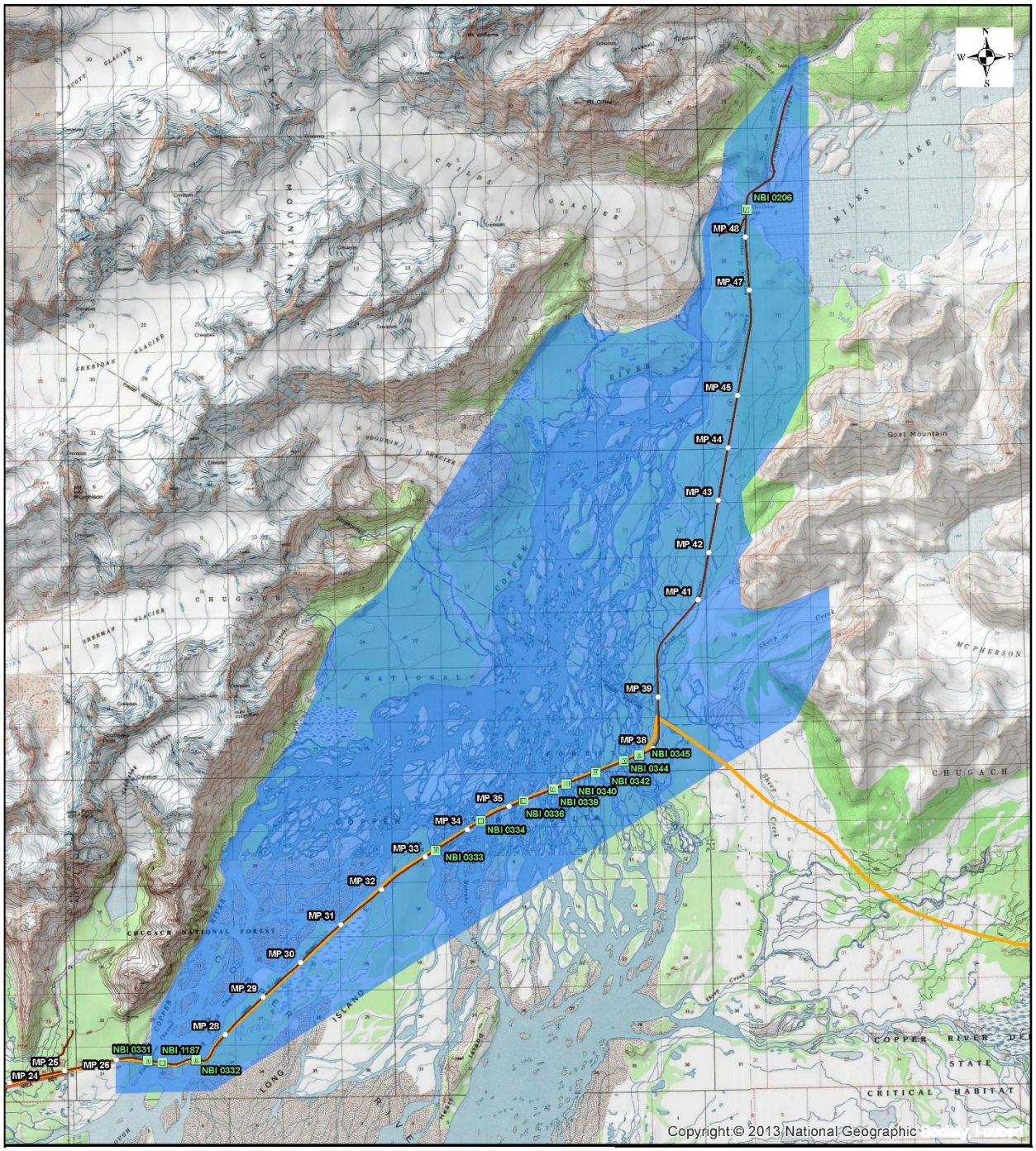
**Draft Copper River Highway Planning and Environmental Linkage Study**
**Alaska Department of Transportation and Public Facilities, December 17, 2019**




The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by the DOT&PF pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated November 3, 2017 and executed by the FHWA and DOT&PF.

# Introduction to PEL

Planning and Environmental Linkage (PEL) studies are a flexible approach that offers States and metropolitan planning organizations the options to use the transportation planning process to produce decisions or analyses that can later be adopted or cited by reference into the National Environmental Policy Act (NEPA) document. For example, PEL studies could include the feasibility of project alternatives, tiered environmental studies, and refinement of the project's purpose and need. The regulatory authority to use planning information in NEPA was explicitly clarified in SAFETEA-LU, including the flexibility of funding that agencies can use.

A PEL study is particularly useful when there is a large study area and it's unlikely that funding will be available to address all the issues or the entire area in a single project, as is the case with this PEL study. The PEL allows for comprehensive evaluations of the whole study area to identify and prioritize smaller independent projects within the study area that can then be addressed one at a time, sometimes referred to as "tiering".

The development or use of a PEL is not required, however the Federal Highway Administration (FHWA) encourages their use, in part, because of the benefits that the PEL process provides, such as:

- Elimination or minimization of duplicative efforts in the planning and NEPA processes.
- Enhanced community involvement by providing the public an early opportunity to assess the project elements and engage in meaningful discussions on future (tiered) projects in a manner that is more accountable and responsive to the community.
- Facilitates decisions, analysis, and documentation to advance NEPA, including the purpose and need statement, development of preliminary alternatives, elimination of unreasonable alternative, analysis of potential impacts, and documentation of how decisions were made.
- Enhanced early consultation, improved communications, and collaboration among partner agencies to identify potential impacts. Resulting in better and mutually beneficial project outcomes and timely permit decisions.
- Accelerated project delivery.

To be viable in NEPA, a PEL study must involve interested state, local, tribal, and federal agencies as well as the public; document relevant decisions in a form that is identifiable and available for review during the NEPA process, and; can be appended to or referenced in the NEPA document.

Additionally, for a PEL study to be incorporated by reference into the NEPA document it must be in compliance with the ten statutory conditions listed 23 U.S. Code §168 - Integration of planning and environmental review (Section 168). One of which is to provide public notice that the resulting planning products may be adopted during a subsequent environmental review (NEPA) process in accordance with Section 168. [1]

Accordingly, the DOT&PF is providing public notice that the Copper River Highway PEL may be adopted during the subsequent NEPA process in accordance with Section 168.

[1] https://www.law.cornell.edu/uscode/text/23/168

# Purpose and Need

The purpose of this PEL is to advance planning analyses, which will be used in support of, and may be adopted by reference in the requirements under NEPA, in order to reconstruct, repair, and replace the damaged transportation infrastructure along a segment of the Copper River Highway (CRH), from approximately Milepost (MP) 27 through approximate MP 51 (Figure 1).

The CRH was constructed between 1945 and 1964, largely upon segments of the abandoned railbed of the Copper River and Northwestern Railway, which lead to the former copper mines in Kennecott, Alaska[2]. From Cordova, the highway is orientated in a general east/northeast direction. The CRH crosses the active alluvial plain of the lower Copper River at Flag Point, MP 27, and extends through approximately MP 38. The highway's alignment then turns to a north-south direction and runs along the eastern side of the Copper River's alluvial plain until it once again crosses the river, via the Million Dollar Bridge. Within the PEL study area are 12 bridges, including the Million Dollar Bridge (Figure 1). Of these 12 bridges, 11 cross the lower Copper River Delta; they range in lengths from 240 feet to 1,200 feet, and some have spur dikes installed at their locations. The Million Dollar Bridge is 1,550 feet long and has icebreakers installed as part of its design to protect Pier 1 and Pier 2 from icebergs that are calving off of Miles Glacier and being transported downstream by the river.

Maintaining the existing transportation infrastructure throughout the PEL study area is problematic, at best. This is primarily due to the powerful dynamics of the Copper River's fluvial processes that are constantly changing the river's braided stream channels and alluvial plain, including scour of the streambed, deposition of sediments, channel migrations, and loss of streambanks to erosion. Damage to the CRH's infrastructure can be directly attributed to the changes in the alluvial system of the lower Copper River, with the exception of the Million Dollar Bridge which has its own unique set of circumstances. [3]

The project need is that in August 2011 the DOT&PF was forced to close one of the 11 bridges that cross the lower Copper River Delta, National Bridge Inventory Number (NBI #) 339, after DOT&PF engineers determined that deep scour of the riverbed had undermined the bridge's support piers and greatly compromised its structural integrity. As such, the DOT&PF closed NBI #339 for public safety reasons. The deep scouring at this bridge, as much as 50 feet, is attributed to additional water from one of the channels of the Copper River being diverted westward through natural fluvial processes, which was accelerated during an October 2006 flood event. [4] Then, during October 2012 and before the DOT&PF was able to make the necessary repairs to this bridge structure, the increased channel flow breached the highway at the bridge's east end. Over the following years this increased flow resulted in the land and segment of the roadway that had previously connected NBI #339 with NBI #340 to be completely eroded away and is now occupied by this active channel, a distance of approximately 1,110 feet. This bridge crossing still remains closed today.

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[2] Alaska Heritage Resource Survey (AHRS), AHRS Number COR-00576; Alaska Department of Natural Resources, Office of History and Archaeology

[3] Brabets, T.P., 2012, *Hydrology and Modeling of Flow Conditions at Bridge 339 and Mile 38-43, Copper River Highway, Alaska*; U.S. Geological Survey Scientific Investigations Report 2012-5153, page 4.

[4] ibid

Additionally, over the past four decades one of the main channels of this braided river has been migrating eastward toward the CRH and is now both threatening and directly impacting segments of the highway from around MP 38 through MP 45. During the fall of 2018 erosion from this channel breached the highway between MP 44 and MP 45 (Figure 2). As of September 4, 2019 approximately 2,875 feet of the CRH has been lost to erosion along this segment and the erosion limits have advanced beyond DOT&PF's ROW, which is defined at this location as 300 feet (150 feet from each side of the road's centerline). The erosion from this channel is also threatening to washout a segment of the CRH between MP 43.5 and MP 44, and during high water events the roadway is often overtopped by the river at various locations between MP 38 through MP 43.5 due to the road's low elevation. [5]

Furthermore, during August 2016 a large iceberg struck and damaged the ice breaker protecting Pier 1 on the Million Dollar Bridge, a resource listed on the National Register of Historic Places (NRHP). During July 2019, a high water event moved this ice breaker further downstream; at its current location it no longer provides protection to Pier 1. Without the protection of the icebreaker the bridge pier is exposed to the full energy of impacts from icebergs, creating a scenario for structural damage to the Million Dollar Bridge. This would be in addition to the damage of the bridge structure caused by the 1964 Good Friday Earthquake, which has yet to be fully repaired. Additionally, computer analysis indicates that Pier 1 and Pier 2 are vulnerable to failure. In part, this is due to the variable quality of the concrete, which has cold joints at unknown locations throughout the piers and no rebar reinforcement. [6]

Also, there are 25 culverts within the highway segment of the PEL study area, from Flag Point (MP 27) through Abercrombie Creek (MP 51); the majority of which have been damaged from various factors, including age. The Alaska Department of Fish and Game (ADF&G) has evaluated these 25 culverts and determined that none of them are likely to be adequate for fish passage requirements. [7] Additionally, 6 of these 25 culverts have been determined to be critical because they are inadequate for fish passage (Figure 4). [8]

The loss of infrastructure has had a negative effect on the commerce in the Cordova area due in part, to the diminished revenue generated from tourism; many of whom come each spring to witness the largest gathering of shorebirds in the western hemisphere and to participate in the annual Copper River Delta Shorebird Festival. Prior to the loss of this infrastructure, approximately 6000-9000 people visited the U.S. Forest Service's (USFS) Childs Glacier Campground and Recreation Area annually. In 2007, the USFS renovated this camp ground and recreational area, the costs of these renovations were approximately $2,200,000. Without access to this highly used federal recreation area the investments made to date for the development and construction of the Childs Glacier Campground and Recreation Area is at risk of being wasted and continued maintenance of this site is both diminished and more costly because of lack of access.

