APPENDIX A

Map Book

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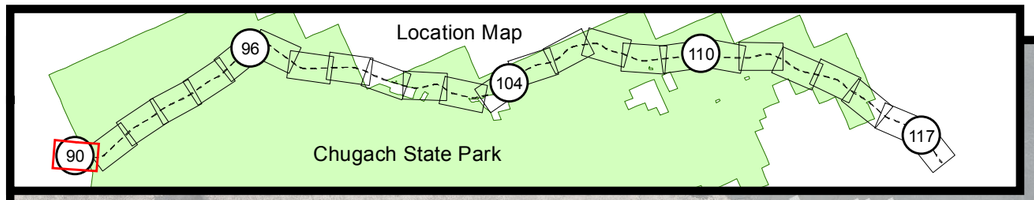

Existing
- Railroad
- Multi-Use Path

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Bridges
- Access Control Area
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

STATE OF ALASKA
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DOT & PF Project No. 54520 / NH-0A31(052)
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Draft Reconnaissance Project

Seward Hwy, Alaska

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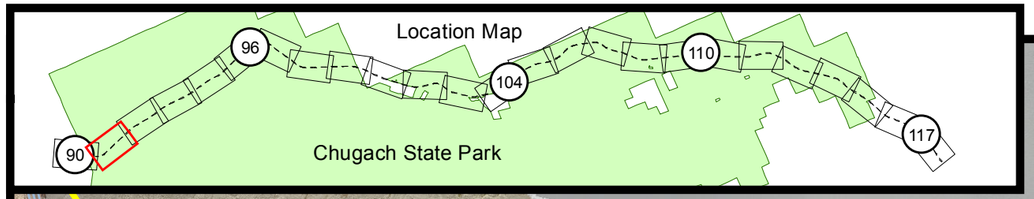

Scenic Overlook

91

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Access Control Area
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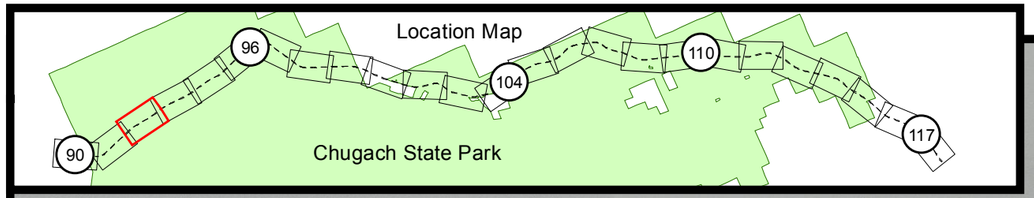

Scenic Overlook

92

93

Bird to Gird Trail
Scenic Overlook
Shelter & Outhouse

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
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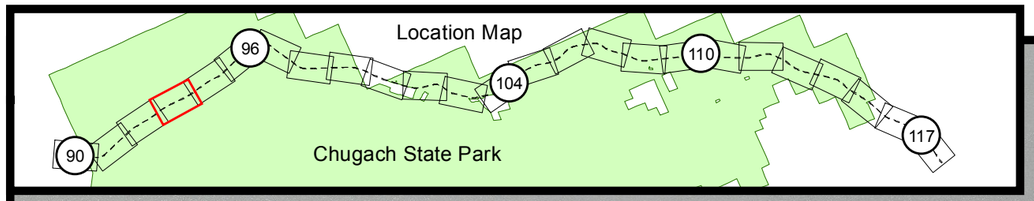

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

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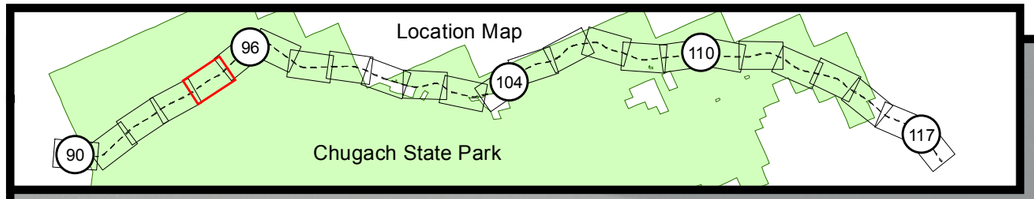

Scenic Overlook

94

95

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

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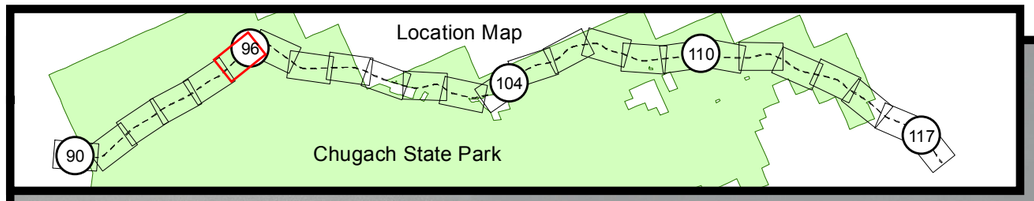

Scenic Overlook

Bird Point Scenic Overlook/Trailhead

95

96

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

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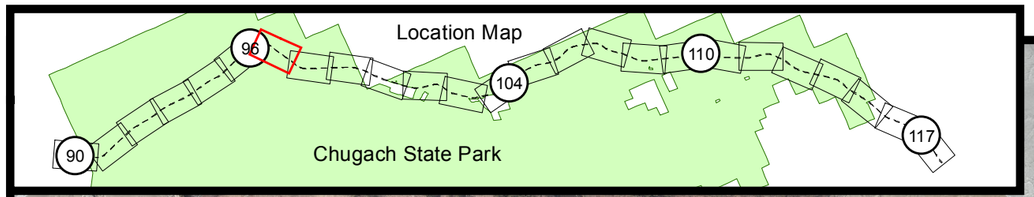

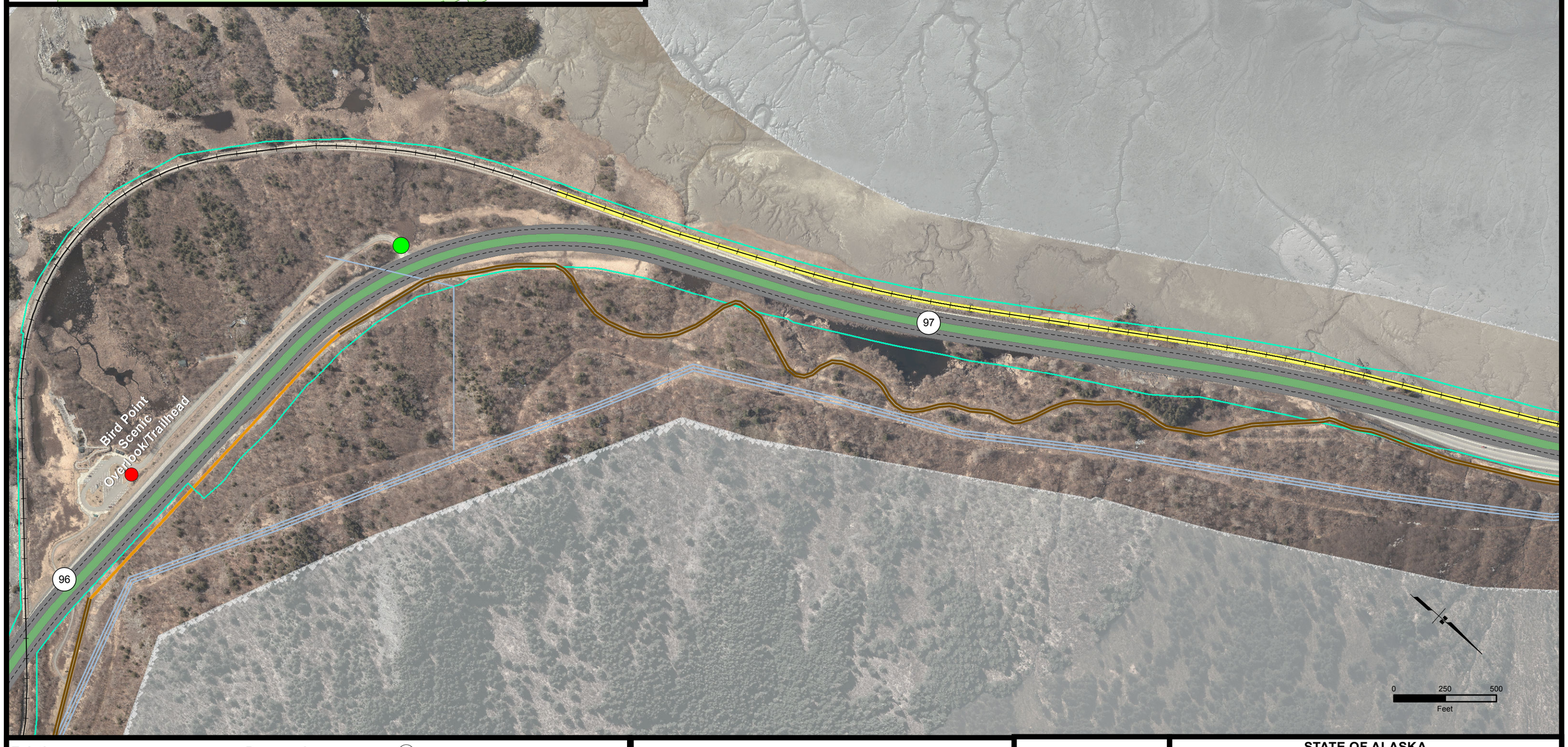

Existing
- Railroad
- Multi-Use Path
- Access North & South Bound
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

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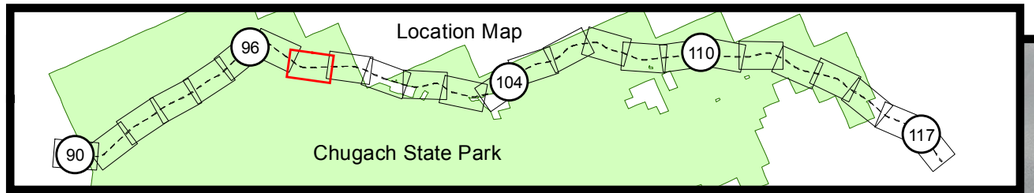

98

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

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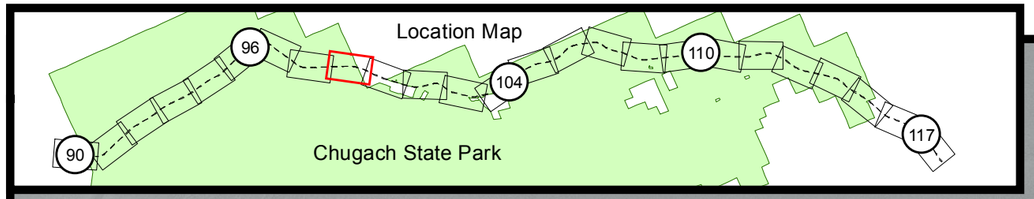

Chugach State Park

Bird Flats
Scenic Overlook

Scenic Overlook and
Bird to Gird Trail Access

99

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

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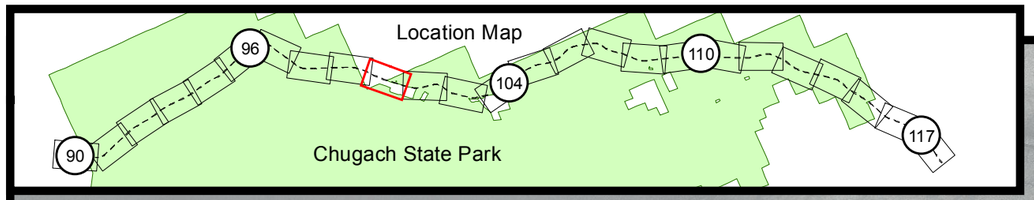

Bird Access Control Area

Bird Creek Trailhead
Bird to Gird Trail

Bird Creek Campground

100

Bird Valley Trailhead/
Park Access

Bird

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Access North & South Bound
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

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Seward Hwy, Alaska

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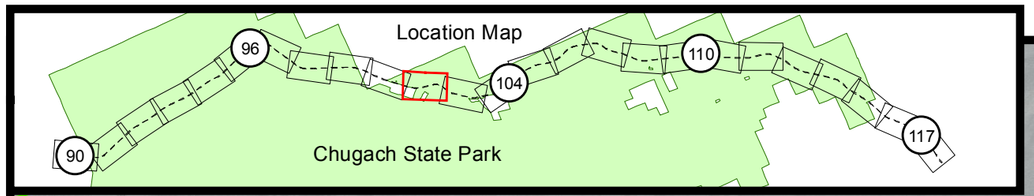

Bird Creek Trailhead
Bird to Gird Trail
Bird Creek Campground
Bird Access Control Area
Bird Creek Parking
Bird Valley Trailhead/ Park Access
101
Bird
Bird Creek Overflow Camping/Parking
Bird Creek
102
Chugach State Park
Chugach State Park
Chugach State Park
Bird Ridge Trailhead
0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Access North & South Bound
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Bridges
- Access Control Area
- Chugach Electric Association Utilities

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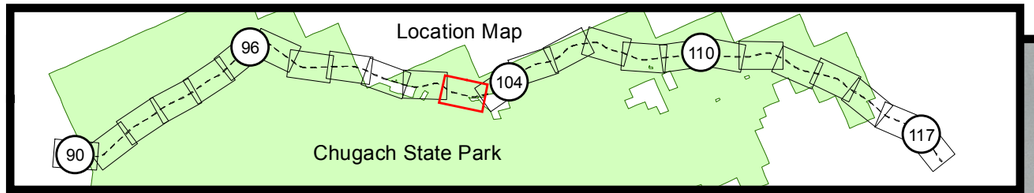

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Bridges
- Access Control Area
- Chugach Electric Association Utilities

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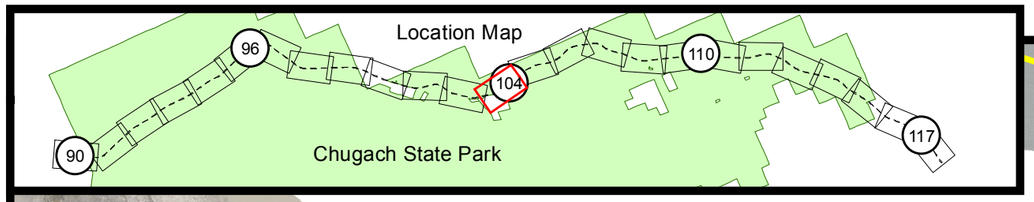

Indian Access Control Area

Indian Access Control Area

Indian Point Scenic Overlook

Overlook

Indian Creek

Indian Valley Trailhead

Power Line Pass

104

Indian

Chugach State Park

0 250 500

Feet

Existing

- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed

- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Bridges
- Access Control Area
- Chugach Electric Association Utilities

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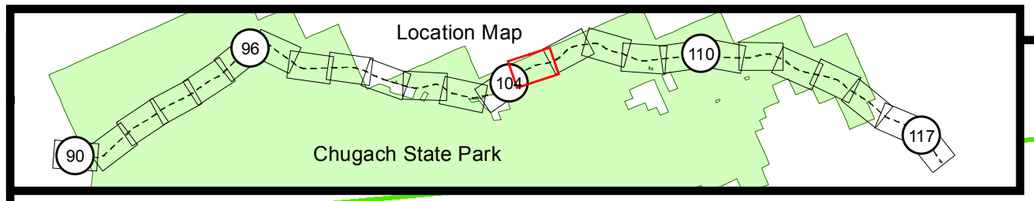

