Sterling Highway MP 45–60
Final EIS and Final Section 4(f) Evaluation

Chapter 1
Purpose of and Need for the Project

Federal Highway Administration
Alaska Division
P.O. Box 21648
Juneau, AK 99802

and

Alaska Department of Transportation
and Public Facilities
P.O. Box 196900
Anchorage, AK 99519-6900

March 2018

Note to Reader:

Changes in this document since the Draft SEIS was published in March 2015 have been highlighted in grey for easy identification by the reader. Deletions and spelling corrections are not shown for clarity purposes.

Table of Contents

List of Maps

List of Figures

List of Tables

1 Purpose of and Need for the Project

1.1 Introduction

Steep mountains in the Kenai River Valley (Cooper Landing, Alaska)

The Sterling Highway, located in Southcentral Alaska, is classified as a "Rural Principal Arterial" and is part of the Interstate Highway System, National Highway System (NHS), and Strategic Highway Network.[1] Named in honor of Hawley Sterling, an engineer of the Alaska Road Commission, the Sterling Highway was constructed starting in the late 1940s and opened in 1950. While the rest of the highway has seen major upgrades since the 1950s, the highway between Mileposts (MP) 45 and 60 has not been substantially upgraded. This portion of the highway is located in the Kenai River Valley and is constrained by the Kenai River, steep mountainsides, salmon spawning areas, private property, and several trails, campgrounds, and other recreational features that have hindered highway upgrades. The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA) are proposing to improve this portion of the Sterling Highway. The proposed project is located about 100 highway miles south of Anchorage in the Kenai Peninsula Borough (Borough) (see Map 1.1-1, Project vicinity).

This chapter of the Final Environmental Impact Statement (EIS) presents the purpose of and need for the project and describes the problems the project seeks to address. Chapter 2 describes alternatives. This Final EIS evaluates four Build alternatives and the No Build Alternative. DOT&PF and FHWA have identified the Juneau Creek Alternative as their preferred alternative. A final decision will appear in an FHWA Record of Decision (ROD). Chapter 3, Sections 3.1 through 3.27, describes the physical, natural, and social elements of the affected environment and environmental consequences of the proposed alternatives to each of these elements. Chapter 4 is a Section 4(f) evaluation addressing impacts to certain protected park, recreation area,

[1] Interstate Highway System. The Dwight D. Eisenhower National System of Interstate and Defense Highways "shall be located so as–(i) to connect by routes, as direct as practicable, the principal metropolitan areas, cities, and border points with routes of continental importance in Canada and Mexico" (23 USC 103[c]). The Interstate Highway System was designed to provide key ground transport routes for military supplies and troop deployments in case of an emergency or foreign invasion. Interstate highways are a subset of the broader NHS. Both are part of the Federal-Aid Highway Program that provides substantial funding to State transportation agencies (23 USC 103[b]).

NHS. The NHS shall: "(A) serve major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities and other major travel destinations; (B) meet national defense requirements; and (C) serve interstate and interregional travel" (23 USC 103[b]).

Strategic Highway Network. The Strategic Highway Network is a network of highways that is important to the United States' strategic defense policy and that provides defense access, continuity, and emergency capabilities for defense purposes.

wildlife refuge, and historic properties. Chapter 5 summarizes the public process since 2001, leading up to this Final EIS, and summarizes comments received. Chapters 6 and 7 describe who prepared this Final EIS and how it is being distributed. The appendices, listed below, provide important additional information.

- Appendix A: Crash Analysis: Traffic Crash Data Analysis, February 2014, and Project Safety Analysis, January 2018
- Appendix B: Conceptual Stage Relocation Study
- Appendix C: ANILCA Section 810 Subsistence Evaluation
- Appendix D: Highway Traffic Noise Assessment
- Appendix E: Preliminary Location Hydraulic Study
- Appendix F: Draft Section 4(f) *De Minimis* Findings Form
- Appendix G: Draft Clean Water Act Section 404(b)(1) Guidelines Analysis
- Appendix H: Financial Plan for Juneau Creek Alternative
- Appendix I: Wildlife Mitigation Recommendations
- Appendix J: Comments and Responses on Draft Supplemental EIS
- Appendix K: Section 106 of the National Historic Preservation Act, Programmatic Agreement Regarding the Sterling Highway Milepost 45 to 60 Project

The first section of this chapter provides an introduction to the project, including an overview of the project area (Section 1.1.1), the project's history (Section 1.1.2), and the project termini (Section 1.1.3). Section 1.2 presents the project purpose and need, and includes details on the following problems that this project would address: (1) undesirable levels of traffic congestion, (2) low percentage of the roadway meeting current design standards, and (3) a higher-than-average number of traffic crashes.

1.1.1 Description of the Project Area

The Sterling Highway is located on the western Kenai Peninsula in Southcentral Alaska. As part of the NHS, the Sterling Highway is the only road connecting western Kenai Peninsula communities (Homer, Kenai, Soldotna, and others) with the rest of Alaska and the rest of the NHS. The NHS supports the statewide economy because it provides efficient overland travel between local cities, major cities, and the ports and airports. The Sterling Highway also serves local, growing traffic in Cooper Landing, including a large influx of summer visitors to the project area.

The project area for this EIS is shown on Map 1.1-1. The project area includes the western end of Kenai Lake and follows the Kenai River Valley downstream about 11 miles, nearly to the western edge of the Kenai Mountains. North and south, the project area extends up Juneau Creek about 2.5 miles and extends up Cooper Creek about 1 mile from its mouth. The project area elevation at the Kenai River ranges from 440 feet at the Kenai Lake outlet to 250 feet at the western end of the project area. High elevations in the project area are along mountain slopes on either side of the valley at 1,000 to 1,500 feet.

The project area encompasses many popular recreational sites, including fishing areas on the Kenai and Russian rivers, the Resurrection Pass National Recreation Trail, and the Russian River and Cooper Creek campgrounds. The community of Cooper Landing was founded during the 1898 gold rush, but Alaska Natives used the Kenai River Valley for more than 1,500 years prior to the discovery of gold (Corbett 1998). Consequently, archaeologists and historians have identified many prehistoric and historic sites in the project area. In addition, the areas surrounding the highway provide habitat for numerous wildlife species, including moose, bald eagle, Dall sheep, and brown bears. Project area water bodies support a world-class fishery for five salmon species, rainbow trout, and Dolly Varden. The Sterling Highway, from the Seward Highway to the western terminus of Skilak Lake Road (MP 37–75), has been identified by the State of Alaska as a State scenic byway in recognition of its scenery, natural setting, recreational activities, historic significance, and wildlife viewing opportunities (Jensen Yorba Lott, Inc. 2008).

World-class fishing and scenery attract thousands of visitors to the project area.

The project area lies within the Chugach National Forest and the Kenai National Wildlife Refuge (KNWR). Remaining lands are owned by the Borough, the State of Alaska, private citizens, and Cook Inlet Region, Incorporated—the area's regional Native Corporation established by the Alaska Native Claims Settlement Act. Land ownership in the project area is further discussed in Section 3.1.

This diverse mountain, forest, and river setting attracts thousands of visitors annually. For example, Alaska Department of Fish and Game statewide harvest surveys estimate that anglers logged approximately 315,000 days of fishing time on the Kenai River each year between 1997 and 2006 (DNR 2010). Similarly, the *Kenai National Wildlife Refuge Final Revised Comprehensive Conservation Plan* estimates that approximately 1.2 million people travel on the Sterling Highway through the KNWR each year, and an estimated 300,000 visitors spend extended periods of time in the KNWR (USFWS 2010a). Cooper Landing, an unincorporated community of 289 people (USCB 2010c), is located along the highway at approximately MP 48. The local economy is based largely on recreation and tourism.

The Sterling Highway MP 45–60 area currently is characterized by sharp curves and narrow shoulders.

Because the portion of Sterling Highway in the project area is bounded by rugged mountains and is situated in the narrow Kenai River Valley, the highway remains narrow and curvy, with steep grades down to Kenai Lake. This portion of the highway lacks shoulders and recommended sight distance to see around corners and over hillcrests. Frequent driveways and side roads connect directly to the highway, creating conflict points as drivers enter and exit the highway. Because of the communities it serves and the popular recreational destinations along the route, the highway is heavily traveled and congested, particularly in summer. The types of vehicles traveling the highway include motor homes, trucks hauling freight, and vehicles towing boats, all of which contribute to slow travel and difficult passing. Additionally, many of the travelers in summer are visitors who are unfamiliar with the area.

Finally, as the only road connecting the western Kenai Peninsula to the rest of Southcentral Alaska, the Sterling Highway provides an emergency connection and evacuation route for all western Kenai Peninsula communities. This could include emergency response to natural disasters, such as eruption of nearby volcanoes, forest fires, or damage from earthquakes as well as military or defense emergencies (see also Footnote 1 above). Because of topography and the popularity of recreational developments in this particular landscape, and proximity to the Kenai River, the highway has not been substantially improved. It remains constricted and cannot serve the day-to-day or potential emergency access needs.

1.1.2 Project History

DOT&PF has been planning and studying improvements in the corridor since the 1970s. A Draft EIS and Section 4(f) Evaluation that assessed reconstruction of the Sterling Highway from the Seward Highway junction (MP 37) to the Skilak Lake Road intersection (MP 58), referred to as the Sterling Highway MP 37–60 Project, was approved by FHWA on June 29, 1982. At that time, the Draft EIS assessed reconstruction of the existing highway with three major realignments that would have extended from MP 42.4 to 43.5, MP 49 to 49.5, and MP 50 to 52. All of the alternatives in the 1982 Draft EIS except for Alternative “B,” which followed the existing alignment, included new bridge crossings of the Kenai River. Because of agency opposition to these crossings and changes in the affected environment that occurred after the Draft EIS was issued, the project was not implemented and was put on hold. Changes to the affected environment included the discovery of important prehistoric sites within the construction limits of the preferred alternative and the creation of the Kenai River Special Management Area, a unit of the Alaska State Park system.

