

ExhibitESoundnessofApproach

State of Alaska

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Exhibit E: Soundness of Approach

The State of Alaska is proposing four projects within rural Alaskan communities within three tribal regions and two statewide/regional planning projects. Many of the communities in these areas have very high social vulnerability indices (Dropbox EXD/D-156) from low student scholastic performance to high rates of domestic violence, substance abuse, suicide, skin infections, hepatitis, and upper respiratory issues. Interestingly, these communities have been historically resilient and adaptive through many shocks over the centuries, and now the environmental impact from changing weather patterns requires new approaches to restore that resilience and preserve their cultures. The State's approach will provide feasible, scalable, and replicable models for improving resiliency statewide, but especially in imperiled communities that have made the decision to relocate or stay in their traditional locations; benefit vulnerable and low to moderate income populations; and enhance socio-economic resiliency of tribal, rural Alaskan populations. Proposed projects focus on infrastructure, housing, and food and economic security, and planning. The Newtok Project is for the relocation of housing and utilities from a climate change imperiled location to a new more resilient, culturally appropriate location. The Galena, Teller and Emmonak Projects are designed to make infrastructure more resilient to systemic events and increase the socio-economic resilience of local and regional, isolated populations. This includes mitigation of residential and community infrastructure; protection of food stores gathered over the summer months; and enhancement of regional port facilities for economic development.

See Attachment F, BCA for detailed project activity descriptions, budget information; BCA details-including benefits to vulnerable populations; risk to community if project is not implemented; and metrics. Project total BCR is 1.07. Project and activity leverage information can be found in Exhibit F.

Project 1: Galena – “It’s All about the Kids”

Galena activities were selected to strengthen an already resilient community. Galena's economic engine is its K-12 public school and the Galena Interior Learning Academy (GILA), a statewide boarding school. The community has three main entities: the local federally recognized tribe (Louden Tribal

Council), the local government (City of Galena), and the local school (Galena City School District (GCSD)). All three entities work together to form a strong community. Activities are grouped into five categories the community identified as essential to increase their resilience: Human and Environmental; Family Resilient and Community Growth; Community Infrastructure and Green Energy; Tribal and Cultural; and School Infrastructure. All activities reflect URN from the qualifying 2013 flood. The Galena BCA and activity schedule may be found at Dropbox EXE/E-17 and E-18.

Human and Environmental Health Activities: **Activity 1**: Dust Control: This activity addresses the URN of mitigating the airborne dust health hazard exacerbated by deposited sediment from the 2013 flood. During dry summer months, the City grades, waters, and adds calcium chloride to prevent dust from becoming airborne. This is costly and labor intensive. The activity is to apply chip seal to roadways throughout town. The State will contract the City to implement the activity with force account labor. This activity reflects the resilient solution of permanently reducing airborne dust impacts to the community, especially to vulnerable populations; and reducing road operations and maintenance (O&M) cost. This is a model for other communities as most Alaska villages lack paved roads, making airborne dust a health issue. This is a simple, replicable and feasible solution. A survey is required for line and grade, but chipping and sealing roads does not require engineering. Gravel and liquid asphalt is available within Alaska. Future O&M cost is minimal and locally supportable. The benefit cost ratio (BCR) is 2.3.

Activity 2: Washeteria: Public Shower House/Laundry Facility: This activity addresses the URN for running water supporting basic community health and welfare. Many residents do not have City water or in-home laundry. There is no operating washeteria. The City's facility, while not in use (not eligible for FEMA repairs), was damaged by the 2013 flood. This is a basic need for a regional hub which hosts school, contractors, cultural, and recreational visitors. Lack of such facilities leaves residents and visitors exposed to public health risk-spread of disease. The resilient solution is a public coin-operated facility. Local residents and visitors would benefit and the facility would generate income for the City. This is a model, feasible activity, as most Alaska communities have a local washeteria. Teller, another

project community is requesting HUD funding to augment USDA funding for an operational washeteria. The existing building is plumbed for showers and needs retrofit, repair and elevation. The BCR is 13.32.

Activity 3: Fire Hall Replacement: This project addresses the URN for a resilient fire hall for Galena. The Antoski Road Fire Hall is inadequate, unreliable and at-risk from another flood. This facility was flooded 4 ft. deep during the 2013 flood (Dropbox EXD/D-116) and is not elevated. It is the storage facility for the fire and response vehicles including two pumpers and a rescue truck; an ambulance; and a water delivery truck. Warming temperatures leading to melting permafrost has damaged the north-side foundation. The 2013 flood exacerbated the problem by further weakening the subsurface under the north-side of the fire hall. The concrete floor is slanting, leaving gaps along the floor where overhead doors no longer create an airtight seal. During the cold winter, two of the five bays are unusable. The resilient mitigation solution is to replace the existing fire hall with a pre-engineered metal building built to the FRE of 136.5. It should include floor drains, exhaust ventilation system, indoor tanker truck filling capabilities, and be connected to the power plant waste heat loop. This project is very feasible using proven and resilient technologies for building type, function and elevation. The BCR is 2.96.

Activity 4: Abandoned Building Remediation: This activity addresses the URN of community debris. During the 2013 flood, a number of properties were damaged beyond repair and have been abandoned. These properties pose a health and safety risk for the community. Some of these properties are a threat to the Yukon River watershed while others could be redeveloped if they were cleaned up. Two FEMA PWS were funded (Dropbox EXE/E-1 and E-2) but there remains a need. Twenty property owners have already requested help with demolition. The City and USDA have determined 20 additional homes need to be demolished that were abandoned during the flood. The resilient mitigation solution would be to continue to clean up of properties, allowing the community to return land to productive use and foster future development. Surrounded by wetlands, Galena has limited developable lands for expansion. Revitalizing damaged properties connected to roads and utilities is cost effective and more sustainable than developing new lands. This is a model activity as other rural Alaska communities have chronic

disaster and disaster related debris-removal issues. There is a similar activity in the Teller project. This project is feasible with locally equipment, services and manpower available. The BCR is 1.20.

Activity 5: Landfill Compliance and Expansion: This activity addresses the URN for landfill expansion. After the 2013 flood, debris removal created a problem at the local landfill. The landfill is currently in violation of its permit condition and is at 90% capacity (Dropbox EXD/D-144 and D-145). The resilient mitigation solution is a landfill expansion project to increase the size by approximately five acres with new fencing around both sections. Currently, 155 damaged vehicles, 30 snow machines, and 15 4-wheelers also need to be backhauled. This is a model activity as other Alaska communities face similar issues with their landfills. This project is feasible as the existing landfill has available land around the facility already owned by the City. There is no need to obtain Site Control.

Family Resilient and Community Growth Activities: **Activity 6:** Land Development and Protection Planning: This project addresses the URN for community planning for local land use. Galena is a regional hub located in a well-known floodplain with limited buildable land. A land plat study is needed to develop a new community subdivision. The two subdivisions within the city are at capacity with no room for new residents to move into the community. This activity includes a study to determine land most suitable for development; a survey; plot development; and infrastructure design for water, sewer, and electrical utilities. A feasibility study would be prepared to derive solutions to protect the GILA school property from flooding. During the 2013 flood, the levee surrounding the city, airport, and GILA School was within 6-inches of being over-topped. A study is needed to determine viable options to protect this critical infrastructure. This activity is a model for other communities as it promotes the benefits of advanced planning before land development, an uncommon strategy in rural Alaska. As a hub, Galena is a natural place to demonstrate the benefits of planning ahead for development. This project is very feasible, as Galena has a history of strong local engagement. With technical assistance and professional services this effort will easily be successful.

Activity 7: Community Development Planning. This activity addresses the URN for community development planning to complement Activity 6. As a regional hub, Galena provides transportation, education, employment, shopping, recreation, cultural activities, and medical care. Galena's rare potential for economic development and growth generates a need for comprehensive community planning. The City, Tribe, and School District have invested heavily in the community and are a strong resource to support local and regional development and growth. This plan will leverage structures and land around the airport which could be used to support the transient population services; look at needs near the clinic for food, lodging and laundry services; look at available land and energy resources to promote private services, businesses, and industry; and opportunities to create jobs, housing, and decrease the cost of living. Galena is a strong, vibrant community that is a state and regional resource Galena is looking to become more resilient through planning. This is a model, feasible activity for Alaska communities with local commitment.

Activity 8: Early Childhood Development: This activity addresses an URN and chronic condition within the community which was exacerbated post-event. The community lacks formal childcare or early development services. The GCSD opted to fund a preschool to provide local students with the skills to be successful later in their academic career. This left families of children ages 0-3 without organized child care. Galena has a high employment rate, meaning that both parents in many families work, and few adults are available for less lucrative, informal work such as in-home babysitting. Many young children are often brought to work due to lack of childcare. Job recruitment to Galena for highly-specialized skills is hindered. Since the Early Learning Center closed, Dr. Huntington tracked the number of young children in the community and informally polled their parents as to childcare preferences, with the goal of planning a day care center. The poll determined that there are 12-17 children under age 3 and 14-21 children between the ages of 3 and 5 require support. The resilient mitigation solution is to provide an early development program with a program director. The program director would develop a program sustainment plan, complete curriculum development, maintain files,

improve communication with parents, and supervise employees. The activity would leverage a 2000 SF space in the City Hall/Clinic to develop the daycare center. It has space to accommodate the numbers discussed and has been inspected by the Fire Marshall. Modifications required include repair to the outer door, installation of an infant toilet, repair to the wooden deck, and installation of a fenced play area. This is a model activity, as access to formal daycare enables families to work and perform subsistence activities. This activity is very feasible with a plan already developed supporting leverage.

Activity 9: Community Garden Improvement: This activity addresses the URN for local food security. The 2013 event caused local power outages which caused most families to lose their subsistence stores of food. It addresses the pre-and post-disaster issue of high food cost and access to fresh produce. Population resiliency is greatly affected by food security. Galena has had a community garden in for decades. However, poor soil, weeds, access to water, and pest management make gardening a challenge. The resilient solution is to expand the community garden with raised beds, watering and gardening equipment, and a moose fence. This is a model and feasible project for other communities as many hearty vegetables grow quite well in Alaska, and is easily replicable given the minimal start-up costs. There is a similar activity in Teller's project. This activity is feasible and beneficial as demonstrated by a small-scale farming project initiated by the community in the summers of 2012 and 2014. In 2012 community members planted and harvested a ½-acre plot of 1,200 pounds of potatoes valued at \$1,524. The 2014 summer produced over 1,500 lbs. of potatoes valued at \$2,076 value. The BCR is 0.79.