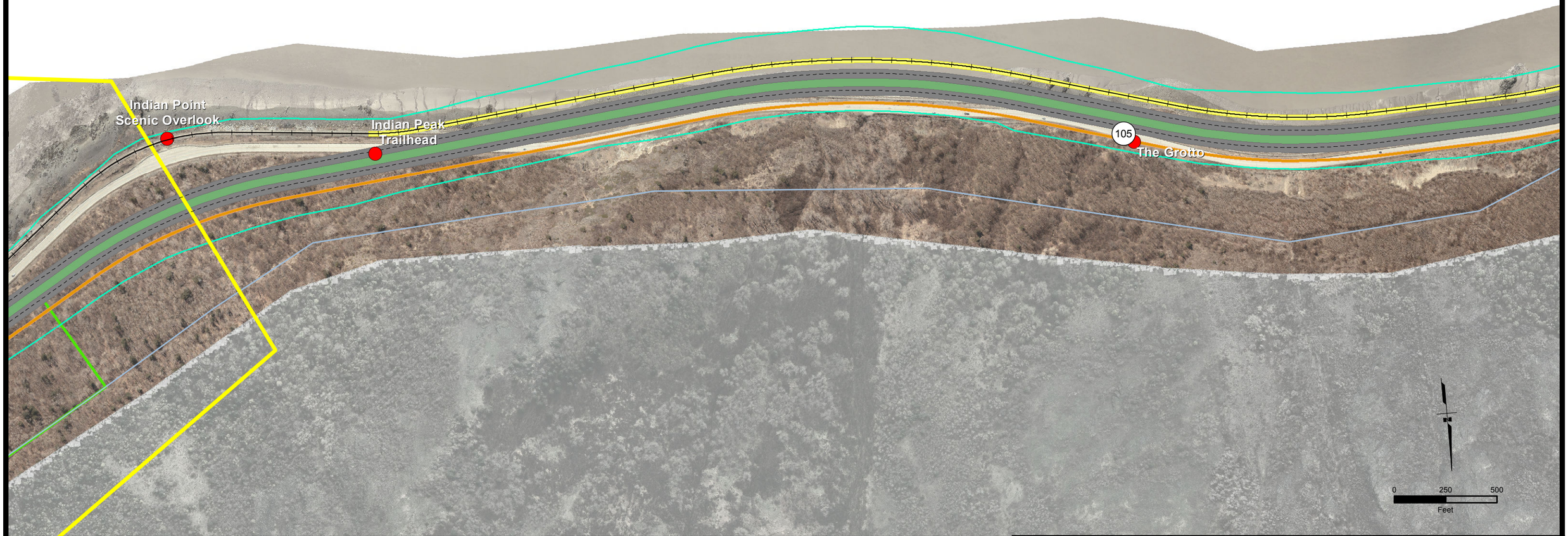

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities

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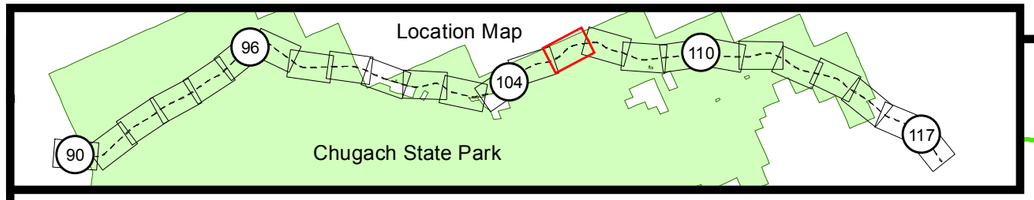

Chugach State Park

Windy Corner Improvements

106

Falls Creek Trailhead

Windy Corner Trailhead

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Current Projects
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
Sec. 4,9, T 11 N, R 3 W Sec. 10,15, T 11 N, R 3 W Sec. 22,23,25,26, T 11 N, R 3 W
Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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Draft Reconnaissance Project

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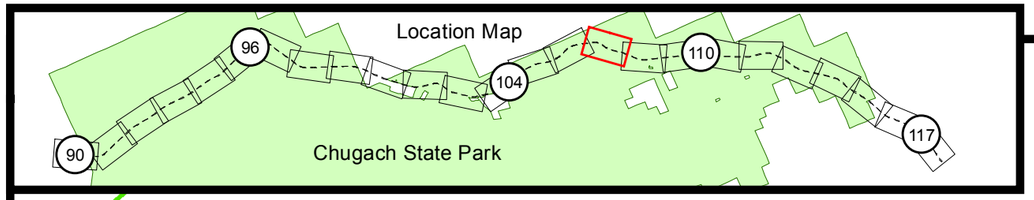

Windy Corner Improvements

Windy Corner Scenic Overlook

Scenic Overlook/ Gold Rush Interpretive Sign

107

Windy Corner Trailhead

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Current Projects
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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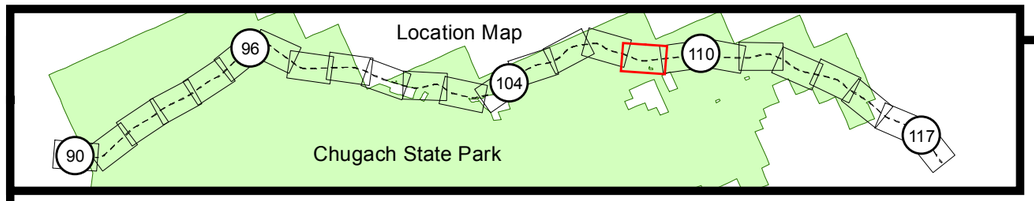

Scenic Overlook/
Gold Rush Interpretive
Sign

Rainbow Point
Scenic Overlook

108

Scenic
Overlook

109

Highway Turnout

Rainbow

Rainbow
Trailhead

Chugach State Park

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Access North & South Bound
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

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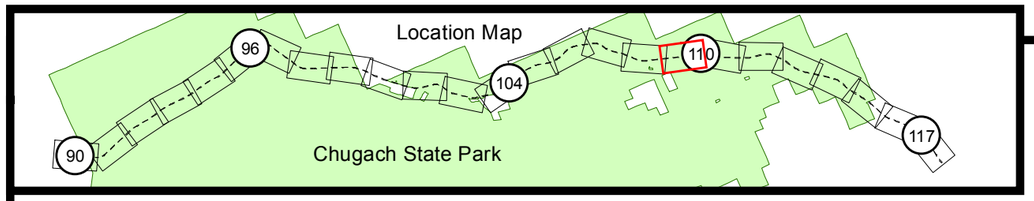

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

(#) Milepost

Chugach State Park

Seward Highway Route Development Plan

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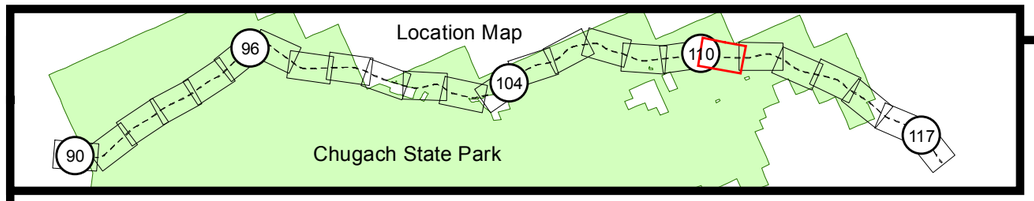

Beluga Point Parking

Tidal Pool

Beginners Rock Climbing Access

Rock Climbing Access

110

111

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Access North & South Bound
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

(#) Milepost

Chugach State Park

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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Sec. 33. T 12 N, R 3 W
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Draft Reconnaissance Project

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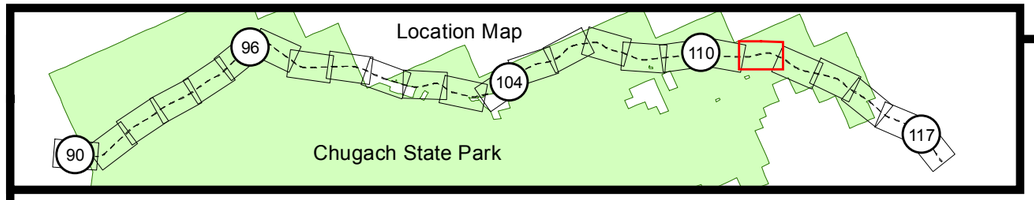

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

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Sec. 33. T 12 N, R 3 W
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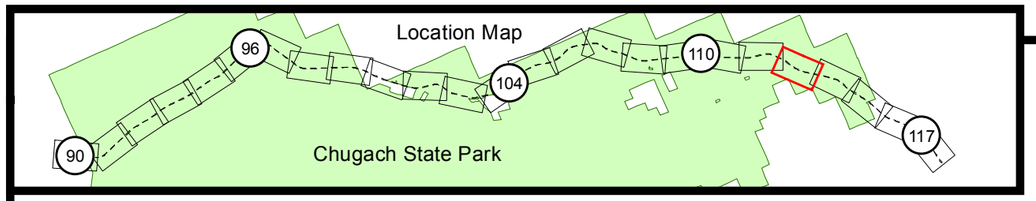

Grunge Wall Pullout
Scenic Overlook

Hole in the Wall
Rock Climbing Access -
Shoulder Parking

113

Chugach State Park

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park

Seward Highway Route Development Plan

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Seward Meridian, Alaska

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Draft Reconnaissance Project

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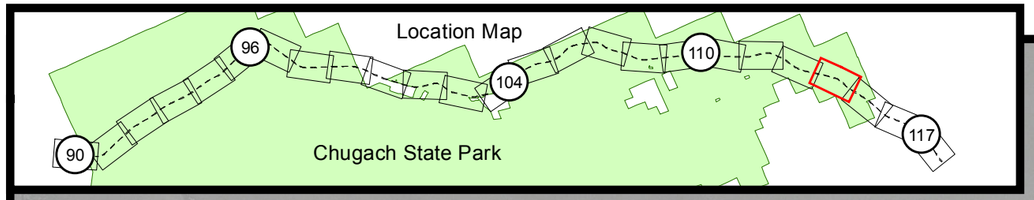

Picnic Rock

114

DOT&PF Weigh Statio

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

(#) Milepost

Chugach State Park

Seward Highway Route Development Plan

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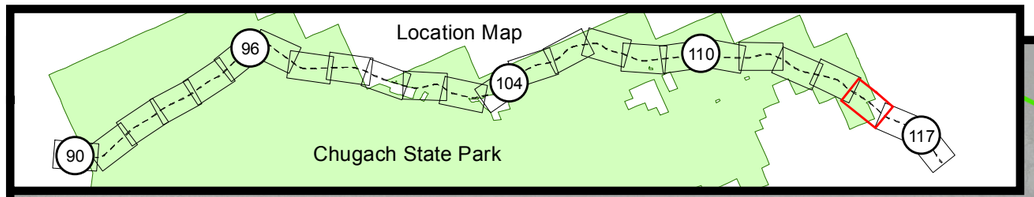

Chugach State Park

Gas Line Station
Inlet Crossing

115

Potter Section House
Chugach State Park Headquarters

DOT&PF Weigh Station

Potter Creek Trailhead
Turnagain Trail

Potter Valley Road
Wildlife Viewing

ADF&G Wildlife Viewing

Old Seward Highway/Potter Valley Road
ADF&G Wildlife Refuge Access
No State Park Access

Chugach State Park

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Frontage Road
- Chugach Electric Association Utilities

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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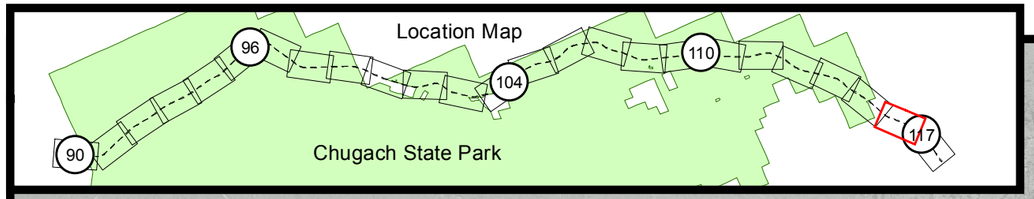

ADF&G Wildlife Viewing

116

ADF&G Wildlife Viewing

ADF&G Wildlife Viewing

117

0 250 500
Feet

Existing
- Railroad
- Multi-Use Path
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Chugach State Park
- Frontage Road

Seward Highway Route Development Plan

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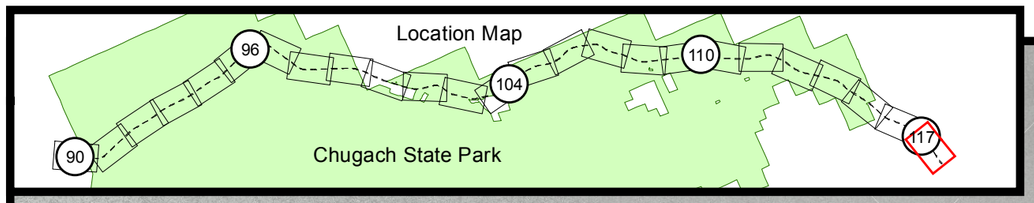

Existing
- Railroad
- Multi-Use Path
- Turnagain Arm Trail
- Access North & South Bound
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- (#) Milepost
- Access Control Area
- Frontage Road

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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APPENDIX B

Project Design Criteria and Guidelines

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DESIGN GUIDELINES

The design guidelines used to analyze the Seward Highway corridor include:

- *Alaska Highway Preconstruction Manual*, DOT&PF, 2005.
- *Alaska Highway Safety Improvement Handbook (12th Edition)*, DOT&PF, 2013.
- *Standard Drawings Manual*, DOT&PF, 2012.
- *A Policy on Geometric Design of Highways and Streets (6th Edition)*, American Association of State Highway and Transportation Officials (AASHTO), 2011.
- *Roadside Design Guide (4th Edition)*, AASHTO, 2011.
- *Alaska Traffic Manual*, DOT&PF, January 13, 2012, which includes:
    - *Manual on Uniform Traffic Control Devices [2009, Rev 2]*, Federal Highway Administration, 2012.
- *Highway Capacity Manual*, Transportation Research Board, 2010.
- *Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities*, U.S. Architectural and Transportation Barriers Compliance Board, 1991 (as amended in 2002).
- *Standard Plans, Ballast and Track Work*, ARRC, 2009.
- *Track Chart*, ARRC, 2010.
- *Manual for Railway Engineering*, American Railway Engineering and Maintenance-of-Way Association (AREMA), 2012.
- *Alaska Highway Drainage Manual*, DOT&PF, 2006

PROJECT DESIGN CRITERIA -- ROADWAY

Project: Seward Highway Reconnaissance Study

ELEMENT	CRITERIA	SOURCE/COMMENTS
Number of Lanes	4	-
Design Vehicle	WB-67	-
Design Speed	65 MPH	-
Minimum Stopping Sight Distance (Vd = 65 mph)	645 ft	*Alaska Highway Preconstruction Manual, Figure 1120-1*
Maximum Grade	4%	*Alaska Highway Preconstruction Manual, Figure 1120-1*
Minimum Grade	0.5%	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 3-119*
Minimum Curve Length	975 ft	*Alaska Highway Preconstruction Manual, Figure 1120-1*
Minimum Radius at Curvature (e=6%)	1,660 ft	*Alaska Highway Preconstruction Manual, Figure 1120-1*
Minimum Tangent Length Between Two Curves (e=6%, R=1660 ft, 80% on tangent)	570 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), Equation 3-23*
Minimum Crest K-value	193	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), Table 3-34*
Minimum Sag K-value	157	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), Table 3-36*
Minimum Shoulder Width	12 ft (outside)	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 8-3*
	8 ft (inside)	
Minimum Lane Width	12 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 8-2*
Minimum Clear Zone Width	30 ft	*Alaska Highway Preconstruction Manual, Table 1130-2*
Minimum Shared Pathway Width	8 ft	*Alaska Highway Preconstruction Manual, Table 1210-1*
Minimum Roadway Median Width (Between Edges of Traveled Way)	50 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 8-7*
Roadway Ditch Depth	3 ft	-
Rock Catchment Criteria		*Alaska Highway Preconstruction Manual, Figure 1130-3*
Depth	2.5 ft	
Flat Bottom Width	10 ft	

APPENDIX C

Turnagain Arm Crossing Concepts Evaluation

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MEMORANDUM

TO:	Tom J. Schmid, P.E., Contract Manager State of Alaska Department of Transportation and Public Facilities
FROM:	Steven Noble, P.E., Project Manager DOWL
DATE:	November 18, 2016
SUBJECT:	Turnagain Arm Crossing Concepts Evaluation Seward Highway: Mileposts 90-117 Route Development Plan State of Alaska Project No. 56631

This memorandum supplements the Seward Highway Route Development Plan (RDP) MP 90-117 project and is intended to summarize possible concepts to construct a bridge across Turnagain Arm as a means of providing additional highway capacity to the Kenai Peninsula. The objective is to determine if any bridge crossing concepts are cost-effective and reasonable solutions that should be included in the Reconnaissance Study as alternatives to constructing a four-lane highway between Anchorage and Girdwood.

PREVIOUS STUDIES

In 1965[1] the Alaska Department of Highways completed a route study for the Turnagain Arm Crossing to connect Anchorage with the Kenai Peninsula. That planning study was prompted by anticipated growth in population and employment opportunities in Anchorage and on the Kenai Peninsula. This growth was seen as creating the need for providing a more convenient and dependable all-season highway network between the two regions.

The 1965 study examined estimates for population and employment growth in the Anchorage area, the communities along Turnagain Arm, and on the Kenai Peninsula. The analysis took into account natural resource extraction, military establishments, service industries, and the early stages of tourism. From the population and employment estimates, the Department developed traffic forecasts for the design year of 1984. The annual growth rate for the traffic volumes were estimated to be about 10 percent per year.