In 1994, DOT&PF and FHWA approved a second Draft EIS and Section 4(f) Evaluation for the Sterling Highway MP 37–60 Project that addressed the No Build Alternative; a new alternative that remained north of the Kenai River and crossed Juneau Creek; and a Resurfacing, Restoration, Rehabilitation (3R) Alternative that followed the existing alignment. After the 1994 Draft EIS was issued, DOT&PF and FHWA decided to separate the Sterling Highway MP 37–60 Project into two distinct projects. The portion of the project from MP 45 to MP 60 examined in the 1994 Draft EIS, with multiple reasonable build alternatives, had more complex environmental and social issues than the portion of the project from MP 37 to 45, which had only one reasonable build alternative. In addition, each portion had logical endpoints and had independent utility, meaning that each would be a valuable improvement regardless of whether the other was constructed. The construction of the Sterling Highway project between MP 37 and 45, covered under a separate environmental document, was completed in 2001.

This current project evaluates the Sterling Highway between MP 45 and 60. FHWA and DOT&PF began this EIS in 2000 to supplement the 1994 Draft EIS. FHWA issued its Notice of Intent to prepare the draft Supplemental EIS (SEIS) in the *Federal Register* in May 2003. Public and agency outreach and formal scoping meetings were held between July 2000 and July 2003. Scoping activities are summarized in the Scoping Summary Report (October 2006). The Draft SEIS and Draft Section 4(f) Evaluation were distributed for public review in March 2015. Public and agency review and input on the Draft SEIS was solicited during a 60-day comment period (March 27–May 26, 2015) and through hearings held in Anchorage, Cooper Landing, Soldotna, and Washington, DC. In December 2015, DOT&PF and FHWA identified the G South Alternative as the preferred alternative for the Sterling Highway MP 45-60 Project. However, because of further comments received about the preferred alternative and because of changes in project area circumstance, DOT&PF and FHWA have taken a fresh look at the least overall harm and have changed the preferred alternative. This Final EIS identifies the Juneau Creek Alternative as the preferred alternative. This alternative best balances the project purpose and need, impacts to the Kenai River, and other impacts to recreation areas, culturally important properties, habitat, and community impacts. See further description and analysis in Sections 2.7 and 4.8 regarding the identification of the preferred alternative.

1.1.3 Project Termini

The project’s logical termini (i.e., starting and stopping points for construction) are the intersection of the existing Sterling Highway with Quartz Creek Road on the east and the intersection with Skilak Lake Road on the west. In reality, the limits of any potential construction activities would be MP 44.5 to 58.2. However, MP 45 and MP 60 have been used historically to define the project, and have therefore continued to be used as the project’s formal name. The issues related to the existing Sterling Highway from MP 45 to 60 are connected to the physical setting of the highway within steep, rugged mountains and the narrow Kenai River valley, the community of Cooper Landing, and a string of popular recreation destinations operated as part of contiguous State Park, National Forest, and National Wildlife Refuge lands. This setting, combined with the period when the highway was constructed (i.e., 1940s to 1950), has resulted in large sections of the road having curves, lane widths, shoulder widths, and other basic safety and function parameters that do not meet current standards. These issues are unique to the project area and support the Quartz Creek Road and Skilak Lake Road intersections with the Sterling Highway as logical end points for the project.

When comparing the adjacent portions of the Sterling Highway to the east and west of the project area (i.e., approximately east of MP 45 and west of MP 58, respectively), the difference in highway character supports the project's end points and its utility. To the east, the existing highway was constructed to current standards in 2001 (see Section 1.1.2) and therefore has lane and shoulder widths and curves that have been upgraded. To the west, the existing highway has shoulders and is characterized by long straight stretches of roadway where the highway leaves mountainous terrain for flat lands. Therefore, tight curves do not exist and its lane and shoulder widths are compatible with the physical setting of the roadway. The improvements proposed for the Sterling Highway from MP 45 to 60 would facilitate meeting driver expectation and improve overall highway function and safety, because recommended design elements would be applied consistently throughout the project area, and because the resulting highway would be consistent with previous improvements that have been made to the east and west.

1.2 Purpose of and Need for Action

1.2.1 Project Purpose

DOT&PF and FHWA propose to improve the Sterling Highway from its intersection with Quartz Creek Road to its intersection with Skilak Lake Road. The highway is classified as a rural principal arterial (see box at right). The purpose of the project is to bring the highway up to current standards for a rural principal arterial to efficiently and safely serve through-traffic, local community traffic, and traffic bound for recreation destinations in the area, both now and in the future. In achieving this transportation purpose, DOT&PF and FHWA recognize the importance of protecting the Kenai River corridor.

Rural principal arterial is the Federal Highway Administration's highest roadway functional classification for a rural area. The rural principal arterial system consists of a connected rural network of continuous routes having the following characteristics:

- "Serve corridor movements having trip length and travel density characteristics indicative of substantial statewide or interstate travel."
- "Connect all or nearly all Urbanized Areas (a U.S. Census designated urban area with 50,000 residents or more) and a large majority of Urban Clusters (a U.S. Census designated area with at least 2,500 residents and no more than 49,999 residents) with 25,000 and over population."
- "Provide an integrated network of continuous routes without stub connections (dead ends)." Exceptions occur where unusual geographic or traffic flow conditions dictate otherwise.

- *FHWA Functional Classification Guidelines*, 2013.

1.2.2 Project Needs

There are three interrelated needs that the project would address:

- **Need 1: Reduce Highway Congestion.** The construction of multiple driveways and connecting side streets over time, combined with a curvy, constrained alignment with little passing opportunity and increasing traffic volumes, has led to considerable congestion that is forecast to worsen in future years. As a result, the highway performs below a desirable level of service for a rural principal arterial that is a component of the NHS.
- **Need 2: Meet Current Highway Design Standards.** Existing characteristics of the Sterling Highway do not meet current design standards for a rural principal arterial road.

The existing highway contains curves, shoulders, guardrail, and clear zones[2] that do not meet current design standards.

- **Need 3: Improve Highway Safety.** Due to the interrelated effects of highway congestion and outdated highway design characteristics, sections of the project area have a higher-than-average number of traffic crashes and a greater severity of crashes when compared to the statewide average.

1.2.2.1 Highway Traffic and Congestion

Traffic Volume Trends

When the Sterling Highway was constructed as a pioneer road to Kenai in the late 1940s and paved in the 1950s, it served a much smaller population, and relatively little tourism existed. The existing road was suitable in the 1950s for the vehicle types and corresponding travel speed of that time. The entire Borough had a population of 4,831 in 1950 and 9,053 in 1960 (KPB 2005a). As of the 2010 Census, the Borough had grown to 55,400 residents.

Traffic continues to increase in the project area as a result of both the increasing population base and an increase in summer tourism, but the highway's capacity to accommodate traffic remains at the 1950s level. Historic annual traffic counts indicate that traffic growth has been increasing steadily, as shown in Table 1.2-1. The highway sections described in Table 1.2-1 are based on locations of DOT&PF traffic recording devices. Map 1.2-1 shows the locations of these sections.

Table 1.2-1. Historic traffic volume growth

Section	Historic Annual Average Daily Traffic Volumes			Percentage of Change 1991–2012	Annual Growth Rate 1991–2012
	1991	2001	2012		
Quartz Creek Road to Snug Harbor Road	3,006	3,320	3,270	0.9%	0.04%
Snug Harbor Road to Russian River Campground	2,900	3,194	3,270	12.76%	0.6%
Russian River Campground to Russian River Ferry Entrance	2,900	2,870	3,456	19.17%	0.88%
Russian River Ferry Entrance to Skilak Lake Road	2,500	3,200	3,140	25.6%	1.15%

Source: DOT&PF *Annual Traffic Volume Report*, 2012

When measured in 2011, DOT&PF determined that nearly 54 percent of all annual traffic occurred during the months of June, July, and August, with approximately 23 percent of the annual traffic occurring in July alone (Lounsbury 2014). In 2011, the *summer* average daily traffic was 8,198 vehicles per day while the *annual* average daily traffic was 3,410 vehicles per day.[3]

[2] Clear zone: A clear zone is an unobstructed, relatively flat area that runs the length of a highway beyond the outer edges of the outer lanes. Such an area allows a driver to stop safely or regain control of a vehicle that leaves the traveled way (FHWA 2006a).

[3] 2011 traffic volumes are from actual counts.

Traffic trends for the last 20 years were used to forecast future traffic volumes for the 2043 design year. Growth over the next 20 years was assumed to be similar to the last 20 years. In general, growth in the project area was approximately 0.67 percent. Distinct destinations and locations related to recreation include many back-and-forth trips that account for higher growth rates in some roadway segments. These travel patterns are expected to continue. Considering overall growth and growth related to destinations, a compound annual growth rate of 1.0 percent was applied to determine future traffic volumes.

Table 1.2-2 compares the actual traffic volumes for 2012 with projected traffic volumes for the design year, 2043. These volumes are used in the traffic analyses for this project, both for annual (12-month) average daily traffic (ADT) and for summer (the peak traffic period).

Table 1.2-2. Future traffic volume growth

	Annual Average Daily Traffic Volumes		Summer Average Daily Traffic Volumes	
Segment	**2012**[a]	**2043**[b]	**2012**[a]	**2043**[b]
Quartz Creek Road to Snug Harbor Road	3,033	5,604	4,953	9,152
Snug Harbor Road to Russian River Campground	3,270	6,042	5,340	9,867
Russian River Campground to Russian River Ferry Entrance	3,456	6,386	5,644	10,428
Russian River Ferry Entrance to Skilak Road	3,140	5,802	5,128	9,475

[a] 2012 traffic volumes come from actual counts.

[b] 2043 volumes were forecast using a 1 percent annual growth rate based on the 20-year linear trend line growth.

