CLIMATE RESILIENCY ACTION PLAN

CHIGNIK BAY TRIBAL COUNCIL
Chignik Bay, Alaska

FINAL (Revision 0)

Bristol Project No. 3222067

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Prepared for:

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Revision History

Revision Date	Author	Summary of Changes	Version ID

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ACRONYMS AND ABBREVIATIONS

%	percent
°	degrees
F	Fahrenheit
ANTHC	Alaska Native Tribal Health Consortium
BBNA	Bristol Bay Native Association
BIA	Bureau of Indian Affairs
Bristol	Bristol Engineering Services Company, LLC
Community	Chignik
Council	Chignik Bay Tribal Council
DCCED	State of Alaska Department of Commerce, Community, and Economic Development
DOT&PF	Alaska Department of Transportation and Public Facilities
FEMA	Federal Emergency Management Agency
km	kilometer
LPSD	Lake and Peninsula School District
MM	Modified Mercalli Scale
mph	mile per hour
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PER	Preliminary Engineering Report
Tribe	Chignik Bay Tribal Council
USGS	US Geological Survey
FY	Fiscal Year
EPA	Environmental Protection Agency
UAF	University of Alaska Fairbanks
HUD	Housing and Urban Development

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EXECUTIVE SUMMARY

This Climate Resiliency Action Plan (Plan) was prepared for the Community of Chignik Bay, Alaska (Community) to better understand the effects of climate change on the Community and to help support Community resiliency to these effects through data development and adaptation planning. This planning document identifies actions and projects to help mitigate the effects of climate change.

The Chignik Bay Tribal Council (Council) secured a grant (FY2021) through the Bureau of Indian Affairs (BIA), Trust Services, Tribal Climate Resilience Program to begin climate change adaptation planning and data development for the Community. Bristol Engineering Services Company, LLC (Bristol) has contracted with the Council to perform these services. It is the goal of the Council to create a climate resilient community for the residents of Chignik Bay, Alaska.

This project combines and summarizes the findings from traditional ecological knowledge (TEK) sessions with the community, a site investigation of at-risk infrastructure, and review of past and current studies and/or data collections related to the climate, erosion, and flooding in the Community. Risk mitigation strategies for at-risk infrastructure were identified along with important data gaps in currently available information.

This plan contains current community information, documents the planning process for the Climate Resiliency Action Plan, identifies the natural hazards that have an impact on the Community, and the Community's vulnerability to these hazards.

The Chignik Bay Climate Resiliency Symposium provided an opportunity for public involvement that identified natural hazards that could affect the Community. The following is a list of natural hazards that have had an impact on the Community.

- Avalanche
- Earthquake
- Erosion

- Flood
- Landslide
- Severe Wind
- Tsunami
- Volcano
- Wildfire
- Fishery Collapse

The plan lists the Community's risk mitigation strategies and prioritizes three future projects that would help support climate resiliency in the Community. The following is a list of the three high priority mitigation actions that should be advanced to the preliminary engineering report stage of design in order of priority:

- #1 Indian Creek Bridge and Road Rehabilitation: The Indian Creek Bridge and Landfill Road both currently serve as the main and only evacuation route for the entire Community in the event of a tsunami and/or flooding. Both need maintenance and/or replacement to ensure they are passable in the event of an emergency.
- #2 Construction of Two Tsunami Shelters: Currently there are no tsunami shelters within the Community and only one evacuation route accessible to vehicles. Tsunami warnings in the winter currently require residents to drive to the top of the evacuation road and sit in their cars to stay warm. This project includes a Preliminary Engineering Report (PER) addressing the construction of two tsunami shelters, one on the west side of town and one on the east side.
- #3 East Side Electrical Distribution Upgrades: Due to funding constraints, a 2008 project was unable to complete needed upgrades to the electrical distribution on the east side of town. Deficiencies include unburied conductors laying directly on the ground, which is a hazard to public safety. In addition to the numerous deficiencies with the distribution system, the power generation system consisting of three generators requires attention as only one engine can be reliably operated.

1.0 INTRODUCTION

This *Climate Resiliency Action Plan* was prepared for the Community of Chignik Bay, Alaska (Community) to better understand the effects of climate change on the Community and to help support Community resiliency to these effects through data development and adaptation planning. This planning document will identify actions and projects to help mitigate the effects of climate change.

Earth's climate is a dynamic force that is constantly changing and must be monitored for the protection of resources, infrastructure, and people. The earth is currently experiencing a rise in both air temperatures and water temperatures around the globe resulting in sea level rise and longer ice-free water seasons. This climate warming, sea level rise, and longer ice-free water seasons are causing coastal communities to be more susceptible to flooding and erosion, and various other climate hazards that will be documented in this report.

1.1 SCOPE OF WORK

This project combines and summarizes the findings of past and current studies and/or data collections related to the climate, erosion, and flooding in the Community as well as identifies important data gaps in currently available data. A site visit was conducted to investigate all at-risk infrastructure and to conduct traditional ecological knowledge sessions with residents. With assistance from the Community, at-risk infrastructure, both commercial and residential, was identified. Mitigation strategies were developed for the identified at-risk infrastructure. Information collected, community goals, recommendations, and next steps are summarized in this report. In addition to identifying risk mitigation strategies, three project recommendations have been developed for future funding opportunities. These project recommendations include a scope, schedule, and budget that the Chignik Bay Tribal Council can use to plan for future work activities in the Community. This information can then be further used by the Council and community leaders to prioritize improvements and act as a starting point for development of detailed plans for the chosen strategies.

1.2 Funding Source

The Council secured a grant (FY2021) through the Bureau of Indian Affairs (BIA), Trust Services, Tribal Climate Resilience Program to begin climate change adaptation planning and data development for the Community. Bristol Engineering Services Company, LLC (Bristol) has contracted with the Council to perform these services. It is the goal of the Council to create a climate resilient community for the residents of Chignik Bay, Alaska.

2.0 COMMUNITY DESCRIPTION

This section describes the location and geography, climate, history, local government, economy, demographics, utilities, and transportation infrastructure of the Community.

2.1 LOCATION AND GEOGRAPHY

The Community is located on Anchorage Bay on the south shore of the Alaska Peninsula. It lies 450 miles southwest of Anchorage and 260 miles southwest of Kodiak. The Community lies at approximately 56.2928° North Latitude and 158.402° West Longitude (See Figures 1 and 2). The Community is located in Section 7, Township 045S, and Range 058W along the Seward Meridian. The Community is located in the Aleutian Islands Recording District. The area encompasses 11.7 square miles of land and 4.2 square miles of water (State of Alaska Department of Commerce, Community, and Economic Development [DCCED], 2022).

2.2 CLIMATE

The Community falls within the southwest maritime climate zone, characterized by persistently overcast skies, high winds, and frequent cyclonic storms (DCCED, 2022). Annual precipitation averages 127 inches, with an average annual snowfall of 58 inches. The average winter temperatures range from 21 to 50 degrees Fahrenheit (°F), and the average summer temperatures range from 39 to 60 °F. Extreme temperature ranges from as high as 76 °F to as low as -12 °F have been recorded (Himes-Cornell, et al., 2013).

2.3 HISTORY

A village called “Kalwak” was originally located here; it was destroyed during the Russian fur boom in the late 1700s. Chignik, meaning “big wind,” was established in the late 1800s as a fishing village and cannery. A four-masted sailing ship called the “Star of Alaska” transported workers and supplies between Chignik and San Francisco. Chinese crews from San Francisco traveled to Chignik in early spring to make tin cans for the cannery. Japanese workers followed in mid-June to begin processing. A post office was established in 1901. Coal mining occurred from 1899 to 1915. Chignik became an incorporated city in 1983. Today, two of the historical canneries are still in operational condition, although the fishery itself has been closed for multiple years due to low numbers of returning fish. (DCCED, 2022).

2.4 LOCAL GOVERNMENT

The Community is a second-class city with a mayoral form of government. There is a federally recognized Tribal government (Chignik Bay Tribal Council) and Alaska Native Claims Settlement Act (ANCSA) chartered Native village corporation (Far West Incorporated) The regional ANCSA corporation is the Bristol Bay Native Corporation (BBNC), and the regional non-profit Native organization is Bristol Bay Native Association (Himes-Cornell, et al., 2013).

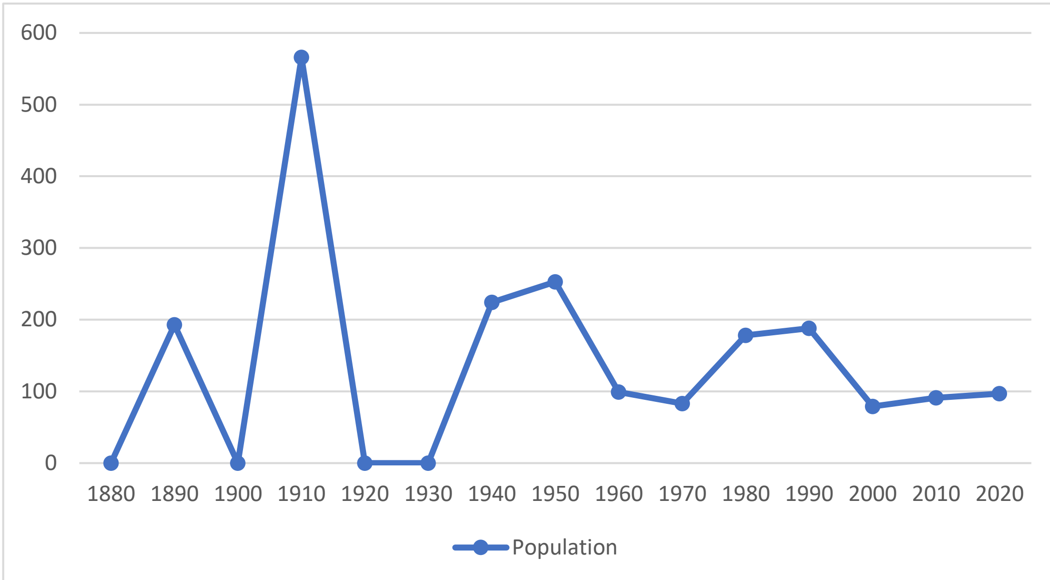
2.5 ECONOMY

The local government, and educational and health services provide the main employment opportunities in the Community (Alaska Department of Labor and Workforce Development, 2022). Other Community employment opportunities include manufacturing, construction, professional and business services, trade, transportation, and utilities. In 2020, the median household income in the Community was $58,750 (DCCED, 2022). The Community's primary source for food is derived from a subsistence lifestyle. This lifestyle includes activities such as hunting, fishing, berry picking, and other similar activities (DCCED, 2022).

2.6 DEMOGRAPHICS

In 2020, Chignik had a population of 97 (DCCED, 2022). Exhibit 2-1 depicts a historic representation of the population of the Community.

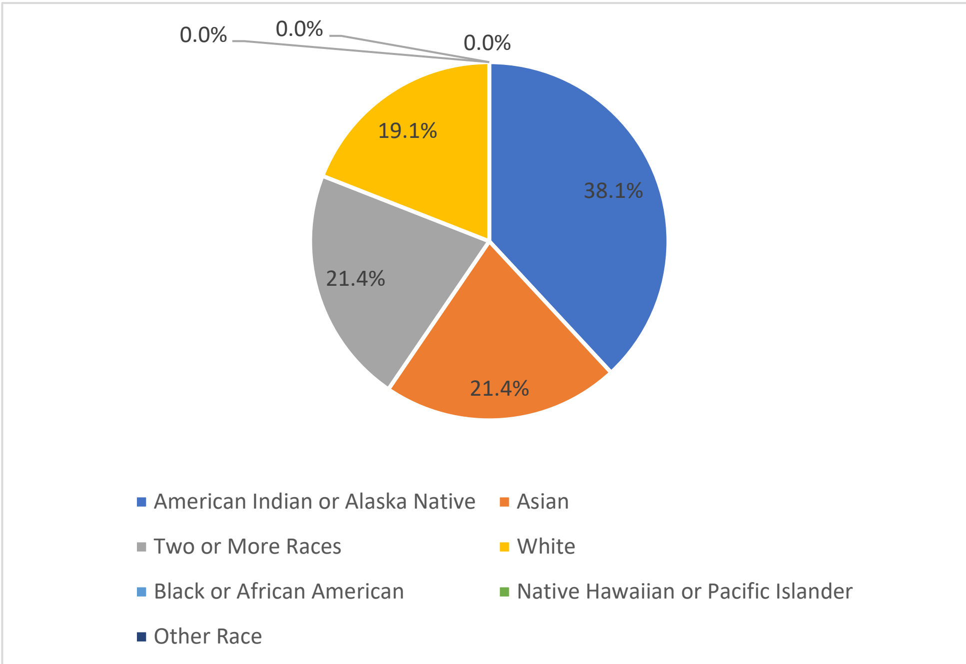
Exhibit 2-1: Population History



Source Note: Census Population History retrieved from DCCED
https://www.commerce.alaska.gov/dcra/dcraexternal/community/

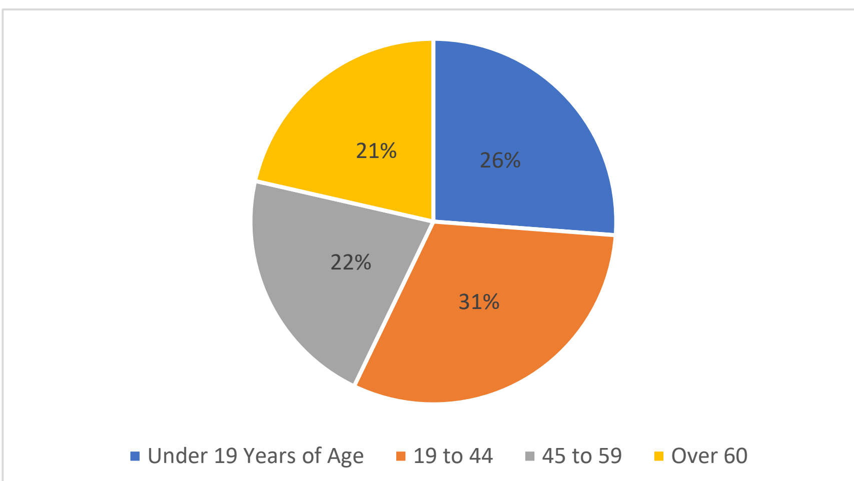
The Community is principally an Alaska Native community with 38.1 percent (%) Alaska Native, 21.43% Asian, 21.43% two or more races, and 19.05% White. In 2010, the population sex was 47.62% male and 52.38% female. The 2010 US Census also revealed that there were 27 households with an average household size of three people (DCCED, 2022).

Exhibit 2-2: Population by Race



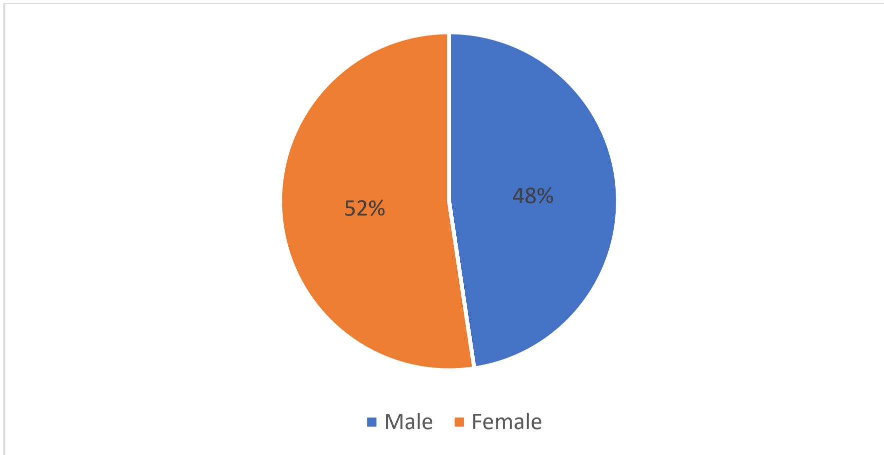
Source Note: Census Population History retrieved from DCCED
https://www.commerce.alaska.gov/dcra/dcraexternal/community/

Exhibit 2-3: Population by Age



Source Note: Census Population History retrieved from DCCED
https://www.commerce.alaska.gov/dcra/dcraexternal/community/

Exhibit 2-4: Population by Sex



Source Note: Census Population History retrieved from DCCED
https://www.commerce.alaska.gov/dcra/dcraexternal/community/

2.7 UTILITIES

- Electricity – The City of Chignik provides power for the Community through the use of a diesel generator at a reduced cost by utilizing the Power Cost Equalization program.
- Fuel – The City maintains four diesel or gasoline tanks with a combined capacity of 108,000 gallons. Additionally, Lake and Peninsula School District (LPSD) maintains heating oil tanks with a total capacity of 30,000 gallons. Trident maintains approximately 47,000 gallons of bulk fuel storage. Fuel is delivered via barge. The fuel barges deliver fuel in the spring and fall. The City purchases any leftover fuel from Trident at the end of the fishing season. In the event of fuel shortages households are rationed to 100 gallons of fuel at a time, and out of town fuel sales are restricted to emergency needs only.
- Landfill / Trash Collection – The City operates and maintains the landfill for the Community. The City also maintains dumpsters throughout the Community.
- Sewer – The City maintains a lift station, sewage lagoon, and a gravity sanitary sewer system. Homeowners outside of the sewer system have septic tanks. The City owns and operates a septic truck.
- Telecommunications – Cell phone and internet services are provided by GCI. Landline services are provided by Alaska Communications, but service is presently intermittent and bad. Long distance is provided by AT&T. Community members have the ability to get Cable TV from the City. The City uses Dish Network for this service.

- Water – Water is provided to homes by a City-operated public water system. The Community water is supplied by Indian Creek that has a dam and reservoir. The Community has a well that serves as the back-up water source for the homes. Some older homes still use well water instead of piped water. The Community has been on a boil notice in the past. The City provides information when boil notices occur through posters, signs, Facebook posts, phone calls, and/or mailed notices depending on the length of the boil water notice.

2.8 Transportation Infrastructure

Air transportation is most frequently used to travel to and from the Community. Mail, supplies, and other goods are also transported to the Community via air transport. There is a state-owned gravel runway that is maintained by the State of Alaska Department of Transportation and Public Facilities (DOT&PF).

Large cargo and fuel are brought in via barge. Docking facilities in the Community include two (2) City-owned docks, a ferry terminal, and the dock owned by Trident. The Community is served by ferries from the Alaska Marine Highway System. Additionally, the Community has a small boat harbor with berths for approximately 50 vessels.

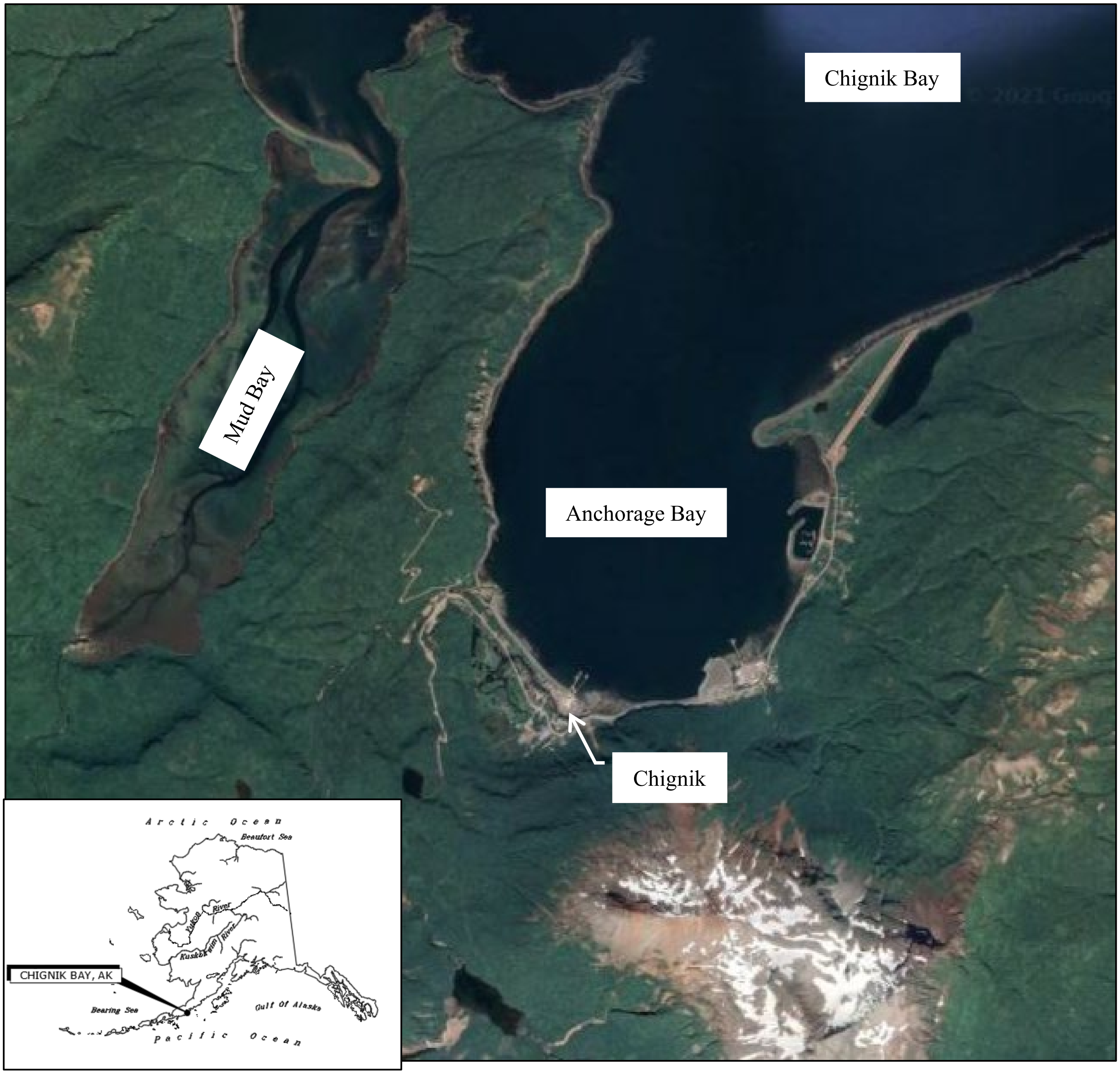
Skiffs, all-terrain vehicles (ATV), and snowmobiles are primarily used for local transportation within the Community and for travel between nearby communities. Roads throughout the Community are gravel surfaced and are maintained by the City.

3.0 CLIMATE HAZARDS

This section provides an analysis of the climate hazards which affect the Community. This section also analyzes the risks associated with each hazard type, and assesses the vulnerabilities of local people, property, and natural environment.

The Community planning area is shown in Exhibit 3-1. Community trails and subsistence areas may extend beyond planning area.

Exhibit 3-1: Planning Area



3.1 HAZARD ANALYSIS

The first step in climate change adaptation planning is to identify the natural hazards that could affect the Community. Natural hazards result from uncontrollable or unexpected natural events. Each hazard was analyzed based on a range of factors that include the location of affected area, the maximum extent or magnitude of the event, the historical occurrences, and the effects of climate change on that hazard.

Table 3-1 shows a summary of the various climate hazards which affect Chignik Bay.

Table 3-1: Climate Hazards in Community

Hazard	Explanation
Avalanche	The Community is surrounded by steep topography. The threat of avalanches is present every year. Avalanches can inhibit airport access, damage utilities, and endanger community infrastructure.
Earthquake	Earthquakes occur in the Community, and can result in damage to buildings, and utilities.
Erosion	The Community is situated along Anchorage Bay. The rivers are experiencing erosion along the banks, which endangers the community waterline under the bridges and the bridges themselves. Many waterfalls and streams run through the Community, which cause erosion. These grow significantly during spring run-off.
Flood	Flooding can occur due to heavy rainfall, high tides, or heavy spring snow melt. Flooding has affected the entire Community in the past, including the airport. Flooding can also compromise utilities and septic systems, and can spread pollution from contaminated sites.
Landslide	Mud slides occur during spring thaw and cover the road, which separates the Community. Large rocks fall without warning almost every year. This damages the roads and poses a risk to residents.
Precipitation	Precipitation can be either rainfall or snowfall. Heavy rainfall can cause accelerated erosion and drainage issues as well as flooding. Heavy snowfall can cause avalanches and extreme loads on structures.
Severe Wind	Strong wind storms occur in the Community. These storms can damage roofs, blow over tall communication towers and trees, potentially leading to loss of power or cell and landline service.
Tsunami	The Community is located on Anchorage Bay and recieves tsunami warnings about once a year. They have not yet experienced an actual tsunami.
Volcano	The Community is near Mt. Veniaminof, which could deposit ash in the Community. There are also a number of active volcanos along the Alaska Peninsula that disrupt flights to the Community. The corrosive properties of volcanic ash are harmful to equipment and detrimental to human health.

Table 3-1: (Continued): Climate Hazards in Community

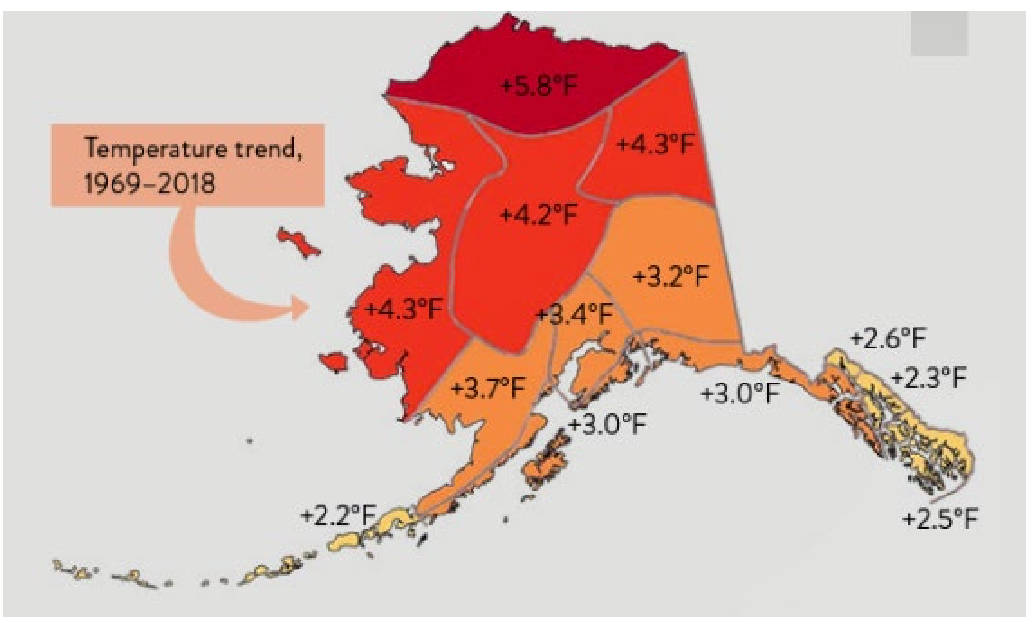
Hazard	Explanation
Wildfire	Wildfires can destroy structures and subsistence resources, and are a severe risk to human life.
Fishery Collapse	Ongoing detoriation of local healthy salmon returns especially between 2017 to 2021. Local sockey returns have not met minimum escapement goals in recent years.

3.2 CLIMATE CHANGE

Before analyzing the hazards that affect the Community, climate change must be discussed to determine how climate change is affecting these hazards and their future projections over time.

Over the past 60 years, the average temperature across Alaska has increased by approximately 3 °F (EPA, 2022). Warming in the winter has increased by an average of 6 °F (EPA, 2022).This increase is more than twice the warming seen in the rest of the United States. Exhibit 3-2 shows Alaska's average temperature trend.

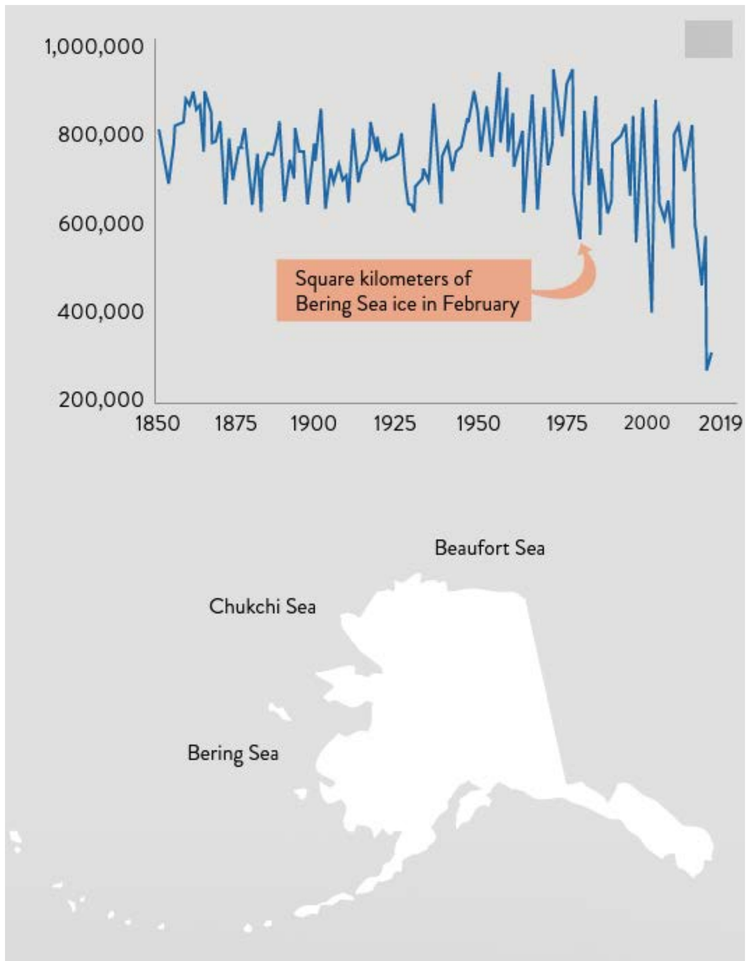
Exhibit 3-2: Alaska Temperature Trend 1969-2018



Source: (Thoman & Walsh, 2019)

This increase in average temperature has had significant impact on the state of Alaska as a whole. This increase in temperature has led to higher rates of glacier melt, less sea ice coverage, melting of permafrost, increased precipitation, and increased flooding and erosion. Exhibit 3-3 shows the measured decline of the Bering Sea ice coverage.

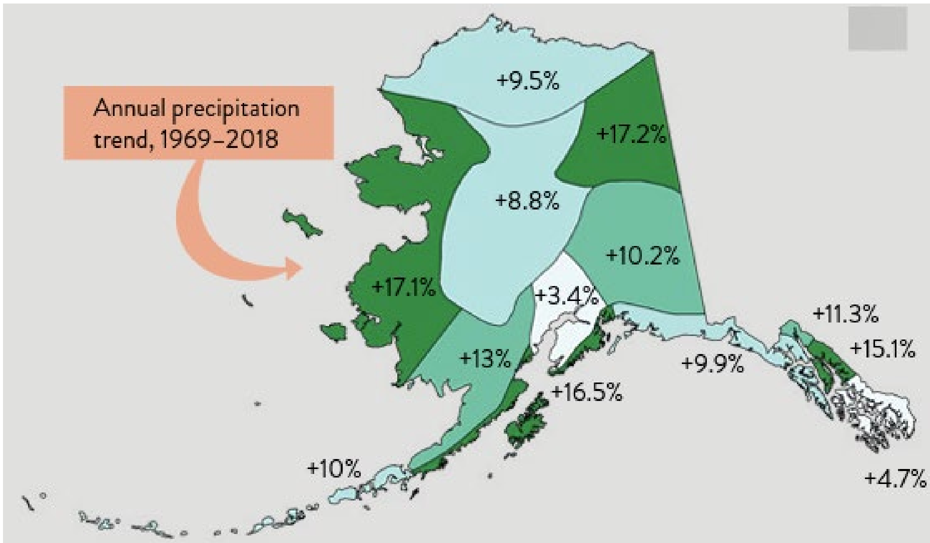
Exhibit 3-3 Bering Sea Ice Extent Decline



Source: (Thoman & Walsh, 2019)

Due to this warming, precipitation is on the rise resulting in more rain and snow. Exhibit 3-4 shows the annual precipitation trend in Alaska. This increase in precipitation causes increased erosion in the summer due to more frequent and intense rain events. Higher precipitation also increases the probability of an avalanche occurring in the winter. Midwinter rains can also build slick ice layers, making the snow layers on slopes unstable.

Exhibit 3-4 Alaska Annual Precipitation Trend



Source: (Thoman & Walsh, 2019)

Regarding climate change, there has been no detectable trend related to the frequency, duration, and intensity of wind across Alaska. Thoman (2019) states the following:

> In and around Alaska there has been a slight overall decline in autumn (September–November) storminess over the past 40 years. Winter (December–February) storminess has shown no clear trend since 1990. There has also been no detectable trend in the number of moderate and strong storms during the past 70 years over the Bering and Chukchi Seas, where sea ice has retreated. However, even without an increase in storms, coastal flooding and erosion in these waters are increasing as the sea ice-free open water season lengthens.

Climate change has been a key factor in increasing the risk and extent of wildfires. Wildfire risk depends on a number of factors, including temperature, soil moisture, and the presence of trees, shrubs, and other potential fuel. Climate change enhances the drying of organic matter in forests (the material that burns and spreads wildfire) and has increased the occurrence of wildfires. Research shows that changes in climate create warmer, drier conditions. Increased drought, and a longer fire season are boosting these increases in wildfire risk. Warmer temperatures and drier conditions can help fires spread and make them harder to extinguish. Warmer, drier conditions also contribute to the spread of beetles and other insects that can weaken or kill trees, building up the fuels in a forest.

The following sections analyze each climate hazard that impacts the Community. This examination includes a general description of each hazard, its anticipated location, anticipated extent, and history of occurrences.

3.3 AVALANCHE

An avalanche is the movement of snow and debris down a slope by force of gravity. Avalanches occur when the stability of the slope changes from stable to unstable. This can be caused by storms, earthquakes, volcanic eruptions, rapid temperature changes, or other human activities. Steep slopes and long slopes have a higher probability to slide. Avalanches cause infrastructure and property damage, environmental disturbance, and possible injuries or fatalities.

Location

Avalanches can occur in the Community almost anywhere since it is surrounded by steep topography. Areas which are highly susceptible to avalanches are identified on Figures 1 and 2 in Appendix A.

Extent

Avalanches occur on the mountains surrounding the Community. The areas above the road sections that connect the two sides of the Community have long, steep slopes. This is dangerous for residents should they be in the area when an avalanche occurs. Critical infrastructure is located on both sides. When avalanches occur, it cuts off access to critical infrastructure for residents on opposite sides of the avalanche.

History of Occurrences

Residents in the Community recalled the following experiences with Avalanches:

- In 2000, the road between the two sides of the Community was not accessible for about 2 weeks. This cut off access to the airport from the main side of the Community.
- In 2013, the city fuel tanks we are at risk of being damaged due to an avalanche. This would have shut down the generators.

3.4 EARTHQUAKE

An earthquake is a sudden trembling or movement in the earth's crust due to a sudden release of energy along the edge of the earth's tectonic plates. Earthquakes typically occur without warning. The effects of an earthquake can be felt far beyond the site of its epicenter. The epicenter is the point on the earth's surface that is vertically above the point in the crust where the seismic movement begins. A seismometer detects the vibrations caused by an earthquake and plots them on a seismograph. The magnitude of an earthquake is measured using the Richter scale. Most earthquake-related deaths and property damage are caused by the collapse and failure of structures due to ground shaking. The amount of damage depends on the duration and extent of the shaking.

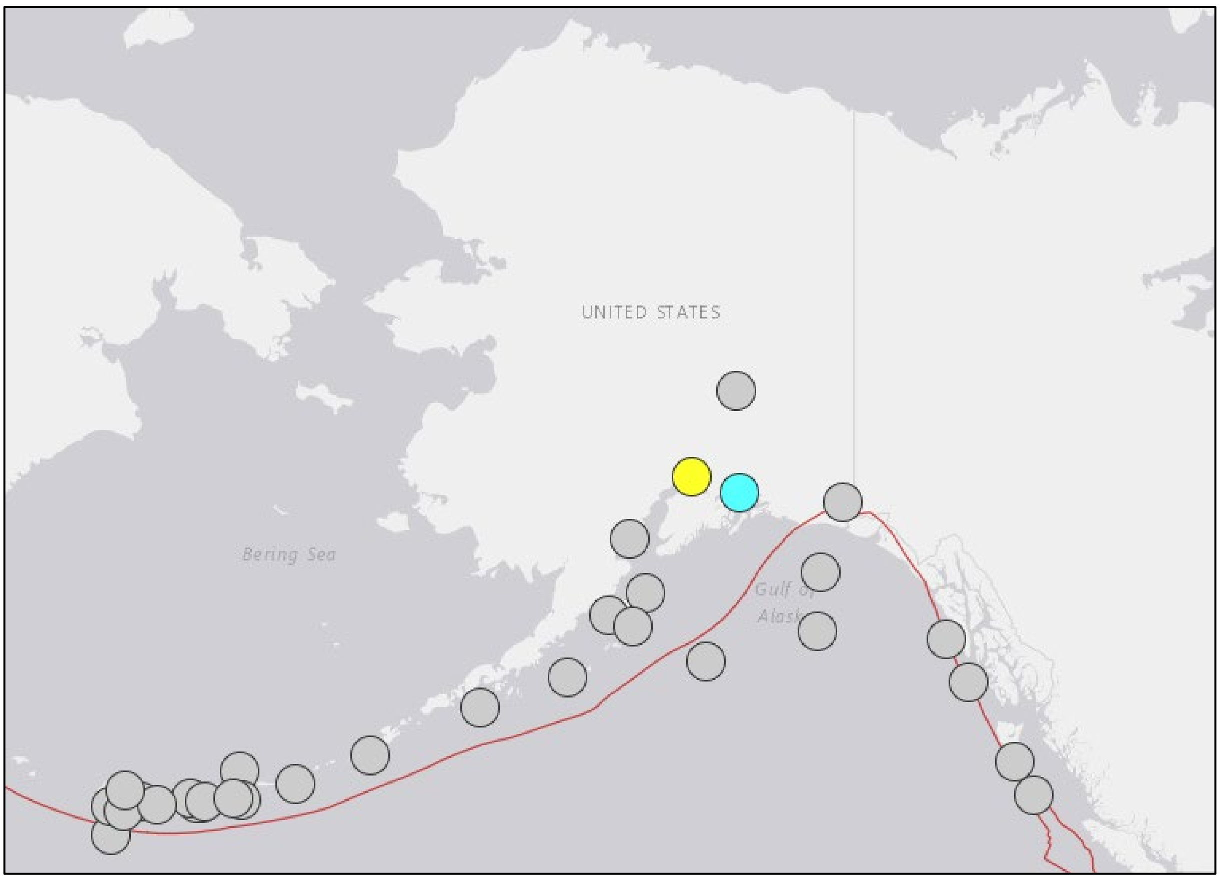
Landslides, liquefaction, and tsunamis are some other damaging effects of an earthquake. Earthquake-induced landslides are the down-slope movement of rock, soil and other debris due to ground movement on a steep mountain or hillside slope. Liquefaction occurs when saturated, unconsolidated sand or soil is disturbed due to the shaking from an earthquake. This shaking causes ordinarily solid material or soils to behave like a liquid.

Location

An earthquake above a 7.0 on the Richter scale is considered a major earthquake. The epicenters of all major earthquakes occurring in Alaska since 1964 are shown on Exhibit 3-5. This map was developed using the US Geological Survey (USGS) Earthquake Catalog Search feature (USGS, 2022). The Community is located approximately 512 miles southwest of the 1964 earthquake epicenter, the largest recorded earthquake in Alaska.

The Community is not located on any mapped fault lines. According to the Chignik Bay Tribal Hazard Mitigation Plan (THMP, 2019) the largest earthquake that has occurred within a 75 miles radius of the Community was a magnitude 6.4 on the Richter scale, located 33.2 miles away on the Alaska Peninsula in March 1972. The closest earthquake to occur near the Community above a magnitude 2.5 was a magnitude 2.8 earthquake that occurred 1.7 miles away in June 2006 (USGS, 2022).

Exhibit 3-5: Major Earthquakes in Alaska



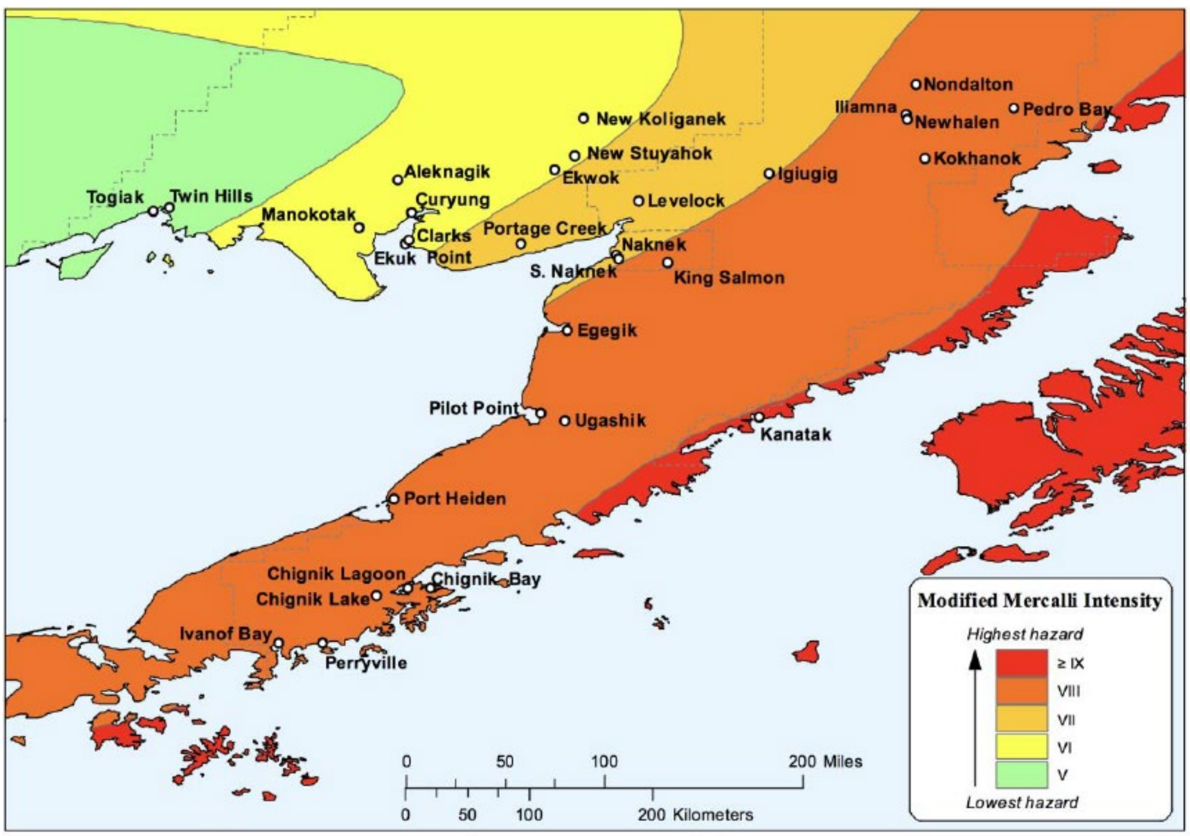
THMP 2019

Extent

Earthquakes are felt in the Community. Community members have reportedly felt tremors from major earthquakes in Alaska. These earthquakes have caused items to fall off walls of homes and public buildings in the Community. The most severe earthquake felt in the Community was the Great Alaska Earthquake of 1964. This earthquake had a recorded magnitude of 9.2 on the Richter scale, making it the second largest recorded earthquake in the world. Its effects were felt as far away as South Africa (UAF, 2022).