Three general routes were considered in the study. The first route follows the existing alignment through Turnagain Pass to Hope Junction and from there to the wye with Sterling Highway. The second route follows Hope Highway to Hope Junction, bypassing Turnagain Pass. The third route would parallel the natural gas line along the base of the Kenai Mountains to Sterling Highway. The three general routes and four proposed crossings are shown in Figure 1. These routes and crossings were used to generate the eight specific route locations considered in the 1965 study:

- Route 1: Existing highway location unchanged
- Route 1: Crossing Blueberry Hill to Ingram Creek
- Route 2: Crossing Sniper's Point to Bird Point

[1] Turnagain Arm Crossing concept drawings dating to 1944 are on file at the UAA Archives as part of a preplan for statehood and likely influenced a statehood request for interstate roads in 1960.

- Route 2: Crossing Toe (Rainbow) to Head (Hope)
- Route 2: Crossing Cape to Isle with connection to Hope Road
- Route 3: Crossing Cape to Isle with new road to Sterling Highway
- Route 3: Crossing Cape to Isle with new road to Sterling Highway and new road to Hope
- Route 3: Crossing Toe to Head with new road to Sterling Highway and new road to Hope

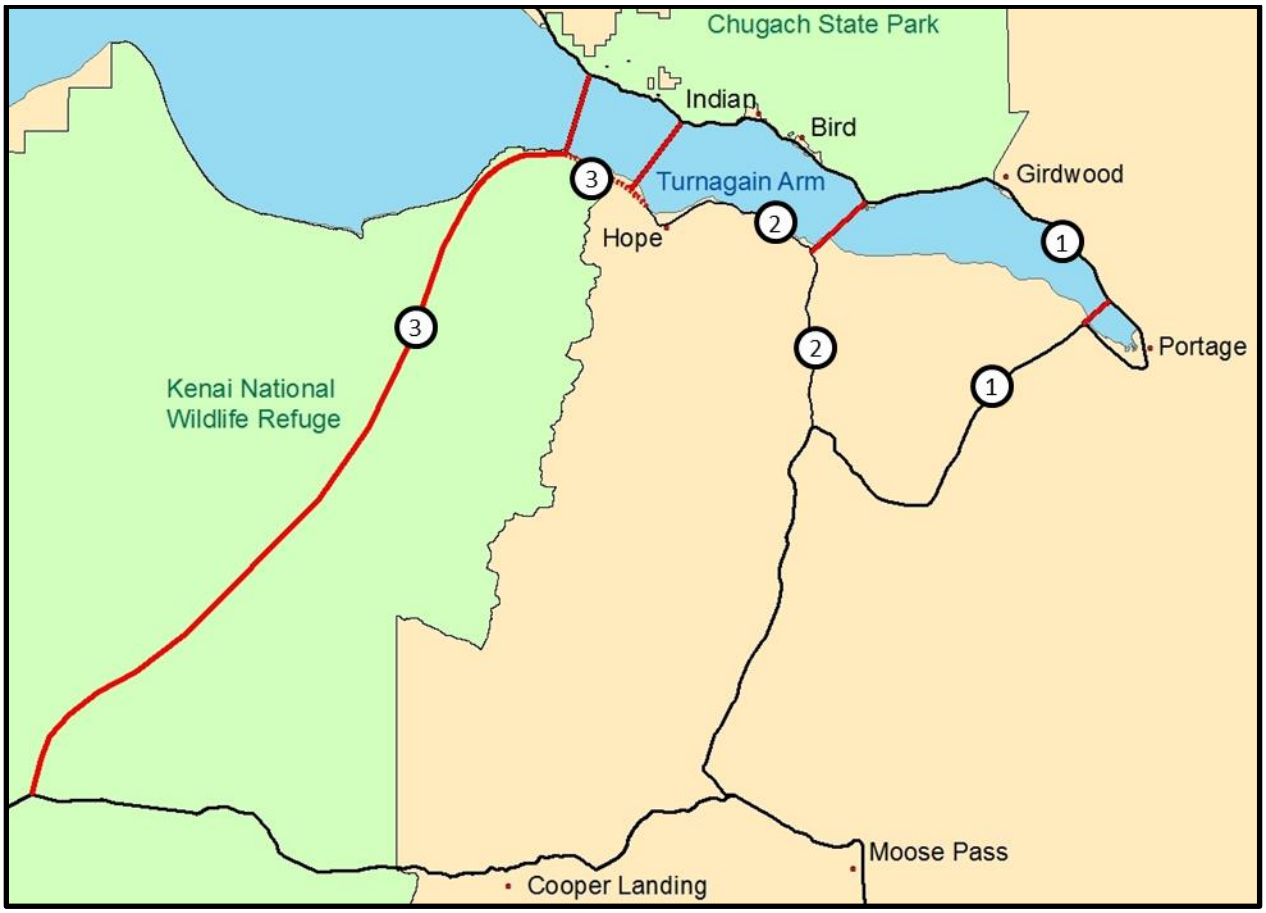

Figure 1: General routes and proposed crossings in Turnagain Arm Crossing Study (1965)

Construction estimates were prepared and cost benefit ratios were developed to allow a comparison of the alternatives. In addition, the evaluation criteria consisted of opening new lands for recreation and development, minimizing route closure due to adverse weather, and grades effecting truck travel. Route 2: Crossing Sniper's Point to Bird Point had the highest benefit ratio of the eight evaluated routes. However, the study recommended the selection of Route 3: Crossing from Cape to Isle with new road to Sterling Highway and new road to Hope as the primary route. The benefits of the selected route included its moderate grades, the shortest travel distance to the Kenai Peninsula, greater economic benefits, and opening of new land to recreation and resource extraction, which outweighed its slightly lower cost benefit ratio. A 1969 financing study estimated that the crossing would cost approximately $47 million. This route was further developed in a Causeway Study completed in 1969 that considered methods of constructing a causeway embankment across Turnagain Arm as an alternative to a bridge. The

study concluded that a causeway would cost an estimated $85 million, $38 million more than a bridge structure.

PRELIMINARY BRIDGE CROSSING CONCEPTS

The route with the crossing from Sniper's Point to Bird Point and the route with the crossing from Cape to Isle with a new road to Sterling Highway and new road to Hope were identified as preliminary concepts for the Seward Route Development Reconnaissance Study. The considered concepts are shown below in Figure 2.

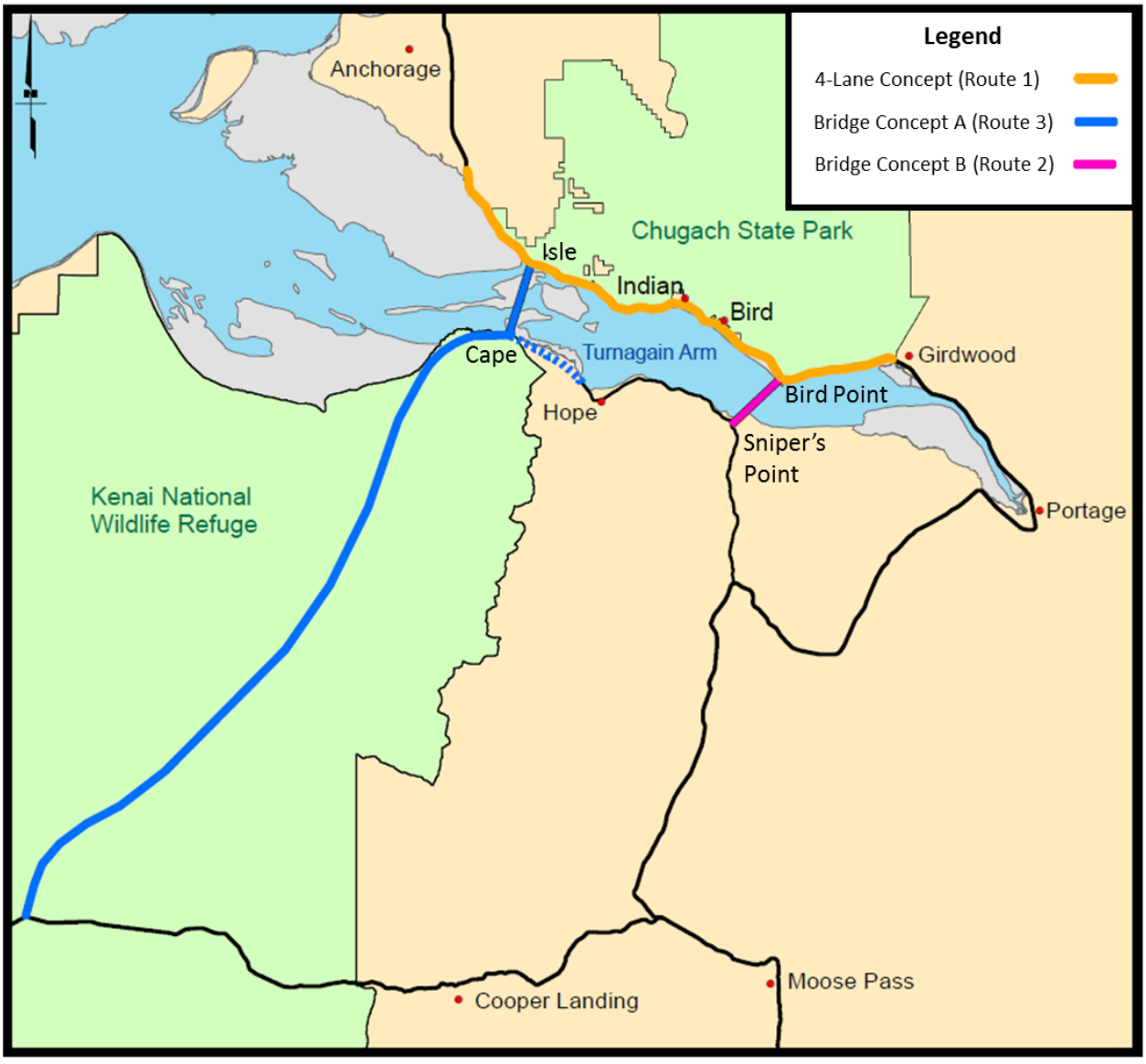

Figure 2: Preliminary alignment concepts

The estimated travel distance and travel times to some primary destinations in the corridor and on the Kenai Peninsula were compared for the bridge and four-lane highway concepts (see **Appendix D** and Table 1). As shown in Table 1, the travel distances and times between Anchorage and Sterling are dramatically reduced by the two Turnagain Arm bridge concepts.

Table 1: Travel Distance and Time from Rabbit Creek Interchange to Kenai Keys

	Distance (miles)	Difference from Existing (miles)	Travel Time (minutes)	Difference from Existing (minutes)
No-Build Concept	123	0	134	0
4-Lane Concept	122	-1	130	-4
Bridge Concept A	56	-66	53	-81
Bridge Concept B	95	-28	102	-32

Based on the reduced travel times and an analysis of travel demand to various destinations on the peninsula, the existing and future traffic volumes were reassigned to the highway system for each build concept. Figure 3 illustrates the 2013 AADT and Design Day (see Reconnaissance Study, p.8 for explanation of Design Day) traffic volumes on the highway segments for each of the concepts. Figure 4 shows the Future 2065 AADT and Design Day traffic volumes. Volumes shown for the four-lane concept in Figures 3 and 4 also apply to the no-build concept.

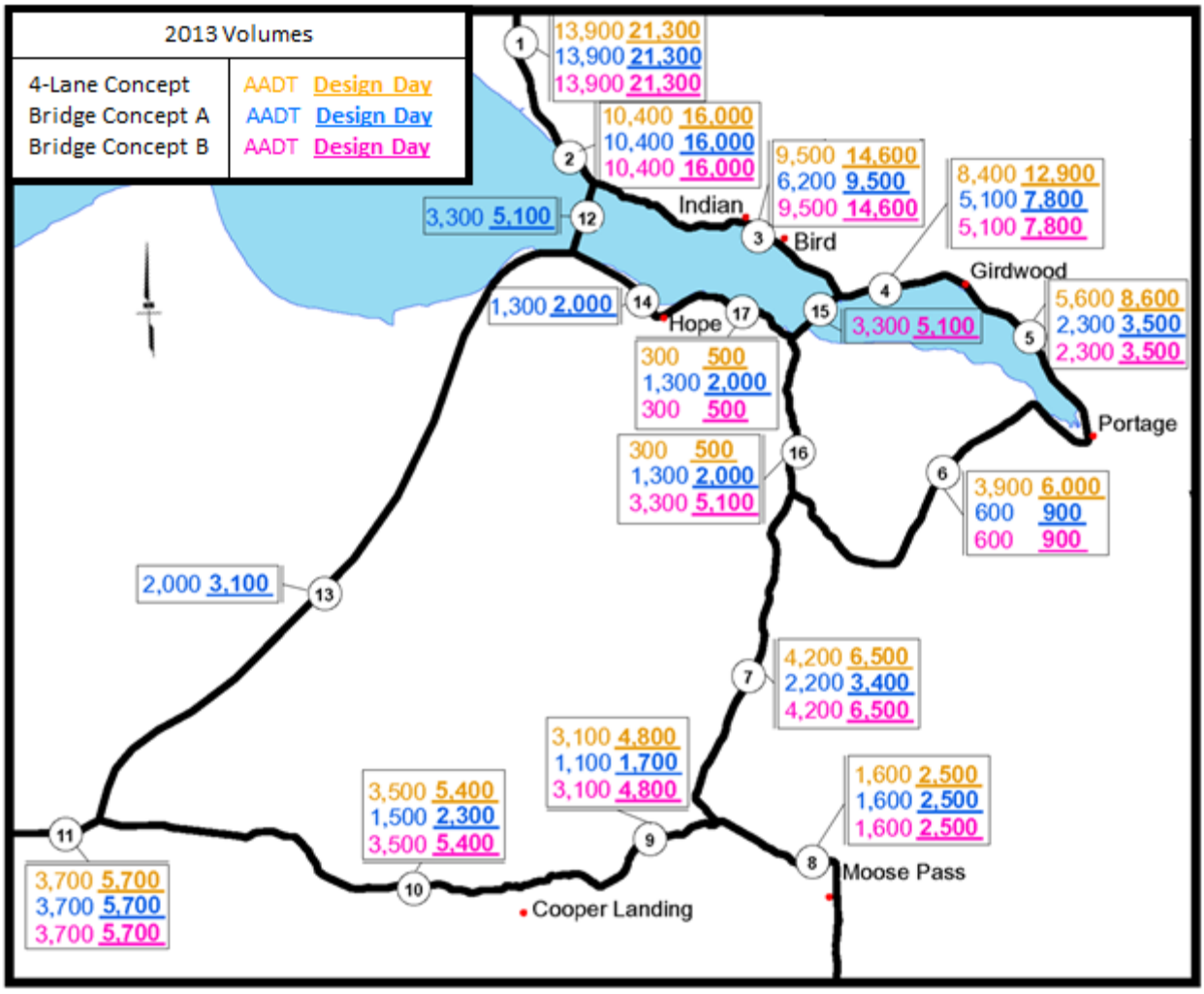

Figure 3: 2013 AADT and Design Day Volumes

Source: DOT&PF Central Region Traffic Volume Report, 2011-2012-2013.