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[5] Brabets, T.P., 2012, *Hydrology and Modeling of Flow Conditions at Bridge 339 and Mile 38-43, Copper River Highway, Alaska*; U.S. Geological Survey Scientific Investigations Report 2012-5153, page 1.
[6] Environmental Assessment, *Copper River Highway Million Dollar Bridge BH-0851(62)/60803*, U.S. Department of Transportation Federal Highway Administration, page 4.
[7] https://adfg.maps.arcgis.com/apps/webappviewer/index.html?id=f5aac9a8e4bb4bf49dc39db33f950bbd
[8] ibid

The Copper River Delta is one of the most important fisheries in the state. The salmon migrating into the Copper River are a significant resource for subsistence, commercial, and sport fisheries. Subsistence-caught fish provide an important food staple for rural residents and are an integral part of the Alaska Native culture. The loss of the road infrastructure within the CRH PEL study area has greatly diminished access to prime subsistence hunting and fishing areas.

The Native Village of Eyak and the ADF&G conduct ecological research within the CRH PEL study area, which include the operation of a fish wheel to collect biological samples from salmon and the operation of a sonar station at Miles Lake, near the Childs Glacier Campground and Recreation Area. The sonar station is used to estimate salmon escapement in the Copper River between the beginning of May and the end of July annually. This project is vital to the management of commercial, subsistence, and personal use salmon throughout the entire Copper River Watershed. There are 900 commercial fishing permit holders for the Copper River and other Northern Gulf waters that rely on this data when making decisions on fishing openers. The U.S. Geologic Survey (USGS) also conducts hydrologic research of the Copper River, with one of their monitoring stations sited at the Million Dollar Bridge, in support of the fisheries. The loss of the road infrastructure to this area has greatly increased the costs of these research programs.

Additionally, the Million Dollar Bridge is listed on the NRHP. Because the DOT&PF is the owner of the bridge and has used state and federal funds to make repairs to the bridge, DOT&PF has an obligation to protect this local, state, and national resource. Allowing the Million Dollar Bridge to deteriorate is not responsible stewardship and needs to be addressed.

# Project Elements

- Reestablish public access across NBI #339 and its associated washout, approximate MP 36.
- Reestablish public access across a segment of the CRH that has been completely eroded away by the Copper River, between approximate MP 44 through MP 45.
- Acquire ROW, dependent on the alternative selected to address the loss of the highway segment between approximate MP 44 through MP 45.
- Repair or replace the icebreaker at Pier 1 of the Million Dollar Bridge and complete any necessary repairs to this bridge that might be identified through future engineering studies.
- Replace culverts that are not in compliance with the Memorandum of Agreement between the ADF&G and the DOT&PF for the design, permitting, and construction of fish passage culverts.
- Expand or develop new material sites, including consideration of a potential granite quarry on land owned by The Eyak Corporation (surface estate) and Chugach Native Corporation (subsurface).
- Determine the logistics that will be required to get the heavy equipment needed to construct the projects to their respective sites, including development of project staging area(s) for construction materials, fuel, equipment, and possible work camp.

# PEL Study Area

The Copper River Highway PEL study area's boundary is depicted in Figure 1 and is described as follows:

The southern boundary is defined as the area around the CRH's northeast-southwest alignment, from Flag Point on the west and extending east to approximate MP 38 where the highway turns to a north-south alignment. Flag Point is located at approximate MP 26.5 and within Section 32, Township 16 South, Range 2 East, Copper River Meridian, U.S. Geological Survey (USGS) Quad map Cordova B-3; or approximately 60.44564 North Latitude, -145.08718 West Longitude (NAD 83). MP 38 of the CRH is located within Section 35, Township 15, Range 3 East, Copper River Meridian, USGS Quad map Cordova B-3; or approximately 60.52827 North Latitude, -144.80507 West Longitude (NAD 83).

The northern boundary of the study area is the project's termini, located at approximate MP 51 on the right bank of Abercrombie Creek, aka Grinnell Creek, and; within Section 32, Township 13 South, Range 4 East, USGS Quad map Cordova C-2; or approximately 60.70626 North Latitude, -144.71945 West Longitude (NAD 83).

The western boundary follows along the right bank of the Copper River, from Flag Point north past Childs Glacier to the Million Dollar Bridge, then continuing north along the CRH and ending at the right bank of Abercrombie Creek.

The eastern boundary flanks along the base of the Chugach Mountains, east and north from approximate MP 38.5 and extending to the southern margin of Miles Lake. The eastern boundary deviates slightly to encompass a granite outcrop that has potential to produce Class IV riprap as well as crushed aggregate surface coarse. The granite outcrop is located approximately 2.25 miles east of MP 40.5 on the south wall of an unnamed valley carved out by the McPherson Glacier, and within Section 20 and Section 21, Township 15 South, Range 4 East, Copper River Meridian, USGS Quad map Cordova C-2; or approximately 60.55521 North Latitude, -144.71025 West Longitude (NAD 83).

# Preliminary Alternatives

The preliminary alternatives presented below addresses each project element as a separate action. The consideration of alternatives for each element includes the no-build alternative.

## Preliminary Alternatives to Reestablish Access Across NBI #339 and its Associated Washout

**Background:** NBI #339 is located at MP 36.2 and was built in 1977. It is 401 feet long and its driving surface width, including shoulders, is 28.5 feet wide. The bridge has 5 spans that are 80 feet in length. There are 6 supports spaced approximately 80 feet apart and each pier consists of 2 steel piles. The bridge has concrete pier caps, pre-stressed concrete double-tee girders, and concrete decking.

As previously mentioned, the DOT&PF closed NBI #339 in 2011 for safety reasons because deep scour occurring in this river channel had undermined the bridge support piers. Subsequent erosion from this river channel has completely washed away the land and segment of the highway that had previously connected NBI #339 with NBI #340. Currently, the width of this active channel, at ordinary high water (OHW), is about 1,110 feet.

The USGS measured the channel flow through NBI # 339. Beginning in early 2011, the USGS determined that about 40 percent (%) of the total flow of the Copper River passed through the channel at NBI # 339 but by mid-August 2011, 64 % of the Copper River's total flow passed through the NBI # 339 channel. [9] NBI # 339 was not designed to convey this amount of flow. [10]

**Alternative 1**

The DOT&PF considered this alternative in 2014, in conjunction with The National Constructors' Group (NCG), who was contracted by the DOT&PF to assist in analyzing its constructability and costs. NCG's report, titled *Constructability Analysis Report Copper River Highway NBI #339*, dated February 11, 2014 is on file at DOT&PF's Northern Region office and is available upon request.

This design proposes a new bridge that is 1,540 feet long and 31 feet wide. Its design consists of 11 spans that are 140 feet and each span is founded upon a pier that is a single 8 feet diameter drilled shaft 170 feet in length and having a hammer head substructure. The superstructure consists of 66 precast concrete "bulb-tee" girders, weighing 80 tons each.
After the new bridge is completed, NBI #339 and NBI #340 would be demolished because they would no longer be used and are within a navigable waterway, as defined by the U.S. Coast Guard (USCG).

In order to build Alternative 1, a temporary construction access trestle, approximately 1,400 long, will need to be constructed downstream of the proposed bridge. A large crane, similar in size to a Manitowoc model 2250, will be required to place each of the 66 precast concrete "bulb-tee" girders across the 140 feet long spans.

A hydraulic casing oscillator would be used to install the drilled shaft piers. As such, an oscillator platform would be constructed at each pier and adjacent to the access trestle for this purpose. Additionally, a service platform would be constructed between each pier for a second smaller crane, similar in size to a 70 ton Grove RT770E Rough Terrain Crane, to support the hydraulic casing oscillator. The oscillator and crane service platforms are proposed, in part, because of the short construction season and the need to construct the main access trestle concurrently with the drilled shaft piers.

A wide track Manitowoc 2250 crane is 27 feet wide. Therefore, the construction of the access trestle would need to be at least 37 feet wide in order to provide a minimum separation distance of 5 feet between the crane's tracks and the outside edge of the work trestle. The smaller crane,

[9] Brabets, T.P., 2012, *Hydrology and Modeling of Flow Conditions at Bridge 339 and Mile 38-43, Copper River Highway, Alaska*; U.S. Geological Survey Scientific Investigations Report 2012-5153, page 25.
[10] Brabets, T.P., 2012, *Hydrology and Modeling of Flow Conditions at Bridge 339 and Mile 38-43, Copper River Highway, Alaska*; U.S. Geological Survey Scientific Investigations Report 2012-5153, page 1.

using the dimensions of a Grove RT770E Rough Terrain Crane with its outriggers fully extended is 23.34 feet wide and 42.32 feet long.

Therefore, the cumulative widths of the existing bridge (29 feet), the new replacement bridge (31 feet), and the main work trestle (≈ 37 feet), plus the oscillator and smaller crane's work platforms (≈ 50 feet), and the separation distances between the structures means that Alternative 1 would exceed DOT&PF's ROW and encroach into the Copper River Delta Critical Habitat Area, a protected resource under Section 4(f) of the U.S. Department of Transportation Act of 1966, as amended. The DOT&PF's ROW at this location is 200 feet (100 feet on each side of centerline).

A variation to Alternative 1 could be to construct the new bridge and its associated work trestle and platforms upstream from NBI #339 to avoid "use" of the Section 4(f) property. The project actions would still extend outside of DOT&PF's ROW, but the temporary encroachment would be outside the northern boundary of the Copper River Delta Critical Habitat Area and onto federal land, managed by the USFS.

In 2014, the cost of Alternative 1 was estimated at $49,000,000. However, the cost did not include the bridge abutment slopes protection, soil investigation, design and construction inspections, nor did it include a costs estimate for the demolitions of NBI #339 and NBI #340.

Three options were proposed for the protection of the bridge abutment slopes.

1. Install sheet pile walls; 2014 cost estimate was $8,065,770.
2. Install riprap; 2014 cost estimate was $2,433,390.
3. Install concrete blocks (dolos); 2014 cost estimate was $4,800,000.

The DOT&PF estimates the cost of the bridge demolitions, given their relatively remote locations, would be approximately $1,000,000/100 feet. NBI #339 is 401 feet long and NBI #340 is 241 feet long, thus $6,420,000.

**Alternative 2**

Alternative 2 was also proposed in 2014 in conjunction with the NCG. This alternative's design proposes a new bridge that is 1,400 feet long. It consists of 14 spans having distances of 100 feet each. There are 15 piers, each pier consists of two 4 feet diameter driven pipe pile that are 150' in length with a precast concrete pile cap. The superstructure consists of precast concrete box girders having dimensions of 3.5 feet wide by 5 feet deep. NBI #339 and NBI #340 would be demolished as part of his alternative because they would no longer be used and are within a navigable waterway.

In order to build Alternative 2, it's proposed that two construction access trestles be constructed along the same alignment as the proposed replacement bridge, one trestle on each side of bridge. The trestles would include rails for the primary hoisting equipment to travel on, which would be a 225-ton straddle carrier gantry crane. As segments of the permanent bridge superstructure are completed those segments will providing the access road required for all material handling. Using this method of construction would allow the new bridge and its associated trestles to remain inside DOT&PF's ROW.

In 2014, the cost of Alternative 2 was estimated at $36,000,000. Similar to Alternative 1, the estimate did not include the costs for the bridge abutment slopes protection, soil investigation, design and construction inspections, nor did it include a costs estimate for the demolitions of NBI #339 and NBI #340.

**Alternative 3**

Alternative 3 considers repairs and extension to existing NBI #339. As previously mentioned, NBI #339 was closed in 2011 because the deep scour occurring in this river channel had undermined the bridge support piers. Since that time, the river's sediments have filled the scour holes that initially caused the bridge to be declared unsafe for public and private use. The streambed sediments at this location ranges from coarse sand to fine and medium grained gravel.[11] Although the scour holes have filled, the DOT&PF determined that the piers did not retain adequate friction or lateral capacity in the case of a seismic event, nor had it significantly reestablished the vertical pile resistance.