The Geological Hazards Team of the USGS National Earthquake Information Center in Golden, Colorado, created a time-independent probabilistic seismic hazard map for the Bristol Bay Region of Alaska. The map (Exhibit 3-6) depicts the intensity of potential earthquake ground shaking that has a 2% chance of occurring in 50 years, presented in terms of the Modified Mercalli Scale (MM) and based on peak ground acceleration. The Community is located in a Zone VIII MM Intensity, indicating the earthquake risk is very high (Ruppert, 2016).

Exhibit 3-6: Bristol Bay Earthquake Hazard Map



USGS map showing the intensity of potential earthquake ground shaking that has a 2% chance of occurring in 50 years, site class B
(based on peak ground acceleration)

Exhibit 3-7 provides a description of damages that can occur at each magnitude of the MM. This exhibit also provides an approximate Richter Scale equivalent for each MM intensity (USGS, 2022).

Exhibit 3-7: Modified Mercalli Intensity Scale with Approximate Richter Scale Equivalent

MM Intensity	Richter Scale (approximate)	People's Reaction	Furnishings	Built Environment	Natural Environment
I	1-2	Not felt			Changes in level and clarity of well water are occastionally associated with great earthquakes at distances beyond which the earhtquakes felt by people
II	3	Felt by a few	Delicately suspended objects may swing.		
III	3.5	Felt by several; vibration like passing truck.	Hanging objects may swing appreciably.		
IV	4	Felt by many; sensation like heavy body striking building.	Dishes rattle	Walls creak; windows rattle	
V	4.6	Felt by nearly all; frightens a few.	Picutres swing out of place; small objects move; a few objects fall from shelves within the community.	A few instances of craked plaster and cracked windows with the community.	Trees and bushes shaken noticeably.
VI	5	Frightens many; people move unsteadily.	Many objects fall from shelves.	A few instances of fallen plaster, broken windows, and damaged chimneys within the community.	Some fall of tree limbs and tops, isolated rockfalls and landslides, and isolated liquefaction.
VII	5.5	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction, but considerable in some poorly built or badly designed structures; weak chimneys broken at roof line, fall of unbraced parapets.	Tree damage, rockfalls, landslides, and liquefaction are more severe and widespread with increasing intensity.
VIII	6	Many find it difficult to stand	Very heavy furniture moves conspicuously.	Damage slight in buidlings designed to be earthquake resistant, but severe in some poorly built structures. Widespread fall of chimneys and monuments.	
IX	6.5	Some forcibly thrown to the ground.		Damage considerable in some buildings designed to be earthquake resistant; buildings shift off foundations if not bolted to them.	
X	7			Most ordinary masonry structures collapse; damage moderate to severe in many buildings designed to be earthquake resistant.	

NOTE: Information in this exhibit is a compilation of information from the USGS Modified Mercalli Scale, and the SMS Tsunami Warning Scale (reference information located in Section 8.0).

Large earthquakes could cause avalanches, landslides, falling rocks, or a tsunami. A large earthquake near the Community could also potentially alter the mineralogy or quality of groundwater. Seismic activity can cause damage to older community structures and utilities. The waterline for the Community runs under bridges and could be damaged.

History of Occurrences

In the THMP, the USGS Search Earthquake Catalog was consulted for a history of recorded earthquakes with epicenters within 75 miles of the Community and magnitude of 2.5 or greater since 1964. Table 3-3 shows the top ten data results by distance from the community, Table 3-4 by magnitude and Table 3-5 by date (THMP, 2019).

Table 3-2: Top 10 Historic Earthquake Epicenters Closest to Community

Date	Magnitude	Distance from the Community (miles)	Location
Jun-2006	2.8	1.7	Alaska Peninsula
Jan-1992	3.9	2.3	Alaska Peninsula
Aug-2016	3.6	2.3	97 kilometer (km) NE* of Chernabura Island, Alaska
Oct-2016	2.7	5.8	103 km NE* of Chignik Lake, Alaska
Apr-2016	3.3	6.4	96 km NNE* of Chignik Lake, Alaska
Jan-1998	3.5	6.5	Alaska Peninsula
Mar-2018	2.6	7.1	62 km ESE* of Chignik Lake, Alaska
Sep-2013	2.9	8.0	100 km E* of Chignik Lake, Alaska
Apr-2016	2.5	9.5	114 km NE* of Chignik Lake, Alaska
Apr-2016	2.6	10.0	94 km NE* of Chignik Lake, Alaska

*Northeast (NE), North Northeast (NNE), East Southeast (ESE), East (E),

Table 3-3: Top 10 Greatest Magnitude Historic Earthquakes near Community

Date	Magnitude	Distance from the Community (miles)	Location
Mar-1972	6.4	33.2	Alaska Peninsula
Jan-1963	6.4	37.8	Alaska Peninsula
Apr-2016	5.9	49.7	98 km NNE* of Chignik Lake, Alaska
Feb-1972	5.8	43.5	Alaska Peninsula
May-2016	5.7	24.0	95 km NE* of Chernabura Island, Alaska
Jan-2004	5.6	20.4	Alaska Peninsula
Dec-2000	5.6	27.5	Alaska Peninsula
Dec-2004	5.3	21.7	Alaska Peninsula
Nov-2016	5.2	32.2	112 km NE* of Chignik Lake, Alaska
Aug-2016	5.1	36.9	55 km SSE* of Chignik Lake, Alaska

* North Northeast (NNE), Northeast (NE), South Southeast (SSE)

Table 3-4: Top 10 Most Recent Historic Earthquakes near Community

Date	Magnitude	Distance from the Community (miles)	Location
Dec-2018	2.7	49.3	108 km NNE* of Chignik Lake
Nov-2018	3.6	41.4	93 km ESE* of Chignik Lake
Nov-2018	2.9	44.7	67 km S* of Chignik Lake
Oct-2018	3.1	48.5	80 km WNW* of Chirikof Island
Oct-2018	2.6	34.2	94 km NE* of Chernabura Island
Aug-2018	2.7	23.6	77 km NE* of Chernabura Island
Aug-2018	2.9	42.7	13 km E* of Chignik Lake
Aug-2018	3.0	45.2	98 km NE* of Chernabura Island
Jul-2018	2.9	47.4	62 km ENE* of Sand Point
Jul-2018	2.7	18.2	102 km NNE* of Chignik Lake

* North Northeast (NNE), East Southeast (ESE), South (S), West Northwest (WNW), Northeast (NE), East (E), East Northeast (ENE)

Additionally, residents recalled a 7.6 earthquake in January 2018. The epicenter of this earthquake occurred outside of the 75-mile radius search. Residents stated that items fell off walls with no injuries. Everyone went to higher ground. There is not a shelter, so residents sat in their cars all night. It was winter with cold temperatures, and some residents ran out of gas in their vehicles.

3.5 Erosion

Erosion is the wearing away, movement, or transportation of land. This can occur along riverbanks, shorelines, dune materials, and beaches. Repetitive flooding events, sea level rise, wave action, subsidence, sediment loss, and climate change can result in long-term erosion. Though most erosion happens gradually over a long period, it can also happen quickly due to periodic natural events such as windstorms, flooding, hurricanes, and storm surges. This can also be intensified by human activities or influences such as the construction of embankment protection structures or water table depletion. Erosion is measured as the rate of change in the displacement or position of the shoreline or riverbank over a given period of time. Erosion does not typically cause death or injury to people; however, it can destroy community infrastructure, buildings, and transportation systems.

Location

The Community experiences erosion along the coast of Anchorage Bay and Indian Creek. Significant erosion areas are identified on Figures 1 and 2 in Appendix A.

Extent

Erosion in the Community is extensive. The Community is surrounded by waterfalls. Waterfalls are larger and stronger during spring run-off, fall, and when it rains. Beaches surrounding the Community have dramatically increased due to high tides. The erosion of highest concern is the spring runoff in rivers and creeks eroding through the Community to the point where homes and the community's infrastructure (utilities, roads, etc.) are undermined. Many residents' homes, roads, and community infrastructure have been affected every year. Bridges in the Community are being undermined. This puts Community waterlines in danger of damage if the bridge is compromised. Other critical Community assets located near erosion areas include the airport and the clinic. Since the two sides of the community are connected via a road that has been affected by erosion, access to any asset between the two sides of the Community can be inhibited.

History of Occurrences

Erosion is an ongoing process; however, particular events can result in notable occurrences of erosion, such as spring-thaw runoff and high tides. Residents reported a house that has a small creek running under it due to severe rain and erosion issues. The Community is currently working to protect their bridges by placing armor rock along the edges of the supports to stabilize the area.

Residents in the Community recalled the following recent experiences with erosion:

- Erosion occurring at Indian Creek and near Indian Creek bridge compromising the bridge structure.
- Erosion from the rock quarry is causing sedimentation into Indian Creek.
- Frequent and heavy rains causing erosion on roads (especially on the landfill/evacuation road that has inadequate drainage and ditching).
- Erosion around the airport due to storm events and high rainfall.

3.6 FLOOD

Flooding is the accumulation of water where normally none exists. There are various types of flooding, such as, coastal flooding, riverine flooding, and overland flooding. Additionally, flooding can occur due to rapid snowmelt, ice jams, heavy rainfall, severe thunderstorms, tropical storms, and other high precipitation events. Flooding can damage buildings, personal property, and infrastructure. It can cause road or bridge closures. It can cause a disruption of services, such as, transportation, or utility services. It can also cause injuries or death.

Flooding events are the most significant threats to ecosystems along river and coastal areas of Alaska. As the water runs over and through the watershed, it picks up and carries contaminants and soil. Everything from leaked motor oil on parking areas, plastic grocery bags, pesticides, fertilizers, detergents, and sediments; known as non-point source pollutants. Point source discharges include discharge points, bulk fuel storage, sewage treatment plants, and other regulated known sources or points of pollutant discharges. If untreated, these pollutants wash directly into waterways carried by runoff from rain and snowmelt. These contaminants can infiltrate groundwater and concentrate in streams and rivers and can be carried down the watershed and into the ocean. Non-point source pollution is linked to the creation of large dead-zones (areas with minimal oxygen) in the ocean and threatens the health of the ecosystem.

Location

Areas in the Community at risk of flooding are depicted on Figures 1 and 2 in Appendix A. Federal Emergency Management Agency (FEMA) flood maps are not available for the Community. The low-lying areas adjacent to Anchorage Bay have the highest risk. This includes most of the Community due to the high volume of runoff from the surrounding mountains. Additionally, many roads and properties in the Community have poor drainage including the airport runway.

Extent

The Community experiences flooding yearly. Flooding occurs due to the high volume of run-off from the surrounding mountains and high tides. Most of the Community is in low-lying areas adjacent to Anchorage Bay and experiences flooding. Heavy rainfall also floods many areas and standing water can occur for days or weeks. The highest risk is during spring thaw. The Community experiences high tides that come over the bank and flood low lying areas. When the airport runway is saturated, it becomes soft, and airplanes cannot land. When this happens, the only transportation is by boat, which is also dependent on the conditions in the harbor. When flooding impacts residential homes and other structures, water must be pumped from buildings. Utilities, septic systems, homes, and roads are also at risk.

History of Occurrences

In the past, flooding has nearly covered the entire Community. They were unable to get kids to school during this event. As a result, roads have been built up so flooding would not continue to wash out the roads. Residents regularly must pump water out of basements due to flooding. In 2018 the city office had 12 inches of standing water in the building and has left visible water marks.

3.7 LANDSLIDE

A landslide is the movement of a mass of debris, rock, or earth by force of gravity down a slope. Landslides occur when the stability of the slope changes from stable to unstable. This can be caused by precipitation, earthquakes, volcanic eruptions, fire, erosion, and human-induced activities. Steep slopes and long slopes have a higher probability to slide. High soil water content and/or slopes with low vegetative coverage are also likely to slide. Landslides cause infrastructure and property damage, environmental disturbance, and possible injuries and fatalities.

Location

Landslides occur in the Community along the steep topography surrounding it (see Figures 1 and 2 in Appendix A). The areas mostly at risk are the roads and bridges connecting the two sides of the Community below the cliffs and steep sloping areas.

Extent

Landslides occur on the mountains surrounding the Community. The areas above the road sections that connect the two sides of the Community have long, steep slopes. In addition to landslides, large boulders and rocks fall from these steep slopes and pose a threat to residents traveling along this road. Falling boulders or rocks can hit travelers or land on the road causing a road hazard. When landslides occur, it cuts off access to critical infrastructure and can wash out the road.

The entire Community is surrounded by areas with steep slopes. Reportedly, large masses of soil and large rocks slough off or topple down onto the road. The road connecting both sides of the Community is most at risk of a landslide.

History of Occurrences

Residents report that landslides occur at least two times a year due to spring run-off and high rain events. Residents also noted that they use extreme caution on the roads near the steep slopes in the spring. There is a concern for falling boulders.

3.8 PRECIPITATION

Precipitation can include rain, snow, freezing rain, sleet, or a mix of the previous forms of precipitation. Heavy snowfall occurs when large quantities of snow are produced in a short period of time. Drifting snow creates an uneven distribution of snow caused by strong winds. This weather can cause harm to individuals, cause power outages, cause property damage, and utility damage. Additionally, flooding can occur due to rapid snowmelt, ice jams, heavy rainfall, severe thunderstorms, tropical storms, and other high precipitation events. Flooding can damage buildings, personal property, and infrastructure. It can cause road or bridge closures. It can cause a disruption of services, such as transportation, or utility services. It can also cause injuries or death.

Location

Severe precipitation affects the entire Community (see Exhibit 3-1).

Extent

Air transportation is essential to the Community. Severe precipitation conditions create a hazard for planes to land in the Community. These storms hinder the ability to evacuate for medical emergencies, and receive needed supplies, medications, and mail due to ice or snow on the runway.

Traveling in severe precipitation conditions is dangerous for residents because of the blowing snow/rain and reduced visibility. This is exacerbated by colder temperatures because of their effect on the snow ratio. Due to the average temperatures in Alaska being lower than the rest of the United States during winter months, a snow ratio of 1:20 was assumed. This means that for every 1 inch of precipitation, 20 inches of snow falls. With extreme cold, the snow ratio can increase up to 1:50. This 'fluffy' snow is hard to manage because it becomes airborne easily (AccuWeather, 2022). The airport and roads are the top priority for snow removal and in general it takes roughly 24 man-hours to keep the roads drivable. High snow loads can cause structures to collapse and as a result, put an economic hardship on the Community in order to repair damaged structures.

Power outages can be caused by severe winter storms. If power is not quickly restored, the clinic is at risk of losing essential medications and vaccines that require refrigeration. Young children and community elders are at greater risk of injury during power outages.

Icy conditions throughout the Community can present a hazard for all residents. Vehicles are at risk of sliding off the roads if the roads are not cleared of snow and ice. Walking residents are at risk of falling and injuring themselves. Walking residents share the road with vehicles and large equipment. This causes a risk to pedestrians walking in the Community.

History of Occurrences

According to the THMP, precipitation data is not readily available for the Community, however, precipitation has been recorded in the nearby community of Port Moller, which is roughly 87 miles away. These communities experience similar amounts of precipitation. Table 3-6 identifies historical severe weather events recorded in Port Moller (THMP, 2019)

Table 3-5: Historical Severe Weather Events

Year	Maximum One Day Precipitation (inches)	# of Days Above 1.0 inch
2018	2.11	5
2017	3.28	7
2016	1.84	3
2015	3.84	12
2014	6.42	27
2013	4.49	9
2012	0.55	0

3.9 Severe Wind

Severe wind can accompany other natural hazards or occur alone. Wind events pose a threat to vital utilities, lives, and property. Severe winds are classified using the Beaufort Wind Scale. Strong gale winds of 47 miles per hour (mph) and greater are considered severe and likely to produce damage.

Location

Severe wind affects the entire Community (see Exhibit 3-1).

Extent

The Beaufort Wind Scale gives a force scale of 1–12 based on sustained wind speed. Exhibit 3-8 identifies the scale and the consequences that are possible at the different levels as well as the impacts to ocean water movement (NOAA NWS, March 2013). Any wind event, Force 9 and higher is considered severe and can cause damage within the Community.

Exhibit 3-8: Beaufort Wind Scale

The Beaufort Wind Scale

Force	Name	Wind Speed knots	mph	Consequence
0	Calm	0	0	Smoke rises vertically
Wave height: 0 m - **Sea:** Like a mirror				
1	Light air	1-3	1-3	Smoke drifts with air
Wave height: 0.1 m (.25 ft) - **Sea:** Ripples - No foam crests				
2	Light breeze	4-6	4-7	Weather vanes become active
Wave height: 0.2-0.3 m (0.5-1 ft) - **Sea:** Small wavelets - Not breaking				
3	Gentle breeze	7-10	8-12	Leaves and small twigs move
Wave height: 0.6-1 m (2-3 ft) - **Sea:** Small wavelets - Crests begin to break				
4	Moderate breeze	11-16	13-18	Small branches sway
Wave height: 1-1.5 m - **Sea:** Small waves becoming longer, numerous whitecaps.				
5	Fresh breeze	17-21	19-24	Small trees sway - Waves break
Wave height: 2-2.5 m (6-8 ft) - **Sea:** Moderate waves - Many whitecaps				
6	Strong breeze	22-27	25-31	Large branches sway
Wave height: 3-4 m (9.5-13 ft) - **Sea:** Larger waves forming - Whitecaps everywhere				
7	Near gale	28-33	32-38	Whole trees sway - difficult to walk
Wave height: 4-5.5 m (13.5-19 ft) - **Sea:** Sea heaps up - White foam blown around				
8	Gale	34-40	39-46	Twigs break off trees
Wave height: 5.5-7.5 m (18-25 ft) - **Sea:** Edges of crests break into spindrifts				
9	Strong gale	41-47	47-54	Shingles blow off roofs
Wave height: 7-10 m (23-32 ft) - **Sea:** High waves - Sea rolls - Reduced visibility				
10	Storm	48-55	55-63	Trees uprooted - Damage to buildings
Wave height: 9-12.5 m (29-41 ft) - **Sea:** Very high waves with overhanging crests				
11	Violent Storm	56-63	64-73	Widespread damage
Wave height: 11.5-16 m (37-52 ft) - **Sea:** Exceptionally high waves				
12	Hurricane	Over 63	Over 73	Violent destruction
Wave height: 16+ m (52+ ft) - **Sea:** Sea completely white - Excessive foam				

Severe wind can be present all year, but these events are most common during the spring and fall months. These conditions can cause loose debris to blow around the Community and detach roofing or siding from homes and other structures.

Severe wind can cause power poles to blow over and cause power outages, and interrupt communications. When power outages happen during cold temperatures it produces a hazard to residents.

In the winter, severe winds can cause snowdrifts that impact visibility and travel throughout the Community. In the summer and fall months, severe wind conditions produce airborne dust. The airport runway and all the roads in the Community are gravel. This produces large amounts of airborne dust, impacting subsistence harvests and producing a breathing risk to everyone, but especially young children and those with respiratory issues.

Severe wind impacts air transportation in and out of the Community. This increases risks to residents if there is a lack of needed supplies, medications, and mail. This also decreases the ability to evacuate for medical emergencies.

Severe wind can also cause large waves to form and can increase the impacts of flooding, and erosion within the Community.

History of Occurrences

According to locals, severe windstorms occur more than once per year. Residents reported that wind speeds of 120 mph and 100 mph, in 2000 and the winter of 2017, respectively. This is not verified due to not having a local weather station. Residents also reported that a roof was blown off a home, and a smoke house was blown to the middle of the road. Also, it was noted that an all-terrain vehicle was seen blowing down the road due to high winds.

According to the THMP, wind data is not readily available for the Community, however, wind speeds have been recorded in the nearby community of Port Moller, which is roughly 87 miles away. These communities are assumed to experience similar wind speeds although topographic features can magnify wind speeds when present in the area.

Therefore, Table 3-6 identifies historical severe wind events recorded in Port Moller (THMP, 2019).

Table 3-6: Historical Severe Wind Events

Year	Max Wind Speed (mph)	# of Days Above 47 mph
2018	37	0
2017	40	0
2016	38	0
2015	39	0
2014	36	0
2013	47	1
2012	54	1
2011	44	0
2010	45	0
2009	45	0
2008	38	0

Residents in the Community recalled the following recent experiences with severe windstorms:

- In December of 2021, 100 mile per hour (mph) winds.
- Roofs blown off houses.
- Cyclonic winds caused by shape of Anchorage Bay and surrounding mountains causing a northeast wind funnel from neighboring bay.
- Two-story old Trident icehouse was completely blown apart.
- Inaccurate weather information from the automated weather observing system (AWOS) station.
- In winter of 2021 power outage due to winds knocking out power lines.
- Experienced typhoons.
- Older unmaintained buildings being blown apart are becoming a hazard to the community.

3.10 TSUNAMI

A tsunami is a series of large waves created by disturbances that take place undersea, such as a landslide, volcanic eruption, or earthquake. These waves are powerful and can travel many miles over open sea and can potentially cause devastating damage to shorelines.

These powerful waves can result in flooding, can cause severe property damage, and cause injuries and deaths.

Location

Tsunamis could affect the entire Community (see Exhibit 3-1).

Extent

Tsunamis have not had an impact on the Community to this point. However, should a tsunami occur in the Community, it would have an extreme impact. Appendix B portrays the maximum estimated tsunami inundation map for the Community created by the Alaska Division of Geological & Geophysical Surveys (Nicolsky, Suleimani, & Koehler, 2016). It shows that the main portion of the village could be covered by up to 100 feet of water. It also shows that the remainder of the Community could be impacted by about 80 feet of water from a tsunami.

History of Occurrences

No tsunamis have occurred in the Community. However, residents stated that they receive tsunami warnings for the Community almost once a year. They receive texts and calls warning residents to get to higher ground until the threat subsides.

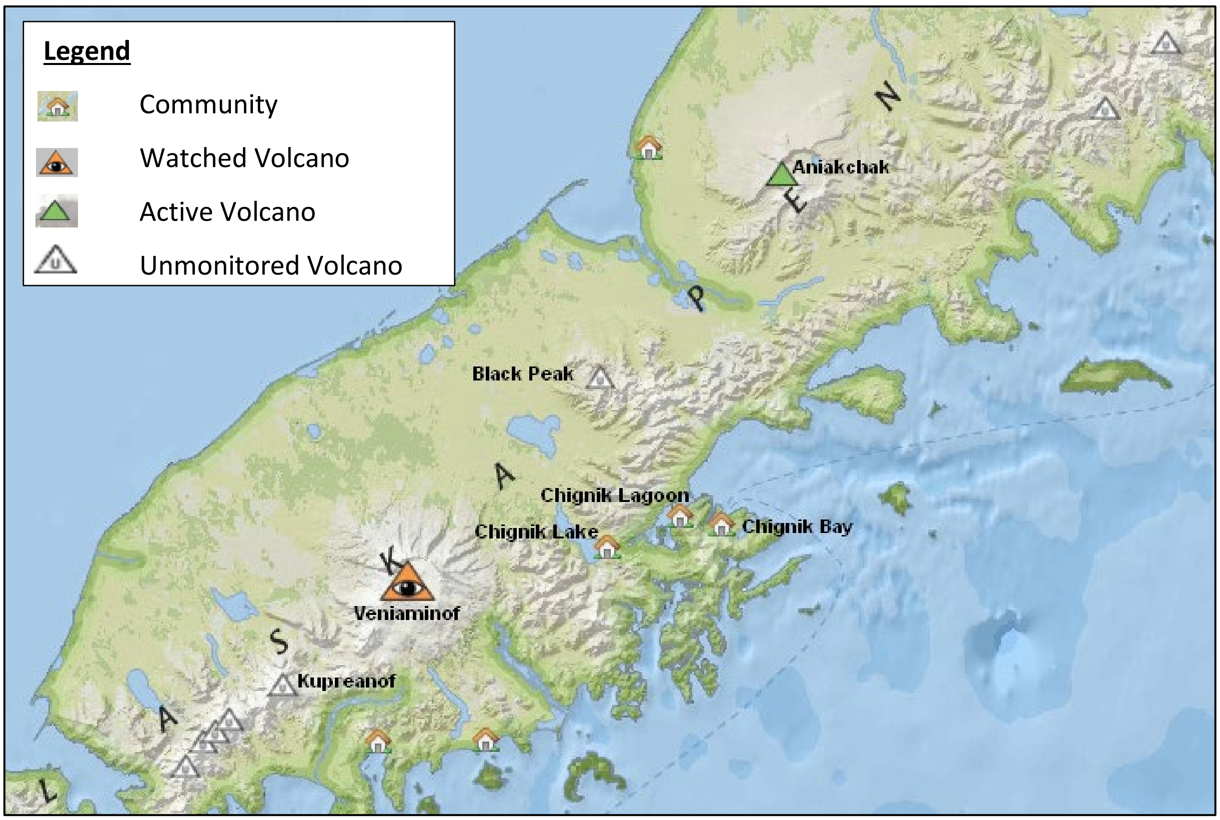
3.11 VOLCANO

A volcano is a typically conical shaped mountain or hill that has a crater or vent. Lava, rock fragments, gases, and hot vapors erupt from the earth's core through the crater or vent. Volcanos are generally found where tectonic plates are diverging or converging. Erupting volcanos can pose hazards to those in the immediate area of the eruption or outside of the area for many miles. A volcano produces volcanic ash when it erupts. This can impact aircraft and vehicle transportation. It can also cause injury to people as it impacts air quality. Breathing volcanic ash can damage the lungs and cause breathing issues.

Location

The entire Community is at risk when ash fall enters the area (see Exhibit 3-1). There are three historically active volcanos within 100 miles of the Community: Veniaminof and Aniakchak at approximately 40 miles, and Kupreanof at approximately 60 miles from the Community. Exhibit 3-9 identifies some of the volcanos that could impact the Community with ash fall.

Exhibit 3-9: Volcanos Near Community



Extent

Volcanic ash is the primary concern for the Community for various reasons. Ash fall produces poor air quality and is a health risk to people with respiratory issues. Ash fall also creates a hazard to equipment, generators, vehicles, or anything with a motor. Volcanic ash is corrosive and can damage machinery. In rural Alaska, it can be challenging to replace equipment due to limited local resources, and delivery access to the

Community. The Community relies upon air transportation for supplies, mail, and medical emergencies. Volcanic ash may or may not fall on the Community depending on the wind direction from the source. However, it can still have an impact if it is in the flight path of the aircraft.

History of Occurrences

Mount Veniaminof is approximately 40 miles from the Community. This volcano has been historically active and is being monitored by the Alaska Volcano Observatory. Veniaminof is one of the largest and most active volcanic centers in the Aleutian Arc and has erupted at least 13 times in the past 200 years. Recent significant eruptions of the volcano occurred in 1993-95, 2005, and 2013. Residents in the Community recall a light dusting of ash from the 2013 eruption. During the 1993-95 activity, a small lava flow was extruded, and in 2013, five small lava flows effused from the intra-caldera cone over about five months. Minor ash-producing explosions occurred nearly annually between 2002 and 2010. Previous historical eruptions have produced ash plumes that reached 20,000 feet above sea level in 1939 and 1956, and ash fallout that blanketed areas within about 25 miles of the volcano in 1939 (Alaska Volcano Observatory, 2018).

3.12 WILDFIRE

A wildfire spreads through the consumption of vegetation. It typically occurs in areas with abundant vegetation. It often begins unnoticed and spreads quickly. It produces dense smoke that can be seen for many miles. Wildfires can result in damage to property, subsistence areas, and loss of life. The smoke produced from wildfires can prohibit air transportation in and out of a community, and reduces air quality.

Fuel, weather, and topography contribute to the behavior of the wildfire (Idaho Firewise, 2018):

- Wildfire fuel includes structures and vegetation. Dense, large areas burn for a longer duration and creates large amounts of heat. Less dense and dry areas burn quickly with less heat.

- Weather that can affect a wildfire includes wind, moisture, temperature, cloudiness, and air pressure. Wind moves the wildfire across the landscape and provides oxygen that can make the fire grow quickly. It can also cause embers to blow to new areas potentially causing new fire locations. Low humidity and high temperatures can cause the vegetation to become dry. High humidity and rain can extinguish or slow the fire down.
- Topography, or physical features, including aspect and slope of an area, can contribute to the behavior of a wildfire. Wildfires burn more rapidly moving up a slope because it preheats the fuels that makes them more combustible. Also, south and west facing slopes have drier fuels due to more exposure to the sun.

Location

Wildfires have an impact on the entire Community (see Exhibit 3-1) due to the impact of smoke and disturbance of subsistence resources.

Extent

Subsistence areas around the Community provide needed food sources for residents. Wildfires can damage these areas and the resources they provide, such as berries, greens, and wildlife.

Smoke from wildfires produce poor air quality. It is hazardous to residents and pets, especially the elders, young children, and those with respiratory issues. Smoke from wildfires can also have a negative impact on subsistence harvests, specifically fish in smoke houses and in drying racks. This is an issue because residents throughout the Community rely on these harvests to sustain themselves through the winter months.

Nearby wildfires are a concern for the Community because they lack the ability to fight a fire if one were to occur.

History of Occurrences

Table 3-8 below is from the THMP which provides a list of wildfires and their impact (in acreage) in or around the Community. Additionally, according to residents, a dump fire occurred about 20 years ago, and about four or five years ago there was a fire ban because of the dry season and concern for fires.

Table 3-7: History of Wildfires

Fire Name	Year	Estimated Impact (Acres)	Distance from the Community (Miles)
Yantarni	1992	880	61.4
Ivan Bay	1992	210	25.3
Chignik	1996	80	12.8
Meshik River	2006	1310	34.6

Residents in the Community recalled the following recent experiences with wildfires:

- Fire at the landfill in May of 2022
- Overgrowing of brush/alder is becoming a problem and a potential fire threat

3.13 FISHERY COLLAPSE

Chignik Bay has experienced ongoing deterioration of local healthy salmon returns, including the sockeye salmon returns of 2017 through 2021. The local sockeye returns have not met minimum escapement goals in many of those years. Salmon populations are affected in all phases of their life by climate, from the initial stages in spawning and rearing habitat, through outmigration survival and food availability in the ocean phase, to return migration and spawning grounds conditions. All aspects of this cycle are tied to the environment in which they live. Tribes and local government entities recognize the need for significant conservation and sustainable management practices to restore the local economy and restore the historically healthy fishery to its previously sustainable salmon returns.

Location

The areas affected by the low numbers of returning salmon include Black Lake, Chignik Lake, Clark River, and Chignik Lagoon. These areas are critical to salmon habitat, spawning, and commercial and subsistence harvesting and processing.

Extent

Over the last four years, Chignik has experienced a collapse in salmon populations to the detriment of local economies, subsistence resources, and cultures. This is directly impacting historic subsistence harvesting locations along such areas as Clark River and Hatchery Beach, which are both key shore spawning areas for salmon. This area is used to provide salmon protein for harvest and trade by area tribes during the winter months (December-February). It remains important to the community's winter food security where few alternative options exist. The Community has always relied on salmon and is their mainstay for commercial and subsistence purposes and central to their cultural practices, including for barter and trade with other tribes in Alaska.

History of Occurrences

On October 30, 2019, the U.S. Secretary of Commerce made a disaster determination for the 2018 Chignik sockeye salmon fishery under the Magnuson-Stevens Fishery Conservation Act. On February 27, 2020, the Secretary of Commerce allocated $10.3 million to address losses to the Chignik management area affected by the fishery failure. The distribution plan allocated funds to help partially restore losses to fishery participants and for research. Research funds will be used to better assess the freshwater and marine conditions that influence productivity of the Chignik sockeye salmon stock and to examine the effects of the fishery disaster on subsistence users.

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4.0 SITE VISIT

Bristol Engineering Services Company, LLC (Bristol) conducted a site visit to Chignik Bay on the dates of May 25-29, 2022. During this site visit Bristol investigated at-risk infrastructure by taking pictures, notating existing conditions, and conducting Traditional Ecological Knowledge (TEK) sessions with the local residents to gather additional data. This data is summarized in a trip report in Appendix C. Bristol collected data about facilities such as location, age, condition of the infrastructure, and climate hazard susceptibility to assist in determining mitigation strategies and to help prioritize the Community's needs.

A subsequent site visit occurred on June 3-6, 2023 to present the final draft reporting to the Community and participate in the 2023 Chignik Regional Climate Resiliency Symposium. A trip report for this visit is included in Appendix D.

4.1 CHIGNIK REGIONAL CLIMATE RESILIENCY SYMPOSIUM

On May 28, during Bristol's site investigation, the Chignik Bay Tribal Council hosted the Chignik Regional Climate Resiliency Symposium. The purpose of the symposium was to bring together multiple organizations actively doing research and planning projects within the Community regarding climate change to allow for collaboration and information sharing. The organizations that presented at the symposium are shown in Table 4-1.

Table 4-1: Climate Resiliency Symposium Presentations

Organization	Project Description
University of Alaska Fairbanks (UAF) Arctic Coastal Geoscience Lab	Chignik Bay Coastal Hazard Analysis Report – Identify natural hazards and mitigation efforts to support community resiliency
Bristol Engineering Services Company, LLC	Chignik Bay Climate Resiliency Action Plan – Identify actions and projects to help mitigate the effects of climate change and support community resiliency
Bristol Bay Heritage Land Trust	Chignik Bay Map Project – Identify land and resources in Chignik Bay that need to be protected and identify next steps to promote conservation
Chignik Intertribal Coalition	BIA Tribal Resiliency Planning Grant – Identify changes in the environment and begin adaptation planning for Chignik Bay, Chignik Lagoon, Chignik Lake, Ivanof Bay, and Perryville.

Local residents attended the symposium to hear from the different organizations on the work they were doing in the Community. Residents were encouraged to share their personal experiences regarding climate change. Notes from the symposium can be found in the trip report in Appendix C.

5.0 COMMUNITY DATA

Identifying partners and stakeholders is a key component to building community resiliency. In addition, identifying past and concurrent studies will aid in development of mitigation strategies for at-risk infrastructure as well as give an idea of data gaps for potential future projects within the Community.

5.1 PARTNERS AND STAKEHOLDERS

Networks and partnerships exist to provide support in times of need. Community resiliency requires building networks and partnerships not just with other communities and governmental bodies, but also with the organizations it serves in both the public and private sectors. The resilience of each organization, a culture of innovation, and its ability to provide its goods and services under all conditions has a strong impact on the overall resilience of the community. Resilient communities encourage preparedness, innovation, and recognize the resilience of the organizations within the community. Table 5-1 and Table 5-2 show the partners and stakeholders of the Community respectively.

Table 5-1: Community Partners

Partner	Description
City of Chignik	City with mayoral form of government
Chignik Bay Tribal Council	Federally recognized tribal government
Far West Inc	Native village corporation
Bristol Bay Native Corporation	Regional corporation
Bristol Bay Native Association	Regional non-profit Native organization
Lake & Peninsula Borough	Regional borough
Lake & Peninsula School District	Regional school district
State of Alaska	State government
Chignik Intertribal Coalition	Coalition formed out of 2018 fishery disaster
University of Alaska Fairbanks	State university
Bristol Bay Heritage Land Trust	Land trust organization

Table 5-1: (Continued): Community Partners

Partner	Description
Alaska Native Tribal Health Consortium (ANTHC)	Consortium of the tribal regional health organizations
Bristol Bay Housing Authority	Regional housing authority
Alaska Energy Authority	Public corporation of the State of Alaska
Bristol Bay Area Health Corporation	Tribal health care
Bureau of Indian Affairs (BIA)	Federal agency
US Department of Housing and Urban Development (HUD)	Federal housing agency
Division of Community and Regional Affairs	State agency
Southwest Alaska Municipal Conference	Non-profit regional economic development organization
Alaska Industrial Development and Export Authority	State public corporation

Table 5-2: Community Stakeholders

Stakeholder	Description
General Communication Inc. (GCI)	Private telecommunications corporation
Alaska Communications (ACS)	Private telecommunications corporation
Alaska Native Tribal Health Consortium (ANTHC)	Consortium of the tribal regional health organizations
Community Members	Local residents of Chignik Bay
Neighboring Communities	Chignik Lake, Chignik Lagoon, Ivanof Bay, & Perryville
Trident Seafoods	Seafood processing company
Commercial fisherman	Commercial fisherman

5.2 PAST AND CONCURRENT STUDIES

Past studies relevant to Chignik Bay and their descriptions are listed in Table 5-3.

Table 5-3: Past Studies

Past Study	Organization	Description
Road Inventory - 2002	US Bureau of Indian Affairs Indian Reservation Roads Program	Identification of routes vital to the economic development of the Tribe
Lake and Peninsula Borough Coastal Management Plan - 2008	Lake and Peninsula Borough	Provide for maintenance of the functions and values of coastal habitats and resources; protection of subsistence, personal use, and commercial and recreational activities dependent on coastal resources.
Lake and Peninsula Borough Multi-Jurisdictional Hazard Mitigation Plan - 2021	Lake and Peninsula Borough	Identify and profile hazards, identify people and facilities at risk, and develop mitigation actions.
Chignik Water and Sewer Improvements - 2005	HDR Alaska, Inc.	Study to develop a cost estimate for proposed water and sewer improvements.
Chignik Bay Community Plan - 2009	Chignik Bay Tribal Council	Comprehensive plan used to address local planning and development initiatives for the village of Chignik Bay.
Sanitation Facilities Community Plan - 2019	ANTHC	Planning document developed to record the existing condition of the water, wastewater, and solid waste infrastructure in Chignik Bay and to define the community's priorities for its sanitation infrastructure.
Southwest Alaska Transportation Plan - 2002	Alaska Department of Transportation	Planning document used to help prioritize the region's transportation infrastructure and determine how transportation links could contribute to Southwest Alaska's economy by improving transportation efficiencies.
2020 Bridge Inspection	Alaska Department of Transportation	Bridge inspection of Indian Creek Bridge and Chignik Creek Bridge.
Tribal Hazard Mitigation Plan 2019	Bristol Engineering Services Company	Planning document, which documented what hazards affect the community and identified potential mitigation strategies.

Concurrent studies and their descriptions are listed in Table 5-4.

Table 5-4: Concurrent Studies

Concurrent Study	Organization	Project Description
Chignik Bay Coastal Hazard Analysis Report	University of Alaska Fairbanks (UAF) Arctic Coastal Geoscience Lab	Identify natural hazards and mitigation efforts to support community resiliency
Chignik Bay Map Project	Bristol Bay Heritage Land Trust	Identify land and resources in Chignik Bay that need to be protected and identify next steps to promote conservation
BIA Tribal Resiliency Planning Grant	Chignik Intertribal Coalition	Identify changes in the environment and begin adaptation planning for Chignik Bay, Chignik Lagoon, Chignik Lake, Ivanof Bay, and Perryville.

5.3 COMMUNITY GOALS

During the site visit and symposium, residents expressed their goals as a community. Some of the community goals expressed include:

- Improve emergency response preparedness.
- Draw more people and families to stay in Community.
- Provide better support systems for older members of community to stay.
- Preserve subsistence cultural way of life (specifically the fishery).
- Improve economy by diversifying resources and providing more jobs to locals in the Community.

6.0 AT RISK INFRASTRUCTURE

A risk analysis was done to determine the potential effects of the identified hazards on the vulnerable infrastructure of the Community. Bristol identified and documented at-risk infrastructure during the site visit investigation. Table 6-1 provides a list of the identified at-risk infrastructure within the Community. Each infrastructure was evaluated for each identified hazard. If the hazard posed a significant risk to the infrastructure an “X” was placed in the corresponding “Hazard Impact” column in Table 6-1. This information helped determine where the Community is most vulnerable and further helped in the identification of mitigation goals and strategies as well as potential future projects.

A combination of historical, exposure, and scenario analysis was used to determine the impact each hazard could have on the Community infrastructure. Historical analysis was performed by reviewing the frequency and impact on the Community of the hazard in the past. Exposure analysis was used by evaluating the existing infrastructure in the area where the hazard is likely to occur or has occurred in the past. Scenario analysis was performed by asking “what if” questions about the hazard and making predictions of how the hazard would impact the Community infrastructure should a hazard occur. Inspection reports for each infrastructure along with maps and photos can be found in Appendices A and B.