Community Infrastructure and Green Energy Activities: **Activity 10:** Electrical Generation Flood Protection: This activity addresses the URN remaining from the 2013 flood. The power plant received 2.1 feet of water, flooding all six generators (Dropbox EXD/D-123). It is currently below the FRE at 133.4 ft. The resilient solution is to replace the existing building with an appropriately-sized pre-engineered metal building on an elevated platform using helical piles drilled to a depth of 35-feet below ground surface, then move the six generators into the new facility. A new control system would be

required to work within the Smart Grid System along with automatic switch gear. This is a model, feasible activity to protect critical infrastructure. The BCR is 0.31.

Activity 11: Community Alternative Energy with 250-kilowatts of Wood Gasification: This activity addresses the pre- and post-disaster URN of high energy costs. Residents in rural Alaska mitigate high energy costs by collecting and processing firewood to heat their homes. Along with their food, their fuel sources such as firewood and diesel fuel tanks were lost in the flood. There is an URN to mitigate the impact of high energy costs in the community. Residents within the City of Galena pay \$0.67 per kWh as compared to Anchorage rates of \$0.11 per kWh. The resilient solution is to reduce the cost of centralized energy to residents. A biomass 250-kW wood gasification component will be added to the power generation capacity of the City plant, which was flooded in 2013 (See project G12). This system would replace 131,000 gallons of fuel while creating local jobs. Based on 2015 fuel prices, this addition would result in a savings of \$344,225 per year. The calculated savings for this system is \$0.08 per kWh. The fuel source for this plant is a sustainable wood chip project being used at the local high school. Currently, the GILA has purchased equipment for wood chip harvesting and has converted from steam to glycol boilers to heat the school with a biomass system. With investment made in harvesting this product for the school biomass system, the City would capitalize local investment and increase savings at the City Power Plant using the wood gasification. The City would supplement power generation with the wood gasification system. A control system would tie-in the existing power plant, the solar array, grid scale battery storage, and the wood gasification system. Currently, plant operators manually switch the Gensets based on load. A smart grid will make the community more resilient to rapidly fluctuating fuel prices. This combination would make Galena's power generation 75% renewable and save the city \$1.2 million annually based on FY15 fuel costs. Other Yukon River communities could also leverage their local biomass supply for wood gasification and reduce their own power generation costs. Galena is well-suited to demonstrate the advantages of combining smart grids with renewable power generation. This activity is very feasible with some funded components and available fuel source. The BCR is 1.24.

Activity 12: 2.6-Megawatt Solar Array with Grid Scale Battery Storage: This activity addresses the URN of pre- and post-disaster URN of high energy costs. See Activity 11. The resilient mitigation, which complements Activity 11, is installing a 2.6-megawatt solar array with grid scale battery storage. This would eliminate the need to burn fuel during the warmest months when recovered heat isn't useful to the community and would save 199,484 gallons of fuel annually. Based on 2015 fuel prices, this would result in a savings of \$738,091 per year. The calculated savings for this system is \$0.28 per kWh. Activities 11 and 12 standalone, but combined they potentially reduce fuel costs to residents by \$0.36 per kWh. This is a model and feasible activity as 40-kW of solar power has recently been installed in the community. Solar systems work very well in the spring and summer months in region. This allows for a “diesel off” scenario for five months of the year. The BCR is 1.72.

Activity 13: Water Treatment Plant Mitigation: This activity addresses the URN for mitigation of the water treatment plant from repetitive flooding. The City water treatment plant was damaged in the 2013 flood (Drop box EXD/D-132). It produces 24 gallons per minute with a total daily output of 34,560 gallons per day. This results in an available water supply to each resident of 63 gallons per capita per day (gpcd). Most piped communities in Alaska use up to 100 gpcd. The limiting factor in the treatment plant is the filtration system. Additionally, five water pumps, a transformer, two boilers, and the system control panel are below the recommended 136.5 foot elevation level. The resilient mitigation solution is to elevate the water plant components and upgrade the filtration unit to produce 70 gpm. The elevation of critical infrastructure is a model project in addition to providing adequate treated water supply to residents. This elevation and capacity expansion project is technically feasible. The BCR is 1.95.

Activity 14: Galena River Bank Stabilization: This activity addresses the URN of mitigation against erosion and seasonal ice-jam flooding. Galena is situated on the cut bank side of the Yukon River. Zone 3 is located just above the Crow Creek road intersection down river to existing rip-rap. This is the longest section and has the steepest and most actively eroding bank. It is 2,700 ft. long, and could be extended upriver even further. The resilient solution is to implement a rip rap embankment stabilization,

preventing further loss of property, roads, infrastructure, and access. This method of erosion control was effective during the 2013 flood. Houses located along the rip-rap sections sustained only water damage, and many homes with no protection were knocked from their pilings by ice. Sections without protection lost from 2-20 feet of bank. The activity is replicated in Galena and throughout Alaska and is feasible. NRCS is scheduled to reinforce a 1,350 foot rip-rapped area in 2016 (EXG/E-5). The BCR is 0.31.

Tribal and Cultural Activities: **Activity 15:** Tribal Office and Cultural Center: This activity addresses the URN for a new tribal office damaged during the 2013 flood. The Louden Tribal Council building was severely damaged (Dropbox EXD/D-138) and condemned by the City. The Tribal Office supports the Tribe, its elders, children and 773 tribal members statewide. Services include housing, child welfare, social services, general services, workforce development/job training, and higher education. The resilient solution is to construct a new facility to house combined Tribal Office and Cultural Center, meeting local flood ordinances. The sustainment of the Koyukon-Athabascan culture is a key component of regional Tribal resilience. The new facility would also meet a need for a place to conduct cultural arts and crafts activities and meetings. The building will be constructed with energy-efficient materials using green products and will be designed to adapt to the environment. This model multi-use tribal facility for other Alaska native communities to serve members' needs and sustain their culture. This activity is very feasible with land, a 35% design, a FEMA PW for leverage (Dropbox, EXD/D-138). The BCR is 1.36.

Activity 16: Residential Home Elevation: This project addresses the URN for residential elevation above the FRE. Since the 2103 flood, 51 residences have been elevated in Galena through funding by three State and FEMA grants (Dropbox EXE/E-7 through E-9), significantly reducing flood risk for families. Participating residents in the A-zone purchased flood insurance, providing an additional risk reduction for loss. According to the Louden Tribal Council, there are 35 additional residents desiring elevation of their homes. Residential elevation above the BFE is ands feasible and model activity in Alaska riverine communities. The recently used foundation design for 51 structures in Galena is adaptable to other communities within flood zones and in permafrost areas. The 8-inch piles with 18-

inch helices were designed for the worst soil conditions where winter frost jacking of homes creates problems. This activity has demonstrated feasibility in Galena and other communities. The BCR is 1.48.

Activity 17: Yukon Elder Assisted Living Facility (YKEALF) Expansion: This project addresses the pre- and post-disaster URN from damage to the YKEALF in the 2013 flood (Dropbox EXD/D-141 and D-142). It is the only such facility in the region and is open statewide. The YKEALF has demonstrated the ability to meet the needs of at-risk elders who require assisted living care. They can no longer live safely at home and their needs exceed what their families can meet. YKEALF currently is at capacity with nine elders in residence. There is increasing inquiry regarding availability of space for elders from all over the State of Alaska. YKEALF also provides a forum in which youth and elders interact. GILA students are separated from family and community. At least three times a week, groups come to spend time visiting or performing activities with elders. This program provides a family and community environment for at risk youth who are separated from families. The resilient mitigation solution is to increase the facility capacity by 11 units; a 1,200 SF area is proposed to provide for a youth/elder interaction/library/staff training area. If implemented with Activity 8, children in daycare can be scheduled for interaction with elders as well. This activity address needs for vulnerable populations statewide in the elder, low-moderate income, children and tribal groups. Additionally, it would provide a regional economic boost (employment). This project is very feasible, as the facility and program already exist and are sustainable. Expansion is possible at the current site. The BCR is 0.43.

School Infrastructure Activities: **Activity 18:** Galena Interior Learning Academy (GILA) Biomass Glycol upgrades: This activity addressed the URN of enhancing the resilience of the GILA facilities and regional emergency services center as critical infrastructure. This facility has specific URN from the 2013 flood as it was heavily used during and after the 2013 flood for response and recovery. The school campus served as the FEMA/State base for the flood recovery, and provided housing for displaced residents and response workers. Aggressive maintenance on this legacy USAF system is required year round. As school facilities were invaluable to the response, the steam system maintenance was deferred

for a year with serious impacts on operations in winter of 2013-14. The legacy system is obsolete. A recent engineering study indicated that the system wastes heat equivalent to about 60,000 gallons of diesel fuel per year, and that it is very likely to fail catastrophically within the next 10 years. The resilient solution is to upgrade the heating system, making the school more resilient, and improving its reliability for local and regional disaster response and recovery support. The proposed activity would replace the heat distribution pipes in the utilidor. The State has approved a grant to replace the boiler portion of the system. The proposed boiler will greatly reduce the cost of operating the buildings, but cannot be implemented without upgrading the utilidor. The wood chip boiler and new utilidor is expected to reduce diesel fuel consumption for the GILA by 200,000 gallons per year. To meet this schedule, the City is seeking funding to pay for the utilidor upgrade. Alaska communities such as Galena, Fort Yukon and others which formed around infrastructure, schools and jobs which old military bases brought rely on inefficient technology. Upgrading legacy infrastructure is a model project. Given its component funding this activity is feasible and has a BCR of 1.57.

