Developing art-based cultural experiences in North Kohala:
A community engagement project with OneIsland

by

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# List of Abbreviations

AGOL        ArcGIS Online

CDP         Community Development Plan

DEM         Digital Elevation Model

GIS         Geographic information system

GISci       Geographic information science

LC          Listening Circle

NKACWA      North Kohala Arts and Culture Web Application

PPGIS       Public Participation Geographic Information Systems

SSI         Spatial Sciences Institute

TMK         Tax Map Key

USC         University of Southern California

UX/UI       User Experience/User Interface

# Abstract

North Kohala, the northwestern district on the island of Hawai`i, does not have its own local government as is common in other states in the union. In the State of Hawai`i, the lowest level of local government is County, of which there are five, each made up of one or more islands. Thus, community development and other policies in North Kohala are governed by its Community Development Plan, which outlines and provides guidance for development within this district, overseen by the County of Hawai`i. The community of North Kohala desires to develop guidelines and policies that will augment the vitality of arts and culture facilities and activities within their district. A non-profit organization focused on sustainability and community building, OneIsland, has been funded to assist by garnering community support through involvement in the planning process. OneIsland intends to use Geographic Information Systems (GIS) and associated technologies such as Esri's ArcGIS Online (AGOL); however, as an organization, they focus on sustainability and community building and do not have technical support. As such, they needed assistance to create a web-based mapping tool which can be used to facilitate communication during community involvement sessions called Listening Circles (LCs).

This thesis focused on creating a web map application that OneIsland could use to collect community input regarding the locations of future arts and cultural events and establishments in the district. The application needed to be simple non-web programmers and general public internet users to operate and manage while incorporating local artistry in the form of icons and a splash screen map. A workflow was generated for OneIsland to follow until they had become familiar with the platform used. Use tests with OneIsland and two unrelated naïve users indicated that the web map application and supporting workflow were simple to use and follow while still allowing OneIsland to collect community input.

# Chapter 1 Introduction

On the island of Hawai`i, the Community of North Kohala has a Community Development Plan, or CDP, that outlines the vision, goals, and other key development elements for the District. The preservation of sites with cultural and social importance remains an important consideration of government action in Hawai`i. The vision for the Community of North Kohala is detailed at the opening of their CDP:

> We are a community that respects, preserves and honors our history, our land, and our diverse culture. We value access to our shores, our forests, and our streams.
> We have a broad range of programs for our youth that includes work on the land. We have good social services, recreation, health, and education.
> We are friendly and hard working people, which enables us to continue to build our small businesses and create jobs as part of our sustainable economic development.
> We have a strong community voice in the development of affordable housing, the use of our land, and the development of alternative energy sources.
> 'Ohana and the Spirit of Aloha are the foundations of our community (County of Hawai'i, Townscape Inc., and the North Kohala Community 2008, 3).

The connection between the people, the land, and their history is clear in their community vision. The goal of the CDP is to "manage the future growth of the district in a manner that is consistent with the Kohala lifestyle and ideals of being a community with a strong cultural heritage, an agricultural base, and a small town feel" (North Kohala CDP 2008, 19). The Kohala lifestyle, according to the CDP, is based on sharing between each other, reliance on available natural resources, and coming together as a community when and where help is needed.

The CDP acts not only as a road map for the goals of the community but is also a County ordinance, which gives the plans detailed in the CDP the "force of law" (County of Hawai'i, Townscape Inc., and the North Kohala Community 2008, 5). North Kohala has also been designated as a Cultural and Historical Preservation Community by the Historical Sites and Cultural Preservation Subcommittee of the County of Hawai'i Planning Department. This

designation affects the process by which land development is approved and carried out. No districts in the County have yet generated a cohesive plan or way to carry out cultural development objectives of their CDPs. OneIsland, a self-described non-profit organization dedicated to promoting sustainability and culture, has involved themselves in the process through applying for and being awarded grant monies to finance their assistance to the community of North Kohala.

OneIsland intends to achieve their goal of developing the arts and culture by involving the community in the decision-making process. For prior projects, OneIsland has used large printed maps and sticky-backed notes to collect community input. The results of this process cannot easily be shared with a larger audience and are difficult to save and compare across many meetings. Using an interactive map allows the results to be easily shared, saved and compared. Cloud-based GIS software is becoming more common and more user-friendly as technology advances; this alleviates OneIsland's need to have extensive experience with GIS before utilizing its available functionalities in a community involvement project. However, OneIsland does not have even basic experience with GIS or mapping in general and needs assistance creating a web mapping tool that they can use to collect community input and is simple to use.

## 1.1. Preserving Culture in Hawaiʻi

As outlined in the North Kohala CDP, maintaining community goals and preserving aspects of culture that are inherently Hawaiian is important. OneIsland strives to maintain focus on that topic by incorporating community-generated opinion and information into the decision-making process with regard to the arts and culture in North Kohala. The following subsections give a brief introduction to the impacts that Western and American culture had on the development of Hawaiʻi from the arrival of the missionaries in 1820 through to its statehood in

1959. By acknowledging this cultural background, OneIsland intends to deepen community

dialog during this development project. To understand how best to move forward, a look at the

past detailing the actions which led to the current societal structure is necessary.

*1.1.1. The Americanization of Hawai`i*

Hawai'i has experienced the injection of American culture into its indigenous culture

since approximately 1820. It began with religious missionaries from the mainland traveling to

the island chain, spreading not only Christianity but Western education and ideals (Okamura

1980, 120). The shift from traditional religious practices to Christianity was accompanied by an

increase in education and followed by an event known as the Great Mahele (Okamura 1980, 120-

121). The Great Mahele occurred in 1848, splitting the lands of Hawai'i into four categories

based on who could own the land, allowing private citizens to obtain ownership of land

previously under the purview of only the King (Borreca 1999). Approximately one-third of the

land remained in the King's possession and the remaining two-thirds was divided between the

government, chiefs, and tenant farmers (Levy 1980, 854). Following this division, the Kuleana

Act was put into effect, allowing for fee simple transactions of the divided landholdings as

opposed to requiring historical or cultural ties to the land, the previous condition for land

acquisition. Following that legislation, most of the land was purchased by people from the

mainland and used for sugar production (HawaiiHistory.org, no date; Okamura 1980, 121). The

politics of Hawai'i took on a more Western-based structure with the generation of a

constitutional monarchy, House of Nobles, and House of Commons in 1840, and universal

manhood suffrage in 1852 (Okamura 1980, 121).

The Western values and practices influencing Hawaiian culture culminated in the

controversial ending of the Hawaiian monarchy in 1893, though Hawai'i would not obtain

statehood until 1959. The changes in religion, government and politics, economy, and education had stemmed from increased Western involvement, and the imported ideals were adapted to dovetail with Hawaiian culture (Okamura 1980, 121). Even with the cultural changes occurring over a relatively short period of time, there are still inherently Hawaiian ideals and feelings that have a bearing on society, namely *aloha kanaka* and *aloha 'aina*, which, simply put, mean "love of the people" and "love of the land," respectively (Okamura 1980, 121-122). These values extend past appreciation and value; rather, the love of people and the land implies that this combination present in the Hawaiian Islands cannot be found elsewhere and must be appreciated and maintained (Okamura 1980, 131-132).

*1.1.2. OneIsland's goals*

Maintaining a distinct, unique combination of culture and values is a daunting process for a community on its own; obtaining help from an organization dedicated to community building lends direction and support to the community. OneIsland is a non-profit organization focusing on generating stronger communities through arts, culture, sustainability, and other goals (OneIsland.org). They have assisted communities with "local food system strengthening, art and culture place-making events, renewable energy/green building, watershed protection, green economy incubation, and health and wellness efforts" (OneIsland.org, no date). The 501(c)(3) non-profit Heritage Ranch, Inc. established OneIsland in 2008, beginning with a project to generate a community service program and create a place to educate the community through sustainability demonstrations.

With over $2.8 million in funding to date, OneIsland has a reach into communities not only in Hawai`i, but in Washington and California with the same intention: to foster the growth of communities with sustainability and the environment in mind (OneIsland.org, no date). As

part of reaching its sustainability and community goals, OneIsland has offered over 250 different informational events and they provide materials about their most successful events to help other communities or groups offer similar ones. To maximize community inclusion, they use Listening Circle (LC) meetings, which enable community members to voice their opinions on a given topic, in order to support collaboration between different groups contributing to their projects.

OneIsland has become involved with the community of North Kohala to assist in executing the arts and culture portion of their CDP. They intend to assist by increasing community involvement in decision-making conversations and intend to use GIS to facilitate their goals. Using Esri Story Maps to catalog oral histories from elders and generate a collection of past cultural events linked to locations within North Kohala would bring the past to life. Additionally, a crowdsourcing application reflecting current events and locations that indicate the culture and art scene within North Kohala would allow community members to access and upload data about what is currently happening and where it is occurring within the district.

Finally, and most importantly, OneIsland wants to collect community input and opinion with regard to what they want to see for the future of arts and culture in North Kohala and where they want to see it occur. The focus of this project is supporting this third goal, providing the container within which OneIsland can not only hold the data generated by the community and display it on a map for ease of communication but also to hold data that will aid in LC meetings. This will allow community participants to see important factors for their consideration such as roads, zoning areas, and current land uses at the parcel level.

## 1.2. North Kohala's Governance and OneIsland's Involvement

North Kohala is the northwestern district on the island of Hawai`i, the largest island in the Hawaiian archipelago. It comprises an area of 125.5 square miles and has a population of

6,322 as of 2010 (The County of Hawai'i, Townscape Inc., and the North Kohala Community 2008, 1; U. S. Census 2010). This part of the island is home to many sites of historical importance, including ancient temples and altar sites. Figure 1 displays the study area and surrounding area.
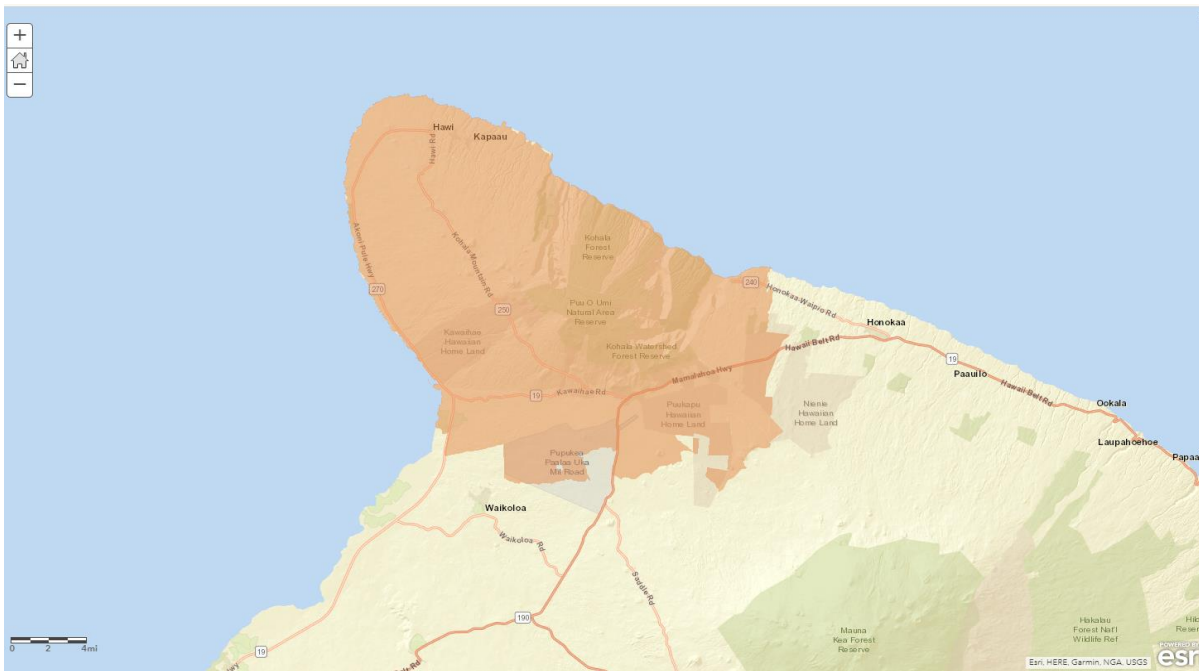


Figure 1. The study area: the district of North Kohala and portions of adjacent districts, shown in light orange.

The governance of individual districts within counties in the State of Hawai'i is unique among the 50 United States since there are no municipal governments; instead, districts are guided by a CDP. The County of Hawai'i has a Council of elected members responsible for generating legislation for the county, as well as a mayor. As such, the CDP is considered a county ordinance and contains legally binding policies, as well as policies that are to be treated as guidelines and are not legally binding (The County of Hawai'i, Townscapes Inc., and the North Kohala Community 2008, 4). There are few guidelines and no precedent in any CDP for fostering the arts and culture within the community; OneIsland is looking to set that precedent so other districts can follow or improve upon the actions taken in North Kohala (OneIsland 2017,

personal communication). The heart of OneIsland's project is to generate community involvement through LCs. Collecting the information from those meetings and opinions of the community in a web map application that also facilitates the communication of that information at other LCs or to decision-making bodies gives the community a voice. The container into which OneIsland will place this data is inherently spatial and using GIS to support their goal will minimize the effort needed to communicate opinions and information between interested parties while maximizing the involvement of the members of the community.

## 1.3. Objectives of this Project

Previous similar projects that OneIsland has conducted relied on large, printed maps on which citizens could place sticky-backed notes to demonstrate locations they were interested in. The resulting paper map is not dynamic and cannot be changed or updated as new information comes available. Also, the results cannot be shared accurately outside of the LC meeting and data between various LC meetings cannot be compared.

Thus, to involve the community more deeply in the planning process for developing the arts and culture in North Kohala, OneIsland decided they need an easy-to-use interactive mapping tool with data loaded into it that will spark and inform discussions during LCs. Additionally, the interactive tool needs to allow the uploading of data generated during individual LCs for comparison and further discussion. However, community members and even OneIsland staff do not have the required body of knowledge to create these tools. To fill that gap, this project provided that required experience with GIS and online mapping applications so that OneIsland can facilitate the community to express their desires for the future of their district.

OneIsland has a different timetable for completion than the required timeline for this thesis; at the completion of this project, the first LC meeting has not yet taken place. The focus

of this thesis was designing and implementing a web map application for OneIsland to collect community input that is simple to use and incorporates art generated by a local artist, not on the actual use of the web map application during the LC meetings. While having a use test would have been beneficial in determining the usefulness of the web map application in real time, it was not a realistic aspect of this thesis given OneIsland's extended time frame for completion of their project.

A Web Application was created that holds freely available information necessary for the community to make informed decisions about their desires for the future of their district. OneIsland can operate the web map application simply and without expert knowledge.

There are three goals for the web map application that drove the project:

1. Simplicity of operation
2. Ability to collect community input
3. Incorporation of local art aesthetic.

The simplicity of the web map application was determined via a virtual walkthrough of the web map application functionality with OneIsland as well as two walkthroughs with naïve users. OneIsland also determined that the web map application was sufficient for sparking a dialog between community members and collecting their opinions about future sites for art and cultural events.

## 1.4. Thesis Structure

The remainder of this thesis is broken into five chapters. Chapter Two discusses public participation and GIS software, case studies in community planning using GIS, geodesign principles applicable to community input, and scientific communication. Chapter Three details the requirements and design principles for the web map application. In Chapter Four, the

development phase of this project is detailed, with platform choice, data inputs, and included widgets discussed therein. The results of the web map application in relation to the goals of simplicity, community input, and aesthetics as evaluated by three naïve users are discussed in Chapter Five. Finally, Chapter Six analyzes the completed web map application, challenges during development, limitations inherent in the project, and future avenues of development both for the current study area and future locations.

# Chapter 2 Related Work

This chapter presents research regarding Public Participation GIS (PPGIS), GIS in community planning, geodesign principles, and scientific communication considerations. Exploring success and failures of other projects provided a framework for the design of the web mapping application generated as part of this thesis. This chapter begins with an outline of what PPGIS involves, followed by how it can be used to catalog community input, using GIS to facilitate community planning, and how geodesign principles support community dialog.

## 2.1. Public Participation GIS

Public Participation GIS, or PPGIS, is the practice of bringing together GIS software and principles to projects involving different user communities (Elwood and Ghose 2000). The goal is to increase citizen involvement in projects that affect communities by utilizing GIS software. Many different private and governmental groups apply PPGIS practices and principles to their projects in an effort to incorporate citizen opinions and garner community support for their projects.

As a field, PPGIS has many different interpretations, but what is common among all interpretations is the use of GIS technology to deepen stakeholder or community involvement in a given process (Schlossberg and Shuford 2005). The process of applying PPGIS to a project is broken down into two parts by Schlossberg and Shuford: the definition of participation and the definition of "public." One definition of participation in PPGIS is indicative of an activity "that individuals engage in" (Schlossberg and Shuford 2005, 16). This would be the definition of participation relevant in the case of this project given the LC meetings OneIsland will lead.

Defining who should be involved in a PPGIS project can be challenging because of the ambiguity in determining how individuals are affected by or have an effect on a given project.