Table 6-1: At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
1	Landfill Road/Evacuation Route	56.301590 N 158.418311 W		X	X			X	X		X	X
2	Water Storage Tank	56.301487 N 158.418670 W		X				X	X		X	X
3	City Office	56.301366 N 158.414026 W		X				X	X	X	X	X
4	GCI Satellite / Building	56.301416 N 158.414065 W		X				X	X		X	X
5	ACS Satellite / Building	56.301733 N 158.412804 W		X				X	X		X	X
6A	Indian Creek Bridge	56.300603 N 158.415371 W		X	X	X		X	X	X	X	X
6B	Chignik Creek Bridge	56.296927 158.409100		X	X	X		X	X	X	X	X

Table 6-1 (Continued): At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
6C	Trident Bridge	56.294860 N 158.405574 W		X	X	X		X	X	X	X	X
6D	Trident Bridge	56.293735 N 158.404669 W		X	X	X		X	X	X	X	X
7	Rock Quarry	56.298925 N 158.416670 W		X	X			X	X	X	X	X
8	Tribal Office Building	56.299145 N 158.411690 W		X		X		X	X	X	X	X
9	Tribal Shop	56.299003 N 158.411665 W		X		X		X	X	X	X	X
10	Tsumani Siren	56.297742 N 158.409203 W		X		X		X	X	X	X	X
11	Bible Chapel	56.294920 N 158.406591 W		X		X		X	X	X	X	X

Table 6-1 (Continued): At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
12	Far West Bunkhouse	56.295213 N 158.406559 W		X		X		X	X	X	X	X
13	Boardwalk	56.294905 N 158.405752 W		X		X		X	X	X	X	X
14	Far West Apartment	56.294726 N 158.406208 W		X		X		X	X	X	X	X
15	Post Office	56.293602 N 158.405975 W		X				X	X	X	X	X
16	Community Hall	56.293484 N 158.407086 W		X				X	X	X	X	X
17	Public Safety Apartment/Office/Equipment	56.293175 N 158.407565 W		X				X	X	X	X	X
18	Water Treatment Plant Backwash Lagoon	56.292432 N 158.407997 W		X				X	X	X	X	X

Table 6-1 (Continued): At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
19	Water Trestle	56.291922 N 158.411178 W	X	X			X	X	X	X	X	X
20	Indian Lake Dam	56.280065 N 158.413964 W		X		X		X	X		X	X
21	Water Treatment Plant	56.292622 N 158.407251 W		X				X	X	X	X	X
22	School Tank Farm	56.292416 N 158.407089 W		X				X	X	X	X	X
23	Storage Unit	56.292830 N 158.406744 W		X				X	X	X	X	X
24	Firehall / First Responder Equipment	56.292777 N 158.407205 W		X				X	X	X	X	X
25	Old Generator Building / City Maintenance Building	56.292743 158.406722		X				X	X	X	X	X

Table 6-1 (Continued): At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
26	School Generator	56.292722 N 158.406383 W		X				X	X	X	X	X
27	City Shop / Equipment	56.292904 N 158.406444 W		X				X	X	X	X	X
28	School / Gym	56.293096 N 158.405392 W		X				X	X	X	X	X
29	Teacher Housing	56.293033 N 158.405575 W		X				X	X	X	X	X
30	City Generator Building	56.294866 N 158.388402 W	X	X			X	X	X	X	X	X
31	City Dock / Ferry / Barge Landing	56.296626 N 158.389277 W		X	X	X		X	X	X	X	X
32	City Fuel Tank Farm	56.295140 158.387416	X	X			X	X	X	X	X	X

Table 6-1 (Continued): At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
33	Subsistence Building	56.295545 N 158.387627 W		X				X	X	X	X	X
34	Clinic	56.301352 N 158.378947 W		X	X	X		X	X	X	X	X
35	Boat Harbor	56.303578 N 158.378316 W		X	X	X		X	X	X	X	X
36	Old Water Treatment & Pump House	56.300795 N 158.375868 W		X				X	X		X	X
37	Old Water Storage Tank (East Side)	56.302982 N 158.371666 W		X				X	X		X	X
38	Harbor Master Building	56.303510 N 158.378178 W		X		X		X	X	X	X	X
39	Airport Maintenance Building	56.307901 N 158.376091 W		X	X	X		X	X	X	X	X

Table 6-1 (Continued): At-Risk Infrastructure

Facility Number (See Fig. 1 & 2 in Appendix A)	Facility Name	Location (Latitude, Longitude)	Hazard Impacts									
			Avalanche	Earthquake	Erosion	Flood	Landslide	Precipitation	Severe Wind	Tsunami	Volcano	Wildfire
40	Airport Runway	56.308029 N 158.377692 W		X	X	X		X	X	X	X	X
41	AWOS Station	56.309351 N 158.378357 W		X	X	X		X	X	X	X	X

7.0 RISK MITIGATION STRATEGIES

The following section presents various mitigation strategy options available to the Community. These mitigation strategies will serve as a long-term plan for reducing the potential losses of at-risk infrastructure due to climate hazards.

7.1 FACILITY IMPROVEMENTS

Facility improvements to the at-risk infrastructure is one strategy to help the infrastructure withstand the adverse effects of the climate hazards identified. Facility improvements could include the following:

- Re-painting outside of structures
- Repair/replace damaged siding
- Repair foundations as needed
- Repair/replace damaged roofs
- Fortifying/retrofitting structures as needed
- Replace rotting wood
- Weatherizing structures (vapor barrier & insulation)
- Re-grading around foundations
- Rehabilitating roads

Implementing facility improvements will extend the useful life of existing structures that face increasingly adverse climate conditions. It should be noted that facility improvement strategies will not defend well against catastrophic climate hazards such as avalanches, landslides, floods, and tsunamis. Structures at risk of such hazards would be better suited for defend-in-place and/or relocation mitigation strategies.

7.2 DEFEND-IN-PLACE

Defend-in-place strategies will protect at-risk infrastructure without the need for re-locating the existing structure. Defend-in-place strategies could include the following:

- Raising finished floor elevations of structures to mitigate flooding
- Constructing dikes to defend against flooding
- Constructing steel sheet pile walls to mitigate flooding and erosion
- Clearing of brush and alder overgrowth to mitigate wildfires

- Installing proper drainage around structures (culverts, ditching, gutters) to mitigate erosion
- Adding armor rock to embankments to mitigate erosion
- Revegetation to protect against erosion

7.3 RELOCATION

Relocation mitigation strategies involve relocating at-risk infrastructure to safer locations. This would be the only economical option for structures that are at risk particularly to catastrophic climate hazards such as avalanches, landslides, floods, and tsunamis. Structures would be re-located out of avalanche, landslide, and flood zones to locations that are not affected by these hazards. Past tsunami inundation studies have shown that most of the Community would be covered in water if a sizable tsunami were to occur with not many options for safer alternative locations due to the steep terrain that surrounds the town. Landownership investigations would be needed to determine where structures could legally be moved. Foundations of structures would also have to be considered. Some structures in Chignik were built on metal skids, which would be relatively easy and cost effective to move. Other structures were built on either wood or concrete foundations, which would be harder to move without undermining the structure itself.

8.0 FUTURE PROJECT RECOMMENDATIONS

Based on climate resiliency research, the initial site visit investigation in Chignik Bay, and input from community members, three possible future projects were prioritized that would help support climate resiliency within the Community.

Bristol recommends the following three potential future projects:

1. Indian Creek Bridge and Road Rehabilitation Preliminary Engineering Report (PER)
2. Design and Construction of two Tsunami Shelters PER
3. East Side Electric Distribution Upgrades PER

8.1 Indian Creek Bridge And Road Rehabilitation PER

The Indian Creek Bridge and Landfill Road both currently serve as the main and only evacuation route for the entire Community in the event of a tsunami and/or flooding. The location of these structures are shown in the figures of Appendix A. Pictures of these structures and noted conditions can be found in the *Trip Report* in Appendix C. Past tsunami studies and inundation maps have shown these structures to support the only viable evacuation route for the entire town. One exception being an alternative route on the east side of town leading to an old water storage tank that is not currently vehicle accessible and can only be used by pedestrians. Tsunamis that may occur in the winter season require evacuation routes to be vehicle accessible so residents can stay warm while waiting because there is currently no tsunami shelter in the entire community. Due to these factors, both the Indian Creek Bridge and the Landfill Road are critical infrastructure to the community.

This proposed project includes a PER describing how best to rehabilitate both the Indian Creek Bridge and the Landfill Road, extending the useful life of both structures. Both structures need rehabilitation due to natural erosion processes and vehicular traffic over their lifespan. Rehabilitation of these structures would ensure the safety of the Community in the event of a tsunami.

Scope, schedule, and budget for this project can be found in Appendix E.

8.2 DESIGN AND CONSTRUCTION OF TWO TSUNAMI SHELTERS PER

Currently there are no tsunami shelters within the Community and only one evacuation route accessible to vehicles. There is a single Conex at the landfill (end of the Landfill Road evacuation route) filled with emergency supplies, which serves the community during tsunami evacuations. Historically, the city office has been used as a tsunami shelter, but this is not a long-term viable solution. According to past studies the city office still lies within the flood zone of tsunami inundation mapping and functionally it is not the building's intended design. Tsunami warnings in the winter currently require residents to drive to the top of the evacuation road and sit in their cars to stay warm.

This project includes a PER addressing the construction of two tsunami shelters, one on the west side of town and one on the east side. The two shelters would provide a warm place for residents to stay in the event of a tsunami and would cut down on evacuation times by having a shelter on each side of town. The tsunami shelter on the west side of town would involve constructing a new prefabricated building near the landfill. An old water storage tank on the east side of town may be retrofitted to serve as a tsunami shelter on the east side of town. Retrofitting the old water storage tank would give residents a safe and warm place to stay during tsunami evacuations if residents did not have time to travel across town to the west side tsunami shelter. If the east side old water storage tank's condition was found to not be suitable for this function, it could be removed, and its foundation used for a new tsunami shelter. This project would help to ensure the safety of the entire Community in the event of a tsunami.

Scope, schedule, and budget for this project can be found in Appendix F.

8.3 EAST SIDE ELECTRIC DISTRIBUTION SYSTEM UPGRADES PER

The west and east sides of Chignik Bay used to consist of two separate sections of electric distribution that were not connected, each having their own generators. In 2008, the west and east electric power generation facilities were consolidated into a single power plant connecting the two systems. This new power plant installed in 2008, was installed with sectionalizing equipment that allows electrical isolation of the west or east side of the City for major repair work. During this consolidation, the west side electric distribution system was upgraded with a new 15kVA system and components; however, the east side was connected using existing components due to lack of funding.

The east side electrical distribution system is in poor condition due to its age and environmental factors. The age of this system is unknown, although some components reportedly date back over 70 years. The system is predominantly residential; however, it does serve the airport. The system primarily consists of overhead poles with the exception of several locations where secondary conductors are buried or routed along the ground surface. Frequent high winds, precipitation, and erosion over the years have caused weather damage to the existing poles and electrical components.

Current east side electric distribution system deficiencies are listed below:

- The current system's cross arm design allows primary lines to contact one another during moderate winds resulting in frequent outages.
- Overhead poles are bleached white and beginning to split at their tops.
- Many poles are leaning severely and several show evidence of scorching due to contact with conductors and failed insulators.
- As components break, they are replaced with what is readily available in the community, which is sometimes different than the original component's kV rated class.
- Many secondary service connections are improperly installed directly on the ground, unburied and with no conduit posing a hazard to public safety.
- Twelve out of 15 streetlights do not work due to the installation of the wrong size electric wire (size 14 installed, rather than size 4, which fails from sun and wind over time).

In addition to the east side distribution system deficiencies, the relatively new power generation system also has deficiencies that need to be addressed. The current power generation system consists of three engines and generators supplied with diesel fuel by three 32,000-gallon above ground storage tanks.

Engine descriptions and deficiencies are:

- Engine #1
  - 9-liter, 230 kW generator
  - Main engine that can typically power the entire community throughout the year.
  - Oil leaks from the rear seal causes a mess that frequently needs to be cleaned up.
- Engine #2
  - 9-liter, 230 kW generator
  - Currently not operational.
  - Village purchased a new generator for the City that will replace this engine.
  - This engine will likely be scrapped for parts.
- Engine #3
  - 4.5-liter, 117 kW generator
  - Preferred engine to be run in winter due to lower energy consumption and cost.
  - Currently leaks coolant into oil pan due to cracked piston liners.
  - The engine is now only used temporarily for a few hours at a time for routine maintenance on engine #1 due to coolant leaks.

In addition to engine deficiencies, two radiators, which connect to all three engines are plugged up with sediment build up and need to be replaced. Attempts to flush the radiators have been made with little success. Fuel tanks are also contaminated with red algae and sediment and need to be inspected and cleaned. A 1987 International bucket/utility truck used for electric distribution maintenance also has trouble starting and engine exhaust is excessively blue/white smoke

This proposed project would be a PER to determine what upgrades the east side electrical distribution system, power generation system, bulk fuel system, and utility equipment would need.

The PER would explore the following possible east side electrical distribution system upgrades:

- Replacement and/or maintenance of power generation engines and various components.
- Inspection and cleaning of fuel tanks.
- New poles, transformers, and electrical lines, as needed.
- New secondary service connections, as needed to maintain safety of public.
- Maintenance and/or repair of utility equipment.

Scope, schedule, and budget for this project can be found in Appendix G.

(Intentionally blank)

9.0 DATA GAP ANALYSIS

While data in this report provides a big picture understanding of the local climate conditions and how they are changing, a more thorough understanding of how the climate conditions are changing specific to Chignik Bay is needed. To assess the risks of these changing climate conditions more accurately, data gaps must be filled by future work.

Data gaps that have been identified thus far include:

- Root cause of low salmon returns
- More accurate weather data specific to Chignik Bay
- Bathymetry of river, lakes, and bay
- Water level monitoring
- Centralized historical flood database
- Sediment transport model
- Updated land ownership maps
- Updated aerial imagery
- Inner transit system feasibility study specific to Chignik region

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10.0 REFERENCES

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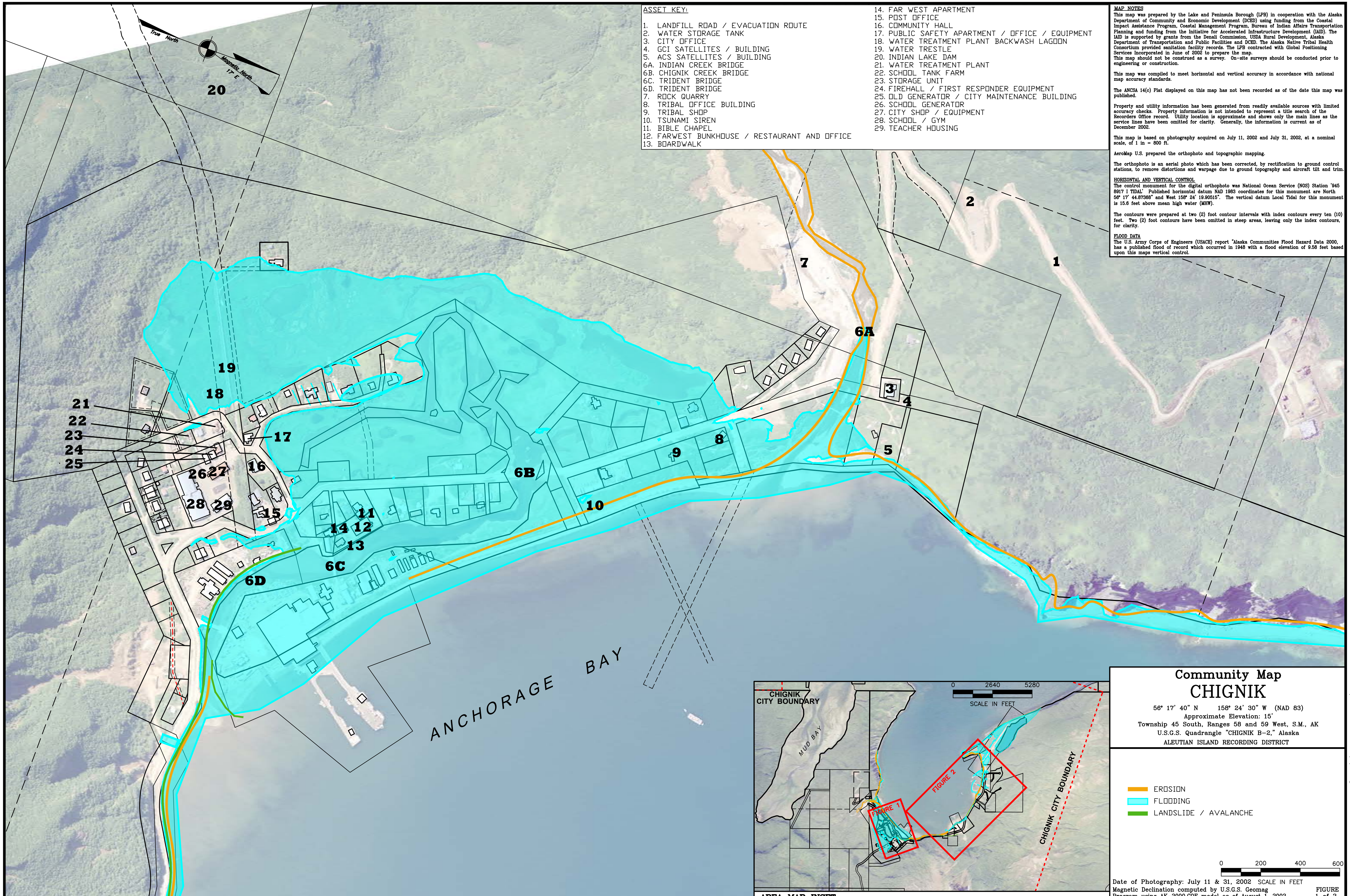
APPENDIX A

Chignik Bay Figures



ASSET KEY:
1. LANDFILL ROAD / EVACUATION ROUTE
2. WATER STORAGE TANK
3. CITY OFFICE
4. GCI SATELLITES / BUILDING
5. ACS SATELLITES / BUILDING
6A. INDIAN CREEK BRIDGE
6B. CHIGNIK CREEK BRIDGE
6C. TRIDENT BRIDGE
6D. TRIDENT BRIDGE
7. ROCK QUARRY
8. TRIBAL OFFICE BUILDING
9. TRIBAL SHOP
10. TSUNAMI SIREN
11. BIBLE CHAPEL
12. FARWEST BUNKHOUSE / RESTAURANT AND OFFICE
13. BOARDWALK
14. FAR WEST APARTMENT
15. POST OFFICE
16. COMMUNITY HALL
17. PUBLIC SAFETY APARTMENT / OFFICE / EQUIPMENT
18. WATER TREATMENT PLANT BACKWASH LAGOON
19. WATER TRESTLE
20. INDIAN LAKE DAM
21. WATER TREATMENT PLANT
22. SCHOOL TANK FARM
23. STORAGE UNIT
24. FIREHALL / FIRST RESPONDER EQUIPMENT
25. OLD GENERATOR / CITY MAINTENANCE BUILDING
26. SCHOOL GENERATOR
27. CITY SHOP / EQUIPMENT
28. SCHOOL / GYM
29. TEACHER HOUSING

MAP NOTES
This map was prepared by the Lake and Peninsula Borough (LPB) in cooperation with the Alaska Department of Community and Economic Development (DCED) using funding from the Coastal Impact Assistance Program, Coastal Management Program, Bureau of Indian Affairs Transportation Planning and funding from the Initiative for Accelerated Infrastructure Development (IAID). The IAID is supported by grants from the Denali Commission, USDA Rural Development, Alaska Department of Transportation and Public Facilities and DCED. The Alaska Native Tribal Health Consortium provided sanitation facility records. The LPB contracted with Global Positioning Services Incorporated in June of 2002 to prepare the map.
This map should not be construed as a survey. On-site surveys should be conducted prior to engineering or construction.
This map was compiled to meet horizontal and vertical accuracy in accordance with national map accuracy standards.
The ANCSA 14(c) Plat displayed on this map has not been recorded as of the date this map was published.
Property and utility information has been generated from readily available sources with limited accuracy checks. Property information is not intended to represent a title search of the Recorders Office record. Utility location is approximate and shows only the main lines as the service lines have been omitted for clarity. Generally, the information is current as of December 2002.
This map is based on photography acquired on July 11, 2002 and July 31, 2002, at a nominal scale, of 1 in = 800 ft.
AeroMap U.S. prepared the orthophoto and topographic mapping.
The orthophoto is an aerial photo which has been corrected, by rectification to ground control stations, to remove distortions and warpage due to ground topography and aircraft tilt and trim.
HORIZONTAL AND VERTICAL CONTROL
The control monument for the digital orthophoto was National Ocean Service (NOS) Station '945 8917 I TIDAL' Published horizontal datum NAD 1983 coordinates for this monument are North 56° 17' 44.87368" and West 158° 24' 19.90515". The vertical datum Local Tidal for this monument is 15.6 feet above mean high water (MHW).
The contours were prepared at two (2) foot contour intervals with index contours every ten (10) feet. Two (2) foot contours have been omitted in steep areas, leaving only the index contours, for clarity.
FLOOD DATA
The U.S. Army Corps of Engineers (USACE) report "Alaska Communities Flood Hazard Data 2000, has a published flood of record which occurred in 1948 with a flood elevation of 9.58 feet based upon this maps vertical control.

True North
Magnetic North 17° E
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5
2
1
ANCHORAGE BAY
CHIGNIK CITY BOUNDARY
MUD BAY
FIGURE 1
FIGURE 2
CHIGNIK CITY BOUNDARY
0 2640 5280
SCALE IN FEET
AREA MAP INSET

Community Map
CHIGNIK
56° 17' 40" N 158° 24' 30" W (NAD 83)
Approximate Elevation: 15'
Township 45 South, Ranges 58 and 59 West, S.M., AK
U.S.G.S. Quadrangle "CHIGNIK B-2," Alaska
ALEUTIAN ISLAND RECORDING DISTRICT

EROSION
FLOODING
LANDSLIDE / AVALANCHE

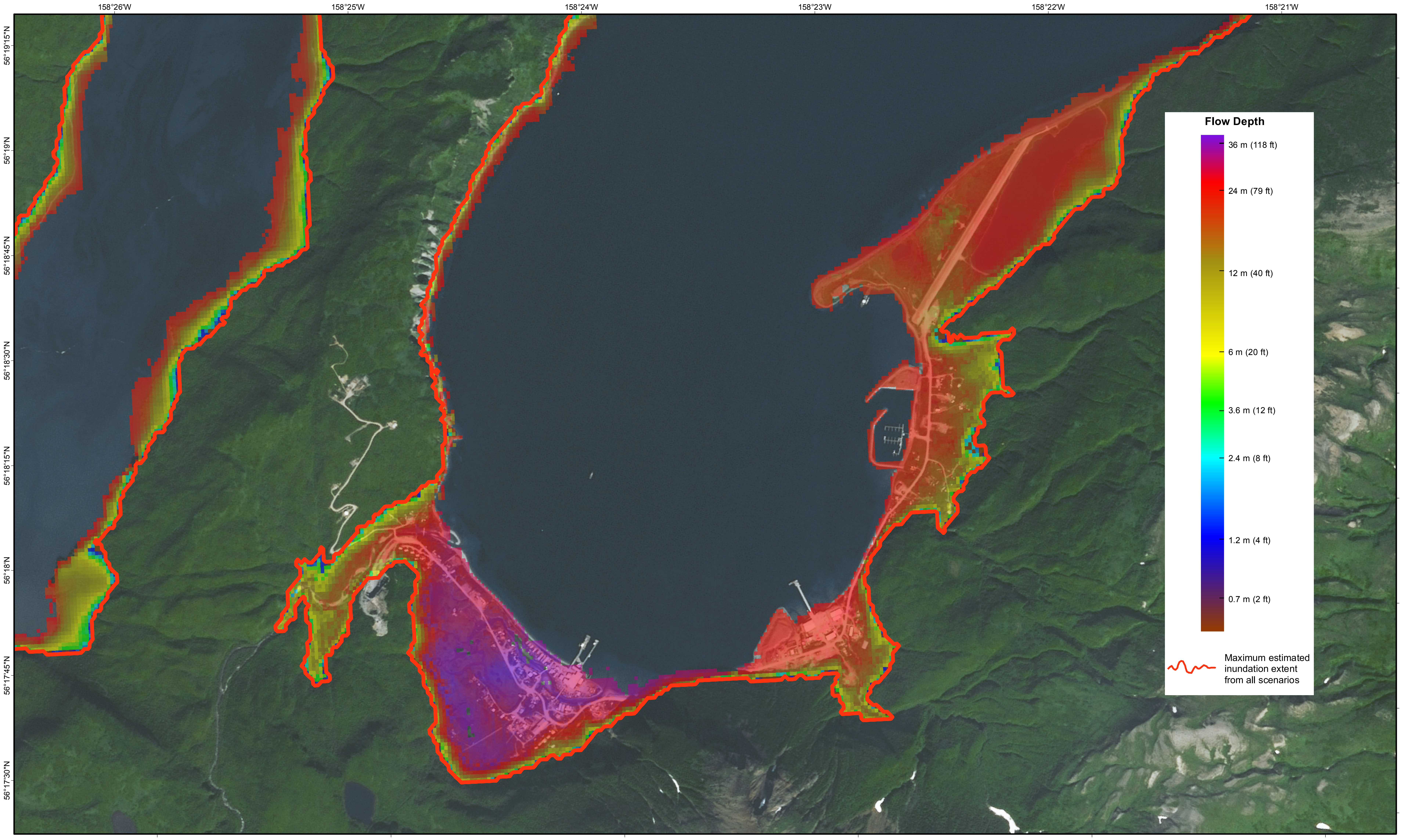
0 200 400 600
Date of Photography: July 11 & 31, 2002 SCALE IN FEET
Magnetic Declination computed by U.S.G.S. Geomag Program using AK-2000.COF model as of August 1, 2002.
FIGURE 1 of 2
CHIGNIK COMMUNITY MAP SHEET 1 1"=200' (2002 PHOTOGRAPHY)

CHIGNIK COMMUNITY MAP SHEET 2 1"=200' (2002 PHOTOGRAPHY)

APPENDIX B

Maximum Estimated Tsunami Inundation Figure

Explanatory text accompanies map



MAXIMUM ESTIMATED TSUNAMI INUNDATION, CHIGNIK BAY, ALASKA

by D.J. Nicolsky[1], E.N. Suleimani[1], and R.D. Koehler[2]

2016

N

SCALE 1:12500

0.5 0.25 0 0.5 MILE

400 0 400 800 1200 1600 2000 2400 2800 FEET

0.5 0.25 0 0.5 KILOMETER

State of Alaska
Department of Natural Resources
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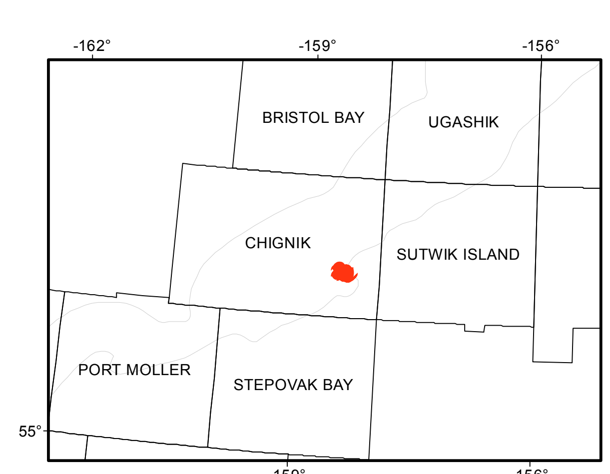
MAP LOCATION



Location of Map Area

Projection:
Alaska State Plane Zone 7 (Feet)
Datum:
North American Datum of 1983
Cartography by:
A.E. Macpherson [1] (2016)
Cartographic review by:
P.E. Gallagher [2] (2016)
Reviewed by:
(2016)

This map has been completed using the best information available and is believed to be accurate; however, its preparation required many assumptions. Actual conditions during a tsunami may vary from those assumed, so the accuracy cannot be guaranteed. Areas inundated will depend on specifics of the earthquake, any earthquake-triggered landslides, on-land construction, tide level, local ground subsidence, and may differ from the areas shown on the map. Information on this map is intended to permit state and local agencies to plan emergency evacuation and tsunami response actions. The map is not appropriate for site-specific use or for land-use regulation. Interpretation of the tsunami-inundation map(s) by qualified experts is strongly recommended.

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APPENDIX C

Trip Report and Meeting Minutes
May 2022

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TRIP REPORT & MEETING MINUTES

Project: **Chignik Bay Climate Resiliency Action Plan Project**
Bristol Project No: 32220067
Reference: Site Visit / Data Collection
Date of Trip: May 25-29, 2022
Location of Meeting: Chignik Bay
Participants:
Bristol: Danielle Dance, Teddy Martin
Symposium: See attached sign in sheet

Summary

DAY 1:

Danielle and Teddy arrived in Chignik Bay around 12:30 PM via Lake Clark Air on May 25, 2022. We are staying in the city apartments for the duration of the stay. Upon arrival we talked with Jeanette Carlson and Debbie Carlson to determine some of the priority infrastructure: *Dump Road/Evacuation Route, Clinic, City Office, Tribal Office, Bridge over Indian Creek, Generator Building, and Tank Farm*.

We also discussed the need for community planning documents that they may have that would pertain to the project. Below is a list of documents provided to us to review:

- Chignik Water and Sewer Improvements Business Plan (HDR Alaska, Inc., June 2005)
- Lake and Peninsula Borough Village / City Contact Information (Updated Fall 2011)
- Chignik Bay Tribal Council BIA Road Inventory (April 1, 2002)
- Southwest Alaska Transportation Plan (HDR Alaska, Inc., November 2002).

Additionally, we are trying to get the latest survey information for the bridge over Indian Creek. This survey was conducted by the State after the last big earthquake (see Day 2 for update). We also requested any community plans from the City that they can find or that they have available.

We conducted field survey / data collection for a few structures. Notes can be found on their individual data inspections sheets.

While conducting our site investigations we had time to talk with two community members (Ailene and Guy Anderson) regarding any concerns for the community. Below are some of the concerns and comments received:

- Erosion is occurring around the back side of the clinic, bridge over Indian Creek, airport.
- There is a need for airport improvements such as runway lights, and runway extension. The runway lights will help with medivac flights. The runway extension would have to be extended out into the ocean and away from the boat harbor. This extension would allow for larger aircraft to land which could have economic benefits for the community. During the spring the runway is soft making it inaccessible for aircraft to land. This is due to the melting permafrost and unsatisfactory surface course material used in constructing the runway. Not having the runway

available for periods of time is hazardous because it makes it so that supplies can't come in (medications), and medivacs are not able to land. In the event of the need for medivac when the runway is not available the coastguard is called in for help.

- It is important to have the following items to bring people back to the community. This used to be a thriving community but over the last few years it is dwindling. These items are also needed to keep the school open.
    - Top 3 priorities to bring:
        - Salmon/Commercial fishing
        - Internet – GCI is estimated to install cable internet in late 2023
        - Economy items
    - Housing -there is a need for more housing in the community. Thinking there is a need for apartments.
- Son lives in one of the oldest homes in the community which was built in roughly 1918. Ailene and Guy live in a red Hud Home. It is subject to flooding/erosion due to the waterfalls behind their home.

DAY 2

Weather today was warm and sunny. We conducted field investigations of most of the tribe and city buildings and other key infrastructure (see attached Infrastructure Inspection notes). We talked with the City mayor about the following items:

- Priority for the City is the Hydro-electric dam. They are currently working to get the road completed up to the hydro dam.
- Airport road to school is owned by the State, City owns the rest. City maintains all roads and employs people to maintain roads. The Tribe contributes funds as needed and identifies other transportation needs in the community to invest tribal transportation money. Tribe provided funds for the parking pad at the clinic.
- City maintains airport and is under contract with the state.
- Bristol Bay owns the subsurface rights at the quarry. City operates quarry and sells material but has to pay royalties. City provided pricing for the materials, but those costs need to increase by $5 to capture royalties. They have the capability to crush own rock.
- City provided a list of equipment and services with cost for each.
- State inspects all bridges in community, Trident owns two bridges near the old Trident buildings. We received the latest survey of two bridges (bridge over Indian Creek, and bridge near the tsunami warning system).
- ANTHC is working to upgrade water system.

DAY 3

More time was spent gathering the last of the needed data (see attached inspection sheets and images). In the evening there was a potluck held at the Community Hall.

DAY 4

We attended and were guest speakers for the Chignik Bay Climate Resiliency Symposium. This event was held to inform community members of projects that are being done in the community and to gather feedback from them. Below are the notes taken during the symposium.

UAF Chignik Erosion Monitoring Update

- Arctic coastal geophysical lab
    - Erosion monitoring
        - Understand how coastline is changing due to erosion
        - Mapping and recording changes
        - Erosion along road between boat harbor and airport
    - Water level gauges – look at tides (hydrographic monitoring)
    - Baseline and repeat surveys and hazard analysis

<u>Community Data</u>

- Events that have happened over the past year?
    - Erosion on the road
    - Wildfire
        - Fire at the dump just a couple of weeks ago
    - Winds
        - 100 mile per hour winds in December 10, 2021
        - Blew tin off house (Danica)
        - A lot of high wind and rain recently
    - Earthquake
        - Rippling in ground (visual that could see from the hill)
            - Danica has pictures
    - Erosion
        - Near Indian Creek
        - Indian creek fills up and erodes the rock quarry
        - Rains in the fall and big tides
        - Big Tides over by the Tribal office
        - Used to be able to walk the whole beach but can't now
        - Erosion on the road to the airport
        - Abutments on the bridges (Indian creek)
            - Evacuation route / critical infrastructure
            - Making it unstable
            - Indian creek flow compromises bridge structure, especially the evacuation bridge
        - Road to dump is dangerous – had a bad accident when truck fell off the road and was on its side that no one could see.

        - When they come down it is usually at night and people can't see
- Water Pipeline - intake at reservoir 50-100' below, bank is really eroding
    - If hydro dam goes through will replace all the piping
    - Parts of where there are pipeline leaks there is ice build up
    - If pipeline breaks the tank has about 8 days of water
    - Erosion along water trestle and pipeline
- Tsunami
    - Several tsunami evacuations over the past 2 years
    - 6' wave would flood the majority of the structures in the community
- Earthquake
    - Tide went out a lot farther but didn't come back in as high as the high tide
- Fishery collapse
    - Early escapement
    - Declined over the last four years
    - Fish and game had an emergency session to put limits further down the chain so that Chignik can get more of the escapement.
    - Not just salmon but the cod fishing as well
    - Erosion
        - Settlement from the erosion and different deposits is potentially blocking the way back up to spawning grounds
- Declined grant on the hydro dam because of the decline in fish
    - Not a distressed community according to the Denali Commission, community wants to change this
- Data
    - What has been done, what can be done
    - Finding strong partnerships
    - Potential video of what is happening in the community
        - Who's the target for the video? – potential funders/politicians
- Jeanette Carlson
    - "Need to keep villages alive"
    - Closing school / domino effect
        - School barely opened last year (barely had enough students)
        - Clinic and post office will close

- “Need to start thinking outside the box” “Lots of resources we can share with the world”
- Priority – tsunami shelter (focus)
- Need to keep economy going and look for other ways to diversify the economy
- Desire to clean up community (dispose of hazardous old structures, equipment, and vehicles)
- 80% of processing happens elsewhere but used to happen here but can’t get it back. All product is being taken elsewhere
  - Fishing community and if fishing goes what do they have?
- Lake and Pen Borough is a partner that takes care of the infrastructure but is typically left out and doesn’t get the money to care for the infrastructure

- Jessie Christian
  - Goal: Conduct research and education that advance coastal processes and hazards knowledge, and by doing so, products that inform decision-making while providing research and workforce development opportunities for students.
  - Develop a *Chignik Bay Coastal Hazard Analysis Report*
  - Stakes for Stakeholders – erosion monitoring
    - Spans 13 communities in Bristol Bay region
  - *Chignik Bay Coastal Hazard Analysis Report*
    - ArcGIS map with digital surface models
    - High resolution mapping imagery
    - Erosion monitoring
      - Site 1 - Head of airport
        - Seen the most erosion over the years
          - 2 feet of erosion over the course of 3 years – ~8 in per year
      - Behind clinic
        - 4 in per year (1 foot over 3 years)
      - ACGLUAF YouTube – time lapse videos
      - Behind the Tribal office
      - Measurements taken every few months by resident
      - Max erosion - ~7 in per year
    - Testing phase of real time water data
    - Where is the sediment gaining?
      - Possible data gap?
    - Any data gathered before the harbor was put in?

            - Harbor was put in place
            - Possible information could be gathered from state entities
            - Rock quarry – not a lot of community input before that process
            - Rock from Sand Point was brought in because rock quality was not very good, crumbling
- Matthew Balazs (UAV Mapping and Products)
    - Erosion in the quarry and where is that sediment going?
        - DEM can measure quantities of material moved/sedimentation and erosion rates
    - Erosion on the road to the airport
    - Earthquake
        - Landslides triggered from recent event
            - Cliff by the landfill
            - Waterfalls by the airport
            - Major slides by the reservoir that could impact the water?
                - Data Gap
                - This is the main water source
            - How do the slope changes impact the infrastructure?
            - Data Gap
                - What is going on under the water with these slope changes.
                - Programs to put systems on boats that survey under the water
                    - Is lidar possible to map the surface of the ocean floor
                        - Economic benefit to use local fisherman to collect this information
                - How are the earthquakes impacting ground surface?
                - Berry flats getting overgrown with alders
- Chris Maio - Alaska Coastal Cooperative
    - Communication network to get the work done (regional and local capacity)
        - Communication network – local priorities being looked at
        - Advance science – physical mapping, food security (socio-economic)
        - Developing demonstration projects
    - Lidar Data set (fly around) – Data Gap
        - Map watershed

        - Ecological system
  - Kirk Larson – Vulcan (Potential Partner)
    - Emphasis is building data sets
    - Proposal development for some of these potential projects

Bristol Engineering Services - Chignik Climate Resiliency Action Plan

  - Climate Hazards
    - Scarcity of fish
    - Severe wind is cyclonic in nature, last October wind was cyclonic and significant. Cyclonic wind caused by shape of Anchorage Bay. NE wind funnel from neighboring bay. Support side of Trident there was a two-story icehouse which completely blew apart. West side of the building is now laying in the bay. Most of the roof is lying around in the shallows. Original quarry site/land slide completely destroyed trailers. Rodrick house lost part of their roof in three separate pieces in end of January in 2000. AWAS gives distorted view of wind direction and rain.
    - Avalanche that same winter covered the road between here and cannery near the city dock closing off transportation to the clinic and airport. Landing craft from Chignik Lagoon had to come down to clear the airport runway because the grader was on the opposite side blocked by the avalanche.
    - Data gap in weather (precipitation and wind)
    - Last winter power outage due to winds blowing and knocking power lines out
    - Typhoons in community
    - Roof blew off a trailer and gets blown into other structures (issues with old, dilapidated buildings & wind)
    - Roof leaks due wind damage
    - Home damage from earthquakes (uneven flooring, settling)
    - Two story near school, blew front of the building in, 10’ x 10’ hole in back of building from wind blowing through the building
    - Older buildings need to be removed to protect surrounding infrastructure
    - Airport runway closures in the past were not reported to DOT and reported directly to the airline companies. Last November they began recording airport runway closures with DOT. Issue with the materials of the resurfacing of the airport. Material was from red colored rocky slide. Airport runway is collapsing and turning into mud. Two airplanes in last two years, one aircraft sucked mud and rock through the engines and went off the runway. Lake Clark air, limit to how much front wheel can turn, it eventually breaks, poor condition of runway broke a pin holding wheel.
    - A lot of debris falling into Indian Creek from the road. Less channel for fish to swim up creek and make it to the spawning ground.
    - Cracked foundations, leaning houses, roof leaks, roofs being blown off
    - Homes need to be weatherized against wind and rain

        - Out migration of people leaving elders vulnerable and unable to maintain structures locally. Labor and material costs are too significant for community members to hire work out directly.
        - May 21 of 2021, significant mud slide and rock fall on road near both bluffs and airport
        - January 2022, pipeline by Trident had a leak and could not treat water for 2 days. Raw water line needs work.
    - Data Gaps
        - Bathymetry of rivers, lakes, and bay
        - Root cause of low salmon return numbers. Genetic studies being done only on chum. Need to work with ADF&G and State to get better funding.
        - Dependable weather data on wind and precipitation (NOAA one of the better sources)
    - Priority Infrastructure
        - Airport***
            - Medivac – soft runway
        - Bridge***
        - Hydro Dam***
        - Waterline***
        - Utilities (heat, water, power, access to emergency services) ***
            - Bridges, airport, emergency shelter
        - City Dock
        - Fuel tank farm
        - Generator
        - Bridge might collapse
            - Where do people go if the bridge goes, if the dam breaks, if there's a mud slide that cuts the rest of the community off from the main evacuation route?
            - Need to look at shelters for both sides
    - AWOS system is not being maintained now (program shut down)
        - Is there better / updated equipment
        - Equipment installed that talks to aircraft and can allow them to change flight path, but project was stalled
        - Ceilometer is required to be (measures cloud heights and density) certified
        - Current monitoring systems are skewed
        - Required to move project forward (get it on the schedule/table)
            - Letters of support, documents of struggles

        - Regional organizations Stakeholder (BBAHC)
        - Identify things that are threats (life threatening) might be able to bypass slow DOT process and got Juneau representatives (lobbyist)
    - Fish Disaster money (2% with the Borough) – this money must be used on a project that is directly related to the fish
    - Lighting needs at the dock
        - Denali Commission
- Tribe has access to federal funding, but tribe does not have property. City and Corporation has the property, and this is an issue that needs to be addressed.
    - Put property to use (1,288 acres)
    - Transfer lands for a specific purpose "In public interest/good"
- Goals
    - Emergency Preparedness / Evacuation route and shelter
        - Earthquake - employees at the processing plant stayed at the school
    - Develop system with stakeholders in the community that prioritizes project ideas
        - *Bridge* & roads
        - *Airport runway re-surfacing, extension, runway lights (include AWAS station?)
        - Water trestle, Hydro Dam, Hydro Dam Road, Water system
        - *Tsunami Shelters
        - Culverts for fish passage (ADF&G has a program used to protect wild stock salmons, funds similar projects)

Chignik Map Project

- Tim Troll – Bristol Bay Heritage Land Trust
- Traditional use conservation area based
    - Native villages should not have to give up their land to promote conservation
    - Benefit shareholders and corporation
    - Conservation education of kids / project
        - Through fly fishing teach land management
        - Teach the kids how to work/run a lodge. But even if they don't do that they will be leaders in their communities and have knowledge of how to care for their environment
    - Important question – who is managing land you want to protect?
    - Wildlife numbers (brown bears) – Data Gap
    - Identify salmon numbers more than what ADF&G already has (anadromous salmon) – Data Gap
    - Protect the spawning and rearing habitat – "may" help turn the lack of salmon around.

