



Safer Seward Highway Project
Seward Highway MP 98.5 to 118,
Bird Flats to Rabbit Creek
Project No.: Z566310000/0A31034

Environmental Assessment

*Appendix E: Highway Configuration
Development and Selection Memorandum*

DRAFT

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Prepared for:

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Memorandum

Date: 10/27/2025
Project Name: Safer Seward Highway Project
To: DOT&PF
From: Project Team
Subject: Highway Configuration Development and Selection Memorandum

1 Introduction

This technical memorandum (memo) describes the screening process used to support concept development and selection for the Safer Seward Highway, Seward Highway Mileposts (MP) 98.5 to 118 Project (Project). This memo is intended to address the configuration of the highway: four-lane divided, three-lane divided, and three-lane undivided. The analysis reviewed the proposed actions against the project Purpose and Need, specifically the safety, reliability, and mobility within the Project corridor. Refer to the Traffic and Safety Analysis Report for additional information beyond what is shown below (Environmental Assessment Appendix G).

When determining the typical section of the Project's Proposed Action, there are many factors to consider. The first would be to determine if the northbound and southbound lanes should be separated, either with a grass median or a physical concrete type barrier, or if they should remain unseparated. The second would be to determine the number of lanes, based on capacity needs, traffic projections, Level of Service (LOS), maintenance, and other qualitative measures.

2 Divided Versus Undivided

The major benefit of dividing a highway is the reduction or removal of head-on collisions between vehicles. When median separated, the increased width between lanes provides a greater clear-zone for a run-off-the-road vehicle to recover. It also provides an increased snow storage area. Based on the crash data from 2017 to 2021 within the Project area, of the 236 total crashes, 11.0 percent were head-on collisions. Of the 76 fatality and injury (FI) crashes, 12 resulted in severe injury or fatality, and of these 12 crashes, 50 percent were head-on collisions. Four fatalities occurred during that period, two in 2018, one in 2019, and one in 2021. Three of the four fatalities (75 percent) resulted from head-on crashes that occurred between MPs 102 and 104. Head-on collisions represent a substantial portion of FI crashes, making the division of northbound and southbound lanes with a median a critical safety improvement. Median separation not only reduces the risk of head-on collisions but also enhances roadway safety by providing recovery zones for errant vehicles and other operational benefits.

The winter months pose the largest risk for vehicles losing control and crossing into oncoming traffic due to slippery conditions and the tightness of curves along the route. Within this corridor,

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by DOT&PF pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated April 13, 2023, and executed by FHWA and DOT&PF.

nearly 40 percent of the total crashes occur during December, January, and February, highlighting the critical need to separate northbound and southbound traffic. Additionally, there are far more curves within this corridor as compared to the sections immediately south, including reverse curves that can be difficult to navigate during wintertime conditions. Any Build alternative should include physical separation, either in the form of a depressed median or a physical barrier. Therefore, a three-lane undivided will not be analyzed further as a potential build alternative in this memo.

Further discussion regarding the typical sections below assumes this separation of northbound and southbound traffic.

3 Three-Lane Versus Four-Lane

3.1 Reduction in Crashes

Reducing crashes on the Seward Highway is critically important for several reasons:

1. **High-Risk Area:** As a designated Safety Corridor, the highway has been identified as a stretch of road that has a higher-than-average rate of serious crashes, often involving fatalities or severe injuries. Reducing crashes within these areas directly addresses the heightened risk and saves lives.
2. **Public Safety:** The primary goal of designating a Safety Corridor is to enhance public safety. Reducing crashes minimizes the risk to drivers, passengers, and pedestrians, contributing to safer travel for everyone using the highway.
3. **Economic Impact:** Crashes, especially severe ones, lead to substantial economic costs, including emergency response, medical expenses, vehicle repair, and traffic delays. Reducing crashes in Safety Corridors helps to lower these economic burdens on communities and governments.
4. **Public Perception and Trust:** Effective reduction in crashes within a Safety Corridor can build public trust in transportation authorities and their ability to create safer road environments. This trust is essential for public cooperation with safety measures and enforcement.