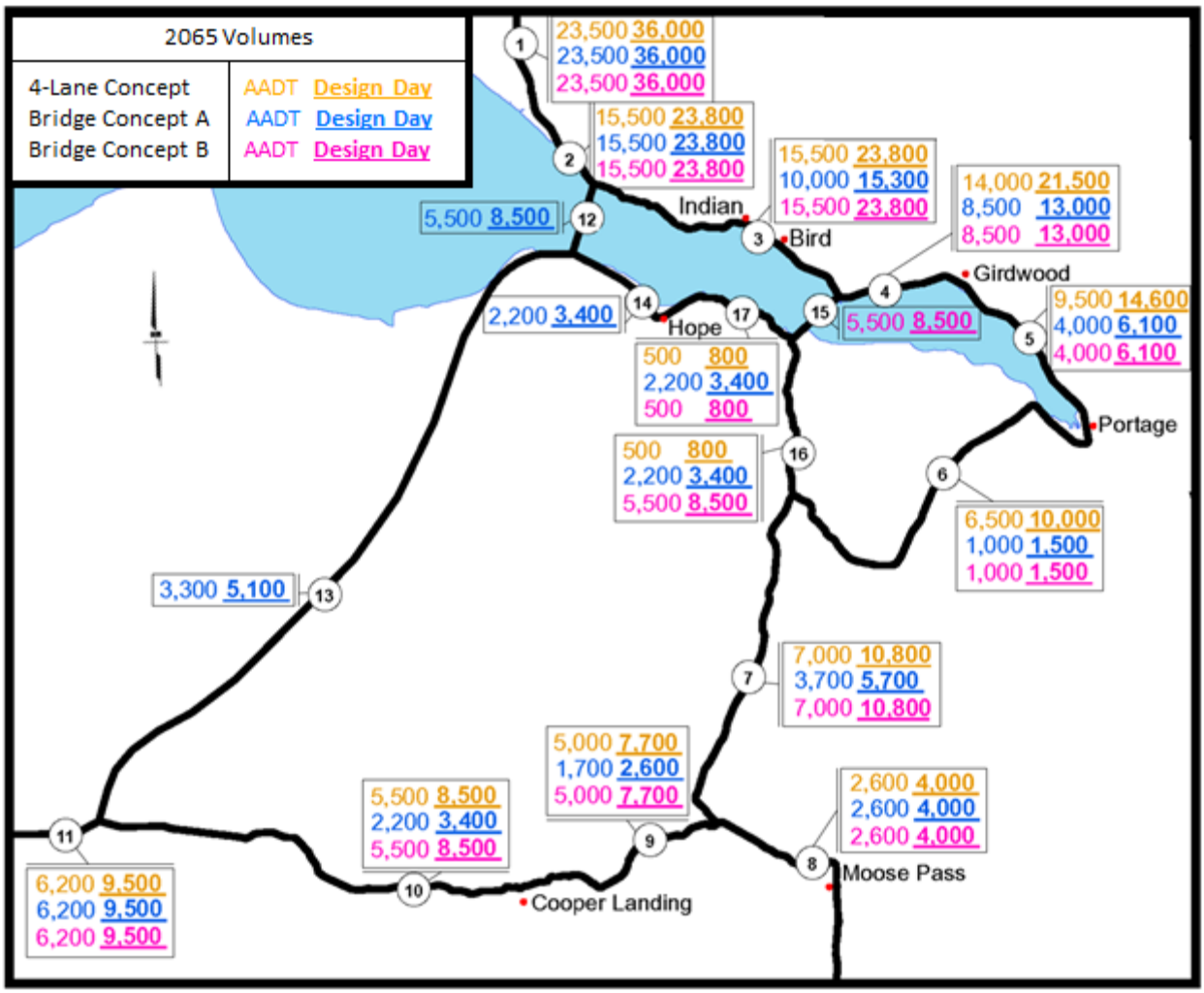

Figure 4: Projected 2065 AADT and Design Day Volumes

A two-lane rural highway capacity of 11,500 to 12,500 vehicles per day was used to assess the base roadway sections of each concept for the 2065 Design Day (see Reconnaissance Study, p.9 for explanation of capacity):

- Four-Lane Concept: The traffic volume analysis indicates that four lanes will be necessary between Anchorage and the Portage Road junction beyond 2030.

- Bridge Concept A: The traffic volume analysis indicates that four lanes will be necessary between Anchorage and the bridge at McHugh Creek. Two lanes will be sufficient for the new bridge, the connection to Hope Highway and the new connection from the bridge to the Sterling Highway. Design Day traffic will begin to exceed the daily service volume criterion south of the bridge on the Seward Highway in approximately 2041. While the concept does not include improvements to the Seward Highway between McHugh Creek and Girdwood, future extension of the 4-lane design south of McHugh Creek is possible as necessary.

- Bridge Concept B: The traffic volume analysis indicates that four lanes will be necessary between Anchorage and the bridge at Bird Point. Two lanes will be sufficient for the new bridge. South of Bird Point, the traffic volume analysis indicates that the Design Day traffic will begin to exceed the daily service volume criterion for a two-lane highway by approximately 2057, but since the highway is already mostly four lanes south of Bird Point, few if any improvements would be needed.

TRAFFIC OPERATIONS

Travel Times

Four lanes on Seward Highway does not significantly alter travel times between Anchorage and Girdwood or between Anchorage and the Kenai Peninsula. While an increase in the posted speed limit to 65 mph for the entire corridor would reduce the travel time between Anchorage and Girdwood by approximately four minutes under optimum conditions, the primary benefit would be the elimination of traffic delays due to congestion during seasonal peaks.

Bridge Concept A would not alter travel times between Anchorage and Girdwood but would result in the greatest reduction in travel times between Anchorage and the Kenai Peninsula. Travel time between Anchorage and Hope would be reduced by 64 minutes to a travel time of 21 minutes and travel time between Anchorage and points on the Kenai Peninsula south of the new highway's junction with Sterling Highway would be reduced by 81 minutes. Travel time between Anchorage and points on the Kenai Peninsula between the Hope Road junction and Jim's Landing would be reduced by 29 minutes. Total travel time between Rabbit Creek Interchange and Kenai Keys would be 53 minutes. For comparison, the total travel time between Rabbit Creek Interchange and Wasilla without traffic is 54 minutes. Bridge Concept A would place Kenai and Soldotna within commuting distance, similar to communities in the Matanuska-Susitna Borough.

Bridge Concept B would not alter travel times between Anchorage and Girdwood but would significantly reduce the travel times between Anchorage and the Kenai Peninsula, though not as significantly as Bridge Concept A. Travel time between Anchorage and Hope would be reduced 53 minutes to a travel time of 33 minutes. Travel time between Anchorage and points on the Kenai Peninsula south of the Hope Road junction would be reduced by 32 minutes.

Capacity

The four-lane concept has the most significant impact on capacity within the project corridor. The four-lane concept would be sufficient to meet the projected 2065 Design Day volume for the entire length of the corridor.

Bridge Concept A would be sufficient to meet the projected 2065 Design Day volume between MP 118 and MP 112. The existing infrastructure between MP 112 and MP 90 would have sufficient capacity to accommodate the projected 2065 AADT but would have insufficient capacity for the Design Day volume. Congestion between MP 112 and MP 90 during the Design Day volume would be comparable to the congestion currently experienced during peak summer usage.

Bridge Concept B would be sufficient to meet the projected 2065 design hour volume between MP 118 and MP 96. The existing infrastructure between MP 96 and MP 90 would have sufficient capacity to accommodate the projected 2065 AADT but would have insufficient capacity for the Design Day volume.

Because Design Day traffic volumes between Anchorage and Girdwood are projected to exceed the capacity of a two-lane rural highway for all three concepts by 2065, the preliminary traffic analysis indicates that there is standalone utility in extending a four-lane divided highway to Girdwood regardless of the construction of a bridge.

Safety

The four-lane concept would result in the greatest increase in safety as it includes alignment improvements and access control for the entire length of the study corridor. Bridge Concepts A and B would implement alignment improvements and access control measures along 21 and 76 percent of the study corridor, respectively.

ENGINEERING CHALLENGES

Constructability

The four-lane concept is considered to be the most favorable from a constructability standpoint. While construction along the project corridor poses challenges due to the presence of steep rock faces to the north and Turnagain Arm to the south, past projects have demonstrated the technical feasibility of the concept.

Bridge Concepts A and B include the construction of a bridge in the tidal waters of Turnagain Arm, which would pose a myriad of design and construction challenges such as the presence of seasonal ice, a large tidal range, strong currents and high seismic activity.

A summary of the concept components is included in Table 2.

Table 2: Concept Components

	Four-Lane	Bridge Concept A	Bridge Concept B
Length of Turnagain Arm Crossing (miles)	0	3.7	3.5
Interchanges	4	1	3
Lane-miles Added	112	121	92
Miles of Track Relocated	19	3	14

Project Length and Coordination

Ideally each concept would be implemented over time as a series of discreet projects with independent utility and logical termini. The four-lane concept has the greatest potential of the three build concepts for collaboration between multiple, fundable projects to achieve a common vision. Both bridge concepts are more difficult to define as smaller projects; the bridge has limited utility without the highway connections on the other side. Thus, construction of the bridge concepts would be much larger “mega” projects that would require a significant infusion of funding beyond the annual federal allocation to achieve.

Utilities

The existing utilities in the corridor and the potential relocations are shown in Table 3. Individual projects will evaluate specific utilities and determine if avoidance alternatives are feasible.

Table 3: Existing Utilities and Potential Relocations

Utility	Asset	Relocation		Map Book Sheet(s) Appendix A
		Beginning	End	
Four-Lane Concept				
ACS	Fiber optic cables	16 miles at various locations		
CEA	115kV and 25kV overhead electric	MP 90.9	MP 95.2	1-3
		MP 98	MP 99	8-9
		MP 102.2	MP 102.6	12
ENSTAR	8" pipeline	MP 115.5	MP 118	23-25
		MP 90.9	MP 103	1-12
GCI	0.500 cable, and fiber optic cables	MP 90	MP102.5	1-12
		MP 115.2 rail crossing		23
Bridge Concept A				
ACS	fiber optic cables	6 miles at various locations		
ENSTAR	8" pipeline	MP 115.5	MP 118	23-25
GCI	0.500 cable and fiber optic cables	MP 115.2 rail crossing		23
Bridge Concept B				
ACS	Fiber optic cables	14 miles at various locations		
CEA	115kV and 25kV overhead electric	MP 98	MP 99	8-9
		MP 102.2	MP 102.6	12
ENSTAR	8" pipeline	MP 115.5	MP 118	23-25
		MP 96	MP 103	1-12
GCI	0.500 cable and fiber optic cables	MP 96	MP102.5	1-12
		MP 115.2 rail crossing		23

Right-of-Way Acquisition

A total ROW corridor of 500 feet would be optimum along the entire transportation corridor between Anchorage and Girdwood. However, given the limited space within the corridor, the ROW for the road and railroad overlap. In areas where the existing rail alignment results in greater separation from the new four-lane highway alignment, the total ROW will be wider. All three concepts would require right-of-way acquisition along this corridor.

Bridge Concept A would also require acquisition of ROW through the Kenai National Wildlife Refuge (KNWR). This area was expanded under the Alaska National Interest Lands Conservation Act (ANILCA). Title XI of ANILCA allows for transportation and utility systems through Conservation System Units designated under it. Although ANILCA Title XI lays out the process for obtaining a ROW through a Conservation System Unit, the Federal agency may

only recommend approval if the system (road) proposed is compatible with the purposes for which the unit was established and there is no economically feasible and prudent alternative route for the system. This is a high standard to meet as the primary purpose of the Kenai National Wildlife Refuge is to conserve fish and wildlife populations and construction of a highway through this area would likely be viewed by USFWS as bisecting wildlife habitat, affecting migration patterns, and increasing the potential for vehicle-wildlife interactions.

ENVIRONMENTAL IMPACTS

Wetlands

Anchorage Wetlands Management Plan (AWMP) wetland designations range from "A" to "C", with "A" being most valuable and most protected and "C" being most developable. Nine wetland areas are located at least partially within the proposed ROW for the four-lane concept, six of which are designated as "A" wetlands in the AWMP. Bridge Concept A impacts two "A" wetlands. The new two-lane highway on the south side of Turnagain Arm included in Bridge Concept A would also impact numerous wetlands as it crosses KNWR, primarily freshwater forested and shrub wetlands. Bridge Concept B impacts seven wetland areas, four or which are designated as "A" wetlands.

Wildlife

While measures to reduce impacts to marine mammals would be required for all three concepts, mitigation efforts necessary for the construction of bridges for Bridge Concepts A and B would be significantly greater than those for the four-lane concept.

Anadromous fish resources are present in 13 streams crossing the existing Seward Highway alignment, nine streams crossing the Bridge Concept A alignment, and eight streams crossing the Bridge Concept B alignment.

COST

Costs for roadway improvements and new road construction were calculated based on an estimated cost of between $20 and $30 million per mile for the four-lane divided highway concept, $5 million per mile of two-lane undivided highway and $45,000 per linear foot of bridge. Costs for interchange structures at four locations (Alyeska Highway, Bird, Indian and Potter Marsh) will add an additional $150 to $200 million. These order of magnitude costs do not take into account environmental permitting and mitigation, land acquisition, and other non-standard roadway elements. They also do not account for tolls, which would likely contribute an income stream to partially offset the cost of the two Bridge Concepts. A summary of the concept cost components is included in Table 4 and Table 5.

The values shown in Tables 4 and 5 are not intended for direct comparison due to the differing termini of the three concepts. A total cost comparison would require an analysis of projected improvements between Anchorage and a single terminus such as Soldotna or Sterling for all three concepts. A complete analysis would also include consideration of possible toll revenue associated with the bridge concepts as well as maintenance and operations costs.

Table 4: Four-Lane Concept Costs

Component	Unit	Unit Cost	Four-Lane Concept	
			Quantity	Cost
4-Lane Divided Highway	mile	$20 to $30 million	28	$560 to $840 million
Interchange	each	$37.5 to $50 million	4	$150 to $200 million
Total			**$710 million to $1.04 billion**	

Table 5: Bridge Concept Costs

Component	Unit	Unit Cost	Bridge Concept A		Bridge Concept B	
			Quantity	Cost	Quantity	Cost
4-Lane Divided Highway	mile	$20 to $30 million	6	$120 to $180 million	21	$424 to $636 million
2-Lane Highway	mile	$5 million	45	$225 million	0	$0
Bridge	linear foot	$45,000	19,325	$870 million	18,269	$822 million
Interchange	each	$37.5 to $50 million	1	$37.5 to $50 million	3	$112.5 to $150 million
Total			**$1.25 billion to $1.32 billion**		**$1.36 billion to $1.61 billion**	

Based on these estimates, the cost for the four-lane concept would range between $710 million and $1.04 billion. The estimated cost for Bridge Concept A would range between $1.25 billion and $1.32 billion and for Bridge Concept B would range between $1.36 billion and $1.61 billion. While there is no single lump sum cost associated with the no-build concept, the existing highway will still require significant maintenance and operational investment, but that investment would be made without a clear long-term vision for the corridor.

CONCLUSION

Evaluation criteria are summarized in Table 6.

Table 6: Summary Evaluation of Preliminary Concepts

Criterion	No Action	Four-Lane	Bridge A	Bridge B
Traffic Operations	○	●	◑	◑
Engineering Challenges	●	◑	○	○
Environmental Impacts	●	◑	○	○
Constructability	●	●	○	○
Permitable	●	●	○	○
Cost	●	◑	○	○
Meets Purpose and Need	○	●	◑	◑
Feasible Concept	○	●	○	○

● Favorable ◑ Somewhat Favorable/ Questionable ○ Cost-Effectiveness and Feasibility is Highly Questionable

While the Bridge Concepts would significantly reduce travel time and distance to the Kenai Peninsula, Design Day traffic volumes between Anchorage and Girdwood are projected to exceed the capacity of a two-lane rural highway by 2065 for all three concepts, indicating a standalone utility in extending a four-lane divided highway to Girdwood regardless of the construction of a bridge. The Bridge Concepts were deemed to be infeasible at this time due to their environmental impacts, constructability challenges, and ability to fulfill the purpose and need. The Bridge Concepts were also judged to be not cost effective for the specific termini of Anchorage to Girdwood; further analysis would be required to determine their cost effectiveness for the Kenai Peninsula highway system as a whole. The four-lane concept was identified as the only feasible alternative to meet the long-term needs of the corridor and was selected for further analysis in the Seward RDP Reconnaissance Study.

