have only slight and indirect benefits for business in the core area.

Alternative "B"

With the widening and minor realignment proposed with the "B" Alternatives, the established patterns of travel in conjunction with community activities can be continued with much less

interruption. Modes of travel may change as the new, wider roadway, and a pathway encourage some to walk or bicycle. These travel modes have a more unifying effect on the community than the popular vehicular mode because they allow more person-to-person contact.

Traffic speed usually accompanies increased capacity, creating greater hazards for pedestrians and bicyclists who must share the highway. The proposed wider roadway with Alternative "B" is safer, with more maneuvering space, but stricter speed limits may also have to be posted. In addition, protection for bicyclists, as well as pedestrians, will be enhanced by clear marking and signing of the proposed widened paved shoulders as a "bicycle route" to indicate people's presence to motorists, particularly at intersections with side roads and driveways. A separate pathway through the community is not feasible, and not necessarily safer, especially for cyclists (App. C-27). The highway right-of-way is not wide enough as it is, and landowners would lose privacy as well as property if a path were to be built. Such impacts would be unavoidable, especially in the center of Cooper Landing where property lines extend from the highway to the river (Fig. 5, p. 24D). Citizen participation in planning and design of this portion of the project is important to its success.

Two storage buildings will require relocation, involving Alternative "B", Bean Creek, and Cooper Landing. One household may be displaced by Alternative "B" (See Relocation Impacts, p. 70).

Right-of-way acquisition at Hamilton's Place and The Shrews Nest will involve losses of property that is currently used for driveway and parking, for which the owners will receive compensation in the acquisition process. The Shrews Nest, due to its hillside location in close proximity to the roadway, may lose its highway frontage access when the roadway is widened. Alternate access will be provided. Other property owners would have driveways shortened by the roadway widening, but access would not be affected adversely.

A boat launching site at the west end of the Kenai River Bridge in Cooper Landing (Station 1800) would be removed by the proposed B-1 Alternative alignment. A replacement facility would be constructed should the B-1 alignment become part of the preferred alternative.

Public access to the river, pedestrian paths, trailhead parking lots, and interpretive area pullouts are features recommended by several public agencies (See letters, App. A) for construction with the highway project. These features would not only provide additional needed recreational facilities, they could contribute to highway safety. Such off-road facilities reduce driver fatigue and the dangerous practice of parking on the roadway shoulders or at unauthorized defacto parking areas where there is no traffic control.

Alternative "B" would improve safety and access at each of the three public lodging establishments outside of the mid-community area, enhancing both social and economic conditions.

Bean Creek Alternative

Established travel patterns would be most affected by the Bean Creek Alternative. It is the only alternative involving a significant departure from the established route within the Cooper Landing core. The Bean Creek route would, in effect, be a by-pass, removing practically all through traffic from the mid-community area. The other by-pass alternatives -- Juneau Creek and Quartz Creek -- would not affect land use patterns as does the Bean Creek route, since they do not involve developed property, or land with development potential.

The principal engineering reasons for the partial control of access feature of the Bean Creek Alternative are safety and retention of carrying capacity. As a result of partial access control, commercial development would be discouraged on that side of the river, preserving the viability of the established core business area.

The Bean Creek Alternative could change the character of Cooper Landing in both the short and long range views of commercial and residential development.

Both positive and negative effects would be felt by the community with opening of the new highway. Customers of core area businesses would find access to commercial establishments easier with the bulk of the traffic shunted to the Bean Creek route. Highway oriented busi-

nesses (service stations, restaurants, motels), however, would lose some of the through traffic trade to existing and possible new establishments located on the main route beyond the by-pass area. Two service stations and some cabin rentals would be affected currently. Business losses are expected to be minimal as a result of the project because Cooper Landing offers sevices and attractions not available in the highway corridor for several miles in either direction (Pers. Comm. Jack Cookman and Shirl Davis, Appraisers). The community has a reputation as a quaint place to visit, and several establishments, Hamilton's Place and the Post Office in particular, are landmarks in their own right.

Residents in the mid-community would find their circulation within the area enhanced by the absence of heavy traffic. Some people would feel freer to walk and bicycle, but students not using the bus would have to cross the new highway to reach school.

To an extent, this type of impact would be temporary, in that people would adjust to the new patterns of movement necessitated by the change.

