Native American / Native Hawaiian Museum Services

Sample Application MN-253080-OMS-23

Native Village of Kwinhagak

Amount awarded by IMLS: $100,000
Amount of cost share: $0

The Native Village of Kwinhagak, in partnership with the Nunalleq Museum in Quinhagak, AK, will create a digital museum guide to facilitate on-site visitor experience of the museum's archaeological collection. The digital guide will feature a responsive mobile application containing a selection of interactive 3D artifacts from the collection together with co-curated interpretative content from climate scientists, archaeologists, Yup'ik culture bearers, artists, and elders. Project activities include gathering resources for inclusion in the guide, developing the back-end data structure, prototyping and beta testing the mobile application, and collecting community feedback. As a result, this historically and scientifically significant collection of Yup'ik materials will be better preserved, while also more accessible and engaging for museum visitors.

Attached are the following components excerpted from the original application.

- Narrative
- Schedule of Completion
- Digital Product Plan
- Performance Measurement Plan

When preparing an application for the next deadline, be sure to follow the instructions in the current Notice of Funding Opportunity for the grant program and project category to which you are applying.

Narrative: The Nunalleq Museum 'Digital Guide'

Project Justification

      The Nunalleq project is an ongoing Cultural Resource Management (CRM) collaboration between an international team of academic researchers and the Yup'ik (pl. Yupiit) village of Quinhagak, Alaska. In 2007, village leadership in Quinhagak contacted archaeologists after local Yupiit found ancient artifacts eroding out onto a nearby beach. With support from community Elders, the first excavation field season took place in 2009, and now–13 years later–a total of 9 excavations have revealed an important, precontact ancestral site (c. AD 1570-1675) threatened by coastal erosion and permafrost melt. Today, the Nunalleq collection represents the single largest collection of Yup'ik material culture in the world, and, in 2018, nearly 100,000 artifacts were returned to Quinhagak after preliminary conservation at the University of Aberdeen. These artifacts are now housed in the newly formed Nunalleq Museum, which is owned and operated by Quinhagak's ANCSA village corporation Qanirtuuq Inc (Q-Corp). Our proposed grant will promote access to this museum through the creation of a digital 'guide' containing a selection of interactive 3D artifacts from the Nunalleq collection together with co-curated, multivocal interpretive content from climate scientists, archaeologists, Yup'ik culture bearers, artists, and Elders. In this manner, our proposal promotes access to the Nunalleq Museum by combining past recorded Yup'ik subsistence knowledge (lit. Yuuyaraq: "the way we genuinely live"), Elder wisdom (lit. Qanruyutet: "Wise words of wisdom"), and archaeological insight into a unified application for on-site learning in Quinhagak.

      The Nunalleq Museum is unique because the collection consists of material culture that was excavated, conserved, and housed on Yup'ik land. The collection resides in Quinhagak and is owned by the village. In this manner, the Nunalleq Museum stands in opposition to colonial models of museum curation that have extracted Yup'ik material culture via expedition to send artifacts to museums in Berlin, New York City, and Washington, DC. As Qanirtuuq CEO Warren Jones notes in a 2022 interview about the Nunalleq excavation and Culture Center: "We're all very proud of what we've done. No other community we know of has done [this] for future generations, and it'll always be here in Quinhagak." At the same time, however, the goal of the Nunalleq Museum has not been fully realized, since the focus has–up to this point–been largely concerned with excavation, conservation, and cataloguing. To this end, the Nunalleq Museum is currently divided in two: a field lab on one side, and a collections room on the other (Figure 1). During July and August the museum is occupied by a visiting team of researchers and archaeologists who are on hand to give tours to visitors. During this time the

Figure 1: The lab and collections room in the Nunalleq Museum in Quinhagak.

museum also hosts workshops where young Yupiit learn about items in the collection from Yup'ik culture bearers, many of whom do not reside in Quinhagak (Figures 2-3). In the off-season, the museum is manned by a local custodian who can open the building and supervise visits as requested.