APPENDIX D

Concept Travel Distance and Travel Time

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Existing Seward Highway Conditions (No-build)		
Destination from Anchorage (Rabbit Creek Interchange)	Distance (miles)	Travel Time (minutes)
Girdwood (Alyeska Road)	28	29
Portage Road	39	41
Hope (Old Hope Road)	78	86
Sterling Highway Wye	80	86
Cooper Landing (Snug Harbor Road)	91	98
Sterling (Kenai Keys)	123	134

Four-Lane Concept: Existing Seward Highway Corridor				
Destination from Anchorage (Rabbit Creek Interchange)	Distance (miles)	Difference from Existing	Travel Time (minutes)	Difference from Existing
Girdwood (Alyeska Road)	27	-1	25	-4
Portage Road	38	-1	37	-4
Hope (Old Hope Road)	77	-1	82	-4
Sterling Highway Wye	80	-1	82	-4
Cooper Landing (Snug Harbor Road)	91	-1	94	-4
Sterling (Kenai Keys)	122	-1	130	-4

Bridge Concept A: Bridge from McHugh				
Destination from Anchorage (Rabbit Creek Interchange)	Distance (miles)	Difference from Existing	Travel Time (minutes)	Difference from Existing
Girdwood (Alyeska Road)	28	0	28	-1
Portage Road	39	0	40	-1
Hope (Old Hope Road)	16	-62	21	-64
Sterling Highway Wye	51	-29	57	-29
Cooper Landing (Snug Harbor Road) via new road through KNWR	75	-16	75	-23
Cooper Landing (Snug Harbor Road) via Hope Road	63	-29	69	-29
Sterling (Kenai Keys)	56	-66	53	-81

Bridge Concept B: Bridge from Bird Point				
Destination from Anchorage (Rabbit Creek Interchange)	Distance (miles)	Difference from Existing	Travel Time (minutes)	Difference from Existing
Girdwood (Alyeska Road)	27	-1	28	-1
Portage Road	38	-1	40	-1
Hope (Old Hope Road)	33	-45	33	-53
Sterling Highway Wye	52	-28	54	-32
Cooper Landing (Snug Harbor Road)	63	-28	66	-32
Sterling (Kenai Keys)	95	-28	102	-32

APPENDIX E

Typical Section

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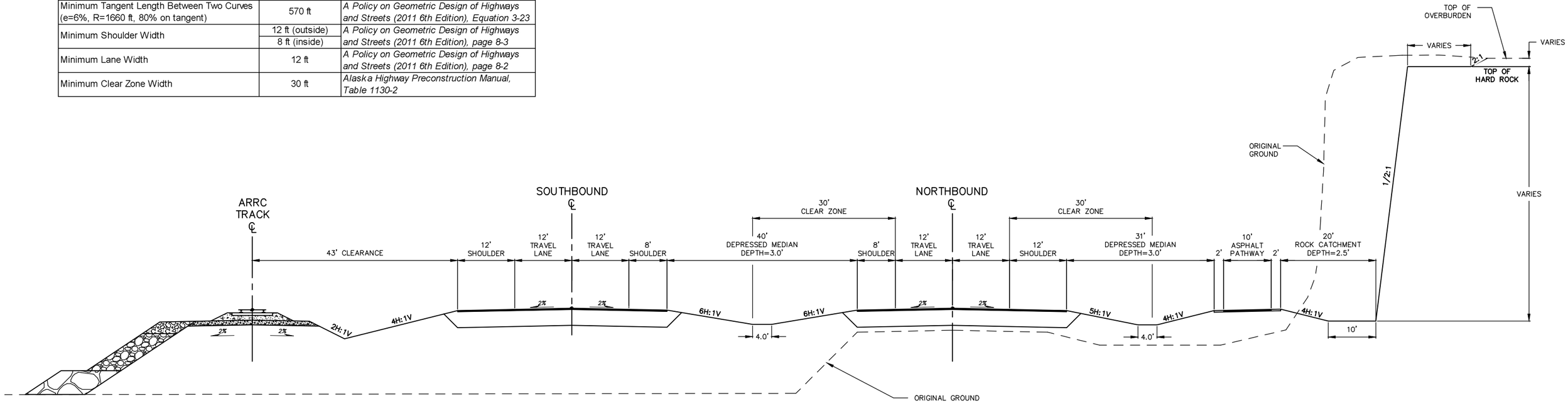
PROJECT DESIGN CRITERIA -- ROADWAY

Project: Seward Highway Route Development Plan

ELEMENT	CRITERIA	SOURCE/COMMENTS
Number of Lanes	4	-
Design Vehicle	WB-67	-
Design Speed	65 MPH	-
Minimum Stopping Sight Distance (Vd = 65 mph)	645 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), Table 3-1*
Maximum Superelevation	6%	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 3-31*
Minimum Radius at Curvature (e=6%)	1,660 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), Table 3-9*
Minimum Tangent Length Between Two Curves (e=6%, R=1660 ft, 80% on tangent)	570 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), Equation 3-23*
Minimum Shoulder Width	12 ft (outside) 8 ft (inside)	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 8-3*
Minimum Lane Width	12 ft	*A Policy on Geometric Design of Highways and Streets (2011 6th Edition), page 8-2*
Minimum Clear Zone Width	30 ft	*Alaska Highway Preconstruction Manual, Table 1130-2*



SEWARD HIGHWAY

TYPICAL SECTION
(LOOKING NORTH)

11/20/14

APPENDIX F

DOT&PF Staff Input on Seward Highway Reconnaissance Study

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APPENDIX F, DOT&PF STAFF INPUT ON SEWARD HIGHWAY RECONNAISSANCE STUDY

The project team conducted a series of interviews with State of Alaska Department of Transportation and Public Facilities (DOT&PF) staff between Dec. 12, 2013, and Feb. 26, 2014 as the project began. The goal was to seek input about the Seward Highway, MP 90-117 (Girdwood to Rabbit Creek) deficiencies, issues and needs.

Project team members from the following DOT&PF sections/divisions responded to interview questions: Maintenance & Operations (M&O), Design and Construction, Materials, Right-of-Way (ROW), Planning, Environmental, Public Information Office, Coastal Engineering, Hydrology, and Utilities. A summary of their responses follows.

In addition, project team members from these sections/divisions provided additional information specific to their areas of expertise. This information is summarized in Appendix G.

What considerations should the Reconnaissance Study (formerly Seward Highway Route Development Plan) have for emergency, recreational and adjacent property access?

The Kenai Peninsula was identified as the Seward Highway's major destination in summer. Girdwood is the major winter destination, although it was noted that more bicyclists are visiting Girdwood in summer. Safety and access (for emergency responders, both road and water; recreationists, utility services; and property owners) were identified as top considerations.

Safety

The (ROW) section identified a 4-lane separated highway as the best way to increase safety for users, along with a bridge to the Kenai.

Emergency Access

Many parties desire increased emergency access to Turnagain Arm waters. More people are kiteboarding and kayaking along the Arm, and the Alaska Railroad is opposed to water access across its tracks due to concerns about safety and trespass.

A review of documented emergencies was suggested; enhanced access by road may not be needed if responders to water emergencies arrive by helicopter. An additional concern from staff regarded who will be responsible for keeping the emergency access open and available.

Recreational Access

The Seward Highway is a heavily used corridor by visitors to Chugach State Park (CSP) and other recreationists (sightseers, climbers, hikers, fishers). Recreational access requires many turnouts. Capacity and functionality must also be maintained for through-traffic to and from the Kenai Peninsula. The needs of both types of travellers must be balanced.

Recreational access has been improved in the past at Bird Creek, which has turn lanes and walkways off-road. These measures are being applied to Windy Corner, and considered for the 20-Mile River Hooligan fishery. Similarly, McHugh Creek, ice climbing areas, water collection (MP 109.3), bore tide viewing areas, and trailheads could be re-evaluated. For

example, areas for viewing bore tides south of Bird Point are over capacity at least once per year and may only need some operational fixes to prevent on-road spill-over.

Recreational access/activities along Turnagain Arm can be inherently dangerous; the railroad has removed rocks to reduce crossing of the tracks by climbers.

Direct Property Access

Direct adjacent property access should be minimized and yet provided for in the same way recreational access has been solved in the past. High-quality consolidated access with turn lanes will improve the level of service (LOS) and safety for both local users and mainline users.

Trying to solve recreational and property access is not a cost-effective or feasible investment at a multitude of locations. When everyone is on a cul-de sac of their own, everyone suffers capacity and safety problems and gets a lesser solution when improvements are not consolidated. Everyone gains when solutions are combined into a single investment at a key point.

What are the top three criteria the team should consider when evaluating/screening alternatives, i.e., safety, capacity, tourism?

The top three criteria identified in the interviews/surveys were safety, access and capacity followed by cost and consistency. The following is a summary of the top three criteria.

Safety

Consistent speed and ease of driving the road.

Minimize severe crash risk by median conflict and roadside conflict risk reduction/ separation from through-traffic. This has been an ongoing goal with Safety Corridor designation. This goal is being attained. We should not turn back on this goal. Fewer deaths and hospitalizations are being attained over time with each improvement.

Because safety is the number one consideration, DOT&PF should be proactive. Technical issues need to be solved first and shouldn't be ignored when funding and developing projects.

Access

Enjoyable opportunity stops and views along the corridor are uniquely Alaskan. Alaskans should not, and likely do not want to, compromise a national Scenic Byway and all the unique opportunities it offers. It is a playground for the state. It has many resident and out-of-state visitors. This makes it of economic importance as well, directly and indirectly. We would be unwise to sacrifice recreation in the same way we would be unwise to sacrifice mobility or safety.

Keeping the railroad on the water side means people will continue crossing the tracks to get to the water. People need to be educated about the decisions that they're making in terms of accessing facilities/activities along Turnagain Arm.

Capacity

Capacity is directly linked to tourism and seasonal variations in traffic volume.

Although capacity (mobility) is important, even locals often stop to view sheep and other wildlife. Those using the corridor for sightseeing and other recreational activities also need to be accommodated.

The table below shows the top three criteria as identified by each section/division.

Top Three Criteria When Evaluating Alternatives							
Section / Division	**Safety**	**Access**	**Capacity**	**Tourism**	**Ownership**	**Cost**	**Consistency**
Coastal &Hydrology	X		X			X	
Design & Construction	X	X	X				
Environmental	See note below.						
Materials	X		X	X			
Planning	X	X	X				
Public Information Office	X	X				X	
Right-of-Way		X			X		
Traffic Safety	X	X					X
Utilities	X		X				X
Count	6	4	4	1	1	2	2

Note: The environmental section's top criteria were: 4f, wetlands, endangered species (belugas), and the 106 Historic Preservation (Alaska Railroad corridor).

Two questions related to public involvement; **Who should be engaged in our public involvement processes? and, what is the best way to reach you with information about our project?**

The following specific stakeholders should be included in future project outreach:

- Alaska Railroad Corporation
- Alaska State Troopers
- Anchorage School District
- Businesses along the corridor
- DOT&PF project managers, team members, M&O, right-of-way staff
- Emergency responders
- Federation of Community Councils
- Fire department/public safety
- Freight companies
- Girdwood Board of Supervisors
- Girdwood 2020 subcommittee
- Girdwood Chamber of Commerce
- Governmental agencies—DNR, USFS, ADFG
- Local, Federal and State elected officials
- Media—Anchorage Dispatch News, KTUU, Turnagain Times
- Motorcycle groups and other recreation groups
- Municipality of Anchorage
- Property/ROW owners (ARRC, DNR, DOT&PF, etc.)
- Regional Governments (Mat-Su and Kenai Boroughs, Seward, Kenai, Homer, etc.)
- Tourism Board/entities
- Turnagain Arm Community Council

The following specific contact methods should be considered for future project outreach in the corridor:

- DOT&PF Facebook page
- Email
- Facebook
- Light/message boards on highway
- Newspapers
- Post flyers at local businesses along the highway
- Post flyers at meeting locations in Anchorage, Girdwood and on the Peninsula
- Postal mailings
- Radio
- Social media
- Television
- Web page

What do you see as the top three challenges to improving the Seward Highway corridor between Girdwood and Rabbit Creek?

1. Cost: The appropriate level of funding will be found when the solution is above average. This is a top-10 scenic byway in the country like few others. It's just around the corner from a metro area. Such a treasure is worth an investment. Don't compromise too much at the planning level. First, set the vision of what this corridor can be based on safety, access and consistency, and then propose stepwise improvements that reach that goal over time. Current efforts have been stepwise improvements already, so this is the process, reusable investment.

2. Compromise: Too much compromise to meet current budgets means all 3 criteria (safety, access and consistency) could suffer. The better each individual criteria is served, the other two criteria are served that much more. Building our way to the ultimate goal can mean phased construction or partial typical sections. Have the long term goal in mind. The previous corridor agreement between DOT&PF, CSP, and ARRC was useful. The legislature approved it.

3. Consistency: The key is balance and continuing what we have already been building region-wide for mobility and safety. As per above:

> **Standards for Mobility** – Need to establish minimum performance levels so that compromise does not mean non-performance. Mobility 45 MPH average travel speed per functional classification (FC) and HCM (not the same as maximum speed limit);
> **Safety** – Strive for near zero risk per the State's Strategic Highway Safety Plan (SHSP). Use HSM probabilities to reduce fatal/major crashes *especially* involving innocent secondary users such as opposing traffic or off-road users. Solve this by good clear zones and barriers. Not the same as zero risk of SVROR severe crashes. We can get to zero by targeting specific subsets of crashes. We have done this with several crash types in Alaska—train collisions, state work zones, school zones, and in isolated areas such as Kodiak.
> **Recreation** – There must be a way to access the highlights of the corridor, not necessarily by car, but to preserve the opportunities—just well away from traffic.

In addition, the sections/divisions identified these items as additional challenges:

- Understanding limitations (funding, ability to inspect, environmental)
- Environmental regulations/permits
- Availability of easily buildable land
- Community concurrence (Indian and Bird Creek)
- CSP limits access to "dry land"
- Terrain
- Corps of Engineering wetlands permitting
- Funding
- ARRC
- ROW
- CSP (4f)
- Endangered Species
- Historic Preservation (6f)

What do you see as the top three reasons for improving the Seward Highway?

1. Consistency/mobility is not meeting the FC value of 45 MPH average on some days due to weather, crashes, and recreational conflicts. This is an economic factor as well—road design promotes successful commerce between "control cities" and surrounding areas, not just for localized areas.

2. Safety was failing at the hands of some drivers claiming innocent motorists in severe crashes—this is a special fear factor for residents as opposed to single vehicle crashes where the driver is "in control." Safety is holding at 50% severe crash reduction within Safety Corridors—see the Safety Corridor Audits. This is an interim solution awaiting more permanent investments.

3. Recreational activities have sprung up along the corridor and are being discovered over time. These actions are less safe due to the lack of facilities, lack of clear separation, and lack of access (some are just off the shoulder). There are more uses along the Turnagain Arm that are not really promoted yet, but offer more to see and do. The views alone are amazing.

Additional comments addressed speed diversity, whether DOT&PF should build for seasonality, mobility and economic development.

Ask Program Development/Environmental about strategies for financing the build out on the project and how it could affect the development of alternatives and project phasing.

From an environmental standpoint:
Using a Categorical Exclusions under the old FHWA 6004 process would not be appropriate for this corridor. The DOT&PF and FHWA have conversations about logical termini and corridor segmentation frequently. Environmental felt like the agencies would likely push for an Environmental Impact Statement (EIS) for the corridor. Projects may exceed the threshold for independent utility, logical termini, etc.

The DOT&PF is leery of EISs because, historically, they have taken a long time to complete. The documentation for this project would likely be higher than an Environmental Assessment.

The level of environmental documentation might be an issue that the Commissioner and FHWA would need to work out. They are having an issue with the Seward Highway MP 75-90 Environmental Assessment.

It is a matter of priorities once the proper use is worked out. We have been phasing OK to date when projects are needed.

What guidance would you provide the team for development of alternatives?

Some estimates are approaching $1 billion for a continuous 4-lane divided highway between Anchorage and Girdwood alone. This would be true if grade separation was the norm. The alternating 3-lane system remains incomplete and would have significantly lesser cost. The entire "corridor" that is actually incomplete includes more than 65 miles between Anchorage and Soldotna. Many of these miles are still pending project studies on the Sterling and Seward Highways.

Recommend examining alternatives that can grow into 4-lane divided, but one option to save funds is to begin with finishing the alternating 3-lane plan which has shown crash benefit, mobility (speed) benefit, and recreational benefit (more time for recreation and less time watching only the car ahead of you). Another alternative to the 4-lane divided highway that has been suggested includes straightening points to accommodate radii at the 65 MPH expected operating speeds consistent with the rest of the corridor to Seward and Homer. This would be similar to the Seward Highway over Turnagain Pass near the Hope area, where the old winding points were a problem. Now those areas are smoother and safer driving, with the old points retained for recreational opportunities. Consider keeping the outer points in view of motorists—this creates a stewardship for safety. Points out of sight can put people out of sight, creating more of a security type of safety risk. This depends on the purpose of the pullout.

Given the land status/ownership in the area, abandoning the current footprint will be extremely difficult.

- The National Environmental Policy Act (NEPA) would prefer taking private property over park land.
- A lot of private property near Indian and Bird would need to be taken to widen the roadway in its current location.
- Many of the lands in Bird and Indian are inholdings.
- Relocating people will be difficult because there isn't always comparable land to move them to.
- Having National Highway System (NHS) routes through communities doesn't always work in terms of access.

Additional comments:

- Develop a long-term corridor plan—quit continuing project-by-project.
- Use the plan to execute the projects in a systematic way.
- Provide a range of alternatives and seek public input. Seek to provide quality informative graphics (charts and graphs) to illustrate the alternatives. Quantify areas that need the most work. Consider tackling the worst areas first and focus on safety.

- Develop a clearly defined goal. If a 4-lane is the goal, you need logical fundable sections.
- What are upper management's goals and objectives and how do we address those?
- Rock can be expensive.

Do we need to look at lower cost per mile solutions? This is a safety corridor, how long should the public wait until the corridor is fully built out?