Schlossberg and Shuford identify three general groups from which the "public" involved in a PPGIS project can originate: those affected by a decision or program, those who can bring important knowledge or information to a decision or program, and those who have power to influence and/or affect implementation of a decision or program (Schlossberg and Shuford 2005, 18). The authors also supply a list of five questions to answer in order to better define the public in a particular project:

1. Who are potential beneficiaries?

2. Who might be adversely affected?

3. Have vulnerable groups been identified?

4. Have supporters and opponents been identified?

5. What is the relationship among stakeholders (Schlossberg and Shuford 2005, 19)?

Once the "public" part of PPGIS is defined, the level of participant involvement can be measured in a variety of ways. In the shifting political climate of the late 1960s, before PPGIS existed, Sherry Arnstein developed a ladder model explaining citizen involvement ranging from non-participation to complete citizen power (Arnstein 1969).
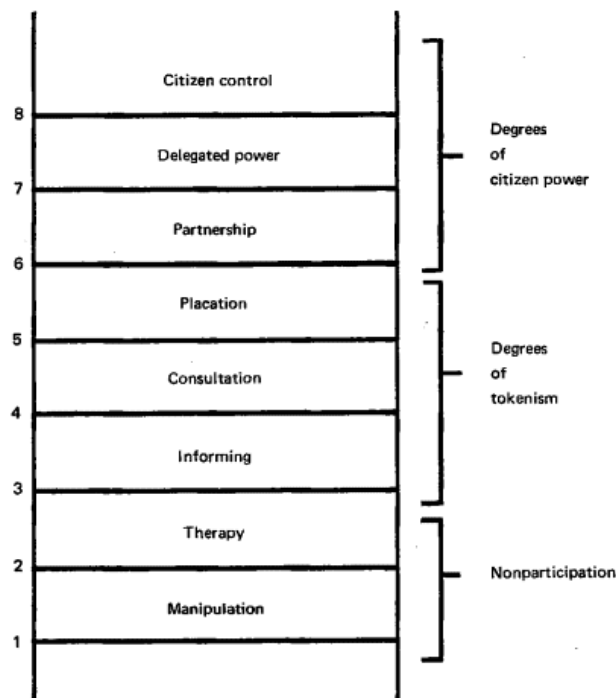
Figure 2. The ladder of citizen participation, as developed by Arnstein (1969).

The lowest rung of the ladder is "manipulation." With this level of participation, there is very little opportunity for citizens to affect change or voice their opinions. Citizens are simply informed or educated about the issue at hand by those in power. The middle rungs of the ladder represent levels of tokenism, where citizens are informed and are allowed to express their opinions but lack the clout to have those opinions taken into account for the issue at hand. Comprising the next two rungs of the ladder are "delegated power" and "citizen control" in which citizens have control over certain aspects of the project at hand and complete control over the project, respectively.

At the upper rungs of the ladder, citizen participation is split into three different tiers. The least amount of citizen power and involvement at this level is the "partnership" rung, where citizens can interact with the organization in power and entreat on their own behalf for consideration of their opinions. While Arnstein's ladder is thought-provoking and an important

first step in detailing citizen involvement, it was written specifically with urban projects as its basis and its application. Other interpretations of the ladder with modifications applicable to a wider set of projects have been generated.

Nineteen years after Arnstein developed and published her ladder, Desmond Connor developed a different ladder designed to be applicable in urban, suburban, or rural projects involving governmental or private sector agencies (Connor 1988). He felt that Arnstein's model was not applicable in many common PPGIS scenarios and that her ladder did not build on the ideas from one rung to the next; there was no flow of ideas up or down the ladder.
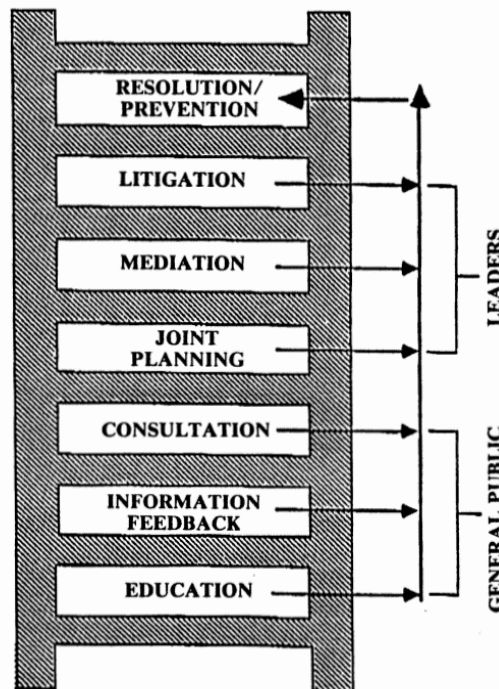


Figure 3. The new ladder of public participation as created by Connor (1988).

His ladder begins with the rung "education," in which the general public is given information about an impending issue or project before the project begins, with the intention of heading off displeasure or hostility before it can develop. The next rung up is "information feedback," where informed citizens are asked to give their opinion about the proposed project, its

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solution, or other aspects of the project. Next, "consultation" steps in where education and information feedback fall short; citizen opinion is still taken into account, but it is weighted before consideration. This is typically done in planning workshops or similar events. Higher rungs include "joint planning," "mediation," and "litigation," in which one or more parties involved in the project have legal jurisdiction and varies from simple workshops and meetings to third-party conflict resolution, ending with the most complex resolution which involves lawyers and court proceedings. The final rung is "resolution/prevention," and any one of the previous rungs can lead to the resolution rung of the project, as long as the citizens involved and the other stakeholders consider the solution fair.

Arnstein's ladder was originally generated to apply to urban populations and related projects (Arnstein 1969). As the discussion above illustrates, there are many different representations and reorganizations of Arnstein's original ladder, each one redesigned to fit a different kind of community or project. While such a ladder cannot be directly applied to this project, the processes included informed the use cases addressed.

## 2.2. GIS in Community Planning

The ability for decision-making bodies to view and understand the desires of the community in an easy-to-interpret format is due to improvements in technology and its spread from higher-level government to citizen-run groups (Elwood 2002). Open interactive data should consist of more than just a web portal housing, where interested parties can view and download data; web map applications where users can interact with the data in a hosted format, without needing to download or meet advanced software requirements, elevates the engagement of the community and decision-making bodies (Szukalski 2016). The acting third party or organization that will represent the citizens must not only commit to learning how to utilize GIS for their own

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projects but also to host and maintain the data for collaboration with other organizations and community members (Elwood and Ghose 2000).

In the following sections, three case studies detail how GIS has increased citizen involvement in community planning and the struggles or successes that the different studies encountered. The case study in Section 2.2.1 was included here as it provides an example of work done by Sarah Elwood, one of the leading researchers in PPGIS. Section 2.2.2 covers a geodesign case study, the principles of which are discussed in Section 2.3. The final case study in Section 2.2.3 was included to detail a project that used interactive web mapping to involve citizens in decision making processes for their community.

*2.2.1. Case Study: the Powderhorn Park Neighborhood Association*

Elwood (2002) conducted a case study on a neighborhood association involved in community planning and utilizing GIS. The Powderhorn Park Neighborhood Association (PPNA) in Minneapolis, Minnesota is responsible for supervision of those implementing the Minneapolis Neighborhood Revitalization Program (NRP). The PPNA is an elected board of community members and strives to include all interested parties in the process of implementing and supervising the NRP, including those who do not own property in the neighborhood but participate in community events (Elwood 2002, 912). A nonprofit software developer created a database of neighborhood demographic information, and other information, at the behest and cost of the PPNA, but the only computer with access was housed in the PPNA office, and staff typically were the only ones who accessed the data and utilized it to disseminate information to the public as needed (Elwood 2002, 913).

Initially, the PPNA and community members intended for the database and software to be available to the public. However, housing the only computer containing the data within the

PPNA office limited the use of the data as well as the value of the data; residents without the freedom to view the data within the PPNA office during business hours could not interact with the data, and there is no portal or application for residents to access the data remotely and interact with it at their convenience. Additionally, the software that the PPNA had available required significant instruction in order to operate it correctly. As such, only trained staff were able to conduct data analyses or create maps, further isolating community members from interacting with the data about their neighborhood.

The PPNA counteracts this isolation by offering to extract any data that community members need from the database and display that data in a map. Furthermore, the PPNA uses GIS to monitor local neighborhood conditions through feedback from community members and inform local government of undesirable conditions, where applicable. So, while the implementation of GIS into the PPNA disempowered community members in one way, it opened avenues of community interaction previously unavailable to the community. Moving forward, Elwood (2002) concluded that making data accessible and simple to use for any interested parties makes the effort of generating and maintaining the data more meaningful and rewarding.

### 2.2.2. Case Study: Caligari, Italy

Utilizing Geodesign methods and concepts, a collaborative effort by experts and locals in Caligari, Italy led to a two-day workshop that determined ways to increase tourism and meet other agricultural and cultural goals (Campagna et al. 2016). While initial stages involved only Geodesign experts, these stages did not provide input or make decisions; rather, background information for the workshop was generated, and participants were selected based on their expertise, occupation, or other characteristics for interest.

At the workshop, there were 32 individuals selected to participate, including experts, academics, and students, as well as local interested parties from both the private and public sectors. Ten maps had been disseminated to the 32 participants prior to the workshop, and the participants were broken into six groups based on their community roles or interests. Groups evaluated and ranked the ten given maps within their group, that information was processed by the Geodesign experts and returned to the participants, who were then asked to choose the group of changes that they felt reflected their goals for change within the community.  This process was made possible through the utilization of the internet and online GIS software. The learning curve was minimal for the participants, as the Geodesign interface is run mostly by experts, with only selection of existing options and input required of the user.

### 2.2.3. Case Study: San Diego Association of Governments

Placeways LLC uses CommunityViz software to meet clients' needs similar to those of OneIsland. They assisted the San Diego Association of Governments (SANDAG) by building a tool which they named Envision 2050, an interactive website geared toward community members (Placeways LLC, n.d.). Users could interact with available data and choose different priorities for the data provided and see how different rankings of the data affected the outcome. Placeways's project also uses three-dimensional representations of the data, which will not be explored as part of this project. However, according to Placeways, this project successfully used an iterative process of communication and approval to ensure all of the client's goals were met.

## 2.3. Using Geodesign to Catalog Community Input

Carl Steinitz provides a basis for understanding and applying geodesign principles to projects in his book *A Framework for Geodesign* (Steinitz 2012). Geodesign is "based on and shaped by a set of questions and methods necessary to solve large, complicated, and significant

design problems" (Steinitz 2012, 3). While this project does not have the scope or reach of a large or complicated project, it is still subject to the requirements of such a project involving community interaction. Using the knowledge that OneIsland has with regards to community planning and input as well as their knowledge of the study area to inform design decisions of this project conforms to Steinitz's idea of collaboration. To Steinitz, the problems presented by projects well-suited to geodesign principles "are beyond the scope and knowledge of any one individual person, discipline, or method. Instead, such problems require both collaboration and ways to organize that collaboration…simply because none of us knows everything" (Steinitz 2012, 3).

The principles of geodesign as they apply to this project and the iterative process inherent with geodesign projects are discussed below.

### 2.3.1. Creating a Scope

The initiation of a geodesign project begins with a stakeholder, according to Steinitz (2012, 35). Steinitz urges that data collection not be the first step in beginning a geodesign project; "Geodesign should be decision-driven, not data-driven," (Steinitz 2012, 35) and illustrates his point with a story about two petitioners in a court each arguing that he needed an orange, without giving more details. The judge does not ask questions about each petitioner's circumstances for needing the orange and, in haste to resolve the conflict, halves the orange and gives one half to each of the petitioners. "Later, the judge found out that one had wanted the peel while the other had wanted the juice," (Steinitz 2012, 35) clearly demonstrating that before jumping into a project, a finite scope for that project must be determined.

*2.3.2. Creating a Method*

Steinitz (2012) utilizes a series of questions, asked and re-asked in different orders, to develop a methodology for geodesign projects. The questions drive a series of models that the collaborative team must work through. One of the types of models is the process model, one part of which is similar to what will be used for this project. Steinitz asserts that when "process models increase in their levels of complexity, we experience a corresponding communication challenge. Models of greater complexity require more (and presumably better) science and more effort, but the simpler levels are easier to describe and explain, and easier for the general public and decision makers to understand," (Steinitz 2012, 73) mirroring the challenge of this project with regard to ensuring that the web map application is not too complex for OneIsland to use or for community members to understand and interact with. Figure 1 below graphically displays this concept, with process model types listed from least to most complex alongside increasing scientific knowledge and effort into improving the model and inversely affected public understanding.
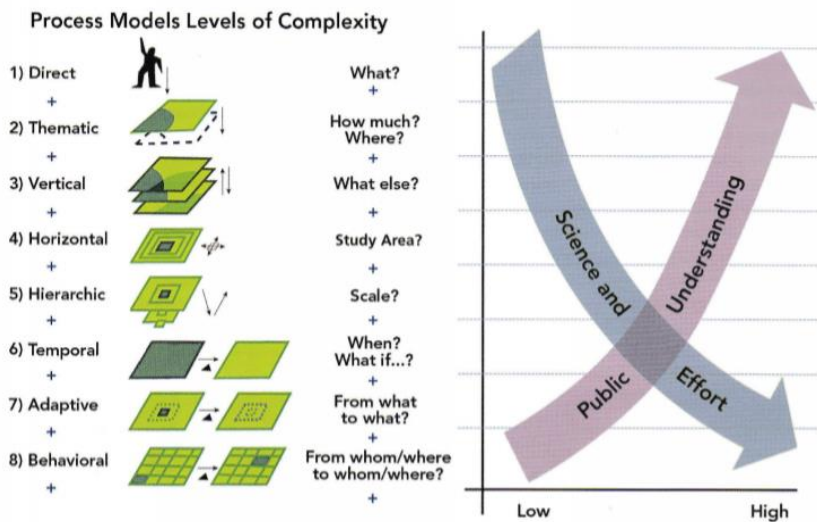


Figure 4. A Framework for Geodesign. From Steinitz (2012).

*2.3.3. Conducting the Experiment*

Steinitz cautions against using his book as a how-to; rather, he states that the "process of implementing the methodology of a geodesign study is inevitably unique, specific to the members of the team in its situation and geographical study area," (Steinitz 2012, 83). Essentially, every project will be significantly different from others and as such, no one methodology or execution of the methodology would be appropriate for all projects. That does not mean that general guidelines cannot be adapted to a given project, however.

Each step in the third iteration is related to one of Steinitz's six framework questions:

1) *How should the study area be described;*

2) *How does the study area operate;*

3) *Is the current study area working well;*

4) *How might the study area be altered;*

5) *What differences might the change cause; and*

6) *How should the study area be changed?*

After working through the six framework questions with the various model types related to each question, the geodesign team reaches a decision stage where they determine if the project is successful. If the team determines the project is not successful, the team must return to the six framework questions and work through them again. If the team determines they have been partially successful, the scale of the project is either expanded or reduced, and the six framework questions are re-worked, using the new scale. Finally, if the geodesign team determines that the six questions and associated models successfully reflect the situation at hand, the study can be presented to decision-makers. The iterative process that Steinitz developed ensures that there are plenty of opportunities for the geodesign team to adapt the models associated with the questions used to their needs.

## 2.4. Scientific Communication

Scientific communication, as the name implies, deals with how subject matter that requires specialized knowledge is disseminated to the populace at large. How can scientists, specialists in their fields, effectively communicate complex issues or solutions with non-specialist laypeople? With society shifting constantly, how to communicate with laypeople is something of a moving target. The discussion that follows interprets scientific communication as it relates to OneIsland and the people of North Kohala.

### 2.4.1. Increased Knowledge Does Not Correspond to Increased Understanding

There are many different scientific disciplines and many specialties within each discipline; it is not strange that many citizens are unfamiliar with scientific innovations or information. What is strange is that so many are skeptical of such innovations or information when backed by facts. Assumedly, "a judgement when informed by scientific fact would tend to be more favorable and consistent with expert opinion than one expressed without recourse to such 'objective' knowledge," but that assumption is not as valid as it would seem (Allum et al. 2008, 36). "The facts are assumed to speak for themselves and to be interpreted by all citizens in similar ways," (Nisbet and Scheufele 2009, 1767-1768) an eventuality that is not guaranteed. We are a society of individuals, not all scientists, and each person thinks and reacts to facts and situations differently.

The culture of the society in question has an effect on the society's attitude toward science, in "post-industrial societies, science is taken for granted, knowledge becomes more specialized and a more skeptical and questioning public views science with greater suspicion, while expecting it to deliver prosperity" (Allum et al. 2008, 37). While OneIsland is not presenting anything as specialized or ethically questionable as genetic research or other new

technology, they are utilizing a relatively new type of technology to gather information and support the community. It is logical that the community may not completely trust the online platform used in this project to accurately catalog their opinions or display true spatial information.

*2.4.2. The Space Race: a Case Study*

Nisbet and Scheufele (2009) used the era of the Space Race to illustrate why the deficit model of scientific communication, that the public needs to have scientific knowledge and must be educated to understand the concepts at hand, is worsening the divide between scientists and laypeople. The time known as the Space Race, between 1957 and 1969, is idolized as a scientific "Golden Era" in the United States with an "informed public pushing for large-scale government investment in science" (Nisbet and Scheufele 2009, 1768). Surveys taken of the general public during that time frame indicate otherwise. Withey (1959) and Michael (1960) conducted public opinion surveys asking a variety of questions. Withey (1959) found that just under half of the adults at the time had taken at least one course in science during their time in high school, but only 11% of the population had completed science coursework at the college level (Withey 1959, 383). After Sputnik, surveys were completed detailing what portion of the American public was familiar with satellites; 54% of those surveyed had not heard of a satellite before (Michael 1960, 574).

What had changed at the time was not the level of the public's knowledge, but the level at which they were exposed to science-related content in the media: "Two-fifths of … editors reported double the [science] coverage; another two-fifths reported increases around 50 per cent" (Withey 1959, 384). However, even with such large increases in media coverage of scientific material, it was still covered less than other news topics (Withey 1959, 384). Michael (1960)

found that opinions collected from Americans following Sputnik's launch "did not indicate unanimous psychological shock or national loin girding, as the press and many issue makers have insisted" (Michael 1960, 581). So, the American public was not as well-informed or science-minded as it seems from the events that followed or news reports from that time.