Source: Lounsbury (2014)

Traffic Congestion

Traffic engineers measure highway function using level of service (LOS). Traffic congestion affects the LOS. LOS categories range from LOS "A" (best) to LOS "F" (worst), as shown in Figure 1.2-1. For a highway such as the Sterling Highway, LOS is determined in two ways: travel speed and percentage of time spent following other vehicles. Speeds below the highway design speed increase travel time and decrease the efficiency of the trip. Comparison of actual speed with design speed is an accepted measure of the LOS a highway provides. The percentage of time spent following other vehicles considers the time drivers spend in queues (lines) behind other drivers. Increased time spent following other vehicles indicates congestion on the highway and negatively affects driver attention and patience, and travel efficiency. For these reasons, percentage of time spent following other vehicles is used to determine LOS.

Few passing opportunities exist in the project area.

Congestion occurs when a platoon of cars forms and when drivers are unable to travel at steady, reliable speeds commensurate with the functional classification of the road—in this case, a rural principal arterial that is part of the National Highway System. Congestion occurs where trucks or RVs are climbing a hill and must gear down to carry the heavy vehicle up the grade, or where curves are sharp and vehicles must slow down to safely maneuver, or where there is little room between oncoming traffic and the ditch and drivers are feeling stress (white knuckle conditions), or where side streets or driveways cause drivers to slow or stop to wait for opposing traffic before making their turns. Each of these examples can cause a platoon to form and cause drivers to spend a percentage of their time following another vehicle. Even when there are passing opportunities, a driver may move freely for a time only to be caught up in another platoon, increasing the time spent following others.

Because of the curvy alignment, narrow roadway, and poor visibility to see around curves, there are very few passing opportunities available in the project area. The growing population of Southcentral Alaska and of Kenai Peninsula communities served by the Sterling Highway, along with the increasing traffic and the limited passing opportunities, result in more time spent following other drivers, higher congestion, lower travel speeds, and consequently a lower LOS.

The highway's many curves require speed limit advisory signs for speeds of 45, 35, and 30 miles per hour (mph). There are many intersecting side roads and driveways, including those for campgrounds, informal highway pullouts, boat launch ramps, interpretive sites, businesses, recreational properties, and homes. These intersections cause highway traffic to slow or stop to wait for vehicles to enter or leave the highway. The need for mobility (i.e., serving through-traffic) and the need for access (i.e., driveways and approach roads that connect local destinations to the larger road and serve local traffic) are considerations when making roadway design decisions. The ideal condition for mobility on a highway is to fully control access, as seen on freeways, with the only access provided via on-ramps and off-ramps so that through-traffic need not slow substantially for local traffic entering or leaving the highway. The ideal condition for access to smaller roads, businesses, and homes is the most direct connection possible from the highway to any given local destination. In the project area, mobility is hampered by the provision of access via driveways, which results in slow-moving vehicles at intersections. Meanwhile, local access is hampered at busy times by a steady stream of through-traffic that makes it difficult to get on the highway.

Level of Service

LOS: A or B

LOS: D or E

LOS A describes the highest quality of traffic service. Motorists travel at their desired speed. Without strict enforcement, LOS A results in average speeds of 55 mph or more. Passing demand is below passing capacity. Platoons of three or more vehicles are rare. Drivers are delayed no more than 35% of their travel time by other vehicles.

LOS B characterizes traffic flow with speeds of 50 mph or slightly higher on level terrain. The demand for passing to maintain desired speeds becomes significant. Drivers are delayed in platoons up to 50% of the time.

LOS C describes noticeable increases in platoon formation, platoon size, and frequency of passing impediments. The average speed still exceeds 45 mph. Chaining of platoons can occur. Although traffic flow is stable, it is susceptible to congestion due to turning traffic and slow-moving vehicles. Percent time spent following may reach 65%.

LOS D describes unstable traffic flow. Passing demand is high, with passing capacity near zero. Platoon sizes of 5-10 vehicles are common, although speeds of 40 mph still can be maintained. Turning vehicles and roadside distractions cause major shock waves in the traffic stream. Motorists are delayed in platoons nearly 80% of their travel time.

LOS E describes a condition where percent time spent following is greater than 80%. Speeds may drop below 40 mph, down to 25 mph on sustained grades. Passing is virtually impossible. Platooning becomes intense. Operating conditions are at capacity and unstable.

LOS F represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity, and speeds are highly variable.

Source: Condensed from *Highway Capacity Manual 2000* (Transportation Research Board 2000)

Figure 1.2-1. Level of service on two-lane highways

As mentioned in Section 1.1.1, the project area is a popular destination for summer recreationists, and their traffic, combined with recreational through-traffic bound for the lower Kenai River and western Kenai Peninsula, results in peak traffic volumes that are high during June, July, and August (see Section 4.2 for details on recreation resources that generate traffic). These high volumes overload the capacity of the highway, causing traffic to slow. Travel speeds are slowest during peak use when the roadway becomes congested.

Traffic congestion is exacerbated on this section of the Sterling Highway by the presence of many large recreational vehicles (motor homes); vehicles pulling boat trailers, all-terrain-vehicle trailers, a spare passenger vehicle, or camp trailers; tractor-trailer trucks; and tourist buses. Such recreational traffic and local traffic merging on and off the highway from multiple access points, including pullouts, result in slow traffic speeds and a large number of conflict points, which result in congestion.

While the project area has a reputation for such congestion during the summer peak traffic period, such delays can happen at any time of year. If a line of vehicles forms in the winter, or a car stops on the highway to make a turn causing other cars to back up, this is a symptom of congestion. Even at lower volume times, congestion causes unsafe passing attempts or crashes when one vehicle hits stopped cars or goes off the road to avoid them. Winter road conditions may also cause some drivers (e.g., those without studded tires, or towing a trailer) to drive more slowly than others and also may lead to congestion.

Based on the resultant travel speeds and percentage of time spent following other vehicles on this portion of the existing Sterling Highway, the 2012 LOS and projected 2043 LOS were determined and compared to national standards put forth by the Transportation Research Board in the *Highway Capacity Manual* (2000). The LOS is not identified for the worst-case condition, but rather for the condition that represents an above average, but less than the worst-case, condition (refered to as the 100th-highest traffic volume hour throughout the course of the year[4]). For this project, this condition occurs during the summer.

Due to the length, varying conditions, and other physical features (such as points of interests, businesses, and trail heads), the LOS for the project area was evaluated in segments based on highway mileposts and reported using the LOS letter grades. The following segments were used to evaluate LOS:

- Segment 1 – MP 44.5 to MP 46.6
- Segment 2 – MP 46.6 to MP 47.8
- Segment 3 – MP 47.8 to MP 49.4
- Segment 4 – MP 49.4 to MP 51.3
- Segment 5 – MP 51.3 to MP 55.1
- Segment 6 – MP 55.1 to MP 58.2

Figure 1.2-2 illustrates hourly summer traffic volumes for both 2012 and the 2043 design year representative of summer conditions. The related LOS for each segment is shown in Table 1.2-3 and Map 1.2-2 and Map 1.2-3.

[4] The 100th-highest hour means that there would be 99 hours over the course of the year where traffic is higher than that used to determine the LOS, but the rest of the time traffic volumes would be equal to or less than that amount. For this project, the 100th-highest hour occurs during the summer.

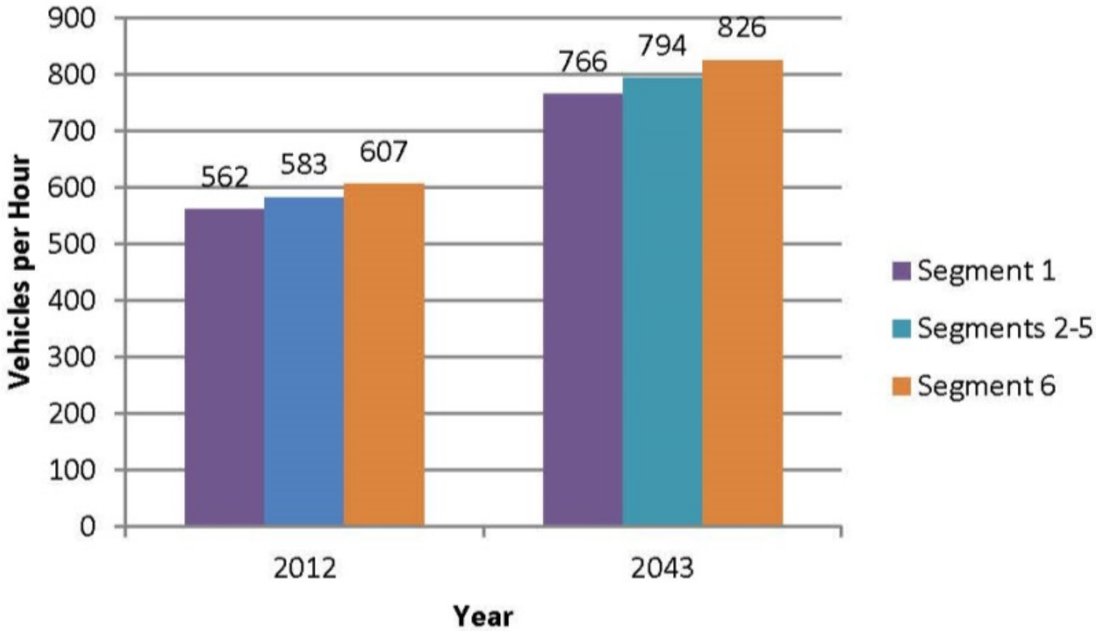


Figure 1.2-2. 2012 and 2043 summer traffic (vehicles per hour)

As shown in Table 1.2-3 and Map 1.2-2 and Map 1.2-3, traffic conditions in summer[5] for both existing and the forecasted conditions are mostly at LOS D with only Segment 6 having a LOS C in the existing condition. When 2043 trips are considered during the summer peak recreation season (i.e., weekends, holidays, and during peak salmon runs), travel speed will be slower, and the percentage of time spent following other vehicles is expected to increase. All segments of the Sterling Highway in the project area are projected to worsen in average speed and percentage of time spent following other vehicles, and to be at a LOS D in the design year 2043.