Yes. It may be possible to set up space for the long-term, but consider the work in increments. The smallest increment is to "finish what we started"—the 3-lane alternating program. This has benefited all 3 criteria under question 1 (emergency, recreational and adjacent property access). Consider design checks for Manual of Uniform Traffic Control Devices (MUTCD) traffic control performance (curve/striping/sight distance) as a cost-effective geometric option. The public does not have to wait if we can find ways to keep improving the corridor such that those upgrades are future layers of an ultimate project.

Yes, until it can be paid for.

What does fully built out mean? If it was truly important, it would be underway. What is the purpose? Tourism/safety? Right now the public is not waiting.

Look at the bigger picture and what the DOT&PF's goal is for safety. How much does a given project contribute to the state's goals and objectives? Do a cost/benefit analysis. How much are we willing to spend on safety? How does the cost of a safety project compare to human life?

We have been looking at interim solutions through the Highway Safety Improvement Program (HSIP) and will continue to do so until full build out is seen. Will the low cost alternative meet the goals? This study needs to look at full build out.

Would two lanes provide sufficient capacity and accommodate other corridor needs?

Most commenters said no, two lanes did not provide sufficient capacity during seasonal peaks but could meet seasonal average demands. Commenters also cites the conflicts with other corridor uses (recreationists, fishers, etc.) and separating slow and fast traffic make a two lane highway less desirable. If traffic demand, for example, due to Kenai Peninsula fishing declines, the two lanes may work.

Commenters also stated that it is evident a 4-lane divided highway is "perfect" for mobility and safety, and perhaps even recreation in terms of separating conflict. We do not need to have the demand to agree there is a benefit. Divided highways are the safest corridors even when volumes are lower. Freeways exist in Wyoming and around the country without having a volume or capacity need. These freeways still provide safety and mobility (speed, percent time spent following) benefits. Those are good reasons to consider divided highway in Alaska. We should also build with an eye toward divided highways as funds become available.

A couple of commenters said that the two lanes could continue to work in winter months.

Do we need to consider spot safety improvements as a potential alternative?

Disagree with the question. The question is more like "Do we need to CONTINUE to add spot safety improvements?" Or, "Are there more opportunities?" Yes. The Bird to Gird new alignment off the mountainside has lowered total crash rates by 40% in that segment. No more white knuckle driving, more driver comfort and separation of conflicts.
We have also invested and programmed $141 million dollars in projects since Safety Corridor designation in May 2006, about $4.6 million per mile. See the Safety Corridors Audit 2012 and 2013 pending. Death and hospitalization rates are currently down by HALF! The most common solution is to divide the highway to achieve these results estimated to cost as much as $25 million per mile in this area.

Do you envision a one-size-fits-all cross section or should alternatives be considered?

No and Yes:
NO—each segment has a variation in the presence of rock face, railroad, and other obstacles which affect road profiles, turn lanes and sometimes grade separation (when there are pedestrians). Variation is likely needed to fit topography under the "No" answer.
YES—Shoulders are desirably consistent, uniform with the rest of the corridor. Optimally there would be enough width to retain rumble strips—typically 8 feet. Lane widths would also be uniform system-wide due to the presence of trucks and trailers—12 feet. The center line marking could vary and be wider, from 12 inches to 2 feet to divided. Consistency is the goal under the "Yes" answer. Multiple cross-sections are needed. Control differences in speeds.

Yes. Users need consistency and intuitive features (i.e. a uniform number of lanes and speed limit). Connectivity with other projects outside of the corridor should also be considered. A single, uniform cross-section should be considered; anything that you can do to reduce impacts to environmental resources. It might be one of the alternatives.

What would help you as a decision-maker in determining the best mix of solutions for the corridor?

Analysis and alternatives, clear maps, matrix/breakdown of impact areas by alternative, rank by anticipated environmental burden. Data to show why/where, etc., volumes, crashes, travel time changes—all visual.

Consider operational performance checks to achieve sight distance and confirm geometry meets the speeds and driver expectations of the entire corridor similar to the entire routes to Seward and Homer. This would be at 65-70 MPH for setting traffic control. Drivers tend to show what they expect of the current geometry here and elsewhere. Other passing lane areas run at 65-70 MPH traffic speeds. Studies show about 73 MPH 85th percentile speeds. There is not an automatic tendency to drive 10 MPH over the Design Speed; instead, there is a maximum speed selected by most drivers on the 3-lane sections throughout the region.

What is it going to take to demonstrate that alternatives pushing fill out into Turnagain Arm meet the COE requirements of the least environmental damaging preferred alternative (LEDPA)?

Is it possible to create enhanced wetlands at the same time as road improvements? This would increase the inventory (of wetlands) as was done historically. This may also enhance the Turnagain Arm saltwater channels as wildlife habitat.

Carefully consider, and discuss with agencies, wetlands preservation against safety trade-offs. Narrow shoulders, steep fills, and guardrail come at an Highway Safety Manual (HSM) estimable safety performance cost. There is a desirable performance width and slope for roadsides that reduces to near zero risk of major injury/fatal crashes, *especially* crashes that involve secondary motorists. These slopes could increase wetlands fills but for cost-effective safety reasons worth considering.

It is going to take a robust discussion to explain how alternatives are/are not the least environmentally damaging. The document will have to talk about the right-of-way, mountains, inlet, etc., and discuss just purpose and why the project is needed. Will need to categorize habitats. There are different wetlands habitats in Turnagain Arm such as salmon rearing ponds, etc.

There are already examples of pushing fill out into the Arm as part of the needed solution. Emphasize safety need. Rocks (i.e. rip rap) do not provide a bad habitat. There may be ways to mitigate impact (i.e., artificial reef).

To what extent should we balance the parkland (4) and historic (6f) resource impacts against the project design criteria in developing project alternatives?

Look at all reasonable ways to avoid impacts to environmental resources.

CSP is an important resource, but shouldn't be the only consideration.

FHWA: "Least impact that meets the design criteria." FWHA can be ultra conservative, but the response depends upon the reviewer.

Do you want the results to look at the whole project corridor or to look at distinct, fundable, and permittable project segments?

The vision should include the whole corridor, the environmental approach should be a corridor approach, and the construction should be project-by-project.

Consistency for the whole corridor is desirable. Then distinct segments could have standalone utility and fundable segments.

A corridor vision should be recognized, but ROW should be dealt with on a project-by-project basis. Funding will be a problem long-term. Even if ROW isn't being obtained all at once, we can still look in advance at material sites, constructability, etc. Banking property may not be an option, given current legislation. Additionally, FHWA would have to grant approval to expand project limits in order to bank ROW.

Do you have thoughts on permitting, funding or design strategies that will deliver Seward Highway improvements sooner?

Start on right-of-way as soon as possible. Do early acquisitions if properties become available. Good cooperation between agencies DOT, ADNR, National Park Service (NPS),

ARRC, US Forest Service (USFS), United States Army Corps of Engineers (COE) and others. Early cooperation is very important.

Engage agencies and the public in the conversation. Many projects have been delivered recently and more are pending soon.

When considering segments versus whole project, what is the best NEPA strategy?

For the purposes of environmental, the project shouldn't be segmented. The three biggest problems in project development are NEPA, utilities and ROW. These problems should be dealt with early to ensure that road blocks can be avoided and that a 30 to 40-year vision can be realized. The design life currently identified in the DOT&PF PCM is 15 years. It should be 30-35 years. (For example, the current embankment was constructed in 1964 after the Good Friday earthquake.)

Consider using state funds to minimize NEPA processes.

Consider the corridor vision, but use an incremental project development approach. That will be easier for ROW.

It depends on FHWA. There are benefits and drawbacks to having an early discussion with FHWA. We talked about how the work done now could benefit future NEPA processes and avoid repetitive work which confounds and confuses the public.

Get buy-in from FHWA on a larger vision and then break it down. The last 5-10 years, DOT&PF has been getting push back on using this corridor/then project strategy.

Do you think this is a recreational or transportation corridor?

The majority of the commenters felt it was both a recreational and transportation corridor. Until there is an alternative corridor across Turnagain Arm, this is Alaskan's access to the Kenai Peninsula. Neither use seems to be feasibly exclusive to this corridor. A recreational emphasis that excludes minimum transportation performance goals negates the economic and primary purpose of the road—which is to keep the road moving in a reasonable time for people and freight/commerce to the Kenai Peninsula. A transportation emphasis that excludes recreational uses negates the unique world-class opportunities serving large numbers of people. This is not just an extreme recreational corridor—it serves all abilities down to viewing and picture taking

Is DOT&PF willing to accept a faster build out of the corridor if it means higher operation and maintenance costs?

Probably. But what does actually mean?

No, because building it is only the first step. Being able to take care of it is important.

Yes, but it probably depends on the circumstances. M&O funding levels are shrinking, not increasing.

In the previous Seward highway improvements ARRC was a willing and cooperative partner. For example, the highway improvements and realignments straightened track and increased railroad operational speeds from 25 mph to 40 mph. In the 1970s the ARRC provided a detour

for the highway construction. The realignment on Bird to Gird provided a benefit to the ARRC. On Bird Flats realignment, the project allowed a railroad material haul that benefited both the ARRC and DOT&PF. **How do we make this work for the railroad again, given that there is no likely benefit to the railroad from the improvements?**

Curve straightening is always a benefit. Remember, the ARRC is just another (sister) state agency. We need to be mindful of the freight haul from Whittier.

This is a challenge because of past history. Make improvements attractive to the ARRC or perhaps assist them with improvements on other parts of their system as a trade-off. Eliminate trespass, reduce their maintenance costs.

Opportunities to benefit include curve straightening, etc. ARRC and DOT&PF will need to partner (this relationship is improving). We need to find common ground for a workable, beneficial solution.

APPENDIX G

Comments by DOT&PF Section/Division

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APPENDIX G, COMMENTS BY DOT&PF SECTION/DIVISION

Maintenance and Operations (M&O)

Winter Maintenance Considerations

- Ice
- Snow storage; not much hauling is done. It's usually just pushed off the road. Pulloffs are not generally cleared, though some smaller ones may get plowed. Turnaround areas for snow removal equipment should also be considered.
- Rocks; especially between Indian and Potter. The slopes are unstable. There is some mesh. Ideally, M&O needs a 10-20-foot flat-bottom ditch for rock fall and snow storage. It would be preferable to lay the rock slope back in new construction. The Bird Point to Girdwood geometry would be ideal. Rock falls usually happen during heavy rainfall and during spring break-up. A tow plow patrols the corridor during these times.
- Avalanches
- Driveways aren't cleaned up after plow goes by. But, no one complains. Permits are clear that all maintenance related to the approach is the sole responsibility of the owner.

Summer Maintenance Considerations

- Rock
- Guardrail
- Bin walls at MP 105 are starting to bend backwards and the guardrail is sloughing.
- Ditch line has to be cleared so new rocks can fall there. MP 106 is cleared twice a year. The material at the pit below McHugh Creek is from the ditches near MP 106.

Corridor Cross-Section and Characteristics

- Should be a 4-lane roadway
- Consideration for dividing the highway:
    - Snow removal/storage may be hampered
    - A depression median in the middle can provide storage as long as sight distance is maintained. North of Bird/Indian, there may be visibility problems with driveways if Bird and Indian are not bypassed.
- The Seward Hwy should be posted at a consistent 65 mph.

Culverts

- McHugh Creek; culverts can't be found on outlet side. This is a candidate for bridge or large box culvert construction.
- There aren't many others to worry about in the corridor that are tidally influenced because the drainage is higher.

Trails/Recreation

- State Parks—Bird Point and old Seward Highway alignment
- DOT clears avalanche debris from paths because State Parks doesn't have equipment.
- Recreation should be dissuaded as much as possible.
- MP 113; ice climbing is a problem. People stand on the fog line to belay for climbers.

- Recreational access becomes a problem (if there are interchanges rather than approaches) in the winter because you can't just not plow them in the winter. It's much easier to plow past a driveway than it is to go past acceleration and deceleration lanes.

Maintenance Funding

- It's hard to guess what the fiscal environment will look like in 20-50 years. Should we be assuming that the resources will be available to maintain the features that we're talking about? Yes.
- Positions have been lost and budgets have been reduced. Next 4-5 years will be hard.
- CPS has been maintaining certain things for years. But now that they're dilapidated, CPS wants to say that they're in DOT ROW because they don't want to pay the cost.

Access

- Access should be every 0.5 miles, not every 500 ft.
- Driveways aren't cleaned up after plow goes by. But, no one complains. Permits are clear that all maintenance related to the approach is the sole responsibility of the owner.

Traffic Volumes

- 50 years would be 40%-50% increase in volumes. At that point, the road could be its own regulator.
- Coming north; the bottom of Turnagain Hill (Ingram Creek) is where traffic starts to back up.
- The wye to Ingram Creek (MP 75) isn't too bad and maybe doesn't need to be 4-lane.

ITS/Avalanche Detection

- Cameras on the roadway are beneficial.
    - There should be 3-4 Road Weather Information System (RWIS) environmental sensor stations along the corridor, to include Bird Point and McHugh Creek.
    - There is very different weather along the corridor.
    - There's a lack of permanent power along corridor.
- Corridor could use message boards; one in Potter and a temporary one in Girdwood.
    - A problem now is that people in Indian and Bird don't get to see the messages being displayed in Girdwood.
- Next summer DOT&PF is putting up speed indicator signs (6 or 7 between Potter and Girdwood) and are talking to ARRC about their use of solar technology.
- www.511.alaska.gov should be promoted.
- Avalanche detection systems—working with ARRC at MP 86. DOT&PF initiated project at 21 mile as well, but there were some issues. Technology would determine whether or not an avalanche came across the road. If so, gates would come down.
    - Attorneys and liabilities have stalled or killed the project.
- An avalanche berm in Bird Flats would be beneficial.

Other Considerations

- There are winter water/hydrology issues around Indian.
- Could we do 4-lane divided in summer and go down to only using one side in the winter (Randy). Most of the money is being spent in winter when there's no traffic on the

roadway. Year-round 4-lane configuration doubles maintenance (cost). Is this the best way to spend state's money, or should it be spent somewhere else?
- What's really the optimum design that works best for the public?
- What is the cost difference between 4-laning ALL of the Seward to the Wye versus putting a bridge across Turnagain Arm?
- Not much between Potter and Indian has changed since it was built. And we'd never build it that way now.

Design and Construction (DC)

- The study should at least consider the alternative of a causeway across Turnagain Arm to divert Kenai/Soldotna/Homer traffic from the Seward/Sterling highway. This could be justified by the reduced cost of improvements required over this stretch of highway if this traffic was diverted. If this cannot be done, then the highway needs major realignments.
- There is a bad combination of recreational traffic, and through-traffic. The former tends to be slower, while the latter is fast. Lower speed limits would also be difficult because of through-traffic demands.
- 4(f) and 6(f) issues, along with COE and railroad lie on either or both sides of the corridor.
- Safety must not get dropped in deference to other issues.
- Guardrails cause errant cars to be redirected back into traffic, 4:1 recoverable slopes are needed for safety.

Typical Cross-section:

- The existing 3-lane sections are scary.
- Adding Jersey barriers is difficult.
- 4-lane is needed, with frontage roads for business areas.
- 4-Lane not needed, not worth the $, but public perception is going to drive it.
- Guardrails should be avoided in a 4-lane section, use 4:1 slopes. This will probably be cost justifiable. Railroad should be moved further out to allow recoverable slopes.
- Must address a non-motorized pathway per Federal requirements and also include full 8' shoulders beyond the rumble strips.

NEPA:

- NEPA docs will have to look at the RDP, this may be a help. Have to work with Planning to ensure this result.
- An EIS could result in a 10-year delay to corridor projects.

Segmentation of the Corridor:

- DOT tends to do the easiest parts of a corridor first, need to tackle the worst.
- The VE Study on Windy Corner suggested the project should be increased to further address issues.

Funding:

- Project development is more of an issue than cost, it takes a long time to develop projects. Funding can be brought to the projects.

Constructability:

- Construction in the Turnagain corridor is very difficult because of traffic from June 1 to mid-August. Must work at night and not at all in July. Timing of construction activities is difficult because the traffic peaks can be at odd hours during the summer.
- Designating and acquiring material sources along the corridor is needed. Hauling gravel from the Mat-SU Valley must be avoided.
- The railroad material haul on a previous segment worked well. There were issues with how the contractor set up the material source to train loading process, the belt feed could have been done better. It was huge not having haul trucks in the corridor. This was a contractor (QAP) set-up.