OneIsland utilizing GIS software to assist a community with planning its cultural development is not directly related to the Space Race era in American history; however, the way that they approach implementing the software within the community and utilizing it to collect community member input reflects a new direction that Nisbet and Scheufele have identified for scientific communication: "connecting to public values" (Nisbet and Scheufele 2009, 1774). To them, connecting science and a subject valuable to the community makes a link "critical for making sense of scientific information" (Nisbet and Scheufele 2009, 1774). Determining the value or belief system of the community to be communicated with beforehand and framing the communication to reflect their values or beliefs can lead to increased understanding of the material by the community in question (Nisbet and Scheufele 2009, 1774). OneIsland is doing exactly that by utilizing a new technology to involve the community in improving their culture and art, aspects that the community values greatly.

# Chapter 3 Web Map Application Design

This chapter discusses OneIsland's requirements for the functionality of the web map application and design principles that drove this thesis. OneIsland has three main goals in their project to contribute to the development of the arts and culture portion of the North Kohala CDP. These are: detailing oral histories of elders to communicate past cultural events and importance, determining current art- and culture-related events and sites, and collecting community input regarding the location and nature of future arts and cultural events and sites. Creating what OneIsland needs to support all three goals is too large a scope for a single thesis, so it was decided the scope of this project would be generating an application for OneIsland to use while interacting with the local residents during community meetings, which they call listening circles (LCs), discussing where they would like to see future arts and cultural events in North Kohala. The application titled the North Kohala Arts and Culture Web Application (NKACWA) would need to be simple for OneIsland to operate, allow them to record input from community members during LC meetings, and incorporate local art.

## 3.1. Web Map Application Requirements

Initially, OneIsland expressed interest in having a tool they could use to both orient the community members at the LCs and to determine what effect a five-year investment in the arts would have on the community. Orienting the viewer with an interactive web map was an attainable goal. However, showing the potential for community improvement based on investing in the arts was not an attainable goal with a simple web map; many components in that determination are either unavailable or are not spatial in nature. Community improvement cannot be directly measured; measures such as outmigration rate, change in average household income, or average house prices might be used as proxies. However, these measurements are subjective

with regard to how they reflect the improvement of the community. Also, there are many components of community improvement that are not spatial in nature, such as the feelings of happiness within the community. As a result, this project focused on orienting the community members present at the LC meetings by creating a web application for interactive exploration of data about the district and collection of input from community members about where activities and facilities should be located.

In order to successfully create a web map application that OneIsland can use during LC meetings to record community member input, OneIsland's expectations for the use of the web map application were discussed. The following sections describe the process by which OneIsland's requirements were married with the constraints of the chosen web mapping application platform.

### 3.1.1. Application Goals

The design goals for this project were threefold and reflected OneIsland's desires:

1. The tool needed to be simple for naïve users. OneIsland and participating community members are not GIS program graduates, many may not even have heard of web-based GIS software. Overly complex widgets or involved analyses could overwhelm the users and render the NKACWA useless to them. Customization of widgets such as that discussed in Esri (2018) and Fili (2017) was not considered as part of this thesis work, though this may be considered in a future iteration of the application.

2. The tools and spatial data layers incorporated into the NKACWA had to reflect potential questions or discussion paths of the LC meetings. It must also allow collection of community member input regarding the location of activities and facilities that foster growth of arts and culture in the district. Predicting what participants will be curious

about and preparing for those questions will deepen and support dialog among

participants and preparing the NKACWA to respond to the community's questions and

record their input will make it useful in deepening and supporting community discussion.

3. Finally, the "look" of the NKACWA had to have features that incorporate local artistry.

    OneIsland wanted the application to reflect their project's focus on the arts. Colors and

    basemaps could not be too modern and the NKACWA must, wherever possible, reflect

    the focus on arts and culture by incorporating local art.

### 3.1.2. Summary of Application Function

The following flowchart details how the application is meant to function in order to assist

with the discussion between community members and record opinions generated during the LCs.
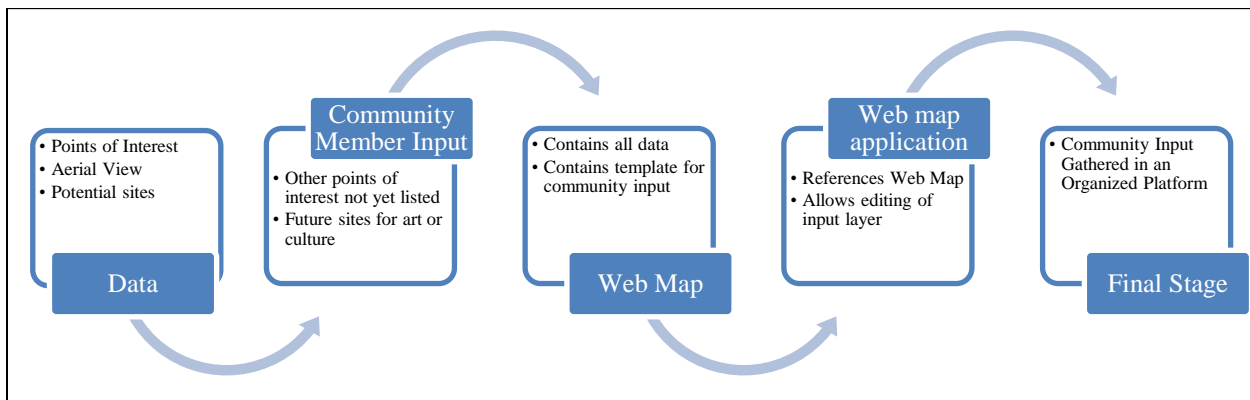


Figure 5. Steps to successful use of the NKACWA.

## 3.2. User Requirements

The tools that the web application should contain were not readily apparent. To make the

components and shape of the NKACWA clearer, use case scenarios were generated for both

community members and OneIsland representatives, similar to those used in user-centered

design techniques. User-centered design collects data about the expected consumer through

interviews, observations, and other inputs, and uses that data to generate an end product that truly

meets a client's needs (Nodder 2017).  The use case scenarios were constructed by determining the relevant characteristics of the user and any conditions that need to be met before using the NKACWA. Then, a success scenario, or set of steps that would lead to the NKACWA being used successfully, was determined. Issues or questions that may arise during utilization of the NKACWA by either category of user were identified.

### 3.2.1. Community Members as Users

Community members are at the heart of the LC meetings; they are the reason OneIsland will hold the meetings, and it is the community members' input that OneIsland seeks. Determining what circumstances define the success of the tool from the point of the community members and any questions that they may generate to be better informed through using the tool gave the project direction. A use case scenario where community members were considered the users helped determine what defines the tool as successful, what the tool should be doing, and any potential questions that participants may have. The main success scenario for the tool is as follows:

1. A community member has a question or a point to make regarding placement of a potential art or culture enrichment location.

2. The area in question is pulled up in AGOL to familiarize participants with the area and allow the community member to better articulate what her question is, or further explain implications of the point she made.

3. A spatial data layer that reflects either the answer to the community member's question or an aspect of that question or potential answer (depending on the question or observation) is already loaded into the map and is turned on for viewing.

4. All participants can now see the area in question, all related spatial information, and can reach a level of understanding of what has been posed or suggested by the community member. Further discussion will now be more meaningful and accurate, although a conclusion may or may not be reached.

The NKACWA is not intended to solve community member issues or completely answer any questions that may arise. Instead, the focus is on supporting the conversation between community members by bringing in a visual component to demonstrate what the speaker is trying to communicate, where possible. It is impossible to predict any and all questions, suggestions, or issues that community members will raise. It is improbable that all of their questions, suggestions, and issues will be spatial in nature. It is likely, however, that the questions generated as part of the use case scenario represent some of the same questions that community members will raise, and for those questions, OneIsland can be prepared. Table 1 lists the questions generated during the development of the use case scenario that were spatial in nature and could be discussed using the data present in the NKACWA.

Table 1. Spatial questions community members may raise and related data layers.

| Question | Layers |
|---|---|
| Will this location be accessible by foot? What is the accessibility of this location safety-wise? | Basemap |
| What is the zoning of this parcel? What type of permitting will be required to accomplish a project here? | Zoning layer |
| What types of non-profit or government agencies could benefit from this installation in this location? | Points of Interest, Trails |
| What will the cost difference be between two similar parcels? How will that difference be reflected in size, accessibility, etc.? Who owns the parcel(s) of interest? | TMK |
| Is this an appropriate installation or activity for near schools? | Points of Interest |
| What else is around this location that would affect the experience? | Points of Interest, Main Roads |

*3.2.2. OneIsland as the User*

A use case scenario was also generated with OneIsland as the user. The main success scenario

for OneIsland is as follows:

1. LC meeting commences, questions and concerns arise from community members.

2. OneIsland is familiar with all data contained in the NKACWA, determines which
   layers will address the community member concerns, and opens those layers.

3. Various spatial data layers are used to clarify, alleviate, or explain concerns of
   community members.

4. Good questions that open up other avenues of consideration are triggered by the
   NKACWA, answers for which may or may not be spatial in nature.

5. An understanding is reached among community members (note, this is not
   necessarily an agreement, rather that each side to the issue understands the other)

and, if it can be represented spatially, OneIsland can record the results in the

NKACWA.

There are two issues raised as part of this use case scenario that could have a negative

effect on the success scenario. The first is that OneIsland's unfamiliarity with the web-based

mapping platform and spatial data generally could slow down the process of determining which

layers to turn on, while verbal communication between community members moves forward and

the tool lags behind. In this case, the NKACWA may be abandoned as the discussion moves

faster than the technology meant to support it. Additionally, another issue OneIsland may

encounter is if community members raise a question or concern about something that cannot be

represented within the NKACWA, whether it is a question about something for which data was

not available or if the question references an inherently non-spatial idea that cannot be presented

using the NKACWA.

*3.2.3. Functional Requirements*

The application must be easy to navigate, contain information that OneIsland can use to

deepen discussions with community members during LCs regarding potential future locations for

arts and cultural events, and maintain aesthetics consistent with the focus on arts and culture.

There must be easy access to and viewing of all data available; OneIsland should not

need to sift through scores of layers to find a desired layer. Additionally, common or populated

locations within the district should be pre-marked and navigated to easily. Ultimately, since the

LCs are real-time, verbal meetings, the NKACWA cannot lag behind the discussion. If the time

between a community member raising a point or concern and the associated information being

brought up for the participants to see lags, then the tool will fall behind the discussion and out of

use.

## 3.3. Design Principles for the Web Map Application

The principles of design for the NKACWA were chosen to reflect OneIsland's desires and requirements for the NKACWA. There are three constraints that drive OneIsland's requirements: simplicity, community interaction, and aesthetics. The choice of what software platform to use directly relates to the constraints. These are each discussed in the next subsections.

### 3.3.1. Simplicity

OneIsland made it clear that the organization's representatives are not familiar with the use of web-based maps or GIS; therefore, the NKACWA needed to be straightforward to understand for naïve users. Additionally, they felt it unlikely that the community members who would partake in the LC meetings would be familiar with these technologies. It is possible they may be distrustful of a tool that seems overly complicated to operate or impatient with a tool that took a long time to process requests. As such, an "out of the box" application was decided on, making it simpler for the end user.

Out of the box applications are available in ArcGIS Online and require little input for arrangement of widgets and other application components. Esri has developed this functionality to minimize the time and effort required by a developer or other type of user to get her web map application running: what Law (2017) calls a "Swiss Army knife solution.". There are different themes programmed and ready for customization in the Web AppBuilder, the interface for users to create web apps with AGOL, and many widgets ready for customization as well. However, design constraints for this thesis were more complicated than any of the basic themes, especially with regard to the need to resolve certain issues or to keep the tool from becoming too complex.

### 3.3.2. Community Interaction

With further discussion, it became apparent that OneIsland intended to gather community member input on where new locations for art and culture installations should be created. They desired a way to catalog, separately for each LC convened, input about locations of interest from the community members. They wanted to be able to count how many of each type of art installation, art event, or cultural installation were generated during the LC meeting.

### 3.3.3. Aesthetics

OneIsland desired a "cozy" map; the colors, artistry, and overall look of the map could not be too futuristic or garish. OneIsland requested that natural colors and aerial imagery be used and that local artistry is incorporated in the form of splash screen maps and icons. This concern arose because OneIsland felt community members would be more comfortable with maps that look similar to paper maps. The aesthetics were tailored to OneIsland's specific requests and critiques.

## 3.4. Summary of Chapter 3

This chapter detailed the application goals, user requirements, and design principles for the web map application. Goals for the application as well as a summary of its function were summarized in Section 3.1.23.1. Section 3.2 outlined user requirements for community members as well as OneIsland as the user and also outlined functional requirements of the web map application. In Section 3.3, design principles of simplicity, community interaction, and aesthetics were outlined for this thesis.

In summary, the application needs to be simple enough for non-technically competent users to operate successfully, and it also needs to be able to collect input generated by community members during LC meetings.

**Chapter 4 North Kohala Arts and Culture Web Application Development**

In this chapter, the platform choice is discussed along with its limitations. The components of the NKACWA are discussed with regard to the three design constraints outlined in Section 3.3 in addition to the spatial data incorporated into the web map application. Widgets configured for this application are discussed in Section 4.4. Evaluations about the NKACWA are detailed in Section 4.5.

## 4.1. Platform Choice

To fulfill all of OneIsland's requirements regarding the simplicity of the NKACWA, the ability to catalog community members' input, and the aesthetics of the NKACWA, ArcGIS Online (AGOL) was chosen as the platform. It is a website-based mapping software created by Esri that allows registered users to maintain their data in Esri's cloud server. Users are also able to create web maps and web map applications using the website. This platform also comes with access to the Living Atlas, a collection of data layers created and maintained by companies, state organizations, and private users. The version for this project that is documented here used the April 2018 updates. Using AGOL minimizes computing requirements and disk space requirements, and eliminates the need to use complicated software such as the full ArcGIS software suite all while meeting OneIsland's requirements. Other cloud-based GIS platforms are available; however, the other platforms do not assert as much user-friendliness as AGOL does.

Esri, the creator of AGOL, has branded AGOL as a user-friendly, simpler version of ArcMap or ArcGIS Pro, with many of the same functions and tools available without having to host data or software on a local machine. This relieves OneIsland from holding many gigabytes of data and software. Also, AGOL is accessible from any computer with internet access and any

smartphone, after logging in to an account. Therefore OneIsland and its participating members are not restricted to use only computers with GIS mapping software installed.

Another consideration that made AGOL a more attractive choice is the non-profit license Esri offers. After applying and being accepted, OneIsland was required to pay $100 for one year of access with 1000 service credits. Similar individual access costs approximately $500 per year and includes only 500 service credits. The package available for nonprofits from Esri gives OneIsland access to advanced mapping tools and content at a greatly reduced rate compared to a "normal" user.

### 4.1.1. Usage Limitations and Costs

OneIsland is limited by the credit system AGOL institutes; their nonprofit license comes with fixed number of credits as well as an administration fee per year. The need for credits beyond that initial amount incurs a fee. Avoiding analyses and operations that consume large numbers of credits was important and emphasized the need for a simplistic approach to the NKACWA.

Many tools available for use in AGOL consume credits. Even storage consumes credits. Accessing data, using AGOL basemaps, exporting data, and searching for a single address do not consume credits. Table 2 details the credit consumption for selected services.

Table 2. Rate at which service credits are consumed in AGOL.

| Service | Credit consumption rate |
|---|---|
| Feature services storage (excluding feature attachments) | 2.4 credits per 10 MB stored monthly based on hourly calculations of storage per month |
| Spatial analysis | 1 credit per 1000 features (queried for Find Existing Locations and Derive New Locations analysis tools) |
| Data enrichment | 10 credits per 1000 attributes (data variables multiplied by total feature records) |

To limit credit consumption, Spatial Analysis and Data Enrichment tools were not included in the NKACWA. This eliminates the possibility of unintended interaction between OneIsland and complex tools that use many credits to cover the study area.

## 4.2. Application Platform Considerations

In order to create an application that OneIsland could use successfully during LC meetings, the three constraints must be adhered to: simplicity, community interaction, and aesthetics. How these considerations were applied within the AGOL platform for each constraint is discussed in the following subsections.

### 4.2.1. Simplicity Constraint

Initially, tools were added to the NKACWA such as "Enrich Layers," which allowed the user to select a layer to which Esri would add information about businesses, population, and other possible subjects. Unfortunately, during testing it was discovered that this tool consumed large numbers of credits, charging a credit fee per record queried. Also, the data available from Esri was broken down into census block groups, of which there are only 11, or by county, which includes the entire island of Hawai`i. As such, the insight gleaned by using this tool would be costly and not useful for OneIsland. Additionally, Enrich Layers has many options to choose from and can be complicated to use for those unfamiliar with the AGOL platform. The tool was removed to maintain simplicity, in keeping with the simplicity constraint outlined in Section 1.3.

### 4.2.2. Community Interaction Constraint

To catalog community member input by LC meeting date, a template layer was created in AGOL that had categories within it generated from OneIsland's specifications, detailed later in Figure 4. Before each LC, OneIsland must create a new layer from this template with the date of

the LC in the title to differentiate easily between meeting records. The layer must then be loaded into the Web Map that serves the NKACWA and made editable in the NKACWA. Then, during the LC, OneIsland will use the Edit tool within the NKACWA to record user input.

The Edit tool and preparing it for each new LC meeting is somewhat complex for a naïve user. There is not a better way to catalog community member input without building a custom widget. However, since the AGOL platform was chosen for its simplicity and since all components and all workflows need to be simple and repeatable for OneIsland, a pre-built template was selected and customized for OneIsland's use. To ensure that OneIsland was able to complete this task, a detailed workflow document was generated for OneIsland. The workflow identifies each step required to create a new layer from the template, explains how to add that new layer into the Web map, and how to make the new layer editable in the NKACWA. Testing how effective the workflow was is discussed in Section 5.1.2. The workflow document includes screen captures to show the location of links and buttons that OneIsland needs to use with the web map and NKACWA and is included in Appendix A Workflow. Additionally, in Appendix B Spatial Data Handout for Community Members, a handout detailing the spatial data layers included in the NKACWA was created for OneIsland to distribute to participating community members during LC meetings. This handout was intended for use at the commencement of the LC meetings to inform all involved community members of what information would be available to them through the NKACWA.