DOT&PF typically strives to achieve at least LOS C on its facilities, but will in some cases accept a lower LOS if the costs or impacts are too great to achieve a higher LOS.[6] For the project area, DOT&PF has determined that, with high traffic volumes in summer and relatively low volumes the rest of the year, it is not economical to develop the highway for optimum LOS year-round. To do so would likely require building a four-lane highway throughout the project area that would be used effectively only 3 months of the year and would provide excess capacity the rest of the year. In addition to higher costs, such a highway would cause unnecessary

[5] Level of service for this study is based on the estimated 100th highest hour of traffic.

[6] The American Association of State Highway and Transportation Officials (AASHTO) standard (AASHTO 2004) indicates that rural arterials generally should be designed for LOS B, except in mountainous terrain, where LOS C is considered appropriate. However, AASHTO provides for flexibility depending on specific conditions, indicating that "as may be fitting to the condition," highway agencies should "strive to provide the highest level of service *practical*" (emphasis added), and "choice of appropriate level of service for design is properly left to the highway designer."

environmental impacts and would not match the adjoining sections of the Sterling and Seward highways, which are two-lane highways with passing lanes.

Table 1.2-3. Existing and forecasted level of service (summer traffic conditions)

Project Area Segment	Direction	% Total Length[a]	2012 Existing LOS	2043 Forecast LOS
1	EB	8.0	D	D
	WB	8.0	D	D
2	EB	4.0	D	D
	WB	4.0	D	D
3	EB	6.0	D	D
	WB	6.0	D	D
4	EB	8.0	D	D
	WB	8.0	D	D
5	EB	12.0	D	D
	WB	12.0	D	D
6	EB	12.0	C	D
	WB	12.0	C	D

Note: EB = eastbound; WB = westbound.

[a] The project corridor is approximately 15 miles long. "Total Length" includes both directions of travel and therefore is approximately 30 miles.

Source: Lounsbury *(2014)*. Note that in the Lounsbury report, Tables 21A and 21B, the segments are numbered in the opposite order from those in this EIS.

Roadway improvements as a result of implementation of this project are intended to increase average travel speeds and reduce time spent following other drivers, thus reducing congestion in the project area.

1.2.2.2 Highway Design Standards

The American Association of State Highway and Transportation Officials (AASHTO) publishes *A Policy on Geometric Design on Streets and Highways* (2004, updated periodically). This publication presents detailed treatment of all elements of road design and is the national source for road design standards. AASHTO provides standards which are often expressed as a range of values. Within this range, AASHTO leaves final selection of the roadway's actual design criteria to engineers based on local conditions and needs. Individual state transportation departments typically adopt the AASHTO standards, with some modifications based on specific conditions in that state. DOT&PF publishes the *Alaska Highway Preconstruction Manual* (2010b, updated periodically). For NHS roadways in Alaska, the *Alaska Highway Preconstruction Manual* typically conforms "to the recommendations of AASHTO."

Within the project area, the Sterling Highway does not meet current standards for a rural principal arterial. This contributes to the congestion and relatively poor LOS, as described in

Section 1.2.2.1 and has a direct correlation to the safety function of the highway. Table 1.2-4 summarizes key design standards determined by DOT&PF for the project. Each of these standards is discussed in turn following the table.

Table 1.2-4. Existing Sterling Highway MP 45–60 and rural principal arterial design standards

	Design Standard[a]	Distance[b] Not Meeting Standard	Percent Not Meeting Standard
Design Speed (mph)	60	15 miles at 55 mph or less 4 miles at 40 mph or less	100%
Minimum Curve Radius (feet)	1,330	21 of 43 curves less than standard radius	49%
Lane Width (feet)	12	13.7 of 15 miles less than 12-foot-wide lanes	91%
Shoulder Width (feet)	6–10	15 of 15 miles less than 6-foot-wide shoulders	100%
Clear Zone (feet)	30–32	14 of 15 miles less than 30-foot-wide clear zone	95%

[a] The design standards are guidelines spelled out in AASHTO (2004) and adopted by DOT&PF and FHWA and, in this case, are specific to "rural principal arterial" highways. The design standards frequently represent a range of values, allowing designers latitude based on local conditions. The *Alaska Preconstruction Manual* states "Interstate rural design speed for level terrain is 70 mph, for rolling terrain is 60 mph, and for mountainous terrain is 50 mph." DOT&PF has identified 60 mph as the appropriate design speed for the project corridor.

[b] The mileposts used for this table are MP 45–60.

The Sterling Highway's existing design can be attributed to the road being constructed to fit the existing topography. The existing alignment does not account for new safety standards, larger vehicles, or more traffic. The highway was constructed at a time when automobiles were slower, truck sizes generally were smaller, and recreational vehicles and tourist buses were much fewer and smaller.

Design Speed

AASHTO recommends a design speed for a roadway in level terrain in the range of 60 to 75 mph, in rolling terrain of 50 to 60 mph, and in mountainous terrain of 40 to 50 mph. The *Alaska Preconstruction Manual* states "Interstate rural design speed for level terrain is 70 mph, for rolling terrain is 60 mph, and for mountainous terrain is 50 mph." The "design speed" means the speed at which the highway should be physically traversable, with adequate ability for a driver to see the road ahead, negotiate curves, and drive comfortably. According to the National Cooperative Highway Research Program (NCHRP), design speeds should reflect the speeds that drivers expect to travel, and are determined by the physical limitations of the roadway and surrounding traffic (NCHRP 2014). The terrain within the project area varies between level and mountainous. However, since the highway traverses along the river valley and sides of the mountains, the corridor characteristics are more typical of rolling terrain rather than mountainous. Highway design engineers have identified that 60 mph is an achievable and desirable design speed to match the driver expectations and conditions of the adjacent highway segments. The steepest grades would not exceed 6 percent, which allows for the higher design recommendation.

The design speed often differs from—and should not be confused with—the posted speed limit. Posted speed limits, as a matter of policy, are not the highest speeds that might be used by drivers. Instead, such limits are usually set to approximate the 85th percentile speed of traffic (AASHTO 2004). The 85th percentile speed is the speed at or below which 85 percent of drivers are operating their vehicles and is usually within a 10 MPH speed range used by most drivers. The posting of a speed based on the 85th percentile promotes uniformity of speed, and vehicle collisions are less likely to occur when vehicles are traveling at about the same speed. The design speed often exceeds the posted speed limit. DOT&PF anticipates that the posted speed limit will be 55 mph.

Curves

The minimum curve radius that allows for a 60 mph design speed is 1,330 feet (i.e., all points on the highway centerline through the curve would be 1,330 feet from the imaginary center point of a circle). There are 43 curves on the existing alignment in the project area, and 21 of them (49 percent) do not meet this standard, as shown in Map 1.2-4.

Sharp curves and narrow shoulders slow traffic and reduce visibility around corners

Approximately 3 miles of the existing highway in the project area have speed limits posted at 35 mph or less, because the curves do not meet the design criteria for curve radius. Curves tight enough to warrant a 35 mph posting may contribute to single-vehicle run-off-the-road crashes and truck rollovers (see Section 1.2.2.3 for information on crashes in the project area). This may be due to limited sight distances around the curve, and the existing roadway characteristic of narrow lanes and limited shoulders and clear zones. An additional 6.5 miles of the existing highway in the project area have posted speed limits of 45 mph. Statewide these sections of the Sterling Highway are among the longest sections of NHS rural principal arterials with such low posted speeds.

One particular area provides a primary example of the complexity of the existing highway's problems with curves: the area between MP 49 and MP 50.5, at the western edge of the Cooper Landing community. Within this 1.5-mile stretch of the highway are seven curves, two of them broad curves that easily meet the standard but five of them well below the standard minimum curve radius. The five substandard curve radii are 441 feet (38 mph), 478 feet (40 mph), 498 feet (42 mph), 716 feet (47 mph), and 955 feet (53 mph). The curves exist in this area because the highway directly follows the toe of the steep mountain slope where it meets the Kenai River floodplain.

In general, the curvy existing road impedes the ability of drivers to see upcoming hazards and reduces the time available to stop or slow down when hazards become visible. Similarly, the visibility required to pass safely and efficiently is hindered. Although 90 percent of the highway in the project area is designated “no passing,” frustrated motorists pass in areas where passing is prohibited. These conditions contribute to safety concerns within the project area. According to the NCHRP, the effects of curvature on crash frequency on rural highways is quite substantial, and this criterion has the third or fourth largest effect of any design criteria on crash frequency for rural highways (NCHRP 2014). The inability to see around curves or over hillcrests affects the ability for drivers to be able to stop adequately should there be a hazard or slowed or stopped vehicles making turns. The inadequate sight distance contributes to safety concerns associated with curves.

Low speeds are currently posted for tight curves and poor visibility

Lanes and Shoulders

Lane width defines the area where vehicles can safely maneuver without encroaching into the path of oncoming traffic or onto the shoulder. AASHTO (2004) standards for rural principal arterials call for 12-foot-wide lanes with 6- to 10-foot-wide shoulders. The DOT&PF has adopted this standard for the project area. The existing highway has lane widths of about 11 feet, with variable shoulder widths down to as little as 0.5 foot and typically not more than 2 feet. As indicated in Table 1.2-4 and shown on Map 1.2-4, 13.7 miles of the 15 miles (91 percent) of existing highway (MP 45–60) has lane widths less than 12 feet. All 15 miles have shoulders less than 6 feet.

Narrow lanes and narrow or non-existent shoulders constrain drivers maneuverability when encountering oncoming vehicles, pedestrians, stalled vehicles, guardrails or ditches, and other obstacles on the side of the road. This in turn leads to reduced driver comfort and corresponding slower driving speeds or, in some cases, may contribute to crashes when drivers do not slow down or are impatient to pass others who have slowed (see Section 1.2.2.3 for information on crashes in the project area). Driving difficulties associated with inadequate lane and shoulder widths include limited maneuvering space, lack of emergency pull-off areas, and limited space for pedestrians who congregate at or travel between recreational sites located near the highway. Insufficient shoulders also contribute to run-off-the-road crashes, which are the majority of severe injury crashes in the project area. According to the NCHRP, lane width is the

Narrow or nonexistent shoulders increase the chance for run-off-the-road crashes.

second most important design criterion with respect to crash frequency on rural highways and shoulder widths have the largest effect on crash frequency (NCHRP 2014).