Chignik Intertribal Coalition

- Goal– get voice out there to have a voice with BBNA and other state representatives, networking with Kuskokwim/Southeast/Bristol Bay
- Focusing on tribal resiliency as it pertains to climate change
  - Sharing network – sharing fish
  - Responsive state – fishery disaster, Methodist Church, United Methodist Committee on Relief (UMCOR) delivery of fish, following year drought and had to bring in bottled water, following year fishery disaster BBNC salmon donation
  - Steady State – needs assessment of all communities, lacking funding or capacity
  - Common concerns
    - Brush/alder overgrowing – Fire and safety hazards
    - Climate
    - Sockeye replaced by Coho
      - Increased coho in the fall?
        - Always been coho but certain years more than most
        - Once the weir is pulled you don't know
        - Sometime fished to the end of September early 80's-90's. Not happening anymore. But there are still silvers
    - Red Tide – water temperature impacts clams more than red tide
    - Breakdown of trading – loss of culture
      - Breakdown in inter-tribal trade due to resource scarcity
      - Would take salmon to friends in Wasilla and they would give Whittier Shrimp but due to less fish this trading is not happening
      - Salmon 68% of the food source in Chignik Region- information coming from household surveys
      - Loss of traditional hunting, gathering, and harvesting areas knowledge
    - Loss of traditional hunting/gathering areas – loss of cultural/accurate place names
  - Representatives need to be at these sorts of meetings to hear what the community members have to say and stories need to share

- Priority funding needs
  - Land
    - Possible way to bring the Tribe, City, Corporation to discuss how to address the issue of land.
    - Tribe is missing out on grant opportunities due to the lack of land. How can this be resolved?
    - Hard to transfer land without a surveyor, and surveyor is costly to bring in
  - Transportation with the region (roads that connect)
    - Access to transportation between the Chignik communities
      - Ferry
      - Inter-tie road-questions of maintenance, cost, and ownership, along with difficult terrain. There is an existing corridor between Chignik Bay, and Chignik Lagoon used to access Mud Bay for fishing in the winter time. Chignik Lagoon residents would use trail to grab mail from Chignik Bay once a month.
    - School children, access to airport, ferry, clinic
      - Access to essential services
      - Ferry between the Chigniks
    - Chignik Intertie – obstacle is the maintenance (who maintains it? It is very costly)
    - Map 14(c)3 – City has the corridor up to the Lagoon corporation
      - Trail or pioneer road? – Could this lead to road?
      - Traditional use – Lagoon people used to hike down to check mail back in the day.
      - RS2477 – easement?
      - UAF mapping of the intertie
        - Looking into the future of hydro electric that could be a corridor to use/share those resources with the Chignik region
          - Could lower cost
    - Corridor to the water tank for a secondary site
  - Fire safety grant? Installing fire breaks
    - Fire up by the dump a few weeks ago
  - Grants for community garden

- Building capacity and resilience
  - Survey – Data Gap
    - Assistance with staking property
  - Access to areas is being cut off because of climate change and the increase of alder growth
  - Displacement of subsistence foods
  - Potential source of information – BBNA Forestry Management plan on website
    - Frank Woods aka “Woodsy”
    - Predicated on Native allotments
  - Forestry management plan for Curyung Corporation
  - Get access to roads to build economy
  - Boardwalk to berry flats/nature viewing to identify where people go, could draw people to the region – economic resource
    - Economic options – infrastructure to support and direct tourists
    - Lots of talent – people can survive on the water safely
  - Aleut words app – cultural resources to educate children
    - School education
    - Have kids go out and record stories from the elders
  - Diversification
  - Potential for BBNC expand “Place Names” effort into Chigniks?
  - Need fish to preserve way of life
  - Angler Tourism – exclusive lodge, intent to draw in wealthy clients
    - Bringing influential people in that has influence in Washington DC
  - Get off the Ferry and look through a museum
  - Trident turns lands over to Community –
  - Boardwalk in the CEDS (historic boardwalk and create cultural center)
    - Accepted but brief outline
- Percentage of having staffer funded / partners?
  - BBNA, BBNC, BB’s, EDA grants,
  - Challenge Distressed Community status (Denali Commission)

- Chignik has been nominated for a Green Community – green star coming out this summer to evaluate Solid waste in the community.

DAY 5:

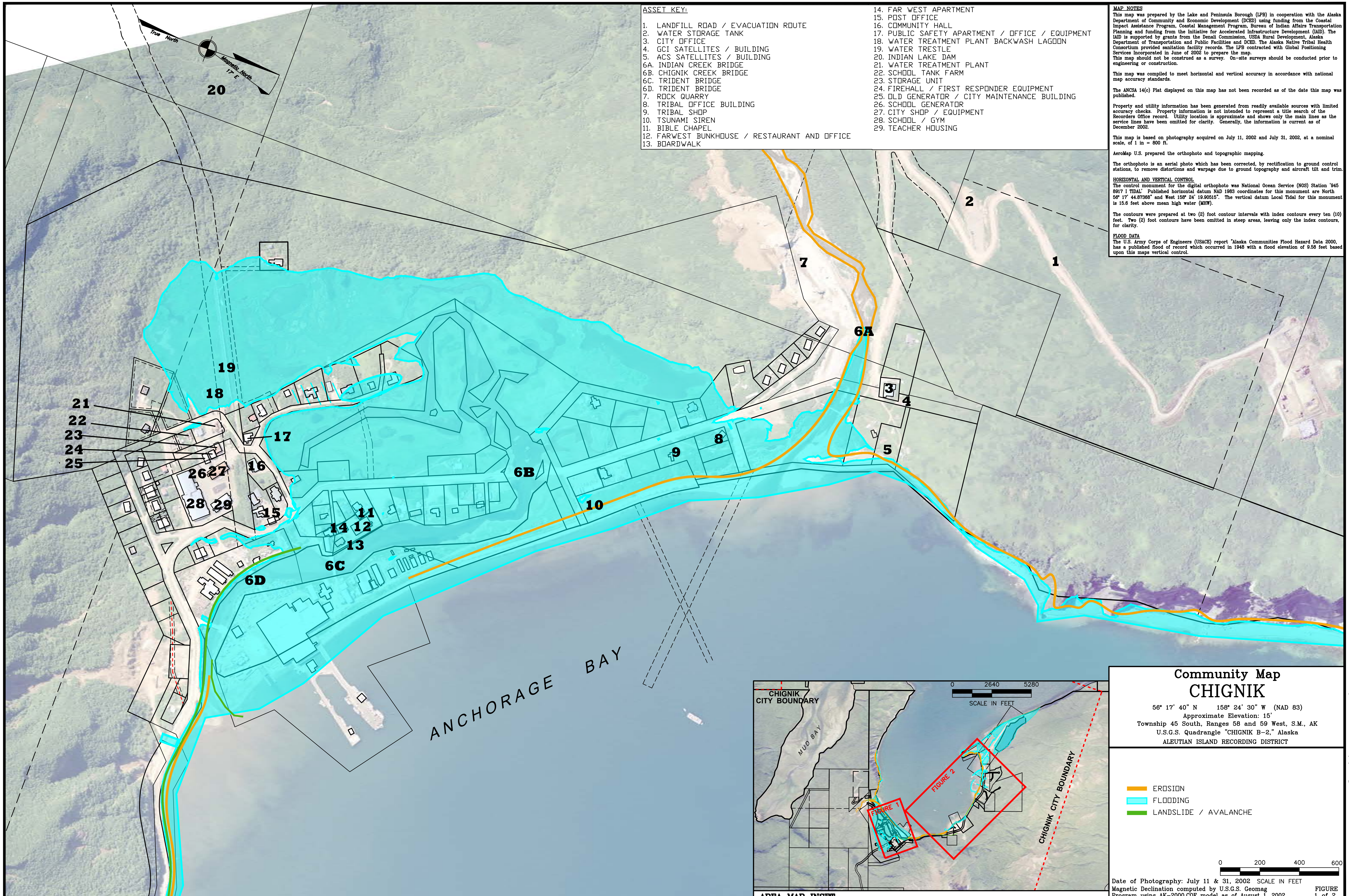
Danielle and Teddy waited in Chignik Bay for plane to arrive around 11:00 AM via Lake Clark Air on May 29, 2022 for ride back to Anchorage. Plane was delayed and did not arrive until 4:00 PM. Danielle and Teddy landed in Anchorage at 6:00 PM.

Attachments:

1. Inventory Map
2. Infrastructure Inspection Sheets / Photos
3. Symposium Agenda
4. Symposium Flyer
5. Symposium Sign-in Sheet
6. Presentation

End Meeting Minutes

CC: File


ASSET KEY:
1. LANDFILL ROAD / EVACUATION ROUTE
2. WATER STORAGE TANK
3. CITY OFFICE
4. GCI SATELLITES / BUILDING
5. ACS SATELLITES / BUILDING
6A. INDIAN CREEK BRIDGE
6B. CHIGNIK CREEK BRIDGE
6C. TRIDENT BRIDGE
6D. TRIDENT BRIDGE
7. ROCK QUARRY
8. TRIBAL OFFICE BUILDING
9. TRIBAL SHOP
10. TSUNAMI SIREN
11. BIBLE CHAPEL
12. FARWEST BUNKHOUSE / RESTAURANT AND OFFICE
13. BOARDWALK
14. FAR WEST APARTMENT
15. POST OFFICE
16. COMMUNITY HALL
17. PUBLIC SAFETY APARTMENT / OFFICE / EQUIPMENT
18. WATER TREATMENT PLANT BACKWASH LAGOON
19. WATER TRESTLE
20. INDIAN LAKE DAM
21. WATER TREATMENT PLANT
22. SCHOOL TANK FARM
23. STORAGE UNIT
24. FIREHALL / FIRST RESPONDER EQUIPMENT
25. OLD GENERATOR / CITY MAINTENANCE BUILDING
26. SCHOOL GENERATOR
27. CITY SHOP / EQUIPMENT
28. SCHOOL / GYM
29. TEACHER HOUSING
MAP NOTES
This map was prepared by the Lake and Peninsula Borough (LPB) in cooperation with the Alaska Department of Community and Economic Development (DCED) using funding from the Coastal Impact Assistance Program, Coastal Management Program, Bureau of Indian Affairs Transportation Planning and funding from the Initiative for Accelerated Infrastructure Development (IAID). The IAID is supported by grants from the Denali Commission, USDA Rural Development, Alaska Department of Transportation and Public Facilities and DCED. The Alaska Native Tribal Health Consortium provided sanitation facility records. The LPB contracted with Global Positioning Services Incorporated in June of 2002 to prepare the map.
This map should not be construed as a survey. On-site surveys should be conducted prior to engineering or construction.
This map was compiled to meet horizontal and vertical accuracy in accordance with national map accuracy standards.
The ANCSA 14(c) Plat displayed on this map has not been recorded as of the date this map was published.
Property and utility information has been generated from readily available sources with limited accuracy checks. Property information is not intended to represent a title search of the Recorders Office record. Utility location is approximate and shows only the main lines as the service lines have been omitted for clarity. Generally, the information is current as of December 2002.
This map is based on photography acquired on July 11, 2002 and July 31, 2002, at a nominal scale, of 1 in = 800 ft.
AeroMap U.S. prepared the orthophoto and topographic mapping.
The orthophoto is an aerial photo which has been corrected, by rectification to ground control stations, to remove distortions and warpage due to ground topography and aircraft tilt and trim.
HORIZONTAL AND VERTICAL CONTROL
The control monument for the digital orthophoto was National Ocean Service (NOS) Station '945 8917 I TIDAL' Published horizontal datum NAD 1983 coordinates for this monument are North 56° 17' 44.87368" and West 158° 24' 19.90515". The vertical datum Local Tidal for this monument is 15.6 feet above mean high water (MHW).
The contours were prepared at two (2) foot contour intervals with index contours every ten (10) feet. Two (2) foot contours have been omitted in steep areas, leaving only the index contours, for clarity.
FLOOD DATA
The U.S. Army Corps of Engineers (USACE) report "Alaska Communities Flood Hazard Data 2000, has a published flood of record which occurred in 1948 with a flood elevation of 9.58 feet based upon this maps vertical control.
True North
Magnetic North 17° E
ANCHORAGE BAY
1 2 3 4 5 6A 6B 6C 6D 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
CHIGNIK CITY BOUNDARY
MUD BAY
FIGURE 1
FIGURE 2
CHIGNIK CITY BOUNDARY
0 2640 5280
SCALE IN FEET
AREA MAP INSET
Community Map
CHIGNIK
56° 17' 40" N 158° 24' 30" W (NAD 83)
Approximate Elevation: 15'
Township 45 South, Ranges 58 and 59 West, S.M., AK
U.S.G.S. Quadrangle "CHIGNIK B-2," Alaska
ALEUTIAN ISLAND RECORDING DISTRICT
EROSION
FLOODING
LANDSLIDE / AVALANCHE
0 200 400 600
SCALE IN FEET
Date of Photography: July 11 & 31, 2002
Magnetic Declination computed by U.S.G.S. Geomag Program using AK-2000.COF model as of August 1, 2002.
FIGURE 1 of 2
CHIGNIK COMMUNITY MAP SHEET 1 1"=200' (2002 PHOTOGRAPHY)

Community Map
CHIGNIK
56° 17' 40" N 158° 24' 30" W (NAD 83)
Approximate Elevation: 15'
Township 45 South, Ranges 58 and 59 West, S.M., AK
U.S.G.S. Quadrangle "CHIGNIK B-2," Alaska
ALEUTIAN ISLAND RECORDING DISTRICT
ASSET KEY:
30. CITY GENERATOR BUILDING
31. CITY DOCK / FERRY / BARGE LANDING
32. CITY TANK FARM
33. SUBSISTENCE BUILDING
34. HARRIS SUBREGIONAL CLINIC
35. BOAT HARBOR
36. OLD WATER TREATMENT PLANT & PUMP HOUSE
37. WATER STORAGE TANK (EAST SIDE)
38. HABOR MASTER BUILDING
39. AIRPORT MAINTENANCE BUILDING
40. AIRPORT RUNWAY
41. AWAS STATION
EROSION
FLOODING
LANDSLIDE / AVALANCHE
0 200 400 600
SCALE IN FEET
Date of Photography: July 11 & 31, 2002
Magnetic Declination computed by U.S.G.S. Geomag Program using AK-2000.COF model as of August 1, 2002.
FIGURE 2 of 2
37
36
34
38
35
32
33
30
31
39
40
41
ANCHORAGE BAY
True North
Magnetic North
17° E
CHIGNIK COMMUNITY MAP SHEET 2 1"=200' (2002 PHOTOGRAPHY)

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	1 - Landfill Road/Evacuation Route
Location (lat & long):	56.301590,-158.418311
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Tsunami Evacuation Route
Dimensions:	18 ft wide, ~4,286 ft long
Date Constructed:	
Age (years):	
Foundation Type:	Gravel & Geotextile
Condition:	*Some areas of exposed larger rock due to the washing away of fines.
Utilities (water, sewer, electric, communications, gas, heating oil):	Water line
Prone to flooding?	No
Prone to erosion?	This occurs due to runoff and lack of ditching
Prone to landslide/avalanche?	No
Drainage problems?	Ditching improvements needed especially around corners
Cause of Failure (if any, date issue started):	Erosion due to runoff
Proposed facility improvements:	N/A
Defend in place strategies:	Add armor rock around corner ditching for more control of the flow of water. Add more ditching & culverts as needed.
Alternative locations:	N/A
Other Notes:	*after bridge heading to dump, left hand side, deep trenching from runoff (6' wide, 2' deep) * (a) washout exposing large rock, sharp corner * (b) carry ditch around corner * (c) ditch work needed *PVC culvert 6" wide

Chignik Bay, Alaska
May 2022
Landfill Road & Evacuation Route

Exposed Geotextile

Lack of Ditching Around Bends
1 of 2

Chignik Bay, Alaska
May 2022
Landfill Road & Evacuation Route

Runoff Washing Away Fines Exposing Larger Rock

Washed Out Ditching Around Bend

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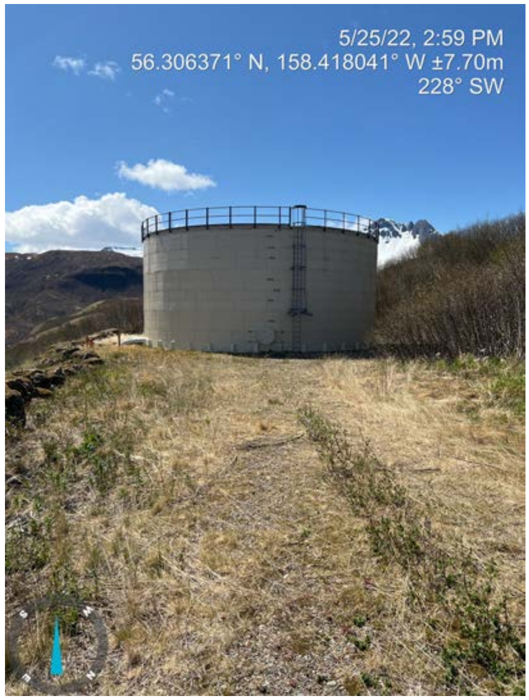
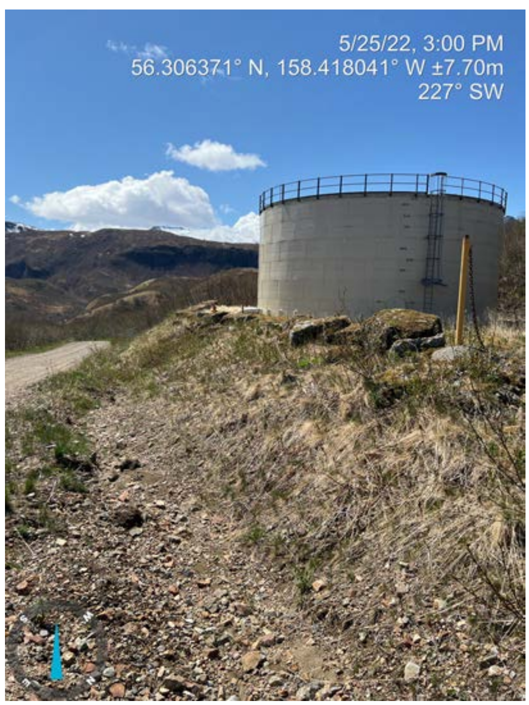
INFRASTRUCTURE INSPECTION

Infrastructure Name:	2 - Water Storage Tank
Location (lat & long):	56.301487,-158.418670
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Water Supply
Dimensions:	~54' diameter
Date Constructed:	
Age (years):	
Foundation Type:	Concrete
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, solar electric
Prone to flooding?	No
Prone to erosion?	No
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Water Storage Tank



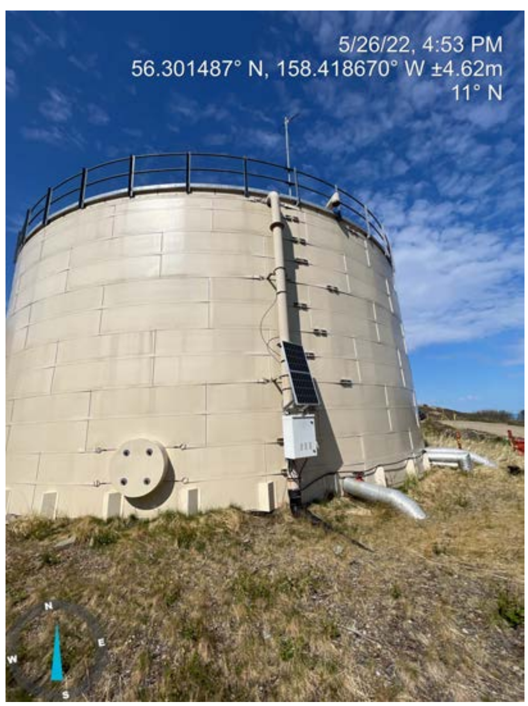
Approach



Embankment
1 of 2

Chignik Bay, Alaska
May 2022
Water Storage Tank

Inlets & Outlets



Water Storage Tank Inlet
2 of 2

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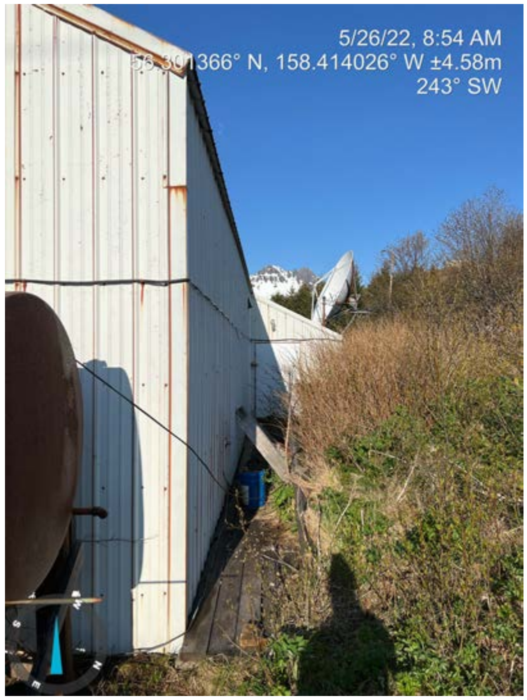
INFRASTRUCTURE INSPECTION

Infrastructure Name:	3 - City Office
Location (lat & long):	56.301366, -158.414026
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	City Office / Payments / Apartments
Dimensions:	57' x 69'
Date Constructed:	
Age (years):	
Foundation Type:	*Wood piling w/ concrete *Wood skirting (some broken)
Condition:	*Outside ok *Inside has some water damage
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, sewer, communications, electric, heating oil
Prone to flooding?	No
Prone to erosion?	No
Prone to landslide/avalanche?	No
Drainage problems?	*French drain not connected to anything in the back *Surface runoff on hill side on back side of building
Cause of Failure (if any, date issue started):	Old building, needs maintenance Inadequate drainage around backside of building Leaning wood retaining wall on back side of building
Proposed facility improvements:	Install new retaining wall on backside of building Install proper drainage around building foundation
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal siding *Wood retaining wall in back - leaning *Unstable staircases

Chignik Bay, Alaska
May 2022
City Office



East Back Side

Front Side
1 of 2

Chignik Bay, Alaska
May 2022
City Office

North Elevation

West Back Side
2 of 2

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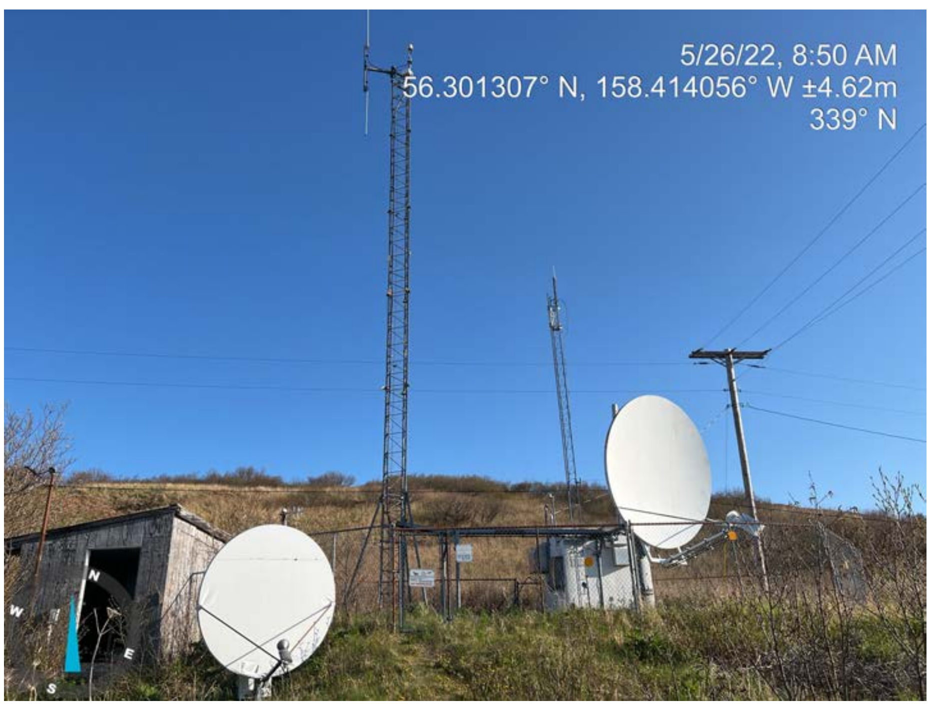
INFRASTRUCTURE INSPECTION

Infrastructure Name:	4 - GCI Satellite / Building
Location (lat & long):	56.301416, -158.414065
Owner (Commercial, Residential, or Public):	Commercial, GCI
Function:	Provide Telecommunications
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Metal Skid
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Communications
Prone to flooding?	No
Prone to erosion?	No
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Fenced *Higher on the hill *Wrapped beds of rock

Chignik Bay, Alaska
May 2022
GCI Satellite

Dish & Building Foundation



GCI Satellite
1 of 2

Chignik Bay, Alaska
May 2022
GCI Satellite

GCI

Tower
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	5 - ACS Satellite / Building
Location (lat & long):	56.301733, -158.412804
Owner (Commercial, Residential, or Public):	Commercial, ACS & AT&T
Function:	ACS Telephone, AT&T Satellite
Dimensions:	20.5' x 8.5'
Date Constructed:	
Age (years):	
Foundation Type:	Metal Skid
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Communications
Prone to flooding?	No
Prone to erosion?	Some erosion on bluff edge
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	Monitor erosion of bluff edge
Alternative locations:	Move further away from bluff edge when needed
Other Notes:	*On edge of bluff *Anchored down *Lots of old equipment stored outside near facility

Chignik Bay, Alaska
May 2022
ACS Satellite & Building

Bluff Edge

Metal Skid Foundation
1 of 2

Chignik Bay, Alaska
May 2022
ACS Satellite & Building

Northside

Sattelite
2 of 2

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INFRASTRUCTURE INSPECTION

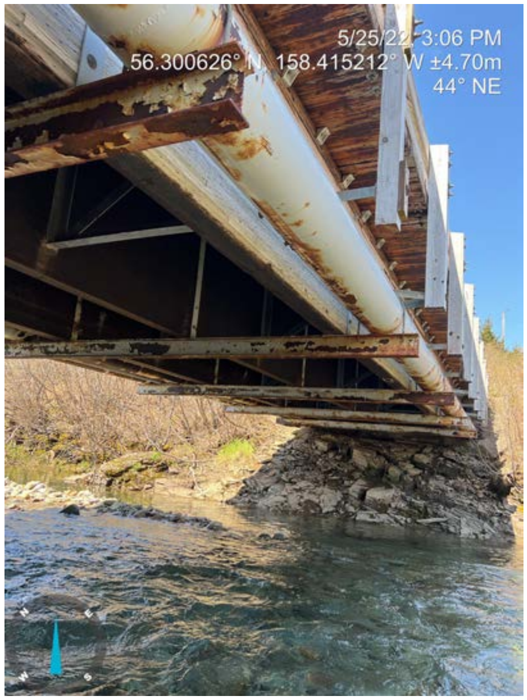
Infrastructure Name:	6A - Indian Creek Bridge
Location (lat & long):	56.300603, -158.415371
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Tsunami Evacuation Route
Dimensions:	72' long, 15' wide (vehicle), 7' (pedestrian)
Date Constructed:	1985
Age (years):	37
Foundation Type:	*Wood decking and wing walls *metal/wood/rock abutments (one side of the deck is resting on the
Condition:	*See most current survey done by the State after last big earthquake. *Unsatisfactory (decking may be ok but abutments need updated
Utilities (water, sewer, electric, communications, gas, heating oil):	Water/Sewer???
Prone to flooding?	Located in flood zone
Prone to erosion?	Yes
Prone to landslide/avalanche?	No
Drainage problems?	*far side connection (Dump Rd), has erosion due to runoff. *Fines are deposited on deck of bridge *Culvert draining and hitting wingwall of bridge *Drainage and erosion on both ends of bridge along wingwalls
Cause of Failure (if any, date issue started):	Erosion at abutments, wear and tear from vehicle traffic
Proposed facility improvements:	Replace bridge structure components as needed
Defend in place strategies:	Stabilize areas of erosion
Alternative locations:	N/A
Other Notes:	*Wood surface decking worn down on side closest to quarry. *Some wood posts and rub rails are cracked on the surface

Chignik Bay, Alaska
May 2022
Indian Creek Bridge

Damaged Decking & Rub Rails

Erosion at South Abutment Wood Wing Wall

Chignik Bay, Alaska
May 2022
Indian Creek Bridge



North Abutment

Side Profile
2 of 3

Chignik Bay, Alaska
May 2022
Indian Creek Bridge

South Abutment

Weight Limit
3 of 3

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INFRASTRUCTURE INSPECTION

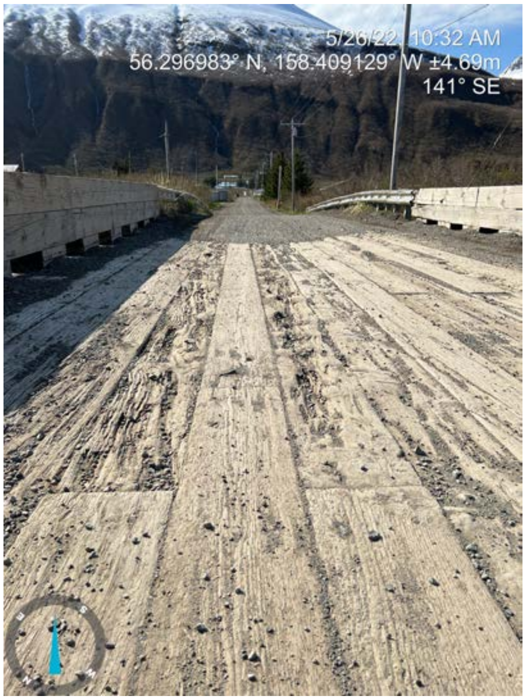
Infrastructure Name:	6B - Chignik Creek Bridge
Location (lat & long):	56.296927, -158.409100
Owner (Commercial, Residential, or Public):	City of Chignik
Function:	Tsunami Evacuation Route
Dimensions:	20' wide x 51' long
Date Constructed:	2002
Age (years):	20
Foundation Type:	*Culvert w/ earth filled (vertical culvert) *Wood wing walls
Condition:	*Wood decking worn *Wood Railing worn *Metal guardrail good except bullnoses need repaired/replaced
Utilities (water, sewer, electric, communications, gas, heating oil):	Lighting/power
Prone to flooding?	Located in flood zone
Prone to erosion?	Some erosion on embankments and near wing walls
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	
Proposed facility improvements:	*Wing wall, wood & metal guardrails, and decking need replaced
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*14" depth due to grading along guardrails *Road narrows (1 lane) *guardrail on either side of bridge

Chignik Bay, Alaska
May 2022
Chignik Creek Bridge

Abutment

Chignik Creek Bridge
1 of 2

Chignik Bay, Alaska
May 2022
Chignik Creek Bridge



Decking

Side Profile

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	6C - Trident Bridge
Location (lat & long):	56.294860, -158.405574
Owner (Commercial, Residential, or Public):	Commercial, Trident
Function:	Transportation
Dimensions:	13.5' wide x 115' long
Date Constructed:	
Age (years):	
Foundation Type:	Piles, one end rests on natural ground
Condition:	*Some loose boards *Loose approach
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, water
Prone to flooding?	Located in flood zone
Prone to erosion?	Piles prone to ocean surges
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	Piles prone to wood rot, loose decking
Proposed facility improvements:	*New decking and approaches *Waterproofing on piles
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Bridge crosses portion of the former Indian Creek (is not cut off from main flow with the construction of the Anderson Rd) *Still gets tidal waters *Mostly Pedestrian Use (visually saw 2 vehicles use it)

Chignik Bay, Alaska
May 2022
6C - Trident Bridge

Abutment

Approach

Chignik Bay, Alaska
May 2022
6C - Trident Bridge

Decking

Piles
2 of 3

Chignik Bay, Alaska
May 2022
6C - Trident Bridge

Side Profile

Weight Limit
3 of 3

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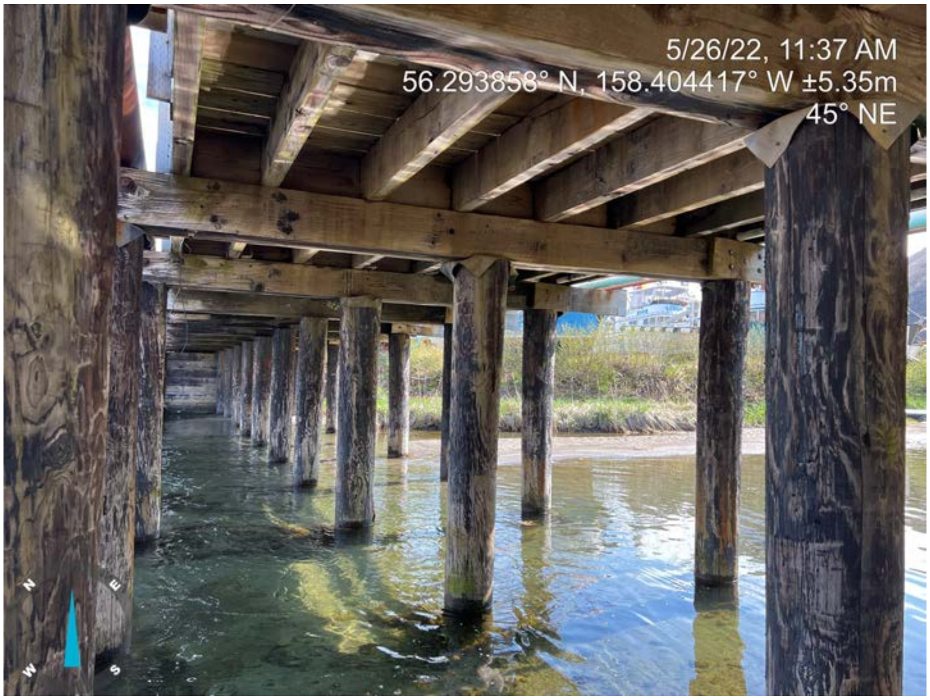
INFRASTRUCTURE INSPECTION

Infrastructure Name:	6D - Trident Bridge
Location (lat & long):	56.293735, -158.404669
Owner (Commercial, Residential, or Public):	Commercial, Trident
Function:	Transportation
Dimensions:	14' wide x 196' long (~100' creek width)
Date Constructed:	
Age (years):	
Foundation Type:	*Wood piles and wing wall, decking and rails *Resting on natural ground
Condition:	*Loose and cracked boards on decking *One side of rail loose
Utilities (water, sewer, electric, communications, gas, heating oil):	Water
Prone to flooding?	Located in flood zone
Prone to erosion?	Piles prone to ocean surges
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	Piles prone to wood rot, loose decking
Proposed facility improvements:	*New decking and approaches *Waterproofing on piles
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Water pipe w/ outflow into creek attached to bridge *Used to haul large quantities of freight

Chignik Bay, Alaska
May 2022
6D - Trident Bridge

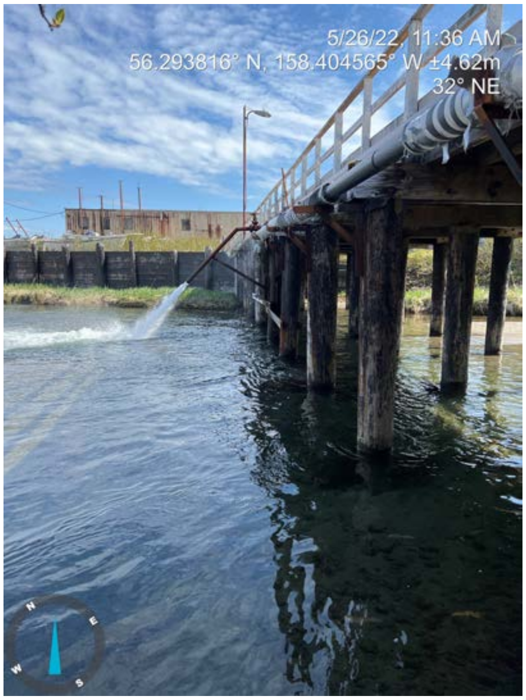
Approach



Piles
1 of 3

Chignik Bay, Alaska
May 2022
6D - Trident Bridge

Retaining Wall on North Side



Water Line Discharge

Chignik Bay, Alaska
May 2022
6D - Trident Bridge

Water Line

Weight Limit
3 of 3

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	7 - Rock Quarry
Location (lat & long):	56.298925, -158.416670
Owner (Commercial, Residential, or Public):	Far West Owns Land, BBNC owns subsurface rights, City can produce rock and pay royalty to BBNC
Function:	Material Source
Dimensions:	~1 acre
Date Constructed:	
Age (years):	
Foundation Type:	Bedrock
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	N/A
Prone to flooding?	No
Prone to erosion?	Yes due to runoff
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Crusher *rock belt/elevator *what is the rock used on in the community, possible grades available?

Chignik Bay, Alaska
May 2022
Rock Quarry

Produced Rock Pile

Rock Crusher
1 of 2

Chignik Bay, Alaska
May 2022
Rock Quarry

Rock Pile Gradation

Rock Quarry
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	8 - Tribal Office Building
Location (lat & long):	56.299145, -158.411690
Owner (Commercial, Residential, or Public):	Public, Tribe
Function:	Tribal Office
Dimensions:	26.5' x 54'
Date Constructed:	1982
Age (years):	40
Foundation Type:	*Wood pile in concrete *Wood skirting
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, Sewer, Electricity, Communications, Heating Oil
Prone to flooding?	Located in flood zone
Prone to erosion?	No
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	Damaged siding, missing paint
Proposed facility improvements:	*Paint to protect siding *Add new siding where needed
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Wood siding (T1/11) - like new

Chignik Bay, Alaska
May 2022
Tribal Office Building

East Elevation

North Elevation

Chignik Bay, Alaska
May 2022
Tribal Office Building

South Elevation

West Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	9 - Tribal Shop
Location (lat & long):	56.299003, -158.411665
Owner (Commercial, Residential, or Public):	Public, Tribe
Function:	Equipment & Material Storage for Projects
Dimensions:	39.5' x 60'
Date Constructed:	2001
Age (years):	21
Foundation Type:	Concrete slab on grade 16" concrete thickness with some pitting
Condition:	Good condition w/ minor foundation pitting Rusted metal dome
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric
Prone to flooding?	Located in flood zone
Prone to erosion?	No
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	Rusted metal dome
Proposed facility improvements:	Paint dome to prevent further dome deterioration & rust
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal Dome

Chignik Bay, Alaska
May 2022
Tribal Shop

East Elevation

Foundation Pitting & Lack of Fill
1 of 2

Chignik Bay, Alaska
May 2022
Tribal Shop

North Elevation

West Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	10 - Tsunami Siren
Location (lat & long):	56.297742, -158.409203
Owner (Commercial, Residential, or Public):	Public
Function:	Tsunami Warning
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Pole in Concrete
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric
Prone to flooding?	Located in flood zone
Prone to erosion?	No
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	Louder siren and/or install multiple sirens along community
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Berm on back side *Only half of community can hear this. Not sufficient for whole community.