The Traffic and Safety Report evaluated the future safety performance of three proposed Build concepts – a three-lane (undivided), three-lane divided, and four-lane divided typical roadway section – and compared them to the No-Build condition. The No-Build condition assumes existing roadway features with 20-year forecasted volumes.

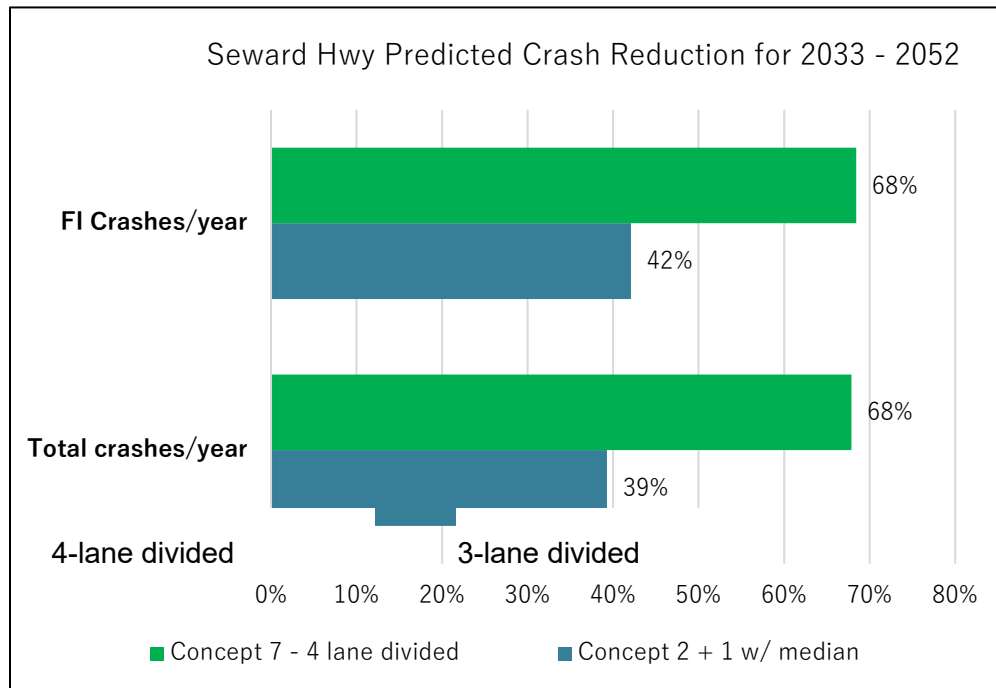
The three-lane divided concept predicted a 39 percent reduction in total crashes compared to the No-Build condition, as well as a 42 percent reduction in FI crashes. The addition of passing lanes, turn lanes, acceleration lanes, and curve flattening are major drivers of the predicted crash reduction.

The four-lane divided concept was estimated to have a higher predicted reduction of crashes compared to the No-Build condition, with a 68 percent reduction in both the total number of crashes and FI crashes. This large reduction can be attributed to a combination of factors. The first would be to remove any platoons of vehicles waiting for passing opportunities, and provide the best benefit for balancing slower, local-access traffic (including sightseeing traffic) and through traffic. Additionally, this option provides enhanced visibility from the wider overall

roadway and better sightlines, which makes for a safer driving experience, especially in winter conditions.

Figure 3.1 shows the predicted crash reduction by Build concept (including intersection and roadway segment crashes) as compared to the No Build condition.

Figure 3.1. Seward Highway predicted crash reduction (crashes/year) for 2033–2052 compared to the existing (No-Build) condition.



The *Alaska Strategic Highway Safety Plan 2023-2027*¹ has a particular emphasis on Safety Corridors. The plan’s vision is “Towards zero deaths and serious injuries so all surface transportation users arrive safely at their destination.”²

Based on the goals for the State of Alaska, outlined in the Safety Initiative, and the larger crash reductions, the four-lane concept should be advanced as the Project’s Proposed Action.