Clear Zones

A clear zone is the area alongside the road from the outer edge of the outer lane that is clear of obstructions such as trees, rock outcroppings, and so on, and where side slopes are moderate. In the project area, the existing clear zones are minimal. The clear zone is intended to allow drivers who might leave the designated lane space to recover control of the vehicle or to bring the vehicle to a rest with minimal damage. For drivers who remain within the roadway, the clear zone also provides for visibility and opportunity to see wildlife or people who may be moving toward the road and gives drivers time to safely slow down or stop if they perceive a hazard.

The applicable AASHTO (2004) design standard for a rural principal arterial for the clear zone is 30 to 32 feet. The DOT&PF has determined that the design criterion for the clear zone along the Sterling Highway in the project area is 30 feet. A total of 14 miles of the 15 miles of existing highway (MP 45-60) has less than a 30-foot-wide clear zone, as shown in Table 1.2-4 and Map 1.2-4.

1.2.2.3 Highway Safety

Roadway safety is of primary importance to all agencies responsible for the construction and maintenance of the nation’s highways. One way to understand how safe a roadway is for drivers is to review historic crash data. This is done by calculating crash rates for a particular roadway and comparing them to similar facilities within the state. A crash rate takes into account the total number of crashes as well as the volume of traffic and length of roadway involved. This allows crashes on both high- and low-volume primary highways to be compared equally.

A crash analysis (Appendix A) for the project area was performed by evaluating historical crash data (2000–2009) for the Sterling Highway from MP 45 to 60, and comparing the project area crash evaluation to crash data for the entire Sterling Highway as well as to the state as a whole.

The following summarizes the results of the crash analysis.

Project Area Crash Rate

Between MP 45–60, 303 crashes occurred between January 1, 2000 and December 31, 2009. This is a crash rate of 1.72.[7]

Crash occurrences on a roadway can vary greatly depending on the season. Considering the crash rate for both the winter and summer seasons helps in understanding the issues that contribute to crashes.

To determine the seasonal crash rate, winter was considered to be the 5-month period from November to March, while summer was considered to be the 7-month period from April to October. The seasonal crash rate from January 1, 2000 to December 31, 2009, is shown in Table

[7] The crash rate of a roadway segment is determined by calculating how many crashes per million vehicle miles (CPMVM) can be expected within the corridor. To calculate the CPMVM, the total number of crashes within the study period is multiplied by 1,000,000 vehicle miles and divided by the product of the number of days during the study period, the average daily traffic, and the length of the area studied.

1.2-5. Although there was less traffic in the winter, there were more crashes during the winter, when snow and ice were likely present and darkness more prevalent.

Table 1.2-5. 2000–2009 Project area seasonal crash rate

Season	Average Daily Traffic	Total Crashes	Crash Rate (CPMVM)
Winter (Nov.–Mar.)	1,635	153	4.13
Summer (Apr.–Oct.)	4,353	150	1.07

CPMVM = crash rate per million vehicle miles

Project Area Crash Severity

The severity of crashes is also a consideration when evaluating the safety of a roadway. The total number of crashes can indicate functional problems with a roadway, but crash severity indicates the magnitude of the crashes as it relates to the health of the passengers involved in the crash. Table 1.2-6 shows the number of vehicle crashes and the number of resulting personal injuries by crash severity type experienced across the project area between 2000 and 2009. Note that there are six instances where more than one injury type occurred with a single crash. Therefore, that crash counted for each personal injury type that occurred.

Table 1.2-6. Project area crash and personal injury summary from January 2000 to December 2009

Crash Severity Type	# of Occurrence Of Each Vehicle Crash Severity Type[a]	# of Resulting Personal Injuries
Fatal	4	4
Major Injury[b]	18	19
Minor Injury[c]	89	129
Property Damage Only	191	N/A
Total	**302**	**152**

[a] Vehicle crashes reported here are from MP 44.5 to MP 58.2. There are six instances where more than one injury type occurred with a single crash. Therefore, that crash is represented for each personal injury type that occurred.

[b] Major injury crashes are crashes that resulted in incapacitating injuries.

[c] Minor injury crashes are crashes that resulted in non-incapacitating injuries or possible injuries.

N/A = not applicable.

Comparison to Statewide Averages

Table 1.2-7 shows the total number of crashes and the crash rate for each of the segments presented in Section 1.2.2.1. The comparison of these segments to the statewide average indicates that two of the six segments are above the statewide average.

Table 1.2-7. Crash rate by segment (2000–2009)

	Crashes						
	Fatal	**Injury**	**Property Damage Only**	**Total**	**Crash Rate[a]**	**Statewide Average Rate[b]**	**Percent above/below the Statewide Average**
Segment 1 (MP 44.5 - 46.59)	0	16	18	34	1.53	1.80	-17.6%
Segment 2 (MP 46.6 - 47.79)	1	4	19	24	1.38	1.80	-30.4%
Segment 3 (MP 47.8 - 49.39)	1	11	11	23	1.31	1.80	-37.4%
Segment 4 (MP 49.40 - 51.29)	1	9	18	28	1.25	1.80	-44.0%
Segment 5 (MP 51.3 - 55.09)	1	34	75	110	2.46	1.80	+26.8%
Segment 6 (MP 55.1 – 58.2)	0	27	50	77	2.38	1.80	+24.7%
Total	**4**	**101**	**191**	**296**			

[a] The crash rate is the number of crashes per million vehicle miles.

[b] The statewide average rate for all crashes for rural other principal arterials roads is 1.80 crashes per million vehicle miles traveled. Source*: 2009 Alaska Traffic Crashes*, June 2012, Alaska Department of Transportation and Public Facilities, Figure 50. http://www.dot.alaska.gov/stwdplng/transdata/pub/accidents/2009_AK_CrashData.pdf

In addition, the crashes within the project area were slightly more severe, on average, as shown in Figure 1.2-3 and Table 1.2-8. Between 2000 and 2009, with the exception of year 2006, the project area (MP 45 to 60) had a higher percentage of major injury (i.e., incapacitating injury) and fatality crashes when compared to the statewide average. Additionally, the project area had consistently fewer property-damage-only and minor-injury (i.e., non-incapacitating injury/possible injury) crashes when compared to the statewide percentage. Fatal injury crashes in the project area were higher than the statewide average for years 2002, 2003, 2004, and 2007.

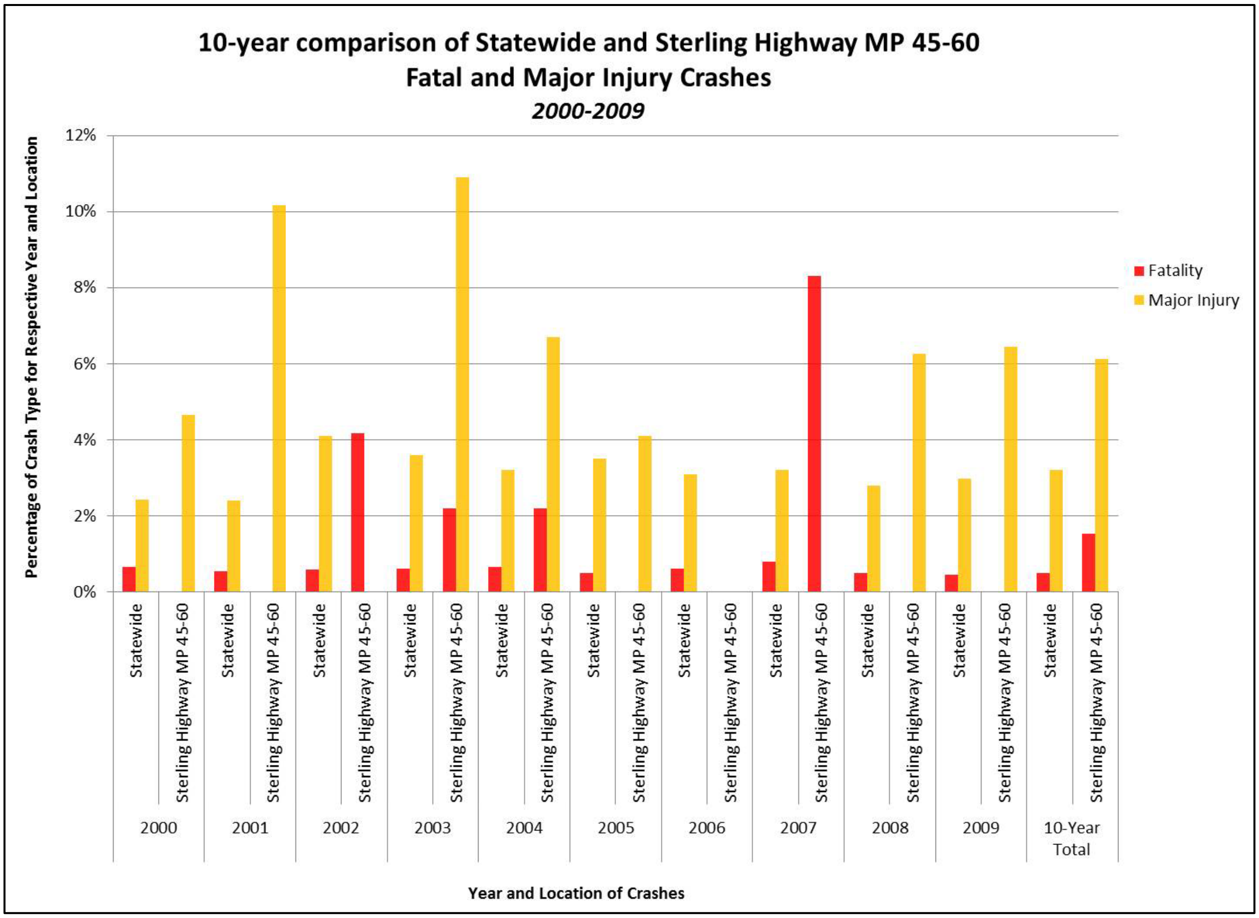


Figure 1.2-3. Comparison of the proportional severity of crashes statewide and within the project area

Table 1.2-8 shows that Segments 2, 3, and 4 exceeded the statewide average for fatal crashes. Segment 5 is just below the statewide average.