### 4.2.3. Aesthetic Constraint

**It was important to OneIsland that a splash screen map and icons created by a local artist be incorporated into the NKACWA to keep the look of the application from being too futuristic.**

**To accomplish this, OneIsland commissioned a local artist to create a splash screen map, found in Appendix B Spatial Data Handout for Community Members**

| Name | Description | Source |
|---|---|---|
| Roads<br>• Main Roads<br>• Streets | Main roads only includes those roads classified as highways or main thoroughfares. Streets includes all main roads as well as all secondary and seller roads. | Hawaii Statewide GIS Program |
| Eligible Parcels | Eligible parcels are all parcels highlighted by OneIsland as potential places for building art and cultural experiences within the community | OneIsland, TMK data |
| Points of Interest | Holds locations of schools, hotels, fire stations, police stations, and hospitals | Hawaii Statewide GIS Program |
| Zoning | Subcategories of zones have been grouped for simpler identification. | Hawaii Statewide GIS Program |
| Parcels – Hawaii County | TMK-linked parcel data for the county. | Hosted by Hawaii State GIS |
| Government Land Ownership | Displays state, state DHHL, county, and federally owned lands. | Hosted by Hawaii State GIS |
| Public Hunting Areas | Displays public hunting area parcels. | Hosted by Hawaii State GIS |
| Top Ten Landowners | The ten landowners with the largest total area owned within the study area | Derived from data downloaded form the Statewide GIS Program |
| State Land Use | Land use categories generated by the state. | Hawaii Statewide GIS Program |
| Mile Markers | Catalog of the location of each mile marker along major highways. | Hawaii Statewide GIS Program |
| Na Ala Hele Trails | Displays the path of Na Ala Hele trails, but is incomplete. | Hawaii Statewide GIS Program |
| TMK Major Owners | TMK data based on the major owner listed and total area owned by each. | Hawaii Statewide GIS Program |
| Large Landowners | The 10 largest areas of land were extracted and displayed | Derived from the Hawaii Statewide GIS Program |

| Name | Description | Source |
|------|-------------|--------|
|  | based on the owners of those largest parcels of land |  |
| Kamehameha School Parcels | Extracted all parcels of land owned by Kamehameha Schools. | Derived form Hawaii Statewide GIS Program |
| Ditches | Lines displaying the location of ditches in the study area | Hawaii Statewide GIS Program |
| Census Block Groups | Displays the block groups used by the US census. | Hawaii Statewide GIS Program |
| Digital Elevation Model Global Mosaic (Color Shaded Relief) | Shaded relief of topography and bathymetry | Hosted by NOAA National Centers for Environmental Information |

Appendix C Splash Screen Map, and icons with familiar Hawaiian imagery to represent the different types of art and culture events or locations that community members would be interested in and for which they would discuss locations during LC meetings. The individual icons are present in Appendix D Icons as larger images Appendix D Iconsand the icons as viewed within the AGOL interface are present in Section **Error! Reference source not found.**.

Aside from images created specifically for this project, the basemap and digital elevation model (DEM) in the NKACWA were chosen to reflect OneIsland's desire to keep natural colors incorporated into the map, accurately representing the conditions on the ground with colors in the layer. For example, arid regions should be more brown-colored while vegetated regions should be green-colored, and water should be blue. A DEM with browns and greens to represent elevation was chosen to avoid garish colors. A basemap of aerial imagery was selected to show actual conditions on the ground, to help viewers situate themselves within the landscapes they are viewing.

## 4.3. Spatial Data Layers Incorporated

Data layers were downloaded from the Statewide GIS Program maintained by the Office of Planning for the State of Hawai'i as well as loaded into the map from the Living Atlas within AGOL. Data collected covered either the Hawaiian archipelago in its entirety or the island of Hawai'i and in either case, was clipped to a boundary that included all of North Kohala as well as parts of South Kohala and Hamakua adjacent to North Kohala. Figure 3 displays the extent of the study area within the NKACWA interface. Specific data themes that OneIsland requested are detailed in Table 2.
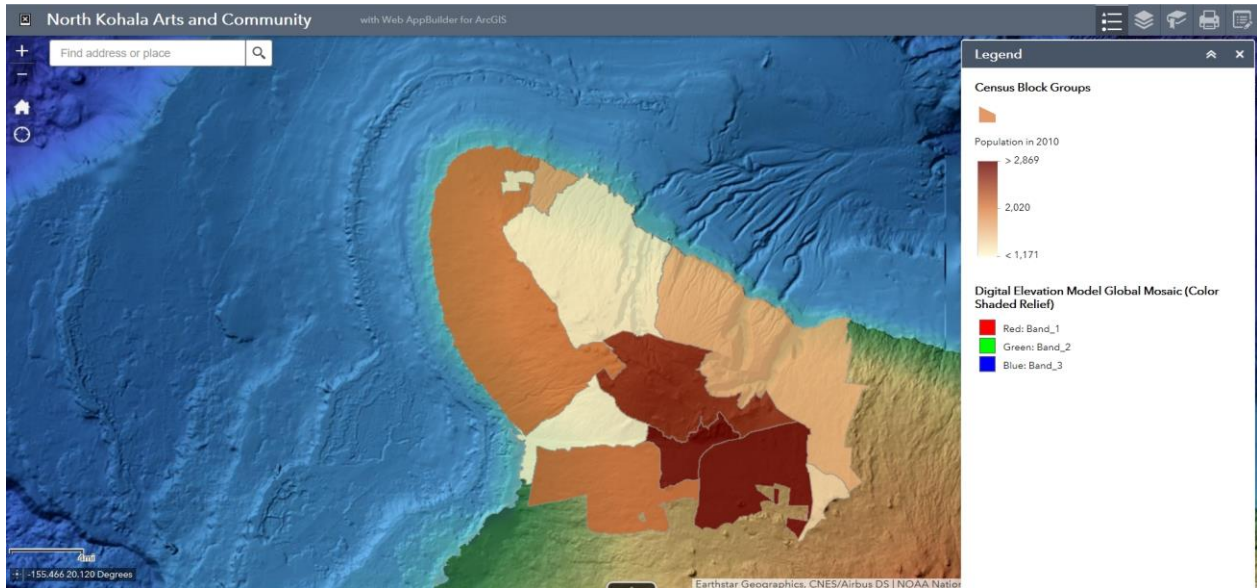
Figure 6. Study area of North Kohala within the web map application interface.

Table 3. Spatial data requested by OneIsland, a description of the data, whether it was included or excluded, name of any included data layer, and the reason for exclusion where applicable.

| Data Requested | Description | Included? | Name of Data Layer | Reason for Exclusion |
|---|---|---|---|---|
| Tax Map Key (TMK) | Property numbers | Yes | Parcels – Hawaii County | N/A |
| Department of Hawaiian Homelands (DHHI) information | Location of properties that belong to the DHHI | Yes | Government Land Ownership | N/A |
| County Water | Location of county water supplies | No | N/A | Not available for security reasons |
| Electricity grid | Location of electrical grid tie-ins for properties | No | N/A | Not available for security reasons |
| Property Values | Current and historical values of parcels in the county | No | N/A | Initially included but removed due to coarse scale of spatial data and inability to share the map publicly |

| Data Requested | Description | Included? | Name of Data Layer | Reason for Exclusion |
|---|---|---|---|---|
| Wages or Income | Wage and income rates within the study area | No | N/A | Initially included but removed due to coarse scale of spatial data and inability to share the map publicly |
| Landmarks | Schools, government facilities, churches, hotels | Yes | All Point of Interest | N/A |
| Functional agricultural land | Land currently being used for agricultural purposes, not just zoned as such | No | N/A | Not available, only zoning information was available, not current use. |
| Trails | Hiking trails within the study area | Yes | Na Ala Hele Trails | N/A |
| Commuting population | Population within the district that either commute into the district or out of the district for work | No | N/A | Spatial data available at too coarse of a scale to be of use. |
| Demographic information | Age, population, race ethnicity, income level | Yes | Census Block Groups | N/A |
| Migration | Any portion of the population that is leaving the area | No | N/A | Spatial data available at too coarse of a scale to be of use. |
| Potential useful parcels | Parcels available for rental or purchase that would be a good location for arts or cultural events | Yes | Eligible Parcels | |

Spatial data layers were initially added to the map individually; each different kind of point of interest was in its own layer, each parcel of land OneIsland identified as potentially useful was its own layer, and the TMK information was in its own layer as well. This configuration made the list of layers impractically long and made it difficult to find any one specific layer of interest. As a result, spatial data layers containing points of interest were collapsed to reflect similar types of data and all layers were evaluated for usefulness. Schools,

hotels, fire stations, police stations, and hospital locations were collapsed into a layer re-titled "All Points of Interest."

Spatial data layers containing polygons were not combined, nor were spatial data layers containing line data. Minimizing the number of point layers present in the list of layers sufficiently reduced the size of the list and made it manageable. Keeping the information within the map compact and easily accessible as well as minimizing the need for OneIsland to concern themselves with credit consumption will make the NKACWA simple for them to use. Below is a description of each included layer and the source of the data, as well as the date it was last updated.

Table 4. Data layer name, description, and data source.

| Name | Source | Last Updated | Downloaded or Hosted |
|---|---|---|---|
| Roads<br>• Main Roads<br>• Streets | Hawaii Statewide GIS Program | September 2012 | Downloaded |
| Eligible Parcels | OneIsland using TMK data | April 2017 | Downloaded |
| Points of Interest | Hawaii Statewide GIS Program | May 2017 (hospitals), August 2017 (police stations), September 2012 (preschools), October 2012 (hotels), August 2017 (fire stations), 2011 (private schools), June 2017 (public schools) | Downloaded |
| Zoning | Hawaii Statewide GIS Program | November 2015 | Downloaded |
| Parcels – Hawaiʻi County | Hawaii Statewide GIS Program | December 2017 | Hosted |
| Government Land Ownership | Hawaii Statewide GIS Program | April 2017 | Hosted |
| Public Hunting Areas | Hawaii Statewide GIS Program | November 2017 | Hosted |

| Name | Source | Last Updated | Downloaded or Hosted |
|---|---|---|---|
| Top Ten Landowners | Derived from data downloaded from the Statewide GIS Program | Derived from Parcels layer, created December 2017 based on data updated same month. | Downloaded |
| State Land Use | Derived from data downloaded from the Statewide GIS Program | Derived from Parcels layer, created December 2017 based on data updated same month. | Downloaded |
| Mile Markers | Hawaii Statewide GIS Program | 2012 | Downloaded |
| Na Ala Hele Trails | Hawaii Statewide GIS Program | September 2017 | Downloaded |
| TMK Major Owners | Derived from the Hawaii Statewide GIS Program | April 2017 | Downloaded |
| Large Landowners | Derived from the Hawaii Statewide GIS Program | April 2017 | Downloaded |
| Kamehameha School Parcels | Derived from the Hawaii Statewide GIS Program | April 2017 | Downloaded |
| Ditches | Hawaii Statewide GIS Program | 2004 | Downloaded |
| Census Block Groups | Hawaii Statewide GIS Program | February 2011 | Downloaded |
| Digital Elevation Model Global Mosaic (Color Shaded Relief) | NOAA National Centers for Environmental Information | January 2018 | Hosted |
| Golf Courses | Hawaii Statewide GIS Program | October 2014 | Downloaded |

*4.3.1. Review of Spatial Data Layers*

Once all available spatial data layers requested by OneIsland were either downloaded or

generated by extracting data from downloaded layers, they were uploaded into a web map in

AGOL for OneIsland to view and give their opinion on what else could be added, left out, or

adjusted. At this point, hosted data layers were added to the map as well. During this review

process, OneIsland was also able to familiarize themselves with the aesthetics, capabilities, and limitations of the AGOL platform.

As a result of this review, OneIsland requested a layer showing surface elevation, as some properties that seem accessible by foot have deep gulches running through them, making access difficult. This request was addressed by adding a color shaded relief layer hosted by the National Oceanic and Atmospheric Administration.

They also asked for a data layer that shows what parcels are owned by state or county departments to help users discern which parcels might more easily be acquired, rented, or otherwise utilized for arts events and cultural purposes.

To fulfill this request, a Hawai'i State-hosted layer was added that allows the user to click on a given parcel to access information about the current owner, parcel size, last price paid for the parcel, and other information. OneIsland can use this information to compare different properties of interest.

Also during this review, it was suggested that it would be useful for OneIsland to create a list of properties they are considering for art or cultural installations to include in the NKACWA. With this information, the properties they had flagged as potential matches were extracted from the state-hosted data and added as a new layer to the web map. All metadata and details for downloaded spatial data layers included in the NKACWA can be found in Appendix E Metadata for layers included in the NKACWA

### 4.3.2. Output Data

While in use during meetings, the NKACWA will display only the layers chosen by OneIsland, depending on the discussion amongst the community members at the moment. A

layer list and legend allow OneIsland to choose which layers are active and visible as well as determine the meaning of the symbols on the map.

After collecting community member input about locations for future art or cultural installments, a process explained in Section **Error! Reference source not found.**, the attribute table will contain each point generated by community members. An attribute table is a collection of information about input data, either points, lines, or polygons. The table contains the locational data associated with its contents, any names, dates, categories, or other information provided when creating the individual entries. The attribute table for data generated using the NKACWA contains the name of the point created; what type of art, cultural, or musical event it is; its location, both in latitude and longitude as well as a field to enter the address of the property; any comments the user wishes to add for the property, and a place to upload photographs or files associated with the property. This attribute table can be displayed within the NKACWA and sorted based on the categories of the locations proposed during the LC meeting.

There is a Print widget in the NKACWA that allows OneIsland to send a digital image of the map as it is currently seen on-screen to a Portable Document Format (PDF) file. OneIsland can then print this map for distribution to community members at the end of the LC. OneIsland wanted involved community members to be able to take home a copy of the work done during that LC to encourage continued thought after the LC is over.

Common locations within the study area were bookmarked to ease OneIsland's navigation during LCs. Common locations within the study area were determined based on the clustered distribution of parcels chosen by OneIsland as potential locations for arts and cultural installations.

## 4.4. Widgets within the North Kohala Arts and Culture Web Application

All components within the NKACWA and web map must not detract from its simplicity, must improve the ability for community interaction, and must maintain the focus on local art and aesthetics. The success of each widget in keeping with each of the constraints is discussed below.

*4.4.1. Contribute Your Places Widget*

The Contribute Your Places widget is the most important widget for facilitating interaction between community members and the NKACWA. With it, OneIsland can record the input of different community members regarding placement of future arts and culture locations at the LC meetings. There are 18 different options for arts and culture available for the community members to choose from. The options include not only arts and culture sites but also options for existing sites that may not have been represented in the Web map. Figure 7 displays the 18 options and their associated icons. Larger versions of the icons can be found in Appendix D Icons.
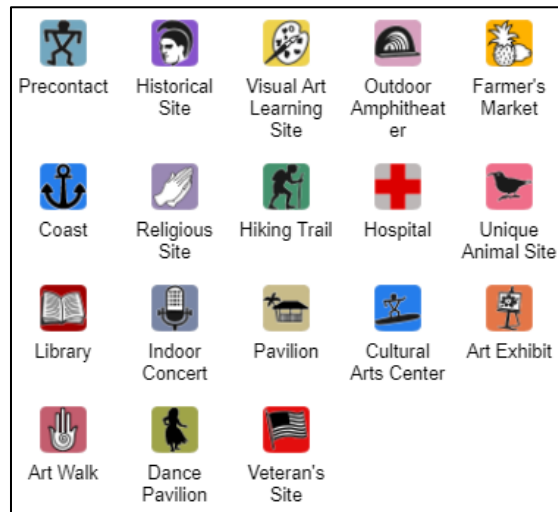


Figure 7. The 18 points of interest and future art or cultural locations and events possible for users to choose from within the Contribute Your Places widget of the Web map application

Using the Contribute Your Places widget is not challenging; the user must only select on the desired category of art event or cultural location and then select the location on the map where the user wishes to see the art event or cultural location. This maintains simplicity within the NKACWA as well as improves community input. The name of the widget is a "call to action" for users, to guide them through the steps for using the NKACWA, similar to techniques detailed by Gaigg (2017).

Following the LC meetings, all of the points generated by community members will be cataloged within one layer per meeting date. After all LC meetings have been held and OneIsland is ready to progress to the next phase of their project, they can add all of the layers generated at each LC to a single map to compare results for each meeting, identifying any trends or differences between the results for the meetings. The attribute tables of each layer can be extracted into Microsoft Excel and sorted to determine how many of each type of art and cultural event or location were placed by community members, as well as which type is the most popular.

*4.4.2. Print Widget*

The Print widget was included so OneIsland can share the results of the LC meeting with community members in attendance; not all attendees are necessarily able to access the NKACWA after the meeting and OneIsland wanted to be able to hand out a sheet with the community input from the current LC meeting at the end, before attendees departed. The Print widget sends an image of the current map extent with all active layers to a PDF, which OneIsland can then print.

Extending the reach of the NKACWA via a printed output to those who are unable to access the application on their own devices allows OneIsland to involve more community

members. A paper map is not interactive like a web map application; however, it does increase community involvement, one of the three constraints of this project.