Figure 2: Images from interpretive sessions with culture-bearers and Elders in the Museum.

Figure 3: Batista's drum making workshop in August 2022. The group worked collaboratively to make a traditional walrus stomach drum inspired by the Nunalleq collection and each student also made their own fabric drum.

Since 2017, the Nunalleq project has worked to develop a series of digital products to communicate knowledge about the collection to a wider global audience online (Figures 4 and 5). However, these outcomes do not address the challenge of intuitive and engaging onsite interpretation within the museum. This is much needed, especially during the fall, winter, and spring when curatorial expertise is not available. Creating onsite interpretation for this collection is thus vital for wider engagement and dissemination, but it is equally important that it is completed together with the local community so that the result is considerate of –and responsive to– local needs and values. In response, the Native Village of Kwinhagak (NVK) proposes a digital museum guide created in consultation with Nalaquq, LLC, a subsidiary of Q-Corp tasked with designing custom CRM solutions for Yup'ik coastal villages (see: supportingdoc6.pdf). This unique collaboration will allow community members in Quinhagak the opportunity to help craft a museum resource that draws explicitly from over 15 years of collaborative, community-based research between tribal entities and academic researchers.
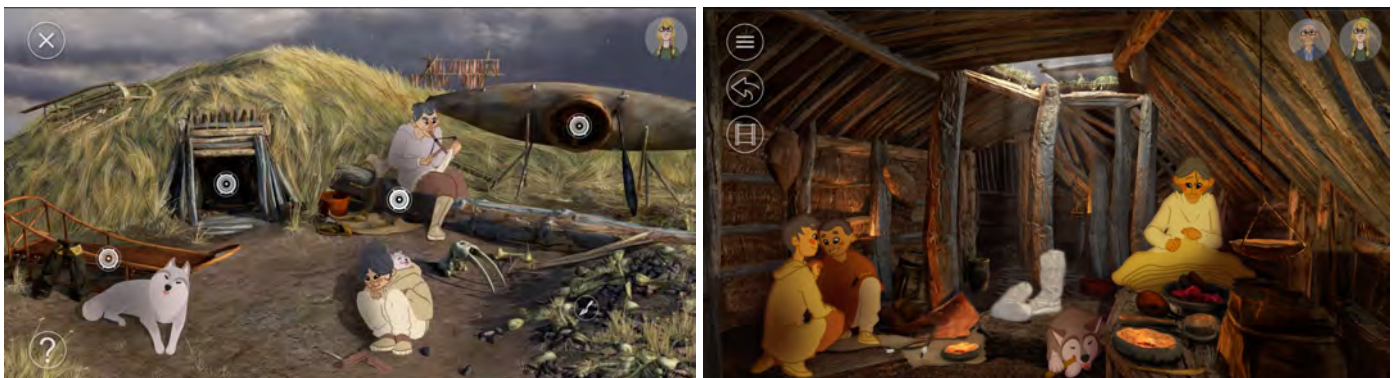
Figure 4: Screenshots from the community co-designed Nunalleq Educational Resource (2019) which can be downloaded for free at www.seriousanimation.com/nunalleq
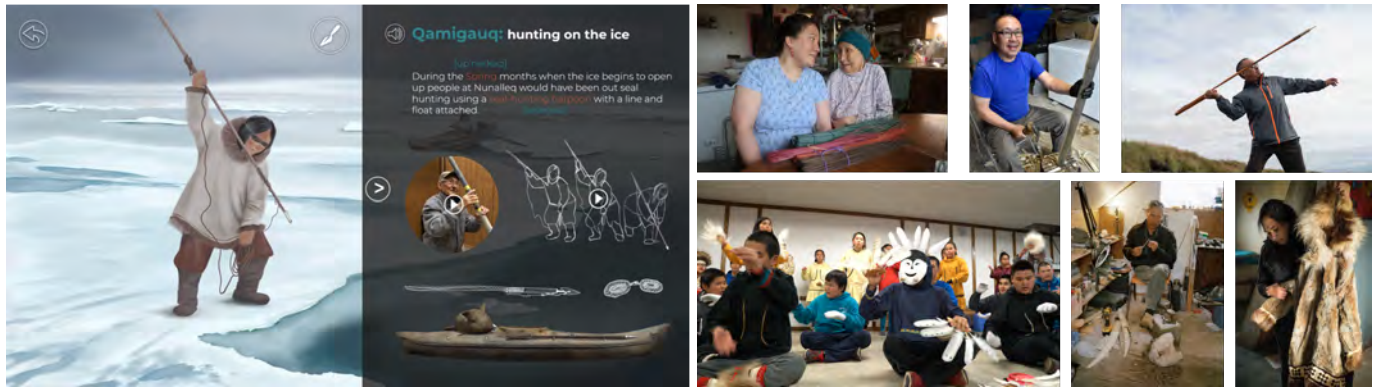