Table 1.2-8. Fatal Crash rate by segment (2000-2009)

	Fatal Crashes	Crash Rate[a]	Statewide Average Rate[b]	Percent above/below the Statewide Average
Segment 1 (MP 44.5 - 46.59)	0	0.000	0.023	N.A.
Segment 2 (MP 46.6 - 47.79)	1	0.058	0.023	+60.3%
Segment 3 (MP 47.8 - 49.39)	1	0.057	0.023	+59.6%
Segment 4 (MP 49.40 - 51.29)	1	0.044	0.023	+47.7%
Segment 5 (MP 51.3 - 55.09)	1	0.022	0.023	-4.5%
Segment 6 (MP 55.1 – 58.2)	0	0.000	0.023	N.A.
Total	4			

[a] The crash rate is the number of crashes per million vehicle miles.

[b] The statewide average fatal crash rate for rural principal arterial roads is 0.023 crashes per million vehicle miles traveled. Source: *2009 Alaska Traffic Crashes*, June 2012, Alaska Department of Transportation and Public Facilities, Figure 50. http://www.dot.alaska.gov/stwdplng/transdata/pub/accidents/2009_AK_CrashData.pdf

Conditions Contributing to Crashes

Between 2000 and 2009, a variety of crash types occurred in the project area, including run-off-the-road and fixed-object (e.g., ditches, culverts, and embankments) crashes; head-on, rear-end, and angle collisions; and moose-related crashes. Figure 1.2-4 illustrates the percentages of crash types within the project area during the analysis period.

While some crashes in the project area are the results of driver error, existing highway design can contribute to crashes as well. Sharp curves, narrow lane and shoulder widths, lack of clear zones, and a proliferation of access points can all contribute to crashes. Engineering analysis completed for the project (see Appendix A) predicted the number of crashes of different types in the design year (2043) based on the design deficiencies described in Section 1.2.2.2. The numbers of crashes are statistically based on analysis of road features such as shoulders, clear zones, passing lanes, and turning lanes. If no design improvements are made, the analysis predicts approximately 33 crashes in 2043. A cost analysis was performed over a 20-year period from 2024–2043. A total of 604 crashes are predicted for the No-Build Alternative in the 20-year period; of which 8 fatal crashes, 33 major injury crashes, and 153 minor injury crashes are predicted, resulting in a total cost of $87.25 million.

The following summarizes these conditions as it relates to potential contributors to crashes.

Curves. As discussed in Section 1.2.2.2, curves that do not meet current design standards impede the ability of drivers to see upcoming hazards and reduce the time available to stop or slow down when hazards become visible. Similarly, the visibility required to pass safely and efficiently is hindered. Although 90 percent of the highway in the project area is designated "no passing," frustrated motorists may pass in areas where passing is prohibited.

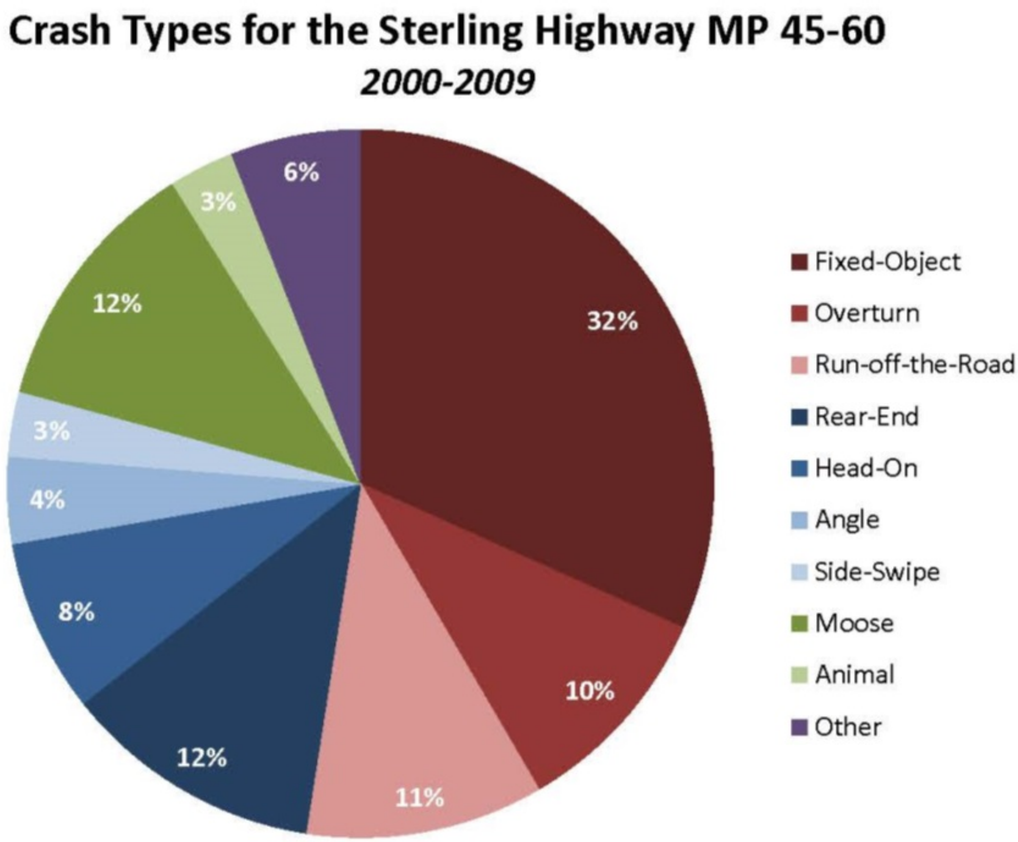


Figure 1.2-4. Crash type within the project area between 2000 and 2009

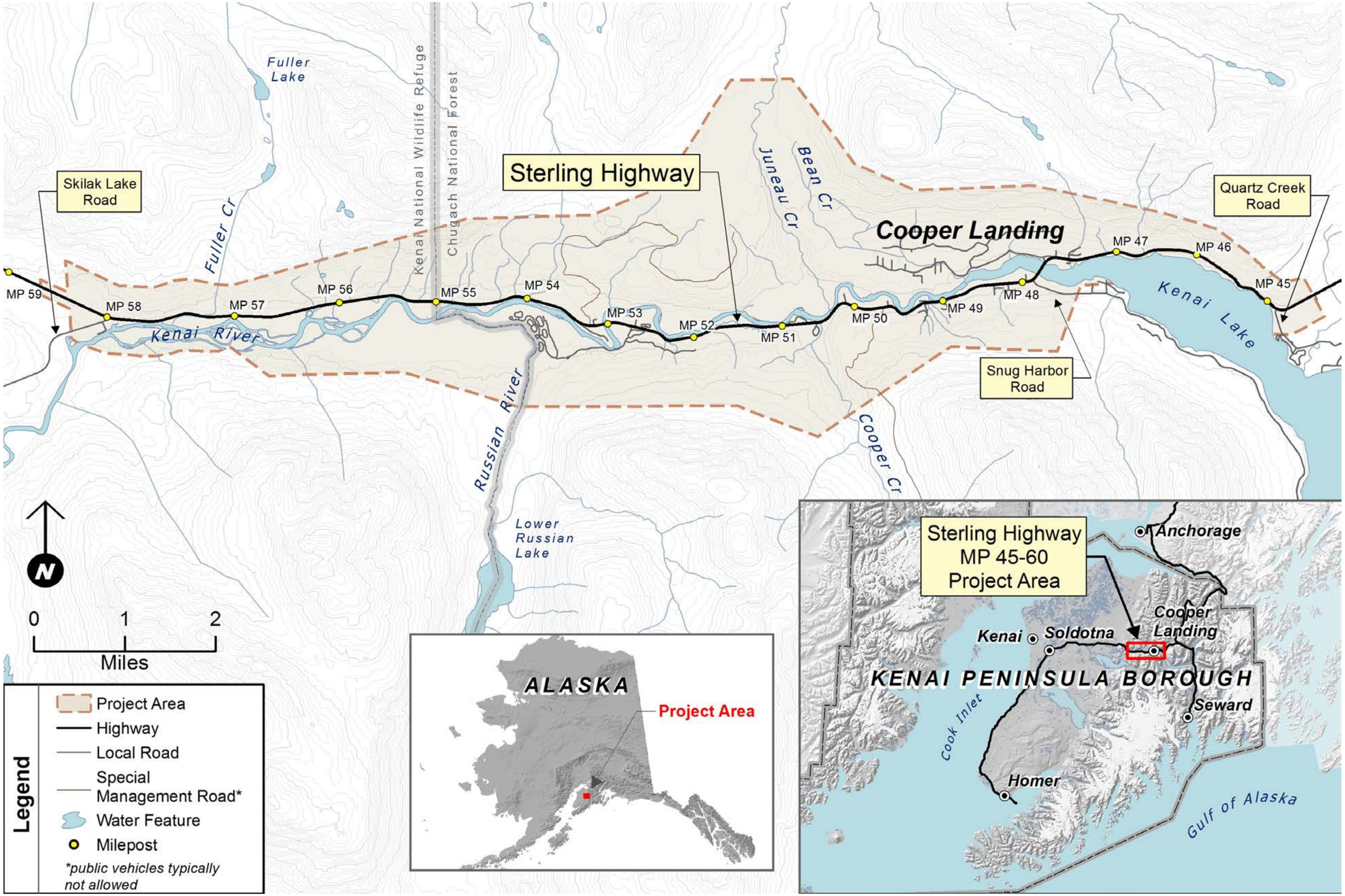
Lanes and Shoulders. In the project area, narrow shoulders with sharp drop-offs at the shoulder edge can cause a vehicle to roll when a driver is taking corrective action or could even pull a vehicle into the ditch once a tire is off the pavement. Narrow lane widths reduce the room available for driver correction and increase the potential for head on crashes. As indicated in Table 1.2-4, all shoulder widths are narrower than rural principal arterial design standards, and 91 percent of the roadway has less than 12-foot-wide lanes. In the project area, there is a high concentration of head-on crash locations, where records indicate there have been two or more head-on crashes per mile from 2001 to 2007 (DOT&PF 2010c, Thomas, personal communication 2011) .