Therefore, in order to utilize the existing bridge, new large diameter piles would need to be driven deep into the alluvium on the outboard side of the existing piers. A new pile cap beam would be built between the new piles and around the existing cap beam. The existing piles would then be cut free and removed. This process would be repeated for each pier until the end of the bridge is reached. The existing NBI #339 is 401 feet long and the channel at this location has expanded to approximately 1,110 feet wide at OHW. As such, the bridge would need to be extended at least another 710 feet.

NBI #339 is 29 feet wide from its outside edge to outside edge. If the existing bridge is to be used as the work platform, required for material handling and construction equipment, then only a small crane would fit. A small crane, similar to a Tadano model GR-350XL Rough Terrain Crane, with its outriggers fully extended is 20.7 feet wide. Its load capacity is 17.35 tons with its boom extended 20 feet at a 34°angle; if the boom is extended to 40 feet at a 0° angle its load capacity is reduced to 9.35 tons. As such, a small crane would only be able to set bridge girders across small spans. Therefore, the closely spaced piers would essentially act as a large strainer, creating barriers to vegetative debris and ice flows, particularly during spring break-up. The navigation opening at the bridge crossing would also be significantly reduced.

A variation to Alternative 3 would be to construct a temporary work structure downstream from NBI #339 so that a large crane could be used to install 100 feet spans and larger superstructure.

**Alternative 4**

Alternative 4 considers the construction of a suspension bridge. A suspension bridge suspends the roadway from huge main cables, which extend from one end of the bridge to the other. These cables rest on top of high towers and have to be securely anchored into the bank at either end of the bridge. The towers enable the main cables to be draped over long distances. Most of the weight or load of the bridge is transferred by the cables to the anchorage systems. These are imbedded in either solid rock or huge concrete blocks. Inside the anchorages, the cables are

[11] Brabets, T.P., 1997, *Geomorphology of the Lower Copper River, Alaska*; U.S. Geological Survey Professional Paper 1581, page 72.

spread over a large area to evenly distribute the load and to prevent the cables from breaking free.

Suspension bridges are more expensive to build than girder bridges. Additionally, based on geotechnical investigations completed at the site, the DOT&PF determined the unconsolidated sandy soils coupled with the shallow groundwater table would be problematic for constructing a concrete anchorage system and that anchoring the cables directly into bedrock is not feasible because of its depth.

Furthermore, it's likely the design height of the suspension bridge towers would exceed 200 feet above the ground level. So as not to impair aviation safety to the numerous aircraft that fly through this area, the DOT&PF anticipates the Federal Aviation Administration (FAA) will require the towers to be lighted in order to alert approaching aircraft of its presence. Therefore, an energy source will be required for the tower lights. It is also anticipated that the bridge cables will be required to have high-visibility sleeves and/or high-visibility aviation orange marker balls installed on them.

**Alternative 5**

Alternative 5 considers the construction of a stay cable bridge. The design of a stay cable bridge is similar to that of a suspension bridge, as they both have towers that help to support the structure and the bridge deck is held in place by huge main cables. The principle difference is that the cables of a stay cable bridge hold the bridge deck by connecting it directly to the support pillars instead of using a suspension bridge type anchorage systems.

Although the initial cost of a stay cable bridge is cheaper to construct than a suspension bridge the routine maintenance for this type of bridge is intensive and its required ongoing maintenance will eventually exceed those savings. [12] Of bigger concerns is that stay cable bridges tend to sway during high-speed crosswinds, like those that occur in the Copper River Delta. Not only does this create hazardous driving conditions but over time it loosens the bridge support cables, making it possible for the structure to eventually fail. [13] Thus, underscoring the importance of ongoing inspections, maintenance, and associated costs for this type of bridge structure.

**Alternative 6**

Aerial ropeways, aka aerial tramways or cable propelled transit systems have been used for more than 2,000 years[14]. Prior to the 20th century their use was primarily for transporting cargo. Today aerial ropeways are mostly used to transport people across difficult or impassable terrain. They are also becoming an increasingly popular solution for urban transportation in order to reduce traffic congestion and/or travel patterns through environmentally sensitive areas. Aerial ropeways are still used for transporting cargo, particularly by the mining industry. Aerial ropeways designed for freight are capable of transporting individual loads up to 40 tonnes (88,185 pounds) on specially designed carriers, and span distances of almost 1 mile (1,500 m)

[12] https://connectusfund.org/6-advantages-and-disadvantages-of-cable-stayed-bridges
[13] ibid
[14] http://www.theelevatormuseum.org/f/f_5b.htm

without the need of intermediary stations [15]. Additionally, aerial ropeways can operate during inclement weather conditions and wind speeds up to 62 miles/hour (100km/h). [16]
There are a lot of subtle variations of aerial ropeway technologies, the primary distinction is that the system can be divided in two groups, monocable and bicable systems.

A monocable ropeway is one where the carrier is attached directly to a single rope (steel cable) by either a fixed gripping mechanism or a detachable gripping mechanism. This single rope provides both the carrying and propulsion functions. A variation to this design is the double monocable ropeway, where the carrier is attached directly to two parallel carrying-haul ropes. The funitel type carrier employs this type of design, where the carrier has two overhead arms attached directly to the two carrying-haul ropes, this configuration provides more stability in high winds.

Bicable or tri-cable systems (3S) has one or two stationary track ropes that the carriers' bogey wheels runs along, much like the wheels of a train would run along its rails. The carriers' propulsion is supplied by a hauling rope that the carrier is attached to by either a fixed or detachable gripping mechanism.

Utilizing aerial ropeway technology would provide public access, including compliance with Americans with Disabilities Act, across the washout out NBI #339 as well as the ability to transport small cargo items along with its passengers, items such as wheelchairs, bicycles, cross-country skis, backpacks, and photography, sport fishing and camping gear. Additionally, if specialized freight carriers were incorporated into the system then it would enable up to 88,185 pounds of freight per load to be transported across this washout, including a small dozers, tractor-trailer, duty light duty vehicles, four wheelers, side-by-side ATVs, and utility trailers. Taking this idea further, an aerial ropeway could be constructed along the NE-SW alignment of the CRH, from the washout at NBI #339 past NBI #345, a distance of approximately 2 miles. This would eliminate the need for maintenance, repairs, and/or replacement to bridges #339, #342, #344, and #345. These referenced bridges could then be demolished because their use would no longer be required and they cross over a navigable waterway.

The costs to construct an aerial ropeway is about 2/3 of what it would costs to construct a bridge, provided that bridges are a feasible option. Although aerial ropeway are a reliable proven technology, there are a lot of moving parts in the system's components and there is considerable fatigue of the cables over time. As such, aerial ropeways require nearly round-the-clock maintenance, repairs, and replacement, which is generally expensive and time consuming. For that reason, maintenance stations are built onsite as part of its infrastructure and engineers and maintenance staff are onsite at all times during operation. Additionally, carrying out rescue operations are difficult, particularly if the carrier is suspended over the Copper River.

Furthermore, heavy equipment required for maintenance and repair of the area within the CRH PEL study area would not be able to be transported across the washout by the aerial ropeway. Aerial ropeways also require electrical power to operate and safety standards for this technology requires a duplicate power source in case one of its electrical generators fail. The ropeway

[15] https://www.doppelmayr.com/en/products/material-ropeway/
[16] ibid

towers will also need to be lighted in order to alert approaching aircraft of their presence and the system's cables will need to be highly visible for the same reason.

**Alternative 8**
The No-Build Alternative would retain the *status quo*, as no attempts to reestablish access across NBI #339 and its associated washout would occur. Funding that could potentially be used to meet the state's project costs share requirements under the federal program funds would remain in DOT&PF's general fund until allocated to a different project(s) that are listed in the Alaska Statewide Transportation Improvement Program (STIP), with exceptions.

However, it should be noted that DOT&PF's funding disbursements do not provide for preference to specific regions or communities. Therefore, there is no guarantee that Cordova's transportation infrastructure would directly benefit from the money saved under the No-Build Alternative.

Depending on the particular federal program requirements, the state's match requirement generally ranges between 9.03% through 20%. For projects along the CRH the state's match requirement is 9.03%. As an example, if a proposed project along the CRH costs 55 million dollars, similar to Alternative 1 above, then the state's match requirement would be $5,115,000. As such, if no money is spent to reestablish access across NBI #339 and its associated washout then that $5,115,000 would remain in DOT&PF's general fund until disbursed to other projects listed in the STIP.

The combined aspects of the washout and leaving the bridge in its current condition means that routine maintenance and necessary repairs to the infrastructure beyond this point would not be made, resulting in the continued degradation of the CRH.

Furthermore, the DOT&PF is the owner of the 12 bridges within the PEL study area, as well as the highway and its underlying culverts. Due to liability issues, as well as statutory obligations with federal and state agencies, the DOT&PF is not able to simply abandon this segment of the CRH, which over time could eventually result in the bridges collapsing into the Copper River as well as the continued impairment to fish passage. Therefore, the cost of bridge demolitions, or clean up if any collapse, in addition to culvert removals could offset the cost savings realized to the state from the No-build Alternative.

## Preliminary Alternatives to Reconstruct or Realign the CRH at the MP 44-45 Washout

**Background**: As previously stated, over the past forty years one the main channels of the Copper River has been migrating eastward, and as of September 2019 it had completely eroded away an approximate 2,875 linear feet (lf) segment of the CRH between MP 44 and MP 45 (Figure 2). Additionally, the erosion limits have advanced beyond DOT&PF's ROW and now extends into land owned by The Eyak Corporation (TEC). In 2019, TEC posted No Trespassing signs along this area to prevent public access through their land, largely due to public safety concerns and liability issues. Erosion continues to impact the CRH at this location and the area is still closed to access across it.

Additionally, the erosion from this channel is also threatening to washout a segment of the CRH between MP 43.5 and MP 44. Furthermore, during high water events the CRH is often overtopped by the Copper River at various locations between MP 38 through MP 43.5.

It is DOT&PF's preference that regardless of the alternative selected, the new infrastructure would last 20 years or more under normal routine maintenance. It is also important to note that every alternative considered below, except the No-build, will require heavy equipment and construction materials to be transported to the project site, at this time the site is inaccessible for overland transport.

**Alternative 1**
This alternative proposes reconstruction of the road back into its original alignment which existed before it was eroded away. The segment of roadway lost to erosion between MP 44 and MP 45 was measured on September 4, 2019 to be 2,875 lf. At that time, the river's cut bank had advanced 30 feet beyond DOT&PF's eastern ROW boundary, DOT&PF's ROW at this location is defined as 150 feet from each side of the road's centerline (300 feet). The face of the cut bank was estimated to be 20 feet high and the depth of the river at this location was estimated to be 3 to 4 feet deep. Therefore, at a minimum, 843,333 cubic yards (cy) of Class IV riprap would be required to construct the road back into its original alignment; using the dimensions of: 2,875 feet long X 330 feet wide X 24 feet high = 843,333 cy.

DOT&PF's standard material specification for Class IV riprap include the requirements that over 50% of the rocks need to weigh greater than (>) 2,000 pounds and up to 10% of rocks need to weigh > 5,400 pounds. The riprap being installed along the western boundary of the ROW, adjacent to the river, will need to be keyed-in to the river's bed in order to inhibit scour. Incorporating spur dikes into the design would also be considered in order to divert the channel's thalweg further westward from the road.

**Alternative 2**
Under this alternative a new segment of road would be construct around the washout area located between MP 44 and MP 45. The proposed alignment would divert east from the CRH just before MP 44 and tie back into the highway near MP 45, an approximate length of 1.25 miles (Figure 3). This proposed alignment would be constructed on land owned by TEC. Therefore, the DOT&PF would need to acquire ROW from TEC. In September 2019, Red Plains Professional, Inc. (Red Plains), under contract by TEC, estimated the construction cost of Alternative 2 would be $2,547,000.