The neighborhood in the near vicinity of the Bean Creek Alternative would be immediately impacted by noise and public exposure, which are presently alien to that area. Direct access to homes would be eliminated by the controlled access character of the new facility. Some home owners, unwilling to live with the changed environment along Slaughter Creek Road, might sell to those more tolerant of the highway influence.

Other than cottage industries or specialized services, conversion of individual private lots to commercial uses along the Bean Creek Alternative is not likely to occur without direct access. Larger scale commercial development encompassing several acres would be required to establish a viable business area located off the main highway, and accessible only by frontage roads. Even with direct access, steep terrain limits the feasibility for establishment of retail businesses immediately adjacent to much of the Bean Creek Route. Some exceptions may exist immediately on either side of Bean Creek.

Fire and emergency service to the upper Bean Creek Road area would be quicker on the new highway and service road. The frontage road access to some homes near the river, however, could be a hindrance to emergency service, depending on the design.

A variety of mitigation measures may be applied to the negative social/economic impacts of the Bean Creek Alternative.

Two measures that would significantly moderate possible business losses in the mid-community area due to by-pass effects are intersections designed for easy access to the core area, and strategically placed signs, directing motorists to services and accomodations located off the main route.

A marked crosswalk serving the school, or a crossing structure for school children and pedestrians could reduce the hazard of crossing the new main highway.

The exposure of homes along Slaughter Creek Road to traffic noise and public view could be mitigated by noise barriers and planting of dense evergreens. (Placement of noise barriers in the area would be determined by specific noise studies conducted if this should be selected as the preferred alternative).

Careful design of frontage roads parallel to the Bean Creek Alternative could preserve a maximum of privacy for homes along the way, as well as reestablishing emergency vehicle access from the new highway.

Comparison of Mid-Community Alternatives

The mid-community alternatives have more potential for socio-economic impact than other portions of the project, because that is the most populus area. Traffic congestion peaks, for instance, affect the mobility and safety of more people in the mid-community area than at any other point on the project where alternative routes are offered. The competition between local traffic and through traffic for space on the road will continue to frustrate drivers under the No Action Alternative. Hazards to pedestrians and bicyclists would also be perpetuated.

Safer access and smoother flowing traffic through the community would result with the improved, wider roadway and turning lanes of Alternative "B".

The Bean Creek Alternative, as a by-pass, would provide the safest access within the core area by carrying all through traffic around the mid-community area.

Impacts of a shift from the current route for traffic would be most strongly felt in the mid-community vicinity. Direct involvement of people would be greatest with the Bean Creek Alternative because it would affect residents on both sides of the river. No Action or Alternative "B" would cause changes only on the valley's south side. Environmental impacts (noise, altered travel patterns, and less privacy) of the Bean Creek Alternative would be most noticible to the people living next to the new by-pass.

The quiet, rural atmosphere of Cooper Landing is important to its residents, and highway effects that disturb those surroundings will be perceived by most of them as negative impacts. (See Table 1-b, p. 46).

C. Relocation Impacts

Few structures would be directly affected by the right-of-way acquisition. A vacant wood frame storage building left of Station 1700

near Milepost 49.75 (Fig. 5 and App. C-59, sheet 15-B_A), would have to be relocated for Alternative "B", Bean Creek, or Cooper Landing. The Highway Maintenance shed left of Station 1755 (Fig. 5 and App. C-59, sheet 17-A_2) would be moved back to avoid the slope limits of Alternative "B", or the Cooper Landing Alternative. Moving these buildings would not be complicated, nor would their relocation have a significant effect on the community.

A mobile home on a permanent foundation is located right of Station 1832 on Alternative "B", near Milepost 47.25 (Fig 5 and App. C-59, sheet 19-B_A), possibly within the proposed right-of-way. It will be the only household displaced by the project. There is room on the remainder of the property (after right-of-way acquisition) to relocate the mobile home. No replacement housing is available in the area, but another option would be to move the mobile home or build a new home on a lot in one of two subdivisions on the Seward Highway south of the Wye. Mobile homes are acceptable at either subdivision. Relocation advisory assistance will be provided should this move be found necessary (see Conceptual Stage Relocation Study, App. C-28).