Clear Zones. Inadequate clear zones could contribute to moose-related crashes that make up 12 percent of the crashes in the project area. The narrower-than-standard clear zones could diminish a driver’s ability to see and avoid moose on the highway. In addition, narrower clear zones reduce the amount of time a driver has to make a correction to other traffic conditions and could contribute to run-off-the-road crashes. Vehicles that leave the roadway and hit an object (fixed object crashes) also contribute to severity of property damage and injury; adequate clear zones reduce these problems.

Driveways cause conflict points that slow traffic and increase the chance of crashes.

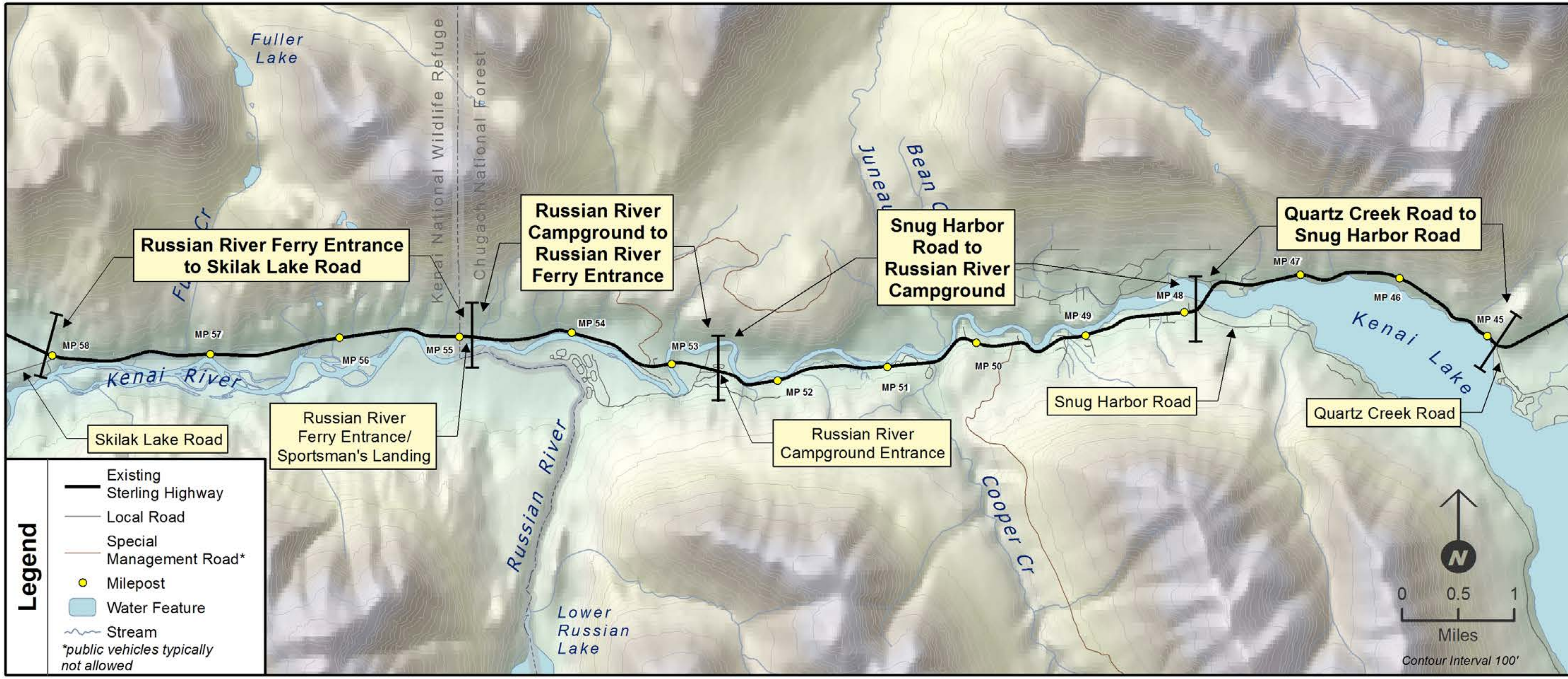
Access Points. The existing Sterling Highway has developed over time, with many driveways and side roads connecting directly to the highway. Between MP 45 and MP 60, 123 driveways, pullouts, and side roads connect to the Sterling Highway (see Map 1.2-5). In the most densely settled part of Cooper Landing (approximately between MP 47.0 and MP 51.0), there are 76 driveways and street intersections. These numerous access points can create unsafe conditions. Rear-end and angle crashes can occur when vehicles waiting to make left turns onto driveways or side streets are struck by vehicles following them, when turning vehicles fail to yield to oncoming traffic, or when vehicles improperly pass other vehicles waiting to turn.

This page intentionally left blank.



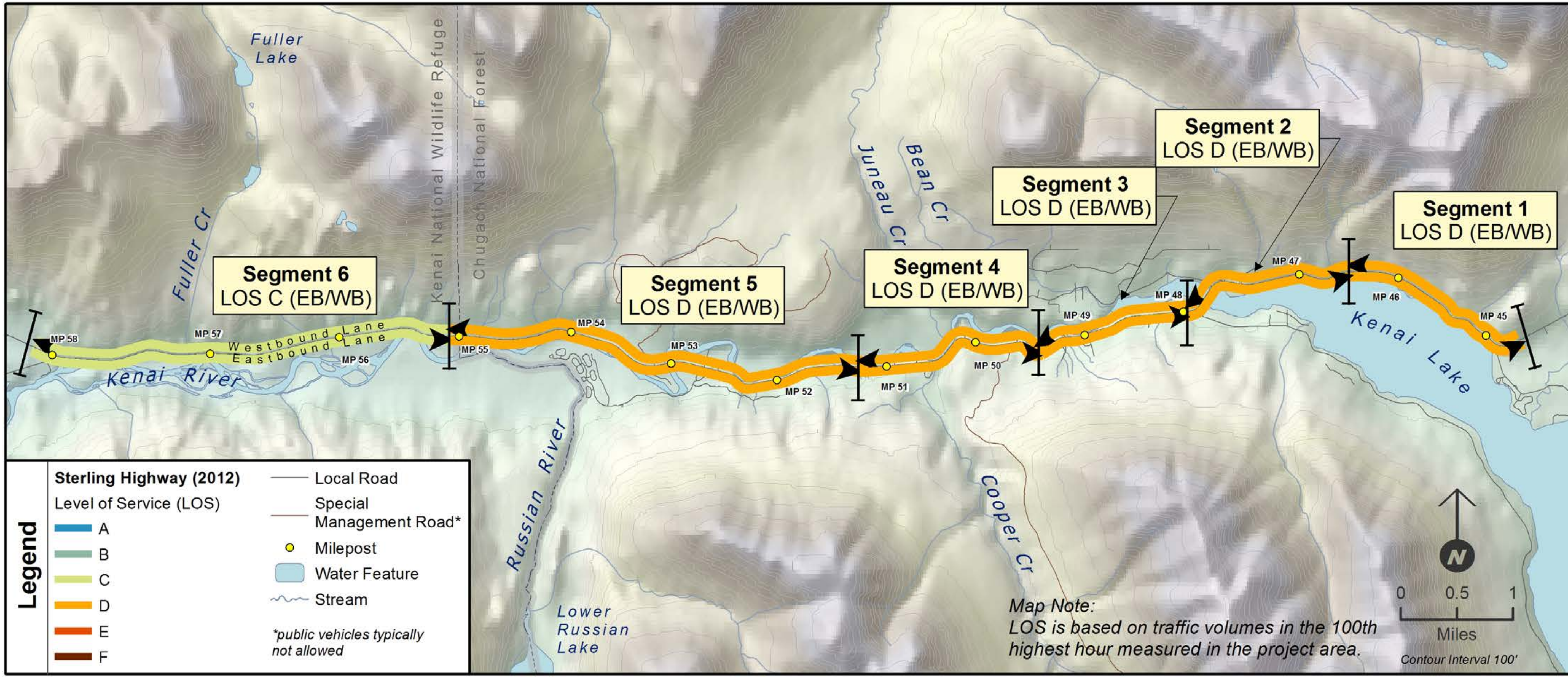
Map 1.1-1. Project vicinity map

This page intentionally left blank.