Figure 5: Concept art for the upcoming Nunalleq Digital Museum & Catalogue (due for release in 2023) and images showing the range of local voices contributing to the narratives around Nunalleq, which bring a range of contemporary lived experiences and traditional knowledge to the archaeological collection.

In sum, we believe our proposal will strengthen services provided by the Nunalleq museum in the following ways:

- Our digital museum guide will combine digital assets from past products created in conjunction with the University of Aberdeen into a mobile application for the Nunalleq Museum. This is important since past projects have been intended for off-site use, or have embraced web-based frameworks, which are difficult to use in Quinhagak given the lack of robust broadband internet access through the Y-K Delta.
- Our digital museum guide will expand existing digital products through the collection of additional interviews and photogrammetry products.
- The project builds capacity for museum tours through the construction of an app that will be uploaded to tablets thereby supporting the local custodian when giving tours of the collection.
- The project and its outcomes will be co-designed and co-curated with the community during meetings over the summer archaeological/conservation field season (July-September 2023) and the winter "freeze up" time period (February 2024). During these meetings community members and village leadership will have the opportunity to help craft the user experience, determine the scope of the application, review prototypes, contribute interviews for the application, and offer feedback on the overall design and implementation.
- This project will strengthen relationships between tribal constituencies in Quinhagak tasked with the care and maintenance of the Nunalleq Museum including Q-Corp, Nalaquq, NVK, and the nonprofit entity Quinhagak Heritage Incorporated (QHI) (see: supportingdoc5.pdf).
- The project will hire local creatives and technical experts to assist with documenting Yup'ik traditional knowledge and incorporating Yugtun language components (see: Projectstaff.pdf).
- The digital guide will feature a custom real-time object detection framework to identify items in the Museum collection (see: Supportingdoc4.pdf). This approach has been used by Nalaquq on past projects, and allows users to use the embedded camera of a tablet or cell phone to detect predetermined features within an image. After training this custom neural network on existing images of the Nunalleq collection, researchers at Nalaquq will design a process workflow that queries the digital guide's database for relevant digital assets (e.g., video/audio/text files, 3d models, etc). This feature will allow individuals to explore the collection at their own pace, and can be scaled to mobile cell phone applications in the future.
- Nalaquq–as a local contractor with established connections in Quinhagak– will offer free workshops during the data collection stage (July-September 2023) for Quinhagak youth interested in learning more about app design, conducting recorded interviews, and 3D photogrammetry.

Our solution–in the form of a digital guide–is designed in response to the economic circumstances and logistical constraints of Yup'ik coastal villages, notably limited broadband internet access. Thus, our core target group is the Yup'ik village of Quinhagak (pop. 798). Yet, our beneficiaries include future Yup'ik generations who will learn about how traditional subsistence knowledge from ancestral sites like Nunalleq has endured over generations despite the effects of

colonialism. Finally, our proposal will help tribal entities in Quinhagak develop a product that can be adopted for future museum projects in rural, circumpolar Indigenous villages that lack the necessary infrastructure for web-based products.