Activity 19: Sustainable Energy for Galena Alaska, Inc. (SEGA): This activity addresses the URN related to Activities 11 and 12. This activity ties into the need for fuel supply for upgrading 2013-flood damaged power generation systems. The damaged power generation system has since undergone repair and some have been identified for mitigation against flooding. This project addresses the need to reduce community reliance on expensive diesel fuel; reduce home heating costs and convert to more sustainable energy sources. The resilient mitigation solution is to provide a fuel supply for the wood boiler system. The City, the School, and the Loudon Tribe have combined to form a non-profit timber harvest entity, SEGA. SEGA will provide local jobs and a responsible, sustainable fuel. SEGA has secured funding from multiple sources (Exhibit F Leverage). The activity need is for loan funds to provide about \$250,000 of operating capital to bridge the transition from the diesel fired boilers to wood fuel. This activity is an example to communities which desire to decrease dependence on expensive diesel fuel and

decrease home heating costs. With funded components, equipment and source material available, this activity is feasible, has high probability of success and return on investment.

The described activities are consistent with the community's multijurisdictional hazard mitigation plan, and 2013 flood long term recovery efforts. See Attachment F, BCA for detailed project activity descriptions, budget information; BCA details-including benefits to vulnerable populations; risk to community if project is not implemented; and metrics. Project total BCR is 1.94. Project and activity leverage information can be found in Exhibit F. Project schedule can be found at Dropbox/EXE E-100.

Project 2: Resilient Mertarvik 2022

Newtok is a traditional Yup'ik Eskimo village located on the Yukon-Kuskokwim Delta along the western coast of Alaska, near the Bering Sea. Newtok is located within the AVCP Target Area, which was qualified in Phase 1 under the MID-URN for damages to residential and community infrastructure. Newtok sustained damages to key community transportation infrastructure (boardwalks and docks) during qualifying event DR-4162 in November 2013.

Project Context: Originally a nomadic people of the Bering Sea coast, the Newtok Tribe settled at the current site in 1949 where the Bureau of Indian Affairs (BIA) built a school. The location was the farthest point upriver that the barge could navigate to offload school building materials. The current village developed around the school. The community became aware of severe and progressive erosion of the Ninglick River toward the village as early as the 1980s, when the community hired an engineering firm to conduct an erosion assessment. The recommendation was, *"Relocating Newtok would likely be less expensive than trying to hold back the Ninglick River"* (Dropbox EXE/E-101). In 1993, when the community made the decision to relocate, the Tribe initiated a relocation site selection process. A site known as Mertarvik, Yup'ik for *"getting water from the spring"*, located nine miles from Newtok on Nelson Island satisfied all relocation site criteria and was selected by the Tribal Council and the community in 1994 as the prime site for village relocation. (Dropbox EXE/E-102). Mertarvik is located on the northern coast of Nelson Island and is bounded on the north by the Ninglick River which drains

Baird Inlet. Blessed with a good supply of potable water, underlain by basaltic bedrock, located above the floodplain and with sufficient developable land area for construction of a new community, Mertarvik was approved for a new village site by the USACE and others (Dropbox EXE/E-103). As Mertarvik is located within the Yukon Delta National Wildlife Refuge, Newtok, led by Newtok Native Corporation (NNC) (organized under the Alaska Native Claims Settlement Act (ANSCA)), began negotiations with the U.S. Fish and Wildlife Service for the land. In 2003, a land exchange was completed between the NNC and the Department of the Interior for the land. In 2006, the Newtok Tribe approached the State, requesting assistance with relocation. In response, the State organized an inter-agency working group, the Newtok Planning Group (NPG). Since 2006, a range of pioneer infrastructure has been developed at Mertarvik, including a barge landing and staging area, an access road to a community development area, a road alignment to a developing materials site, the foundation of a future multi-use building, a number of storage building and three homes (Dropbox EXE/E-113). Two water wells have been drilled and an Airport Layout Plan has been approved by the FAA. In 2012, the NPG completed the Mertarvik Strategic Management Plan (SMP) which lays out Newtok's phased relocation strategy. The plan focuses on strategic areas and lays out priority actions, which trigger opportunities and investment for the relocation effort. While the community has been implementing this strategy with the assistance of the NPG, *the single greatest hurdle to the relocation effort has been identifying resources for housing*, which will allow people to move out of harm's way and establish the necessary population at Mertarvik. AVCP Regional Housing Authority plans to contract the Cold Climate Housing Research Center (CCHRC) to develop the master housing plan in winter 2015 at the community's request. Mertarvik was the subject of the *U.S. Army Corps of Engineers 2008 NEPA document, Revised Environmental Assessment and Finding of No Significant Impact, Newtok Evacuation Center, Mertarvik, Nelson Island, Alaska* which includes a wetlands delineation of the project site. To meet federal requirements for No Net Loss Policy for the development of any wetlands at the project site, the State is currently conducting

the an environmental inventory and assessment which will develop a clean-up strategy for restoring the village site to natural wetlands after the community has relocated (Dropbox EXE/E-105).

The health and safety of the Native Village of Newtok is threatened by severe riverine erosion and flooding. The Ninglick River is eroding toward Newtok at an average rate of 72 feet per year and a maximum yearly observed rate of erosion is 300 feet per year (Dropbox EXE/E-104). Since 1954, approximately one mile of land fronting the village has been lost. This land was an important buffer that protected the village from Bering Sea storms. As a result, the community has become increasingly vulnerable to coastal storms and its survival at the current village is extremely limited. Historical and projected erosion rates of the Ninglick River toward Newtok indicate that the Ninglick River will reach the community school by 2017, followed by the loss of the rest of community infrastructure (Dropbox EXE/E-106). These changes, likely exacerbated by climate change and associated thawing permafrost, have increased the frequency and severity of flooding in Newtok during the last decade. According to local residents, the coastal storm season has become longer in recent years. A powerful storm surge can raise tide levels 10 to 15 feet above normal, and severe flood events, such as the 20-year flood of 2005 and the lesser flood of 2006, permeate the village water supply, spread contaminated waters through the community, displace residents from homes, destroy subsistence food storage, and shut down essential utilities. The USACE predicts the 50-year flood would inundate almost the entire community. Newtok's increased vulnerability to storms and its decision to relocate have led to broad disinvestment by funding agencies at the current village site. In 2006, a comprehensive environmental public health assessment conducted jointly by the Yukon-Kuskokwim Health Corporation (YKHC) and ANTHC made a direct link between this disinvestment and significant public health issues in the village. The assessment found that during the study period, 29% of Newtok infants were hospitalized with lower respiratory tract infections, including 20% for pneumonia, 18% for respiratory syncytial virus, and 11% for pneumonia respiratory syncytial virus, nearly twice the national average for these diseases. These conditions appear to result from lack of infrastructure development and failure to maintain existing infrastructure. The

assessment concluded, “*Sanitation conditions in Newtok are grossly inadequate for public health protection. The situation appears to be one of compounding deficiencies, high levels of community contamination, little potable water for drinking and hygiene/sanitation practices, and household crowding. While it is true that sanitation conditions in the [Yukon-Kuskokwim] Delta region as a whole lag well behind those of other regions of the U.S., most all communities in Alaska have access to a year-round potable water supply, a contained location to dump raw sewage, and reasonable access to a solid waste disposal site. We know of no U.S. community other than Newtok that lacks all three.*”

The Resilient Mertarvik 2022 Project: The community’s relocation to Mertarvik is the only way to effectively mitigate impacts of future disasters and climate change. Project activities include the development of a community subdivision design and record plat; prototype housing; water/sewer and power utilities, subdivision roads, pioneer runway, bulk fuel tank farm, and landfill at Mertarvik. Workforce development, and interim education and health-care strategies are also part of the project proposal. This project will be carried out in coordination with the NPG and will implement the community resilience strategy presented in the *Mertarvik Strategic Management Plan*) (Dropbox: EXE/E-107. This project will implement the strategic initiatives in the plan.

Activity 1: Subdivision Design and Record Plat. To site roads, homes, energy and water/sewer facilities, this activity builds upon the Mertarvik Final Community Layout Plan (May 12, 2015) and the Mertarvik Final Paper Plat (May 12, 2015) to produce a final subdivision design and record plat which will guide development at Mertarvik establish public and private property boundaries (Dropbox: EXE/E-108 and E-109). The NNC owns the land at Mertarvik. Site control of land at Mertarvik has been issued to the tribal governing body, Newtok Village Council (NVC), through established site control mechanisms agreed to and signed by both the NNC and NVC on May 12, 2015 (Dropbox: EXE/E-110).

Activity 2: Mertarvik Prototype Housing. Acquisition of approximately 66 homes in Newtok will allow for design and construction of an equal number of new housing units at Mertarvik. New homes will be based on a prototype designed by CCHRC and constructed by a trained local labor force over the next

four to six years to help the community relocate. CCHRC is an industry-based nonprofit corporation created to facilitate development, use, and testing of energy-efficient, durable, healthy, and cost-effective building technologies for people living in cold climates. Homes are designed to be moveable and use 75% less energy than the average home in the region, and be built for an average price of \$360,000, including materials, labor, and shipping, well below average for residential construction in rural Alaska. Homes will demonstrate extreme energy efficiency and incorporate local knowledge and traditional design principles. The foundation allows the building to be moved. Homes may be built at the barge landing pad in Mertarvik and towed to the designated plat, speeding construction. CCHRC is working with AVCP in Bethel to develop local timber harvesting and truss manufacturing to decrease the cost of materials. A project manager will coordinate all aspects of construction with the community, partners and stakeholders. CCHRC will create a manual and film to document design, construction, and workforce training components to provide a replicable model. CCHRC will also retrofit a 32 ft. by 64 ft. structure (Dropbox: EXE/E-111 and E-112) in place at Mertarvik to serve as an interim classroom.

Decentralized Water, Sewer, and Power Infrastructure: A huge challenge for relocating communities is the development of critical infrastructure before a population is established at a new village site. State and federal investment guidelines preclude infrastructure investments in locations where there is no established population (Dropbox: EXE/E-114). This issue is addressed by development of standalone water, wastewater, and electric systems. Homes are designed to incorporate renewable energy such as solar and wind. There are a variety of power, water, and wastewater solutions for rural housing projects, including an innovative system for the Newtok demonstration house now under construction. Utilities can either stand-alone off-grid or tie into centralized systems. A gravity-fed water system cleans water from a local source, and there is an innovative on-site wastewater treatment system. This eliminates the use of the honey bucket. Lighting and mechanical systems are designed to run on DC or AC power, allowing buildings to run off grid on generator and battery bank, or plug into a conventional electrical grid. These systems ensure occupants will have safe, uninterrupted service without centralized services.