Alternative 2 is a shorter alignment than Alternatives 3, discussed below, and therefore less ROW acquisition would be required to construct the new segment of roadway, as well as less cost to build it. The disadvantage is that this alternative does nothing to address the potential threat of a washout occurring between MP 43.5 and MP 44. Nor is it certain that Alternative 2 would meet the goal of having the new road segment last 20 years or more, given the accelerated rate of erosion that's occurring along the channel's eastern bank.

**Alternative 3**
Alternative 3 proposes a new segment of roadway be constructed around the washout between MP 44 and MP 45 and the area that is being threatened by erosion between MP 43.5 and MP 44. This proposed alignment would divert east from the CRH near MP 43 and tie back into the highway past MP 45, an approximate length of 2.5 miles (Figure 3). This proposed alignment would be constructed on land owned by TEC, therefore ROW acquisition would be required. In September 2019, Red Plains estimated the construction cost of Alternative 3 would be $2,789,847.

**Alternative 4**
Under this alternative the DOT&PF is proposing to raise the elevation of the road's grade by 5 feet, starting at MP 38 and continuing through MP 43. Then at MP 43 a new road segment would be constructed along the same alignment that's proposed under Alternative 3, above (Figure 3). Additionally, Class III riprap would be installed along the west side of the road's new embankment from MP 38 through MP 43. DOT&PF's material specification for Class III riprap include the requirements that over 50% of the rocks weigh > 700 pounds and up to 10% of rocks need to weigh > 1,400 pounds.

Through a cooperative water study agreement with the DOT&PF, the USGS completed an evaluation of effects that could result from raising the road grade 5 feet higher along the area of MP 38 through MP 43. This study was commissioned, in part, because during high water events this segment of the CRH is sometimes overtopped by the Copper River. As part of this study, the USGS used their Survey Flow and Sediment Transport with Morphologic Evolution of Channels model to simulate water-surface elevation through this area for three flow scenarios, 116,000 cubic feet per second ($ft^3/s$), 174,000 $ft^3/s$, and 400,000 $ft^3/s$. The USGS concluded, based on the results of their models, that the CRH would not be overtopped by the river if the road's elevation was raised 5 feet along the area of MP 38 through MP 43.[17] The preliminary cost estimate for Alternative 4 is $18,450,000.

Alternative 4 would meet the criteria of lasting 20 or more years. Its proactive approach of raising the road grade from MP 38 through MP 44 would be a safeguard against travelers being stranded on the wrong side of the CRH in the event that the river overtops the roadway during a high water event. Additionally, because the action raising the road grade would occur on the existing road, it would be the least environmentally damaging practicable alternative (LEDPA) when compared to having to reconstruct or reroute this segment of roadway should it be lost to the impending erosion that is occurring in this area.

**Alternative 5**
Alternative 5 is the No-build Alternative. Under this alternative no money would be spent to reestablish access across the MP 44 through MP 45 washout. Any persons wanting to skirt around this washout area, via traverse over TEC land, will need prior authorization from TEC, otherwise it would be trespass. Additionally, there would be no attempts to address the potential loss of roadway near MP 43.5 from the channel's eastern migration in this area, nor would there

[17] Brabets, T.P., 2012, *Hydrology and Modeling of Flow Conditions at Bridge 339 and Mile 38-43, Copper River Highway, Alaska*; U.S. Geological Survey Scientific Investigations Report 2012-5153, page 25.

be any attempts to address the overtopping and erosion of the roadway by the Copper River during high water events.

## Preliminary Alternatives to Repair the Million Dollar Bridge

**Background**: The Million Dollar Bridge is located at MP 48 of the CRH and within Section 7, Township 14 South, Range 4 East, Copper River Meridian, USGS Quad Map Cordova C-2, or 60.67293 North Latitude and -144.74541 West Longitude (NAD 83). The history of the Million Dollar Bridge has been well documented by past scholars. As such, only a brief summary is provided in this background section below.

The construction of the Million Dollar Bridge started in 1909 and was completed in 1910 as part of the Copper River and Northwestern Railway (CR&NWR). The CR&NWR was a 196 miles long railroad built to haul processed copper ore from the Kennecott Copper Corporation's mining and milling facilities, located in the Wrangell Mountains about 66 miles east of Chitina, to the tidewater port facilities in Cordova. The Million Dollar Bridge is the longest bridge along the CR&NWR. The bridge is 1,550 feet long and rises 30 feet above OHW. It has four spans of Pennsylvania through trusses mounted on three piers. Each pier is a massive six-sided concrete structure that is 55 feet tall and having dimensions of 64 feet long by 21 feet wide at its base and 13 feet wide at its coping. [18] The lower portions of the piers have steel rail track embedded into their outer surfaces to help protect them from being damaged by icebergs that have calved off from Miles Glacier and then floated downriver. However, the main structures protecting the bridge piers from iceberg collisions are two detached concrete ice breakers located slightly upstream from Pier 1 and Pier 2, constructed as part of the original bridge design. These ice breakers are somewhat pyramidal in shape and each are 58 feet long by 33 feet wide and 28 feet high. [19] They also have steel rail track embedded into their outer surfaces to help protect them from iceberg damage.

In 1938, the Kennecott Copper Corporation shut down their mining operations in the Wrangell Mountains and abandoned the CR&NWR. Circa 1950, the Alaska Road Commission started removing the rail tracks from the CR&NWR and slowly began converting the former railroad bed and its associated bridges into the CRH. However, it wasn't until 1962 that the then, Alaska Department of Highways, converted the Million Dollar Bridge into a highway bridge by removing the old railroad tracks and installing an 18 feet wide concrete bridge deck and guardrails.

On March 27, 1964, the Million Dollar Bridge sustained substantial damage during the devastating 9.2 magnitude Good Friday Earthquake. As part of its earthquake damage, Span 3 was shifted 12.5 feet north and 4.5 feet east, damaging its bottom chord. The upper portion of Pier 3 was offset 3 feet from its bottom portion. Span 4, which is the northern most span, was sheared off from Pier 3 and its southern end fell into the river. The rivets on bridge's north abutment, Abutment 2, were sheared and the abutment's concrete was broken. Numerous cracks were also identified throughout the bridge's super and substructure. [20]

[18] United States Department of Interior-National Parks Service, Form 10-900, National Register of Historic Places Registration Form, OMB No. 1024-0018, February 16, 2000, page 5.
[19] ibid
[20] ibid

In 1973, the Alaska Department of Highways made repairs to the bridge that included construction of a ramp that connected Span 3 with the downed Span 4, and; removal of several bridge members, sway bearings, and two panels on the top laterals in order to provide overhead clearance for vehicles. Additionally, two temporary false bents were erected to support the super-structure should Pier 3 fail. In the fall of 1995, a high water event destroyed the eastern false bent at Pier 3, which was repaired the following year. [21]

In 2000, the Million Dollar Bridge was listed on the NRHP for its significance under Criterion A and under Criterion C. Criterion A is defined as: Properties that are associated with events that have made a significant contribution to the broad patterns of our history. Criterion C is defined as: Properties that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The Million Dollar Bridge is also listed on Historic American Engineering Record for landmark American bridges.

Beginning in October 2003 and completed in the spring of 2005, the DOT&PF constructed a new bridge pier to replace Pier 3, which had been damaged beyond repair during the Good Friday Earthquake. After its completion, the DOT&PF raised the fallen span, Span 4, back onto the new Pier 3. The DOT&PF also replaced the damaged and missing bridge members with newly fabricated parts, which resembled, to extent practicable, the original bridge materials and installation methods (workmanship) so as to maintain the bridge's historic integrity.

In August 2016, a large iceberg struck and damaged the ice breaker protecting Pier 1 on the Million Dollar Bridge. Then, during July 2019, a high water event moved this ice breaker further downstream. At its current location it no longer provides protection to Pier 1. As previously stated, without the protection of the icebreaker the bridge pier is exposed to the full energy of impacts from icebergs, creating a scenario for structural damage to the Million Dollar Bridge.

Every alternative considered below, with the exception the No-build Alternative, will require heavy equipment and construction materials to be transported to the project site, at this time the site is inaccessible by overland transport.

**Alternative 1**

Under Alternative 1, the DOT&PF proposes to install flat, precast concrete slabs that would be stacked or "pancaked" on top of each other in order to construct a new ice breaker at Pier 1. As part of this design, each slab would have guide holes to keep them aligned as they are lowered through steel piles that would be installed around the ice breaker's original caisson. After all the stacking is complete, the guide holes in the slabs would be grouted with concrete. A temporary work trestle would be required to construct this structure. The DOT&PF anticipates this alternative would cost approximately $25,000,000 per ice breaker.

[21] ibid

**Alternative 2**
Under Alternative 2 the DOT&PF proposes to install three 12-feet diameter steel-cased drilled shafts in front of Pier 1 to serve as a replacement ice breaker. The DOT&PF estimates the cost would be around $30,000,000 per ice breaker.

Disadvantages of this alternative includes the need to construct a temporary work trestle, the need for thick large diameter casing which is not readily available, and the need for large specialty equipment, such as a hydraulic casing oscillator.

**Alternative 3**
Under this alternative, the DOT&PF proposes to construct two islands consisting of large riprap, or precast concrete equivalent (aka dolos), in order to protect Pier 1 and Pier 2 of the Million Dollar Bridge from iceberg damage. Given the force of the Copper River, each piece of riprap would need to weigh 6,000 to 7,000 pounds (lbs.) so as not to be moved by the river. DOT&PF's preliminary costs estimate is about $10,000,000 per island. However, these islands are considered sacrificial, as loss of the riprap would occur over time due to the natural chemical and physical weathering processes, including abrasion from the vast amount of suspended sediments in the river and potential dislodgements by ice. As such, maintenance of these structures and their associated costs would be required as needed.

This approach has been successfully been used at other bridges to protect the structures from being damaged by vessels colliding onto their respective piers. However, these other bridge locations do not have the logistical challenges that the Million Dollar Bridge does, as they are accessible by barge.

Two construction methods are proposed to install these riprap islands. One method would be to construct the islands during the winter when the river is completely frozen over. This would have the least impact on the river's biological environment. The challenges associated with this approach, in part, is that the ice needs to be cleared from the area where the riprap islands will be installed while at the same time their parameters need to have sufficient ice thickness to safely support the weight of the equipment needed to construct these islands. The ice can be thickened utilizing ice road building techniques but only if there is no open water, as it is not possible to thicken ice where none exists. During January 2019, there was still open water under the Million Dollar Bridge and within other channels downstream from the bridge (Figure 5).

The second method would be to construct the riprap islands during the late fall utilizing at least two shallow draft river barges; one barge would be used to support a small crane and the other to transport riprap. Since the lower Copper River Delta is too shallow for a barge to travel up its waters, the barges would have to be transported overland to the Million Dollar Bridge, where they could then be launched into the river. Complicating this further is that even if the CRH was accessible all the way to the Million Dollar Bridge, which it's not, the existing bridges along this route are too narrow to accommodate the width of the barges. As such, the barges would have to be transported around these bridges via ice roads at their respective crossings and then be stored over winter at the project site until they are needed. Additionally, the construction of the islands will be a slow process, in part because the riprap will be placed one rock at a time. Given the river's strong current and the need to have a stable platform for the crane to safely operate, it's

anticipated that the barges would have spuds driven into the riverbed to hold them in place or possibly guide cables stretched across the river and anchored into each bank to help keep them moored, or possibly both.

**Alternative 4**
Under this alternative the DOT&PF proposes to float a precast concrete ice breaker or caisson out to the former location of the ice breaker at Pier 1 then fill it with cast-in-place (CIP) concrete, rocks, or other material to sink in the desired location. This is an unusual approach and the DOT&PF does not have any historical data in which to replicate a design from. The DOT&PF roughly estimates that this alternative would cost around $20,000,000 per float. However, this alternative should include a very high contingency factor if it is advanced for further consideration. Disadvantages include the potential inability to float the structure to the site, need to prepare and level the riverbed, and the likely need for anchoring piles and subsequent work trestle around its perimeter.