Time and the development of the project may cause changes in the requirements for relocation (Other Relocation Factors, App. C-29). It is not expected that businesses, farms or non-profit organizations will be involved in relocation from the right-of-way. The final disposition of all relocations will be done in full conformance with applicable State and federal laws (A.S. 34.60, Uniform Relocation Assistance and Real Properties Acquisition Practices Act of 1971, and Public Law 91-646).

D. Air Quality

The obvious clarity of the air in the highway corridor attests to its high quality. Except for extremely cold, stable winter periods, air is considered well-mixed in the complex terrain of peaks and mountain valleys. (Official topical wind data is non-existent, the nearest observations being at Kenai, Seward and Anchorage).

Emissions from existing point sources of carbon monoxide--primarily homes with oil furnaces and/or wood-burning stoves -- are not often evident. The gravel surfaces of roads in the Quartz Creek Campground area and the Snug Harbor Road are local sources of particulates. No industrial development exists or is anticipated which would produce significant air pollutants.

Highway sources are likewise of low significance, with present traffic volume less than 2,000 vehicles (ADT), and future volumes not expected to reach higher than about 6,400 ADT by the year 2004. This level of traffic will be achieved whether or not the project is constructed. Low concentrations of development in the corridor, and the scarcity of land available for development, is reasonable assurance that additional traffic will not be generated because of the improved highway.

Anticipated pollution levels, exemplified as carbon monoxide emissions in Table 3, will decline over time as more efficient vehicles replace less efficient ones. In addition, the improved highway will make faster, more consistent speeds feasible, which will allow more efficient vehicle operation with lower levels of carbon monoxide and other emissions. Even on the more congested sections of the highway, left turn lanes will let traffic flow more smoothly, reducing emissions.

TABLE 3

CARBON MONOXIDE EMISSIONS IN GRAMS PER MILE

YEAR	AUTOS	LIGHT TRUCKS	MEDIUM TRUCKS	HEAVY TRUCKS		COMPOSITE EMISSION FACTOR
				Gas	Diesel	
1982	9.4	15.4	3.8	2.0	.30	31.0
1984	6.9	13.8	3.4	1.8	.29	26.2
2004	2.8	5.9	1.5	1.0	.25	11.4

Given the rural character of the area, low traffic volumes, and improvements expected from the project, a sophisticated and comprehensive analysis of air quality is considered unnecessary.

This project is in an area where the State Implementation Plan does not contain any transportation control measure. Therefore, the conformity procedures of 23 CFR 770 do not apply to this project.

D. Noise Impacts

The existing highway is the only significant source of noise in the highway corridor. The level of traffic noise emanating from the Sterling Highway is closely keyed to the seasonal nature of recreational activity on the Kenai Peninsula, with winter being the quiet time of year. Although current and future traffic volumes and attendant noise levels are relatively low on the average, highway-generated noise will be a significant factor with most of the proposal's alternatives. Residential areas and recreational activities, which require a relatively quiet atmosphere, will be affected by the project at several locations.

The most noise-sensitive areas are a concentration of residences, summer homes and campgrounds adjacent to Kenai Lake and the upper reaches of the Kenai River (Figure C, Appendix B, Noise Study Report). Also, a church, two schools, a cemetery and the Cooper Landing Community Hall are within the project corridor. Other noise sensitive sites are lodges, campgrounds and hiking trails at scattered locations along the existing highway.

The Kenai National Wildlife Refuge, bordering the western end of the project, was created in part to protect animals from the effects of human influence. No significant change in the ambient noise conditions is expected that would adversely affect the wildlife refuge.

Except for commercial activities, with a maximum of 72 decibels (dBA) equivalent sound level (L_{eq}), land uses in the project corridor have a maximum design noise level of 67 dBA. The 67 dBA (L_{eq}) contour line was used as a yardstick superimposed on lands adjacent to the highway to determine the effect of traffic noise on noise-sensitive areas.

Traffic noise levels for each alternative under study have been predicted through use of a computer (Appendix B). A theoretical model of computed noise levels has been applied to the various alternatives to determine relative noise impacts on sensitive receptors (homes, campgrounds, businesses, etc.) along the highway (Table 4).

It was determined that receivers within 600 feet of the highway may experience noise in excess of 60 dBA with year 2004 traffic, depending on local site conditions. Many residents of the Cooper Landing community can expect this level of noise from the highway in the future, regardless of which alternative is selected--even with "No Action."

