

## **3.19 Floodplains**

Floodplains provide numerous benefits by providing temporary storage of floodwaters, and absorbing and distributing excess water and associated suspended solids, nutrients, and pollutants. Floodplains help improve and maintain water quality in streams by filtering and absorbing storm water runoff resulting from substantial rainfall and larger flood events by storing and slowly releasing floodwaters. Floodplains attenuate stream flows during flood events and increase the ability of stream channels to move flood flows downstream. Natural floodplain habitats are important because undeveloped areas within the floodplain provide recharge to groundwater, a link in the food chain and nutrient cycle, a filtering mechanism for pollutants that might otherwise reach the stream or river, and protection from storm and flood waters (Boggs et al. 1997, DNR, ADF&G, KPB 1997). Floodplains also provide unique environments that contribute to wetland and upland habitat complexes. The Kenai River floodplain also provides a variety of recreational opportunities from fishing to wildlife viewing. These types of impacts are discussed relative to the types of natural resources that exist in floodplain areas, such as wetlands and vegetation (Section 3.20), water bodies and water quality (Section 3.13), wildlife (Section 3.22), fish and essential fish habitat (Section 3.21), and parks and recreation resources (Section 3.8).

### **3.19.1 Affected Environment**

#### **3.19.1.1 Regulatory Setting**

Executive Order 11988, “Floodplain Management,” requires the Federal Highway Administration (FHWA) to follow established procedures for assessing and avoiding potential floodplain impacts. Encroachment by a road may be a floodplain impact if there could be “a significant potential for interruption...of a transportation facility which is needed for emergency vehicles,” for example, if the road washed out during a flood. According to 23 CFR § 650, a proposed action within the limits of a 100-year floodplain (“base floodplain”) is considered to be a floodplain encroachment. Significant encroachments, as defined in 23 CFR § 650.105, must be avoided to the extent practicable (23 CFR § 650.113).

The Kenai Peninsula Borough (Borough) has developed a floodplain ordinance that regulates construction and improvements in flood hazard areas. The Borough Floodplain Development Ordinance (KPB 1988) requires that floodplain encroachments not result in any increase in flood levels during the occurrence of the base flood discharge. This no-net-rise policy applies to areas both upstream and downstream of any floodplain encroachment.

According to Borough Code Chapter 21.06.050, within floodways (designated portions of the flood hazard area) “all encroachments, including fill, new construction, substantial improvements, and other development are prohibited unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.”

The FHWA requires a Location Hydraulic Study (LHS) during the planning of highway improvements where construction may encroach on mapped floodplains or regulatory floodways (23 CFR § 650, Subpart A). The purpose of the LHS is to determine whether a highway location alternative encroaches on a regulatory floodplain/floodway, whether there are practicable

alternatives to this encroachment, and mitigation measures to minimize environmental impacts of encroachments on floodplains. A preliminary *Location Hydraulic Study* has been prepared for this project and is included as Appendix E of this Final Environmental Impact Statement.

### **3.19.1.2 Effective and Preliminary (100-Year) Floodplain Mapping**

The 100-year floodplain is the area adjacent to a stream or river that is subject to a one percent chance of flooding in any given year (Kuwada 2001). The 100-year floodplain for the Kenai River extends from its mouth at Cook Inlet to the upper end of Kenai Lake. Within the project area, mapped floodplains exist for only the area between approximately Milepost (MP) 47 to MP 55 for a portion of the Kenai River and Cooper Creek (Map 3.19-1). The 100-year floodplain was originally mapped by the Federal Emergency Management Agency (FEMA) using approximate methods and was adopted by the Borough in 1981. The 1981 mapping is the Borough’s officially adopted floodplain.

The Borough has been working with the U.S. Army Corps of Engineers (USACE) and FEMA to update the regulatory floodplain maps for certain areas within the Borough, including updates made in 2008 on the Kenai River near Cooper Landing. The preliminary floodplain mapping extends from approximately the outlet of Kenai Lake, near MP 47, to just downstream of the Cooper Creek confluence, near MP 51 (Map 3.19-1). FEMA has released preliminary drafts of the new floodplain maps, including floodways, which are currently under public review. Official adoption of the preliminary mapping has not yet occurred. However, the updates are considered the best available data and, as of 2013, were being used as the regulatory floodplain boundaries (Bevington, personal communication 2013).