Activity 3: Subdivision Roads. Transportation in Newtok is by all-terrain vehicles (ATVs) or snow machines in winter. The proposed roads for the new Mertarvik subdivision will consist of a 20-ft wide section with 24-inches of gravel overlaying a non-woven geotextile and two inches of rigid foam board insulation. There are two trail sections bisecting the subdivision. These trails will consist of a similar cross section but will only be 10-ft wide with 12-inches of gravel. All roads and trails will be crowned, and culverts will be used for drainage. Roads will be graded and graveled to follow natural terrain. Road construction will minimize ground disturbance to limit impacts to permafrost (Dropbox: EXE/E-109 and E-108). NDRC funds will be leveraged against the NVC's BIA Reservation Roads funding.

Activity 4: Pioneer Runway. Interim air service at Mertarvik will be provided by helicopter and fixed wing aircraft. A helicopter landing pad currently exists adjacent to the barge-landing staging area. The Mertarvik site has no infrastructure to support planes. Access is only via water, which makes access very limited. An Airport Layout Plan (ALP), the pre-cursor to funding for a new airport has been approved by the FAA (Dropbox: EXE/E-115). A pioneer 3,000 ft. by 50-ft runway will be developed along the alignment identified as Runway 13-31 in ALP. The pioneer runway is vital to complete construction of new housing and community improvements in Mertarvik, to bring personnel, construction equipment and materials to the site, and to assist with medical evacuation, if necessary.

Activity 5: Bulk Fuel Tank Farm. New homes in Mertarvik will each have their own small fuel storage tanks to feed oil burners used for heating. The community still needs mass storage. Obtaining fuel is very expensive, but costs can be decreased by constructing a facility with a large capacity and reducing the frequency of shipping fuel. The facility would consist of eight 25,000 gallon double-wall, skid-mounted aboveground storage tanks and associated equipment. This would provide a 12-month fuel supply to the community, and could be expanded if needed. BCR for Activities 2-5 is 2.35.

Activity 6: Landfill. The community landfill will serve the population of 380. The landfill will operate as an above ground area fill landfill, meaning that a two foot gravel pad will needed as a base to insulate the waste from coming in contact with the tundra or with high surface water in the region. The site

should be bermed and fully fenced. The recommended 1.75 to 2 acre site should be sufficient to serve the resident population. DEC design approval and a Class III Solid Waste Permit will be obtained for this landfill. The landfill should operate with a modified collection system. Residents should drop off waste at a central transfer site near the landfill, consisting of several pull-behind trash cages. At least six wheeled, fully- enclosed trash cages, and a four-wheeler to pull them are recommended for a community this size. A Tok burn unit is recommended for volume reduction of household waste. Burning waste will reduce the landfill footprint, lengthen the landfill lifespan, and reduce water impacts to the surrounding area decreasing landfill capacity requirement. A Class III landfill is not designed to accept all waste streams, therefore a material handling shed should be placed at the site for hazardous and recyclable waste management. An oil burner with energy recovery should be included for local management of used oil and for heating the shed. The shed can also be used to house and protect landfill equipment. A tracked skid steer is needed to assist with landfill cover; emptying ash from the burn unit; and material handling from the waste diversion program. A medium-sized, or D-4 sized dozer is needed for handling waste not burned or diverted from the landfill; applying cover; and maintaining site access.

Activity 7: Retrofit of 12 Relocated Homes. Twelve homes in Newtok are currently slated for relocation to Mertarvik. These homes are not equipped with indoor plumbing. The proposed activity would provide funds to renovate and retrofit the 12 relocated homes with water and wastewater filtration systems, self-contained electricity from a generator and an on-site water holding tank. BCR is 10.78.

Activity 8: Existing Homes Demolition. After the buy-out of homes in Newtok and residents have moved to new homes at Mertarvik, the existing structures in Newtok will remain to decay and erode away into the river. All the debris and waste generated from Newtok could potentially contaminate the water starting from Newtok downstream all the way to the Bering Sea. This would also cause significant navigation hazards to boats and barges. This activity will demolish the vacated site and minimize the human footprint. This will also serve to stop debris from falling into the river and ocean. To support this

effort, the State is currently conducting an environmental inventory and assessment which will develop a clean-up strategy for Newtok to restore the site to natural wetlands (Dropbox EXE/E-105). BCR is 0.24.

Activity 9: Interim Education Plan. Fifty percent of Newtok's population is under the age of 18. As families with school-aged children move to Mertarvik, it will be necessary to provide for their interim education needs until a school can be built. The Lower Kuskokwim School District (LKSD) has a robust distance -learning program which provides for the education needs of children living within remote villages in the region. An Interim Education Plan will lay out the education strategy for the next 4-6 years. Additional funding is requested to cover any equipment needs. The Mertarvik Evacuation Center (MEC) will serve a school function until the LKSD constructs a school at Mertarvik.

Activity 10: Interim Public Health-Care Plan. An Interim Public Health-Care Plan will be developed to lay out the public health-care strategy for the next 4-6 years. The MEC will house all clinic functions until a clinic is built at Mertarvik.

Activity 11: Regional Workforce Development. CCHRC and the regional trade school, Yuut Elitnaurviat in Bethel, will develop a workforce training program specific to NDRC-funded projects, including building science, mechanical, electrical, and plumbing components, so regional projects in Mertarvik and Emmonak can be constructed by local labor. Yuut Elitnaurviat (Yuut) is a 501(c)(3) Corporation dedicated to providing training and education opportunities for the people of the Yukon-Kuskokwim Delta Region. It is partnering with the State to offer culturally relevant and regionally responsive training programs, in response to the suffering regional economies and high unemployment rates. The State, CCHRC and Yuut will build programs that combine intensive academics and on-the-job training for our proposed projects. Each training delivery will serve 12 to 20 participants. These trainings will provide hands-on and in-class experience in construction, welding, hazmat, and business management. The cost is roughly \$8,000-\$10,000 per student for a total cost of \$400,000. This includes travel, room and board, classroom materials, and instruction. The goal is to train a diverse workforce that can support regional economic growth and stability.

All activities will be completed according to the project schedule (Dropbox EXE/E-100).

The Resilient Mertarvik 2022 Project Objective: By 2022, build social, physical, cultural, economic, and ecological resilience into the daily lives of the Native Village of Newtok at Mertarvik, maintaining cultural identity and connection to place through a community-driven process, providing a model for imperiled Alaska villages.

Increased Resilience to Current and Future Disasters: The Newtok community's move to Mertarvik is the only way to ensure protection from current and future threats and hazards, including future risks associated with climate change. This project is consistent with Newtok's desire to create a new model for a sustainable Alaska Native Village based on leading edge technology and lessons learned from unsustainable community development activity in the past.

Without this proposed project, the property of the residents of Newtok will be lost and lives will be threatened. Newtok's situation is not a question of *if* the community will be lost to the Ninglick River, but *when*. In the near-term, homes closest to the Ninglick River will be lost; and many residents will need to leave their homes to find shelter on higher ground during a 50-year flood. The community will be without drinking water, power, or sanitary facilities and will be surrounded by contaminated water. A severe flood would leave homes uninhabitable after waters receded and the people could require other shelter or evacuation until homes were repaired or rebuilt. Weather or damage to the airstrip may prevent aid from reaching the community. The potential for disease and injury during a severe flood would increase. In the long-term, the survival of the entire community hangs in the balance. For a remote indigenous community, this would mean the loss of culture and a Federally-Recognized Tribe.

Benefit to Vulnerable Populations: By assisting the Newtok community to relocate to Mertarvik, this CDBG-NDR-assisted project will benefit the elderly, people with disabilities, individuals and families at risk of becoming homeless, the working poor, minorities, and Native Americans. Most residents of Newtok fit into at least one of these vulnerable populations. The creation of energy-efficient, affordable,

culturally appropriate housing for the Newtok community at Mertarvik will help the community move from harm's way. Community capacity will be increased, and the local economy enhanced by training a local workforce to help build homes and install decentralized water, sewer and power utilities.

Model/Replicable/Holistic: This proposal represents an important model for other communities considering relocation. This project will be significant, not only on a state-wide basis, but on a national and international basis as well. There is documentation globally of a number of indigenous communities forced to relocate due to the impacts of climate change. The Newtok model provides an example of how this process can be replicated. In Alaska, Newtok is one of several communities imminently threatened by the impacts of flooding and erosion. In 2009, the U.S. Government Accountability Office reported that 31 Alaska Native Villages were imminently threatened by erosion and flooding. The GAO report noted that at least 12 of the 31 threatened villages have decided to relocate. The report identified that Newtok has made the most progress in its relocation effort. This proposed project will provide a huge boost to Newtok's relocation effort by enabling the entire community to move to Mertarvik. Once this population is established, the development of long-term core infrastructure will be triggered including the design and construction of a school and airport at Mertarvik. These actions provide a clear, feasible model for the relocation of other communities. Additionally, this project could prompt a new paradigm in community sustainability in rural Alaska. Over the last several decades, many rural Alaska villages developed with little thought about economic development and long-term energy costs, transportation, water and sewer, freight delivery, air access, and other community infrastructure. Newtok's relocation presents a unique opportunity to create a new model for a sustainable Alaska Native Village based on innovative technology and the lessons learned from past decades of community development activity.

Project Feasibility: The State of Alaska has engaged the most qualified partners to carry out the Resilient Mertarvik 2022 Project. CCHRC is an industry-based nonprofit corporation created to facilitate the development, use, and testing of energy-efficient, durable, healthy, and cost-effective building technologies for people living in cold climates. CCHRC's approach is informed by the Alaska Water

and Sewer Challenge initiated by DEC to develop innovative and cost-effective water and sewer systems for homes in remote Alaska villages. The project focuses on decentralized water and wastewater treatment, recycling, and water minimization. These approaches have a high potential for use in individual homes and housing clusters with the goal of significantly reducing the capital and operating costs of in-home running water and sewer in rural Alaska homes.

Consultation with other Jurisdictions in Region: Newtok and Mertarvik are located within the AVCP Target Area. The SIWG has held several partner briefings during both phases of this project application to consult and ally with communities within the region.