MATERIALS

- Fix all geotechnical problems, not just the minimum.
    - Stabilize the base, don't just shave and pave.
    - A geotechnical corridor analysis should be done.
    - Look at all aspects of the road and how they relate/interact.
        - i.e. lighting versus fencing to stop moose kills on the Glenn Highway
- After Flint Hills closes, in-state asphalt will only be coming from Kenai. So, many more trucks will be using this route.
    - Out-of-state asphalt will likely come in from Whittier or Nikiski.
- Because of the summer traffic volumes, summer construction is extremely disruptive. Between inconvenience and cost, it would be ideal to push out into tideland and only move the railroad one time and construct 4 lanes.
- Design for summer, not Annual Average Daily Traffic (AADT).
- Based on most recent crash data, does the Seward Highway still need to be classified as a Safety Corridor?
    - Are most accidents occurring in summer or winter?
- Rock slides occur within the corridor.
    - Safety liability for rock falls does not lie with DOT&PF. But, this rock fall is a geometric problem/consideration moving forward.
    - Dave Stanley should be contacted about rock fall and geotech.
    - DOT&PF should consider laying back rock slope angles where rock fall and icing are an issue.
- The roadway function should be defined and then the corridor should be laid out based on constraints.
- DOT&PF is working on centralizing data and making it more usable.
    - ITS upgrades are planned.
    - Drew can send pavement management system/maintenance management system (PMS/MMS) data. He can also send the GIS work that he's been doing; to include geospatially-referenced lists of M&O issues such as rock falls, failing culverts, and frost heaves.

    - Steve should contact Jim Amundsen to talk about the GIS deliverables for this project; maybe we could get the database up to speed and use components of it for current projects.
- User costs should be included in lifecycle costs.
- Commissioner Kemp is pushing for the use of hard aggregate.
    - There is no aggregate in MOA.
    - 2-3M tons of aggregate is consumed in MOA annually.
- There will be excess rock (where is this excess best used?) from other projects and there are adequate resources to build in the flats.
    - i.e., 30,000 yds. excess on the MP 99-100 job.
- Should this study look at Portage, too?
- The 50-year horizon is appreciated.

RIGHT OF WAY (ROW)

- ARRC has full rights to their existing submerged lands. However, DNR says it is against state law to convey full rights to submerged lands.
- A bill is being introduced in the legislature this session that will modify this current law and allow ARRC to deed ROW for the purposes of building roads. ARRC would like to fee simple in as many cases as possible without the current restrictions.
- It is unclear as to whether or not quit claims deeded to the State of Alaska belong to DNR or DOT&PF.

ENVIRONMENTAL

Environmental indicated the wanted to understand more about the document being prepared and discuss how we can take the information from this project and apply it toward future NEPA processes.

FHWA/US DOT Planning and Environmental Linkages (PEL) initiatives and Every Day Counts initiatives could be used to accelerate processes.

PUBLIC INFORMATION OFFICE (PIO)

Check with PIO when the project team has the outreach list.

PIO added that the DOT&PF is steering away from town hall-type meetings and leaning toward open house public meetings. This allows for civil one-on-one discussion and eliminates grandstanding and angry public discourse.

The team shared the web map/comment application with the PIO who suggested we add the businesses in the area to the map.

PIO would also like to review public service announcements in advance of distribution.

COASTAL ENGINEERING/HYDROLOGY

What are the biggest concerns with current conditions?

- DOT&PF is relying on ARRC to maintain protection/eliminate erosion problems for the road when the railroad is on the water side
  - We need to know what constraints exist.
  - We need to be clear on responsibilities (i.e., via maintenance agreements).
- There are no regular inspections of hydro elements done by someone who is knowledgeable in hydrology and hydraulics
  - M&O looks for signs of slumping, etc. when they're doing work.
  - Only bridges are required by FHWA to be regularly inspected.
- Outlets of culverts are regularly damaged (presumably) by ice banging into them
  - This can affect how they carry water.
  - The use of rip rap around these culverts has been considered as a possibility, but that may result in destabilization.

  Railroad:

  - Can DOT&PF rely on the railroad to protect the highway from erosion?
  - May need a maintenance agreement.
  - Railroad does not like people crossing the tracks.
  - Are there cost sharing opportunities with the Railroad?

Are there any places of significant concern or general considerations to be aware of for the future?

- Corridor culverts are all old and at varying risk of failure.
  - McHugh Creek Culvert is at a high risk of failure.
  - 1R and 3R projects along the corridor have historically not included culvert replacement.
- Rabbit Creek coming out of Potter Marsh could be a bridge someday.
- The project team should talk to Statewide Hydraulics Engineer.
- The culverts within the corridor are in need of analysis
  - Analysis methodologies have changed since they were installed.
  - There haven't been any problems with the highway, so the culverts are likely properly sized and designed adequately for discharge, but do not meet fish pass criteria.
  - There are not any culverts that appear to be in need of replacement with bridges.
  - There is an MOA in place between DOT&PF and ADF&G for the design, permitting, and construction of culverts for fish passage.
- Project team should review new FEMA floodplain maps (is Tidewater Slough in the floodway?)

- Contact Steve Ellis at the Municipality of Anchorage if more information is needed.

Are there any other considerations?

- An expanded footprint into the inlet likely wouldn't have as big of an ecological impact as most people think. It may even be good for some species.
- Rock types in the area may be a factor to consider in the future and material site reconnaissance will be important. There are many types of rock in the area. Based on rock quality, you can design for more loss.

UTILITIES

Are you aware of any utility expansions/upgrades?

- Fiber lines will likely need expanded capacity at some point.
- Not aware of other changes/expansions.

Discussion of fiber optic relocations:

- Splicing is still an issue with fiber companies.
- Adding splices at each end of 2-5 mile segments will be an issue. Possible solutions:
  - Relocate all fiber cables out into Turnagain Arm early in the project.
  - Add extra conduits for fiber, then allow them to use them to install longer segments later.
  - FHWA and DOT&PF policies must also be considered.
- ACS and GCI are the owners; talk to them.
- Route diversity (cables can't cohabitate):
  - DOT&PF not willing to participate.
  - Concreting may be a solution.

TRAFFIC & SAFETY

What do you like about the Seward Highway corridor between Anchorage and Girdwood?

All three responded that they have traveled through the corridor on a regular basis for many years. Personally, they want to maintain a comfortable travel speed through the corridor and secondarily enjoy the scenic views. They want the traffic to move along at a steady speed with less stress so they can enjoy the views.

Is the public perception of crashes in the corridor in line with the actual crash data?

- Need to show crashes (number and severity) by time of day – Are the crashes occurring when the traffic demand is the highest?

- Show the results of the safety improvements undertaken in the corridor during the past five-six years.

What should the design speed be for the corridor?

- Develop corridor facilities that produce driver speed expectations in line with design features. Green Book (AASHTO) guidelines as well as MUTCD operating speeds.
- 65 miles per hour is the expected operating speed.
- Balance of safety and mobility
- Maintain through-traveler expectation for long distance trip times (Anchorage to Girdwood, Anchorage to Seward, Anchorage to Soldotna/Kenai)
- In certain sections, like Bird to Indian where there are more turn movements due to property access, it may be necessary to slow drivers down to 45 mph in the 50 year horizon if alternative access management cannot be provided to allow 55-65 operating speeds. However, a 45mph speed would be inconsistent with the highway's function and current conditions/conflicts. Instead, DOT&PF is designing turn lanes to common access points to improve safety and maintain regional mobility. Speeds of 55 mph or higher are needed to achieve the highest mobility standard for the National Highway System.
- Currently the 85th percentile speed in the corridor is about 72-73 mph.

How should the highway alternatives address the trade-off of mobility versus accessibility?

- Needs to be a mobile and functionally accessible facility as there are no or limited alternative routes available for recreation users.
- This is a National Highway System (NHS-Interstate) route – set appropriate design criteria to match functional classification.
- Design to create function and beauty balance.
- Recognize value of recreational uses and scenic views in corridor.
- Highway design should be self-explaining and have self-expectations for the drivers.
- Design good pull-out areas with sufficient signage to discourage pull-offs/stopping in non-designated areas.
- Concern for left turns from fast lanes as slowing down/accelerating presents safety issues.
- Consider access spacing of 2-3 miles (see Draft Park Highway Access Development Plan in Appendix I).

What should be the design hour criteria?

- AADT vs. Seasonal ADT vs. 30th highest hour
- Provide graphs of seasonal traffic variations
- Need to be budget conscious, but also recognize that this is the only highway corridor linking Anchorage with the Kenai Peninsula in the foreseeable future (20-30 years).

- Need to recognize vehicle classification data as this is the primary freight route between Anchorage/Kenai Peninsula/Alaska Marine Highway System – truck percentage is about 15-18%

Other comments:

- Alternatives should include a four-lane divided highway.
- Consideration of Turnagain Arm Crossing bridge/ferry as a corridor alternative to widening the Seward Highway.
- For safety reasons, barrier between through-traffic lanes should be examined.
- Solid barrier between through lanes may create snow drifting maintenance concerns.
- Use of tunnel sections for Seward Highway to move through traffic away from the water and provide separate roadway for access to recreational/scenic view areas.

APPENDIX H

Grade-Separated Intersection Concepts

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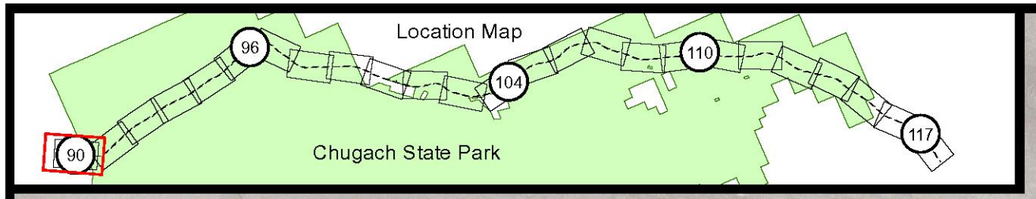

Seward Highway Route Development Plan

Access Alternatives

Girdwood

Access Alternative 1A

January 23, 2015

Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
Sec. 4,9, T 11 N, R 3 W Sec. 10,15, T 11 N, R 3 W Sec. 22,23,25,26, T 11 N, R 3 W
Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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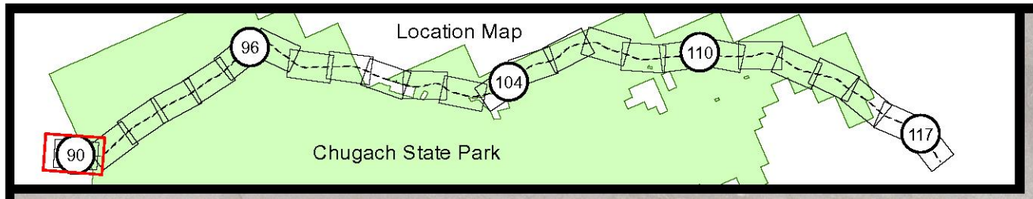

Seward Highway Route Development Plan

Access Alternatives

Girdwood

Access Alternative 1B

January 23, 2015

Existing
- Milepost
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
Sec. 4,9, T 11 N, R 3 W Sec. 10,15, T 11 N, R 3 W Sec. 22,23,25,26, T 11 N, R 3 W
Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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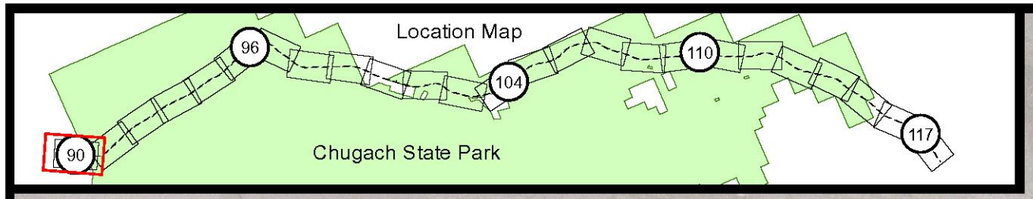
Seward Highway Route Development Plan

Access Alternatives



Girdwood

Access Alternative 1C

January 23, 2015

Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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Sec. 4,9, T 11 N, R 3 W Sec. 10,15, T 11 N, R 3 W Sec. 22,23,25,26, T 11 N, R 3 W
Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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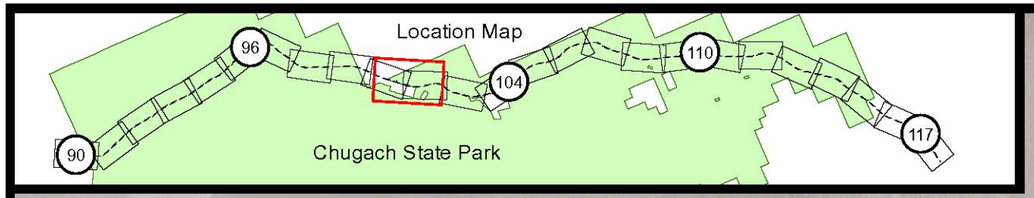
Seward Highway
Route Development
Plan

Access Alternatives

Bird

Access Alternative 2A

January 23, 2015



(#) Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
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Sec. 4,9, T 11 N, R 3 W Sec. 10,15, T 11 N, R 3 W Sec. 22,23,25,26, T 11 N, R 3 W
Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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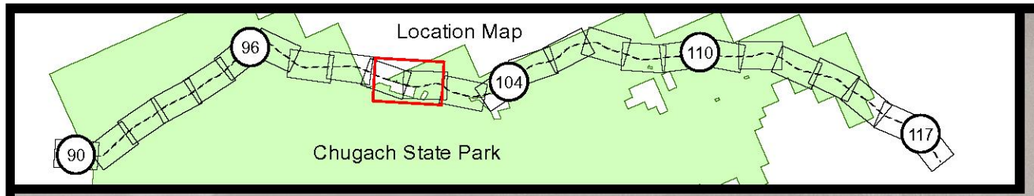
Seward Highway
Route Development
Plan

Access Alternatives

Bird

Access Alternative 2B



Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
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Sec. 33. T 12 N, R 3 W
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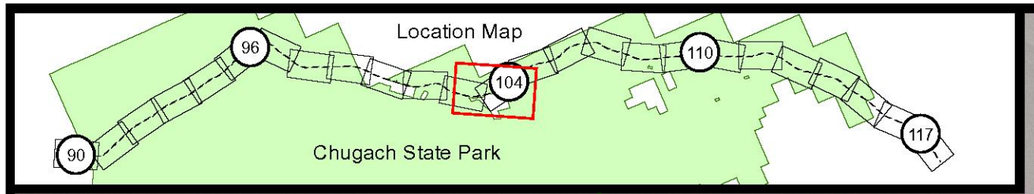
Seward Highway Route Development Plan

Access Alternatives

Indian

Access Alternative 3A



Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
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Sec. 33. T 12 N, R 3 W
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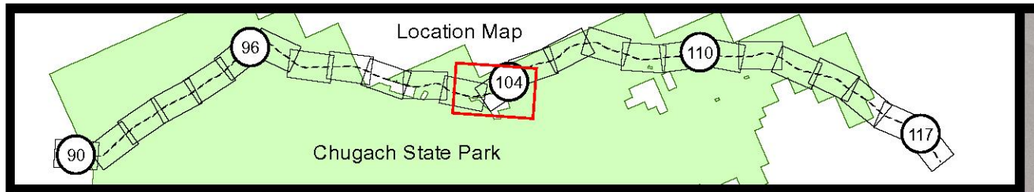
Seward Highway
Route Development
Plan