The 1981 Zone A 100-year flood zone for the Cooper Landing area (depicted as the “effective 100-year floodplain” on Map 3.19-1) was mapped as an “approximate” zone, meaning that flood elevations and other detailed information were not generated (Kenai River Center 2011). Rather, the flood levels were based on “field examinations, historical information, map reconnaissance, and engineering judgment” (FEMA 2013), and the 100-year boundary was delineated on relatively coarse topographic mapping with 100-foot contour intervals. The recent USACE floodplain analysis has resulted in more detailed information to allow the Borough to regulate with greater accuracy.

### **3.19.1.3 Kenai River Flood Levels at Cooper Landing**

Flooding on the Kenai River can occur in association with heavy rainfall, spring melt, ice jams, and a recurring glacial lake outburst in the upper Snow River tributary. Table 3.19-1 provides a list of various Kenai River flood levels and the associated impacts to features within the community of Cooper Landing and the existing highway. The Alaska Department of Transportation & Public Facilities (DOT&PF) has historically made repairs to the Sterling Highway in the project area where flood waters have damaged the highway embankment. There is no alternative to the Sterling Highway to use in case of flooding or flood damage. As noted in the table, the highway surface is known to flood at MP 54.

**Table 3.19-1. Flood levels on the Kenai River at Cooper Landing**

Water level <sup>a</sup>	Water level description
16.5	Many houses and businesses along Sterling Highway MP 48–50 will begin to flood. Quartz Creek and North Cooper Creek Campgrounds will be underwater. Water will also be over the Sterling Highway at MP 54. Exceeded once (17.18 feet) since 1960.
15.0	Quartz Creek Campground boat ramp is submerged and water encroaches on campsites that are located next to Kenai Lake. Water should start to approach foundation level of buildings along Sterling Highway MP 48–50. North Cooper Creek Campground begins to flood. Water in slough at MP 54 will encroach on the Sterling Highway. Exceeded seven times since 1960.
14.0	Properties along the Sterling Highway MP 48–50 begin to see water in their yards. USGS gauge house adjacent to Cooper Landing Bridge begins to flood. Bottom of wooden walkway at boat ramp starts to be submerged. Exceeded 18 times since 1960.
13.0	Official National Weather Service flood stage. Exceeded 24 times since 1960.
11.0	High water level—Class II+ whitewater above Jim's Landing; Class III below Jim's Landing.
9.0	Medium water level—Class II whitewater above Jim's Landing; Class II+ below Jim's Landing.
6.0	Low water level—Class II whitewater above and below Jim's Landing.

<sup>a</sup> Measured in feet on the Cooper Landing Bridge gauge. Highest recorded is 17.18 feet on September 21, 1974. Floods typically occur in Sept–Oct, but twice have occurred in June.

Source: NOAA (2005).

### **3.19.2 Environmental Consequences**

This section summarizes the findings of the LHS (refer to Appendix E for the full report). This section describes, by alternative, encroachments on the regulatory floodplain and floodway and mitigation measures to minimize the environmental impacts to floodplains. Additional information on anticipated changes to flood risks due to climate change can be found in Section 3.14, Air Quality and Climate Change.

#### **3.19.2.1 No Build Alternative**

##### **Direct and Indirect Impacts**

No changes to the roadway within the 100-year floodplain are anticipated under the No Build Alternative. The existing highway situated within or near the Kenai River and Kenai Lake 100-year floodplain would remain unchanged. The existing highway would continue to be maintained as needed. In floods of 15 feet or higher (seven times since 1960), the existing highway surface would continue to flood at MP 54, and depending on the severity of the flood event, the highway could require emergency repairs.

#### **3.19.2.2 Issues Applicable to the Build Alternatives**

Each of the build alternatives would have varied impacts to floodplains within the project area. Both the Cooper Creek and G South alternatives entail new bridges to be constructed within the

official and preliminary mapped floodplains and floodway associated with the Kenai River. For the Cooper Landing Bridge under the Cooper Creek Alternative, construction would occur within the preliminary floodway. The Cooper Creek Bridge under the Cooper Creek Alternative would clear span the floodplain associated with Cooper Creek and have no effect to floodplains at this location. The new bridges over Juneau Creek required for the G South, Juneau Creek, or Juneau Creek Variant alternative would not affect mapped floodplains. Encroachment calculations are estimated by alternative to account for potential floodplain impacts resulting from bridge piers, fill embankment required for bridge approaches, and longitudinal encroachments where roadway widening would extend into mapped floodplains. See Table 3.19-2 for a summary of encroachment upon official (albeit “approximate”) and preliminary floodplains and preliminary floodway. See Map 3.19-1 for locations of floodplain encroachments by alternative.