Chignik Bay, Alaska
May 2022
Tsunami Siren

Electrical

Pole Foundation
1 of 2

Chignik Bay, Alaska
May 2022
Tsunami Siren

Tsunami Siren

UAF Erosion Monitoring Stakes
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	11 - Bible Chapel
Location (lat & long):	56.294920, -158.406591
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Religious
Dimensions:	44' x 63'
Date Constructed:	
Age (years):	
Foundation Type:	Wood skirting / wood foundation
Condition:	Okay
Utilities (water, sewer, electric, communications, gas, heating oil):	propane, heating oil, electric
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	trench in front created from rain runoff from roof (no gutter)
Cause of Failure (if any, date issue started):	Old structure
Proposed facility improvements:	*General building maintenance *New roof *New siding
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*T1/11 and some metal siding

Chignik Bay, Alaska
May 2022
Bible Chapel

East Elevation

Front Entrance
1 of 2

Chignik Bay, Alaska
May 2022
Bible Chapel

North Elevation

West Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	12 - Far West Bunkhouse
Location (lat & long):	56.295213, -158.406559
Owner (Commercial, Residential, or Public):	Commercial, Far West
Function:	Housing
Dimensions:	57' x 97'
Date Constructed:	
Age (years):	
Foundation Type:	Unsure but has wood skirting at a minimum
Condition:	Good w/ some minor repairs needed
Utilities (water, sewer, electric, communications, gas, heating oil):	electric, propane, heating oil
Prone to flooding?	Located in the flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Old structure
Proposed facility improvements:	*New windows *Update/repair broken siding
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*T1/11 siding - some broken sections *Some insulation (plastic) is exposed to the elements

Chignik Bay, Alaska
May 2022
Far West Bunkhouse

East Elevation

North Elevation
1 of 2

Chignik Bay, Alaska
May 2022
Far West Bunkhouse

South Elevation

West Elevation
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	13 - Boardwalk
Location (lat & long):	56.294905, -158.405752
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Pedestrian Use
Dimensions:	*6' wide *680' long (old boardwalk), 188' (newer boardwalk)
Date Constructed:	
Age (years):	
Foundation Type:	timber sleepers
Condition:	Most is good. A few boards are damaged and need replaced. There's a new section. Bridge 7C approach needs replaced.
Utilities (water, sewer, electric, communications, gas, heating oil):	N/A
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Old structure
Proposed facility improvements:	*Replace approach near bridge 7C *Replace broken boards as needed
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Boardwalk

Bridge Approach

Farwest Bunkhouse Section
1 of 2

Chignik Bay, Alaska
May 2022
Boardwalk

New Section

Old Section

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	14 - Far West Apartment
Location (lat & long):	56.294726, -158.406208
Owner (Commercial, Residential, or Public):	Far West Corporation
Function:	Lodging
Dimensions:	41' x 41'
Date Constructed:	
Age (years):	
Foundation Type:	Wood
Condition:	Okay
Utilities (water, sewer, electric, communications, gas, heating oil):	electric, fuel tank
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Old structure
Proposed facility improvements:	Siding needs to be replaced to repair holes in several locations
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Far West Apartment

Backside

East Elevation
1 of 2

Chignik Bay, Alaska
May 2022
Far West Apartment

Front Entrance

West Elevation
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	15 - Post Office
Location (lat & long):	56.293602, -158.405975
Owner (Commercial, Residential, or Public):	Public, Federal Government
Function:	Mail
Dimensions:	Building addition/extension
Date Constructed:	
Age (years):	
Foundation Type:	Wood piling?
Condition:	Wood siding (old)
Utilities (water, sewer, electric, communications, gas, heating oil):	Heating oil, electric
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Some wood foundation supports seem old/rotten
Proposed facility improvements:	Add more wood foundation supports as needed
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Home built on slope of hill *Small extension of residential home

Chignik Bay, Alaska
May 2022
Post Office

Back Side

Foundation
1 of 2

Chignik Bay, Alaska
May 2022
Post Office

Front Entrance

Post Office
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	16 - Community Hall
Location (lat & long):	56.293484, -158.407086
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Public gathering, some groceries for sale, game hall
Dimensions:	61.5' x 40'
Date Constructed:	
Age (years):	
Foundation Type:	*Wood beams, concrete planks
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, heating oil, water
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	No visual evidence
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal siding / roof *Trench of some sort on the back side (unsure of cause)

Chignik Bay, Alaska
May 2022
Community Hall

Backside

Entrance
1 of 2

Chignik Bay, Alaska
May 2022
Community Hall

South Elevation

West Elevation
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	17 - Public Safety Apartment/Office/Equipment
Location (lat & long):	56.293175, -158.407565
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Storage, no longer used for housing
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Wood
Condition:	Poor
Utilities (water, sewer, electric, communications, gas, heating oil):	No visual evidence
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Old/dated structure
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	Dispose of structure before it becomes a hazard
Other Notes:	*Old building *Tribe says it needs to be torn down *Metal siding / roof

Chignik Bay, Alaska
May 2022
Public Safety Apartment

Entrance

North Elevation
1 of 2

Chignik Bay, Alaska
May 2022
Public Safety Apartment

South Elevation

West Elevation

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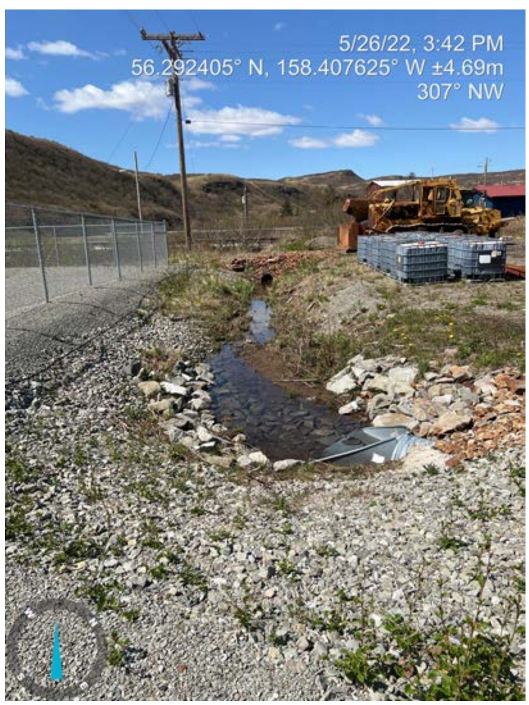
INFRASTRUCTURE INSPECTION

Infrastructure Name:	18 - Water Treatment Plant Backwash Lagoon
Location (lat & long):	56.292432, -158.407997
Owner (Commercial, Residential, or Public):	Public, City of Chignik (ANTHC)
Function:	Water Treatment
Dimensions:	65' x 94.5'
Date Constructed:	
Age (years):	
Foundation Type:	
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Water
Prone to flooding?	No visual evidence *some evidence of marsh around perimeter
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	No visual evidence
Proposed facility improvements:	Improve drainage around lagoon with adequate ditching
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Gravel pad embankment *Fenced off

Chignik Bay, Alaska
May 2022
Water Treatment Plant Backwash Lagoon

Backwash Lagoon



Drainage Around Lagoon
1 of 2

Chignik Bay, Alaska
May 2022
Water Treatment Plant Backwash Lagoon

Embankment

Pipe from Water Treatment Plant

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	19 - Water Trestle
Location (lat & long):	56.291922, -158.411178
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Water Supply
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Trestle
Condition:	Poor
Utilities (water, sewer, electric, communications, gas, heating oil):	Water
Prone to flooding?	No
Prone to erosion?	Yes
Prone to landslide/avalanche?	Yes
Drainage problems?	Yes
Cause of Failure (if any, date issue started):	Leaks from old pipe, wood trestle in poor condition, ice build up on trestle and pipe in winter
Proposed facility improvements:	Replace trestle, replace water line
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Trestle is old and wood is rotting. Not safe to climb anymore. *Water pipe as broken several times over the past years.

Chignik Bay, Alaska
May 2022
Water Trestle

Pipe & Trestle

Water Trestle
1 of 1

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	20 - Indian Lake Dam
Location (lat & long):	56.280065, -158.413964
Owner (Commercial, Residential, or Public):	
Function:	Water Intake for Raw Water Line
Dimensions:	
Date Constructed:	1940
Age (years):	82
Foundation Type:	Dam
Condition:	Unsatisfactory
Utilities (water, sewer, electric, communications, gas, heating oil):	Water
Prone to flooding?	No
Prone to erosion?	Yes
Prone to landslide/avalanche?	No
Drainage problems?	Yes
Cause of Failure (if any, date issue started):	
Proposed facility improvements:	
Defend in place strategies:	
Alternative locations:	
Other Notes:	* Refacing needed *Can still see the old wood piping *City currently working to finish road to dam (3/4 way complete)

Chignik Bay, Alaska
May 2022
Indian Lake Dam


Indian Lake Dam


Indian Lake

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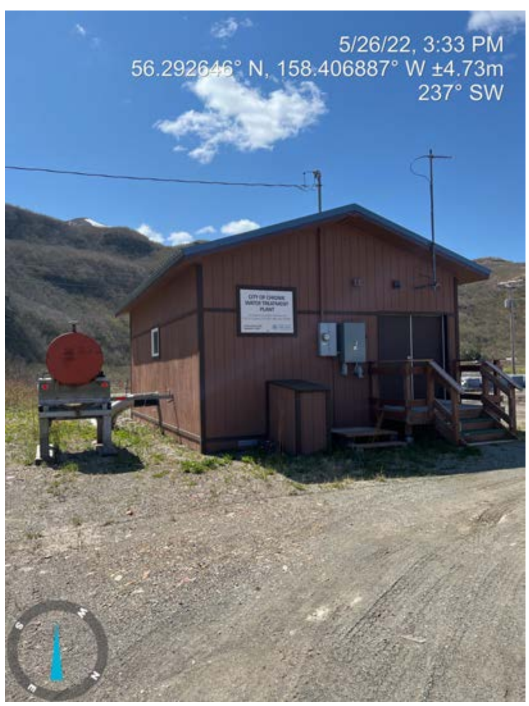
INFRASTRUCTURE INSPECTION

Infrastructure Name:	21 - Water Treatment Plant
Location (lat & long):	56.292622, -158.407251
Owner (Commercial, Residential, or Public):	Public, City of Chignik (ANTHC)
Function:	Water Treatment
Dimensions:	20.5' x 29'
Date Constructed:	*Constructed in 1987 *Updated in 2018
Age (years):	4
Foundation Type:	Wood
Condition:	Good (Like new)
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Wood T1/11 siding *Metal roof

Chignik Bay, Alaska
May 2022
Water Treatment Plant

East Elevation



Front Entrance
1 of 2

Chignik Bay, Alaska
May 2022
Water Treatment Plant

South Elevation

West Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	22 - School Tank Farm
Location (lat & long):	56.292416, -158.407089
Owner (Commercial, Residential, or Public):	Public, Lake and Peninsula School District
Function:	Fuel Supply
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Metal skid on concrete planks
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Gas, electric
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Containment - concrete lined w/ black material

Chignik Bay, Alaska
May 2022
School Tank Farm

Backside

Fuel Rail
1 of 2

Chignik Bay, Alaska
May 2022
School Tank Farm

Metal Skid on Concret Planks

School Tank Farm
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	23 - Storage Unit
Location (lat & long):	56.292830, -158.406744
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Storage
Dimensions:	49' x 25'
Date Constructed:	
Age (years):	
Foundation Type:	Concrete slab on grade
Condition:	*Good w/minor issues at corners *Minor siding needs
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Minor siding damage
Proposed facility improvements:	Replace/patch siding and roofing as needed
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal building *3,000 gal fuel tank (empty)

Chignik Bay, Alaska
May 2022
Storage Unit

Back Entrance

Damaged Siding
1 of 2

Chignik Bay, Alaska
May 2022
Storage Unit

Front Entrance

North Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	24 - Firehall / First Responder Equipment
Location (lat & long):	56.292777, -158.407205
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Store First Responder and Fire equipment
Dimensions:	38.5' x 40'
Date Constructed:	
Age (years):	
Foundation Type:	*Wood piling
Condition:	Okay
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Damaged siding and roofing
Proposed facility improvements:	*Replace/patch roofing and siding as needed
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal siding

Chignik Bay, Alaska
May 2022
Firehall

Back Entrance

Foundation

Chignik Bay, Alaska
May 2022
Firehall

Front Entrance

South Elevation
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	25 - Old Generator Building / City Maintenance Building
Location (lat & long):	56.292743, -158.406722
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Maintenance Equipment Storage
Dimensions:	51' x 26.5'
Date Constructed:	
Age (years):	
Foundation Type:	*Wood Piles? *Concrete slab on grade?
Condition:	Okay
Utilities (water, sewer, electric, communications, gas, heating oil):	Gas, electric
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Old structure
Proposed facility improvements:	*General building maintenance
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Old structure

Chignik Bay, Alaska
May 2022
Old Generator & City Maintenance Building

East Elevation

North Elevation

Chignik Bay, Alaska
May 2022
Old Generator & City Maintenance Building

South Elevation

Wood Structure
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	26 - School Generator
Location (lat & long):	56.292722, -158.406383
Owner (Commercial, Residential, or Public):	Public, Lake and Peninsula School District
Function:	Power
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Concrete slab on grade
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal siding w/ a few holes

Chignik Bay, Alaska
May 2022
School Generator

Damaged Siding

Northeast Elevation
1 of 2

Chignik Bay, Alaska
May 2022
School Generator

Northwest Elevation

South Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	27 - City Shop / Equipment
Location (lat & long):	56.292904, -158.406444
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Workspace / Equipment/ Tools
Dimensions:	52' x 103'
Date Constructed:	
Age (years):	
Foundation Type:	Concrete slab on grade
Condition:	*Wood ends (worn) *Metal siding (rusted, bent, torn)
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Rust
Proposed facility improvements:	*Patch/replace metal dome & wood ends
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Old *Double metal layer with wood between (circular) *Concrete foundation broken (visual from one side)

Chignik Bay, Alaska
May 2022
City Shop

Backside

Damaged Exterior Dome
1 of 2

Chignik Bay, Alaska
May 2022
City Shop

Entrance

South Elevation
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	28 - School / Gym
Location (lat & long):	56.293096 -158.405392
Owner (Commercial, Residential, or Public):	Public, Lake and Peninsula School District
Function:	Education
Dimensions:	Information from School District
Date Constructed:	1993
Age (years):	29
Foundation Type:	Concrete slab on grade
Condition:	Metal siding looks good
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, sewer, electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Some exposed insulation *Missing skirting

Chignik Bay, Alaska
May 2022
School

Backside

East Elevation
1 of 2

Chignik Bay, Alaska
May 2022
School

Front Entrance

North Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	29 - Teacher Housing
Location (lat & long):	56.293033, -158.405575
Owner (Commercial, Residential, or Public):	Public, Lake and Peninsula School District
Function:	Housing
Dimensions:	Information from School District
Date Constructed:	Built in 1967, major remodel in 1993
Age (years):	29
Foundation Type:	Wood skirting, possibly slab on grade?
Condition:	Metal siding - good condition
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, sewer, electric, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Teacher Housing

East Elevation

North Elevation

Chignik Bay, Alaska
May 2022
Teacher Housing

South Elevation

West Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	30 - City Generator Building
Location (lat & long):	56.294866, -158.388402
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Power Generation
Dimensions:	40' x 15.5'
Date Constructed:	2008
Age (years):	14
Foundation Type:	Metal Skid
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	heating oil, electric
Prone to flooding?	No
Prone to erosion?	No
Prone to landslide/avalanche?	landslides/avalanches have happened in past and have come close to hitting building
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	Move further away from base of landslide area towards shoreside and build gravel pad to safe flood elevation
Other Notes:	*Empty barrels next to building

Chignik Bay, Alaska
May 2022
Generator Building

Metal Skid Foundation

Northeast Elevation
1 of 2

Chignik Bay, Alaska
May 2022
Generator Building

Southeast Elevation

Southwest Elevation

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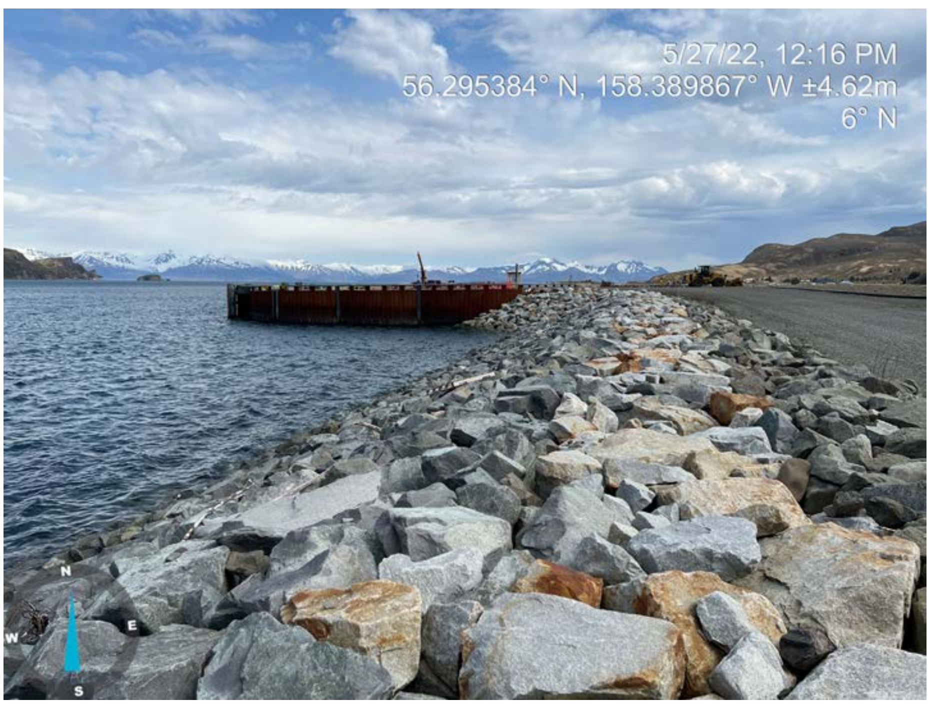
INFRASTRUCTURE INSPECTION

Infrastructure Name:	31 - City Dock / Ferry / Barge Landing
Location (lat & long):	56.296626, -158.389277
Owner (Commercial, Residential, or Public):	City / Lake and Peninsula Borough
Function:	Alaska Marine Ferry, Barge Landing
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Sheet pile
Condition:	Like new
Utilities (water, sewer, electric, communications, gas, heating oil):	
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

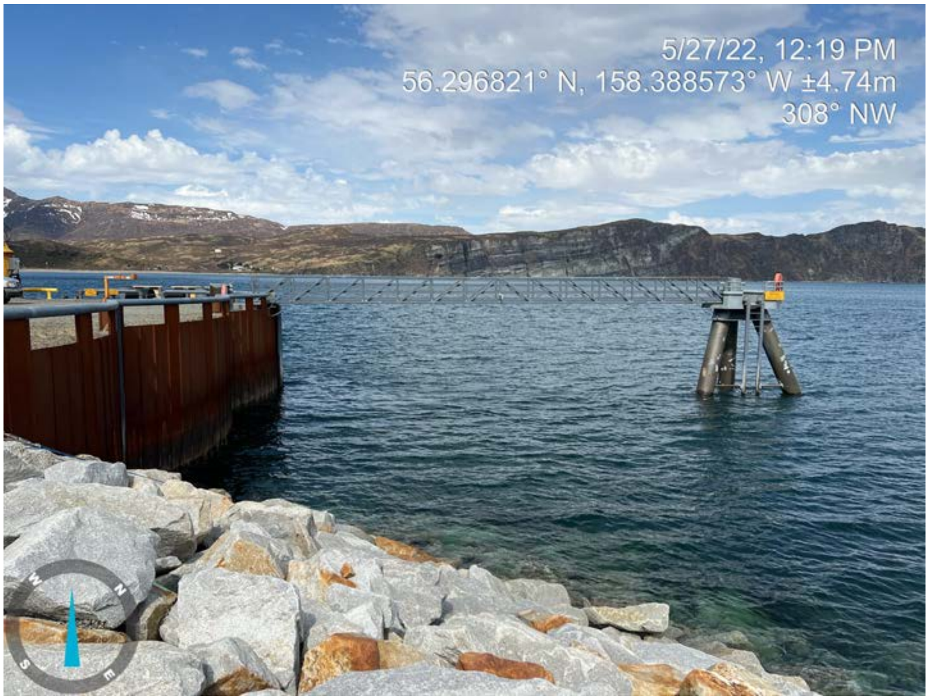
Chignik Bay, Alaska
May 2022
City Dock

Eastside



Embankment
1 of 2

Chignik Bay, Alaska
May 2022
City Dock



Pedestrian Bridge

Westside
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	32 - City Tank Fuel Farm
Location (lat & long):	56.295140, -158.387416
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Fuel for Power Generation
Dimensions:	(4) 32,000 gal #2 diesel (1) 6,000 gal gasoline
Date Constructed:	2008
Age (years):	14
Foundation Type:	*Each tank on a metal skid *Containment around all #2 diesel tanks w/pvc type honeycomb material
Condition:	*Good w/some honeycomb exposure
Utilities (water, sewer, electric, communications, gas, heating oil):	Gas
Prone to flooding?	Located in flood zone
Prone to erosion?	No
Prone to landslide/avalanche?	landslides/avalanches have happened in past and have come close to hitting building
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	Move further away from base of landslide area towards shoreside and build gravel pad to safe flood elevation
Other Notes:	

Chignik Bay, Alaska
May 2022
City Tank Fuel Farm

Diesel Fuel Tanks

Gasoline Fuel Tank

Chignik Bay, Alaska
May 2022
City Tank Fuel Farm

Metal Skid & Fuel Rails

Pump Station

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	33 - Subsistence Building
Location (lat & long):	56.295545, -158.387627
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Subsistence Use
Dimensions:	51' x 121'
Date Constructed:	2005
Age (years):	17
Foundation Type:	Concrete pad (broken up with rebar exposed) *rebar can be seen in foundation on both sides of building
Condition:	Foundation not in good repair, building not closed to elements
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, water, gas
Prone to flooding?	No visual evidence
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	No visual evidence
Proposed facility improvements:	*Reinforce concrete floor *Enclose foundation (new skirt around building)
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal siding / roof

Chignik Bay, Alaska
May 2022
Subsistence Building

Damaged Concrete Foundation

East Elevation
1 of 2

Chignik Bay, Alaska
May 2022
Subsistence Building

Northeast Elevation

Southwest Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	34 - Clinic
Location (lat & long):	56.301352,-158.378947
Owner (Commercial, Residential, or Public):	Public, Tribe
Function:	Non-emergency Outpatient Care
Dimensions:	62' x 73.5'
Date Constructed:	2008
Age (years):	14
Foundation Type:	Concrete slab on grade
Condition:	Good w/ some minor siding issues (missing or broken pieces)
Utilities (water, sewer, electric, communications, gas, heating oil):	water, sewer, electric, communications, heating oil
Prone to flooding?	Located in flood zone
Prone to erosion?	back side of clinic near Bay
Prone to landslide/avalanche?	Community members can be cut off from the clinic if there was a landslide/avalanche.
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	*Replace broken/missing siding
Defend in place strategies:	*armor rock the embankment behind the clinic to prevent erosion
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Clinic

East Elevation

North Eelvation

Chignik Bay, Alaska
May 2022
Clinic

South Elevation

West Elevation

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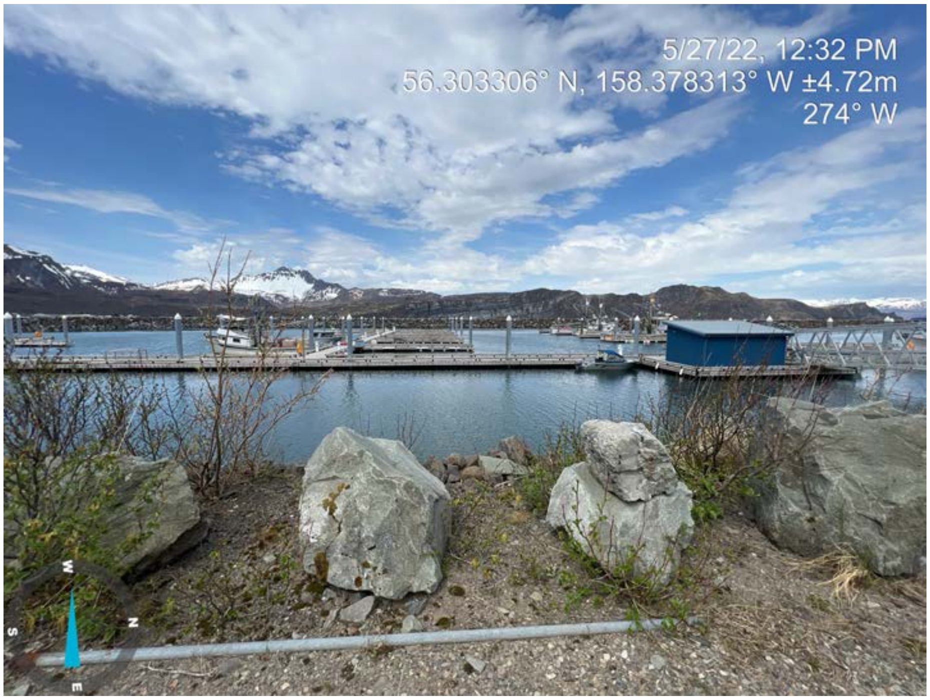
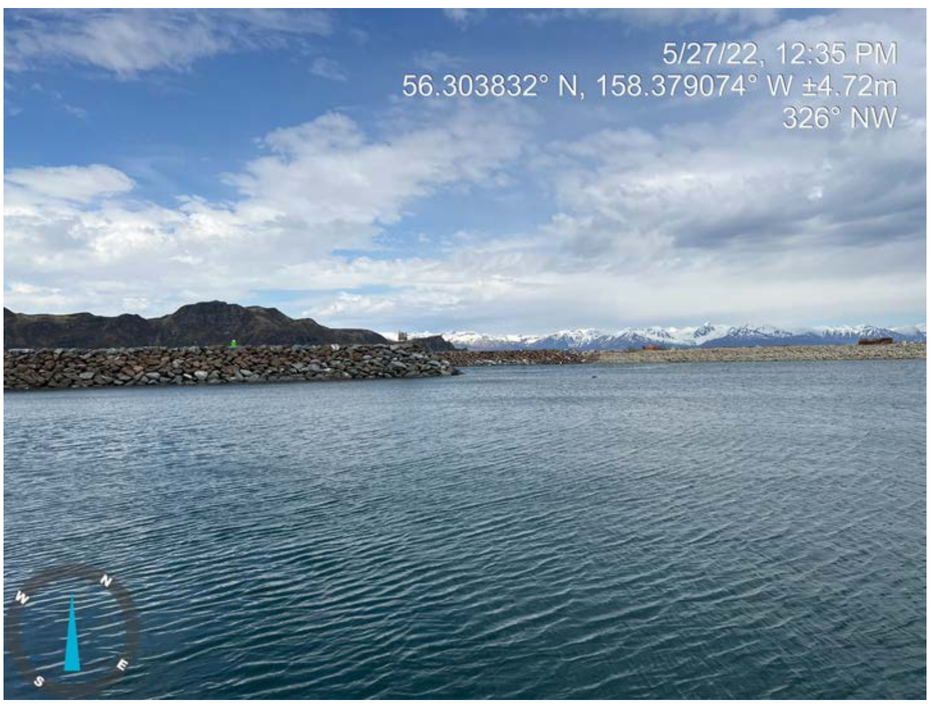
INFRASTRUCTURE INSPECTION

Infrastructure Name:	35 - Boat Harbor
Location (lat & long):	56.303578, -158.378316
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Boat Storage
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Piers & Floats
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric, water
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Boat Harbor



Boat Dock



Boat Entrance
1 of 2

Chignik Bay, Alaska
May 2022
Boat Harbor

Boat Harbor

Bridge
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	36 - Old Water Treatment & Pump House
Location (lat & long):	56.300795, -158.375868
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Water pump / treatment house
Dimensions:	12.5' x 12.5'
Date Constructed:	
Age (years):	
Foundation Type:	Concrete slab on grade
Condition:	old, but average
Utilities (water, sewer, electric, communications, gas, heating oil):	Water, electric, heating oil
Prone to flooding?	Creek runs behind building but no visual evidence of flooding
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	Old structure
Proposed facility improvements:	*General Maintenance *Chimney needs to be replaced
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*T1/11 Siding

Chignik Bay, Alaska
May 2022
Old Water Treatment & Pump House

East Elevation

Entrance
1 of 2

Chignik Bay, Alaska
May 2022
Old Water Treatment & Pump House

Foundation


North Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	38 - Harbor Master Building
Location (lat & long):	56.303510, -158.378178
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Boat Harbor Administration
Dimensions:	12' x 30'
Date Constructed:	
Age (years):	
Foundation Type:	Concrete footings
Condition:	Like new
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Metal siding *Gutters

Chignik Bay, Alaska
May 2022
Harbor Master Building

Back Entrance

East Elevation
1 of 2

Chignik Bay, Alaska
May 2022
Harbor Master Building

Front Entrance

North Elevation
2 of 2

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	39 - Airport Maintenance Building
Location (lat & long):	56.307901, -158.376091
Owner (Commercial, Residential, or Public):	Public, Alaska Department of Transportation & Public Facilities
Function:	House maintenance equipment used for the runway
Dimensions:	47' x 24.5'
Date Constructed:	
Age (years):	
Foundation Type:	Concrete pad
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	
Prone to flooding?	Located in flood zone
Prone to erosion?	Yes
Prone to landslide/avalanche?	No
Drainage problems?	No
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	*Minor siding repairs needed. *New door needed to hold out elements.
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	

Chignik Bay, Alaska
May 2022
Airport Maintenance Building

Damaged Siding

Northwest Elevation

Chignik Bay, Alaska
May 2022
Airport Maintenance Building

South Elevation

West Elevation

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	40 - Airport
Location (lat & long):	56.308029, -158.377692
Owner (Commercial, Residential, or Public):	Public, Alaska Department of Transportation & Public Facilities
Function:	Takeoff and Landing of Aircraft
Dimensions:	~2,600' long by 60' wide
Date Constructed:	1968
Age (years):	54
Foundation Type:	Gravel
Condition:	*can become soft in the spring due to permafrost melt and unsatisfactory surface course material
Utilities (water, sewer, electric, communications, gas, heating oil):	
Prone to flooding?	Located in flood zone
Prone to erosion?	Yes, at end of airport runway
Prone to landslide/avalanche?	No
Drainage problems?	Yes
Cause of Failure (if any, date issue started):	Unsatisfactory surface course material, lack of armor rock protecting embankments
Proposed facility improvements:	*Install runway lights *Extend runway into ocean side
Defend in place strategies:	Add amor rock where needed, replace surface course with satisfactory material
Alternative locations:	N/A
Other Notes:	*Armor rock at ocean end is smooth with consistent sizes *Rock at the Bay side is more jagged and varying sizes *Lake is located on one side *Runway is soft during spring months due to permafrost melt. *Two airplane crashes in the past 2 years due to mud and rock on runway

Chignik Bay, Alaska
May 2022
Airport

Airport Lake

Runway Northeast Side
1 of 2

Chignik Bay, Alaska
May 2022
Airport

Runway South Side

Shoreside Runway Embankment

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INFRASTRUCTURE INSPECTION

Infrastructure Name:	41 - AWOS Station
Location (lat & long):	56.309351, -158.378357
Owner (Commercial, Residential, or Public):	
Function:	Weather Station
Dimensions:	
Date Constructed:	
Age (years):	
Foundation Type:	Wood
Condition:	Good
Utilities (water, sewer, electric, communications, gas, heating oil):	Electric
Prone to flooding?	Located in flood zone
Prone to erosion?	No visual evidence
Prone to landslide/avalanche?	No visual evidence
Drainage problems?	No visual evidence
Cause of Failure (if any, date issue started):	N/A
Proposed facility improvements:	N/A
Defend in place strategies:	N/A
Alternative locations:	N/A
Other Notes:	*Sandy *Marsh-like area behind *Small ponds

Chignik Bay, Alaska
May 2022
AWOS Station

AWOS Station

Coast
1 of 2

Chignik Bay, Alaska
May 2022
AWAS Station

Southside

Windsock
2 of 2

Chignik Regional Climate Resiliency Symposium

Location: Chignik Bay Community Hall

Date: May 27-28, 2022

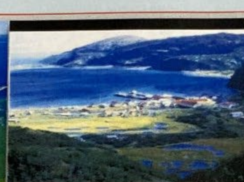
Time: May 27 (5-8 pm)

May 28 (9:30am – 5:30pm)

Agenda

May 27 (Friday)	Potluck Dinner & Introduction Note: Trident store will be closed so for those flying into Chignik, please bring food to contribute to potluck.
May 28 (Saturday)	
9am	Welcome & Agenda Overview (Jeanette 'Chickie' Carlson, Chignik Tribal Environmental Coordinator)
9-10:30am	Chignik Erosion Monitoring Update (Chris Maio/UAF Arctic Coastal Geoscience Lab)
10:30-noon	Chignik Climate Resiliency Action Plan (Danielle Dance & Teddy Martin/Bristol Engineering Services Company, LLC)
12-1:30pm	Lunch Note: Trident store will be closed so for those flying into Chignik, please bring food to contribute to potluck.
1:30-3pm	Chignik Map Project: Areas of Subsistence, Cultural and Historical Significance in the Chignik Subregion (Tim Troll, Bristol Bay Heritage Land Trust)
3-3:15pm	Break
3:15-4:15	Chignik Intertribal Coalition: Overview & Follow up of interviews for Regional Tribal Resilience Project (George Anderson, CIC President & Hazel Nelson, Land & Sea Resources)
4:15-4:45pm	Wrap Up

CHIGNIK REGIONAL CLIMATE RESILIENCY SYMPOSIUM


WHEN

May 27th —5:00 pm - 8:00 pm

Potluck and Introductions

May 28th —9:30 am - 5:30 pm

Guest Speakers & Discussion

WHERE

Chignik Bay Community Hall

GUEST SPEAKERS

Sue Flensburg • Chris Maio• Danielle Dance• Teddy Martin• Tim Troll• George Anderson• Hazel Nelson

CHIGNIK BAY TRIBAL COUNCIL

Welcome and Introduction With Jeanette "Chickie" Carlson

UAF ARCTIC COASTAL GEOSCIENCE LAB

Chignik Erosion Monitoring Update

BRISTOL ENGINEERING SERVICES COMPANY

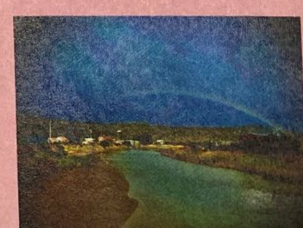
Chignik Climate Resiliency Action Plan

BRISTOL BAY HERITAGE LAND TRUST

Chignik Map Project: Subsistence, Cultural, and Historical Significance

CHIGNIK INTERTRIBAL COALITION AND LAND & SEA RESOURCES

Overview and interview follow up for Regional Tribal Resilience Project



Chignik Bay Tribal Council Regional Symposium

5/28/2022

Sign in Sheet

Name/ Organization **Phone/e-mail**

1. George Anderson Chignik Intertribal Coalition
2. Guy Ashby Chignik 717-4522
3. Chuck McCallum Borough/CRAA 9073519107
4. Debbie Carlson Chignik Bay 907-749-4018
5. Hazel Nelson Anch 907-301-8023
6. Danielle Dance Bristol Eng. 907-563-0013
7. Tim Troll Land Trust 907-317-6593
8. Kelly Cooper
9. Riley Ashby
10. Dannica Anderson City of Chignik 9077175311
11. James Anderson City of Chignik 9077494141
12. Jessie Christian UAF ~~jechristian~~ jechristian@alaska.edu
13. KIRK LARSEN Vulcan/PGAFF kirkl@vulcan.com
14. SUSAN Flensburg consultant sflensburg6@gmail.com
15. Robert Carpenter City of Chignik 907-749-4003 robertcarpenterchignik@msn.com
16. MATTHEW Balazs UAF 907-699-1887
17. ERNEST Carlson Chignik bay 907-749-4042
18. Ilane Ashby Chignik 907-717-3824
19. Clara Stepanoff Chignik 907-717-3824
20. Edward Krause Chignik (907)749-4004
21. Chris Mario Fairbanks 5082802831
22. Arlene Kopun
23. Roderick E Carlson Chignik Bay Tribal President IGAP
24. Chickie Carlson Chignik Bay Tribal Council
25. Lana Anderson (907) 770 5605
26. Billy Ander 907529-4542
27. Alan Olson 907-444-1701

28. William Amerson 907-5294542

29. Peter Andersson 907-512-1992

30 Trevin Anderson 907-512-1992

31 James Brewer 907-749-4012

32 ALvIN Pedersen 907 444 2919

33 Eddie Overton 907 538-2065

34 Hanna Overton 9075382755

35

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49

Climate Resiliency Action Plan

Bristol Engineering Services Company, LLC
Danielle Dance
Teddy Martin

Overview

- Project Description
- Climate Resiliency
- Action Plan Development
- Climate Hazards
- Past, Concurrent, & Future Studies
- At-Risk Infrastructure
- Risk Mitigation Strategies
- Future Project Ideas
- Community Goals

Project Description

- Project Description
  - Funding for the Climate Resiliency Action Plan
  - Project Vision
  - Outcomes
    - Climate Resiliency Action Plan
      - Identify climate hazards
      - Identify partners & stakeholders
      - Compile data from both past and concurrent studies
      - Identify data gaps
      - Determine community goals & priorities
      - Identify at-risk infrastructure
      - Develop risk mitigation strategies
      - Develop scope, schedule and cost for three future projects

Climate Resiliency

- What is Climate Resiliency?
- Risks to a community
  - Environmental Factors
  - Climate Change
  - Scarcity of Resources
- Measures of a resilient community
  - Healthy Environment
  - Responsible Governance
  - Quality of Life
  - Strong Economy
  - Preparedness

Action Plan Development

1. Form a Collaborative Team
2. Understand the Situation
3. Determine Goals & Objectives
4. Plan Development
5. Plan Preparation, Review, and Approval
6. Plan Implementation and Maintenance

Climate Hazards

- Hazards
  - Avalanche
  - Landslide
  - Earthquake
  - Erosion
  - Flooding
  - Tsunami
  - Extreme Cold
  - Rising Temperatures
  - Flood
  - Severe Wind
  - Precipitation
  - Volcano
  - Wildfire
  - Scarcity of Resources
- What experiences have you had?
  - When did it happen?
  - Where did it happen?
  - How bad was it?

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Past, Concurrent, & Future Studies

- Our Study
  - Investigate All At-Risk Infrastructure
  - Take Pictures
  - Take Notes of Existing Conditions
  - Prepare Risk Mitigation Strategies
- Concurrent Studies
  - Chignik Erosion Monitoring
  - Chignik Map Project
  - Green Star Site Assessment
- Past Studies
  - Community Plan
  - Long Range Transportation Plan
  - Indian Creek Bridge Survey
  - BBNA Emergency Response Plan
  - BBNA Tribal Hazard Mitigation Plan
- Data Gap Analysis
  - Root cause of low salmon returns resulting in closure of commercial fishing
- Other studies you know of or gaps in data?

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At-Risk Infrastructure

- Assets
  - People
  - Economy
  - Built Environment
  - Natural Environment

U.S. Army Corps of Engineers *Alaska District*
Alaska Baseline Erosion Assessment
Erosion Information Paper - Chignik Bay, Alaska
December 17, 2008

- Major Infrastructure Assets
  - City Office
  - Tribal Council Building
  - Church / Cemetery
  - School
  - Community Hall
  - Clinic
  - Post Office
  - Roads / Trails / Bridges
  - Airport
  - Boat Harbor
  - Utilities
- What are your priority infrastructure?

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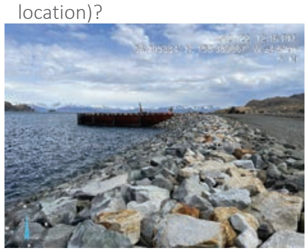
Risk Mitigation Strategies

- Defend in Place
  - Raise structures on posts to prevent flooding
  - Install new culverts and ditching for adequate drainage
  - Add armor rock to embankments to prevent erosion
  - Periodic blasting on mountain sides to prevent avalanches
  - Install proper drainage around building foundations
- Facility Improvement
  - Roof reinforcement for high winds and snow loads
  - New exterior paint to prevent further damage from precipitation
  - Replace siding where needed
- Re-location of Infrastructure
  - Move structure to safer alternative location
- What other strategies would you like to be considered?
- Which strategies would you want to prioritize (Defend in Place, Facility Improvement, Re-location)?



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Community Goals

- Draw More People into the Community
  - Faster internet
  - Jobs
  - Commercial fishing and processing
  - Housing
  - Utilities
  - Larger airport runway
- Hazard Mitigation
  - Hazard mitigation actions from Hazard Mitigation Plan
  - Install culverts where needed
  - Re-grade roads where needed
- Emergency Response Preparedness
  - Construct tsunami shelter
- Boost Economy
  - Sport fishing
  - Commercial fishing
  - Adventure lodge
- What are your community goals and priorities?

Bristol

Future Project Ideas

- Bridges
  - New decking
  - New retaining walls/wing walls
  - New wood beams
  - New guardrails
  - Weather proof wood piles
- Airport Runway
  - Install lighting
  - Extend runway to accommodate larger aircraft
  - Add armor rock to protect from erosion
- Water Trestle & Dam
  - Replace as needed
- Hydro-electric Dam
  - Finish road
  - Begin design & construction
- Roads
  - Install ditching where needed
  - Install culverts where needed
  - Re-grade where needed
- Tsunami Shelter
  - Begin design & construction
- What future project recommendations do you have?

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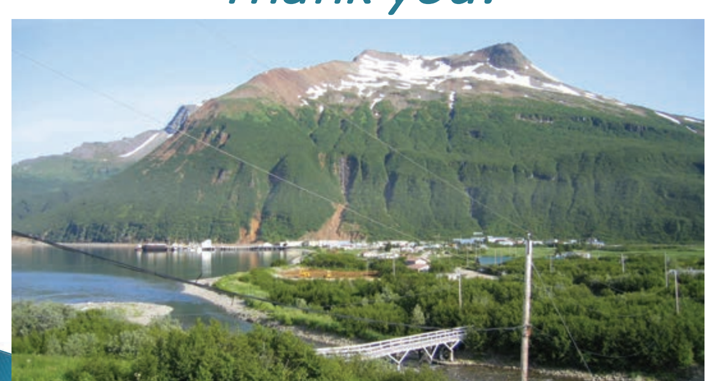
Thank you!



APPENDIX D

Trip Report June 2023

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TRIP REPORT

Project: **Chignik Bay Climate Resiliency Action Plan Project**
Bristol Project No: 32220067
Reference: Presentation of final draft reporting
Date of Trip: June 3-6, 2023
Location of Meeting: Chignik Bay
Participants:
Bristol: Isaac Pearson
Symposium: See attached sign in sheet

Summary

DAY 1:

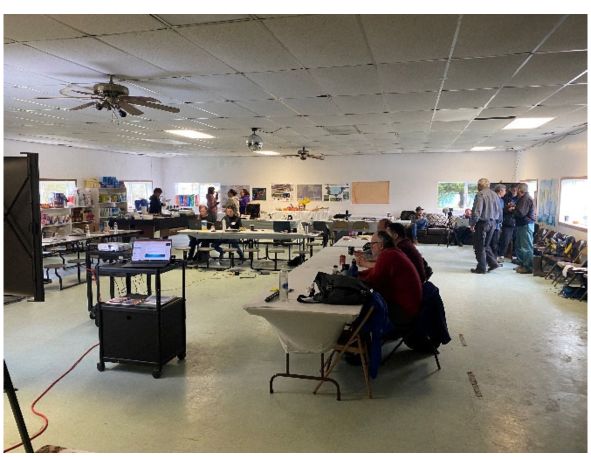
On June 6, 2023 Isaac arrived at Lake Clark Air for a 9AM departure. The plane was delayed until 1PM. Isaac arrived in Chignik Bay around 5:00 PM via Lake Clark Air on May 25, 2022. Isaac stayed at the City apartments for the evening.