Plan Consistency: The Resilient Mertarvik 2022 Project is consistent with and implements several projects from the following plans: Mertarvik Strategic Management Plan (Dropbox: EXE/E-107); Mertarvik Relocation Report (Dropbox: EXE/E-115); Mertarvik Community Layout Plan, 2015 update (Dropbox: EXE/E-109); Mertarvik Paper Plat, 2015 (Dropbox: EXE/E-116); Newtok Long Range Transportation Plan (Dropbox: EXE/E-117); Revised Environmental Assessment and Finding of No Significant Impact, Newtok Evacuation Center, Mertarvik, Nelson Island, Alaska (Dropbox: EXE/E-105); and the Newtok Local Hazard Mitigation Plan 2015 (Draft) (Dropbox: EXE/E-118) .

Project 3: Emmonak - The Resilient Emmonak Transportation Improvement Project

The City of Emmonak is located near the mouth of the Yukon River on the coast of Western Alaska, approximately 10 miles from the Bering Sea, bordered on the south by Kwiguk Pass and to the east by Emmonak Slough (Dropbox: EXE/E200-202). This small Yupik Eskimo community of 800 residents is recognized as the most suitable site for a port and dock facility in the lower Yukon region. Emmonak is strategically situated to provide basic shipping and transportation redistribution services to 13 other small communities in the lower Yukon region, serving over 5,500 residents.

During the Qualified Disaster (DR-AK-4122) from May 17- June 13, 2013, severe ice jams diverted water from the Yukon River into Emmonak and nearby communities. Flood waters and large ice chunks removed the top three inches of surface gravel from the roads and pushed the base layer of six inches

plus size rock deep into the mud. Other roads were completely inundated with flood waters. Flood waters overtopped roads and choked the culverts, rendering travel hazardous. Approximately 50-feet of the taxiway washed out, along with runway lights and transmission lines serving the FAA navigational equipment. The Airport Road was washed out in five places preventing access to the runway (Dropbox: EXE/E203-205). Infrastructure damage was so extensive that goods could not reach Emmonak. Not only did this affect the residents of Emmonak, but at the September 2, 2015 community meeting, residents of surrounding villages said that this affected them also. Since Emmonak does not currently have a port, the movement of materials and equipment to Emmonak via air to complete other flood repairs and the normal building needs of the community was extremely limited by the damage to the airport. Pictures of the flood damage are included in Dropbox: ATTE/Emmonak Background Info. Six activities are proposed under the Emmonak project, including an Alakanuk Barge Landing Study supporting the regional port at Emmonak (Activity 1). The objective for this project is to plan and deliver a disaster resilient, cost effective transportation system that will enable easy movement of people and goods, and will improve the economy and quality of rural Alaska life. See Attachment F, BCA for detailed project activity descriptions, budget information; BCA details-including benefits to vulnerable populations; risk to community if project is not implemented; and metrics. Project and activity leverage information can be found in Exhibit F. Project total BCR is 1.72. Project schedule can be found at Dropbox/EXE E-220.

Activity 1: Emmonak Port: Located at the mouth of the Yukon River with access to deep river channel morphology for barge maneuvering and landing, Emmonak is recognized as the most suitable site for a regional port. Despite the lack of port infrastructure, local maritime activity has significantly increased in recent years. Today, lack of infrastructure hinders logistics, damages the riverbank, and delays cargo transport. For example, Kwikpik Fisheries, the region's largest private employer, must build and maintain earthen barge landings along the riverbank to facilitate port operations. The landings continually wash away and occasionally fail catastrophically, choking the river with sediment and creating a hazardous work environment. The 2011 Planning for Alaska's Regional Ports and Harbors:

Final Report commissioned by USACE, identified Emmonak as the best investment opportunity in the lower Yukon region (Dropbox: EXE/E206). The proposed Lower Yukon River Regional Port (LYRR) project would construct a modern barge landing facility and upland staging area in Emmonak, facilitating the safe and efficient offloading of cargo from barge vessels that are the primary resupply method of the community. The Community of Emmonak has proposed a 650-ft port that would be a transportation hub in Western Alaska. Currently, everything that is brought into town is offloaded from barges directly onshore. This can be challenging in times of high and low water, especially as the volume of cargo continues to increase. According to city data, the number of shipping containers moved through Emmonak has grown steadily from 450 in 2002 to 1,700 in 2011. Over the same time the gross tonnage of total cargo moved in and out of the community has increased from 15,100 tons to 41,800 tons (Dropbox: EXE/E210-213). This project is an investment in fundamental maritime infrastructure that would directly support continued economic growth in the lower Yukon River communities to help stabilize and diversify economies largely dependent on government employment and unpredictable commercial fisheries. The design for this project was completed in 2012. Final drawings, technical specifications, and cost estimate are included in Dropbox: ATTF/Project Emmonak/BCA Narrative& Appendices. The LYRR Port project design meets both current demands and anticipated future demand, with the additional benefit of river bank stabilization and erosion control. BCR is 2.54

Activity 2: Flood Protection Pad: The pad will be used by the future Port of Emmonak as a staging and material handling area when construction on the regional port is finished. The Flood Protection Pad will also provide a safe staging area for people, animals, critical life-sustaining supplies, and high-value equipment above the historic flood level elevation. The pad will be constructed near the city docks on 8.9 acres of scrub-shrub wetlands. A survey of the proposed pad location and concept drawing as well as a budget are included in Dropbox: ATTF/Project Emmonak/BCA Narrative& Appendices. The City of Emmonak has already applied for the USACE Individual Permit Application and which has been approved. They have also received approval from the State of Alaska, DEC Division of Water

Wastewater Discharge Authorization Program (Dropbox: EXE/E208-209). This project is replicable to other Yukon River Communities. BCA is 2.93

Activity 3: Airport Project: Emmonak is one of the region's largest communities and serves as the regional hub for aviation and marine transport. It has one of the area's largest fish processing plants providing an economy to about 20 area villages. The current runway is too short to allow for cargo jet service. For jets to fly into Emmonak, they need a 6,000-ft. to land and take off safely (Dropbox: EXE/E214-215). Lack of transportation capacity limits fishing and the economy in the region. This activity will extend the runway to 6,000-ft., improve drainage, and install lighting (approximately additional 1,600-ft.). It will also extend the runway safety area to meet C-III standards, place embankment stabilization materials for the runway, improve drainage, improve lighting, and provide a safety area expansion (Dropbox: EXE/E213). Dropbox: ATTF/Project Emmonak/BCA Narrative & Appendices highlights the risk to the community if this proposal is not implemented. BCA is 1.29.

Activity 4: Improved Airport Road with Bypass Project: A 1994 Corps Trip Report estimated that historic erosion rates along the city's waterfront ranged from 2 to 25 ft. per year (Dropbox: EXE/E207). Erosion is closest to the road at the old landfill, with a vertical cut bank of about 10 to 15 ft. Frontage Road is in this area. At the estimated rate of erosion, the next flood will take out sections of this road. Frontage Road is vital to the community as it is the only road that tractor trailers can haul fish to the airport (Dropbox: EXE/E211). The other existing road to the airport, Airport Road, has a tight corner that tractor trailers cannot navigate. Also, a utility powerline is too low for a tractor trailer to clear. To armor Frontage Road the estimate is roughly \$100M. This is not a long term resilient solution. An alternate solution is to construct a new road that is away from the eroding banks of the Yukon River, which would connect with the current Airport Road after it passes through the community. The new road would allow tractor trailers to deliver the fish to the airport. In addition to constructing this new section of road, Airport Road will require improvements. During the 2013 flood event, Airport Road was washed out in multiple locations, leaving residents without access to the airport. Improvements to

Airport Road will include elevating the road and installing culverts to improve drainage. The road will still be subject to impacts from seasonal flooding, however the elevated surface and the addition of culverts will minimize overtopping and associated erosion. Airport Road is owned and maintained by Alaska DOT&PF. The new bypass road will be constructed on City-owned land and will be maintained by the City. Dropbox: ATTF/Project Emmonak/BCA Narrative& Appendices shows a detailed need that the community faces without this proposed project. BCA is 1.34

Activity 5: Water Tank Storage: During the spring ice breakup and the fall freeze up, Emmonak is unable to extract water from the river for 14 days. Based on Emmonak's current population, water usage and the current capacity of 300,000 gallons, Emmonak will run out of potable water in 9.8 days. During the summer months the community fish processing plant uses large quantities of water to meet USDA standards. During the height of the 2014 season the processor had to suspend operations due to lack of water, costing local fishermen \$48,000 per day. Over the past 50 years, Alaska has warmed at more than twice the rate of the rest of the United States' average. Its annual average temperature has increased 3.4°F, while winters have warmed even more, by 6.3°F. Higher temperatures are contributing to earlier spring snowmelt, reduced sea ice, widespread glacier retreat, and permafrost warming (Dropbox: EXE/E216). For the present and for a 20 year design horizon, the existing water storage system will not be adequate to support the community. Current water storage tanks cannot supply the community needs with the potable water during the two week periods of spring breakup and fall freeze-up, when the Yukon River water source is unavailable. During this time the river is too clogged full of ice, debris and extremely silt-laden water to be pumped for treatment. By adding two additional water tanks we can address this issue and mitigate the problem of inadequate potable water for the community. The two existing water storage tanks, totaling 300,000 gallons, are not figured into this plan, as they are almost 30 years old and are not expected to be usable in the 20-year design horizon. However, they will be used as reserve tankage for the rest of their useful lives (Dropbox: EXE/E217). As Emmonak is subject to serious flooding at times, a foundation with adequate ground clearance and resistance to ice damage and

ice erosion is necessary. A 80 ft. x 180 ft. long pile-supported deck would provide a safe platform for the two new 428,000 gallon water tanks. The Kwik'pak Fisheries processing plant suspended operation in June 2014 when there was not enough water to allow operations. The closure came at the height of the commercial chum salmon season, when fishermen were catching between 10,000-15,000 fish each day. With no ability to process the fish, fisherman had to avoid fishing until the next day when the plant reopened. This temporary closure had a financial impact on the 450 families that depend on fishing as their primary source of income in the community of Emmonak. This one day closing cost roughly \$48,000 total in lost revenue to these 450 fishing families. Kwik'Pak pays the fishermen \$0.60/chum and \$0.70/coho per pound. An average chum salmon weighs 8 lbs. and an average coho weighs 12 lbs (Dropbox: EXE/E218-219). BCA is 1.18