Two areas of longitudinal encroachment outside the floodplain mapping limits are also shown on Map 3.19-1.

**Table 3.19-2. Area of floodplain and floodway encroachment for each build alternative (acres)**

<b>Alternative</b>	<b>Approximate Encroachment Area in Official (1981) Mapped Floodplains</b>	<b>Approximate Encroachment Area in Preliminary USACE (2008) Floodplains</b>	<b>Approximate Encroachment Area in Preliminary USACE (2008) Floodway</b>
Cooper Creek	5.4	0.5	0.1
G South	6.6	0	0
Juneau Creek	0	0	0
Juneau Creek Variant	0	0	0

Source: Geographic Information System analysis by HDR, 2016; HDR (2011a)

Note: USACE = U.S. Army Corps of Engineers

Little or no change to historic drainage patterns is expected within or downstream of the project area. Impacts to the floodplain are minimized by following standard stream crossing design criteria and avoiding direct impacts on stream channels, where possible. Additional specific mitigation measures are described below under each alternative.

### **3.19.2.3 Cooper Creek Alternative**

#### **Direct and Indirect Impacts**

The Cooper Creek Alternative intersects FEMA mapped floodplains of the Kenai River in six places: two bridge crossings and four longitudinal encroachments where the cut and fill footprint of the alignment intersects the mapped floodplain.

The Cooper Creek Alternative would replace the existing Cooper Landing Bridge with a longer bridge immediately adjacent to the existing structure. The new Cooper Landing Bridge would involve approximately 0.7 acre of fill within the official floodplain. Based on the preliminary mapping, the encroachment area of the bridge approaches would total approximately 0.5 acre. Preliminary floodway encroachment for bridge approaches and bridge piers would total

approximately 0.1 acre. Because of its longer spans, flood conveyance capacity would be increased over existing conditions, resulting in a net benefit to the floodplain function. Floodway encroachments would be developed pursuant to Borough Code, Chapter 21.06.050, and not result in any increase in flood levels during the occurrence of a base flood discharge.

South of the Kenai River, the proposed alignment would cross Cooper Creek and its mapped floodplain upstream of the existing Cooper Creek Bridge. The new Cooper Creek Bridge abutments and associated fill would be placed outside of the official floodplain and outside of the active stream channel. Floodplain encroachment of the bridge piers is estimated to be 0.15 acre.

The alignment crossing of the Kenai River and replacement of Schooner Bend Bridge at MP 53 would be located approximately 80 feet downstream of the existing bridge. The new Schooner Bend Bridge would be slightly longer than the existing bridge. Effective floodplain encroachment for bridge approaches and bridge piers would total approximately 0.8 acre. The old bridge and piers would be removed and replaced by the new structure.

Longitudinal encroachments on floodplains occur on the floodplain fringe where the alignment footprint is wider than the existing footprint. Floodplain encroachment would result from placement of fill and riprap, and installation of culverts to accommodate road widening. Four encroachments occur within the official floodplain (at MPs 47.2, 53.5, 53.9, and 54.7), with a total area of impact of approximately 4 acres. An additional 0.2-acre encroachment into the Kenai River, but outside the mapped floodplain, occurs near MP 57.7.

In addition to the Kenai River and Cooper Creek, this alternative would cross approximately 57 small streams or drainages. Most of the stream crossings are outside the official floodplain, and none of these streams has an established regulatory floodplain. This alternative would require replacing approximately 10 existing culverts located in or adjacent to the effective floodplain in the MP 53 to 55 segment.

### **Construction Impacts**

During bridge construction, work platforms may be temporarily placed within the floodplain. During the Borough floodplain development permit review process, or other permit reviews required for bridge construction, permit requirements relative to allowable fill in the floodplain would be established.

### **Mitigation**

The Cooper Landing Bridge preliminary design incorporates several features that will minimize and mitigate impacts to mapped floodplains. The overall structure would be longer than the existing structure, resulting in a flood conveyance capacity greater than the existing bridge. Retaining walls would be used at the north and south approaches to the bridge to limit impacts to the Kenai River floodplain and floodway and the existing boat launch.

The new Schooner Bend Bridge would be longer than the existing bridge, which would increase the flood conveyance capacity over existing conditions.

During design, longitudinal encroachments on the floodplain occurring in areas where the alignment footprint is wider than the existing highway footprint would be minimized when possible, and in many cases may be avoided by a slight alignment shift or other engineering solution.