4 Mobility

The *Highway Capacity Manual (HCM): A Guide for Multimodal Mobility Analysis*³ states the capacity of a two-lane highway facility is 1,700 vehicles per hour for passing zones and passing constrained segments. For sections where a passing lane is provided, the capacity is dependent on several variables, including the roadway’s horizontal geometry and gradient. At the point capacity is reached along a two-lane highway, passing opportunities are theoretically impossible

¹ <https://dot.alaska.gov/stwdplng/shsp/assets/Alaska-SHSP-2023-2027-Updated-Aug-2024.pdf>

² *Ibid.*

³ <https://nap.nationalacademies.org/catalog/26432/highway-capacity-manual-7th-edition-a-guide-for-multimodal-mobility>

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due to the density and platooning of the peak directional volume as well as the high opposing directional volumes. This results in a substantial reduction in travel speeds; an increase in time spent following other vehicles; potentially undesirable driver behavior, such as higher risk maneuvers; and an inability to turn onto the highway from minor approaches, turnouts, pullouts, and driveways.

The HCM uses Follower Density (FD) as a service measure to establish LOS values when evaluating two-lane highways. FD is the calculated number of vehicles following a lead vehicle and is measured in followers per mile per lane (followers/mile/lane).

Per the *Alaska Preconstruction Manual*⁴, the 2011 American Association of State Highway and Transportation Officials' *A Policy on Geometric Design of Highways and Streets*⁵ provides recommendations for appropriate LOS thresholds for this Project. They are based on functional classification and area/terrain types shown in Table 4.1. The Seward Highway, as a level (albeit sinuous) arterial roadway, would be considered level-to-rolling and therefore is recommended to provide a LOS B.

Table 4.1. LOS based on terrain and functional class.

Functional Class	Appropriate LOS for Specified Combinations of Area and Terrain Type			
	Rural Level	Rural Rolling	Rural Mountainous	Urban and Suburban
Freeway	B	B	C	C
Arterial	B	B	C	C
Collector	C	C	D	D
Local	D	D	D	D

4.1 Three-Lane Divided Capacity Analysis

Table 4.2 provides the segment capacity performance metrics for the three-lane divided concept. Service measures that exceed the target LOS threshold are shown in red-shaded cells.

Table 4.2. 2052 concept three-lane divided segment capacity results.

Seward Highway Location	Segment	MP Range	Performance Measures				Service Measures		LOS ^a
			ATS (mph)		PF (%)		FD (followers/mile/lane)		
			NB	SB	NB	SB	NB	SB	
South of Community of Bird Creek – Boretide Road	1	98.7–103.1	53.5	52.0	79.6	74.7	15.3	11.9	E/D
Boretide Road – Indian Road	2	103.1–103.8	53.5	52.0	79.6	74.7	15.3	11.9	E/D

⁴ <https://dot.alaska.gov/stwddes/dcsprecon/preconmanual.shtml>

⁵ Geometric Design of Highways and Streets (GB), 2018, American Association of State Highway and Transportation Officials

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Seward Highway Location	Segment	MP Range	Performance Measures				Service Measures		LOS ^a
			ATS (mph)		PF (%)		FD (followers/mile/lane)		
			NB	SB	NB	SB	NB	SB	
Indian Road – Rainbow Valley Road	3	103.8–108.4	57.3	55.4	68.3	76.8	9.2	13.0	D/E
Rainbow Valley Road – Potter Valley Road	4	108.4–115.4	56.9	56.5	71.4	75.9	10.0	12.5	D/E
Potter Valley Road – Potter Marsh	5	115.4–117.6	56.4	56.3	76.7	81.5	12.9	15.7	E

Notes: NB = northbound; SB = southbound; ATS = Average Travel Speed; PF = Percent Followers; service measures that do not meet the recommended LOS are shown in red-shaded cells.