Current (1979) volume of traffic moving at 45 MPH produces noise levels of 67 dBA at receivers 50 feet from the nearest traffic lane (Figure B, Appendix B). By the time the project has been completed, say in 1984, that distance will have increased to approximately 70 feet; and by the year 2004, receivers out to 100 feet from the highway are expected to experience noise levels in excess of 67 dBA with 45 mph traffic. With traffic volumes the same, but with speed increased, the 67 dBA noise contour will move out as far as 160 feet by the year 2004.

TABLE 4

COMPARISONS OF ALTERNATIVES FOR NOISE IMPACTS ANALYSIS

LOCATION	ALTERNATIVES	--NOISE IMPACTS PREDICTED FOR YEAR 2004-- NOISE LEVEL dBA(L_{eq}) 1979	2004	NO. OF SENSITIVE NOISE RECEPTORS POTENTIALLY IMPACTED BY 67 dBA
Beginning of project to Station 1585 (Sites 1-5)[a]	"B"	62[b]	67[b]	5
	No Action	62[b]	67[b]	5
Station 1585 to 1683 (Sites 6-8)[a]	"B"	62[b]	67[b]	2
	Juneau Creek	±37[c]	±67[b]*	No regular human use
	No Action	62[b]	67[b]	2
Station 1683 to 1700	"B"	--	--	None within 67 dB contour
	No Action	62[b]	67[b]	None within 67 dB contour
Station 1700 to 1812 (Sites 9-22)[a]	"B" (including B-1)	62[b]	67[b]	13 - 15
	Cooper Landing	62[b]	67[b]	12 - 16
	Bean Creek	±37[c]	±67[b]*	8
	No Action	62[b]	67[b]	14
Station 1812 to 2018 (Sites 23-26)[a]	"B"	62[b]	67[b]	19
	No Action	62[b]	67[b]	19
Station 2018 to 2101 (Site 27)[a]	"B"	--	--	None within 67 dB contour
	Quartz Creek	56[d]	64[d]	1 (± 8 dB max. impact expected)
	No Action	--	--	None within 67 dB contour
Sta. 2101 to End of Project (Site 28)[a]	"B"	58[d]	63[d]	Tern Lake Campground
	No Action	58[d]	63[d]	Tern Lake Campground

a. Sites described in Appendix B, Noise Report.

b. Estimated average noise level at 160 ft. source/receptor distance. Interpolated from Figure B, Appendix B.

c. Estimated average noise level at 1200-1400 ft. source/receptor distance. Interpolated from Figure B, Appendix B.

d. Estimated average noise level at campground (Crescent Cr. or Tern L.) Interp. from Fig.B., App.B.

* 30 dBA increase due to introduction of high volume roadway where none existed before.

The design noise level of 72 dBA for commercial properties is exceeded at only two occupied locations: The highway maintenance shed, and the gas pumps and front porch of Hamilton's Store.

Descriptions of noise sensitive sites located close to the existing highway, and the alternative routes are listed in Appendix B. Generalized locations of the sites are shown on a map (Figure C, Appendix B), along with land use. Details of each site's relationship to year 2004 design noise level standards (67 dBA and 72 dBA contour lines) can be studied on the Project Plan and Profile drawings (App. C-59).

Noise impacts of each alternative are compared on Table 4. For noise analysis, the highway proposal is broken into segments comprised of comparable alternatives. The highway's existing alignment is roughly the same for both Alternative "B" and "No Action." Consequently, there is no significant difference in the noise levels produced by these two alternatives. Other alternatives involve short segments of the highway which deviate from the existing alignment. These alignments (Juneau Creek, Bean Creek, and Quartz Creek) create changes of source/receptor distance that are the main cause of the resulting noise increases. In the case of the Cooper Landing Alternative, the alignment shift is not enough in the vicinity of the present receivers to cause a difference in noise levels.

Three measures of noise impact are illustrated in Table 4. One is the change in noise level that occurs with traffic volume and source/

receptor distance changes. Another is the number of sensitive receptors that are affected. The third type of impact is not necessarily from a violation of standard noise levels, but is nevertheless significant since it involves the abrupt influx of traffic noise into previously quiet areas. Currently, these areas are roadless or are lightly travelled (Bean Creek and Juneau Creek Alternatives).