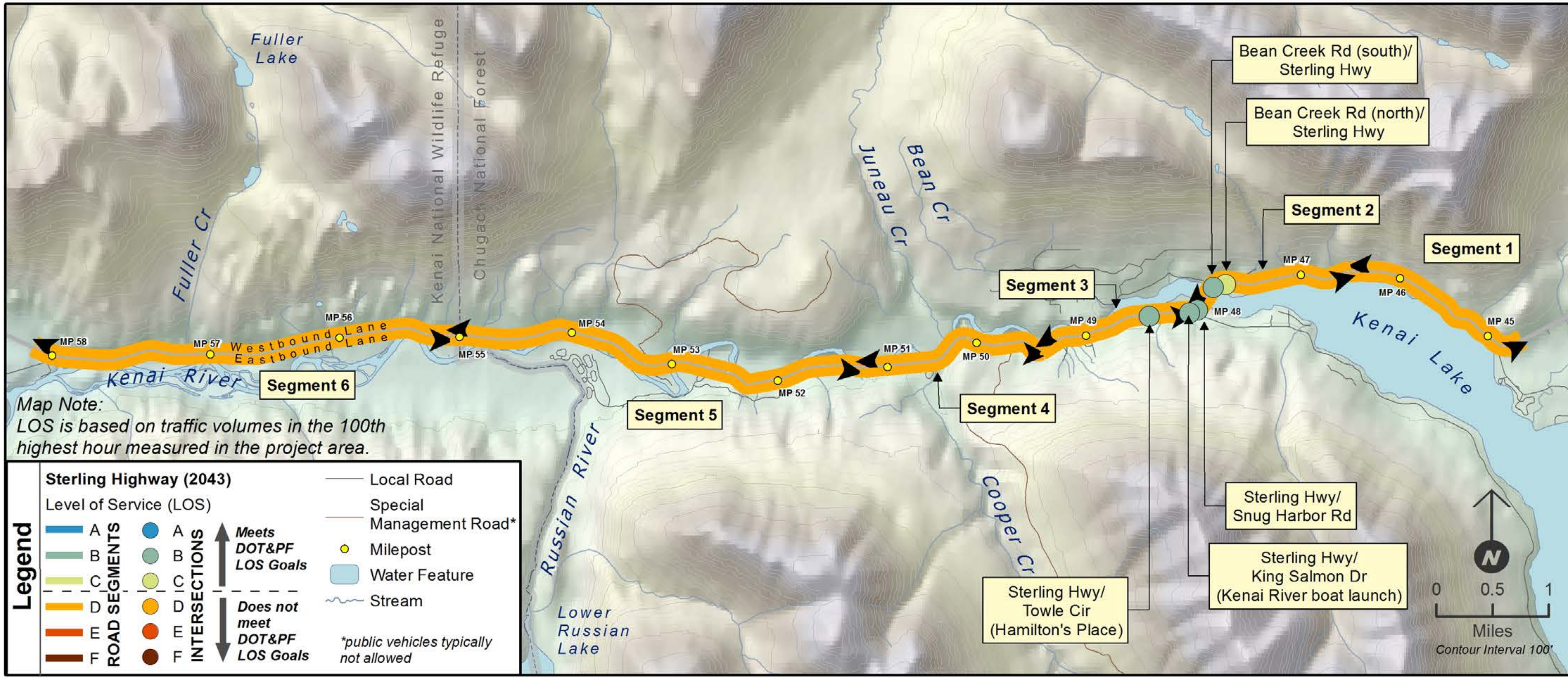
Map 1.2-1. Highway sections used to report DOT&PF traffic counts [Updated]

This page intentionally left blank.



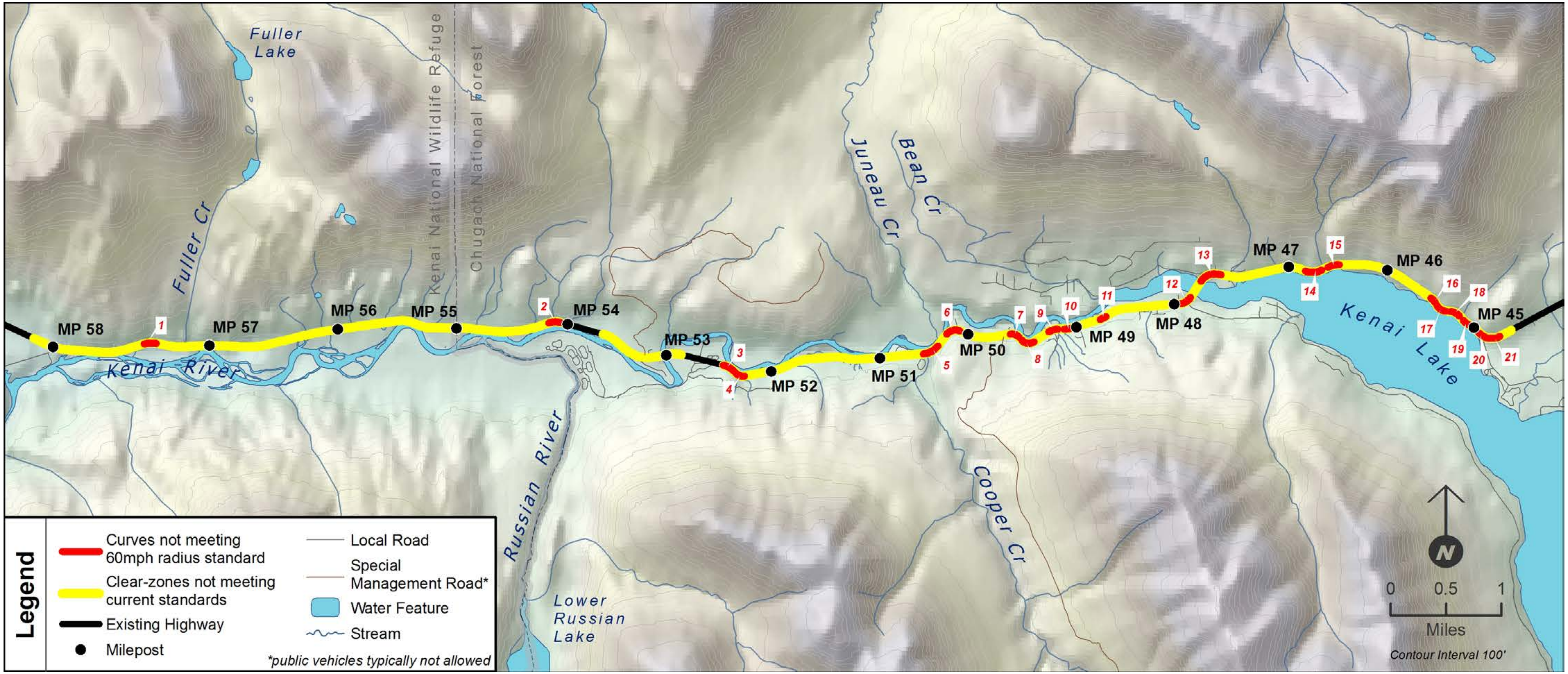
Map 1.2-2. Sterling Highway existing LOS, 2012 [Updated]

This page intentionally left blank.



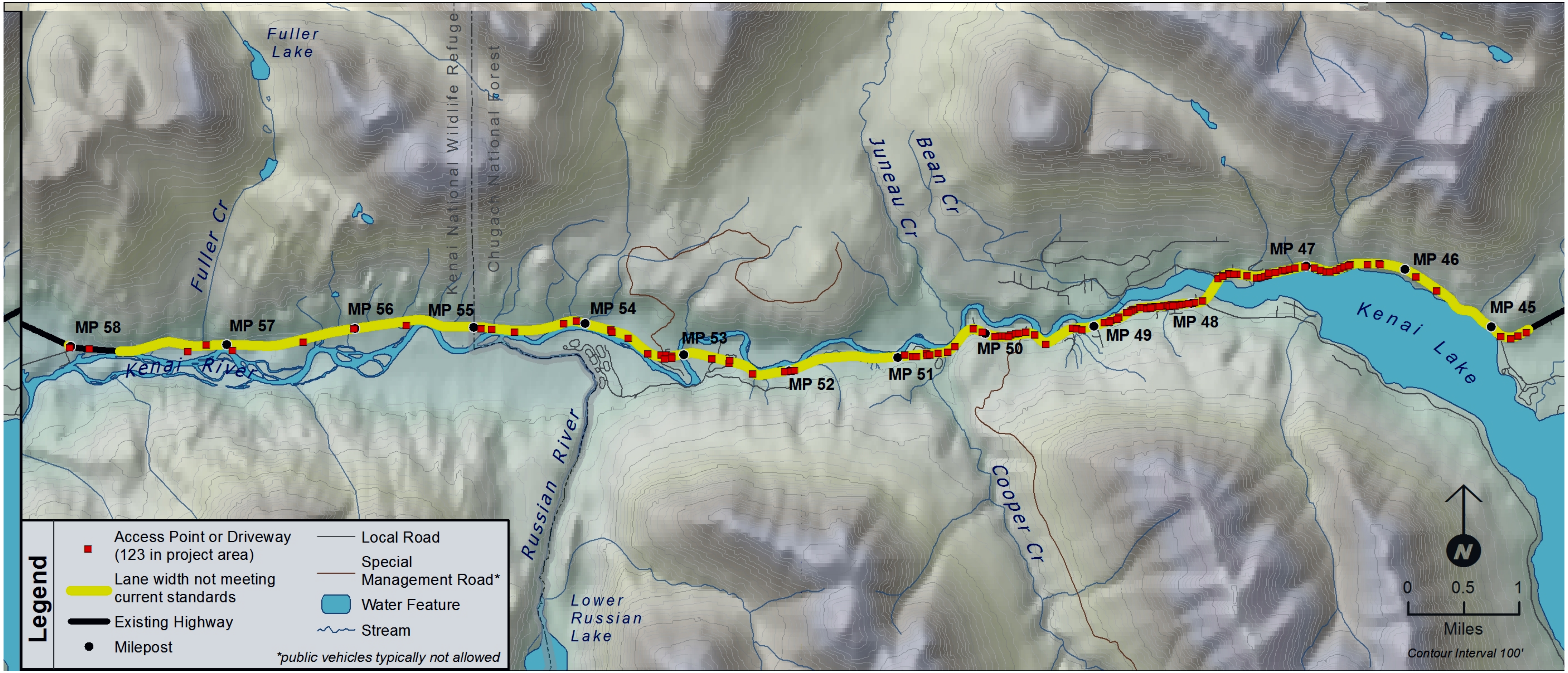
Map 1.2-3. Sterling Highway projected LOS, 2043 [Updated]

This page intentionally left blank.



Map 1.2-4. Curves and clear zones in the project area [Updated]

This page intentionally left blank.



Map 1.2-5. Access points and narrow lane widths in the project area [Updated]

This page intentionally left blank.