^a Northbound/Southbound

4.2 Four-Lane Divided Capacity Analysis

For the four-lane divided concept, the HCM uses a different methodology to determine the capacity as compared to a two-lane highway since passing opportunities are theoretically infinite, negating any percent following (PF) and FD as useful performance metrics. Free-flow speed (FFS) plays a critical role in the capacity of multi-lane highways. The HCM states the capacity of a multi-lane highway with an FFS of 60 miles per hour (mph) is 2,200 passenger cars per hour per lane. At 55 mph, the capacity is reduced to 2,100 passenger cars per hour per lane.

LOS for a multi-lane highway is based on the segment density, which is a measurement of the proximity of vehicles to each other along the roadway segment. As density increases and the distance between vehicles decreases, speed also decreases, resulting in a degradation of LOS. Table 4.3 provides the HCM LOS density thresholds for a multi-lane highway.

Table 4.3. Multi-lane LOS based on FFS and density.

LOS	FFS (mph)	Segment Density (passenger car/mile/lane)
A	All	≥0–11
B	All	>11–18
C	All	>18–26
D	All	>26–35
E	60	>35–40
	55	>35–41
	50	>35–43
	45	>35–45
F	Demand Exceeds Capacity	Demand Exceeds Capacity
	or	or
	60	≥40
	55	≥41
	50	≥43
	45	≥45

Table 4.4 provides the segment capacity performance metrics. Service measures that meet or exceed the LOS are shown in green-shaded cells.

Table 4.4. Four-lane divided segment capacity results.

Seward Highway Location	Segment	MP Range	FFS (mph)		Segment Density (passenger car/mile/lane)		LOS
			NB	SB	NB	SB	
South of Community of Bird Creek – Boretide Road	1	98.7–103.1	56.0	56.1	10.6	13.3	A/B ^a
Boretide Road – Indian Road	2	103.1–103.8	56.0	56.1	10.6	13.3	A/B ^a
Indian Road – Rainbow Valley Road	3	103.8–108.4	56.7	56.9	9.9	13.0	A/B ^a
Rainbow Valley Road – Potter Valley Road	4	108.4–115.4	56.7	56.7	10.3	11.9	A/B ^a
Potter Valley Road – Potter Marsh	5	115.4–117.6	56.6	56.4	12.3	14.6	B

Notes: NB = northbound; SB = southbound; service measures that meet or exceed the LOS are shown in green-shaded cells.

^a Northbound/Southbound

Based on the metrics above, the four-lane concept meets the LOS requirements for the Project, and the three-lane alternate passing concept does not.

In addition to the LOS metrics above for the four-lane concept, there has also been research on the performance of a three-lane alternate passing roadway section with respect to volume. The HCM states the capacity of a two-lane highway facility is 1,700 vehicles per hour for passing zones and passing constrained segments. National Cooperative Highway Research Program’s (NCHRP’s) *Application of European 2+1 Roadway Designs* (Research Results Digest Number 275, April 2003)⁶ provided recommendations for the use of three-lane (2+1) roadways in the United States. It was recommended that a three-lane roadway *not* be considered where current or projected flow rates exceed 1,200 vehicles per day directionally.

Table 4.5 shows the projected 2052 traffic volumes by segment. Three of the five segments exceed the NCHRP-recommended 1,200 vehicles per day threshold for the corridor. The remaining two segments are just below the 1,200 vehicles per day threshold. To maintain consistency for the driver, consistent LOS, and lane continuity, maintaining the four-lane section for the entirety of the Project is recommended.

⁶ https://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_275.pdf

Table 4.5. 2052 (design year), design ADT, Design Hourly Volume.