Project Work Plan

The project will begin on July 1st of 2023 and continue until June 30th of 2024. Our proposed timeline includes six phases designed to mitigate risks and encourage collaboration from Yup'ik community members in Quinhagak:

Phase 1: Project Planning & community feedback (July 2023)

The project director (Sean Gleason), project manager (Lynn Church), and other key team members including archaeological consultants (Rick Knecht, Charlotta Hillerdal, and Alice Watterson) will meet in Quinhagak to clarify roles, responsibilities, and timelines. Representatives from Nalaquq and NVK will decide on a preferred Content Management System (CMS) to communicate project updates and share resources. The project director will introduce the project to the village of Quinhagak through focus groups with Nunalleq museum staff and volunteers. Yupiit in Quinhagak will have the ability to offer guidance about overall project design and outputs during community meetings at the end of July. Finally, the project director will work with a Yup'ik computer scientist from Quinhagak (Lonny Strunk) to conduct network connectivity tests within the Nunalleq Museum to determine the extent to which web-based APIs can be integrated into the digital guide.

The primary objective of this phase is to determine which existing digital assets should be included within the museum guide, decide on the number of new assets that must be added, and make important decisions about the network architecture for the digital museum guide. During this phase Nalaquq, LLC's subcontract includes funds to cover travel and lodging for key staff in Quinhagak, lead focus groups/community meetings, and prepare visual aids and oral presentations to communicate the scope and aims of the digital museum guide. The primary risk to completion of this phase is that it will occur during the summer subsistence and commercial fishing seasons, which is the busiest time of the year in Quinhagak. To mitigate this risk, the Project Manager (Lynn Church) will schedule meetings during bad weather days whenever possible, and work to complete the community meetings after the King salmon run, but before the summer berry picking season.

Phase 2: Data Collection & on-site fieldwork (August-September 2023)

The project director (Sean Gleason) will coordinate on-site data collection at the Nunalleq Museum with key staff members to produce additional digital assets for the museum guide. Nalaquq's archaeologist/visual artist (Alice Watterson) will scan selected artifacts to create 3D models. The project director, local photographer/videographer (Jacki Cleveland), and archaeologist/visual artist will also conduct recorded (mp4, .wav) interviews with community members and researchers about items in the collection. Finally, the project manager will coordinate training sessions and workshops for young Yupiit interested in learning more about recording interviews, photogrammetry, museum conservation, and computer science.

The purpose of this phase is to translate the knowledge shared with community members during tours into enduring digital assets that can be used when archaeologists or Yup'ik culture bearers are not physically present in the Nunalleq Museum. Costs associated with this phase include compensation for the project's photographer and visual artist, housing/food for visiting staff, and equipment rental/purchase to create the digital assets. To mitigate the risk of duplicating prior work or knowledge, the project director and consulting archaeologists will cross reference new proposed digital assets with items already owned by the Nunalleq Museum.

Phase 3: Database construction, application architecture, and preliminary UI design (September 2023-January 2024)

At the conclusion of the summer field season, the project director, project manager, and computer scientist/Yugtun linguist will determine the number of digital assets to include in the museum guide. Next, the project director and computer scientist will construct a non-relational database to collate new and existing digital products. Once the database is complete, benchmark tests will determine the efficiency of different query types, and a network/application architecture will be selected based on the total size of all assets. At this stage the project director will train an object recognition algorithm on existing photographs of the Nunalleq collection, while the project's visual artist designs concept art for the preliminary User Interface (UI). Nalaquq will reduce costs at this stage by conducting remote work during this portion of the project.

Phase 4: Community feedback & revision (February 2024)

Once concept art, application architecture, and UI prototypes have been developed, Nalaquq will facilitate community meetings to gather feedback and help community members co-construct the final project . The project manager and director will prepare oral presentations and distribute visual aides containing wireframes (i.e., mock-ups) of the museum guide. Nalaquq will conduct focus groups in both Yugtun and English to ensure that: 1) the application architecture and UI

meets community needs, and that 2) individuals have the opportunity to offer feedback in the language of their choice. Finally, Nalaquq will conduct recorded interview sessions in Yugtun and English, so that meeting participants can add their voice to the guide. The costs associated with this portion of Nalaquq's subcontract include travel for the project director, lodging, recording interviews, and select Yugtun translations/transcriptions.