**Alternative 5**
Alternative 5 proposes construction of a closed cell sheet pile wall around Pier 1. The DOT&PF anticipates the cost to be about $15,000,000 per cell. This is a more conventional approach but will require an expensive in-water work trestle, a pile driving template to accommodate the high flow velocity, and relatively large diameter cell of about 60 feet to resist the anticipated loads. Driving piles for the work trestle, template, and cellular cofferdam will prove very difficult in the high velocity water and ice loads would be even more difficult to accommodate during construction. Furthermore, the DOT&PF is not sure if the relatively flexible sheet piles can be driven into the streambed, as they may be too long and susceptible to buckling during driving.

**Alternative 6**
Alternative 6 and Alternative 7 (below) were first discussed as possible options to address the damaged ice breaker at Pier 1 after it was identified that it had been dislodged from its caisson in August 2016. Since that time, this ice breaker has moved downstream and is no longer located in a positioned that provides protection to Pier 1. However, the DOT&PF recognizes that the same types of events that damaged the ice breaker at Pier 1 could also occur at Pier 2. Therefore, in order to take a proactive approach to prevent the loss of the ice breaker at Pier 2, the DOT&PF proposes the following two alternatives, which could be implemented in conjunction with the alternative that solely address Pier 1's ice breaker.

Under Alternative 6, the DOT&PF proposes to advance three diamond core borings through the ice breaker at Pier 2 using PQ drill pipe, which has an outside pipe diameter of 4.8 inches. The drill pattern would place two borings on each end of the downstream side of the ice breaker and they would drilled at a 45° angle towards the upstream direction. The third boring would be placed on the upstream end of the ice breaker, it will be drilled at a 45° angle towards the downstream direction. All three boring will be advanced to depths of 150 to 200 feet. After each boring is completed the drill pipes will be filled with cement grout and then entire drill string will be unscrewed from the drill head and left in their respective boring. This alternative would in effect nail or pin the ice breaker in place.

A temporary work trestle, positioned over the ice breaker, would need to be constructed to support the drill rig, its tooling, and other necessary equipment. It is anticipated that each boring could be completed within two to three 12-hour shifts, provided that no steel rails are encountered when coring through the ice breaker or its caisson. A diamond core bit is capable of drilling through steel rails, but the penetration rate will be slow and it's expected that more than one drill bit would be required to complete the boring. The DOT&PF has not developed this alternative in sufficient detail to provide a cost estimate.

**Alternative 7**
The DOT&PF proposes to construct a steel cage framed around steel piles that have been installed around the perimeter of the ice breaker at Pier 2. The DOT&PF has not developed this alternative in sufficient detail to provide a cost estimate. However, since a temporary work trestle would be required to construct this alternative, its cost estimate would be in the general range of what it would cost to implement Alternative 4.

**Alternative 8**
The actions proposed under Alternative 8 have already been determined by the FHWA to have no significant impacts on the human environment; FHWA's Finding of No Significant Impact (FONSI) for Copper River Highway Million Dollar Bridge Project No. BH-0851(62)/60803, issued February 28, 2002, is on file at the DOT&PF Northern Region office and is available upon request. The reasons these actions are included in Alternative 8 is to identify, through public involvement, which project elements and their associated actions should be prioritized in respect to their sequencing, given the availability of funding. Additionally, because the original environmental document, an Environmental Assessment (EA) and its associated FONSI, was approved 18 years ago (November 30, 2001), the DOT&PF will reevaluate these proposed actions against the original EA to ensure they conform to the impact analyses in the original environmental document (EA), that the data contained remains substantially valid, that there are no significant environmental changes, and that all pertinent conditions and requirements of prior approval have been met or will be met in the current proposed actions, discussed below.

The actions proposed under Alternative 8 are to finish repairs to the damaged bridge structure that occurred during the 1964 earthquake. The DOT&PF is also proposing to install seismic retrofits on Pier 1 and Pier 2, and to rehabilitate deteriorated bridge components that have occurred overtime, as the bridge is over 100 years old and has not received any maintenance, routine or otherwise, since 2005.

Specifically, the DOT&PF is proposing to drill vertical holes down through the entire length of Pier 1 and Pier 2 and through their respective caissons. The borings would be drilled from the bridge deck using diamond core or air rotary drilling techniques. High-strength post-tensioning anchor rods, having dimensions of 110 feet long by 1-3/8" diameter, would then be installed inside these borings. The anchor rods would increase the piers' external overturning resistance as well as its internal flexural and shear strength. After the rods are installed, pressurized grouting techniques would be used to inject cement grout, through tremie pipe, to fill any voids within the caissons' cofferdam cribs and any voids within the gravel of the caissons' working chambers, as well as filling the annulus of the borings within the piers. Provided that sufficient strength could be achieved with the steel bars alone and that this alternative could be completed

from the bridge deck without the need for a temporary work trestle, the DOT&PF estimates it would cost approximately $15,000,000 per pier.

Additional actions proposed under Alternative 8 are to install frictional pendulum bearings on Pier 1 and Pier 2 for seismic isolation of the bridge's superstructure; Pier 3 has already had this type bearing installed during its 2003-2005 repairs. The frictional pendulum bearings assembly consists of a concave dish and an articulated slider surface. During an earthquake, the slider moves back and forth on the concave dish, in a motion similar to that of a pendulum, hence its name. In order to install this bearing assemblage the bridge spans will need to be lifted and the existing bearings removed, at that time a bracket system will be used to support the lifting mechanism and the spans will be realigned back to its pre-earthquake position.

The seismic retrofitting and realignment of the bridge's superstructure will require the back wall of the south abutment (Abutment 1) to be adjusted to allow room for the superstructure to move during an earthquake. At that time, repairs of cracks and spalls on this abutment would be completed.

Other actions proposed to restore the bridge's structural integrity would include repairs or replacements, as needed, of the bridge's bottom chords, bottom laterals, missing bolts, tie-rods, and concrete corbels.

Furthermore, the Million Dollar Bridge is in need of a new application of paint to protect its steel from rusting any further. On September 4, 2019, DOT&PF personnel collected three composite samples of paint chips from the bridge and then submitted them for laboratory analysis for lead in paint. The analytical results of these samples confirmed that the existing paint on the Million Dollar Bridge contains lead. Therefore, before the old paint can be removed, in preparation for the new paint, the entire work area will need to be enclosed and a n pressure system with a filter bag at its exhaust will need to be installed. The action of painting the Million Dollar Bridge was not included in the original EA or its subsequent FONSI.

**Alternative 9**

Alternative 9 is the No-build Alternative. Under this alternative no attempts to repair or rehabilitate the Million Dollar Bridge would occur. The bridge would continue to deteriorate, icebergs would continue to strike Pier 1, there would be no attempt to address Pier 1 and Pier 2's vulnerability to structural failure, and there would be no attempt to help protect the bridge from being damaged by future large magnitude earthquakes.

If a bridge pier(s) were to fail or if a bridge span(s) fell into the river there is potential for serious impacts to the navigation of the river, the environment, and scientific research that is being conducted upstream by the Native Village of Eyak, ADF&G, and the USGS. Additionally, depending on the time of year and water level of the river, the wave generated from a collapse would damage infrastructure at the USFS' Childs Glacier Campground and Recreational Site. Anyone located along the shoreline of the campground and recreational site at the time of collapse could be washed into the river. The Childs Glacier Lodge, located closer to the bridge on the opposite bank from the campground but a slightly higher elevation could also be inundated or destroyed.

Due to statutory obligations with federal and state agencies, as well as liability issues, the DOT&PF would have to retrieve the downed span(s). The cost of this endeavor would be extremely expensive and likely cost more than the proposed actions to repair and rehabilitate the bridge.

Furthermore, should a bridge pier and/or span fall into the river, the bridge would most likely be destroyed beyond repair. Because the Million Dollar Bridge is on the NRHP, and because the DOT&PF is the owner of the bridge and has used state and federal funds to make repairs to the bridge, DOT&PF has an obligation to protect this local, state, and national resource. Allowing the Million Dollar Bridge to deteriorate is not responsible stewardship.

## Preliminary Alternatives to Repair the Culverts

**Background**: The ADF&G is solely responsible for maintaining anadromous waters data as well as revision to and publication of the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* and its associated Atlas (AWC). As part of their data set, the ADF&G inspects culverts within the State of Alaska and provides an assessment of their respective "Overall Fish Passage Rating". ADF&G's overall fish passage rating for culverts are classified then coded using three separate colors, green, gray, and red. Green is defined by the ADF&G as "Conditions at the crossing are likely to be adequate for fish passage"; Gray is defined as "Conditions at the crossing may be inadequate for fish passage", and; Red is defined as "Conditions at the crossing are likely inadequate for fish passage".

There are 25 culverts within highway segment of the PEL study area, from Flag Point (MP 27) through Abercrombie Creek (MP 51). The ADF&G has evaluated these 25 culverts and determined that none of them are likely to be adequate for fish passage (Green). The ADF&G has classified 5 of these culverts as having "Conditions at the crossing are likely inadequate for fish passage" (Red), and that the remaining 20 culverts have been classified as "Conditions at the crossing may be inadequate for fish passage" (Gray).

Every alternative considered below, with the exception the No-build Alternative, will require heavy equipment and construction materials to be transported to the project site, at this time the site is inaccessible for overland transport.

**Alternative 1**

Under Alternative 1, the DOT&PF proposes to replace the culverts within the CRH's PEL study area. The new replacement culverts will meet current design standards for conveyance of water during a 50-year flood event (2% probability of occurring in any given year). Culverts that require fish passage will be designed in coordination with the ADF&G and in accordance with the *Memorandum of Agreement* [MOA] *between Alaska Department of Fish and Game and Alaska Department of Transportation and Public Facilities for the Design, Permitting, and Construction of Culverts for Fish Passage*, August 3, 2001

The DOT&PF estimates that non-fish pass culverts would cost $300 per lf and the fish pass culverts would cost about $600 per lf.

**Alternative 2**
Alternative 2 is the No-build Alternative. Under this alternative no attempts will be made to repair or replace the existing culverts along the CRH PEL study area. The existing undersized and damaged culverts could result in water overtopping and washing out segments of roadway during high water events. The culverts that are inadequate for fish passage will continue to prevent anadromous species from migrating upstream to essential fish habitat (EFH), defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

However, the DOT&PF is not able to simply abandon the culverts that are preventing migration of anadromous species to valuable upstream habitat, as it would be inconsistent with the MOA between the ADF&G and the DOT&PF, as well as being construed as an adverse effect on EFH of an anadromous fishery resource, under the authority of the Magnuson-Stevens Fishery Conservation and Management Act, as amended. Therefore, the DOT&PF would either have to completely remove the culverts which are impeding fish passage, rendering those segments of the CRH impassible or, if they are left in place the DOT&PF would be subjected to fines for not meeting the requirements of the MOA between the ADF&G and the DOT&PF, as well not being in compliance with Alaska Statute 16.05.841.

## Preliminary Alternatives to Expand or Develop New Materials Sites

**Background**: Earthen material will be required to construct the majority of the PEL's preliminary alternatives. The DOT&PF has researched the status of existing material sites (MS) along the CRH from approximate MP 9 through MP 52. Twenty-three MS were identified between MP 9 and MP 52. However, most of these sites are unavailable for various reasons, which include: the sites have been mined out; existing material sales agreements with the Alaska Department of Natural Resources (DNR) or the USFS have expired and are unlikely to be renewed; shallow groundwater table constrains further extraction of gravel material, as mining below the water table is generally discouraged by resource agencies, and; the material at some sites consist mostly of sand and silt which is unsuitable for construction purposes. Both the Chugach Native Corporation and TEC have reviewed DOT&PF's material site research and have concurred with its accuracy and conclusions.

As part of selecting a viable MS, the material being extracted needs to meet DOT&PF's standard material specifications for its intended purpose. It's advantageous to have a MS located as close to the project site as possible, as it not only reduces project costs, but also reduces the amount of emissions produced by the haul trucks, reduces fugitive dust produced along the roadway by the trucks, reduces noise impacts, and increases public safety by reducing the chance of encountering a haul truck along a smaller segment of roadway.