All proposed stream crossings would have new or replaced culverts sized to accommodate the design flood and to avoid impacts during flood events. The surface elevation of the rebuilt highway in the MP 54 area that is prone to flooding would be raised to reduce the likelihood of flooding.

Additional measures would be implemented during the project design phase, including hydraulic and hydrologic analyses needed to comply with FHWA, DOT&PF, and Borough floodplain regulations and policies that exist at the time of the design. Compliance with EO 11988 would occur as part of the Kenai Peninsula Borough and Kenai River Center multi-agency permit process (see Section 3.24.2.2 in Permits), during design.

### **3.19.2.4 G South Alternative**

#### **Direct and Indirect Impacts**

The G South Alternative would encroach on the mapped floodplain in six locations: two new bridges and four longitudinal encroachments where the cut and fill footprint of the upgraded alignment is wider than the current highway. The G South Alternative would encroach upon approximately 6.6 acres of the Kenai River floodplain, but would not encroach upon the preliminary floodplain or floodway.

The G South Alternative includes a new bridge over Juneau Creek, which does not have a mapped floodplain, and a new bridge over the Kenai River. Fill placed into the floodplain for bridge abutments and piers to construct the Kenai River Bridge would affect approximately 2.0 acres of the Kenai River floodplain. The “old” highway would be raised to provide wildlife passage under the intersection with the new alignment near MP 51, resulting in a longitudinal encroachment (see below) into the floodplain of 0.2 acre. See Section 3.22.3.2 in Wildlife and Appendix I for additional detail on the wildlife mitigation proposal.

The Schooner Bend Bridge impacts are identical to those described for the Cooper Creek Alternative. There are four locations of longitudinal encroachments to the Kenai River (at MPs 51, 53.5, 53.9, and 54.7), with a total area of impact of about 4 acres (Map 3.19-1). An additional 0.2-acre encroachment into the Kenai River occurs near MP 57.7, which is outside the mapped floodplain.

In addition to the major bridge crossings, the G South Alternative would cross approximately 73 small streams or drainages. Most of the stream crossings are outside the official floodplain, and none of these streams has an established regulatory floodplain. This alternative would require replacing approximately 10 existing culverts located in or adjacent to the mapped floodplain in the MP 53 to 55 area.

#### **Construction Impacts**

During bridge construction, temporary work platforms may be placed within the 100-year floodplain. During the Borough floodplain development permit review process, or other permit reviews required for bridge construction, permit requirements relative to allowable fill in the floodplain would be established.

#### **Mitigation**

The new Schooner Bend Bridge would be slightly longer than the existing bridge, which would increase the flood conveyance capacity over existing conditions.

During design, longitudinal encroachments on the floodplain occurring in areas where the alignment footprint is wider than the existing highway footprint would be minimized when possible, and in many cases may be avoided by a slight alignment shift or other engineering solution.

All proposed stream crossings would have new or replaced culverts sized to accommodate the design flood and to avoid impacts during flood events. The surface elevation of the rebuilt highway in the MP 54 area that is prone to flooding would be raised to reduce the likelihood of flooding.

Additional measures would be implemented during the project design phase, including hydraulic and hydrologic analyses needed to comply with FHWA, DOT&PF, and Borough floodplain regulations and policies that exist at the time of the design. Compliance with EO 11988 would occur as part of the Kenai Peninsula Borough and Kenai River Center multi-agency permit process (see Section 3.24.2.2, Permits) during design.

### **3.19.2.5 Juneau Creek and Juneau Creek Variant Alternatives**

#### **Direct and Indirect Impacts**

The Juneau Creek Alternative (preferred alternative) would not encroach on official floodplains or the preliminary floodplain and floodway mapped areas, and would not require bridge crossings of any regulatory floodplains. There is a 0.2-acre encroachment into the Kenai River (common to all build alternatives) outside the mapped floodplain that occurs near MP 57.7.

The Juneau Creek Variant would not encroach on official floodplains or the preliminary floodplain and floodway mapped areas, and would not require bridge crossings of any regulatory floodplains. There is a 0.6-acre encroachment into the Kenai River around MP 55.5, outside the mapping limits, where the vertical alignment of the alternative descends the hill from Juneau Creek toward the Kenai River. There is an additional 0.2-acre encroachment into the Kenai River (common to all build alternatives) outside the mapped floodplain that occurs near MP 57.7.

The Juneau Creek and Juneau Creek Variant alternatives would require a new bridge over Juneau Creek as well as crossing approximately 63 small streams or drainages, including Bean Creek. None of these streams, including Juneau Creek, has an established regulatory floodplain.