Phase 5: Application prototyping and beta testing (February 2024-May 2024)

There are unique and specific risks associated with designing digital products for village life in the Y-K Delta, notably intermittent power outages, internet disruptions, and infrequent software/hardware update cycles. To mitigate these risks, Nalaquq will employ staff who have experience designing both web and mobile applications for rural Alaskan Native communities. In addition, during the fifth stage of the project the project director and project manager will work to refine the architecture of the digital museum guide to ensure that it operates efficiently within the Nunalleq Museum. Specifically, the project manager will test the guide to ensure that the object detection model works accurately within the museum, and that the design is responsive across devices. This period of beta testing will allow the Nalaquq team the opportunity to mitigate potential risks: 1) by using QR codes should the object detection model produce inaccurate results, and 2) restricting publication of the guide to microsoft surface tablets if the application is not responsive across different devices and operating systems. Costs associated with this stage include handheld tablets, tablet accessories, and signage for the guide.

Phase 6: Deployment (June 2024)

Nalaquq will utilize the 2024 archaeological field season to introduce the digital museum guide to the community through in-person workshops. In addition, Nalaquq will offer in-person training and a visual workflow document for the local Museum custodian. Finally, Nalaquq will archive the digital guide on cloud-based servers and publish relevant APIs, code, and databases for public use (see: Digitalproduct.pdf) .

Project Results

This project is specifically aimed at extending the collaborative model for community-based inquiry that has typified the Nunalleq project for over a decade. Thus, NVK and other relevant constituencies have developed a Logic model to determine appropriate activities, outcomes, and results (supportingdoc5.pdf). More information about our workflows and outcomes is also included in our digital products plan and supplementary attachments.

Short & Medium term Objectives & Impacts:

- Reduce handling of the collection during tours.
- Continue 3D scans of relevant items within the collection to increase total to 750 total items scanned.
- Develop a database of current and new digital assets for the Nunalleq Museum.
- Design a computer vision model that can recognize items in the collection and retrieve relevant digital assets.
- Conduct testing and planning about internet connectivity at the Nunalleq Museum.