The unconsolidated sediments along the lower Copper River Delta is colluvium, comprised of a mixture of reworked glacier till, alluvium and, windblown (eolian) sand and silt. DOT&PF's MS reports for the former quarries in this area indicates, in general, that the upper 6 foot stratigraphic horizon is eolian deposits of sand, silt, and clay, which were carried and deposited over time by the strong winds that occur throughout this delta. Below this horizon, the stratigraphy generally consists of sandy course gravels with boulders. This material is permeable and its upper horizon closely corresponds to the elevation of the groundwater table.

Every alternative considered below will require heavy equipment to be able to access the project sites. At this time the sites are inaccessible for overland transport.

**Alternative 1**
Under Alternative 1, the DOT&PF proposes to utilize existing material sites, including expansion of these sites if necessary. As previously mentioned, the vast majority of the MS identified between MP 9 and MP 52 are no longer available. The most viable sites available are owned by TEC (surface) and the Chugach Native Corporation (subsurface).

Beginning at Flag Point, heading southwest toward Cordova the closest available MS is a DNR site, 851-077-5, located at MP 26. The DOT&PF has an existing material sales agreement with the DNR for use of this site, ADL 226620 which expires on December 31, 2022. However, the DOT&PF has reserved this site primarily for its Maintenance and Operations (M&O) Department use, restricting extraction for other projects to < 5,000 cy.

At MP 17.5, TEC and Chugach Native Corporation have a granite quarry that produces quality riprap with the ability to produce crushed aggregate surface course. They also have a quarry at MP 14 that produces mostly sandy gravel. Their quarry at MP 9 produces mostly sand, so this site is not under consideration as a viable MS.

The Sheridan Glacier Road MS (851-067-5) located near MP 13.5 and the Cabin Lake Road MS (851-066-5) located near MP 12 are DOT&PF/DNR sites. However, both are reserved for the DOT&PF's M&O Department use and for infrastructure development at the Merle K. (Mudhole) Smith Airport only, therefore they are unavailable.

Availability of MS from Flag Point, heading northeast across the lower Copper River Delta are more scarce. Many of the former MS were located in the active river channel and they have since been lost to erosion. There are seven MS located between MP 40.5 and MP 51 where the Bureau of Land Management (BLM) has issued ROW grants to the DOT&PF for their use, TEC and Chugach Native Corporation owns the subsurface estate at these sites. None of these sites have been mined in over 30 years. Four of the seven MS are functionally depleted and the shallow groundwater table has inundated their respective pits. The remaining three MS, 8510014-5, 851-048-5, and 851-015-5 are located north of the Million Dollar Bridge, at approximate MP 49, MP 49.4, and MP 50-51, respectively. Geotechnical investigations of these sites have reported the material contains large boulders mixed with sand and silt.

**Alternative 2**
Under Alternative 2, the DOT&PF proposes to develop new material sites along the CRH PEL study area.

Traveling east along the CRH from the Merle K. (Mudhole) Smith Airport to about MP 38.5, DOT&PF's ROW is 200 feet, measured 100 feet from each side of centerline. North from MP 38.5, DOT&PF's ROW expands to 300 feet. Neither ROW dimensions are wide enough for development of new material sites that could be sited entirely within existing ROW. Therefore, new MS developments would need to be located on land outside DOT&PF's ROW. Directly

south from the CRH at approximate MP 38.5 is the northern boundary of the Copper River Delta Critical Habitat Area (Figure 1). Material site development within this critical habitat area is unlikely. The area north of the CRH from Flag Point to approximate MP 37 is within the active floodplain of the Copper River, an important anadromous river for the region. As such, the DOT&PF does not consider this area, an active floodplain of an important anadromous river, to be a viable area in which to develop new MS. The land north of MP 38.5, beginning at the southwest corner of Section 25, Township 15 South, Range 3 East, is owned by TEC (surface) and Chugach Native Corporation (subsurface). Development of new MS on their property may be a viable option.

It's DOT&PF's premise that the colluvium downstream from Childs Glacier is a fairly homogenous deposit. As such, selection of a MS location would in large part consider whether a quarry could be developed in an area that would be able to maintain at least a 200 feet separation distance from the closest surface waterbody and that access to the site could be achieved without having to build a bridge. Geotechnical investigations would still need to be completed to ensure there is sufficient quantities and quality of material, as well as the requirements to have material sales agreements emplace with the land owners, and that all necessary permits and clearances have been obtained prior to its development.

Another site that has potential as a new MS is a granite outcrop located approximately 2.25 miles east of MP 40.5 on the south wall of an unnamed valley carved out by the McPherson Glacier, and within Section 20 and Section 21, Township 15 South, Range 4 East, Copper River Meridian, USGS Quad map Cordova C-2; or approximately 60.55521 North Latitude, -144.71025 West Longitude (Figure 6 and Figure 7). The land is owned by TEC and the Chugach Native Corporation.

If developed, the quarry has potential to produce Class IV riprap as well as crushed aggregate surface coarse. However, development of this granite deposit is not without challenges. In part, the headwaters of Sheep Creek, an anadromous stream (AWC 212-20-10040-2011), starts at the terminus of McPherson Glacier and flows southward adjacent to the toe of the valley wall at the location of the granite outcrop (Figure 6 and Figure 7). Mining equipment and haul trucks will need to cross Sheep Creek in order to access the quarry site. Additionally, the walls of this glacial valley are extremely steep and prone to avalanches. Therefore, the quarry could only be mined during the summer when the threat of avalanches are gone, particularly since it is anticipated that blasting will be required to mine this resource. Furthermore, it would be difficult, if not impossible, to keep quarried rock from falling into the stream, at least during the initial stages of development.

There is an existing trail that leads into this valley, though it will need to be improved for haul truck use (Figure 7). The Chugach Native Corporation has expressed interest in developing this granite resource into a commercial quarry. Through coordination and approval from the ADF&G, U.S. Army Corps of Engineers (USACE), and the National Oceanic and Atmospheric Administration – National Marine Fisheries Service, Alaska Region (NOAA Fisheries) it may be possible to realign the segment of Sheep Creek that flows next to the granite outcrop in order to move it away from the proposed quarry area.

**Alternative 3**
Alternative 3 is the No-build Alternative. The No-build for this project element mainly pertains to the development of new material sites (Alternative 2, above). Under this alternative, the DOT&PF would not attempt to identify any potential new material sites within the PEL study area. Nor would the DOT&PF commission any geotechnical or environmental evaluations of potential new resources, enter into any material sales agreements for material extraction, nor submit any permit applications to respective state and federal agencies requesting authorization for the MS development. Therefore, earthen material required to construct any of the project elements' alternatives would have to be mined and transported from existing permitted MS, which are few and far between.

## Preliminary Alternatives for the Logistics Required to Get Heavy Equipment, Service Equipment, Construction Materials, and Personnel to the Respective Project Sites

**Background**: As previously mentioned, the DOT&PF was forced to close NBI #339 in August 2011 after DOT&PF engineers determined that deep scour of the riverbed had undermined the bridge's support piers. Subsequently and before the DOT&PF could complete the necessary repairs, the land and segment of the roadway that had previously connected NBI #339 with NBI #340 was completely eroded away and is now occupied by an active channel of the Copper River. This bridge crossing still remains closed today. As such, the alternatives below are premised on idea that the access across NBI #339 and associated washout has not been reestablished and therefore, utilizing the CRH beyond this point remains inaccessible for vehicles.

**Alternative 1**
The DOT&PF proposes to construct an ice road across the washout at NBI #339. Once the equipment and personnel have crossed this washout, via the ice road, the CRH could be utilized until the washout at MP 44-45 is reached. Alternative 1 would be the LEDPA.

However, if there is open water and strong current in this channel, as there was during the winter of 2019 (Figure 6), then construction of an ice road across this washout would not be possible. Additionally, if the project actions could not be completed before spring break-up then the equipment would remain on the opposite side of the access to Cordova until another ice road can be constructed, presumably the following winter, although there is no guarantee. Under this scenario, the contractor would charge the DOT&PF for use of their equipment, regardless of whether it is sitting idle or not.

It would be possible to temporarily stage, or store the equipment if needed, within DOT&PF's ROW. It might also be possible for the contractor to lease a temporary staging area from TEC. If a reliable ice road is constructed across the washout then personnel, fueling, and maintenance equipment could be staged out Cordova, albeit a long drive.

**Alternative 2**
Under Alternative 2, DOT&PF proposes to construct an ice road that follows the route that the owner of the Childs Glacier Lodge uses to access his property during the winter. The lodge owner stated that he is able to access his property using a monster truck during the late fall or by

snow-cat during the winter and early spring, before break-up. During that time of year the river is at its lowest level and the owner has stated that the open water that he has encountered in the past has only been 6 inches deep or less.

From the Childs Glacier Lodge, the Million Dollar Bridge and the north end of MP 44-45 is accessible. However, the Million Dollar Bridge is only 20 feet wide so that is a limiting factor. Additionally, skirting around the Childs Glacier moraine might be difficult for large pieces of equipment, such as cranes, even if they have wide tracks because they do not float over the snow like a snow-cat does. Furthermore, this route would be much more time consuming to travel than that proposed under Alternative 1, so it is anticipated that a work camp for personnel and a dedicated equipment staging area and fuel depot would be required.

**Alternative 3**
Alternative 3 is the No-build Alternative. Under this alternative no attempts to access the proposed project area, via an ice road would occur. Without the ability to have the required equipment necessary to construct the preliminarily alternatives or the necessary personnel, DOT&PF's obligations to resource agencies, e.g. fish passage culverts, would not be met and DOT&PF's liability issues, such as the potential for bridges to collapse, will remain.

# Affected Environment

Preliminary analysis of potential environmental impacts on the NEPA resource categories are provided below. The resource categories are addressed in alphabetical order to make it easier for reference. Further analysis of these resource categories will occur once the preliminary alternatives have been reduced for each of the respective project element presented in the CRH PEL.

## Air Quality

Neither the City of Cordova nor the CRH PEL study area is located in an air quality nonattainment or maintenance area. Therefore, projects receiving federal funds or approvals do not require a conformity analysis under the Transportation Conformity regulations.

However, temporary impacts to air quality may occur if any of the PEL's project elements advance to construction, resulting from fugitive dust produced from ground disturbance activities, trucks hauling materials to the respective project site, and from increased vehicle exhaust. As such, particular attention will be given during any construction activity to take reasonable precaution, per 18 AAC 50.045(d), to reduce air quality impacts. Abatement measures such as applying water, as needed, to the exposed ground disturbed by the project activities and on roads that the equipment is traveling on would mitigate fugitive dust issues. No permanent impacts to air quality is anticipated.

Under the No-build Alternative, no effects on air quality would occur.

## Biological Resources

The Copper River Delta ecosystem has been designated as a Western Hemisphere Shorebird Reserve Network Site of Hemispheric Importance. The Copper River Delta is also one of the most important fisheries in the state. The salmon migrating into the Copper River are a significant resource for subsistence, commercial, and sport fisheries. Subsistence-caught fish provide an important food staple for rural residents and are an integral part of the Alaska Native cultural. In addition to the fishery in the delta area, one of the state's most popular subsistence fishery occurs approximately 80 miles upstream from the Million Dollar Bridge near the community of Chitina. Sport fishing is also very popular along the river's numerous clear water tributaries, as well as in marine waters at its mouth.