Access Alternatives

Indian
Access
Alternative 3B



Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits

- Access North & South Bound
- Chugach State Park
- Access Control Area
- Chugach Electric Association Utilities
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
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Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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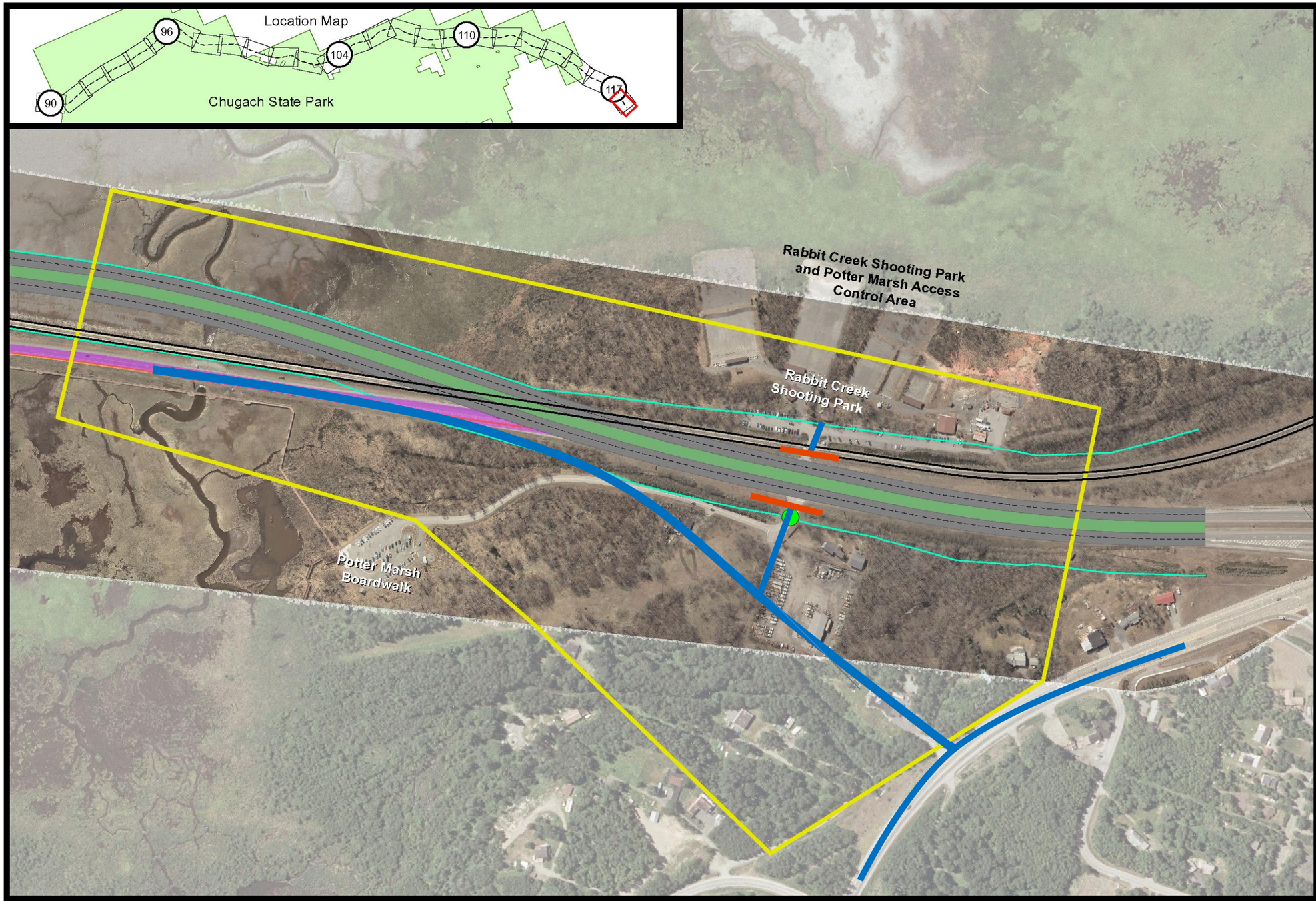

Seward Highway Route Development Plan

Access Alternatives

Rabbit Creek Shooting Park and Potter Marsh

Access Alternative 4

January 23, 2015

Milepost

Existing
- Railroad
- Multi-Use Path
- Bridges
- Chugach State Park Facilities

Proposed
- Road
- Median
- Railroad
- Multi-Use Path
- Slope Limits
- Access North & South Bound
- Chugach State Park
- Access Control Area
- Frontage Road
- Roadway Obliteration

0 250 500
Feet

Seward Highway Route Development Plan

Sec. 21-30, T 10 N, R 1 W Sec. 5,6,8,9,10,14,15,23,24,25, T 10 N, R 2 W
Sec. 19, T 10 N, R 2 E Sec. 1,2,3, T 10 N, R 2 W Sec. 30-34, T 11 N, R 2 W
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Sec. 33. T 12 N, R 3 W
Seward Meridian, Alaska

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APPENDIX I

Draft Parks Highway Access Development Plan

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Parks Highway Access Development Plan (ADP) – Southcentral Alaska

Functional Class	Population Area	Recommended Intersection/Interchange Spacing					
		Interchange	Signalized	Unsignalized w/o Median	Unsignalized w/Median		
					Full Median Opening	Directional Median Opening	Right In/ Out
Freeway or Interstate	Rural	4mi	- Minimize signalized intersections - Recommended access spacing: 2 to 6mi - Minimum access spacing: 1/2mi* *If minimum access spacing is not feasible, see principal arterial.				
	Suburban/ Developing Urban Clusters[9]	2mi					
	Urbanized Areas[10]	1mi[4, 6]					
Principal Arterial	Rural	2mi[4, 6]	2640ft[1]	2640ft[1]	2640ft[1]	1320ft[1]	660ft
	Suburban/ Developing Urban	--	2640ft[1, 6]	2640ft[1]	2640ft[1]	1320ft[1,8]	660ft
	Urban	1mi[4, 6]	2640ft[6]	--	2640ft[6]	660ft[8]	660ft
Minor Arterial	Rural	2mi[4, 6]	2640 +/- 300ft[1]	1500ft[1]	1320ft[1]	660ft[1]	660ft[1]
	Suburban/ Developing Urban	--	2640 +/- 300ft[1]	660ft[1]	1320ft[1]	660ft[1,8]	330ft[1]
	Urban	1mi[4, 6]	640 +/- 300ft[1]	--	1320ft	660ft[8]	330ft

[1] Access Management Manual, TRB, 2003
[2] AASHTO A policy on Design Standards Interstate System, Jan 2005
[3] AASHTO A policy on Geometric Design of Highways and Streets 6th Edition, 2011
[4] NCHRP Report 687 Guidelines for Ramp and Interchange Spacing, 2011
[5] AKDOT&PF Alaska Highway Preconstruction Manual, Effective November 15, 2013
[6] ITE Traffic Engineers Handbook 7th Edition, 2016
[7] Highway Capacity Manual, TRB, 2000
[8] HSIP Program median mitigation projects (Tudor, Muldoon, Debarr roads)
[9] Based on 2010 US Census, pop. > 5,000
[10] Based on 2010 US Census, pop. >50,000

Parks Highway Access Development Plan (ADP) – Southcentral Alaska

Functional Class	Population Area	Recommended Intersection/Interchange Spacing Ranges						Source	Notes
		Interchange	Signalized	Unsignalized w/o Median	Unsignalized w/Median				
					Full Median Opening	Directional Median Opening	Right In/ Out		
Freeway or Interstate	Rural	6mi[1] 3mi[4] 2 mi[6*] 0.5 to 2mi+[7*]	4 mi - Minimize signalized intersections - Recommended access spacing: 2 to 6mi - Minimum access spacing: 1/2mi* *If minimum access spacing is not feasible, see principal arterial.					[1] pg. 159 [4] pg. 32 [6] pg. 254 [7] pg. 13-6	[5] Interstate roadways by definition are major arterials. Urban areas should have no private access. In rural areas public roadways are desirable, but private access points may be required where the route traverses major private land holdings. *(1120.2.4 Access Control)* [5] Freeways and expressways are special, high-design-type arterials that are exclusively for through traffic. Access is legally controlled along the arterial and no private driveways are permitted *(1190.3 Functional Classifications)* [6] Interchanges with spacing less than 1 mile may have detrimental effects and should be assessed carefully. (pg. 254) [6*] Ramp spacing (pg. 406) [7*] 2 miles or more is ideal, 0.5mi is the minimum (Freeway). Interchange density becomes significant for speed estimation purposes under 1 interchange per mile. (13-11) [7] On-ramp merge influence length of 1,500ft, off-ramp merge influence length of 1,500ft (pg. 13-21).
	Suburban/ Developing Urban Clusters[9]	3mi[1] 0.5 to 2mi+[7*] 1mi							
	Urbanized Areas[10]	1mi[4, 6*] 0.5 to 2mi+[7*]							
Principal Arterial	Rural	2mi[4, 6*]	2640ft[1*] 0.5 to 2mi[7]	2640ft[1]	2640ft[1]	1320ft[1]	990ft[1] 660ft	[1] pg. 149, 156 [4] pg. 32 [6] pg. 254, 406 [7] pg. 10-6	[1*] Ideal Uniform Signal Spacing; minimum bandwidth 50% (peak). (pg. 149) [1**] Ideal Uniform Signal Spacing; minimum bandwidth 40% (peak). (pg. 149) [3] As access-point density increases, accident rates increase. See Fig. 2-32, Fig. 2-33, Fig. 2-34. (pg 2-75 to 2-77) [5] Driveways will not be allowed on other arterials if other access is available. The Departments primary concern is the safe, efficient movement of through traffic. *(1190.3 Functional Classifications)* [6] An increase in access-point density increases crash rates (Fig. 12-13) [6*] Ramp spacing (pg. 406) [6**] Unsignalized median openings that are not suitably located for signalization should be designed for left or U-turns where the spacing of intersections permit such a median opening. (pg. 406) [7**] Urban: High access-point density, Suburban/Intermediate: Low to Moderate access point density. (pg. 10-6)
	Suburban/ Developing Urban	--	2640ft[1*, 6] Up to 1mi[7] 1320ft min	2640ft[1]	2640ft[1]	1320ft[1,8]	1320ft[1] 660ft		
	Urban	1mi[4, 6*]	2640ft[6]	--	2640ft[6]	660ft[8] See note[6**]	660ft		
Minor Arterial	Rural	2mi[4, 6*]	2640 +/- 300ft[1*]	1500ft[1]	1320ft[1]	660ft[1]	660ft[1]	[1] pg. 149, 155, 156 [4] pg. 32 [6] pg. 254, 406 [7] pg. 10-6	
	Suburban/ Developing Urban	--	2640 +/- 300ft[1*] 2640ft[6] Up to 1mi[7] 1320ft min	660ft[1]	1320ft[1]	660ft[1,8]	330ft[1]		
	Urban	1mi[4, 6*]	2640 +/- 300ft[1*] 1320ft min	--	2640ft[6] 1320ft	660ft[8] See note[6**]	330ft		

[1] Access Management Manual, TRB, 2003
[2] AASHTO A policy on Design Standards Interstate System, Jan 2005
[3] AASHTO A policy on Geometric Design of Highways and Streets 6th Edition, 2011
[4] NCHRP Report 687 Guidelines for Ramp and Interchange Spacing, 2011
[5] AKDOT&PF Alaska Highway Preconstruction Manual, Effective November 15, 2013
[6] ITE Traffic Engineers Handbook 7th Edition, 2016
[7] Highway Capacity Manual, TRB, 2000
[8] HSIP Program median mitigation projects (Tudor, Muldoon, Debarr roads)
[9] Based on 2010 US Census, pop. > 5,000
[10] Based on 2010 US Census, pop. >50,000

- Signalized access-point density may be higher for one-way roadways

Alaska DOT/PF Preference/Practice

Parks Highway Access Development Plan (ADP) – Southcentral Alaska

Access Notes:

SAFETY AND OPERATION:

[3] *Spacing of openings should be consistent with access management classifications or criteria. Where traffic patterns show nearly all through traffic and well below capacity, a simple less costly median break design may be sufficient. In areas of high cross, turning or through traffic of high speed and high volume, provide for turning movements to be made without encroachment on adjacent lanes and with little or no interference between traffic movements. The design should be based on traffic volumes, urban/rural area characteristics, and type of turning vehicles. (9.8.1 General Design Considerations, pg 9-140/141)*

[5] *For arterials in urban areas, provide median openings only if the volume of cross- or left-turn traffic is relatively large. Since these are major traffic points, assume future signalization of the opening. (1150.2.2 Medians)*

[5] *Per the Roundabout First Policy, consider a single lane roundabout where a new traffic signal is being considered. Justification for not installing a roundabout needs to be included in the Design Study Report. (pg 430-13)*

[5]*The location of driveways must minimize interference with the free movement of normal roadway traffic. This will reduce the hazards caused by congestion. Driveways should not be placed adjacent to/within an intersection, on a separated turning roadway, auxiliary lane, nor exclusive turning lane. (1190.4 General Principles)*

[5] *Median Openings: Where a median exists or is to be constructed on a public roadway, driveways should be designed and controlled to allow right turns only. Median openings should not be provided for driveways unless all the following conditions exist:*

- ***a.*** *There is a sufficient volume of traffic using the subject driveway to warrant driveway intersection design as a public intersection.*
- ***b.*** *The driveway intersection is evenly spaced between adjacent arterial or collector intersections.*
- ***c.*** *Installation of a signal at present or in the future at the subject driveway intersection will not adversely affect the capacity of the public roadway.*

To minimize wrong way movements on the divided public roadway, driveways planned near a median opening should be placed either directly opposite the median opening or at least 200 feet from the median opening. (1190.4 General Principles)

[6] *Access management safety benefits: (1) Improved access design, (2) fewer traffic conflict locations, and (3) higher driver response time to potential conflicts. (pg 415)*

[6]*Access management strategies avert the poorly planned conversion of rural land to urban areas … [it] supports economic growth and bicycle, pedestrian, and transit mobility. Land use planning actions include:*

- ***a.*** *Encouraging multiuse activity centers rather than single-use developments*
- ***b.*** *Establishing minimum densities and infill incentives in designated activity centers and along express transit corridors*
- ***c.*** *Orienting urban development along streets where practical (pg. 422)*

ROW:

[1] Access Management Manual, TRB, 2003
[2] AASHTO A policy on Design Standards Interstate System, Jan 2005
[3] AASHTO A policy on Geometric Design of Highways and Streets 6th Edition, 2011
[4] NCHRP Report 687 Guidelines for Ramp and Interchange Spacing, 2011
[5] AKDOT&PF Alaska Highway Preconstruction Manual, Effective November 15, 2013
[6] ITE Traffic Engineers Handbook 7th Edition, 2016
[7] Highway Capacity Manual, TRB, 2000
[8] HSIP Program median mitigation projects (Tudor, Muldoon, Debarr roads)
[9] Based on 2010 US Census, pop. > 5,000
[10] Based on 2010 US Census, pop. >50,000

[3] *It's often desirable to initially acquire sufficient ROW for the ultimate development of multilane divided arterials, including that needed for future intersection improvements and grade separations. (7.2.9 Ultimate Development of Multilane Divided Arterials, pg 7-9)*

[1] Access Management Manual, TRB, 2003
[2] AASHTO A policy on Design Standards Interstate System, Jan 2005
[3] AASHTO A policy on Geometric Design of Highways and Streets 6th Edition, 2011
[4] NCHRP Report 687 Guidelines for Ramp and Interchange Spacing, 2011
[5] AKDOT&PF Alaska Highway Preconstruction Manual, Effective November 15, 2013
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[10] Based on 2010 US Census, pop. >50,000

Parks Highway Access Development Plan (ADP) – Southcentral Alaska

Interstate design standards:*

23 CFR 625.4(a)(2)

"A Policy on Design Standards Interstate System, AASHTO, January 2005"

*"**Control of Access***

"Access to the interstate system shall be fully controlled. The interstate highway shall be grade separated at all railroad crossings and selected public crossroads. At-grade intersections shall not be allowed. To accomplish this, the intersecting roads are to be grade separated, terminated, rerouted, and/or intercepted by frontage roads. Access is to be achieved by interchanges at selected public roads.

"Access shall extend the full length of ramps and terminals on the crossroad. Such control shall either be acquired outright prior to construction or by the construction of frontage roads or by a combination of both.

"Access control beyond the ramp terminals should be affected by purchasing access rights, providing frontage roads, controlling added corner right-of-way areas, or prohibiting driveways. Such control should extend beyond the ramp terminal at least 30m (100ft) in urban areas and 90m (300ft) in rural areas. However, in areas of high traffic volume, where exists the potential for development which would create operational or safety problems, longer lengths of access control should be provided." (pg. 2) [2]

23 USC 103(c)(1)(B)(i)

"In general.-Except as provided in clause (ii), highways on the Interstate System shall be designed in accordance with the standards of section 109(b)."

23 USC 109(b)

"The geometric and construction standards to be adopted for the Interstate System shall be those approved by the Secretary in cooperation with the State transportation departments. Such standards, as applied to each actual construction project, shall be adequate to enable such project to accommodate the types and volumes of traffic anticipated for such project for the twenty-year period commencing on the date of approval by the Secretary, under section 106 of this title, of the plans, specifications, and estimates for actual construction of such project. Such standards shall in all cases provide for at least four lanes of traffic. The right-of-way width of the Interstate System shall be adequate to permit construction of projects on the Interstate System to such standards. The Secretary shall apply such standards uniformly throughout all the States."

***Alaska is exempt from interstate design standards:**

23 USC 103(c)(1)(B)(ii)

"Exception.-Highways on the Interstate System in Alaska and Puerto Rico shall be designed in accordance with such geometric and construction standards as are adequate for current and probable future traffic demands and the needs of the locality of the highway."

[1] Access Management Manual, TRB, 2003
[2] AASHTO A policy on Design Standards Interstate System, Jan 2005
[3] AASHTO A policy on Geometric Design of Highways and Streets 6th Edition, 2011
[4] NCHRP Report 687 Guidelines for Ramp and Interchange Spacing, 2011
[5] AKDOT&PF Alaska Highway Preconstruction Manual, Effective November 15, 2013
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[10] Based on 2010 US Census, pop. >50,000