Long-term Objectives & Impacts

- Empower local Yup'ik to contribute to the Nunalleq Museum through community meetings, employment, and technical skills training.
- Construct an inventory of digital assets for the guide that can be owned and archived by Q-Corp and NVK to strengthen Yup'ik data sovereignty.
- Contribute to tribal, state, regional, and national knowledge bases about best practices for creating progressive mobile applications that provide robust services to rural Alaskan Native villages who lack internet and cellular connectivity.
- Develop a digital museum guide that is scalable, efficient, and compatible with future development environments and services.
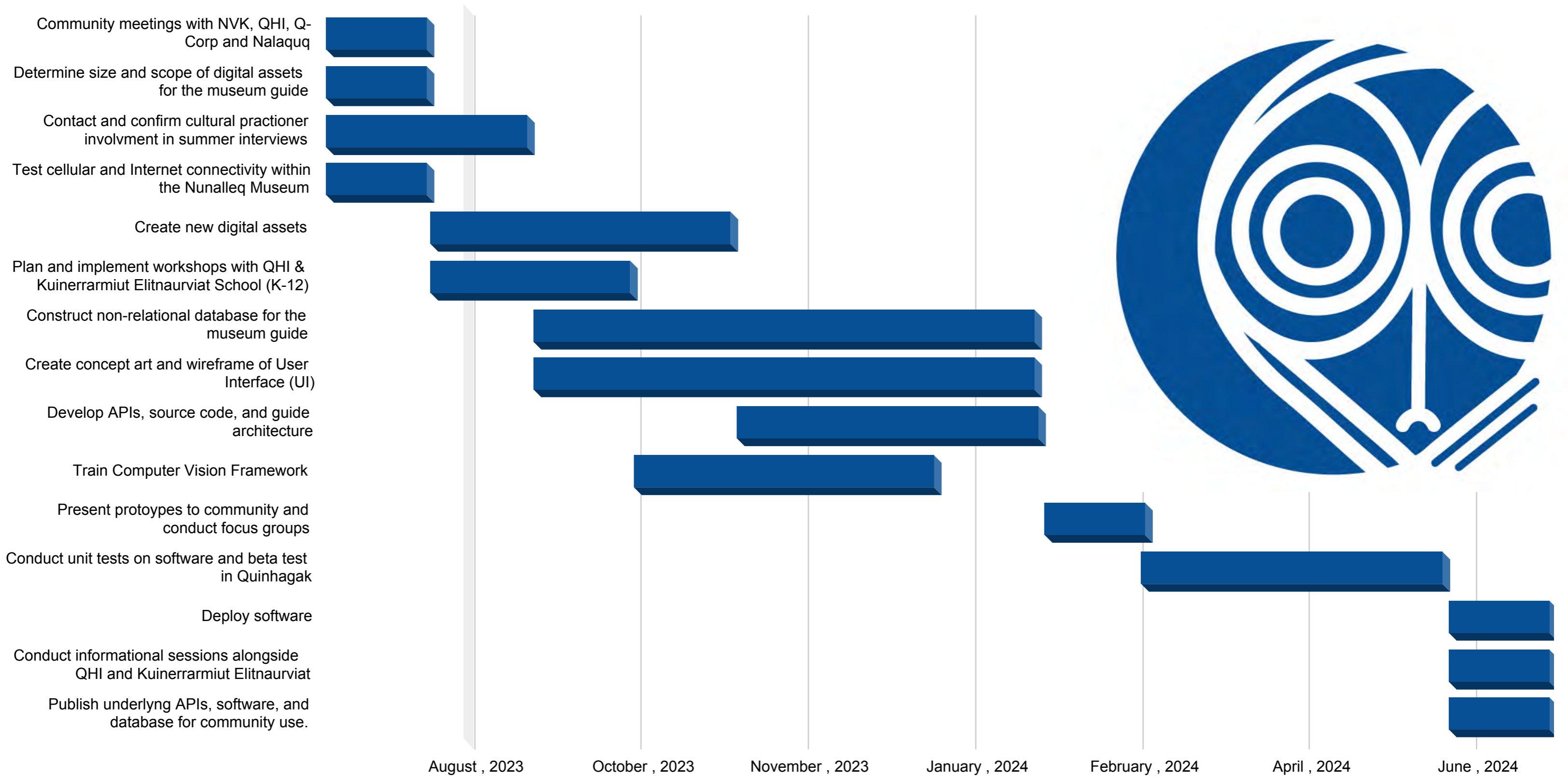
We envision a product that allows users to stand before an item in the collection, capture an image of the object using a digital device, and then learn about the collection from digital assets containing 3D models recordings of Yup'ik culture bearers, other community members, and academic researchers. We believe that such a product will aid language and cultural heritage preservation efforts for Yupiit. Finally, we believe that the Nunalleq digital museum guide will offer important resources for other rural Indigenous museums constrained by limited cell and internet service through the RESTful APIs and code bases we will publish in conjunction with this project.

The Nunalleq Digital Museum Guide
Schedule of Completion
July 1, 2023 - June 30, 024

The Native Village of Kwinhagak

Activities

Activity	Timeline
Community meetings with NVK, QHI, Q-Corp and Nalaquq	
Determine size and scope of digital assets for the museum guide	
Contact and confirm cultural practioner involvment in summer interviews	
Test cellular and Internet connectivity within the Nunalleq Museum	
Create new digital assets	
Plan and implement workshops with QHI & Kuinerrarmiut Elitnaurviat School (K-12)	
Construct non-relational database for the museum guide	
Create concept art and wireframe of User Interface (UI)	
Develop APIs, source code, and guide architecture	
Train Computer Vision Framework	
Present protoypes to community and conduct focus groups	
Conduct unit tests on software and beta test in Quinhagak	
Deploy software	
Conduct informational sessions alongside QHI and Kuinerrarmiut Elitnaurviat	
Publish underlyng APIs, software, and database for community use.	