DAY 2

Isaac participated in the 2023 Chignik Regional Climate Resiliency Symposium (CRCRS) from 8am to 4pm. See attached agenda and sign-in sheet. After the symposium Isaac met with James Anderson, the power plant operator, regarding his comments on the final draft plan and toured the water treatment plant and power plant. James' comments were on the Priority Project #3 and are noted in the final draft community comment log. At the conclusion of the day there was a community potluck. Isaac met with James Brewer and received comments on plan as noted int the log.

DAY 3

Isaac participated in the CRCS from 9am to 4pm. Isaac presented to the group from 11am to 12pm and received comments. The no comments were substantial to require plan modification but were requests for additional information. Isaac developed a handout for the symposium that



included a project summary and slides from this presentation, see attached. At the conclusion of the day there was a community potluck.

DAY 4:

Isaac waited in Chignik Bay for plane to arrive around 12:30pm via Lake Clark Air on June 3, 2023 for ride back to Anchorage. Plane was delayed and did not arrive until 5:00 PM. Isaac arrived in Anchorage at 7:30 PM.

Attachments:
1. Symposium Agenda
2. Symposium Sign-in Sheet
3. Handout and Presentation

End Trip Report

CC: File

Chignik Regional Climate Resiliency Symposium
June 4-5, 2023

Location:	**Chignik Bay Community Hall**
June 4 (Sunday)	**8:30 am – 1:00 pm presenters/sessions below** **1:00-2:00 pm: lunch** **2:30… Walking tour of Chignik Bay weather permitting**
June 5 (Monday)	**8:30am-12:45 pm presenters/sessions below** **1:00-2:30 pm breakout discussions on Day 1 presentations**

AGENDA

June 4 (Sunday)

8:30-9 am Coffee & Refreshments, Welcome & Agenda Overview (Jeanette Carlson, Chignik Bay Tribal Environmental Coordinator)

9:00-10:30 am Coastal Erosion Monitoring in Chignik subregion communities (Chris Maio/UAF Arctic Coastal Geoscience Lab)

10:30-11:30 am Chignik Intertribal Coalition and Chignik Regional Aquaculture Association projects (George Anderson/CIC President, Chuck McCallum/CRAA Executive Director)

11:45-12:45 pm Chignik Subregion Map Project – conservation planning for subsistence, culturally important areas, etc. (Marcus Geist/Artesian Knowledge LCC)

1:00-1:15 pm Chignik Subregion Watershed Plan recently awarded grant (Agnew: Beck contractor and/or Jeanette Carlson/Chignik Bay Tribal Environmental Coordinator)

1:15-2:15 pm Lunch

2:30 pm.... Breakout discussions on presentations
Walking Tour of Chignik Bay *weather permitting!*

6:30 pm BBQ at the Community Hall-bring a dish to share if you wish.

June 5 (Monday)

8:30-10:00 am Coffee & Refreshments, Breakout discussions on Day 1 topics continued

10:00-11:00 am Green Star Program Assessment of Chignik Bay (Joy Britt/Alaska Forum on Environment, Environmental Programs Director)

11:15-12:15 pm Chignik Bay Climate Resiliency Action Plan Final Draft (Isaac Pearson/Bristol Engineering Services Corporation, LLC Senior Civil Engineer)

1:00-4:00pm Lunch, Breakout discussions continued

4:00pm Closing Remarks

AMPAD ACCUPAD

2023 Chignik Bay Science Symposium

Sign In Sheet

	Name	Organization	E-mail/Phone #
1.	Robert Carpenter	City of Chignik	chignikcityclerk@gmail.com 907-749-4003
2.	Chickie Carlson	CBTC	jeanettecarlson749@gmail.com
3.	Matthew Balazs	UAF	mbalazs@alaska.edu
4.	MIKE WILLIS	UAF	mdwillis@alaska.edu
5.	ISAAC PEARSON	BRISTOL	IPEARSON@BRISTOL-COMPANIES.COM
6.	Molly Mylius	Agnew::Beck	mmylius@agnewbeck.com
7.	Shelly Wade	Agnew::Beck	shelly@agnewbeck.com
8.	Debbie Carlson	CBTC	cbaytc@aol.com
9.	GABE MILLER	PAUL G ALLEN FAM FDN	gabem@vulcan.com
10.	MYRA SCHOLZE	ADF G	myra.scholze@alaska.gov
11.	Carl Burnside	ADFG	carlton.burnside@alaska.gov
12.	Cayman Christ	ADFG	cpchrist@eckerd.edu
13.	Chris Muir	UAF	cvmuir@alaska.edu
14.	Charles McCallum	CRAA	chuckmccallum@gmail.com

AMPAD ACCUPAD

15. BO JENSEN FWS REFUGES 907-469-0433 BARBARA_JENSEN@FWS.GOV
16. Dannica Anderson City of Chignik chignikcityclerk@gmail
17. Axel Kopun (907) 952-7240
18. Arlene Kopun City of Chignik (907) 229-9022
19. Magda Kopun Chignik (907) 952-7692
20. Jim Brewer City of chignik (907) 749-4012
21. James Anderson City of Chignik
22. Billy Anderson Chignik 907 ~~3~~29-4542
23. Eugene Carlson Chignik 907-749-4008
24. George Anderson CIC 907 830-2623
25. Russell Nelson BBNC 907-843-1075
26. Roderick E Carlson Chignik Bay tribal ~~president~~ 907-749-4020
27. [signature] 907.749.4064
28. Guy Ashby Chignik 907-717-4524 guxashby7@yahoo.com
29. Dakota Anderson Chignik 907 395-7696
30. Kavik Skonberg chignik 907-654-9238
31. Steven walker Jr Chignik 907 414 7028
32. Polly Carlson Chignik.
33. [signature] CHIGNIK
34.

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MEMORANDUM

DATE: June 2, 2023

TO: Jeanette Carlson
Chignik Bay Tribal Council
PO Box 50
Chignik Bay, Alaska 99654

FROM: Isaac Pearson, PE

RE: CRCRS 2023 - Bristol Summary

The following memorandum summarizes Bristol's involvement in the Chignik Regional Climate Resiliency Symposium (CRCRS) held on June 4-5, 2023 in Chignik Bay, Alaska. Bristol's project manager, Isaac Pearson, will travel to Chignik to patriciate in the CRCRS and present the final draft reporting of the Climate Resiliency Action Plan (Plan) developed for the Chignik Bay Tribal Council with funding through a BIA Tribal Resiliency grant award.

The Isaac presented to the CRCRS participants using a power point presentation. This is the third presentation Bristol has provided for the Plan. The first occurred during the 2022 CRCRS in May 2022 the second occurred in November 2022 for the Alaska Forum on the Environment (see attached). This newest presentation (2023 CRCRS) will provide new information related to the development of the report, priority projects, and a data gap analysis discussion.

The objectives of Bristol's participation in the 2023 CRCRS are to 1) provide the community with a presentation that summarizes the reporting, 2) present the data gap analysis to a group of industry professionals to workshop ideas and understand priorities, dependencies, resources, timelines, costs, funding opportunities, and other. Please see the attached 2023 CRCRS presentation for additional information.

Upon the conclusion of the 2023 CRCRS and receipt of comments on the final draft Plan Bristol will finalize the Plan for distribution.

[End Memo]

Attachment(s):

- 2022 AFE Presentation for reference information (8 pages)
- 2023 SRCRS Presentation (16 pages)

Cc: File.

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Climate Resiliency Action Plan

Bristol Engineering Services Company, LLC

Teddy Martin

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Overview

- Project Description
- Climate Resiliency
- Action Plan Development
- Climate Hazards
- Past, Concurrent, & Future Studies
- At-Risk Infrastructure
- Risk Mitigation Strategies
- Community Goals
- Future Project Ideas
- Priority Projects

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Project Description

- Funding for the Climate Resiliency Action Plan
- Outcomes
  - Climate Resiliency Action Plan
    - Identify climate hazards
    - Identify partners & stakeholders
    - Compile data from both past and concurrent studies
    - Identify data gaps
    - Determine community goals & priorities
    - Identify at-risk infrastructure
    - Develop risk mitigation strategies
    - Develop scope, schedule and cost for three future projects

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Climate Resiliency

- What is Climate Resiliency?
- Risks to a community
  - Environmental Factors
  - Climate Change
  - Scarcity of Resources
- Measures of a resilient community
  - Healthy Environment
  - Responsible Governance
  - Quality of Life
  - Strong Economy
  - Preparedness

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Action Plan Development

1. Form a Collaborative Team
2. Understand the Situation
3. Determine Goals & Objectives
4. Plan Development
5. Plan Preparation, Review, and Approval
6. Plan Implementation and Maintenance

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Climate Hazards

- Hazards
  - Avalanche
  - Landslide
  - Earthquake
  - Erosion
  - Flooding
  - Tsunami
  - Rising Temperatures
  - Flood
  - Severe Wind
  - Precipitation
  - Volcano
  - Wildfire
  - Scarcity of Resources
- How is climate change affecting these hazards?
- What infrastructure is at risk due to these climate hazards?
- How can we mitigate risk?

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for reference only

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Past, Concurrent, & Future Studies

- Our Study
  - May 2022 site visit
  - Chignik Regional Climate Resiliency Symposium
  - Investigate All At-Risk Infrastructure
  - Take Pictures
  - Take Notes of Existing Conditions
  - Prepare Risk Mitigation Strategies
  - Scope, schedule, and budget for three priority projects
- Concurrent Studies
  - Chignik Erosion Monitoring - UAF
  - Chignik Map Project – Bristol Bay Heritage Land Trust
  - Green Star Site Assessment
  - BIA Tribal Resiliency Planning Grant – Chignik Intertribal Coalition
- Past Studies
  - Community Plan
  - Long Range Transportation Plan
  - Indian Creek Bridge Survey
  - BBNA Emergency Response Plan
  - BBNA Tribal Hazard Mitigation Plan
- Data Gap Analysis
  - Root cause of low salmon returns
  - More accurate weather data
  - Bathymetry of river, lakes, and bay
  - Updated land ownership maps
  - Updated aerial imagery
  - Transit system feasibility study between the Chigniks
  - Sediment transport model

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At-Risk Infrastructure

- Assets
  - People
  - Economy
  - Built Environment
  - Natural Environment

U.S. Army Corps of Engineers *Alaska District*
Alaska Baseline Erosion Assessment
Erosion Information Paper - Chignik Bay, Alaska
December 17, 2008

- Major Infrastructure Assets
  - City Office
  - Tribal Council Building
  - Church / Cemetery
  - School
  - Community Hall
  - Clinic
  - Post Office
  - Roads / Trails / Bridges
  - Airport
  - Boat Harbor
  - Utilities

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Risk Mitigation Strategies

- Defend in Place
  - Raise structures on posts to prevent flooding
  - Install new culverts and ditching for adequate drainage
  - Add armor rock to embankments to prevent erosion
  - Periodic blasting on mountain sides to prevent avalanches
  - Install proper drainage around building foundations
- Facility Improvement
  - Roof reinforcement for high winds and snow loads
  - New exterior paint to prevent further damage from precipitation
  - Replace siding where needed
- Re-location of Infrastructure
  - Move structure to safer alternative location

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Community Goals

- Improve emergency response preparedness
- Draw more people and families to stay in Community
- Provide better support systems for older members in community to stay
- Preserve subsistence cultural way of life (specifically the fishery)
- Improve economy by diversifying resources and providing more jobs to locals in the Community

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Future Project Ideas

- Bridges
  - New decking
  - New retaining walls/wing walls
  - New wood beams
  - New guardrails
  - Weatherproof wood piles
- Airport Runway
  - Install lighting
  - Extend runway to accommodate larger aircraft
  - Add armor rock to protect from erosion
- Water Trestle & Dam
  - Replace as needed
- Hydro-electric Dam
  - Finish road
  - Begin design & construction
- Roads
  - Install ditching where needed
  - Install culverts where needed
  - Re-grade where needed
- Tsunami Shelter
  - Begin design & construction

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Project #1

- Preliminary Engineering Report (PER) for two tsunami shelters, one on each side of town
  - Possible partnership with ANTHC to decommission east side water storage tank (WST) and retrofit existing tank and/or foundation for a tsunami shelter
  - New tsunami shelter on west side of town

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Project #2

- Preliminary Engineering Report for Indian Creek Bridge and Evacuation Road Rehabilitation

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Project #3

- Raw Water Source and Transmission Line Replacement
  - City approved resolution for project
  - 7.5 million in funds waiting approval at the IHS national level
  - Design expected to go to bid September 2023
- Hydro-electric Project?
  - Finish road to hydro-electric site
  - Design and construction of penstock, turbine, and generator

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Thank you!

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June 4-5, 2023
Chignik Bay, AK

Climate Resiliency Action Plan

Chignik Regional Climate Resiliency Symposium
Chignik Bay, Alaska
June 4-5, 2023

Bristol Engineering Services Company, LLC
Isaac Pearson, PE

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2023 CRCRS
June 4-5, 2023
Chignik Bay, AK

Overview

- Report Information & Status
- Project Objectives
- Project Methodology
- Summary of Previous Presentations
- Risk Mitigation & Community Goals
- Priority Projects
- Data Gap Analysis
- Closing

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Report Information & Status

- Project Sponsor / Owner: Chignik Bay Tribal Council
- Project funding: BIA Tribal Resiliency grant award
- Contractor: Bristol Engineering Services Company, LLC

- Report Status
  - Final Draft Report issued on May 30, 2023
  - Next step, receive final comments Sponsor
  - Final reporting, two weeks after receipt of final comments

Project Objectives

- Community engagement
- Understand past and ongoing studies
- Identify data gaps
- Identify at-risk infrastructure
- Identify mitigation strategies
- Develop tools to implement mitigation strategies
- Compile reporting to present the findings of the project

Project Methodology

- Project kick-off meeting
  - w/ Traditional Ecological Knowledge (TEK) discussion
- Climate hazard summary / gap analysis
  - Hazard summary presented in previous presentations
  - Gap analysis discussed later
- Site visit(s) / community meeting
  - May 25-29, 2022: Site investigation & CRCRS 2022
  - November 2022: AFE 2022
  - Today!
- At-risk infrastructure identification
  - Data analysis, TEK, and visual inspection
  - Outcome summarized in previous presentations

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Project Methodology (cont.)

- Risk mitigation strategies and implementation
  - Strategies identified and discussed in previous presentations
    - Cost evaluation of all strategies to be provided in final reporting
- Project sponsor selected three (3) priority projects
  - Additional details discussed later
- Project Reporting
  - Developed in draft, final draft, and final reporting

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June 4-5, 2023
Chignik Bay, AK

Summary of Previous Presentations

- May 25-29 2022: Site investigation & CRCRS 2022
- November 2022: AFE 2022
  - Included in handout for additional participant information
    - Project Description
    - Climate Resiliency
    - Action Plan Development
    - Climate Hazards
    - Past, Concurrent, & Future Studies
    - At-Risk Infrastructure
    - Risk Mitigation Strategies
    - Future Project Ideas
    - Community Goals

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Risk Mitigation & Community Goals

- Risk Mitigation
  - Focus on public infrastructure
  - General strategies
    - Defend in place
    - Facility improvements
    - Relocation
- Community goals
  - Improve emergency response preparedness
  - Grow community
  - Elder support
  - Preserve subsistence cultural way of life (specifically the fishery)
  - Improve economy by diversifying resources and providing more jobs to locals in the Community

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Priority Projects

- Priority Projects
  - Align with risk mitigation and community goals
  - Focused on public infrastructure
  - Brainstorming list developed during workshops guided by Bristol
  - Three priority projects selected by Sponsor
    - Indian Creek Bridge and Road Rehabilitation Preliminary Engineering Report (PER)
    - Design & Construction of Two Tsunami Shelters PER
    - East Side Electric Distribution Upgrades PER

Priority Projects (cont.)

- Capital assets
  - What are they
    - Public infrastructure owned by public entity
  - How are they developed (project life cycle)
    - Planning
    - Preliminary engineering
    - Engineering design
    - Construction
    - Operations and maintenance
    - Decommissioning

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Priority Projects – Project #1

Indian Creek Bridge and Road Rehabilitation PER

- Community goal
  - emergency preparedness
- Mitigation strategy
  - Defend in place & facility improvements
- Background
  - Critical infrastructure for community evacuation routes
  - Bridge constructed in 1985 (38 years)
    - Vulnerable to erosion
    - Deteriorating structural systems
  - Landfill Road
    - Vulnerable to erosion

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Priority Projects – Project #1 (cont.)

- Objectives
  - Collect data required for analysis of preliminary design alternatives, including a geotechnical investigation, infrastructure inspection, and survey.
  - Identify design alternatives of bridge and road upgrades necessary to stabilize the existing impacted structures and their associated construction cost estimates.
  - Develop PER, that includes preliminary drawings and construction cost estimates for the alternatives. The PER will evaluate design alternatives, recommend a preferred solution, and discuss construction needs for the road and bridge improvements.

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Chignik Bay, AK

Priority Projects – Project #1 (cont.)

- Scope
  - Task 1: Project management
    - Subtask 1.1: General Project Management
    - Subtask 1.2: Project Kick-Off Meeting
    - Subtask 1.3: Design Review Meetings
      - Alternative meeting
      - Draft PER
    - Subtask 1.4: Project Closeout
    - Deliverables: monthly reporting / invoicing, meeting minutes, final reporting
  - Task 2: Data Collection and Site Investigations
    - Subtask 2.1: Desktop and Background Data Collection
    - Subtask 2.2: Site Investigation w/ Trip Report
    - Subtask 2.3: Surveying and Base Mapping Desktop Study
    - Subtask 2.4: Geotechnical Desktop Study
    - Deliverables: Trip report, others in PER

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June 4-5, 2023
Chignik Bay, AK

Priority Projects – Project #1 (cont.)

- Scope
  - Task 3: Design Alternatives Analysis
    - Subtask 3.1 – 3.2 Design Bridge and Road Alternatives
      - plan details
      - material quantity estimates
      - estimated construction costs
      - estimated construction schedule
    - Deliverable: Alternative Memo
      - draft w/ sponsor review
      - Final will be in PER
  - Task 4: Preliminary Engineering
    - Subtask 4.1 – 4.2: Develop PER in US Department of Transportation Federal Highway Administration (FHWA) format
    - Deliverable: Preliminary Engineering Report (PER)
      - Draft w/ sponsor review
      - Final

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Chignik Bay, AK

Priority Projects – Project #1 (cont.)

Schedule

Task No.	Task	Timeline
-	Funding Obtained / NTP	To be determined
1.2	Project Kick-Off Meeting	1 month after NTP
2.1	Desktop Background Data Collection	2 months after Kick-Off Meeting
2.2	Site Investigation w/ Trip Report	1 month after Desktop Background Data Collection
2.3	Surveying and Base Mapping Desktop Study	1 month after Site Investigation
2.4	Geotechnical Desktop Study	1 month after Site Investigation
3.1	Bridge Design Alternatives	2 months after Desktop Studies
3.2	Road Design Alternatives	2 months after Desktop Studies
1.3	Design Alternatives Review Meeting	1 month after Design Alternatives
4.1	Draft PER	3 months after Design Alternative Review Meeting
1.3	Draft PER Review Meeting	1 month after Draft PER
4.2	Final PER	2 months after Draft PER Review Meeting
1.4	Project Closeout	1 month after Final PER
Total = 15 months		

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Priority Projects – Project #1 (cont.)

- Budget

Task No.	Task	Budget
1.1	General Project Management	$ 3,500
1.2	Project Kick-Off Meeting	$ 2,500
1.3	Design Review Meetings	$ 5,000
1.4	Project Closeout	$ 5,000
2.1	Desktop Background Data Collection	$ 30,000
2.2	Site Investigation w/ Trip Report	$ 20,000
2.3	Surveying and Base Mapping Desktop Study	$ 20,000
2.4	Geotechnical Desktop Study	$ 30,000
3.1	Design Bridge Alternatives	$ 35,000
3.2	Design Road Alternatives	$ 30,000
4.2	Final PER	$ 75,000
	Subtotal	$ 256,000
	Tribal Administration (10%)	$ 25,600
	Total Budget	**$ 281,600**

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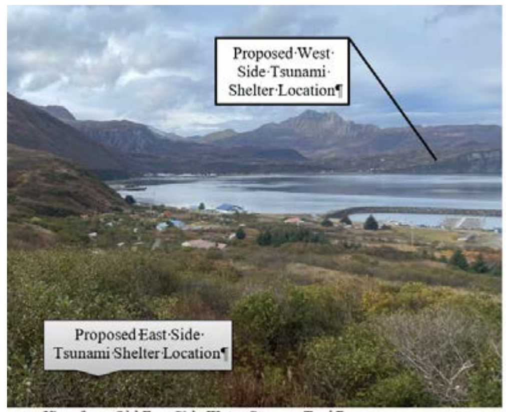
Priority Projects – Project #2

Design & Construction of Two Tsunami Shelters PER

- Community goal
  - emergency preparedness
- Mitigation strategy
  - New facility
- Background
  - Critical shelter(s) needed during emergency event
  - None currently exist



View from Old East Side Water Storage Tank

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Chignik Bay, AK

Priority Projects – Project #2 (cont.)

- Objectives
  - Collect data required for analysis of preliminary design alternatives, including a geotechnical investigation, infrastructure inspection, and surveying.
  - Identify design alternatives for the two tsunami shelters and associated construction cost estimates.
  - Develop a preliminary engineering report (PER) that includes preliminary drawings and construction cost estimates for the alternatives.

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Chignik Bay, AK

Priority Projects – Project #2 (cont.)

- Scope
  - Task 1: Project management
    - Subtask 1.1: General Project Management
    - Subtask 1.2: Project Kick-Off Meeting
    - Subtask 1.3: Design Review Meetings
      - Alternative meeting
      - Draft PER
    - Subtask 1.4: Project Closeout
    - Deliverables: monthly reporting / invoicing, meeting minutes, final reporting
  - Task 2: Data Collection and Site Investigations
    - Subtask 2.1: Desktop and Background Data Collection
    - Subtask 2.2: Site Investigation w/ Trip Report
    - Subtask 2.3: Surveying and Base Mapping Desktop Study
    - Subtask 2.4: Geotechnical Desktop Study
    - Deliverables: Trip report, others in PER

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Priority Projects – Project #2 (cont.)

- Scope
  - Task 3: Design Alternatives Analysis
    - Subtask 3.1 – 3.2 East side and West side Alternatives
      - plan details
      - material quantity estimates
      - estimated construction costs
      - estimated construction schedule
    - Deliverable: Alternative Memo
      - draft w/ sponsor review
      - Final will be in PER
  - Task 4: Preliminary Engineering
    - Subtask 4.1 – 4.2: Develop PER in standard format
    - Deliverable: Preliminary Engineering Report (PER)
      - Draft w/ sponsor review
      - Final

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Chignik Bay, AK

Priority Projects – Project #2 (cont.)

- Schedule

Task No.	Task	Timeline
-	Funding Obtained / NTP	To be determined
1.2	Project Kick-Off Meeting	1 month after NTP
2.1	Desktop Background Data Collection	2 months after Kick-Off Meeting
2.2	Site Investigation w/ Trip Report	1 month after Desktop Background Data Collection
2.3	Surveying and Base Mapping Desktop Study	1 month after Site Investigation
2.4	Geotechnical Desktop Study	1 month after Site Investigation
3.1	East Side Tsunami Shelter Design Alternatives	2 months after Desktop Studies
3.2	West Side Tsunami Shelter Design Alternatives	2 months after Desktop Studies
1.3	Design Alternatives Review Meeting	1 month after Design Alternatives
4.1	Draft PER	3 months after Design Alternative Review Meeting
1.3	Draft PER Review Meeting	1 month after Draft PER
4.2	Final PER	1 month after Draft PER Review Meeting
1.4	Project Closeout	1 month after Final PER
	Total = 14 months	

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Priority Projects – Project #2 (cont.)

- Budget

Task No.	Task	Budget
1.1	General Project Management	$ 3,500
1.2	Project Kick-Off Meeting	$ 2,500
1.3	Design Review Meetings	$ 5,000
1.4	Project Closeout	$ 5,000
2.1	Desktop Background Data Collection	$ 30,000
2.2	Site Investigation w/ Trip Report	$ 20,000
2.3	Surveying and Base Mapping Desktop Study	$ 20,000
2.4	Geotechnical Desktop Study	$ 30,000
3.1	East Side Tsunami Shelter Design Alternatives	$ 30,000
3.2	West Side Tsunami Shelter Design Alternatives	$ 30,000
4.2	Final PER	$ 75,000
	Subtotal	$ 251,000
	Tribal Administration (10%)	$ 25,100
	Total Budget	**$ 276,100**

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Priority Projects – Project #3

East Side Electric Distribution Upgrades PER

- Community goal
  - emergency preparedness
- Mitigation strategy
  - facility improvements
- Background
  - Critical infrastructure
  - Power grid improvements required
    - Distribution system
    - Power plants (engines / generators) 3each.

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Chignik Bay, AK

Priority Projects – Project #3 (cont.)

- Objectives
  - Collect data required for analysis of preliminary design alternatives, including geotechnical investigation, infrastructure inspection, and survey as warranted.
  - Complete preliminary design alternatives for the electrical upgrades, to include estimates of construction cost.
  - Develop a preliminary engineering report (PER), with preliminary drawings, construction cost estimates, and recommendations. The PER will evaluate design alternatives, select a preferred solution, and discuss construction needs.

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Priority Projects – Project #3 (cont.)

- Scope
  - Task 1: Project management
    - Subtask 1.1: General Project Management
    - Subtask 1.2: Project Kick-Off Meeting
    - Subtask 1.3: Design Review Meetings
      - Alternative meeting
      - Draft PER
    - Subtask 1.4: Project Closeout
    - Deliverables: monthly reporting / invoicing, meeting minutes, final reporting
  - Task 2: Data Collection and Site Investigations
    - Subtask 2.1: Desktop and Background Data Collection
    - Subtask 2.2: Site Investigation w/ Trip Report
    - Subtask 2.3: Surveying and Base Mapping Desktop Study
    - Subtask 2.4: Geotechnical Desktop Study
    - Deliverables: Trip report, others in PER

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Chignik Bay, AK

Priority Projects – Project #3 (cont.)

- Scope
  - Task 3: Design Alternatives Analysis
    - Subtask 3.1: East Side Electric Distribution System Design Alternatives
      - Considering: bulk fuel, power generation, bulk fuel, and utility equipment
      - plan details
      - material quantity estimates
      - estimated construction costs
      - estimated construction schedule
    - Deliverable: Alternative Memo
      - draft w/ sponsor review
      - Final will be in PER
  - Task 4: Preliminary Engineering
    - Subtask 4.1 – 4.2: Develop PER in standard format
    - Deliverable: Preliminary Engineering Report (PER)
      - Draft w/ sponsor review
      - Final

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Priority Projects – Project #3 (cont.)

- Schedule

Task No.	Task	Timeline
-	Funding Obtained / NTP	To be determined
1.2	Project Kick-Off Meeting	1 month after NTP
2.1	Desktop Background Data Collection	2 months after Kick-Off Meeting
2.2	Site Investigation w/ Trip Report	1 month after Desktop Background Data Collection
2.3	Surveying and Base Mapping Desktop Study	1 month after Site Investigation
2.4	Geotechnical Desktop Study	1 month after Site Investigation
3.1	East Side Electrical Distribution Upgrades Design Alternatives	2 months after Desktop Studies
1.3	Design Alternatives Review Meeting	1 month after Design Alternatives
4.1	Draft PER	3 months after Design Alternative Review Meeting
1.3	Draft PER Review Meeting	1 month after Draft PER
4.2	Final PER	1 month after Draft PER Review Meeting
1.4	Project Closeout	1 month after Final PER
	Total = 14 months	

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2023 CRCRS
June 4-5, 2023
Chignik Bay, AK

Priority Projects – Project #3 (cont.)

- Budget

Task No.	Task	Budget
1.1	General Project Management	$ 3,500
1.2	Project Kick-Off Meeting	$ 3,500
1.3	Design Review Meetings	$ 5,000
1.4	Project Closeout	$ 5,000
2.1	Desktop Background Data Collection	$ 30,000
2.2	Site Investigation w/ Trip Report	$ 20,000
2.3	Surveying and Base Mapping Desktop Study	$ 20,000
2.4	Geotechnical Desktop Study	$ 30,000
3.1	East Side Electric Distribution Design Alternatives	$ 30,000
4.2	Final PER	$ 75,000
	Subtotal	$ 222,000
	Tribal Administration (10%)	$ 22,200
	Total Budget	**$ 244,200**

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2023 CRCRS
June 4-5, 2023
Chignik Bay, AK

Data Gap Analysis

- Root cause of low salmon returns
- More accurate weather data specific to Chignik Bay
- Bathymetry of river, lakes, and bay
- Water level monitoring
- Centralized historical flood database
- Sediment transport model
- Updated land ownership maps
- Updated aerial imagery
- Inner transit system feasibility study specific to Chignik region
- *Discuss in breakout session or now?*
  - *Priorities, dependencies, resources, timelines, costs, funding opportunities, and other?*

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Closing

- Questions / Comments?

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June 4-5, 2023
Chignik Bay, AK

Thank you!

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APPENDIX E

Project #1 Summary
Indian Creek Bridge and Landfill Road

P R O J E C T   S U M M A R Y

Project Title: Indian Creek Bridge and Landfill Road Preliminary Engineering Report

Reference: Chignik Bay Climate Resiliency Action Plan, Priority Project #1

Date: May 17, 2023

Owner: Chignik Bay Tribal Council

BACKGROUND

A Climate Resiliency Action Plan (dated May 2023) was developed for the Chignik Bay Tribal Council (Council) to better understand the effects of climate change on the community of Chignik Bay, Alaska. This Action Plan will help support community resiliency to the effects of climate change through data development and adaptation planning. One outcome of the Action Plan is to develop three priority projects based on community input. This Memorandum summarizes the estimated Scope, Schedule, and Budget for Priority Project #1: Indian Creek and Landfill Road Preliminary Engineering Report (PER), as directed by the Chignik Bay Tribal Council.

Data collection activities performed as part of the Action Plan included researching past and current studies related to climate change, erosion, and flooding, visual documentation of impacted infrastructure, and traditional ecological knowledge sessions with locals.

Priority Project #1 involves engineering activities required to re-habilitate and/or replace the Indian Creek Bridge and Landfill Road that are currently being impacted by erosion degradation. The Indian Creek Bridge and Landfill Road both currently serve as the main and only evacuation route for the entire community in the case of a tsunami and/or flooding. Past tsunami studies and inundation maps have shown these structures to be the only viable evacuation route for the entire town with exception of one alternative route on the east side of town leading to an old water storage tank that is not currently accessible by vehicle and can only be used by pedestrians. Tsunamis which may occur in the winter season require evacuation routes to be accessible by vehicle so residents can stay warm while waiting as there is currently no tsunami shelter in the entire community. Due to these factors, both the Indian Creek Bridge and the Landfill Road are critical infrastructure to the community.

This proposed project would include a PER evaluating how to best rehabilitate and/or replace both the Indian Creek Bridge and the Landfill Road extending the useful life of both structures. Both structures need work due to natural erosion processes and vehicular traffic experienced over their lifetime. Rehabilitation and/or replacement of these structures would ensure the safety of the community in the event of a tsunami.

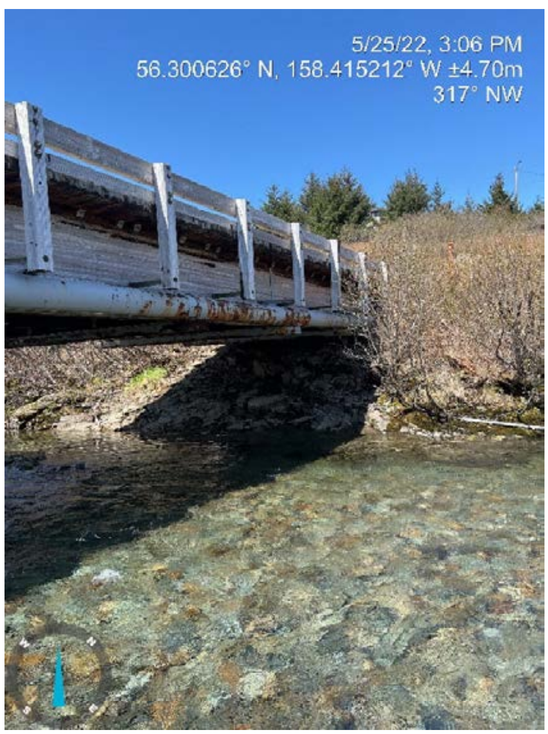
Indian Creek Bridge

Indian Creek Bridge was built in 1985 and spans over Indian Creek. The bridge is located at 56.300721° latitude and 158.415354° longitude. The bridge is owned by the City of Chignik, but the Alaska Department of Transportation (DOT) still performs inspections of the bridge every two years. The most recent inspection performed by DOT was in 2022. The bridge is single lane with a separated pedestrian walkway on the upstream side. The overall length and width of the bridge is 70' and 21.6' respectively. The bridge structure consists of three wood stringers/girders, 5.5" thick glu-lam beams for decking, and 3.5" thick wood planks for the wear surface. The bridge has multiple utilities attached with steel utility hangers on both the upstream and downstream sides of the bridge. The north side abutment consists of a concrete footing and timber backwall resting on a rock fill embankment. The south side abutment consists of a timber mud sill and timber backwall resting on fill retained by a steel bin wall. Timber railings are on both sides of the bridge.

Bank erosion is present along both bridge abutments. The north side upstream bank is eroding into the channel where the stream bends sharply. Erosion can be observed on either side of the abutments at both ends of the bridge. Residents have reported seeing multiple high-water events in Indian Creek causing significant erosion along the bridge abutments.

Indian Creek Bridge

South Side Abutment



North Side Abutment

Downstream of Indian Creek Bridge

Landfill Road

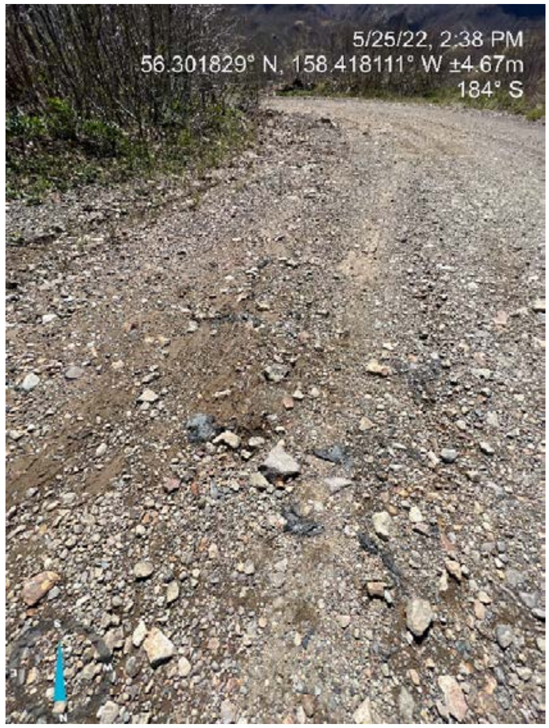
The landfill road starts at the end of Indian Creek Bridge and ends at the city landfill after an elevation gain of approximately 360 feet. The landfill road is a 14-foot-wide one lane gravel roadway that is approximately 3,759 linear feet long. No existing construction plans could be found for the road, but based on historical email correspondence, which included a scope of work and estimate of cost, the road section consists of geotextile, subbase, base, and surface course material. Drainage is currently addressed by minor ditching and several culverts that are in fair condition.

The landfill road incurs significant erosion due to its location on steep terrain and the accumulation of surface water runoff. The road has minimal ditching, especially along turns, which results in surface water sheet flow across the road. This runoff has washed away fines exposing larger rock in the subbase. In some areas of the road the geotextile is exposed by the erosive forces.

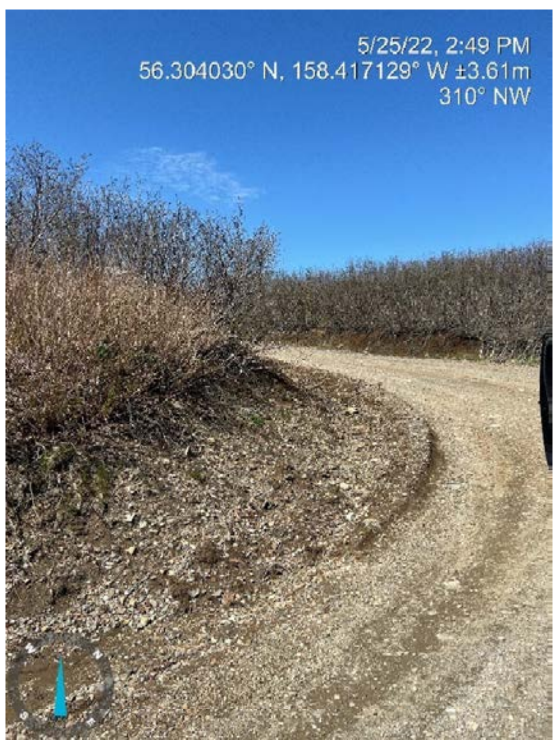
Several options to rehabilitate the road include:

- Placement of additional surface course material, compacting, and re-grading.

- Constructing ditches along road and adding cobbles or riprap where needed to withstand the erosive forces.
- Placing additional culverts where needed.
- Increase the road width where possible.
- Increase the number of pullouts on the single lane road, and increase the size of the pullouts.
- Add guardrails around the pull outs as warranted.
- Clear brush and alders along the sides of the road to improve visibility and eliminate blind spots at corners.



Exposed Geotextile



Washed Out Ditching Around Bend

To address the identified issues at the Indian Creek Bridge and landfill road, a team of professional planners, scientists, and engineers (the Consultant / Design Team) will be engaged to complete the project in direct consultation with the community. The project will accomplish the following tasks:

1. Collect data required for analysis of preliminary design alternatives, including a geotechnical investigation, infrastructure inspection, and survey.
2. Identify design alternatives of bridge and road upgrades necessary to stabilize the existing impacted structures and their associated construction cost estimates.
3. Develop a preliminary engineering report (PER), that includes preliminary drawings and construction cost estimates for the alternatives. The PER will evaluate design alternatives, recommend a preferred solution, and discuss construction needs for the road and bridge improvements.

The project scope, schedule, and budget are further defined below.

SCOPE

The Consultant shall implement the following tasks to accomplish the goals of this project.

Task 1: Project Management

Subtask 1.1: General Project Management

This task involves all general project management services including project startup and closeout activities, schedule and budget monitoring, staff and client coordination, records management, monthly invoicing, and other project organization, communication, and administration activities.

Subtask 1.2: Project Kick-Off Meeting

The Consultant shall coordinate and host a Project Kick-Off Meeting with the Tribe and Design Team. The meeting will be a telephonic or video conference meeting. The purpose of the meeting will be to discuss the project scope, schedule, and budget, and identify next steps including data collection and field visits. The Consultant shall provide a record of the meeting at its conclusion.

Subtask 1.3: Design Review Meetings

The Consultant shall coordinate and host Design Review Meetings with the Tribe and Design Team after each major deliverable. The purpose of the meetings will be to review the latest deliverable and address any questions or comments from the Tribe and/or Design Team. The Consultant shall provide a record of each meeting at its conclusion. At a minimum, the following review meetings are anticipated:

1. Draft Bridge and Road Design Alternatives Meeting (Subtask 3.1 & 3.2)

2. Draft Preliminary Engineering Report Review Meeting (Subtask 4.1)

Subtask 1.4: Project Closeout

The Consultant shall develop a closeout report summarizing the overall project, findings, and conclusions.

Task 2: Data Collection and Site Investigations

Subtask 2.1: Desktop and Background Data Collection

The Consultant will perform a desktop study for both the existing road and bridge. The study will review past construction plans, studies, and any other informational materials that pertain to the road and bridge.

Subtask 2.2: Site Investigation w/ Trip Report

The Consultant shall travel to the community to perform an inspection of the existing road and bridge. The existing conditions and deficiencies of the systems shall be summarized in a technical memo.

Subtask 2.3: Surveying and Base Mapping Desktop Study

The Consultant shall collect planimetric and topographic data of the existing bridge and road using public maps available online. The Consultant shall use mapping to determine approximate size and scale of road and bridge. Mapping will also be used to determine landownership with respect to the bridge and road.

Subtask 2.4: Geotechnical Desktop Study

The Consultant shall conduct a desktop review of existing geotechnical information for the project. The Consultant will perform a desktop study of soil properties for both the landfill road and bridge. The soil properties will help identify foundation requirements for both the road and bridge design.

Task 3: Design Alternatives Analysis

Subtask 3.1: Design Bridge Alternatives

The Consultant shall prepare preliminary design alternatives for the bridge. These design alternatives would consider the following:

- Bridge Rehabilitation
- Bridge Replacement
- No Action

The design alternatives would include plan details, material quantity estimates, and estimated construction costs. The design alternatives would also include a proposed construction schedule with each option. Once the Tribe has identified the preferred alternative, the Consultant shall develop preliminary design plans.

A draft version of the preliminary design will be submitted to the Tribe for review. A design review meeting (Subtask 1.3) will be held following a 30-day review period to discuss the draft design submittal.

A final draft of the preliminary design will address comments and questions received from the Tribe prior to inclusion in the PER.

Subtask 3.2: Design Road Alternatives

The Consultant shall prepare preliminary design alternatives for the road. These design alternatives would consider the following:

- Road Surface Improvements
- Drainage Improvements
- Safety Improvements

The design alternatives would include plan details, material quantity estimates, and estimated construction costs. The design alternatives would also include a proposed construction schedule. Once the Tribe has identified the preferred alternative, the Consultant shall develop preliminary design plans.