Activity 6: Barge Landing Area Study in Alakanuk: when Emmonak, Nunam Iqua (formerly known as Sheldon Point), and Kotlik flood, Alakanuk does not flood and becomes a hub for recovery. Alakanuk is seven nautical miles from Emmonak and provides a good location for a secondary barge landing site. Currently, the barge dock is located near where most of the erosion in Alakanuk is occurring. When barges land at the dock, an extensive amount of forward thrust is needed to keep it in place during offloading. This creates a massive amount of water movement near the bank, which in turn creates or accelerates continuing erosion of the shoreline of the Yukon River. Ten homes, the tribal building, and the high voltage inter-tie power line from Emmonak are threatened by erosion related current barge landing operations. Additionally, barges delivering goods to the community previously landed on the Yukon River side of Alakanuk. However, due to changing river patterns, this site required dredging. This project would allocate funds to for an erosion control study to evaluate approximately two miles of the Kulupuk Slough running through the middle of the City of Alakanuk and conduct a feasibility study for a deep draft barge landing site where it will not impact the community's infrastructure nor be impacted by continuing erosion. Local, state, and federal governments incurred higher costs of the necessary materials needs during 2013 flooding recovery operation. Had this port been in place prior to

the disaster, materials would have already been in place and stored for future use, thus reducing the high cost of flying in emergency materials. Alaska DOT&PF flew one load of culverts and materials into Emmonak. That single flight cost \$12,000. Costs to fly materials into Alakanuk would be even higher.

The Resilient Emmonak Transportation Improvement Project Objective: This project would create disaster/climate change transportation infrastructure for innovative rural roads, a port at the mouth of the Yukon River and an extended taxiway/runway for the AVCP regional hub, Emmonak, and a protection pad for heavy equipment and essential assets in the community. Through these projects, the national objective will be met by benefiting low and moderate income persons. The cost of transportation and goods will be less expensive, benefitting the community.

Increased Resilience to Current and Future Disasters: There are currently no established port or harbor facilities on more than 700 miles of Western Alaska coastline between Bethel and Nome. Aviation provides a vital link to everyday goods and services in rural Alaska. Alaska's vast size, harsh terrain, extreme climate and large percentage of federally protected land make airports often the only mode of transportation serving the rural population. Creating an extended taxiway/runway that can withstand disasters and climate change is critical to this hub community, as well as allowing larger planes to land. The isolated villages dotting Alaska's landscape are all connected to each other and to the rest of the world by their airports. Aviation provides that fundamental link for access to necessities such as food, mail, healthcare, education, and travel but at such a high financial cost. In terms of investment for rural access, there is simply no near term possibility of achieving a fully connective road system.

Benefit to Vulnerable Populations: The communities of the lower Yukon region face some of the most challenging living conditions in Alaska. The high costs of goods and fuel, high unemployment rates, and limited economic opportunity threaten the long-term sustainability of these communities. This program is a modest but durable investment in basic port and barge landing infrastructure, aviation structures, and road structure that may directly improve the quality of life, health, and safety of local residents. The strategic location of this infrastructure investment will allow Emmonak to act a regional redistribution

hub for cargo and fuel, potentially lowering costs of living and supporting local industry. This project may also promote the continued growth and diversification of economic opportunities available to local residents in this struggling region of rural Alaska.

Project Feasibility: The airport and associated access roads are essential to the health and safety of the entire community. The designs and construction practices will be consistent with projects that have been completed in rural Alaska, will not require the acquisition of new lands and can be maintained by existing equipment in the community. The port project is a much needed improvement to the community that will have long-lasting beneficial impacts including economic development, reduced prices of goods and services, increased opportunities for business and residents and overall improvements to the region.

Consultation with other Jurisdictions in Region: Emmonak is located within the AVCP Target Area. The SIWG has held several partner briefings during both phases of this project application to consult and ally with communities within the region.

Plan Consistency: The Emmonak program is consistent with and implements several projects from the following the following planning documents: AVCP Community Economic Development Strategy Plan, 2012-2017 [Dropbox EXE/E-221] and the Emmonak Local Hazard Mitigation Plan 2014 (Dropbox EXE/E-221).

Community 4: Teller: A More Resilient Community for a Better Future

The community of Teller is located on a spit between Port Clarence and Grantley Harbor, 72 miles northwest of Nome, on the Seward Peninsula. Teller is connected to Nome by a 72 mile highway that is maintained by the ADOT. Teller is located across the harbor from Brevig Mission (Dropbox: EXE/E300), and because of their road access to Nome, Teller provides decreased cost of services and increases the resiliency of both communities in the event of future disasters. Teller, population 256, and Brevig Mission, population 411 (Dropbox: EXE/E301), are both predominantly Inupiat Eskimo communities, depending primarily upon a subsistence lifestyle supplemented with a limited cash economy. There are two Federally Recognized tribes in Teller, the Native Village of Teller and the

Native Village of Mary's Igloo and one Federally Recognized tribe in Brevig Mission, the Native Village of Brevig Mission. These two sister communities did not sustain equal damage during the 2013 qualifying events, DR-4050 and DR-4162. Brevig Mission sustained minimal damage during these disasters, while Teller sustained significant damage and is still recovering. This disparity is due to the lack of resilient infrastructure in Teller. All proposed activities were developed by the community of Teller, and are published community priorities (Dropbox: EXE/E302). See Attachment F, BCA for detailed project activity descriptions, budget information; BCA details-including benefits to vulnerable populations; risk to community if project is not implemented; and metrics. Project and activity leverage information can be found in Exhibit F. Project schedule can be found at Dropbox/EXE E-320. The State of Alaska, in conjunction with the Community of Teller, proposes to develop the following eleven activities that address the unmet needs after the 2013 storm. Project total BCR is 3.01.

Activity 1: Wind Energy: In 2013 during a severe fall storm, the electrical intertie that bridged the two communities' sustained significant damage (Dropbox: EXE/E303). This damage to the intertie has not been repaired and leaves Teller with a dilapidated power plant to supply its power. Frequent power outages have led community members without power for extended periods of time. The Alaska Village Electric Cooperative (AVEC) proposed an alternate project instead of replacing the intertie, because they felt that the area was no longer suitable for the intertie due to the expectation of the effects of climate change. AVEC is committed to providing a solution for Teller's power supply issues, however, there remains an URN as a result of the while design of a new power plant is underway. The new power plant is planned to be further from the coastline, but due to funding limitations, does not include a renewable energy component that would decrease the costs of electricity for the community. While building a new power plant in Teller is a step in the right direction, the State recommends a resiliency component to include a wind-energy power supply that would decrease local utility costs and provide an avenue for additional savings through wind-heat production. The cost of fuel (\$6.15 a gallon for gasoline and \$5.13 for diesel) and electricity (.65 cents/KWH) (Dropbox: EXE/E304) are substantial for

a local tribal and municipal budgets (Dropbox: EXE/E305) and inhibit economic revitalization and development. Wind energy development in Teller is consistent with the Bering Straits Regional Energy Plan (Dropbox: EXE/E306). This activity entails construction of two wind turbines and a tieline that connects to the new power plant. The tieline will follow the Nome-Teller Highway. BCR is 0.46.

Activity 2: Innovative Seawall: The USACE identified an erosion area about 600 ft. long with a 10 ft. high bank in Teller (Dropbox: EXE/E307). It identified the existing seawall as protecting the town and its critical infrastructure from storm surges. Further, without this seawall, slow and persistent erosion would be expected to continue, and infrastructure such as the school and sewage lagoon, would be jeopardized if left unchecked. The Teller Seawall has protected the community since before 1980, and while it is old, it did protect the community during the last three major storm events in 2011, 2013, and 2014. The seawall was evaluated by FEMA, and a project worksheet was funded in 2011, but before repairs could be conducted, the seawall sustained additional damage during the subsequent storm events. FEMA ruled that the seawall repairs were ineligible because they were unable to distinguish between the damages of the two natural disasters. The seawall is the community's first priority listed on their Local Economic Development Plan (Dropbox: EXE/E308), and this desire was reaffirmed at the stakeholder community meeting held on August 25th, 2015 (Dropbox:EXE/E309-311). This activity is critical to the longevity of this community and is still an URN. With the advent of climate change, the sea ice forms later in the year and melts earlier in the year, leaving the community more vulnerable to more storm events than in the past. The time has come to implement the recommendation of the USACE and install innovative technology and revamp the seawall in Teller so that it can continue to protect the community. This project will have additional benefits beyond protecting the new community power plant. It will also protect other critical infrastructure in Teller. Dropbox: ATTF/Project Teller/BCA Narrative & Appendices contains more information on why this project is so critical for the community.

Activity 3: Road Elevation for Flood Prevention: The Nome-Teller Highway connects Teller to Nome, but it also connects the newest housing development in Teller to critical infrastructure, including the

local school and medical center. A section of this road floods annually during and after storms events, cutting off the new housing development from the rest of the community. Without access to critical infrastructure and medical care, Teller cannot be truly resilient because not all of their community members will be able to recover equally. During the August 2015 community meeting (Dropbox: EXE/E312), one local told of how his elderly father was injured and unable to travel to the clinic to seek treatment because the highway was flooded. Also, the proposed wind-energy transmission line is also planned to follow the highway, and this section of road should be more resilient to flooding events to prevent creating a similar situation that rendered the Teller - Brevig Mission intertie unreliable. Also, the primary road in Teller, Front Avenue, extends along Grantley Harbor on the east side of the city from the spit to where it connects with Bob Blodgett Highway. Approximately 1.5 miles of Front Avenue sits below the historic flood level (elevation 14). To provide a safe evacuation route for Teller residents, Front Avenue should be elevated to above 14 ft. The existing road is approximately 20-feet wide. The proposed road would match the existing roadway width with 2:1 embankment slopes. Several areas along the coast will likely require riprap protection to minimize erosion. Culverts extending from one side of the new road to the other will be needed to allow any storm water that may overtop the proposed seawall to exit the other side of the roadway. BCR is 9.35 for Activities 3 and 4.