Timeline axis: August , 2023 — October , 2023 — November , 2023 — January , 2024 — February , 2024 — April , 2024 — June , 2024

Duration in ■ Days

Digital Products Plan

What digital products will you create?

This project supports the development of a 'digital museum guide' for on-site interpretation for the internationally significant but remotely located Nunalleq archaeological collection. This will be realized through co-curation between the local Yup'ik community and Nunalleq archaeologists of an interactive tablet application containing a selection of digitized artifacts from the collection paired with multivocal narratives and interpretive imagery. The database will consist of 750 3D scanned artifacts in .gbl and/or .obj format, high-res photographs as .jpeg, accompanying multi-vocal narratives as .wav audio files and .mp4 video files at 4K resolution. The types of media created through this project have been selected with consideration of the core audiences for the resource which include general public, Indigenous communities and school groups all of whom will be able to examine the artifacts without causing damage and wear to the originals.

Although the digital museum guide is the final product, we will also create a number of valuable resources for other developers interested in serving Indigenous, and particularly Yup'ik, populations. First, our digital guide features a custom computer vision algorithm (supportingdoc4.pdf) designed to assist museum guides identify objects in the collection. Second, the mobile application will utilize a non-relational database of all digital assets (video/audio files, 3D models, etc) of the Nunalleq collection as well as photographs of the collection. Finally, both the non-relational database and object-detection framework will be through RESTful APIs at the conclusion of the project.

Availability

The data and digital assets created for this project will be generated in consultation with the local community for a specific public reach outcome. As such, the material will be freely available for the general public to view and download for use within the museum as part of the guide. Moreover, the application itself will utilize open source frameworks and libraries, and the source code will be made available to the public via Github, Docker, and other relevant distribution services. Application architecture and program implementation may also be published in open-access journals at the discretion of NVK, QHI, Q-Corp, and Nalaquq. These parties will decide the governance procedures for the reuse of data including digital assets and Traditional Knowledge (TK). The criteria stipulated for the long term access and reuse of this data will be recorded in collaborative agreements between Yup'ik leadership in Quinhagak and individual repositories/archives.

Sustainability

Given the lack of broadband access in Quinhagak, a mobile application for the digital guide will be created using the Electron framework and will be identical in every respect and functionality to a web application. Moreover, the museum guide will be installed on offline tablets meaning it will not require frequent software updates. In agreement with Nalaquq, however, subsequent versions of the digital museum application and associated project materials (including full length unedited interviews, etc.) will be archived on Nalaquq servers long-term and select assets from the collection will be archived using a CMS platform designed to facilitate Indigenous Data Sovereignty (https://mukurtu.org). In addition, the non-relational

database and object detection framework created for the museum guide will be archived via RESTful web APIs, so that developers can utilize them for future web applications.

The digital museum guide will be created using an underlying structure of semantic markup to record the provenance and knowledge about the individual data. This will ensure that the integrity of the knowledge is preserved independently from other aspects of the design through a rigorous separation of content, document structure, visual style, and program logic. This will safeguard the content and structure of the digital museum should it be overhauled and modernized in the future and content reused. Archived data will not exceed 5TB, so long term storage costs will be minimal. Appropriate metadata will be applied to the datasets held in the static website to aid discovery (i.e. title, creator(s), publisher, grant award information, size, keywords/subjects, a DOI, publication date, licensing, associated publications and the ORCiDs of the creators). Preservation formats have been selected for all data to facilitate interoperability with other systems and ensure long term access. Additionally, a landing page describing the museum guide and associated archive files assigned with a DOI will be preserved within the repository in perpetuity.