*4.4.3. Favorite Locations Widget*

Within the Bookmark widget locations that contain clusters of parcels, OneIsland identified as potentially useful for their project within the study area are pre-set. During an LC meeting, OneIsland needs only to select the tool and the desired region and the NKACWA instantly centers on that area. This allows for much faster movement between locations under discussion; however, jumping from one area to the next can disorient some viewers, especially areas without sufficient landmarks to speed identification. Additionally, it can be confusing for community members to attempt identification of common locales using aerial photography as most of their interaction with the areas in question is in person, on the ground.

Ultimately, rapid movement between areas under discussion during the LC meeting supports the LC meeting and ensures that the NKACWA keeps up with the discussion. While some participants may get temporarily disoriented, OneIsland and other community members can help re-orient them and bring them back into the discussion.

*4.4.4. OneIsland Workflow*

To assist OneIsland and provide instructions on how to prepare the NKACWA for LC meetings, a workflow was created detailing how to create a new layer from the LC Input template, load it into the Web map and prepare it for editing within the NKACWA. The workflow was meant to be simple to follow, with screenshots of each step along the way and arrows which point to where necessary buttons, layers, or boxes are located. This workflow document is shown in Appendix A.

A second part of the workflow is a table listing potential questions that users may raise during LC meetings. Associated with each question is a list of the layers that relate to those questions so that OneIsland can quickly find and enable those layers within the NKACWA in response to the question being raised. Also in the table are instructions on how to use the layer related to the question in the most effective way, or, if a widget is required, which one and how to use it.

## 4.5. Preliminary Review of the Web Application

Once the application was functional, a virtual meeting was held with OneIsland and an associate to go over the available functions and data present within the Web map and NKACWA. They felt that along with the workflow document, a series of how-to demonstrations for various simple operations would be helpful to them as they learn to use the application. The demonstrations they envisioned would show them how to add new data to a map, how to change icons or symbolization within existing layers, how to reorder layers on the map, how to save maps and layers, and other basic, general functions of AGOL, not the functions specific to the NKACWA included within the workflow. Much of the focus of the meeting was on what was available to OneIsland in terms of data, and much of what OneIsland wanted to see was changes in symbology in accordance with the aesthetic constraint. While this informed further revisions to the tools, it also highlighted some of the challenges in this project that are discussed in the final chapter.

## 4.6. Final NKACWA Interface

Figure 8 displays the NKACWA in the AGOL interface as a potential user would encounter it. To illustrate its functionality, the eligible parcels selected by OneIsland have been activated, as well as points of interest and main roads. The Contribute Your Places widget, the

right-most icon in the upper task bar of the NKACWA, is what OneIsland will use to collect

location information from community members for future arts and cultural events. The next

widget to the left in the task bar is the Print widget, which allows OneIsland to print static, paper

version of the map at the conclusion of each LC meeting for users to take home and view again

later if they are unable to access the NKACWA on their own outside the LC meetings. OneIsland

can change the location in focus by using the Bookmark widget, the next widget to the left in the

task bar. Villages and towns within the district that have a concentration of eligible parcels

identified by OneIsland are pre-loaded into the widget for simple refocusing as needed. The final

two widgets, the Layer widget and the Legend widget, allow OneIsland to select any desired

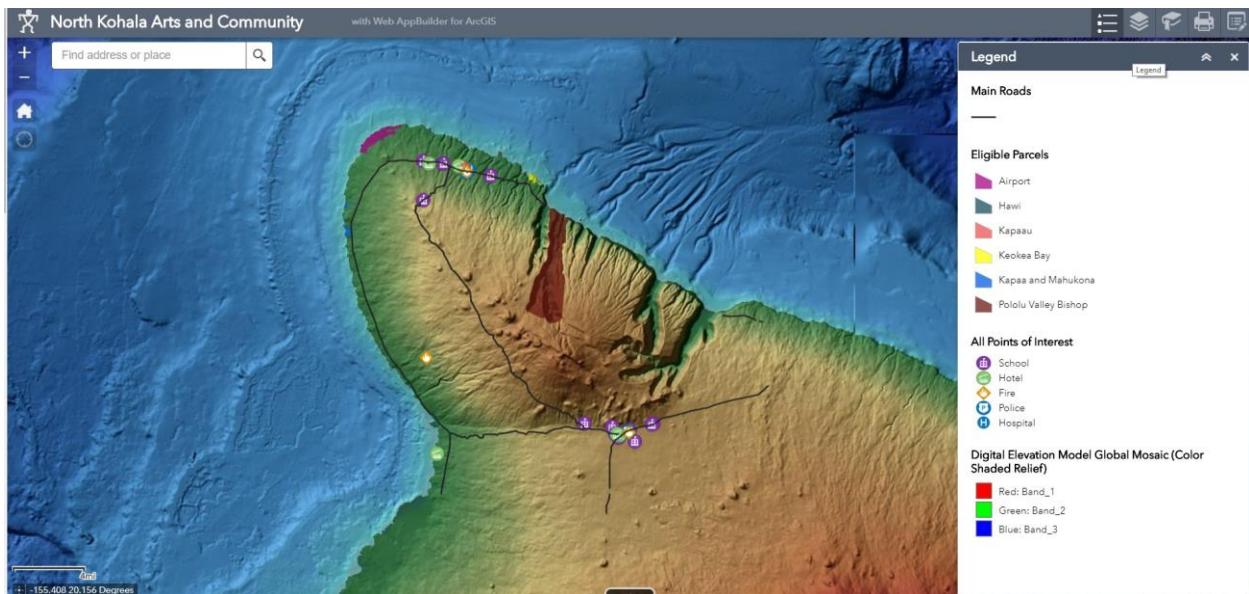spatial data layer and display the symbology for that layer, respectively.



Figure 8. A screen capture of the NKACWA interface, with OneIsland's suggested parcels and
points of interest, displayed, along with major roads. Icons for the widgets included are visible in
the top right.

## 4.7. Chapter 4 Summary

In Chapter 4, the platform choice, considerations for that platform with regard to the three main design constraints, spatial data incorporated into the web map application, and preliminary review of the NKACWA were detailed. AGOL was chosen as the platform for the NKACWA because of its reputation for user-friendliness. Data and widgets added focused on the need for simplicity and community interaction functionality.

## Chapter 5 Evaluation of the North Kohala Arts and Culture Web Application

Evaluation of the NKACWA focused on generating feedback from naïve users as well as OneIsland and determining whether the tool met the three constraints outlined in the methods: simplicity, community interaction, and aesthetics. To obtain feedback, testing was completed by requesting two naïve users to complete the workflow intended for OneIsland. The selected users were available during the time frame needed for testing, were not familiar with the AGOL interface, and were amenable to completing the workflow in a timely manner. They were asked three questions regarding the walkthrough following its completion. Finally, over two virtual meetings, OneIsland completed the walkthrough two times and was asked the same questions given to the naïve users. The combined feedback from the naïve users and OneIsland constitutes the success of the NKACWA with regard to its simplicity, community interaction capabilities, and aesthetics.

To determine if the most important constraint, simplicity, was successfully adhered to when developing the NKACWA, testing was carried out by selected two naïve users who were asked to follow through the workflow provided to OneIsland. In addition, two virtual meetings with OneIsland were held to help them walk through the workflow and to discuss this and other aspects of the NKACWA as it had been implemented.

### 5.1. Subjects and Design of Test

The two naïve users were chosen based solely on their lack of experience with the AGOL platform and their availability to test the workflow. They were each asked if they were willing to participate with full anonymity and both agreed. Each participant was asked to confirm their level of experience with AGOL to ensure that they were truly naïve users. Neither participant

was familiar with the purpose for which the application was generated, the study area, or the content of the NKACWA.

OneIsland, also a subject in the context of the testing of the NKACWA, are inexperienced users. However, unlike the two naïve users selected, OneIsland is familiar with the reason for the creation of the NKACWA, the study area, and the content within the NKACWA.

OneIsland and the two naïve users were asked three questions regarding the simplicity of the workflow following each subject's completion of the workflow:

1. Was the workflow simple?

2. What part(s) could be simplified, and in what way?

3. What else could be done to improve the information given in the workflow?

The subjects' answers were recorded and issues or problems raised were addressed, where possible. The following subsections detail the naïve user test, the OneIsland user test, and the evaluations of the NKACWA by all subjects.

*5.1.1. Naïve User Test*

Each naïve user was given the workflow and a login for AGOL, but no further instructions. The goal was for the workflow to be simple to follow with little outside assistance as OneIsland will be preparing for LC meetings and working with the data on their own following this project.

Following completion of the workflow, the naïve users were asked a series of three questions relating to the simplicity of the workflow and any improvements that could be made. Their responses were recorded in a Microsoft Word document and did not include their names or any other identifying information.

Both users determined that the workflow was simple; however, both found small steps that were missed in the initial draft of the workflow and these steps were added into the workflow. This missing information identified required adding extra information on how to make layers active, how to remove layers and other basic functions within the AGOL platform not touched upon as part of the preparation for or use of the NKACWA. Their responses were used to make improvements to the workflow provided to OneIsland.

*5.1.2. OneIsland User Test*

The same workflow given to the naïve users was sent to OneIsland in preparation for an initial virtual meeting. During the meeting, OneIsland followed the workflow on their own machine while watching a live demonstration of each step in the workflow. Any questions that arose relating to the workflow were recorded. An issue was encountered with ownership of the NKACWA; the way it was transferred from the AGOL Enterprise account of the University of Southern California made it so that OneIsland was unable to edit the NKACWA. The walkthrough was concluded at that point, and other questions regarding the NKACWA were addressed. Questions regarding the functionality of the Legend as well as the ability to group layers were answered; specifically, the Legend is controlled by symbology within the Web map, and there is no grouping of layers available in AGOL at the time of this project.

A second virtual meeting was conducted after rectifying the NKACWA editing issue for OneIsland. The workflow was again gone through, this time OneIsland elected to simply watch rather than attempt completing it on their own machine while watching it live. OneIsland felt that the workflow will become simpler over time. As it stands, the instructions are simple, but OneIsland does not yet have facility with the AGOL interface. They felt that they would lean heavily on the workflow until the interface becomes familiar.

During this second meeting OneIsland also requested information regarding how to change categories assigned to icons; obtaining access for others to view the NKACWA only, not to change it in any way; the possibility of generating a layer of current art and cultural sites to add to the NKACWA; and revising the workflow to include how to filter the attribute table.

In all, the product exceeded OneIsland's expectations of what was possible using AGOL. They did not expect the functionality or range of options available and expressed a positive outlook for utilizing the NKACWA in LC meetings. OneIsland felt that the options presented with AGOL allowed them to effectively collect, catalog, and analyze community member input resulting from LC meetings. Time and familiarity will allow them to effectively use the tools available in AGOL.

# Chapter 6 Discussion

No project comes without its challenges and limitations, and no project is only ever applicable in a single situation. This project is no exception; there are many opportunities left for improvement to the NKACWA as well as potential uses in other locations. What follows is a discussion of the final product: a summary of the NKACWA and its functions, challenges, and limitations encountered during all phases of the project, and potential future uses and improvements that could be made to the NKACWA.

## 6.1. What constitutes the North Kohala Arts and Culture Web Application?

Three constraints drove the design of the NKACWA: simplicity, community interaction, and aesthetics. The final NKACWA reflected these design constraints with a simple interface and simple widgets while incorporating local art and allowing community members present at LC meetings to interact and share their opinions.

The Contribute Your Places widget allows OneIsland to collect community member input regarding potential locations for future arts and cultural events. This component was extremely important to OneIsland, as they intend to utilize the opinions of the community to influence decision-makers in later stages of their project.

OneIsland also desired for local art to be incorporated into the NKACWA and for the aesthetics of the map to reflect that art. To achieve this, a basemap with muted colors, icons created by a local artist, and a splash screen map created by the same artist were incorporated into the Web map and NKACWA as well.

Finally, to maintain the simplicity of the NKACWA, only widgets that were simple to use and did not consume AGOL credits were included. Additionally, a workflow with screen captures and step-by-step instructions was created for OneIsland to prepare for LC meetings.

## 6.2. Challenges During Development

Many challenges during the development of the NKACWA stemmed from the nature of the AGOL interface. Customization of the application template used in this thesis is possible but would have been far beyond the capabilities of the client to manage and update over the long term. Thus one overarching decision was to work only with the out-of-the-box solutions, such as the widgets, with the exception of making modifications to address specific requests from the LC. One significant challenge involved using the map icons created by the local artist, which became a time-consuming practice. AGOL allows custom icons to be used in Web maps and Applications; however, in order to set an icon to a custom icon, the image must be uploaded via a link, meaning it must be hosted online. The 18 icons had to be individually uploaded into OneIsland's AGOL content and loaded into the Web map using the link generated by sharing the icon from the Content page.

With all of the icons and symbols associated with other layers, the legend was very crowded and difficult to interpret. There is little to no control over the legend in AGOL. The grouping function available in ArcGIS Pro, ArcMap, and AGOL 3-dimensional mapping is not available in AGOL 2-dimensional maps. As such, layers with similar attributes had to be aggregated outside of AGOL, to minimize credit usage, and brought back into AGOL rather than being grouped within AGOL to simplify the legend. This added complexity not only for this project but also adds complexity to any subsequent similar projects.

In order to keep the NKACWA viewable by all interested parties, all Esri-hosted layers, with the exception of the basemap, had to be removed. Many of the Living Atlas layers initially added to the NKACWA, hosted by Esri, required any unregistered viewers to log in to an AGOL account before being allowed to view the NKACWA, even though all other layers were shared publicly. The challenge became a decision; keep the layers and limit who can view the NKACWA or remove the layers, and the associated information in those layers, so that any interested community member can interact with the NKACWA? Community interaction was at the heart of OneIsland's reasoning for being involved in this process, and so it was decided to remove the layers obstructing public sharing.

In all, challenges for this project that arose during the development phase were not necessarily difficult to resolve. Rather, they presented difficult decisions that needed to be made regarding which path reflects most closely what OneIsland desires from the NKACWA, or they were time-consuming to resolve.

## 6.3. Limitations of This Project

Initially, narrowing the scope of this project proved problematic. The compulsion to do as much as possible and fill all the client's needs is difficult to temper with time limitations inherent in any project. The other two prongs of this project, collecting historical accounts from elders regarding traditional arts, crafts, and dancing and collecting current cultural assets, the who, what, and where for current art and cultural experiences, are also well-suited to a GIS mapping solution, even multiple NKACWAs. Knowing that something can be accomplished and not being able to complete all aspects of a project in the time frame allotted is a difficult thing to admit.

In addition to not having sufficient time to address all of OneIsland's needs for this project, there was not sufficient time to conduct a true use test. LC meetings have not yet taken

place, and therefore the NKACWA is untested with regard to naïve viewers and community members in the study area. The feedback from community members at a LC meeting using the NKACWA would have been helpful in determining if the NKACWA is complete and successful from their point of view, not just OneIsland and other naïve users who tested the Application with regard to the aesthetics, ability for them to interact with the Application, and the simplicity of the Application.

Simplicity is inherent in the AGOL interface; Esri touts that AGOL is more streamlined and user-friendly than the more complex, and thereby more capable, ArcMap or ArcGIS Pro software. However, in its simplicity it can seem more complex for those familiar with the full desktop software and it can still be overly complex to naïve users who have not encountered GIS software at all before. It is difficult to communicate to a non-web programmer, general internet user partner what AGOL is capable of delivering in order to reach an understanding of its possibilities. Much time was spent attempting to communicate what is and is not possible to accomplish within AGOL for OneIsland. Additionally, the aesthetic options are many, and a newcomer is easily distracted by the many choices that are available. Steering early conversations to obtain OneIsland's requirements, desired inclusions and other expectations for the NKACWA were challenging because of OneIsland's lack of familiarity with the AGOL platform. It was not only a discussion about what they wanted from the NKACWA, but also what AGOL is capable of delivering as well as the method by which the desired outcome can be delivered.

## 6.4. Future Development of the North Kohala Arts and Culture Web Application

The NKACWA, while complete in terms of this project, can always be extended in scope and improved upon much like any project. Additionally, other locations in similar situations can adapt the NKACWA to their needs, given that they are familiar with the AGOL interface or have the assistance of someone who is familiar with AGOL. What follows is a discussion of further avenues of development for the NKACWA created as part of this project.

### 6.4.1. Improving Upon the Existing Web Map Application

The existing web map application could be improved with additional data, as it becomes available. Hiking trails are popular and common in the study area; however, no complete catalog of the trails within North Kohala was available at the time of this study. One of the possible art installations that OneIsland was interested in making available was an "art walk," a hiking trail with sculptural installations along its length. Having a complete catalog of trails in the area would allow community members to discuss which trails would be most benefitted by the addition of art installations.

Additional data about current locations where community members can seek out art events and cultural events would improve the NKACWA as it stands as well. The community members are discussing where they would like to see new art and culture events; knowing where these events are already available eliminates community discussion revolving around facilities and activities that are already in existence.

Utilizing User Experience/User Interface (UX/UI) principles to strengthen the existing application would also be beneficial. Interviewing OneIsland according to Roth's (2015) protocol could lead to new widget developments or additions previously overlooked. The protocol gathers user information regarding the correlation between her work tasks and spatial

data, having the user demonstrate her normal work tasks, and asking the user what she thinks or knows about interactive maps. This deep interview process determines the extent to which the user is involved with spatially-based data currently, the extent to which GIS-based software is used to manipulate the available data and its fitness for the user's tasks, and the extent to which the user is knowledgeable about interactive mapping as a subject. Applying this process to OneIsland and the NKACWA would be more structured and deliver a more cohesive picture of what OneIsland knows and what it expects going forward with interactive mapping in its organization.