A draft version of the preliminary design will be submitted to the Tribe for review. A design review meeting (Subtask 1.3) will be held following a 30-day review period to discuss the draft design submittal.

A final draft of the preliminary design will address comments and questions received from the Tribe prior to inclusion in the PER.

Task 4: Preliminary Engineering

Subtask 4.1: Draft Preliminary Engineering Report

This task involves preparing a Preliminary Engineering Report (PER) to meet PER guidelines provided in United States Department of Transportation Federal Highway Administration. The PER shall evaluate solutions to mitigate the issues with the bridge and road. The PER will identify the design criteria, engineering and construction requirements, capital and operational costs, and other considerations to evaluate alternatives and select a preferred alternative. The PER will include preliminary (35%) design drawings and third-party cost estimates.

The PER will be developed in Draft and Final versions. The Draft will be submitted to the Tribe for review. A PER Review Meeting (Subtask 1.3) will be held following a 30-day review period to discuss the Draft PER submittal.

Subtask 4.2: Final Preliminary Engineering Report

The Final PER will address comments and questions received from the Tribe prior to finalizing. The PER figures, cost estimates, calculations, and other supporting documents will be updated and finalized. The Final PER will be submitted to the Tribe.

SCHEDULE

The anticipated Project timeline is provided in Table 1. The Consultant shall develop an updated Project Schedule upon Notice to Proceed (NTP).

Table 1: Project Schedule

Task No.	Task	Timeline
-	Funding Obtained / NTP	To be determined
1.2	Project Kick-Off Meeting	1 month after NTP
2.1	Desktop Background Data Collection	2 months after Kick-Off Meeting
2.2	Site Investigation w/ Trip Report	1 month after Desktop Background Data Collection
2.3	Surveying and Base Mapping Desktop Study	1 month after Site Investigation
2.4	Geotechnical Desktop Study	1 month after Site Investigation
3.1	Bridge Design Alternatives	2 months after Desktop Studies
3.2	Road Design Alternatives	2 months after Desktop Studies
1.3	Design Alternatives Review Meeting	1 month after Design Alternatives
4.1	Draft PER	3 months after Design Alternative Review Meeting
1.3	Draft PER Review Meeting	1 month after Draft PER
4.2	Final PER	2 months after Draft PER Review Meeting
1.4	Project Closeout	1 month after Final PER
Total = 15 months		

BUDGET

The budget for this project is $281,600. The cost estimate includes all project activities identified above, as well as expenses for travel, printing, and other project materials. The budget includes a 10% for Tribal Administration (indirect cost). A project budget, separated by task, is provided in the following table.

Table 2: Project Budget

Task No.	Task	Budget
1.1	General Project Management	$ 3,500
1.2	Project Kick-Off Meeting	$ 2,500
1.3	Design Review Meetings	$ 5,000
1.4	Project Closeout	$ 5,000
2.1	Desktop Background Data Collection	$ 30,000
2.2	Site Investigation w/ Trip Report	$ 20,000
2.3	Surveying and Base Mapping Desktop Study	$ 20,000
2.4	Geotechnical Desktop Study	$ 30,000
3.1	Design Bridge Alternatives	$ 35,000
3.2	Design Road Alternatives	$ 30,000
4.2	Final PER	$ 75,000
	Subtotal	$ 256,000
	Tribal Administration (10%)	$ 25,600
	Total Budget	**$ 281,600**

The final project scope and budget shall be negotiated with the Consultant upon grant award.

[END OF MEMO]

Attachments:

A. Indian Creek Bridge & Landfill Road Figure

B. Climate Resiliency Action Plan Infrastructure Inspections

C. Alaska DOT 2022 Indian Creek Bridge Inspection

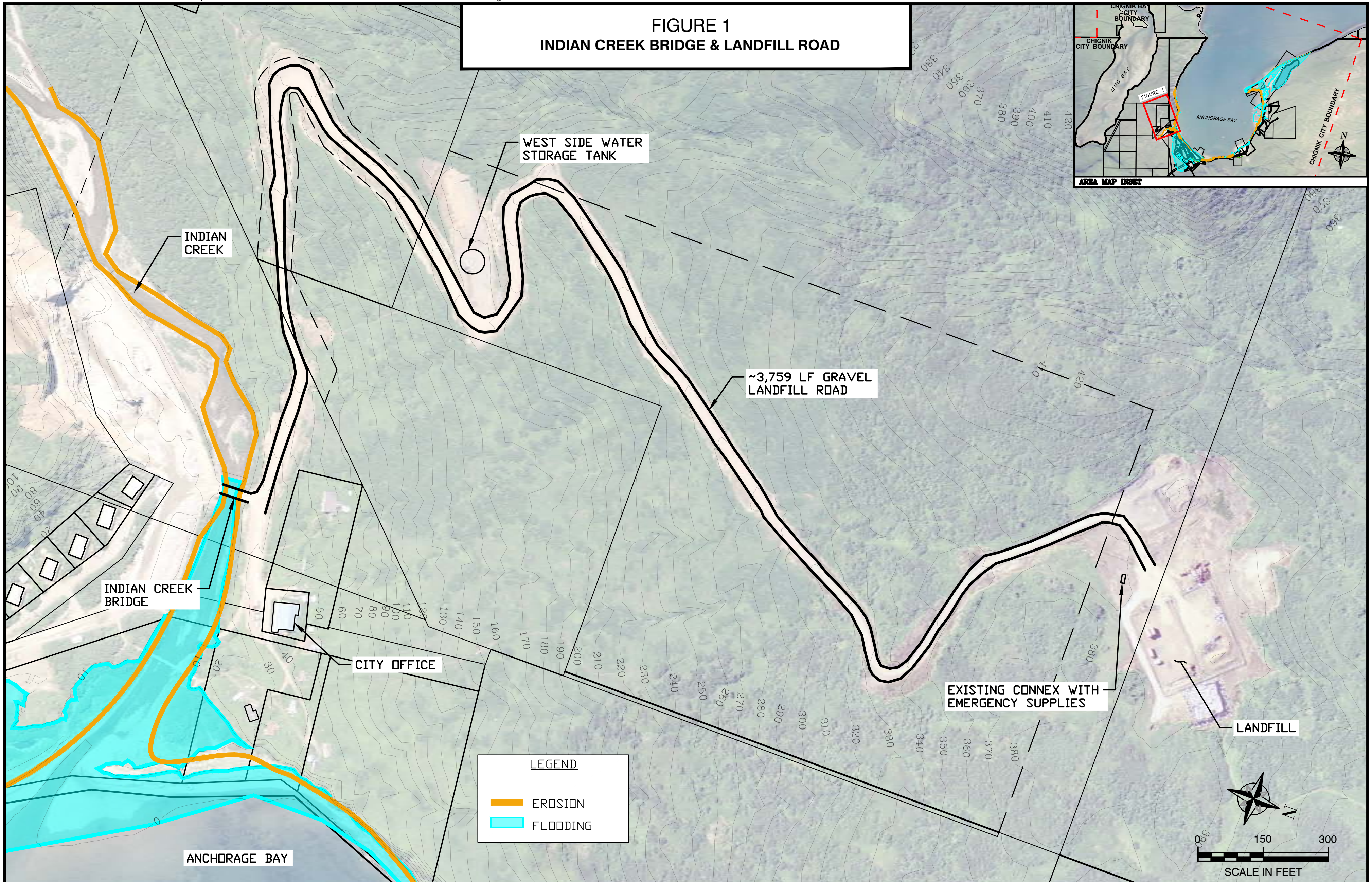
D. Landfill Road Construction Correspondence

Attachment A

Indian Creek Bridge & Landfill Road Figure

Drawing: U:\BEESC\JOBS\32220067 CHIGNIK BAY RPT\ACAD-DESIGN\02_32220067_CHIGNIKBAY_REPORTFIGURES.DWG – Layout: FIG 1
User: TMARTIN Dec 19, 2022 – 12:34pm Xrefs: CB200.DWG X_BR_85X11L_REPORT.DWG – Images: CHIGBAY.TIF CHIGNIK_7-31-02.TIF

FIGURE 1
INDIAN CREEK BRIDGE & LANDFILL ROAD



Chignik Bay Tribal Council
PO Box 50
Chignik Bay, Alaska 99654
(907) 749-2445

Bristol
ENGINEERING SERVICES COMPANY, LLC

111 W. 16th Avenue, 3rd Floor
Anchorage, AK 99501
Phone (907) 563-0013
Fax (907) 563-6713
License Number: AECC697

PROJECT LOCATION	CHIGNIK BAY, AK
PROJECT NAME	CHIGNIK BAY TRIBAL COUNCIL CLIMATE RESILIENCY ACTION PLAN
PROJECT No.	32220067
SUBMITTAL	DRAFT
DATE	8/29/22
DWN.	TJM
SCALE	SHOWN
APPRVD.	IPP
PAGE	

Attachment B

Climate Resiliency Action Plan Infrastructure Inspections

Bristol
ENGINEERING
SERVICES COMPANY, LLC

111 W. 16th Avenue, Third Floor
Anchorage, AK 99501-5169
phone (907) 563-0013
fax (907) 563-6713
www.bristol-companies.com

INFRASTRUCTURE INSPECTION

Infrastructure Name:	1 - Landfill Road/Evacuation Route
Location (lat & long):	56.301590,-158.418311
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Tsunami Evacuation Route
Dimensions:	18 ft wide, ~4,286 ft long
Date Constructed:	
Age (years):	
Foundation Type:	Gravel & Geotextile
Condition:	*Some areas of exposed larger rock due to the washing away of fines.
Utilities (water, sewer, electric, communications, gas, heating oil):	Water line
Prone to flooding?	No
Prone to erosion?	This occurs due to runoff and lack of ditching
Prone to landslide/avalanche?	No
Drainage problems?	Ditching improvements needed especially around corners
Cause of Failure (if any, date issue started):	Erosion due to runoff
Proposed facility improvements:	N/A
Defend in place strategies:	Add armor rock around corner ditching for more control of the flow of water. Add more ditching & culverts as needed.
Alternative locations:	N/A
Other Notes:	*after bridge heading to dump, left hand side, deep trenching from runoff (6' wide, 2' deep) * (a) washout exposing large rock, sharp corner * (b) carry ditch around corner * (c) ditch work needed *PVC culvert 6" wide

Chignik Bay, Alaska
May 2022
Landfill Road & Evacuation Route

Exposed Geotextile

Lack of Ditching Around Bends
1 of 2

Chignik Bay, Alaska
May 2022
Landfill Road & Evacuation Route

Runoff Washing Away Fines Exposing Larger Rock

Washed Out Ditching Around Bend

Bristol
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SERVICES COMPANY, LLC

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Anchorage, AK 99501-5169
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www.bristol-companies.com

INFRASTRUCTURE INSPECTION

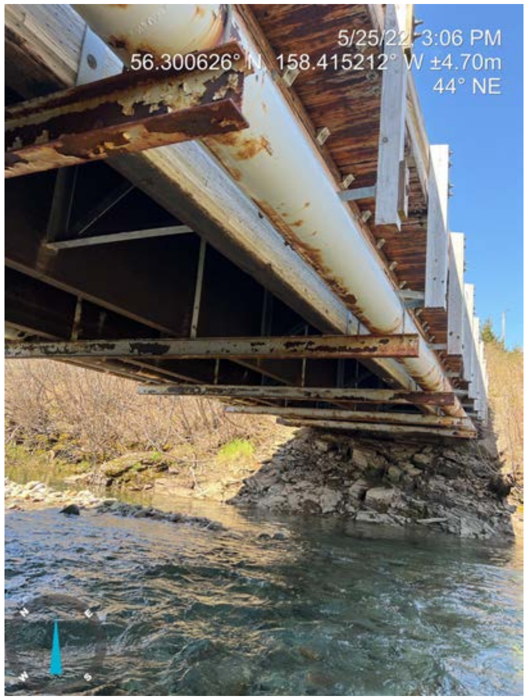
Infrastructure Name:	6A - Indian Creek Bridge
Location (lat & long):	56.300603, -158.415371
Owner (Commercial, Residential, or Public):	Public, City of Chignik
Function:	Tsunami Evacuation Route
Dimensions:	72' long, 15' wide (vehicle), 7' (pedestrian)
Date Constructed:	1985
Age (years):	37
Foundation Type:	*Wood decking and wing walls *metal/wood/rock abutments (one side of the deck is resting on the
Condition:	*See most current survey done by the State after last big earthquake. *Unsatisfactory (decking may be ok but abutments need updated
Utilities (water, sewer, electric, communications, gas, heating oil):	Water/Sewer???
Prone to flooding?	Located in flood zone
Prone to erosion?	Yes
Prone to landslide/avalanche?	No
Drainage problems?	*far side connection (Dump Rd), has erosion due to runoff. *Fines are deposited on deck of bridge *Culvert draining and hitting wingwall of bridge *Drainage and erosion on both ends of bridge along wingwalls
Cause of Failure (if any, date issue started):	Erosion at abutments, wear and tear from vehicle traffic
Proposed facility improvements:	Replace bridge structure components as needed
Defend in place strategies:	Stabilize areas of erosion
Alternative locations:	N/A
Other Notes:	*Wood surface decking worn down on side closest to quarry. *Some wood posts and rub rails are cracked on the surface

Chignik Bay, Alaska
May 2022
Indian Creek Bridge

Damaged Decking & Rub Rails

Erosion at South Abutment Wood Wing Wall
1 of 3

Chignik Bay, Alaska
May 2022
Indian Creek Bridge



North Abutment

Side Profile

Chignik Bay, Alaska
May 2022
Indian Creek Bridge

South Abutment

Weight Limit
3 of 3

Attachment C

Alaska DOT 2022 Indian Creek Bridge Inspection

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Transportation and Public Facilities

Design & Engineering Services
Bridge & Standards Section

3132 Channel Drive
P.O. Box 112500
Juneau, AK 99811-2500
907-465-8890
907-465-3124 (fax)
dot.state.ak.us

December 19, 2022

The Honorable Guy Ashby, Mayor
City of Chignik
P.O. Box 110
Chignik, AK 99564-0110

Subject: 2022 Bridge Inspection, Indian Creek (1764) & Chignik Creek (1932)

Dear Mayor Ashby:

I am enclosing one copy of the reports for the subject bridges. The reports provide the following summary information:

- Bridge location, rail types, and signage.
- Work Candidates: A list of recommended work or repairs to maintain the bridge. The photographs help identify the recommended repair needs.
- Element Inspection: Presents a summary of observed conditions on and around the bridge.
- Hydraulics: Observations, stream bank conditions, soundings and drift.
- Structural Inventory and Appraisal (SI&A) sheet: Presents the condition ratings, appraisal codes, and other information, described in the 1995 Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, found at *http://www.fhwa.dot.gov/BRIDGE/bripub.htm*.

The reports document the biennial inspection required by the National Bridge Inspection Standards (NBIS), and identifies the work necessary to maintain the structures in a safe and serviceable condition.

Please contact Larry Owen, Bridge Management Engineer, at (907) 465-8897 if you have questions regarding the inspection report.

Sincerely,

Leslie Daugherty

Leslie Daugherty, P.E.
Chief Bridge Engineer

Enclosures: Inspection Reports

cc: Pete Forsling, Structures & Research Engineer, FHWA, Juneau (letter only)

Routine Inspection Report

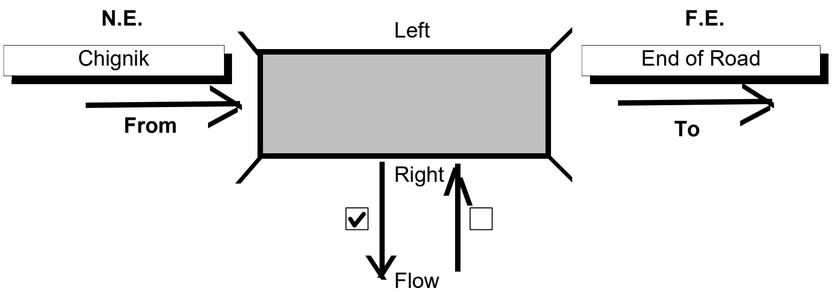
Date: 9/21/2022

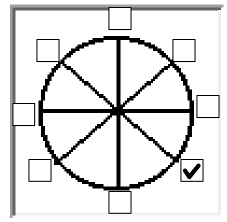
Br No 1764 | INDIAN CREEK

Sunny 55 F

INSPECTOR: David McAdoo
Initials DoM

ASSISTANT: Javier De Leon
Initials JD




North Direction

Apprh Rdwy Width (ft)	12.00
Est Camber (inch)	0.00
Bridge Length (ft)	72.00
Bridge Width O-O (ft)	22.80
CDS Route	0
CDS Mile Point	0.0

Left

Type BRIDGE RAIL	Ht (in)	Curb Ht (in)	Transition Type	Ht (in)	Approach Type/Post	Leading End Treat
Timber Ped. Rail	41.50	0.00	None		None	
Timber 6"x12"	10.50	4.50	None		None	

Right

Type BRIDGE RAIL	Ht (in)	Curb Ht (in)	Transition Type	Ht (in)	Approach Type/Post	Leading End Treat
Timber 6"x12"	20.50	5.00	None		None	

SIGNS

Near End

Lt.	Rt.	
☐	☐	Object Markers
	☑	Restricted Width
	☐	Vertical Clear
	☑	Load Limit
	☐	Name Place

Load Limit Wording or Other Signs

Weight Limit, Maximum Axle Group 15 Tons, Weight Limit 18 Tons
One Lane Bridge

Far End

Lt.	Rt.	
☐	☐	Object Markers
	☑	Restricted Width
	☐	Vertical Clear
	☑	Load Limit
	☐	Name Place

Load Limit Wording or Other Signs

Weight Limit, Maximum Axle Group 15 Tons, Weight Limit 18 Tons 2 - One Lane Bridge signs, US & DS

Deck Material	Thk(Inches)
Glu Lam	5.50

Location Measured: Edge of Deck

Wear Surface	Thk (Inches)
Timber	3.50

Wear Location: Edge of Deck

Drive Condition: Satisfactory

Locality: Chignik

Route: IRR:ANDERSON ROAD

Utilities

Kind	Size	Location	Owner
1 Steel pipe, insulated	12" diameter, 13" OD	Upstream side	City
1 Steel pipe, insulated	16" diameter, 17" OD	Upstream side	City
1 Steel pipe	2.5" diameter	Upstream side	Unknown
1 Steel pipe, insulated	16" diameter, 17" OD	Downstream side	City

Abbreviations: FE=Far End, NE=Near End, DS=Downstream, US=Upstream, LT=Left, RT=Right, P=Pier, FB=Floorbeam, G=Girder, S=Span

Bridge No. 1764, INDIAN CREEK

Work Candidates

Inspected on: *09/21/2022*

Priority	*Description*	*Quantity*	*Work Needed*
High	Substructure-Repair (EA)	1	Re-establish full contact between NE timber mud sill and abutment fill. Repair binwall.
High	Substructure-Repair (EA)	1	Remove and replace the spalled concrete from US side of the FE abutment cap.
Medium	Deck-Resurface (SF)	80	Replace running planks.
Medium	Bridge Rail-Repair (LF)	6	Replace worn and splintered end rail sections (16 feet 10 inches) at both NE sides and both FE sides. Replace split timber posts. Replace damaged rub rail.
Medium	Misc-Install Sign (EA)	6	Install name place signs at each end of the bridge. Install object markers at each corner of the bridge.
Medium	Channel-Repair Washouts / Erosion (EA)	1	Develop project to stabilize NE US bank.

Bridge No. 1764, INDIAN CREEK

Element Inspection

Inspected on: *09/21/2022*

Element	*Description*	*Observations*
31	Timber Deck	Running plank spikes are driven through the deck and protrude from the soffit and girder bays at the FE.
> 510	*Wearing Surfaces*	NE DS running planks worn away, a 4-foot by 2-foot section. Running planks in other locations worn, split and checked. Hardware is exposed and bent over at the NE of the deck.
111	Timber Open Girder/Beam	Girder 1 US face, timber preservative is discolored in a few places. Girder 1 has horizontal splits along the DS Face about half way-up and along the girder from midspan to the FE. Girder 2 has horizontal splits along the US Face about half way-up and along the girder from the NE to midspan. Girder 3 DS face, timber preservative is discolored from exposure. Utility hangers bolted to girders are rusty.
218	Other Abutments	NE abutment has timber mud sill and timber backwall. Timber mud is sill undermined 12 to 14 inches along full length. At the ends, the timber mud sill is undermined 3-feet. Steel binwalls retain soil to support the mud sill. The binwall us rusted out at streamline at NE. Binwalls are bent and twisted at NE DS and NE US corners. FE abutment has concrete footing and timber backwall. The concrete footing is soft, spalled and deteriorated at FE US side near exterior girder bearing for about 9-feet. The FE US bearing plate has lost approximately 2-inches of bearing area around the edges. The concrete footing is soft, spalled, and deteriorated under Bay 2 around the post tensioning rods in the concrete. Top of both timber backwalls tilt away from bridge. Gap is present but no loss of material visible at FE. Definite loss of material at NE.
310	Elastomeric Bearing	Bearing pads at FE have crept approximately 3/4-inch beyond bearing plate under beam. FE bearing pads are cracked and breaking off.
332	Timber Bridge Railing	Ends of timber bridge railing are worn and splintered. Posts are split at bolted connections. Pedestrian railing has minor spilts.
600	Signs Smart Flag	Object markers, name place signs, and bridge number plates are missing.
604	Bank Protection Smart Flag	NE US bank is sloughing from the bridge for about 100 feet.
606	Approach Fill Erosion Smart Flag	Fill is sloughing at both NE corners of the bridge. Concrete with cable tie back placed at NE US. Erosion gulley forming in roadway at NE DS and NE US corner of bridge. Large concrete mass visible in ground on NE DS side.

Br No 1764 | **INDIAN CREEK** | **Date:** 9/21/2022 | **ID** 01 Even 2022 1764

INSPECTOR: David McAdoo **ASSISTANT:** Javier De Leon

Weather Sunny **Temperature** 55 F

HYDRAULICS REPORT

Inspection To Mudline At All Piers and Abuts? *Yes*

Apparent HW *No*

AHW Comments

Bank Erosion *No*

Erosion Comments NE US bank is eroding into channel. Stream sharply bends upstream of bridge.

Stream Bottom Material
Cobble
Gravel
Sand

Activities None

Drift Light

Drift Comments Branches.

Riprap Condition Minimal riprap around the bridge. FE abutment is on bedrock.

Other Hydraulic Comments Small erosion gullies are forming at the NE of both corners of the roadway. FE US has a smalll culvert pipe sticking out from under the roadway.

SOUNDINGS

Measured At Surface Top Rail **Location** Upstream

Soundings Report

All measurements in feet 01 Even 2022 1764

Horiz Dist from NE	Substr Unit No.	Vert Dist to Water Surface	Vert Dist to Stream Bottom	Remarks
0.00	1	0.0	10.7	Begin Bridge
2.80	1	0.0	19.0	EOW
11.00	1	0.0	18.3	
22.00	1	0.0	17.4	EOW
28.70	1	0.0	17.0	
35.00	1	0.0	17.2	EOW
40.70	1	0.0	20.2	
45.40	1	0.0	17.4	EOW
57.10	1	0.0	13.2	
70.00	1	0.0	9.6	End Bridge

Structure Inventory and Appraisal Sheet (English Units)

Bridge Key: 1764	Agency ID: 1764	On/Off System: Off System	SR: 38.1	SD/FO/ND: SD

IDENTIFICATION

State 1:	02 Alaska	Struc Number 8:	1764
Facility Carried 7:	IRR:ANDERSON RD	Location 9:	CHIGNIK
Rte.(On/Under)5A:	Route On Structure	Rte Signing Prefix 5B:	8 Other
Level of Service 5C:	0	Rte. Number 5D:	NSP00
Directional Suffix 5E:	0 N/A	% Responsibility:	
SHD District 2:	03 Southcoast	County Code 3:	Lake and Peninsula Borou
Place Code 4:	Chignik	Mile Post 11:	0.000 mi
Feature Intersected 6:	INDIAN CREEK		
Latitude 16:	56d 18' 2.6 "	Longitude 17:	158d 24' 55.4 "
Border Bridge Code 98:	Unknown (P)		
Border Bridge No. 99:	NA		

STRUCTURE TYPE AND MATERIALS

Number of Approach Spans 46: 0	Number of Spans Main Unit 45: 1
Main Span Mat'l and Type 43A/B:	
7 Wood or Timber	2 Stringer/Girder
Appr Span Mat'l and Type 44A/B:	
N/A	N/A
Deck Type 107:	8 Wood or Timber
Wearing Surface 108A:	7 Wood or Timber
Membrane 108B:	0 None
Deck Protection 108C:	0 None

AGE AND SERVICE

Year Built 27:	1985	Year Reconstructed 106:	
Type of Service on 42A:	1 Highway		
Type of Service under 42B:	5 Waterway		
Lanes on 28A:	1	Lanes under 28B: 0	Detour Length 19: 1 mi
ADT 29:	45	Truck ADT 109: 21%	Year of ADT 30: 2018

GEOMETRIC DATA

Length Max Span 48:	67.50 ft	Structure Length 49:	70.00 ft
Curb/Sdwlk Width L 50A:	0.0 ft	Curb/Sidewalk Width R 50B:	0.0 ft
Width Curb to Curb 51:	14.1 ft	Deck Width Out to Out 52:	21.6 ft
Approach Roadway Width 32: (w/ shoulders)	12.14 ft	Median 33:	0 No median
Deck Area:	1,510.8 sq ft		
Skew 34:	0	Structure Flared 35:	0 No flare
Route Minimum Vertical Clearance 10:	99.99 ft	Route Horizontal Clearance 47:	11.81 ft
Minimum Vertical Clearance Over Bridge 53:	100.0 ft		
Minimum Vertical Underclearance 54A:	N Feature not hwy or RR		
Minimum Vertical Underclearance 54B	0.0 ft		
Minimum Lateral Underclearance 55A:	N Feature not hwy or RR		
Minimum Lateral Underclearance R 55A:	99.9 ft		
Minimum Lateral Underclearance L 56:	0.0 ft		

INSPECTION

Frequency 91:	24 months	Inspection Date 90:	09/21/2022	Next Inspection:	09/21/2024
FC Freq. 92A:	NA	FC Insp. Date 93A:	NA	Next FC Inspection:	NA
UW Freq. 92B:	NA	UW Insp. Date 93B:	NA	Next UW Inspection:	NA
SI Freq. 92C:	NA	SI Date 93C:	NA	Next SI:	NA

CLASSIFICATION

Defense Highway 100:	0 Not a STRAHNET hwy	Parallel Structure 101:	No || bridge exists
Traffic Direction 102:	3 1-lane Br for 2-way	Temporary Structure 103:	No
Highway System 104:	0 Not on NHS	NBIS Length 112:	Long Enough
Toll Facility 20:	3 On free road	Functional Class 26:	08 Rural Minor Collector
Natl. Network 110:	0 Not on truck network	Historical Sig. 37:	5 Not eligible for NRHP
Owner 22:	City or Municipal Highway Agency		
Custodian 21:	City or Municipal Highway Agency		

CONDITION

Deck 58: 7 Good	Super 59: 7 Good	Sub 60:	4 Poor
Channel/Ch. Protection 61:	7 Minor repairs needed	Culvert 62:	N/A

LOAD RATING AND POSTING

Operating Rating 64:	HS 28	Operating Method 63:	1 LFR
Inventory Rating 66:	HS 10	Inventory Method 65:	1 LFR
Design Load 31:	5 HS-20	Posting 70:	3 10.0-19.9% below
Posting Status 41:	P Posted for load		

APPRAISAL

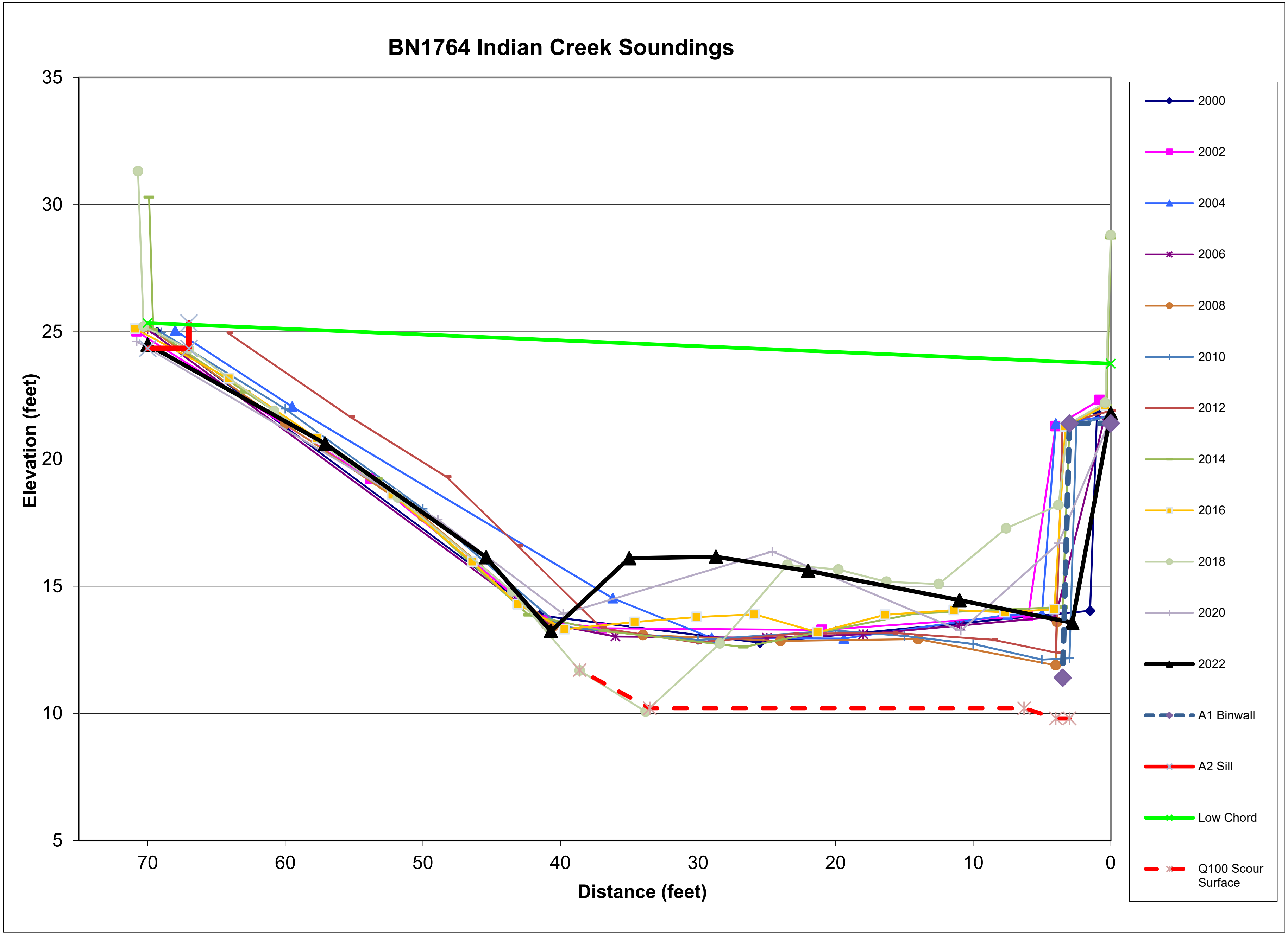
Bridge Rail 36A:	0 Substandard	Approach Rail 36C:	0 Substandard
Transition 36B:	0 Substandard	Approach Rail Ends 36D:	0 Substandard
Str Evaluation 67:	4 Min Tolerable	Deck Geometry 68:	6 Equal Min Criteria
Underclearance, Vertical and Horizontal 69:	N/A		
Waterway Adequacy 71:	7 Better than Min	Approach Alignment 72:	6 Equal Min Criteria
Scour Critical 113:	3 Scour Critical - Within Limits		

PROPOSED IMPROVEMENTS

Bridge Cost 94:	$0	Type of Work 75:	Unknown
Roadway Cost 95:	$0	Length of Improvement 76:	0.0 ft
Total Cost 96:	$0	Future ADT 114:	60
Year of Cost Estimate 97:	Unknown	Year of Future ADT 115:	2035

NAVIGATION DATA

Navigation Control 38:	0 Permit Not Required		
Vertical Clearance 39:	0.0 ft	Horizontal Clearance 40:	0.0 ft
Pier Protection 111:	1 Not required	Lift Bridge Vertical Clearance 116:	0.0 ft


BN1764 Indian Creek Soundings
Elevation (feet)
Distance (feet)
35
30
25
20
15
10
5
70
60
50
40
30
20
10
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
A1 Binwall
A2 Sill
Low Chord
Q100 Scour Surface

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**1**
Ahead at Bridge				File	**P9210406.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**2**
Back at Bridge				File	**P9210418.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**3**
Looking US				File	**P9210412.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**4**
Looking DS				File	**P9210409.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**5**
NE DS				File	**P9210410.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**6**
NE US				File	**P9210414.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**7**
FE US				File	**P9210413.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**8**
FE DS				File	**P9210411.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**9**
NE Joint				File	**P9210407.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**10**
FE Joint				File	**P9210417.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**11**
NE Abutment				File	**P9210434.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**12**
FE Abutment				File	**P9210435.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**13**
FE Abutment Bay 1, Typ.				File	**P9210425.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**14**
FE Abutment Bay 2, Typ.				File	**P9210428.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**15**
Crossframe, Typ.				File	**P9210426.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**16**
Deck Underside, Typ.				File	**P9210429.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**17**
Elevation from US				File	**P9210433.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**18**
Elevation from DS				File	**P9210437.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**19**
Wearing Surface, Typ.				File	**P9210408.jpg**

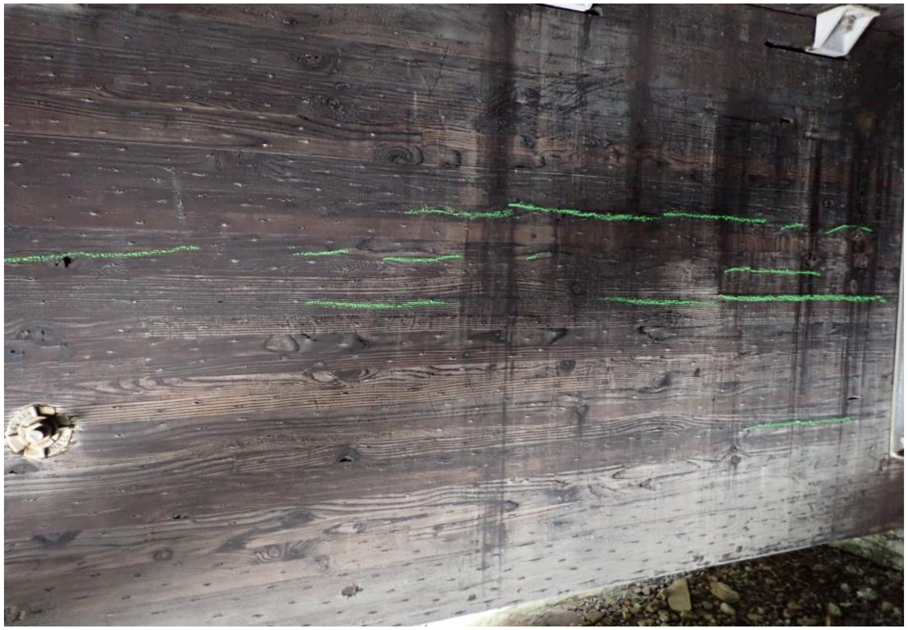
Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**20**
Rail Post, Typ.				File	**P9210415.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**21**
NE US Backwall Separation				File	**P9210436.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**22**
FE US Backwall Separation				File	**P9210423.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**23**
FE US Backwall Separation				File	**P9210424.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**24**
FE Abutment Cap Spall				File	**P9210431.jpg**



Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**25**
Girder 1 FE DS Face Splits				File	**P9210432.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**26**
FE US Culvert Outlet				File	**P9210421.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**27**
Looking Through FE US Culvert				File	**P9210422.jpg**

Bridge No.	1764	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**28**
FE DS Unknown Utility				File	**P9210438.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**29**
NE DS Signage				File	**P9210439.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**30**
FE US Signage				File	**P9210419.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**31**
FE DS Sign				File	**P9210420.jpg**

Bridge No.	**1764**	Br. Name	**Indian Creek**	Date	**09/21/22**
Inspector		**David McAdoo / Javier De Leon**		Frame	**32**
FE US Stream Gauge				File	**P9210427.jpg**

Attachment D

Landfill Road Construction Correspondence

CHIGNIK LANDFILL ACCESS ROAD CONSTRUCTION
STATE PROJECT NUMBER 51605
PHS PROJECT NUMBER AN-95-A82

APPENDIX A

A. Scope of Work: This is a cooperative project with the PHS. Funding from PHS, in conjunction with the funding from this Agreement will be used to construct a 3,759-foot long access road to a new solid waste site. The roadway will be a 14-foot-wide one lane roadway.

B. Estimated Cost of Phase:

Line Item	Line Item Cost
Clearing & Grubbing	$ 34,000
Common Excavation	120,000
Rock Excavation	15,500
Borrow - Type B	24,800
Borrow - Type C	25,200
Surface Course	56,400
Stockpiled Materials	31,000
36-inch CMP	21,000
24-inch CMP	28,350
Seeding	4,200
Topsoil	2,000
Mobilization	60,000
Construction Surveying	29,500
Engineering Services & Construction Management	85,000
TOTAL (Rounded to the nearest thousand)	$537,000

APPENDIX F

Project #2 Summary
Design and Construction of Two Tsunami Shelters

P R O J E C T   S U M M A R Y

Project Title: Design & Construction of Two Tsunami Shelters Preliminary Engineering Report

Reference: Chignik Bay Climate Resiliency Action Plan, Priority Project #2

Date: May 17, 2023

Owner: Chignik Bay Tribal Council

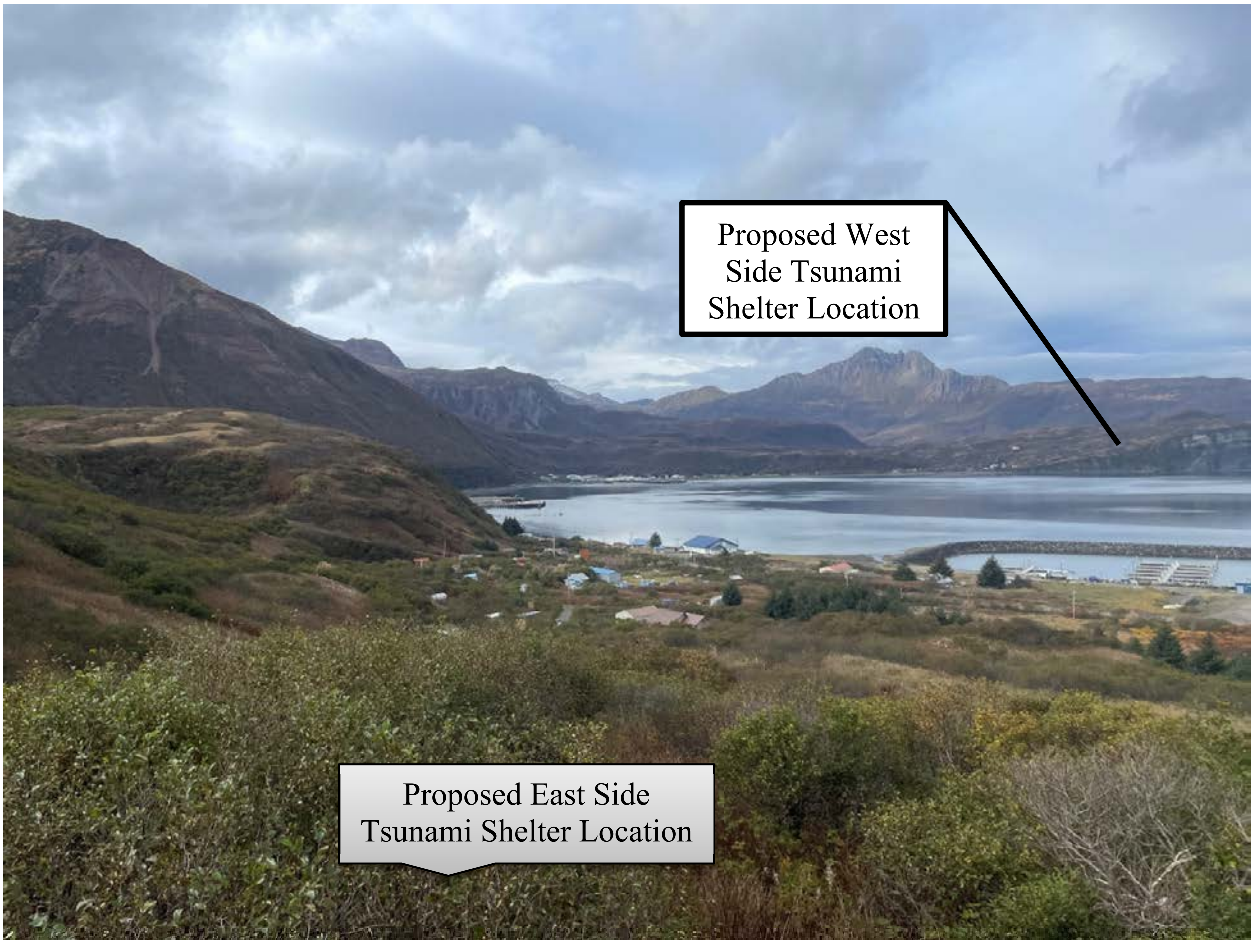
BACKGROUND

A Climate Resiliency Action Plan (dated May 2023) was developed for the Chignik Bay Tribal Council (Council) to better understand the effects of climate change on the community of Chignik Bay, Alaska. This Action Plan will help support community resiliency to the effects of climate change through data development and adaptation planning. One outcome of the Action Plan is to develop three priority projects based on community input. This Memorandum summarizes the estimated Scope, Schedule, and Budget for Priority Project #2: Construction of Two Tsunami Shelters Preliminary Engineering Report (PER), as directed by the Chignik Bay Tribal Council.