Additionally, the commercial salmon fisheries, established in this region during the late 1800s, have developed into a major economic industry in Prince William Sound, harvesting annually upwards of 74 million fish. [22] Furthermore, the Copper River's Chinook and sockeye salmon runs are among the earliest in Alaska, coupled with the fact that these are extremely high quality fish makes it one of the most prized fisheries. So much so that helicopters and fixed-wing aircraft take fish caught during the first openings in mid-May directly from the fishing grounds to the Cordova airport for immediate delivery to Seattle and other major markets where chefs and salmon connoisseurs await. [23]

The following anadromous fish, managed under the Magnuson-Stevens Fishery Conservation and Management Act, as amended, occur in the Copper River, AWC number 212-20-10080:

- Chinook [king] salmon, (*Oncorhynchus tshawytscha*);
- Sockeye [red] salmon, (*Oncorhynchus nerka*);
- Coho [silver] salmon, (*Oncorhynchus kisutch*);
- Pink [humpback] salmon, (*Oncorhynchus gorbuscha*);
- Steelhead salmon, (*Oncorhynchus mykiss*);
- Dolly Varden, (*Salvelinus malma*);
- Cutthroat trout, (*Oncorhynchus clarkii*);
- Eulachon [candle fish], (
- Pacific lamprey, (*Lampetra tridentata*).

Sheep Creek is a tributary of the Copper River and near its headwaters the stream flows next to a potential granite quarry. Sheep Creek is an anadromous stream, AWC number 212-20-10040-2011. The ADF&G lists the following anadromous fish occur within Sheep Creek:

- Sockeye salmon;
- Coho salmon;
- Pink salmon;
- Cutthroat trout;
- Dolly Varden, and;
- Whitefish, undifferentiated, (*Salmonidae coregoninae*).

[22] https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareapws.main
[23] ibid

The Copper River Delta ranks as one of the most important wildlife habitats in the world. This delta is a critical stop for millions of migratory birds on the Pacific Flyway. Each spring (late April through May) the Copper River Delta hosts the largest gathering of shorebirds in the western hemisphere. An estimated 12-16 million shorebirds stop to rest and feed on the delta's tidal flats on the way to their northern nesting grounds each year.

The Copper River Delta is the single most important stopover site for the western sandpiper (*Calidris mauri*) and the Pacific coast population of dunlins (*Calidris alpina*). [24] The Copper River Delta is also home to the world's largest population of nesting trumpeter swans (*Cygnus buccinator*). [25] Furthermore, nearly the entire population of dusky Canada geese (subspecies of *Branta canadensis occidentalis*) nests on the Copper River Delta, a primary reason that the dusky Canada goose is the only wildlife species listed as a Species of Conservation Concern in USFS Region 10. [26]

In addition to the birds listed above, other migratory birds present in the Copper River Delta include: least sandpipers (*Calidris minutilla*); knots (Scolopacidae); short-billed dowitchers (*Limnodromus griseus*); long-billed dowitchers (*Limnodromus scolopaceus*); white-fronted geese (*Anser albifrons*); Canada geese (*Branta canadensis*); northern pintails (*Anas acuta*); green-winged teals (*Anas carolinensis*); American wigeons (*Anas americana*); shovelers (Anatidae); greater scaup (*Aythya marila*); common goldeneye (*Bucephala clangula*); Barrow's goldeneye (*Bucephala islandica*); oldsquaw (*Clangula hyemalis*); bufflehead (*Bucephala albeola*); tundra swans (*Cygnus columbianus*); dabbling ducks (Anatidae); mergansers (*Mergus sp.*); red-throated loons (*Gavia stellata*); rusty blackbirds (*Euphagus carolinus*); Arctic terns (*Sterna paradisaea*); Aleutian terns (*Onychoprion aleuticus*); mew gulls (*Larus canus*); red-necked phalaropes (*Phalaropus lobatus*); bald eagles (*Haliaeetus leucocephalus*), and; a myriad of other shorebirds, seabirds, and waterfowl species, including the world's largest Glaucous-winged gull (*Larus glaucescens*) colony, which is located on Egg Island. [27] [28]

Terrestrial mammals present in the Copper River Delta include brown bears (*Ursus arctos*); black bears (*Ursus americanus*); weasels (*Mustelidae*); mink (*Neovison vison*); wolverines (*Gulo gulo*); river otters (*Lontra canadensis*); muskrats (*Ondatra zibethicus*); wolves (*Canis lupus*); marten (*Martes americana*); beaver (*Castor canadensis*), and; porcupines (*Erethizon dorsatum*). Moose (*alces alces*) were first introduced to the Copper River Delta in 1949 and have thrived in the expanding shrub habitats. [29]

Harbor seals (*Phoca vitulina*) are also present in the Copper River and some of its tributaries during the summer. Harbor seals are opportunistic predators that take advantage of the

[24] https://www.audubon.org/important-bird-areas/copper-river-delta#
[25] http://www.adfg.alaska.gov/index.cfm?adfg=copperriverdelta.species
[26] U.S. Forest Service, Chugach National Forest, *Dusky Canada Goose Habitat Enhancement on the Copper River Delta*, May 15, 2019
[27] http://www.adfg.alaska.gov/index.cfm?adfg=copperriverdelta.species
[28] https://www.audubon.org/important-bird-areas/copper-river-delta#
[29] http://www.adfg.alaska.gov/index.cfm?adfg=copperriverdelta.species

abundance of salmon and eulachon that are migrating up the river. Harbor seals are protected under the authority of the Marine Mammal Protection Act of 1972, as amended.

The vegetation within the active floodplain of the PEL study area consists mainly of shrubs, the primary species being Barclay willow (*Salix barclayi*); Sitka alder (*Alnus viridis* ssp. *sinuata*), and; sweetgale (*Myrica gale* var. *tomentosa*). Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) and Sitka spruce (*Picea sitchensis*) trees are often intermixed within the stands of shrubs. [30] Devil's club (*Oplopanax horridus*) is ubiquitous throughout the study area. Outside the active floodplain, predominantly in upland areas, are mature forest of western hemlock (*Tsuga heterophylla*); Sitka spruce; western red cedar (*Thuja plicata*), yellow cedar (*Cupressus nootkatensis*); and intermittent black spruce (*Picea mariana*). [31]

Additionally, the Copper River Watershed Project and the University of Alaska-Anchorage's Alaska Natural Heritage Program have identified ten species of non-native plant occurrences within the vicinity of project area, they are:

1. Elodea (*Elodea sp.);*
2. Reed canarygrass (*Phalaris arundinacea);*
3. Bohemian knotweed (*Fallopia x bohemica);*
4. Orange hawkweed (*Hieracium aurantiacum)*
5. annual bluegrass (*Poa annua L.);*
6. common dandelion (*Taraxacum officinale F.H. Wigg.);*
7. common plantain (*Plantago major L.);*
8. prostrate knotweed (*Polygonum aviculare L.);*
9. pineappleweed (*Matricaria discoidea DC.), and;*
10. big chickweed (*Cerastium fontanum Baumg. Ssp. Vulgare (Hartm.)*

## Climate

The PEL study area is within the productive interface between the marine environment and the coastal rain forest of the North Gulf Coast, characterized by moderate temperatures and abundant precipitation. The mean annual temperature for the area (measured at the airport) is about 38.3° F (3.5° C). The mean minimum temperature for January is around 15.08° F (-9.4° C) and the mean maximum temperature for August is 61.34° F (16.3° C). The area receives a mean annual rainfall of about 90.94 inches (7.58 feet or 2,310 mm) and the mean annual snowfall is around 121.65 inches (10.14 feet or 3,090 mm).

## Coastal resources

The marine waters of the Gulf of Alaska are approximately 16 miles downstream from the CRH at Flag Point (MP 27). The Copper River Delta creates barrier islands as it enters into the Gulf of Alaska. However, these barrier islands are not a unit of the Coastal Barrier Resource System; thus, the proposed elements in the CRH PEL would not have any actions subject to the Coastal Barrier Resources Act.

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[30] Thilenius, John F., June 1990, *Woody plant succession on earthquake-lifted coastal wetlands of the Copper River Delta, Alaska*; Forest Ecology and Management, Volume 33-34, Pages 439-462, Abstract.

[31] Dorava, Joseph M. and Sokup, James M., 1994, *Overview of Environmental and Hydrogeologic Conditions At the Merle K. "Mudhole" Smith Airport Near Cordova, Alaska*; U.S. Geological Survey Open-File Report 94-328, page 4.

The marine waters of the Copper River Delta, Prince William Sound, and the Gulf of Alaska contain the following threatened and endangered species: the endangered fin whale (*Balaenoptera physalus*), the threatened Mexico Distinct Population Segment (DPS) of humpback whale (*Megaptera novaeangliae*), and the endangered western DPS of Steller sea lion (*Eumetopias jubatus*) and its designated critical habitat.

In addition to the species listed above, the following marine mammals occur within the Copper River Delta, Prince William Sound, and Gulf of Alaska: minke whale (*Balaenoptera acutorostrata*); killer whale (*Orcinus orca*); grey whale (*Eschrichtius robustus*); Dall's porpoise *(Phocoenoides dalli);* harbor porpoise (*Phocoena phocoena*); (*Lagenorhynchus obliquidens*); harbor seal (*Phoca vitulina*); northern fur seal ( and; sea otter (*Enhydra lutris*).

The DOT&PF will initiate informal consultation under section 7(a)(2) of the Endangered Species Act with NOAA Fisheries after a preferred alternative for the respective PEL element has been selected and its associated potential impacts have been assessed.

## Department of Transportation Act, Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 U.S.C. § 303) is a federal policy that requires in part, that special efforts be made to preserve the natural beauty of the countryside and public parks and recreational lands, wildlife and waterfowl refuges, and historical sites.

There are three Section 4(f) resources within the PEL study are: the Million Dollar Bridge, the USFS's Childs Glacier Campground and Recreational Site, and the Copper River Delta Critical Habitat Area.

- The Million Dollar Bridge (COR-0005) is located within Section 7, Township 14 South, Range 4 East, Copper River Meridian, USGS Quadrangle Map Cordova C-2. On January 22, 1996 the Alaska State Historic Preservation Officer (AK SHPO) determined the Million Dollar Bridge is eligible for listing on the NRHP. On March 31, 2000, the Keeper listed the Million Dollar Bridge on the NRHP under Criterion A and Criterion C. As defined in 23 CFR 774.17, a historic site for purposes of Section 4(f) is significant only if it is on or eligible for the NRHP. The Million Dollar Bridge is listed on the NRHP.

- The USFS's Childs Glacier Campground and Recreational Site is located within Section 7 and Section 8, Township 14 South, Range 4 East, Copper River Meridian, USGS Quadrangle Map Cordova C-2. This campground/recreational area is open to the public with camping permits issued from June 10th through September 30th. Services and amenities at this campground/recreational area include: camping sites, campground host, drinking water, toilets, fire rings, food lockers, grills, interpretive displays, picnic area, picnic pavilion, picnic tables, and a glacier viewing platform/overlook. Even though the road is closed at approximate milepost (MP) 36 due to Bridge # 339 being washed out, as well as a segment of the road between MP 44-45, the Childs Glacier Campground and Recreational Site is still used by rafters coming down the Copper River and by commercial services out of Cordova that shuttle people to and from this site, via river

boats. The Childs Glacier Campground and Recreational Site is a significant public park and recreation area and therefore, the requirements of Section 4(f) apply.

- The Copper River Delta Critical Habitat Area is located east of Cordova and is adjacent to the project corridor along the CRH's southern boundary (Figure 1). The Copper River Delta Critical Habitat Area has been officially designated as a critical habitat area by the ADF&G and is managed by the ADF&G. The Copper River Delta Critical Habitat Area is open to most public uses provided the activity does not damage refuge resources, disturb wildlife or disrupt existing public uses. Allowable activities generally include hunting, trapping, fishing, wildlife watching, hiking, boating, snow machining, and camping. Properties that may function as wildlife and waterfowl refuges for purposes of Section 4(f) include: state or federal wildlife management areas; a wildlife reserve, preserve, or sanctuary, and; waterfowl production areas including wetlands and uplands that are permanently set aside (in a form of public ownership) primarily for refuge purposes. Therefore, the requirements of Section 4(f) would apply to the Copper River Delta Critical Habitat Area

"Use" of a Section 4(f) property occurs when land is permanently incorporated into a transportation facility, when there is a temporary occupancy that is adverse, or when there is a constructive use. The process of evaluating and determining whether there is use of a Section 4(f) property cannot occur until after a preferred alternative for the respective PEL element has been selected and its associated potential impacts have been assessed.