Activity 4: Debris Removal: Leftover disaster and pre-disaster chronic debris is an ongoing issue in Teller. To recover more quickly in the event of another natural disaster, the Native Village of Teller and the Native Village of Mary's Igloo have secured funding for debris removal within Teller. They plan to remove and transport hazardous material and scrap metal that would pose an environmental and/or public safety hazard in the aftermath of another natural disaster out of the community. Because scrap metal and construction and demolition debris are planned to be removed utilizing this funding, the State proposes to augment this local project to increase the amount of debris that is removed in increase resiliency. Because the new power plant is scheduled to begin construction in the fall of 2016, the demolition of the current power plant would fall outside of the grants awarded to each of the Federally

Recognized tribes, and only materials created during the construction process would be eligible for removal under the tribal projects. If the State were to receive an award for additional debris removal funding, it could increase the amount of debris that the community could divert for proper recycling or disposal during their tribal project. BCR is 9.35 for Activities 3 and 4.

Activity 5: Water and Sewer Improvements: Teller is one of three dozen Alaska Native Villages (Dropbox: EXE/E313) that are still living without water and sewer services. It is also part of an even smaller demographic that also does not have a functioning washeteria. A washeteria is a community building that provides a place for people to shower and wash laundry. The Teller washeteria has two nonfunctioning toilets. A laundromat and is managed by the local School District. Laundry services are limited to a single washer and dryer. The current method of providing toilet services is with a honey bucket. Without running water, there is not a means to wash hands after using the communal honey bucket. When the honey bucket fills with waste, the bag is tied and the waste is hand-carried to an unpermitted site for disposal. It is not uncommon for some communities to forgo the use of bags and carefully carry a full honey bucket to a dump site. This often leads to spills and contamination. Without access to clean drinking water and basic sanitation needs, levels of respiratory infection and rashes are extremely elevated, leading to increased medical care costs and more sick days. Reliable access to clean drinking water and sanitary means of managing human waste should be a basic human right because without these services it is impossible for a community to flourish. This is one of the primary unmet needs for the community of Teller and is a significant roadblock to their ability to prepare and recover in the event of a natural disaster. BCR is 1.25.

Activity 6: Elder Food Pantry: With the advent of climate change, the community of Teller recognizes that many of their local subsistence foods may become harder to access and may change in availability from season to season. For the past few summers, the Kawerak Tribal Region and Teller has had tremendous variation in the bounty of local berries, ranging from almost no availability to a crop so prosperous that storage space became limited. Traditional foods make up the majority of the diet in

Teller, but the community lacks the storage space available and the canning, refrigeration, and freezers necessary to store excess traditional foods when they are available. This is an URN for the community of Teller (Dropbox; EXE/C314-316). The community of Teller has tried for many years to get grant funding to start a program to serve their elders. Access to proper nutrition is essential for this vulnerable population. Many elders have limited mobility, and their ability to hunt, fish and gather their own foods has significantly decreased. The community of Teller has tried to fulfill this unmet need for their elders by applying for funding for a food pantry and a program for providing meals that include traditional foods for their elders, but has been unsuccessful in securing grant funding for this worthy program. Teller does participate in the State of Alaska elder nutrition program, but the food that is supplied is generic for all communities and is made up of food that is not traditionally consumed by Alaska Natives. The digestive tracts of elders are sensitive, and they do not adapt well to consuming heavily-processed foods. This led to the planning effort behind the Teller Elder Food Pantry. This program would be managed by the local tribal government and would provide a central storage facility for traditional foods and food preparation for elders. It would also allow them to prepare traditional foods and deliver them to elders who have decreased mobility. This project also would provide socioeconomic benefits, because it would provide employment opportunities and the preservation of culture for the elderly in Teller. The State of Alaska is asking for start-up costs for this program only; this program would be managed and sustained by the two local Federally Recognized Tribes after the first year of funding.

Activity 7: Community Garden: This activity addresses the URN for local food security. The 2011 and 2013 qualifying events impacted the AVEC power intertie, an URN. The lack of a replacement infrastructure is cause for ongoing local intermittent power outages. This leads to community food security/storage issues with regard to subsistence food. This activity also addresses the pre-and post-disaster issue of high food cost and access to fresh produce. Population resiliency is greatly affected by food security. With the advent of climate change, the community of Teller is cognizant that some of their traditional foods may be harder to access than before. They have access to programs that will

supply free seeds for growing local crops, but they lack the soil that would be required to be successful with local gardening. The community would like to have a community garden to increase the availability of nutritious non-processed food. Children and the elderly would have priority access to the food grown in the community garden, but in similar communities in Alaska that have a community garden, there is usually excess available to the community at large after the children and elders' needs have been met. This activity can stand alone from the Activity 6, but if HUD were to fund both programs, it would lead to increased food security for the community and would increase their overall health. Food security is essential for recovery and resilience to natural disasters. There is a similar activity in Galena's project. This activity is feasible and beneficial as demonstrated by a small-scale farming project initiated by the community in the summers of 2012 and 2014. In 2012 community members planted and harvested a ½-acre plot of 1,200 pounds of potatoes valued at \$1,524. The 2014 summer produced over 1,500 lbs. of potatoes valued at \$2,076 value. BCR is 0.67.

Activity 8: Community Development Building: The Mary's Igloo's Community Center activity developed because current facilities are unsafe, unhealthy, small, old and dilapidated, and/or non-existent. The previous Traditional Council Office Building was destroyed in a fire. The community of Teller has worked with Stantec and CCHRC to design a new community building. The building design is included in this application as leverage and is at 95% completion. The City of Teller has provided land to build the new building. It is very urgent that the building be constructed in a timely fashion before the architectural plans are outdated and construction costs increase. The new facility will have an impact on member communities from all over the region primarily Nome, Teller, Brevig Mission, Wales, and Shishmaref. The project has received an Our Town grant award from the National Endowment for the Arts to integrate local and regional culture into the design of the building. The building will showcase regional culture and will include government office space, library, commercial kitchen, large meeting room (Native dancing), workshop and small business operation space, cultural museum, and gift shop (for regional arts and crafts). The new building will impact the region locally and

beyond by promoting wellness, culture, and economic development. The new facility will also become a significant destination for regional community members for meetings and cultural gatherings as well as tourists who use Nome as a base for regional travel. BCR is 0.45.

Activity 10: Vocational Training: The community of Teller would benefit financially if their people were provided the training necessary to work on NDRC-HUD funded projects in addition to other capital improvement projects that may be available in the coming years. Providing this training will provide economic revitalization and stability, because it will allow trained individuals from Teller to compete regionally for skilled employment. This training will also provide the community with the skills they need to operate and maintain current and new infrastructure projects in Teller, including NDRC-HUD projects. Zender Environmental, who provides significant vocation training for the State of Alaska has pledged their service towards this project (Dropbox: EXE/E317). However, Zender Environmental has a limited amount of seats available annually for vocational training, so the State of Alaska would like to augment their services and provide additional vocation training opportunities for the community of Teller. The State of Alaska proposes to provide training in skilled trades that Zender Environmental does not provide, including carpentry and technology training, which will be required with alternative energy projects. The Norton Sound Economic Development Corporation also has a long-standing vocational training program that can be utilized for vocational training up to \$14,000 annually for each Bering Strait Norton Sound community in the region. They provided a letter outlining their program for the State of Alaska NDRC-HUD grant application (Dropbox: EXE/E318).

Activity 11: Recovery and Resiliency study: This study would create an adaptation plan for the community of Teller. The community has developed a new subdivision outside of the current community in an area less vulnerable to climate change. This location shows promise, as a small section of land near this new housing development was evaluated for the new washeteria (Dropbox: EXE/E319), and was found to be suitable for development. Further evaluation is necessary to determine whether permafrost or other geological factors that may inhibit the development of additional

infrastructure. It is not currently known if this new area is able to support additional infrastructure, and this is critical information that is needed for long-term planning in Teller.

Increased Resilience to Current and Future Disasters: The repair/reinforcement of Teller’s seawall is vital to the “protect in place strategy of the community”. This is the only long-term solution to the community’s viability and resilience. The community is culturally rooted in this area and is a vital center of activity for the Native Village of Mary’s Igloo, Teller, and Brevig Mission, and the City of Teller.

The power, washeteria community building and planning activities also contribute to resilience.

Without this proposed project, the critical community infrastructure and residential property will be eroded away, and the community will be forced to consider the much more expensive and culturally challenged option of relocation. Relocation is not consistent with local and regional planning documents or practical given the option to mitigate the seawall.

Benefit to Vulnerable Populations: By assisting the Teller community to protect in place and upgrade its sewer water, community and self-sustaining (garden and food pantry) activities, this CDBG-NDR-assisted project will benefit the elderly, people with disabilities, individuals and families at risk of becoming homeless, the working poor, minorities, and Native Americans. Most residents of Teller and Brevig Mission fit into at least one of these vulnerable populations.

Model/Replicable/Holistic: This proposal represents the “protect in place” model for communities challenged by climate change and erosion. Emmonak and Galena are “protect in place” communities, but Teller is one of the coastal communities and the only one in its region (Kawerak) being submitted. This project will be significant, for other small coastal communities with similar resilience strategies.

Project Feasibility: The State engaged the most qualified partners to carry out this project. As the smallest project, the Teller Project is very feasible using innovative technologies, proven methods and regional resources. This project will also boost the local economy through workforce development, employment and skills training for future local and regional facility maintenance and operations

Plan Consistency: As previously referenced in the activity descriptions.

Project 5: Moving From the Past into the Future

The US lacks a clear process for helping a tribe face the impacts of climate change when the decision they have to make is to defend in place or migrate to a more resilient location. This project will provide Alaska's tribes, the tribes of the "lower 48" states and the US government with a tested, documented process for developing tribal awareness, assessment, monitoring, and community and government engagement to complete this decision making process. This process will help tribes make future resiliency decisions based on their own awareness and actions.