### 6.4.2. Extending the Scope of the Web Map Application

After OneIsland completes collecting community input, they plan on bringing those opinions generated with them to meetings with stakeholders and decision-makers in a planning stage of their project. For this stage, OneIsland has expressed interest in modifying the Web map to include all separate layers, as it was initially, rather than the simplified layers used for the NKACWA, as well as all community input layers. They feel this will better allow them to communicate with stakeholders during planning. Additionally, they could incorporate other layers such as soils or transportation information to help determine building requirements and access potential, more of a concern at that stage.

The NKACWA can incorporate elements of the two other prongs initially discussed with OneIsland as pieces of their project: the "past" and "present." The collection of stories and historical information from elders on arts and culture, once created, can be added into the NKACWA. The additional information regarding what is currently available to community members for art education or display as well as cultural education, again, once generated, can

also be incorporated into the current NKACWA. These additions will complete OneIsland's goals for the project and greatly extend the usefulness of the NKACWA.

*6.4.3. Use in Other Locations*

The web map application could be used by other organizations similar to OneIsland, or even by OneIsland for other locations that they are assisting with cultural development. In order to use the NKACWA in other locations, though, they must modify the Web map to reflect the new study area. For the most part, data was clipped to reflect only the study area related to this project. Other layers hosted by the Hawai'i Statewide GIS Program cover the Hawaiian archipelago and could be used for projects elsewhere in the state. Anywhere outside the archipelago will need different data specific to their location.

## 6.5. Conclusions Regarding the North Kohala Arts and Culture Web Application

Working with non-web programmer, general internet user partners is challenging, but communication and demonstration alleviate some of the issues that come with a lack of technical knowledge. Using AGOL, touted for its user-friendliness, also lowered the need for a deep understanding of the technology on OneIsland's part, though not completely.

This thesis has accomplished the creation of a web map application that conforms to expectations set by OneIsland. It is simple to use, allows OneIsland to record input from involved community members, and incorporates local artistry through splash screen maps and icons. The citizens in the district of North Kohala have a way to voice their opinion about the changes to be made within their community with OneIsland and the NKACWA.

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## Appendix A Workflow for OneIsland to Use during Listening Circles

| Question | Layers | How to |
|---|---|---|
| Will this be accessible by foot/what is the accessibility safety-wise? | Basemap | Turn off digital elevation layer, this will show the basemap. Zoom in to area in question and see actual image of ground/terrain. |
| What is the zoning? What type of permitting will be required to accomplish leasing here? | Zoning layer | Turn on zoning layer, it is categorized generally, so see provided metadata packets for further information. |
| What types of non-profit or government agencies could benefit from this installation in a given location? | All Points of Interest, Trails | Turn on, zoom in to area in question, see what is around the parcel in question |
| What will the cost difference be between two similar parcels? How will that difference reflect in size, accessibility, etc. Who owns the parcel(s) of interest? | TMK | Turn on layer, click on parcel in question. A popup window will come up, and at the bottom of the window is a "qpub" link. Clicking the link will bring you to the County of Hawaii Real Property Tax Office website, where different land values are present, current owner, and other information. |
| Is this appropriate for near schools or not? | All Points of Interest | Turn on layer, schools are symbolized as purple circles with a white building superimposed on it. |
| What else is around this that would affect the experience? | All Points of Interest, Main Roads | Turn on layers, zoom out slightly from parcel, see what points of interest or roads are nearby. |

CONTRIBUTE YOUR PLACES TOOL
Before Listening Circle:
- We will make a layer for the current Listening Circle, based on the Listening Circle Template layer. First, go to your Content in your ArcGIS Online account.
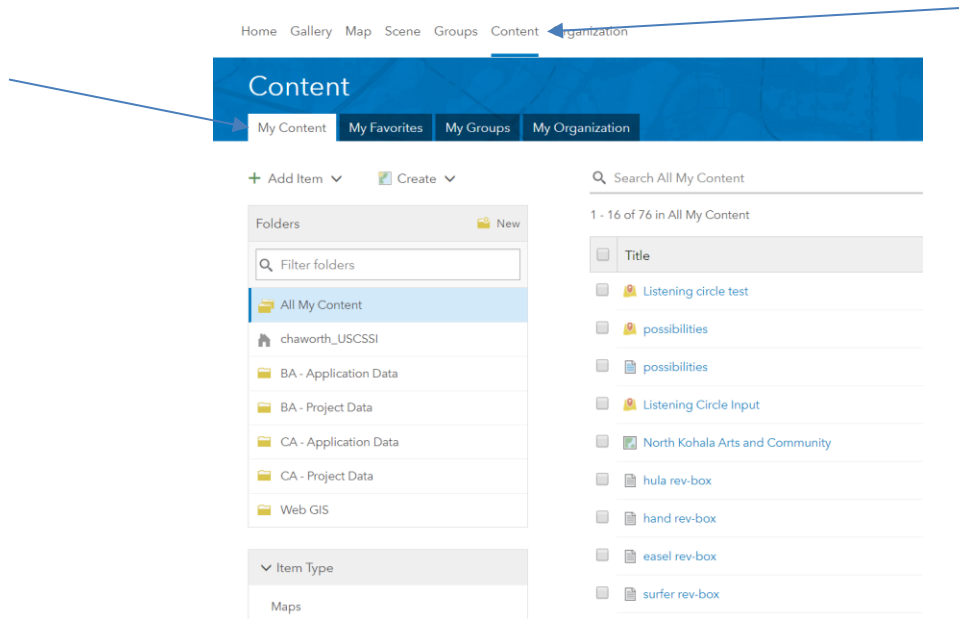


- Now, click on the "Create" icon and a drop down menu will appear, click on the "Feature Layer" option. This opens a pop up window.
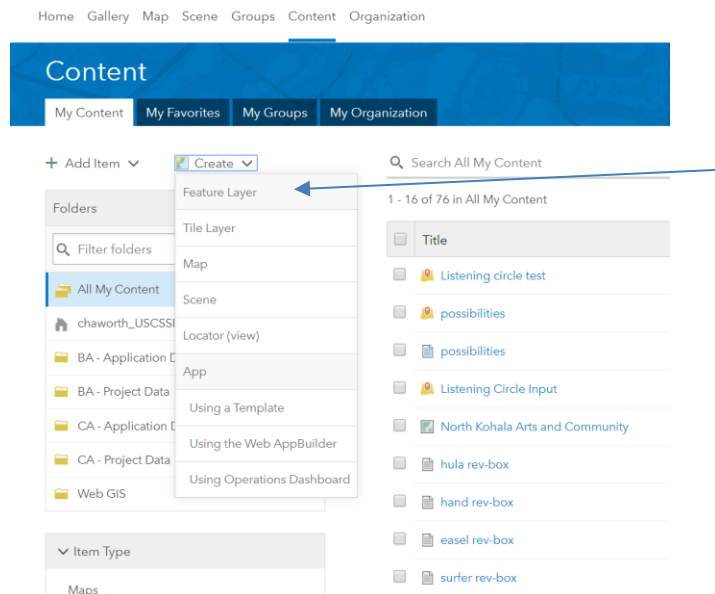
o   In the popup window, click on the tab for "From Existing Layer" and either scroll through or use the "Search" box to find the Listening Circle Input Template layer.
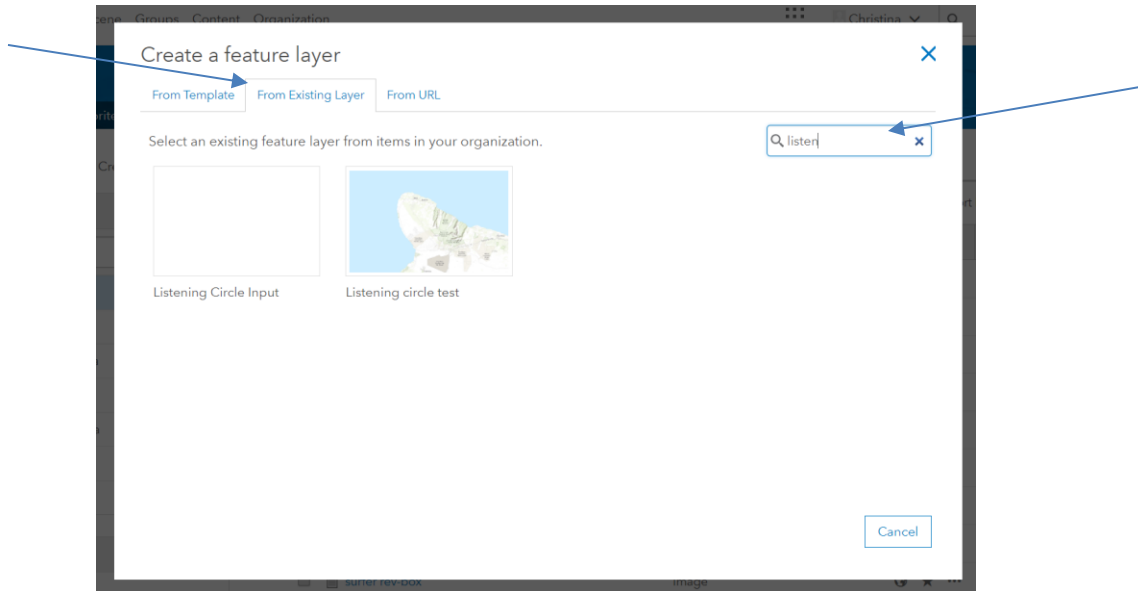


o   Once you find it, click on the layer. A pane will open on the right hand side of the popup window asking to create the new layer from that layer or to close the window. Select "Create."
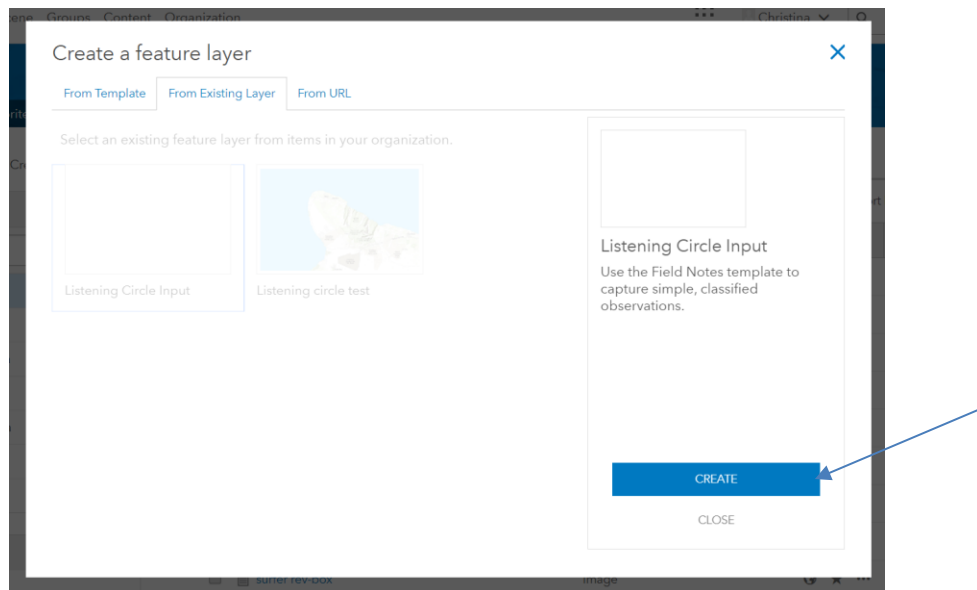
o This brings you to a new popup window, where it asks you to select what layers from the template you want to include in the new layer. Accept the defaults and click "Next."
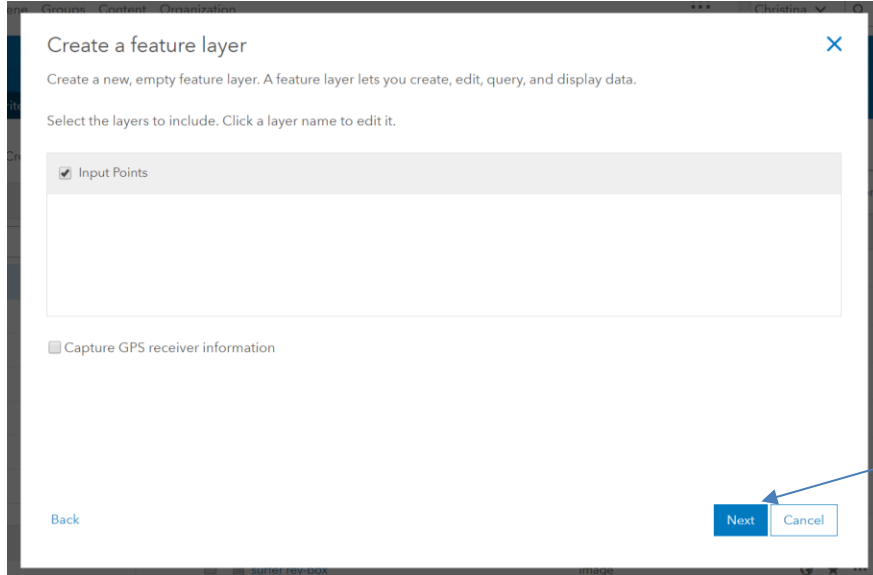


o A new popup replaces this one. Now we need to set the map extent for our new layer. Using the scroll feature on your mouse or the zoom buttons, zoom and pan to the North Kohala area from the zoomed out globe and then click Next.
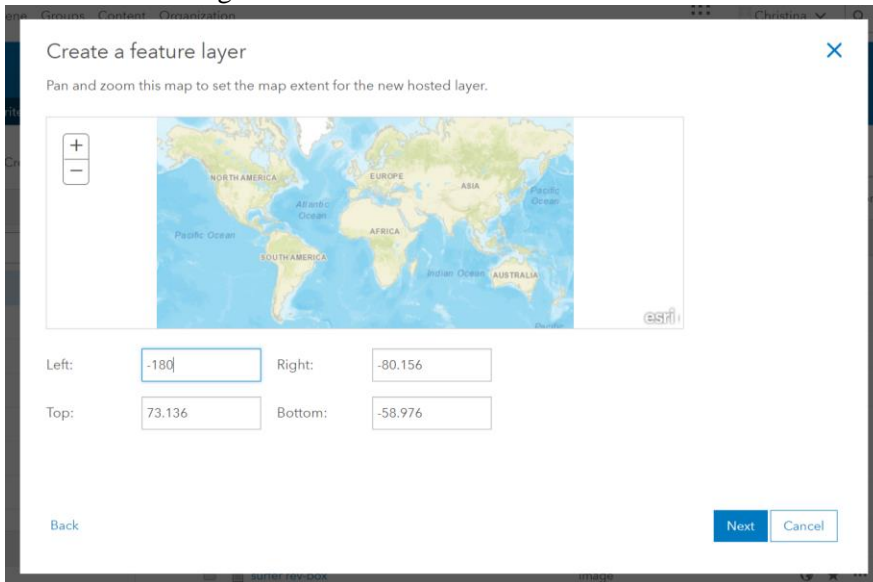
o   Another popup opens over the old one. Here is where we name the layer, choose tags, a summary, and where we want it to be saved. Enter the name you want, modify the tags as you see fit, update the summary, and choose the folder within your Content where you want the layer to be saved. I've entered example fields for all of that in the screen capture below:



o   Once you're satisfied with how you've filled out the information, click Done.

- The layer will be created based on the template layer, with all the same icons/symbolizations. We just need to add it to the map off of which the Application is based.
- Return to your Content.
- Click on the North Kohala Arts and Community Web Map (NOT the Web Mapping Application).

o   Once you select the map, choose to open it in the Map Viewer.
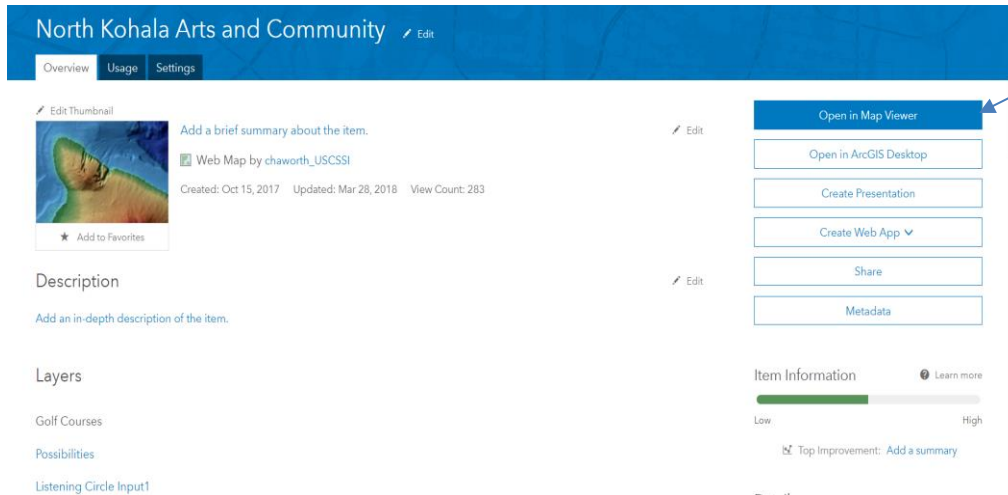


- In Map Viewer, we can add or remove layers, which we cannot do in the Web Mapping Application. This map is linked to the Application, so any changes we make here will show up in the Application.