#### **Construction Impacts**

During bridge construction, temporary work platforms may be placed within the 100-year floodplain. During the Borough floodplain development permit review process, or other permit reviews required for bridge construction, permit requirements relative to allowable fill in the floodplain would be established.

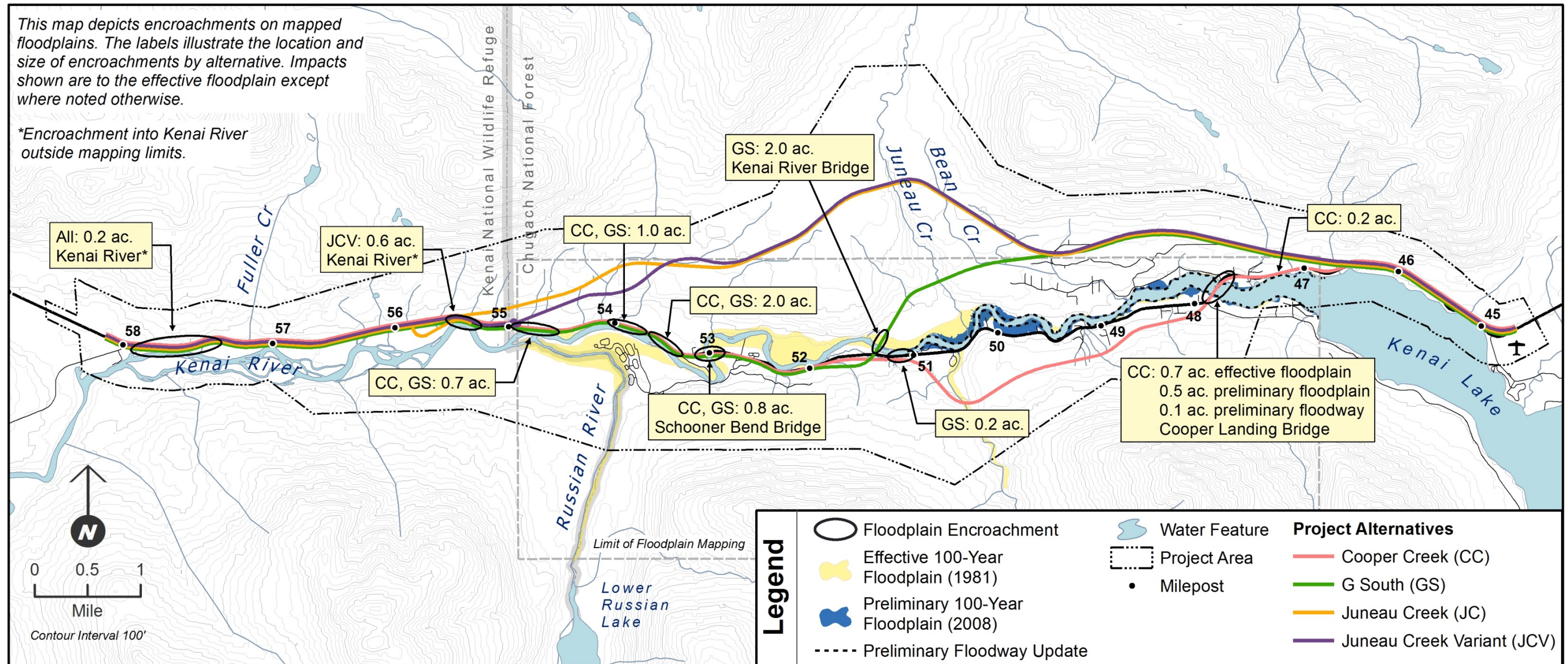
#### **Mitigation**

During design, longitudinal encroachments occurring in areas where the alignment footprint is wider than the existing highway footprint would be minimized, when possible, and in many cases may be avoided by a slight alignment shift or other engineering solution. All proposed stream or drainage crossings would have new or replaced culverts that would be sized to accommodate the design flood and avoid impacts during flood events.

Additional measures would be implemented during the project design phase, including hydraulic and hydrologic analyses needed to comply with FHWA, DOT&PF, and Borough floodplain

regulations and policies that exist at the time of the design. Compliance with EO 11988 would occur as part of the Kenai Peninsula Borough and Kenai River Center multi-agency permit process (see Section 3.24.2.2 in Permits) during design.





Map 3.19-1. Floodplain impacts in the project area [Updated]

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