This project focuses on the development of an organizational structure and methodology to support Alaskan communities in their efforts to develop climate change adaptation strategies based on applied science, local observations, and community engagement. This methodology recognizes the state's early history and climate adaptation work with vulnerable riverine and coastal communities which motivated a vision for the future. The central theme of this project is to mold a future where communities can foster their resilience and adaptation through a collaboratively developed methodology that improves access to resources; information on technological advances; adaptation best practices; and assists with intergovernmental bureaucracies. This project would develop a concerted organizational structure linking three existing climate change adaptation projects by Alaska Native Tribal Health Consortium (ANTHC), Alaska Institute for Justice (AIJ), and the State of Alaska. This structure will develop synergy amongst local, regional, state, and federal stakeholders to support rural Alaska Native communities in building adaptive capacity to prepare for, respond to and recover from the impacts of climate change. These adaptation activities are stand-alone projects that combined develop a planning continuum that can be leveraged by the communities for planning and implementation purposes. These three adaptation activities related to climate change effects on social, economic and cultural activities in rural Alaska communities are 1) DCRA's Alaska Community Coastal Protection Project (ACCP), a resiliency planning effort, with Community Inter-Agency Working Groups on "Defend in Place" or Relocation options. ACCP is working with Kivalina, Shishmaref and Shaktoolik (Dropbox:

EXE/E50); 2) ANTHC's Local Environmental Observer (LEO) program which engages communities as front line observers of climate change. (Dropbox: EXE/E51). LEO provides a platform to document impacts through citizen science and exchange information between local observers and experts related to the observation. This program builds capacity for planning and addressing environmental health concerns through opportunities for dialogue with field experts and the science community. This program has been implemented throughout rural Alaska and has observers in Alaska, Canada, Greenland, Washington, Oregon, and Arizona. ANTHC also offers 7 Generations, an interactive training workshop, which introduces a community-based curriculum for developing local environmental plans, raises awareness associated to emergency preparedness and climate change (Dropbox: EXE/E52); and 3) Alaska Institute for Justice has received a \$287,000 NOAA grant to research and develop an adaption methodology template by working with 5 of the 31 imperiled communities identified in the 2009 Government Accounting Office (GAO) report "*ALASKA NATIVE VILLAGES - Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion.*" (Dropbox: EXE/E53)

These activities overlap in some ways but form a planning continuum with a spectrum ranging from identification and monitoring to building capacity and planning then ultimately to implementation. At the early stages of a planning process a community must build awareness. The LEO and 7 Generations programs build community capacity to implement data collection (citizen science) and awareness, but at present don't collect data specifically for the purpose of engaging government officials in developing a methodology for action on climate change impacts. This activity would require funds (see attached budget and schedule) leveraging ANTHC's original investment and ongoing program management costs to develop the next generation of the LEO mobile APP. The development of this new tool would expand environmental and public health event data collection capabilities at the local level. The expansion would include the ability to log geographic coordinates, designate specific transects or polygons of interest and to illustrate with audio, photo or video images. All captured content would be transferred to a web and/or hand held map for analysis and/or sharing to appropriate planners, topical experts or

responders. Features may also include GPS, polygon or track maker (which can be used to map coastal erosion), notifications and scheduling tools. Upon development, the enhancements will be tested within the NDRC targeted areas (first) to supplement the impact of the other proposed NDRC projects. This is particularly important in remote villages of Alaska where the ability to respond to disasters is limited by weather. The 7 Generations program curriculum currently focuses on providing communities with basic awareness of environmental impacts commonly observed in rural communities, including climate change. It introduces them to a community-based planning process that prepares them for and to respond to these impacts. This activity will expand the climate change curriculum and host workshops in all three targeted tribal areas of the NDRC application (Dropbox: EXE/E54).

Following the identification and documentation portion of the continuum a community must build the capacity to monitor and assess the problem. The focus of the Alaska Institute for Justice (AIJ) NOAA grant is to collaborate with five imperiled coastal communities to collect information and monitor impacts of climate change with the specific goal of engaging government officials to take action to address climate change impacts in the community. Their efforts are collaboration between AIJ, ANTHC and the Alaska Native Science Commission. The selection process for these five communities has not been completed. This will leverage the NOAA grant by adding two riverine communities to the scope, adding to the robustness of the research by comparing results for riverine and coastal communities. The two riverine communities will be in NDRC target tribal areas (Dropbox: EXE/E55).

The next step on the continuum is planning. This effort must engage government, community and regional leaders in direct discussion on choices that determine a community's adaptive strategy to either defend in place or relocate. DCRA's Coastal Protection Project is ongoing project in four communities, three of which are in NDRC target tribal areas (Newtok, Shishmaref and Shaktoolik) (Dropbox:EXE/E56). This activity will leverage the commitment DCRA has already made and expand the Inter-Agency Working Group model to other communities in NDRC target tribal areas-Teller and Emmonak.

The last activity is a summary report on the activities funded under this project. The report will develop a written comprehensive methodology that helps communities build awareness through observation and education; develop assessment and monitoring capacity; and engage in a collaborative planning process to evaluate needs and combine resilience measures into alternative plans for comparison. The report will present an evaluation of the effort, detailing the changes in the metrics proposed. The report will be a step-by-step guide which documents the community transition process, from awareness to action. It will be prepared via a professional contract, steered by a committee made up of ANTHC, AIJ, community stakeholders and DCRA. DCRA will serve as the project manager.

Direct metrics for this activity are related to increased community participation; the percentage increase in observations in the LEO system from 2013-2014 baseline of (28%); percentage increase in the number of youth observers; percentage increase in 7 Generations workshops held in prior year(2014); the change in participation rates in the engagement process of the AIJ study and DCRA's community strategy sessions; and ultimately the number of communities that begin an adaptation strategy process beyond currently number (four). Completion of all proposed activities will influence larger metrics for resilience, environmental, social and economic value.

Together, all proposed activities will decrease risks to vulnerable populations and improve community resilience in a number of ways: train local people in the "citizen science" needed to recognize and collect data on climate change and environmental issues; reduce social stresses attributed to a lack of resilience measures; and using a proven stakeholder engagement process, give communities (local, regional, statewide) a clear methodology to assess and improve resilience.

This project is a replicable model for a planning continuum that any community facing future impacts from climate change can use. At least one activity (LEO) is already being used by people in other countries and states. This activity is scalable in that positive outputs and outcomes related to adaptation planning will be achieved even if one or the other components aren't funded. Funds would enrich collaboration between similarly focused programs which would offer more holistic resources to

communities. It incorporates and builds upon these existing programs that have sustaining funding for current operations but without NDRC lack a comprehensive outcome.

This project is very feasible. From an implementation perspective, ANTHC has already successfully implemented both activities throughout Alaska by leveraging their relationships with Native communities and working with experienced software and curriculum developers. AIJ has already begun the NOAA grant using accepted research practices and methodologies in partnership with other agencies. DCRA has been conducting community engagement activities for many years with an experienced planners and local government specialists. This is a planning and research project using existing models. The \$1.48 million budget for this project (Dropbox: EXE/E57) and the schedule of work (Dropbox: EXE/E58) are based on realistic estimates of previous work (ANTHC) and current efforts (AIJ and DCRA). The outputs from this activity (software and the step-by-step process to build a community based adaptation strategy) have no shelf life. They have a continuing usefulness far into the future. Preparation to address risks, rebounding faster from the next event will help each community reduce the threats and hazards of climate change. This project will be a clear, replicable process that can form the basis of national relocation policy and process. ANTHC currently hosts the LEO network on its webpage and maintains the 7 Generations programming. The usefulness of these activities will be maintained as core programming of ANTHC. The results of the AIJ NOAA research project will be maintained in the final adaptation guide produced as a part of this project. DCRA will host the guide on the State of Alaska, DCRA website and use it as part of the stakeholder engagement process for community resilience planning. A minimal amount of resources will be needed to maintain these activities' usefulness over the long run.

Regional Consultation: Representatives from the Alaska and Louisiana NDRC teams met in August of 2015, agreeing to share information, research and outcomes from NDRC projects regardless of funding. Coastal communities in Louisiana and Alaska are dealing with similar issues of displacement by the impacts of climate change. Since 2005, indigenous people of Alaska and Louisiana have met in each

other's homes, evolving a common vision of resettling their communities in the face of environmental catastrophes; climate change and loss of viable homeland; and challenges of relocation. The NDRC presents an opportunity for communities of both states to continue and formalize this relationship; collaborate going forward; and benefit from each other's experiences as they work to preserve community resiliency. Both states have agreed to a series of collaborative efforts that will generate more robust outcomes in each state and provide national policy level benefit (Dropbox: EXE/E59).

In August of 2015, President Obama announced that the Denali Commission will be the federal coordinating agency for research on the environmental dangers facing climate impacted communities in Alaska. The Denali Commission has pledged \$2 million towards this effort and re-affirmed its long standing commitment of coordination with the State on programs and projects (Dropbox: EXE/E60). Coordination and leveraging of Denali Commission funding, with the ANTHC, AIJ NOAA and DCRA activities will add substantial value to this project. Denali Commission findings can be incorporated in these activities. Citizen science produced through the LEO network will provide ground truth data to Denali Commission improving the robustness of their research.

Project 6: Improving Statewide Baseline Geologic Hazards Assessments

A sound, science-based understanding of the natural hazards impacting Alaska communities is an essential first step to building resilience in the face of future disasters. This is particularly important in the backdrop of ongoing climate change in Alaska. Understanding of characteristics and magnitude of geological hazards in Alaska is poor or nonexistent. Repair, mitigation, and remediation of community structures and infrastructure are essentially wasted efforts if that work is carried out without knowledge of the nature and extent of the natural hazards that could damage or destroy them. Community planning and construction to develop true, long-term resilience must be informed by the scientific reality of the conditions under which these projects are expected to perform. This project proposes to carry out baseline geologic hazard assessments for the TCC, AVCP and Kawerak regions with scalable "options" for NDRC project communities only (Galena Newtok, Emmonak, and Teller). This project supports a

successful and sound, science-based approach to Alaska community resilience. Project details, options, budget and scope are provided in Dropbox EXE/E-500 through E-111. This effort complements Project 5 and can be leveraged into Projects 1-4. This is a feasible model using existing state resources including contracted capacity, and is a replicable and model project nationally and internationally. Along with Project 5, a comprehensive improvement in understanding the environment in which we live will provide benefits to all populations, including especially sensitive vulnerable populations. If not performed, there will continue to be a gap in characterizing the risk to population posed by our changing environment.