- We need to add the current Listening Circle layer. In the Map Viewer, there is a button called "Add." Click on it and a drop down menu will open. Click on the "Search for Layers" option.
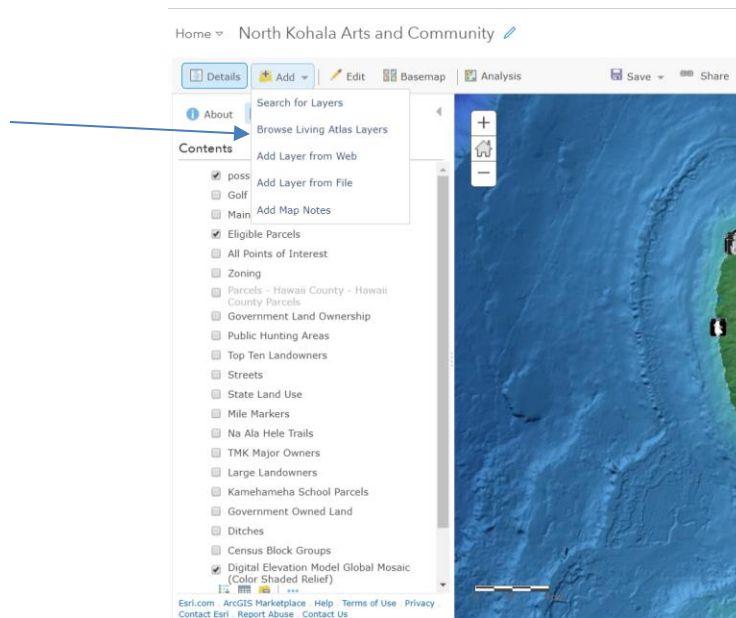
o This will open the Search for Layers pane, where you can enter a search term and search your Content, the Living Atlas, etc. For starters, select the drop down arrow next to "In:" and click on My Content.
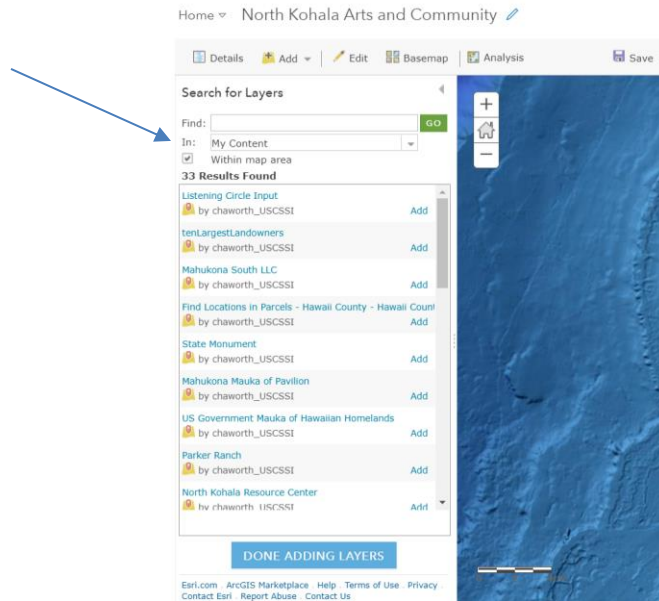


o All of the files in your content folders will be there. You can either scroll through or use the Find: bar to enter in a search term to help you find it faster. Once you find the layer you want to add, click the "Add" link to the right of the name, and then the "Done Adding Layers" button at the bottom of the pane.
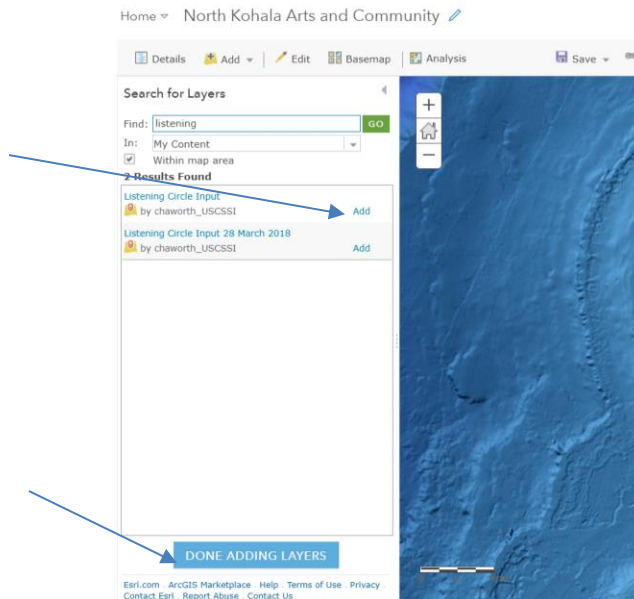
- The layer for the current Listening Circle is now added to the map, but we need to Save the map to make sure the changes are transferred to the Web Mapping Application. Click the Save button in the middle of the task bar.
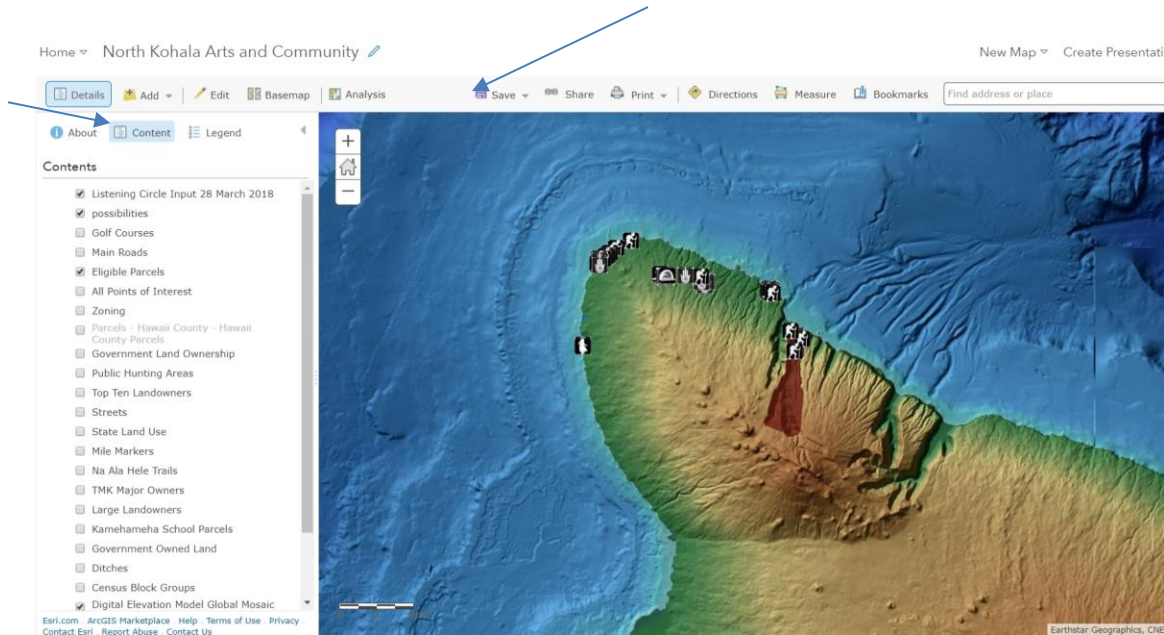


- The last thing we need to do is make the layer editable in the web map application. Return to your content in ArcGIS Online, click on the North Kohala Arts and Community Web Mapping Application, bringing you to the overview page for the Application. Click on the "Edit Application" button.
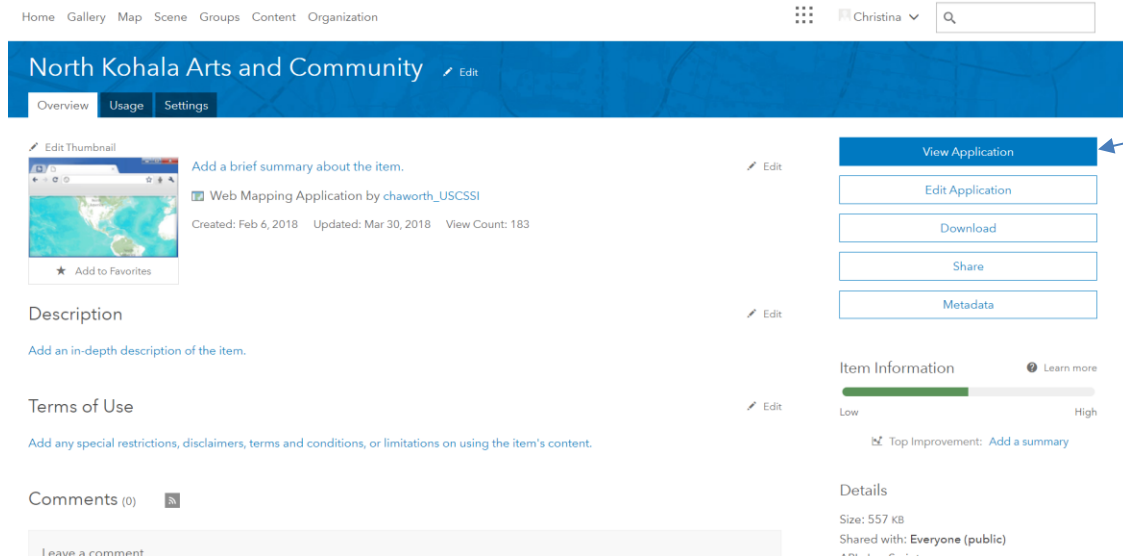
o   Now you will be in the Web AppBuilder for ArcGIS. Click the "Widget" tab, then the "Set the widgets in this controller" tab in the pane that opens.
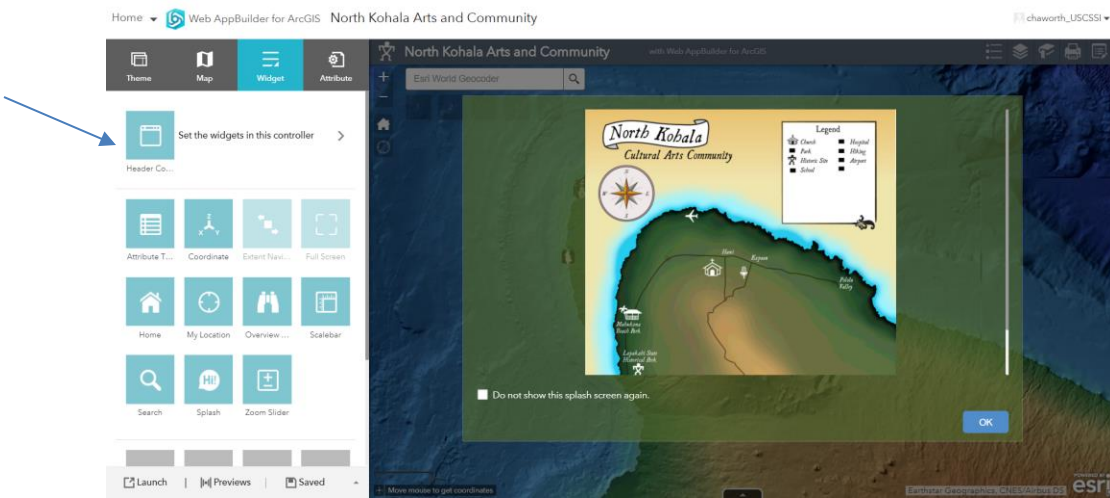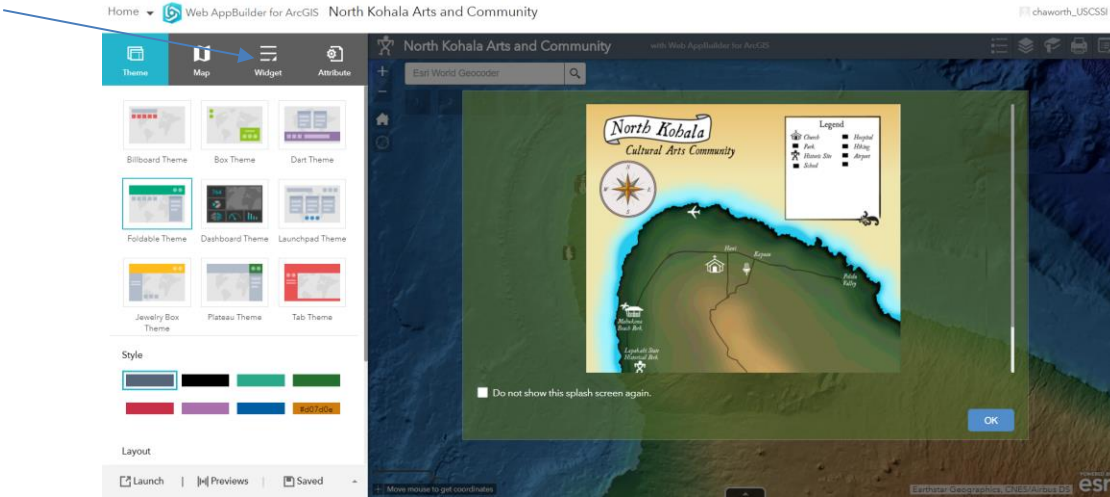
o   Hover over the "Edit" widget icon, and click on the pencil image that pops up in the lower right hand corner of the icon. This will open a pop up window where you can edit the widget.
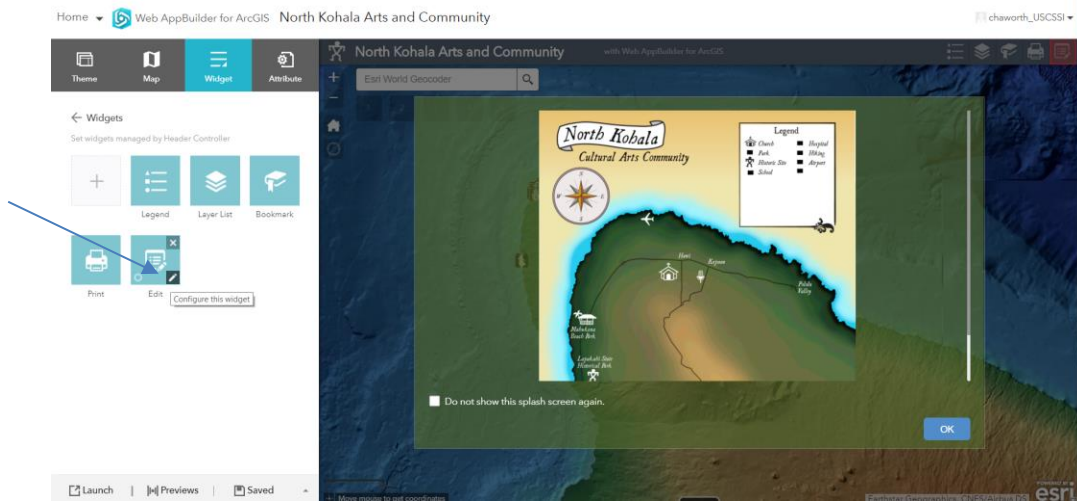


o   At the bottom of the popup window is a table with a dark gray bar as the title bar. The Listening Circle layer we added to the map in the previous steps should be visible in the table. Make sure that the box below "Editable" is checked. Once checked, click OK in the bottom right corner of the window.
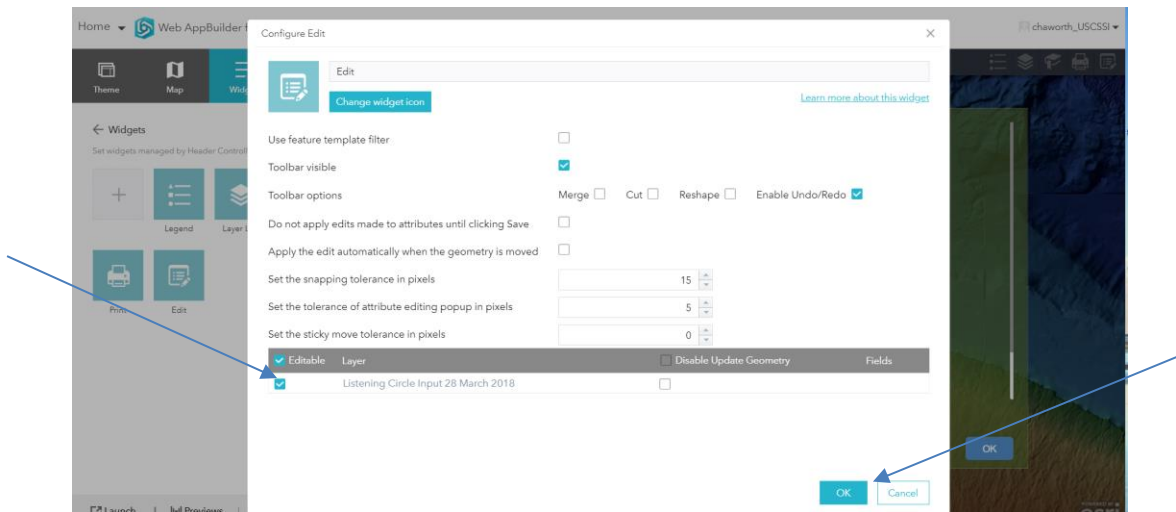
o The popup window will close and bring you back to the normal view. In the pane on the left hand side of the window, at the bottom, the "Save" icon will now be blue, indicating that changes have been made to the map that have not yet been saved. Click this button.
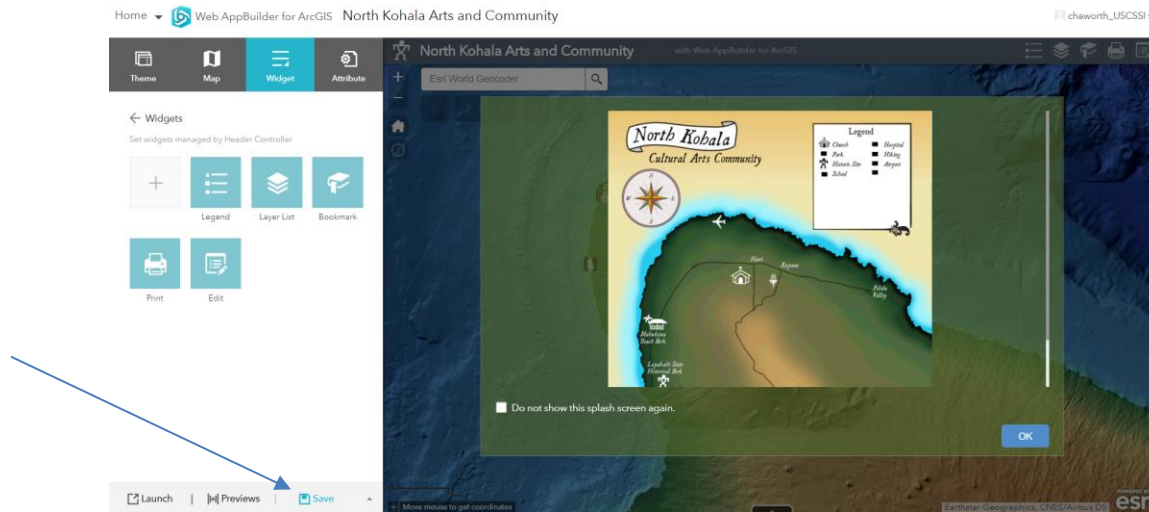


o Once it has finished saving, the icon will turn gray, matching the two to its left. Now you are ready to collect input at the Listening Circle!