Data collection activities performed as part of the Action Plan included researching past and current studies related to climate change, erosion, and flooding, visual documentation of impacted infrastructure, and traditional ecological knowledge sessions with locals.

Priority Project #2 involves engineering activities required for the design and construction of two tsunami shelters on both the west and east sides of town. Currently there are no tsunami shelters within the Community and only one vehicle accessible evacuation route. There is a single connex at the landfill (end of the only evacuation route) filled with emergency supplies which serves the community during tsunami evacuations. Historically the city office has been used as a tsunami shelter, but this is not long-term viable solution as according to past studies the city office still lies within the flood zone of tsunami inundation mapping and functionally is not building's intended design. Tsunami warnings in the winter currently require residents to drive to the top of the evacuation road and sit in their vehicles to stay warm.

This project includes a PER for the design and construction of two tsunami shelters, one on the west side of town and one on the east side. The two shelters would provide a warm place for residents to stay in the event of a tsunami and would cut down on evacuation times by having a shelter on each side of town. The tsunami shelter on the west side of town would be a new prefabricated building near the landfill. An old water storage tank on the east side of town may be retrofitted to serve as a tsunami shelter on the east side of town. Retrofitting the old water storage tank would give residents a safe and warm place to stay during tsunami evacuations if residents did not have time to travel across town to the west side tsunami shelter. If the east side old water storage tank's condition was found to not be suitable for this function, it could be removed, and its foundation incorporated into the new tsunami shelter. This project would provide access to safe shelter for the entire Community in the event of a tsunami.



View from Old East Side Water Storage Tank

Old East Side Water Storage Tank

Old East Side Water Storage Tank Foundation

To develop the design of the two tsunami shelters, a team of professional planners, scientists, and engineers (the Consultant / Design Team) will be engaged to complete the project in direct consultation with the community. The project will accomplish the following tasks:

1. Collect data required for analysis of preliminary design alternatives, including a geotechnical investigation, infrastructure inspection, and surveying.
2. Identify design alternatives for the two tsunami shelters and associated construction cost estimates.
3. Develop a preliminary engineering report (PER) that includes preliminary drawings and construction cost estimates for the alternatives.

The PER will evaluate design alternatives, recommend a preferred solution, and discuss construction needs.

The project scope, schedule, and budget are further defined below.

SCOPE

The Consultant shall implement the following tasks to accomplish the goals of this project.

Task 1: Project Management

Subtask 1.1: General Project Management

This task involves all general project management services including project startup and closeout activities, schedule and budget monitoring, staff and client coordination, records management, monthly invoicing, and other project organization, communication, and administration activities.

Subtask 1.2: Project Kick-Off Meeting

The Consultant shall coordinate and host a Project Kick-Off Meeting with the Tribe and Design Team. The meeting will be a telephonic or video conference meeting. The purpose of the meeting will be to discuss the project scope, schedule, and budget, and identify next steps including data collection and field visits. The Consultant shall provide a record of the meeting, at its conclusion.

Subtask 1.3: Design Review Meetings

The Consultant shall coordinate and host Design Review Meetings with the Tribe and Design Team after each major deliverable. The purpose of the meetings will be to review the latest deliverable and address any questions or comments from the Tribe and/or Design Team. The Consultant shall provide a record of each meeting at its conclusion. At a minimum, the following review meetings are anticipated:

1. Draft Tsunami Shelter Design Alternatives Meeting (Subtask 3.1)

2. Draft Preliminary Engineering Report Review Meeting (Subtask 4.1)

Subtask 1.4: Project Closeout

The Consultant shall develop a closeout report summarizing the overall project, findings, and conclusions.

Task 2: Data Collection and Site Investigations

Subtask 2.1: Desktop and Background Data Collection

The Consultant will perform a desktop study regarding the use of the old east side water storage tank as a tsunami shelter. The study will also review the potential locations and designs for new tsunami shelters. The study will review required design criteria for the proposed tsunami shelters, tsunami shelter protypes and designs, design plans of old east side water storage tank, and any other available information that pertains to the design and construction of the two tsunami shelters.

Subtask 2.2: Site Investigation w/ Trip Report

The Consultant shall travel to the community to perform an inspection of the old east side water storage tank and potential locations for the proposed tsunami shelters. The existing conditions and potential locations shall be summarized in a technical memo.

Subtask 2.3: Surveying and Base Mapping Desktop Study

The Consultant shall collect planimetric and topographic data of the existing east side water storage tank site and of the potential locations for the two shelters. The Consultant shall use mapping to determine approximate size, scale, and location of proposed tsunami shelters. Mapping will also be used to determine landownership with respect to the two shelters.

Subtask 2.4: Geotechnical Desktop Study

The Consultant shall conduct a desktop review of existing geotechnical investigations in the community for the project. The Consultant will perform a desktop study of soil properties for the proposed locations of the two tsunami shelters. The soil properties will help identify foundation requirements for both shelters.

Task 3: Design Alternatives Analysis

Subtask 3.1: East Side Tsunami Shelter Design Alternatives

The Consultant shall prepare preliminary design alternatives for a tsunami shelter on the east side of town. These design alternatives would consider access requirements and the following:

- Decommissioning the Old East Side Water Storage Tank
- Retrofitting the Old East Side Water Storage Tank into a Tsunami Shelter

- Construction of a Prefabricated Tsunami Shelter Utilizing the Existing Foundation of the Old East Side Water Storage Tank
- No Action

The design alternatives would include plan details, material quantity estimates, and estimated construction costs. The design alternatives would also include a proposed construction schedule with each option. Once the Tribe has identified the preferred alternative, the Consultant shall develop preliminary design plans.

A draft version of the preliminary design will be submitted to the Tribe for review. A design review meeting (Subtask 1.3) will be held following a 30-day review period to discuss the draft design submittal.

A final draft of the preliminary design will address comments and questions received from the Tribe prior to inclusion in the PER.

Subtask 3.2: West Side Tsunami Shelter Design Alternatives

The Consultant shall prepare preliminary design alternatives for the tsunami shelter on the west side of town. These design alternatives would consider the following:

- Potential Locations for Tsunami Shelter
- Prefabricated Build Options
- No Action

The design alternatives would include plan details, material quantity estimates, and estimated construction costs. The design alternatives would also include a proposed construction schedule. Once the Tribe has identified the preferred alternative, the Consultant shall develop preliminary design plans.

A draft version of the preliminary design will be submitted to the Tribe for review. A design review meeting (Subtask 1.3) will be held following a 30-day review period to discuss the draft design submittal.

A final draft of the preliminary design will address comments and questions received from the Tribe prior to inclusion in the PER.

Task 4: Preliminary Engineering Report

Subtask 4.1: Draft Preliminary Engineering Report

This task involves preparing a Preliminary Engineering Report (PER). The PER shall evaluate multiple options for the design and construction of two tsunami shelters. The PER will identify the design criteria, engineering and construction requirements, capital and operational costs, and other considerations to evaluate alternatives and select a preferred alternative. The PER will include preliminary (35%) design drawings and third-party cost estimates.

The PER will be developed in Draft and Final versions. The Draft will be submitted to the Tribe for review. A PER Review Meeting (Subtask 1.3) will be held following a 30-day review period to discuss the Draft PER submittal.

Subtask 4.2: Final Preliminary Engineering Report

The Final PER will address comments and questions received from the Tribe prior to finalizing. The PER figures, cost estimates, calculations, and other supporting documents will be updated and finalized. The Final PER will be submitted to the Tribe.

SCHEDULE

The anticipated Project timeline is provided in Table 1. The Consultant shall develop an updated Project Schedule upon Notice to Proceed (NTP).

Table 1: Project Schedule

Task No.	Task	Timeline
-	Funding Obtained / NTP	To be determined
1.2	Project Kick-Off Meeting	1 month after NTP
2.1	Desktop Background Data Collection	2 months after Kick-Off Meeting
2.2	Site Investigation w/ Trip Report	1 month after Desktop Background Data Collection
2.3	Surveying and Base Mapping Desktop Study	1 month after Site Investigation
2.4	Geotechnical Desktop Study	1 month after Site Investigation
3.1	East Side Tsunami Shelter Design Alternatives	2 months after Desktop Studies
3.2	West Side Tsunami Shelter Design Alternatives	2 months after Desktop Studies
1.3	Design Alternatives Review Meeting	1 month after Design Alternatives
4.1	Draft PER	3 months after Design Alternative Review Meeting
1.3	Draft PER Review Meeting	1 month after Draft PER
4.2	Final PER	1 month after Draft PER Review Meeting
1.4	Project Closeout	1 month after Final PER
Total = 14 months		

BUDGET

The budget for this project is $276,100. The cost estimate includes all project activities identified above, as well as expenses for travel, printing, and other project materials. The budget includes a

10% for Tribal Administration (indirect cost). A project budget, separated by task, is provided in the table below.

Table 2: Project Budget

Task No.	Task	Budget
1.1	General Project Management	$ 3,500
1.2	Project Kick-Off Meeting	$ 2,500
1.3	Design Review Meetings	$ 5,000
1.4	Project Closeout	$ 5,000
2.1	Desktop Background Data Collection	$ 30,000
2.2	Site Investigation w/ Trip Report	$ 20,000
2.3	Surveying and Base Mapping Desktop Study	$ 20,000
2.4	Geotechnical Desktop Study	$ 30,000
3.1	East Side Tsunami Shelter Design Alternatives	$ 30,000
3.2	West Side Tsunami Shelter Design Alternatives	$ 30,000
4.2	Final PER	$ 75,000
	Subtotal	$ 251,000
	Tribal Administration (10%)	$ 25,100
	Total Budget	**$ 276,100**

The final project scope and budget shall be negotiated with the Consultant upon grant award.

[END OF MEMO]

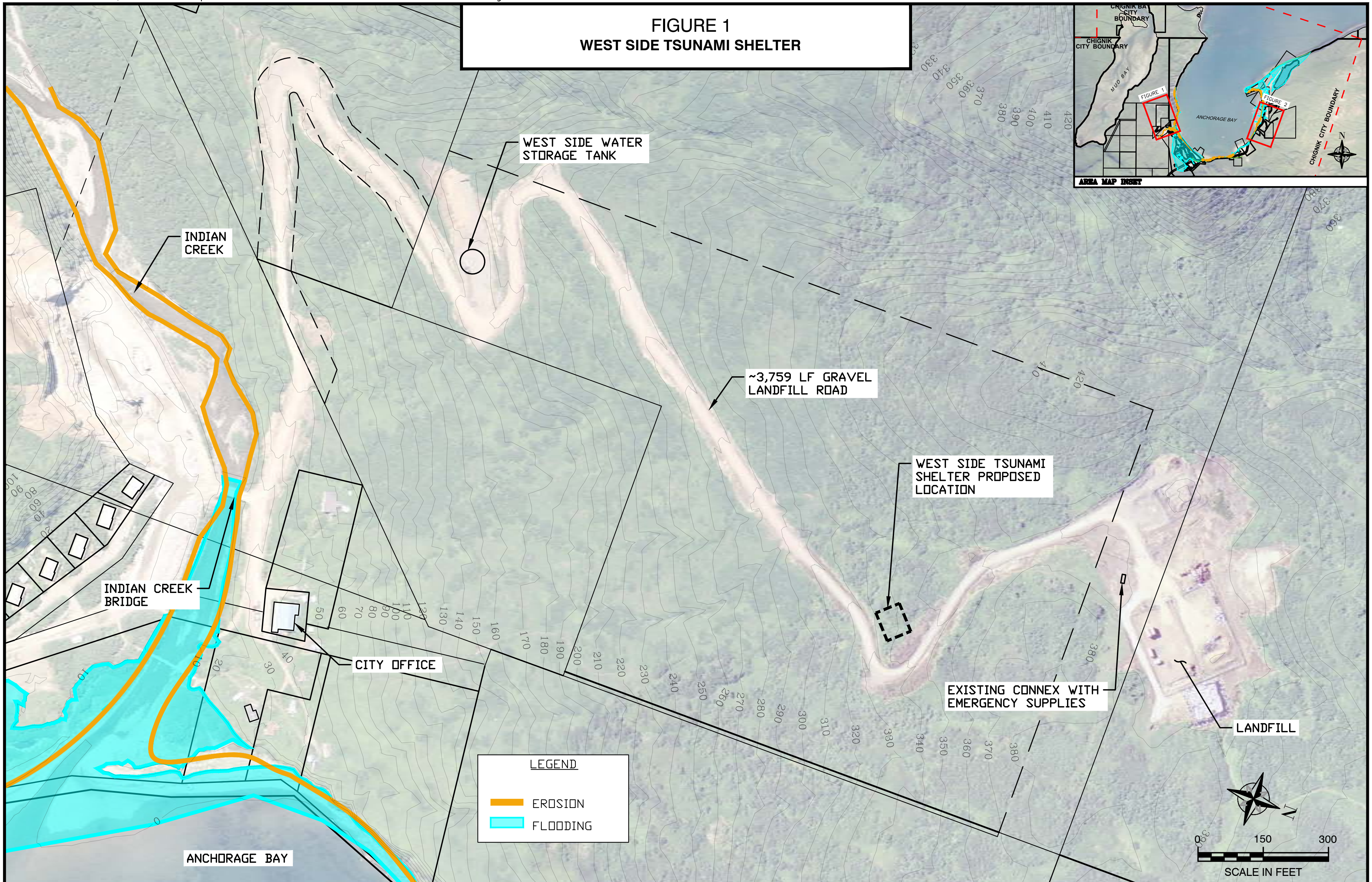
Attachments:

A. Tsunami Shelter Figures

Attachment A

Tsunami Shelter Figures

FIGURE 1
WEST SIDE TSUNAMI SHELTER



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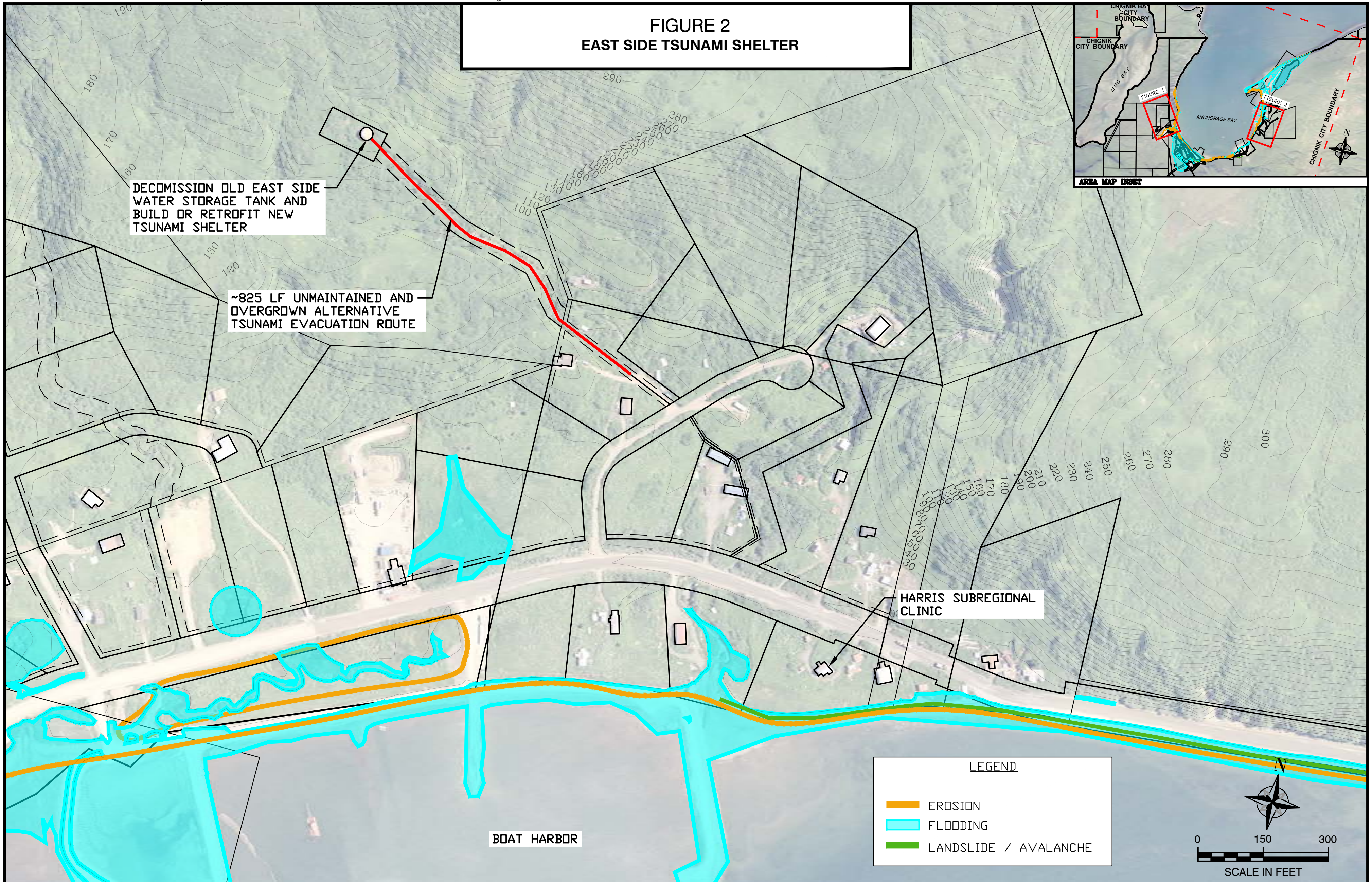
ENGINEERING SERVICES COMPANY, LLC

111 W. 16th Avenue, 3rd Floor
Anchorage, AK 99501
Phone (907) 563-0013
Fax (907) 563-6713
License Number: AECC697

PROJECT LOCATION	CHIGNIK BAY, AK
PROJECT NAME	CHIGNIK BAY TRIBAL COUNCIL CLIMATE RESILIENCY ACTION PLAN
PROJECT No.	32220067
SUBMITTAL	DRAFT
DATE	8/29/22
DWN.	TJM
SCALE	SHOWN
APPRVD.	IPP
PAGE	

Drawing: U:\BEESC\JOBS\32220067 CHIGNIK BAY RPT\ACAD-DESIGN\02_32220067_CHIGNIKBAY_REPORTFIGURES.DWG - Layout: FIG 3
User: TMARTIN Dec 20, 2022 - 12:52pm Xrefs: CB200.DWG X_BR_85X11L_REPORT.DWG - Images: CHIGBAY.TIF CHIGNIK_7-31-02.TIF

FIGURE 2
EAST SIDE TSUNAMI SHELTER



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PROJECT No.	32220067	SCALE	SHOWN
SUBMITTAL	DRAFT	APPRVD.	IPP
		PAGE	

APPENDIX G

Project #3 Summary
East Side Electric Distribution Upgrades

PROJECT SUMMARY

Project Title: East Side Electric Distribution Upgrades Preliminary Engineering Report

Reference: Chignik Bay Climate Resiliency Action Plan, Priority Project #3 – Revision 1

Date: August 4, 2023

Owner: Chignik Bay Tribal Council

BACKGROUND

A Climate Resiliency Action Plan (dated May 2023) was developed for the Chignik Bay Tribal Council (Council) to better understand the effects of climate change on the community of Chignik Bay, Alaska. This Action Plan will help support community resiliency to the effects of climate change through data development and adaptation planning. One outcome of the Action Plan is to develop three priority projects based on community input. This Memorandum summarizes the estimated Scope, Schedule, and Budget for Priority Project #3: East Side Electric Distribution System Upgrades Preliminary Engineering Report (PER), as directed by the Chignik Bay Tribal Council.

Priority Project #3 involves engineering activities required to develop the east side electric distribution system upgrades. The west and east sides of Chignik Bay used to consist of two separate sections of electric distribution that were not connected, each having their own generators. In 2008, the west and east electric power generation facilities were consolidated into a single power plant connecting the two systems. This new power plant installed in 2008 was installed with sectionalizing equipment which allows electrical isolation of the west or east side of the City for major repair work. During this consolidation, the west side electric distribution system was upgraded with a new 15kVA system and components, however the east side was connected using existing components due to lack of funding.

The east side electrical distribution system is in poor condition due to its age and environmental factors. The age of this system is unknown, although some components reportedly date back to over 70 years ago. The system is predominantly residential however it does serve the airport as well. The system primarily consists of overhead poles with exception of several locations where secondary conductors are buried or routed along the ground surface. Frequent high winds, precipitation, and erosion over the years have caused damage to the existing poles and electrical components.

Current east side electric distribution system deficiencies are listed below:

- The current system's cross arm design allows primary lines to contact one another during moderate winds resulting in frequent outages
- Timber overhead poles are weathered and beginning to split at their tops
- Many poles are leaning severely and several show evidence of scorching due to contact with conductors and failed insulators.
- As components break, they are replaced with what is readily available in the community which is sometimes different than the original component's kV rated class
- Many secondary service connections are improperly installed directly on the ground, unburied, and with no conduit posing a hazard to public safety
- Twelve out of fifteen streetlights do not work due to the installation of the wrong size conductors (size 14 installed, rather than size 4, which fails due to wind and sun exposure).

In addition to the east side distribution system deficiencies, the relatively new power generation system also has deficiencies which need to be addressed. The current power generation system consists of three engines and generators supplied with diesel fuel by three 32,000-gallon above ground storage tanks.

Engine descriptions and deficiencies are listed below:

- Engine #1
  - 9-liter, 230 kW generator
  - Main engine which can typically power the entire community throughout the year.
  - Engine has high crankcase pressure and low oil pressure. This is likely due to failing piston rings.
- Engine #2
  - New 8.1-liter, 230 kW generator (6081 John Deer, tier 2 motor)
  - Village purchased for City and had it installed in 2022.
- Engine #3
  - 4.5-liter, 117 kW generator
  - Preferred engine to be run in winter due to lower energy consumption and cost.
  - Motor down. New long-block in the community waiting for mechanics to install.

In addition to engine deficiencies, two radiators which connect to all three engines are plugged up with sediment build up and need to be replaced. Attempts to flush the radiators have been made with little success. Fuel tanks are also contaminated with red algae and sediment and need to be inspected and cleaned. A 1987 International bucket/utility truck used for electric distribution maintenance is not operational.

To supplement the power generation system the City has an ongoing hydro-electric project with the Alaska Energy Authority. The consultant shall research and include this in the PER recommendations.

This proposed project includes a PER to analyze the upgrades to the east side electrical distribution system, power generation system, bulk fuel system, and utility equipment.

The PER would explore the following east side electrical distribution system upgrades:

- Replacement and/or maintenance of power generation engines and various components
- Inspection and cleaning of fuel tanks
- New poles, transformers, and electrical lines as needed
- New secondary service connections as needed to maintain safety of public
- Maintenance and/or replacement of utility equipment

Data collection activities performed as part of the Action Plan include research of past and current studies related to climate change, erosion, and flooding, visual documentation of impacted infrastructure, and traditional ecological knowledge sessions with locals.

To develop the design of the east side electrical upgrades, a team of professional planners, scientists, and engineers (the Consultant / Design Team) will be engaged to complete the project in direct consultation with the community. The project will accomplish the following tasks:

1. Collect data required for analysis of preliminary design alternatives, including geotechnical investigation, infrastructure inspection, and survey as warranted.
2. Complete preliminary design alternatives for the electrical upgrades, to include estimates of construction cost.
3. Develop a preliminary engineering report (PER), with preliminary drawings, construction cost estimates, and recommendations. The PER will evaluate design alternatives, select a preferred solution, and discuss construction needs.

The project scope, schedule, and budget are further defined below.

SCOPE

The Consultant shall implement the following tasks to accomplish the goals of this project.

Task 1: Project Management

<u>*Subtask 1.1: General Project Management*</u>

This task involves all general project management services including project startup and closeout activities, schedule and budget monitoring, staff and client coordination, records management, monthly invoicing, and other project organization, communication, and administration activities.

Subtask 1.2: Project Kick-Off Meeting

The Consultant shall coordinate and host a Project Kick-Off Meeting with the Tribe and Design Team. The meeting will be a telephonic or video conference meeting. The purpose of the meeting will be to discuss the project scope, schedule, and budget, and identify next steps including data collection and field visits. The Consultant shall provide a record of the meeting, at its conclusion.

Subtask 1.3: Design Review Meetings

The Consultant shall coordinate and host Design Review Meetings with the Tribe and Design Team after each major deliverable. The purpose of the meetings will be to review the latest deliverable and address any questions or comments from the Tribe and/or Design Team. The Consultant shall provide a record of each meeting at its conclusion. At a minimum, the following review meetings are anticipated:

1. Draft East Side Electric Distribution System Design Alternatives Meeting (Subtask 3.1)
2. Draft Preliminary Engineering Report Review Meeting (Subtask 4.1)

Subtask 1.4: Project Closeout

The Consultant shall develop a closeout report summarizing the overall project, findings, and conclusions.

Task 2: Data Collection and Site Investigations

Subtask 2.1: Desktop and Background Data Collection

The Consultant will perform a desktop study on the old east side electric distribution system to determine what deficiencies there are and possible upgrades to the system. The study will review required design criteria for the proposed electrical distribution system upgrades and any other informational material that pertains to the design and construction of the electrical system improvements.

Subtask 2.2: Site Investigation w/ Trip Report

The Consultant shall travel to the community to perform an inspection of the old east side electrical distribution system. The existing conditions and deficiencies shall be summarized in a technical memo.

Subtask 2.3: Surveying and Base Mapping Desktop

The Consultant shall collect planimetric and topographic data of the old east side electrical distribution system. The Consultant shall use the mapping to determine approximate size, scale, and location of the needed upgrades.

Subtask 2.4: Geotechnical Desktop Study

The Consultant shall conduct a desktop review of existing geotechnical information for the project. The Consultant will perform a desktop study of soil properties for the proposed electrical distribution system. The soil properties will help identify foundation requirements for electrical poles and other system components.

Task 3: Design Alternatives Analysis

Subtask 3.1: East Side Electric Distribution System Design Alternatives

The Consultant shall prepare preliminary design alternatives for improvements and upgrades to the east side electrical distribution system. These design alternatives would consider the following:

- Electrical Distribution System
- Power Generation System
- Bulk Fuel Storage System
- Utility Equipment

The design alternatives would include plan details, material quantity estimates, and estimated construction costs. The design alternatives would also include a proposed construction schedule. Once the Tribe has identified the preferred alternative, the Consultant shall develop preliminary design plans.

A draft version of the preliminary design will be submitted to the Tribe for review. A design review meeting (Subtask 1.3) will be held following a 30-day review period to discuss the draft design submittal.

A final draft of the preliminary design will address comments and questions received from the Tribe prior to inclusion in the PER.

Task 4: Preliminary Engineering Report

Subtask 4.1: Draft Preliminary Engineering Report

This task involves preparing a Preliminary Engineering Report (PER). The PER shall evaluate multiple options for the design and construction of the electrical system upgrades. The PER will identify the design criteria, engineering and construction requirements, capital and operational costs, and other considerations to evaluate alternatives and select a preferred alternative. The PER will include preliminary (35%) design drawings and third-party cost estimates.

The PER will be developed in Draft and Final versions. The Draft will be submitted to the Tribe for review. A PER Review Meeting (Subtask 1.3) will be held following a 30-day review period to discuss the Draft PER submittal.

Subtask 4.2: Final Preliminary Engineering Report

The Final PER will address comments and questions received from the Tribe prior to finalizing. The PER figures, cost estimates, calculations, and other supporting documents will be updated and finalized. The Final PER will be submitted to the Tribe.

SCHEDULE

The anticipated Project timeline is provided in Table 1. The Consultant shall develop an updated Project Schedule upon Notice to Proceed (NTP).

Table 1: Project Schedule

Task No.	Task	Timeline
-	Funding Obtained / NTP	To be determined
1.2	Project Kick-Off Meeting	1 month after NTP
2.1	Desktop Background Data Collection	2 months after Kick-Off Meeting
2.2	Site Investigation w/ Trip Report	1 month after Desktop Background Data Collection
2.3	Surveying and Base Mapping Desktop Study	1 month after Site Investigation
2.4	Geotechnical Desktop Study	1 month after Site Investigation
3.1	East Side Electrical Distribution Upgrades Design Alternatives	2 months after Desktop Studies
1.3	Design Alternatives Review Meeting	1 month after Design Alternatives
4.1	Draft PER	3 months after Design Alternative Review Meeting
1.3	Draft PER Review Meeting	1 month after Draft PER
4.2	Final PER	1 month after Draft PER Review Meeting
1.4	Project Closeout	1 month after Final PER
Total = 14 months		

BUDGET

The budget for this project is $244,200. The cost estimate includes all project activities identified above, as well as expenses for travel, printing, and other project materials. The budget includes 10% for Tribal Administration (indirect cost). A project budget, separated by task, is provided in the table below.

Table 2: Project Budget

Task No.	Task	Budget
1.1	General Project Management	$ 3,500
1.2	Project Kick-Off Meeting	$ 3,500
1.3	Design Review Meetings	$ 5,000
1.4	Project Closeout	$ 5,000
2.1	Desktop Background Data Collection	$ 30,000
2.2	Site Investigation w/ Trip Report	$ 20,000
2.3	Surveying and Base Mapping Desktop Study	$ 20,000
2.4	Geotechnical Desktop Study	$ 30,000
3.1	East Side Electric Distribution Design Alternatives	$ 30,000
4.2	Final PER	$ 75,000
	Subtotal	$ 222,000
	Tribal Administration (10%)	$ 22,200
	Total Budget	**$ 244,200**

The final project scope and budget shall be negotiated with the Consultant upon grant award.

[END OF MEMO]

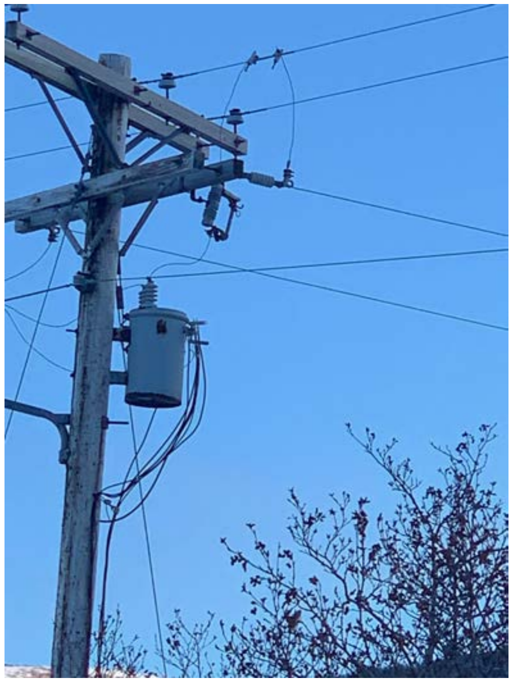
Attachments:

A. East Side Electrical Infrastructure Photos

Attachment A

East Side Electrical Infrastructure Photos

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska



1 - Rusted Transformer

2 - Bleached Weathered Pole

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

3 - Bleached Weathered Poles

4 - Bleached Weathered Poles

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska


5 - Bleached Weathered Pole


6 - Bleached Weathered Pole

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

7 - Electric Service Line in Tree

8 - Exposed Electric Service Line

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

9 - Exposed Electric Service Line

10 - Exposed Electric Service Line

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

11 - Rusted Transformer

12 - Rotted Pole

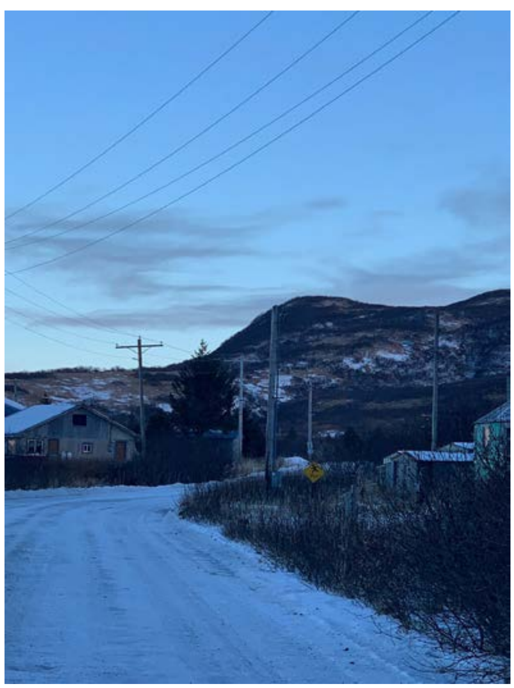
East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

13 - Rusted Transformer

14 - New Cross Member from Prior Fire

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

15 - Leaning Pole



16 - Rotted Pole

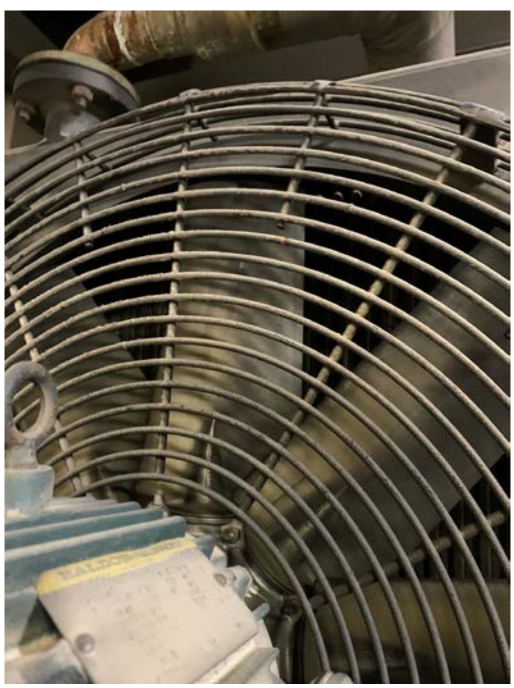
East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

17 - Radiator Coolant Temperature and Pressure


18 - Radiators and Fans

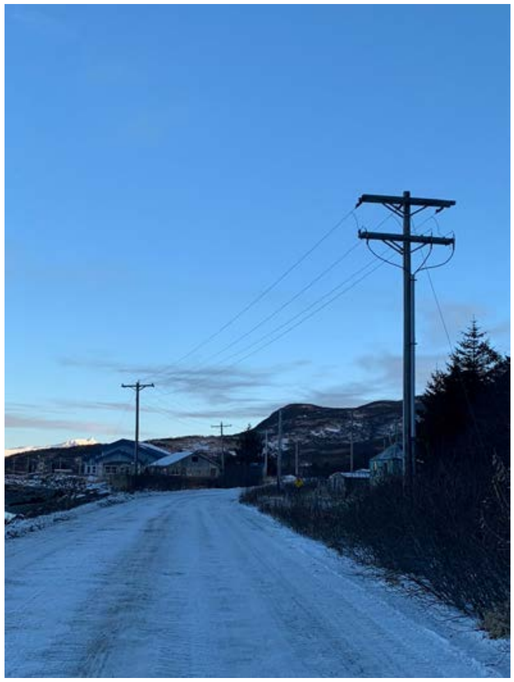
East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

19 - Radiators and Fans



20 - Radiator Fan

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska



21 - Start of East Side Electric Poles

22 - Radiator Coolant Pressure

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

23 - Radiator Leaks

24 - Radiator Leaks

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

25 - Radiator Fan

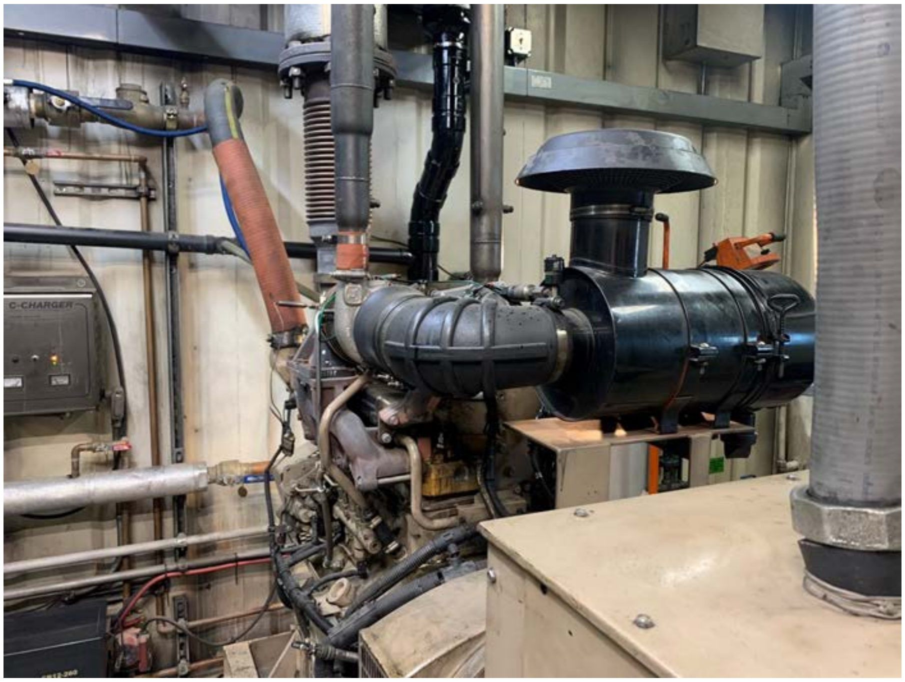
26 - Radiator Fan

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska


27 - #3 Engine


28 - #3 Generator Chaffed Wire Temporary Fix

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

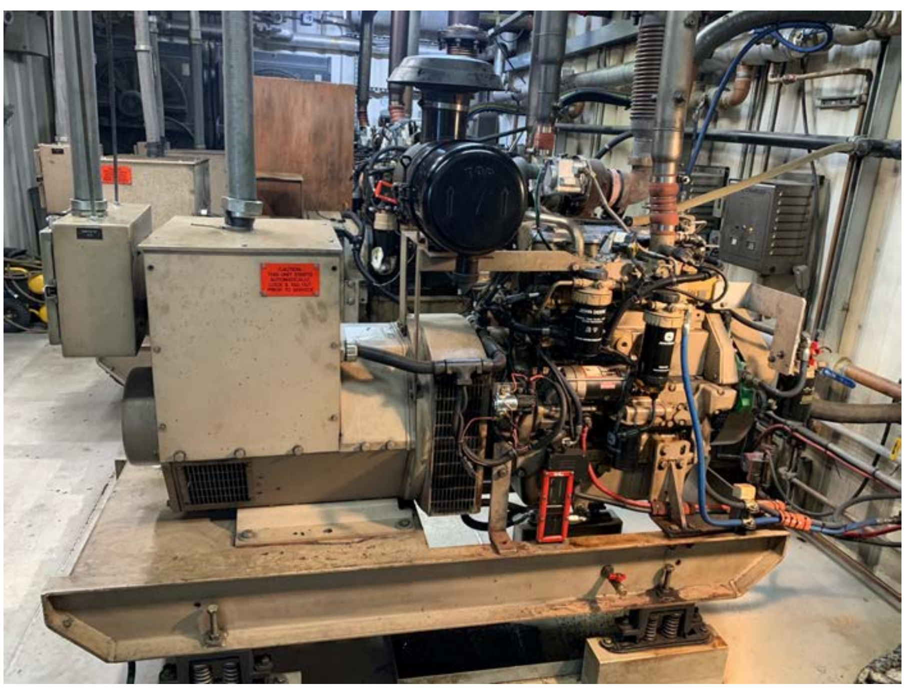


29 - #3 Engine

30 - #3 Engine Oil Leak

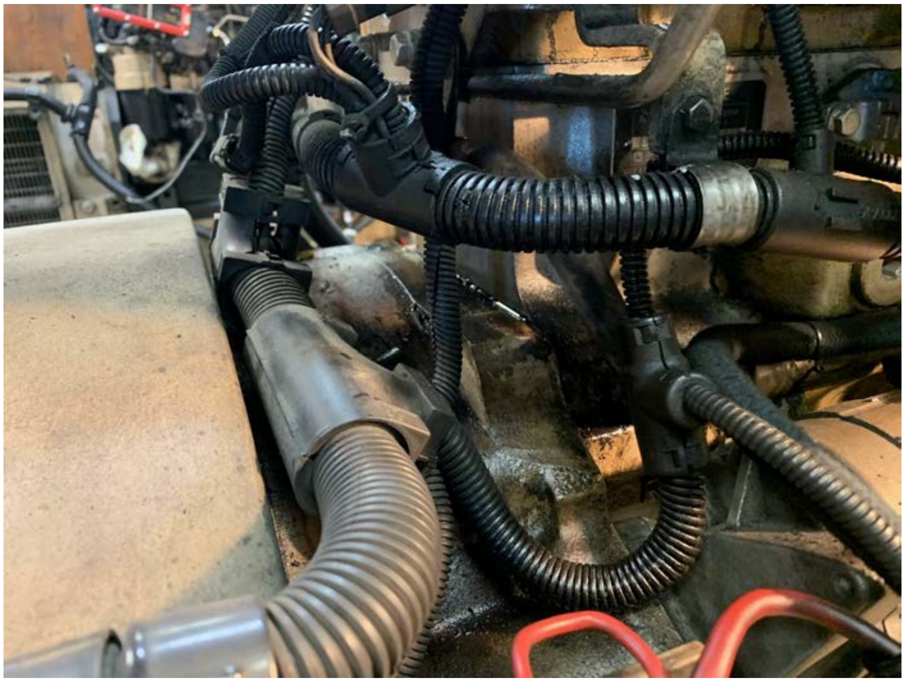
East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

31 - Radiator Fans



32 - #3 Engine

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska


33 - #3 Engine Oil Leak


34 - #3 Engine Oil Leak

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

35 - #3 Engine Oil Leak

36 - #3 Engine

East Side Electric Distribution Photos
December 2022
Chignik Bay, Alaska

37 - #3 Engine Oil Leak

38 - #3 Engine