The noise attenuating effect of separating receptors from traffic can be illustrated by contrasting existing situations in Cooper Landing. With today's volumes of traffic on Sterling Highway, a person standing in his yard 50 feet from the highway in Cooper Landing experiences an average noise level (L_{eq}) ranging between 66 and 69 decibels (Figure B, Appendix B). At the same time, an individual walking along Slaughter Creek Road near the Community Hall receives only 35 to 38 dBA. This phenomenon is partially explained under "drop off rate" in the definitions, Appendix B.

The significance of relative noise increases can be seen in the projections of future noise levels in Fig. B, App. B. Within 20 years, noise levels in the yard near the existing highway will have increased about 3.5 decibels, possibly exceeding the residential standard by 5 dBA if the highway location is not changed. Shifting the main flow of traffic to the other side of the river would greatly reduce traffic noise along the by-passed section of the Sterling Highway through Cooper Landing. This would produce a positive impact for residents and busi-

ness patrons along the older existing roadway. On the other hand, a highway location shift to the vicinity of Slaughter Creek Road would raise noise levels in that area by 30 dBA.

Noise impacts from the Juneau Creek Alternative are also expected to be relatively severe. Although ambient noise was not measured at this location, an estimate derived from computer predictions for the Bean Creek Alternative, which exhibits similar site conditions, was used to produce the simulation. This method indicated a noise level of between 37 and 45 dBA along the proposed route. Depending on individual site characteristics, that noise level would be raised to a range of 65 to 69 dBA at 100 feet from the new roadway -- an increase of 24 to 32 dBA (Figure B, Appendix B).

Effects of noise on the human environment in the Juneau Creek area cannot be assessed since few humans currently frequent the area. No development exists there now, and none is planned. Recreational uses could follow road development, with hikers, sport fishermen, etc., in the vicinity of the new roadway experiencing the effects of traffic noise. On the other hand, users of Cooper Creek Campground, across the river, would benefit from increased isolation from the highway as they would then be camped near the end of a dead end road.

Noise levels along any of the alternative routes are estimated to exceed 67 dBA at some residential or recreational locations near the highway (see 1979 levels in Figure B, Appendix B).

Noise abatement measures, reviewed in Appendix B, will be recommended for sensitive sites where feasible only after the route has been selected and the project is in the final EIS/Noise Report phase.

Construction noise will temporarily affect the noise-sensitive locations on each of the alternative routes. The close proximity of homes, businesses and campgrounds to the highway will make impacts unavoidable in most cases.

The different phases of construction vary in the noise levels they produce, depending on the type of equipment used. Site excavation, and clearing and grading operations will create the highest average levels of noise. Associated trucking of material along the highway will be kept to a minimum by balancing the quantities of cut with fill requirements in the same vicinity. In this way, planning the project work for best efficiency will also reduce equipment noise.

Noise levels from construction activity are considerably higher than normal highway traffic noise. At almost any point on the project, noise levels in excess of 80 dBA will occur within 100 feet of the noise source whenever equipment is operating. Considering all construction phases, and the loudest types of equipment in each phase, a mean hourly equivalent sound level of 84 dBA has been estimated. The effects are illustrated in Table 5, where a "drop off rate" of 4.5 dBA has been applied, as explained in the definitions, Appendix B.

Peaks of noise may occur when explosive charges are detonated to excavate solid rock. The explosion itself is not usually very loud, depending on size of charge. Its impact is primarily in the startling effect the resulting concussion may have on humans and animals. Safety precautions require notification of area residents regarding the blasting schedule, and clearing the immediate vicinity of personnel just prior to detonation. This reduces the effect on people of any noise from explosions. Animals are usually frightened from the blast area by site preparations -- operation of impact equipment such as jack hammers, rock drills and compressors. At the time of detonation they are far enough away from the area, and should not experience ill effects from blast noise. Earthmoving machinery associated with rock excavation, including bulldozers, loaders, and trucks, produce levels of noise, which, if not louder, are on a par with the overall construction noise depicted in Table 5.