Seward Highway Location	Segment	MP Range	2052 Projected Design ADT ₂₀₅₂ (2024 Design ADT x Gr)	2052 DHV (AADT ₂₀₅₂ x K)	DDHV (AADT ₂₀₅₂ x K x D)
South of Community of Bird Creek – Boretide Road	1	98.7–103.1	14,607	2,191	1,183
Boretide Road – Indian Road	2	103.1–103.8	14,740	2,211	1,194
Indian Road – Rainbow Valley Road	3	103.8–108.4	15,040	2,256	1,218
Rainbow Valley Road – Potter Valley Road	4	108.4–115.4	15,520	2,328	1,257
Potter Valley Road – Potter Marsh	5	115.4–117.6	18,153	2,723	1,469

Notes: AADT = annual average daily traffic; ADT = annual daily traffic; D = peak directional; DHV = Design Hourly Volume; Gr = Growth rate; K = peak hour factor

5 Reliability

As the only surface connection to Girdwood, Whittier, and the entirety of the Kenai Peninsula, the reliability of the Seward Highway is extremely important. This highway provides connection for recreational uses; tourism access to the Kenai; and more importantly, a way for Kenai residents to access hospitals, large grocery options, and Ted Stevens Anchorage International Airport. Without the Seward Highway, the Kenai Peninsula would be isolated as there are no alternate routes.

Key to reliability is the Seward Highway’s ability to remain open. Through discussions with the Anchorage Police Department, HDR determined that, since July 2023, the highway between Anchorage and Bird has been fully closed on four separate occasions, two of which were due to responding to fatality accidents. HDR reviewed existing four-lane divided sections of the Glenn Highway (north of Eagle River) to determine the ability to keep the highway open during these types of events. Since January 1, 2019, three fatal collisions have occurred between the South Eagle River exit and the Knik River on the Glenn Highway. None of these collisions resulted in a full closure in both directions. Two collisions resulted in northbound lanes being closed, and one resulted in the southbound lanes being closed. A substantial increase in reliability of the highway occurs when a four-lane divided section can be provided.

6 Roadway Use

6.1 Balancing Users within the Corridor

As a Scenic Byway, the Seward Highway often attracts not only regular traffic but also tourists who may drive slower to enjoy the scenery. A four-lane highway, with two lanes in each direction, allows faster-moving vehicles to pass slower vehicles safely without causing congestion. In contrast, the three-lane configuration can still lead to bottlenecks and delays for through traffic, especially during peak tourist seasons.

The HCM (Chapter 15) describes how some highways serve as scenic and recreational areas, and how passing delays distract from the scenic enjoyment of trips and should be minimized wherever possible. The Seward Highway was designated a Scenic Byway in 1998, meeting six intrinsic qualities set by the Federal Highway Administration (FHWA). In 2000, the Seward Highway was given the highest honor of Scenic Byways and designated as an All-American Road. Reducing time spent following and minimizing passing delays is important to provide safe and reliable access to the scenic and recreational areas along the corridor.

6.2 Maintenance of Traffic During Construction

The four-lane options offer substantial advantages in maintaining traffic flow during construction. The contractor can first construct two lanes, allowing traffic to be shifted onto the completed section while the remaining two lanes are built. Since the northbound and southbound directions are divided, it becomes easier for the contractor to work alongside traffic as well. This phased approach ensures that the roadway remains operational throughout the construction period, substantially reducing inconvenience for motorists and ensuring smoother traffic flow.

In contrast, the three-lane configuration presents challenges in maintaining traffic during construction due to its asymmetrical design. The lack of a balanced lane layout complicates staging, often requiring more closures requiring pilot cars to move traffic through one direction at a time.

6.3 Routine Maintenance After Construction

Post-construction, the four-lane configuration continues to provide benefits with regards to maintenance activities. Divided four-lane roadways enable routine maintenance activities—such as restriping, pothole repairs, or guardrail replacement—to occur while still providing space for traffic to move around the maintenance equipment. This design accommodates lane shifts, minimizing the need for full closures or lengthy detours.

The three-lane divided roadway substantially complicates routine maintenance. In single-lane sections there is no room to shift traffic during repairs. As a result, even minor maintenance activities require lane closures, disrupting traffic flow and increasing delays.