## Farmlands

There are neither agricultural farms nor aquatic farms within the PEL study area.

## Hazardous materials, solid waste, and pollution prevention

A February 4, 2019 review of the ADEC's Contaminated Sites database indicated there were no contaminated sites listed within the PEL study area.

On September 4, 2019, DOT&PF personnel collected three separate composite samples of paint chips from the Million Dollar Bridge, which were then submitted them to SGS North America, Inc. for laboratory analysis of lead in paint.

- The 1st sample was a composite sample collected from the bridge's north end; the analytical results for this sample was 110,000 mg/kg.
- The 2nd sample was a composite sample collected from the middle of the bridge, the analytical results for this sample was 210,000 mg/kg.
- The 3rd sample was a composite sample collected from the bridge's south end; the analytical results for this sample was 164,000 mg/kg.

## Historical, architectural, archaeological, and cultural resources

On March 30, 1993 the AK SHPO determined the CR&NWR railbed (COR-00398) is not eligible for listing on the NRHP; Alaska Office of History and Archaeology (OHA) File No. 3330-6N Copper River and Northwestern Railway R.R. Railbed.

On February 2, 2015 the AK SHPO determined the segment of the CRH within the PEL study area (COR-00576) is not eligible for listing on the NRHP; OHA File No. 3130-1R-FHWA, 3330-6N COR-576.

On March 31, 2000, the Keeper listed the Million Dollar Bridge (COR-0005) on the NRHP under Criteria A and C.

The DOT&PF will be initiating consultation with OHA, tribal government, and other consulting parties, in compliance Section 106, once the preliminary alternatives have been reduced.

## Land use

There is both private and public land within the PEL study area. The private land is owned by the TEC (surface eastate) and Chugach Native Corporation (subsurface). Entering their land, like what would be needed to skirt around the MP 44-MP 45 washout, requires a permit from TEC. The public land is a mixture of federal and state ownership. The USFS manages the federal land within the PEL study area. The State of Alaska owns the land below OHW, managed by the DNR. The ADF&G manages the Copper River Delta Critical Habitat Area.

The PEL study area is used by tourist and residence for hunting, fishing, snowmachining, boating, ATV use, bird and wildlife viewing, glacier viewing, and photography to name a few. Important ecological research is also conducted within the PEL study area.

## Natural resources and energy supply

Southeast of the PEL study area and northeast from Katalla, Alaska is the Bering River coal fields. The Bering River coal fields are comprised of two low to medium grade bituminous coal deposits, one at Kushtaka Mountain and the other at Cunningham Ridge. Kushtaka Mountain is about 23 miles east-southeast from MP 39 of the CRH and approximately 20 miles northeast from Katalla. Cunningham Ridge is approximately 28 miles east-southeast from MP 39 and about 25 miles northeast from Katalla. There is also an anthracite coal deposit at Carbon Mountain, located approximately 34 miles east from MP 39 and about 30.5 miles northeast from Katalla.

The Bering River coal fields have a long history, briefly summarized as: In 1905, Daniel Guggenheim and J.P. Morgan acquired controlling interest in the Bonanza Ridge copper deposits in the Wrangell Mountains. They organized under the name of the Alaska Syndicate. [32] The Alaska Syndicate's plans included building a railroad from a yet to be determined tidewater port to a mill site near the copper mines, developing the Bering River coal fields, and constructing a smelter on the Copper River Delta. [33] The Alaska Syndicate eventually chose Cordova as the terminus of the CR&NWR, however prior to that selection the Alaska Syndicate envisioned Katalla as the tidewater port because it was closer the Bering River coal fields. [34] Then in 1906,

[32] United States Department of Interior-National Parks Service, Form 10-900, National Register of Historic Places Registration Form, OMB No. 1024-0018, February 16, 2000, page 7.
[33] ibid
[34] ibid

President Theodore Roosevelt closed the Bering River coal fields to entry as part of a national debate over development of federal lands. [35]

In 1971, pursuant to the Alaska Native Claims Settlement Act, the Chugach Alaska Corporation selected 73,000 acres for ownership in the Bering River region including the Bering River coal field. The Bering River coal patent was later transferred to the Korean Alaska Development Corporation (KADCO) when the Chugach Alaska Corporation restructured their finances. [36]

In December 2016, the largest carbon-offset conservation transaction in Alaska's history occurred when 115,000 acres of rainforest and the patented title to 62,000 acres of the Bering River coal title was transferred to the Native Conservancy land trust, the Eyak Preservation Council (EPC) assisted Chugach Alaska Corporation with this transaction. [37] However, there still remains the 11,000 acres of coal tracts owned by KADCO.

This remaining 11,000-acre tract of Bering River coal fields is going to be retired by EPC. Retiring this historic Bering River Coal title will essentially preserve the entire Copper and Bering River watershed from the threat of mountaintop removal coal mining. EPC is aggressively fundraising for the purchase of this title and has set a non-negotiable goal to get this land retired by the end of 2019. [38]

The Katalla area is also the location of Alaska's first commercial oilfield. British oil expert Sir Thomas Boverton Redwood first noted the oil potential of Katalla in 1900 and by 1901 the British were drilling in Katalla Meadows, from a depth of 365 feet, pumping at least 50 barrels of oil a day. Two more wells were drilled and then a fourth one, which turned out to be dry. When the oilfields did not live up to expectations, they sold their interests to a Washington state firm, Amalgamated Development; other entities, including Chevon, have also expressed interest in the area. [39]

According to the DNR, 28 oil wells were drilled in the Katalla oil field between 1902 and 1932. An oil refinery was constructed in 1911 and operated until it burned in 1933, it was never rebuilt. Presently, the Cassandra Energy Corporation, based in Nikiski, has applied for a lease to explore oil and gas in Katalla and Controller Bays, an area about 40 miles east of Cordova. [40] In September 2019, the Cordova City Council passed a resolution recommending "following the cautionary principle to protect its salmon economy by opposing issuance of a license of oil and gas exploration on or offshore of the eastern Copper River Delta." [41] The DNR accepted public comments on their Best Interest Finding until October 4, 2019. [42]

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[35] ibid
[36] http://www.eyakpreservationcouncil.org/conservation/bering-coal-watershed-initiative/bering-coal-fields-overview/
[37] ibid
[38] http://www.eyakpreservationcouncil.org/conservation/bering-coal-watershed-initiative/bering-coal-fields-history/
[39] https://www.thecordovatimes.com/2019/08/16/historic-katalla-area-attracts-new-oil-and-gas-interests/
[40] https://www.ktuu.com/content/news/State-readies-for-oil-exploration-in-Copper-River-Delta-564259241.html
[41] ibid
[42] ibid

The CRH PEL does not include consideration of constructing an access road to the Katalla area, as no road is proposed at this time.

## Noise and compatible land use

Three of the preliminary alternatives to address the washout that has occurred between MP 44 and MP 45 would be considered a Type I project, as defined in 23 CFR 772, because the proposed highway alignment alternatives would be a new location. Although the closest receptor in this area is the USFS's Childs Glacier Campground and Recreational Area, located approximately 3 miles away, the realignment of the roadway could possible effect Category A activities, defined as "Lands on which serenity and quiet are of extraordinary significance and serve an important public need and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose." Therefore, depending of the alternative selected, through the public involvement process, an analysis of traffic noise impacts would be necessary.

## Socioeconomics, environmental justice, and children's environmental health and safety risks

Beneficial impacts are anticipated to occur by reestablishing access to areas beyond the NBI #339 washout for subsistence activities and through increased commerce generated through tourism.

The preliminary alternatives proposed in the CRH PEL are not anticipated to have a direct or indirect effect on any minority or low-income populations protected under Executive Order 12898 (Environmental Justice).

## Visual effects

The project elements and their respective preliminary alternatives proposed in the CRH PEL are not anticipated to have any direct or indirect visual effects within the study area. However, some of the preliminary alternatives proposed to address NBI #339 and its associated washout (e.g. suspension bridge, stay cable bridge, or aerial ropeway) may have light emissions produced from the lighting installed on the structure's towers, required to warn approaching aircraft of their presence. However, none of the alternatives are anticipated to have a direct or indirect adverse effect on the environment.

## Water resources

The Copper River Delta is a vast 35 mile wide wetland complex and is the largest continuous wetlands along the Pacific coast of North America. [43] A review of the U.S. Fish and Wildlife Service's (USFWS) National Wetland Inventory map[44] identifies two wetland types within the PEL Study area; one wetland type is Freshwater Forested/Shrub Wetland, its habitat classification code is PF01C, the other is Riverine, its habitat classification code is R3UBH. Additionally, the Copper River is designated as a navigable waterway, thus it's classified as Waters of the U.S.

[43] http://www.adfg.alaska.gov/index.cfm?adfg=copperriverdelta.main
[44] https://www.fws.gov/wetlands/data/Mapper.html

Therefore, authorization, under a Section 404 permit, from the USACE will be required to place fill onto wetlands. Additionally, authorization, under Section 10 of the Rivers and Harbors Act, will be required for the construction of any structure in or over any navigable Waters of the United States, including its tributaries. Furthermore, a USCG Bridge Permit will be required if a bridge is to be constructed over the NBI #339 washout.

The Copper River is not a regulated floodway. However, the vast majority of the CRH PEL study area is within the active floodplain of the Copper River and as such, all project elements and their associated alternatives will be designed to be in compliance with Executive Order 11988, Floodplain Management, so as not to have any adverse impacts or significant encroachment to the floodplain from the associated occupancy and modifications of the floodplain.

The project elements of the CRH PEL would not have any significant long term impacts to the water quality of the Copper River or its tributaries. Short term impacts could occur from increased turbidity during construction. However, best management practices will be implemented to control and prevent sediment runoff into the streams and wetlands. The DOT&PF will require the awarded contractor to have an approved Storm Water Pollution Prevention Plan (SWPPP) prior to any ground disturbance activities, and installations of silt curtains around the parameters of the work area within the tributaries of the Copper River will occur in order to control turbidity and to prevent the potential burial of fish eggs or alevin.

The area within the Copper River floodplain has a shallow groundwater table and the USFS's Childs Glacier Campground and Recreational Area has three groundwater wells that supply potable water at this site. Therefore, protection of the groundwater will be a priority during all construction activities. No fueling or storage of petroleum, oils, or lubricants will be allowed within 200 feet of a surface waterbody.

The Copper River is not one of the designated river included in the National Wild and Scenic Rivers System.

# Environmental Consequences

The Council on Environmental Quality (CEQ) Regulations state that the determination of a significant impact, as used in NEPA, requires consideration of both context and intensity (40 CFR § 1508.27). The significance of an impact may vary with the context and setting of a proposed alternative and its associated actions. Depending on the proposed action, the context may be society as a whole, nationwide, an affected region, affected interests, or a locality. For a site-specific action, significance would usually depend upon local impacts. Both short and long-term impacts are relevant. According to the CEQ Regulations, intensity refers to the severity of the impacts and includes, but is not limited to, consideration of the following:

- Unique characteristics of the geographic area (e.g., proximity to historic or cultural resources, parks, prime farmlands, wetlands, wild and scenic rivers, ecologically critical areas);
- Adverse impacts on properties listed or eligible for listing in the National Register of Historic Places;
- Loss or destruction of significant scientific, cultural, or historical resources;

- Adverse impacts on endangered or threatened species or critical habitat;
- Whether an action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment;
- Impacts that may be both beneficial and adverse. A significant impact may exist even if the federal agency believes that on balance the impact will be beneficial;
- The degree to which the effects on the quality of the human environment are likely to be highly controversial, and;
- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance cannot be avoided by terming an action temporary or by breaking it down into component parts.

However, in order to complete an analysis of the Environmental Consequences, as described above, detailed information about what is being proposed is required. Therefore, an analysis of Environmental Consequences will be completed once the preliminary alternatives provided in the CRH PEL has been selected or reduced, through the public involvement process. Additionally, DOT&PF's analysis will occur in conjunction with consolations with state, federal, tribal government, and other participating agencies to ensure that the information provided in this section is accurate and complete.

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