TABLE 5

MEAN HOURLY EQUIVALENT SOUND LEVELS
ALL CONSTRUCTION PHASES

Distance from noise source on centerline of highway	100 ft.	200 ft.	400 ft.	800 ft.	1600 ft.
Noise level dBA (L_{eq})	84*	79.5	75	70.5	66

(* Interpolated from FHWA Special Report Highway Construction Noise: Measurement, Prediction and Mitigation, by Reagan, Jerry A. and Grand, Charles A., May 2, 1977).

Several rock excavation sites (see Fig. C. App. B) will be located close enough to sensitive receptors to cause significant impact. Noise levels from the rock excavation phase of construction have the possibility of being louder than the noise caused by earthwork phases on the project where rock excavation is not included.

1. Seward Wye--The intersection area is the most extensive rock cut on the project. Tern Lake Campground is the only noise sensitive site that may be affected. It is within 600 feet of the nearest rock excavation site, and other sites are no more than 800 feet away.

2. Quartz Creek Alternative, Station 2039--This alternative, downstream from the Crescent Creek Campground, will involve blasting a rock outcrop between the existing roadway and the creek. The campground is within 800 feet of the excavation site.

3. Alternative "B", Station 2017 to 2100--Noise from blasting the rock faces to widen the existing roadway will affect the campground area 900 feet away.

4. Alternative "B", Station 1925 to 1950--Rock excavation in the vicinity of Sunrise Inn will primarily affect the immediate vicinity of the lodge, including a few lakeside homes. These receptors are within 400 to 800 feet of the proposed rock cut. The mountain above this point is Dall Sheep habitat, and wildlife

managers have requested that blasting be limited to times not critical to the animals' life cycle. The mid-April to mid-May lambing period is a particularly important period when blasting should be avoided.

5. Alternative "B", Station 1897 to 1911+10--Rock cutting on the high side of the roadway will be within 250 to 600 feet from the Broadview Guard Station building.

6. Alternative "B", Station 1884--This excavation site is 100 to 200 feet from homes on the hillside above it.

7. Alternative "B", Station 1877--Excavation noise at this site will impact two homes located 400 feet and 650 feet away.

8. Alternative "B", Station 1844--Seven homes within 100 feet to 600 feet will be impacted.

9. Alternative "B", Station 1441 to 1450--Rock excavation work at the western end of this site will be within 200 feet of the nearest guest cabin, and 500 feet from the Sportsman's Lodge residence.

Construction noise impacts will be much the same wherever sensitive receptors are affected. (See list of Sensitive Receptors, Appendix B.) As with long term traffic noise impacts, construction noise will be most noticible where the current ambient sound levels are lowest. The Bean

Creek, Quartz Creek, and Juneau Creek Alternatives would affect receptors more severely than alternatives along the existing highway, which is the area's primary noise source. Alternative "B", outside of Cooper Landing, has a high occurance of rock excavation sites, which, as noted above, may result in slightly higher noise levels at those locations.

The "No Action" Alternative would involve no construction noise impacts.

Mitigation

A "noise abatement ordinance," delineating acceptable maximum noise levels permitted from specific sources in various situations, is not in force within the Kenai Peninsula Borough (See discussion in Appendix B on the only applicable Borough ordinance). Noise control on the project will therefore be the responsibility of the highway contractor and the Alaska Department of Transportation and Public Facilities.

Noise created by construction machinery is controllable to an extent by the use of mufflers on engine exhausts and air filter devices to reduce air intake noise. Requirements for the use of such standard devices are usually included in the construction contract. (Decibel levels quoted in this report assume the reasonable use of muffling devices on machinery).

Construction noise is most troublesome during the evening and early morning, the usual sleeping period. Construction operations in the

vicinity of sensitive receptors will be limited in the contract to the weekday hours between 7 A.M. and 10 P.M.

The contractor could be called upon to take other mitigating measures, including:

1) Provision of temporary enclosures for particularly noisy equipment or activity sites

2) Early construction of permanent noise abatement barriers if such are required in the contract, and if the early action is feasible and effective

3) Performance of proper maintenance and inspection of noise control equipment

4) Routing of haul roads away from schools, hospitals, and residential areas where possible

F. Water Quality Impacts

Stream and lake waters in the highway corridor are of a high natural quality, characteristic of lightly populated, mountainous regions. Stream flow originates from glacial melt and precipitation. There are seasonal fluctuations, with higher flows and higher water tables in the summer and early autumn during the rainy season.