Applicant Names: The Native Village of Kwinhagak (NVK)
Project Title: The Nunalleq Museum Digital Guide

Performance Measure	Data We Will Collect (e.g., counts, costs, weights, volumes, temperatures, percentages, hours, observations, opinions, feelings)	Source of Our Data (e.g., members of the target group, project staff, stakeholders, internal/ external documents, recording devices, databases)	Method We Will Use (e.g., survey, questionnaire, interview, focus group, informal discussion, observation, assessment, document analysis)	Schedule (e.g., daily, weekly, monthly, quarterly, annually, beginning/end)
Effectiveness: The extent to which activities contribute to achieving the intended results	1. At the end of the summer field season (July-September 2022) Nalaquq, LLC will prepare a written document and short oral presentation for tribal leadership at the Native Village of Kwinhagak (NVK), Qanirtuuq Incorporated, and Quinhagak Heritage Incorporated (QHI) to report the number of interviews conducted and artifacts digitized. 2) Before our winter meeting (February 2024) Nalaquq will create a visual representation of the collections database to communicate the number of artifacts, interviews, and oral histories included within the digital guide. 3) In preparation for the winter community meeting, Nalaquq will craft a preliminary wireframe of the User Interface (UI) to distribute to community members for feedback. Interviews, informal discussions, and focus groups will be conducted by Sean Gleason and Lynn Church to gather suggestions about design and implementation. 4) By the end of April 2024 Nalaquq will conduct benchmark tests on the object recognition framework for artifacts to estimate the accuracy of the algorithm and the speed of detection in terms of Frames per Second (FpS). 5) By the end of June 2024 our team will have installed the requisite software and hardware within the Nunalleq museum. 6) By the end of June 2024 our team will have trained the Nunalleq Museum custodian to introduce the digital guide to visitors.			
Efficiency: How well resources (e.g., funds, expertise, time) are used and costs are minimized while generating maximum value for the target group	1) NVK will subcontract the majority ($87,000) of the proposed award to Nalaquq, subsidiary of Qanirtuuq Incorporated (Q-Corp). Doing so will reduce costs by limiting travel funds for in-person community meetings, progress reports, and training. Furthermore, this will increase transparency and open lines of communication since Q-Corp owns the collection and is thereby charged with the care and maintenance of the Nunalleq Museum. 2) Nalaquq will empower local expertise by employing a photographer and computer scientist from Quinhagak. This will reduce costs associated with on-site work in the village. 3) Nalaquq will leverage existing Memorandums of Understanding (MoU) with Hampden-Sydney College and the University of Aberdeen to secure the necessary equipment and software to conduct/edit interviews for the digital museum guide as well as existing digital assets. This will reduce costs by approximately $40,000. 4) Our proposal includes a mobile app design that can be utilized without internet access. Doing so will provide an efficient and cheap framework for the Nunalleq museum that is tailored for connectivity issues that plague rural Alaskan villages.			

Quality: How well the activities meet the requirements and expectations of the target group	1) We will conduct a community planning session at the beginning of the summer field season (July 2023-September 2023) to gather additional feedback about the artifacts to be scanned and interviews to be completed. 2) We will present concept art and 3D models for feedback (September-January) during online and in-person community meetings in Quinhagak Alaska. 3) We will present the User Interface (UI) for the digital museum guide to tribal leadership and community volunteers during in-person winter "freeze up" meetings during February 2024. Focus groups with Nunalleq Museum volunteers and community members will allow us to refine the user interface to ensure that it is easily used by visitors in both English and Yugtun.
Timeliness: The extent to which each task/activity is completed within the proposed time frame	1) Nalaquq will hold weekly project team meetings to synchronize on-site and remote workforces. 2) Every month representatives from Nalaquq will meet with NVK to present accomplished tasks and update leadership about the overall progress of the project. 3) At the conclusion of each major milestone, which are detailed in the Schedule of Completion, Nalaquq will meet with representatives from NVK, Qanirtuuq Incorporated, and Quinhagak Heritage Incorporated to update each constituency and solicit feedback.