During Listening Circle:

- Open North Kohala Arts and Community Web Mapping Application
- Select the Contribute Your Places tool ⬚ from the upper right-hand tool bar. A window will open with all of the icons generated by the artist, labeled by function.
- Choose the icon that relates to the point of interest you wish to place within the edit window and click on it, so it is highlighted.
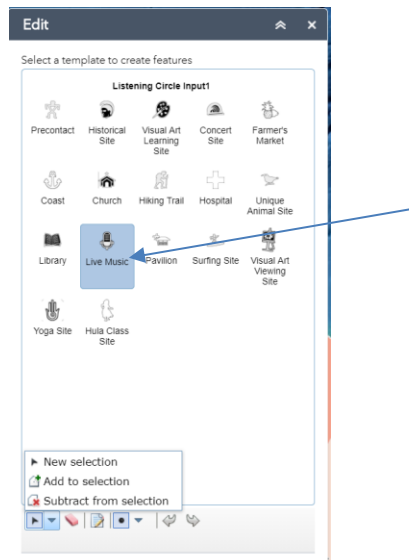
- Click on map where you would like the point to be.
  - At this point the icon will be just a red dot. A window will pop up, allowing you to name the point, detail the location, choose the date and time, add comments regarding the new point, and add an attachment that might be associated with the site. Once you have filled in the popup window with all the information you wish, click "Close" and click anywhere on the map to see the icon representing your point of interest!
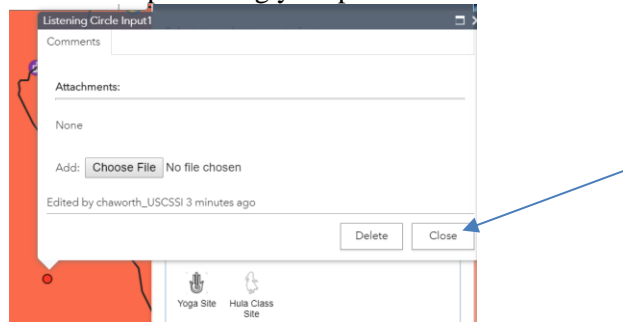


  - **If you accidentally click somewhere you don't want the point to be**, click on the point that you accidentally added (it will change from the custom icon back to a red dot), look in the Contribute Your Places tool window at the bottom, and click on the red "X" and the point will disappear!

# Appendix B Spatial Data Handout for Community Members

| Name | Description | Source |
|---|---|---|
| Roads<br>• Main Roads<br>• Streets | Main roads only includes those roads classified as highways or main thoroughfares. Streets includes all main roads as well as all secondary and seller roads. | Hawaii Statewide GIS Program |
| Eligible Parcels | Eligible parcels are all parcels highlighted by OneIsland as potential places for building art and cultural experiences within the community | OneIsland, TMK data |
| Points of Interest | Holds locations of schools, hotels, fire stations, police stations, and hospitals | Hawaii Statewide GIS Program |
| Zoning | Subcategories of zones have been grouped for simpler identification. | Hawaii Statewide GIS Program |
| Parcels – Hawaii County | TMK-linked parcel data for the county. | Hosted by Hawaii State GIS |
| Government Land Ownership | Displays state, state DHHL, county, and federally owned lands. | Hosted by Hawaii State GIS |
| Public Hunting Areas | Displays public hunting area parcels. | Hosted by Hawaii State GIS |
| Top Ten Landowners | The ten landowners with the largest total area owned within the study area | Derived from data downloaded form the Statewide GIS Program |
| State Land Use | Land use categories generated by the state. | Hawaii Statewide GIS Program |
| Mile Markers | Catalog of the location of each mile marker along major highways. | Hawaii Statewide GIS Program |
| Na Ala Hele Trails | Displays the path of Na Ala Hele trails, but is incomplete. | Hawaii Statewide GIS Program |
| TMK Major Owners | TMK data based on the major owner listed and total area owned by each. | Hawaii Statewide GIS Program |
| Large Landowners | The 10 largest areas of land were extracted and displayed based on the owners of those largest parcels of land | Derived from the Hawaii Statewide GIS Program |

| Name | Description | Source |
|---|---|---|
| Kamehameha School Parcels | Extracted all parcels of land owned by Kamehameha Schools. | Derived form Hawaii Statewide GIS Program |
| Ditches | Lines displaying the location of ditches in the study area | Hawaii Statewide GIS Program |
| Census Block Groups | Displays the block groups used by the US census. | Hawaii Statewide GIS Program |
| Digital Elevation Model Global Mosaic (Color Shaded Relief) | Shaded relief of topography and bathymetry | Hosted by NOAA National Centers for Environmental Information |

**Appendix C Splash Screen Map**

# Appendix D Icons

| Icon | Category |
|------|----------|
| | Coastal Site |
| | Visual Art Learning Site |
| | Outdoor Amphitheater |
| | Art Exhibit |
| | Farmer's Market |
| | Veteran's Site |
| | Art Walk |
| | Hiking Trail |
| | Hospital |
| | Dance Pavilion |

| Icon | Category |
|------|----------|
|  | Unique Animal Site |
|  | Historical Site |
|  | Library Site |
|  | Indoor Concert |
|  | Pavilion |
|  | Precontact Site |
|  | Religious Site |
|  | Cultural Arts Center |

# Appendix E Metadata for layers included in the NKACWA

| | |
|---|---|
| Layer Name: | 2010 Census Block Groups |
| File Name: | blkgrp10 |
| Layer Type: | Polygon |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | Universal Trans Mercator, Zone 4 (Meters), NAD 83 HARN |
| Description: | 2010 Census Blocks Groups |
| Source: | U.S. Census Bureau (February, 2011). |

History: Projected from decimal degrees to UTM Zone 4 NAD83 HARN using ArcToolbox. Removed extraneous fields (e.g., State Code). The census blocks layer was clipped to the State GIS coastline, which resulted in 2 census blocks being deleted, so those blocks were added back into the layer – therefore, the coastline for the census layers is slightly different than the State GIS coastline. Specifically:

- Block number 150030001122002, population = 95 (Kuapa Isle, Hawaii Kai, Oahu)
- Block number 150039814001002, population = 15 (islet just west of Sand Island, Oahu).

This revised coastline was then used to clip the remaining 2010 census layers - block groups, census county divisions, census designated places and census tracts.

Attributes: Polygons:

| | |
|---|---|
| GEOID10 | 12-digit (State – 2 dig, County - 3 dig, Tract – 6 dig, Group – 1 dig) |
| POP10 | Population from 2010 Census |

County Codes:

| | |
|---|---|
| 001: | Hawaii |
| 003: | Honolulu |
| 005: | Kalawao (Kalaupapa) |
| 007: | Kauai |
| 009: | Maui |

Note: The official City and County of Honolulu census geography includes the Northwestern Hawaiian Islands, which we have not included in this layer.

Contact: Statewide GIS Program, Office of Planning, State of Hawaii
PO Box 2359, Honolulu, Hi. 96804
Phone: (808) 587-2846, email: gis@hawaii.gov

| Layer Name: | Ditches |
|---|---|

Layer Name:     Ditches

File Name:      Ditches

Layer Type:     Line

Status:         Complete

Geog. Extent:   All major Hawaiian islands except Kahoolawe

Projection:     UTM Zone 4 (Meters)

Datum:          NAD 83 HARN

Description:    Ditches

Source:         USGS Digital Line Graphs, 1983 version;
                DLNR Division of Aquatic Resources (DAR), 2004.

History:        Lines were extracted from the 1983 DLG hydrography layers.  DAR coded lines with the
                Hawaii Stream Assessment codes and additional attribute data.  Ditch Type and
                Subtype were coded based on USGS hydrography major and minor codes.

                OP Staff removed USGS DLG Major/Minor codes and HSA and DAR codes, leaving only
                Ditch Type, Subtype, and Subtype 2.  OP staff also merged islands together and
                projected into NAD83.

Attributes:     Lines:

                Shape:      Feature Geometry
                Length:     Length of segment in meters
                Type:       Type of ditch or structure
                Subtype:    Subtype of ditch or structure
                Subtype2:   Additional Subtype of ditch or structure

Contact:        State of Hawaii GIS Program
                PO Box 2359, Honolulu, Hi.  96804; (808) 587-2846.
                email:  gis@hawaii.gov

| Layer Name: | Hawaii Fire Stations |
| --- | --- |
| File Name: | firestations_state |
| Layer Type: | Point |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | Universal Trans Mercator, Zone 4 (Meters) |
| Datum: | NAD 83 HARN |
| Description: | Locations of fire stations within the State of Hawaii. |
| Source: | Hawaii, Honolulu, Maui and Kauai Counties. |
| History: | Received from and/or verified by counties, August 2017. |

Per County GIS Personnel, layers are current as of August 2017.
Kauai, Maui, Hawaii Counties – received from county GIS staff
Oahu – downloaded from CCH Open Data Portal

OP GIS staff merged county layers into one statewide layer, keeping only the name field from each county layer, and adding an island field.  Complete attributes for each county fire department layer can be found in the individual county fire station layers.

Note:    Includes Hawaii County Volunteer Fire Stations.


Attributes:    Points:

NAME        Station Name
ISLAND      Island Name


Contact:    Statewide GIS Program, Office of Planning, State of Hawaii,
PO Box 2359, Honolulu, Hi.  96804; (808) 587-2846.
email:  gis@hawaii.gov

Layer Name:    Golf Courses

File Name:     golfcourses.shp

Layer Type:    Polygon

Status:        Complete

Geog. Extent:  Main Hawaiian Islands

Projection:    Universal Trans Mercator, Zone 4

Datum:         NAD 83

Description:   Locations of golf courses in the state of Hawaii.

Source:        Created by Hawaii Statewide GIS Program, Office of Planning, State of Hawaii, October, 2014.

History:       Used County TMK Parcel layers overlaid with aerial photos to extract polygons representing golf course boundaries.  Some boundaries follow TMK parcel boundaries and other boundaries were screen digitized.

Attributes:    Polygons:

| | |
|---|---|
| Golf_Cours: | Golf Course Name |
| Shape_leng: | Length in meters |
| Shape_Area: | Area in sq. meters |
| Island: | Island |
| Acres: | Acres |

Contact:       Hawaii Statewide GIS Program, Office of Planning, State of Hawaii, PO Box 2359, Honolulu, Hi.  96804; (808) 587-2846. email:  gis@dbedt.hawaii.gov

| | |
|---|---|
| Layer Name: | Government Landownership, as of 2017 |
| Layer Type: | Polygon |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | Universal Trans Mercator, Zone 4 (Meters) |
| Datum: | NAD83 HARN |
| Description: | Government Landownership in the State of Hawaii: Federal, State, State DHHL, and County |
| Source: | C&C of Honolulu (March 2017), Kauai County (August 2017), Maui County (April 2017), Hawaii County (April 2017). |
| History: | This dataset was created using the Large Landowners layer that was derived from the TMK Parcel shapefiles from the counties of Honolulu, Kauai, Maui and Hawaii. Lands were selected for Type = "Public." |

Attributes: Polygons:

| | |
|---|---|
| MajorOwner | Name of Public Landowner |
| Island | Island |
| Type | Type of Public Ownership (Federal, State, State DHHL, County) |
| GIS_Acres | Acreage calculated by GIS |

Contact: Statewide GIS Program, Office of Planning, State of Hawaii
PO Box 2359, Honolulu, Hi. 96804
Phone: (808) 587-2846.
Email: gis@hawaii.gov

| Layer Name: | Hospitals |
|---|---|
| Layer Type: | Point |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | Universal Trans Mercator, Zone 4 (Meters) |
| Datum: | NAD 83 HARN |
| Description: | Locations of hospitals in the State of Hawaii. |
| Source: | The Hawaii hospitals layer was created by the Pacific Disaster Center (PDC) in 2003 from data downloaded from the FEMA Multi-Hazard Mapping Initiative's (MMI) Emergency Response Facilities database: <http://www.hazardmaps.gov>. |
| History: | Risk Management Solutions, Inc. originally developed this database under contract to the National Institute of Building Sciences in 1997. This database was developed from emergency operations centers data provided by FEMA in late 1994 and supplemented with data gathered using the 1996 edition of the electronic phonebook, ProCD. |

The PDC found that some locations were improperly referenced. Therefore, all locations were quality control checked (via their addresses) using USGS 1:24,000 DRG's, Census road data, as well as aerial photos. Two new points were added on the Island of Oahu. Locations of points on the other islands were moved accordingly.

The corrected shapefile was re-projected to UTM Zone 4, NAD 83 HARN.

May, 2017 – Updated the name of St. Francis Medical Center - West to Queen's Medical Center – West Oahu.

**Attributes listed on following page**

| Layer Name: | Hotels |
|---|---|
| Layer Type: | Point |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | Universal Trans Mercator, Zone 4 (Meters) |
| Datum: | NAD 83 HARN |
| Description: | Locations of hotels in the State of Hawaii. |
| Source: | List of hotels from Hospitality Advisors LLC, 2006. Revised October 2012. |

History: This dataset was created from a table in Excel format from Hospitality Advisors, LLC. The address field was used to initially locate the hotels by geocoding using ArcMap. Further rectification was done using various sources including TMK Parcels, aerial and satellite photos, etc.

December, 2010: At the request of Hospitality Advisors, price field was removed because some categories had changed since 2006.

December, 2010: Hospitality Advisors provided updated names for various hotels.

October, 2012: Hospitality Advisors provided a new list of additional hotels including smaller hotels. Data received March 2012. Hotels with less than 10 units were not included.

Attributes: Points:

| ISLAND | Island |
|---|---|
| Area | Geographic Area |
| NAME | Hotel Name |
| ADDRESS | Hotel Address |
| ZIPCODE | Zip Code |
| TYPE | Type of Accomodation |
| UNITS | Number of Units |
| Year_OPEN | Year Opened |

Contact: Statewide GIS Program, Office of Planning, State of Hawaii, PO Box 2359, Honolulu, Hi. 96804; (808) 587-2846. email: gis@hawaii.gov

| Layer Name: | Mile Markers |
| --- | --- |
| Shapefile: | SDOT_Mile_Markers |
| Layer Type: | Point |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | Universal Trans Mercator, Zone 4 (Meters) |
| Datum: | NAD 83 HARN |
| Description: | DOT Road Inventory (Mile Markers) for the main Hawaiian islands. |
| Source: | Received from State of Hawaii Dept. of Transportation, January, 2016 |

History: Prepared/Updated for State DOT, 2012 for islands of Kauai, Molokai, and Hawaii and 2014 for Oahu and Maui islands

Originally published by/for State DOT in 2005

See SDOT_Routes_2005_Metadata.pdf for additional historical and processing information.

| Attributes: | Island: | Island |
| --- | --- | --- |
| | Route: | Official Route Number |
| | MP: | For DOT Use |
| | Direction: | - : Direction is from end of route towards milepost 0 |
| | | + : Direction is from milepost 0 towards end of route |
| | FeatureChar: | Mile displayed on milepost sign |
| | Location: | Left: Location of the sign is on the left side of the road in the direction of travel |
| | | Right: Location of the sign is on the right side of the road in the direction of travel |
| | Lat: | Latitude in Decimal Degrees |
| | Lon: | Longitude in Decimal Degrees |
| | Comments: | sign condition, additional mile marker sign notes |
| | Surveyed: | Date photolog taken |
| | ID2: | For DOT internal use |

Contact: Goro Sulijoadikusumo, Department of Transportation, State of Hawaii
Phone: (808) 587-1839
Email: Goro.Sulijoadikusumo@hawaii.gov

Statewide GIS Program, Office of Planning, State of Hawaii,
PO Box 2359, Honolulu, Hi. 96804; (808) 587-2846.
email: gis@hawaii.gov

| Layer Name: | Na Ala Hele Trails |
|---|---|
| File Name: | NaAlaHeleTrails |
| Layer Type: | Line |
| Status: | Complete |
| Geog. Extent: | Islands of Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii |
| Projection: | Universal Transverse Mercator, Zone 4 (Meters) |
| Datum: | NAD 83 HARN |
| Summary: | This dataset depicts the general geographic locations of statewide Na Ala Hele trail and access for the public use. This dataset is to be used in tandem with the trail's datasheet that describes in detail the exact location, route, amenities and hazards. |

**DO NOT wander off marked trail as it may be hazardous.**

| | |
|---|---|
| Description: | Public trails within the Na Ala Hele Trail and Access system, which are managed by Na Ala Hele Trail Specialists at DOFAW's county district offices. |
| Source: | Information was compiled and digitized by DLNR/DOFAW from various sources, 1998-2000. For a higher accuracy some trails have been GPSed and/or over-layed onto satellite imagery to verify accuracy. Updates provided 2002, 2010, 2012, 2014, 2015, 2016, 2017. |

Latest update – December, 2017

**Attributes:** Lines:

| | |
|---|---|
| OBJECTID | Polygon ID (for Arc/Info use) |
| TRAIL_NUM | Trail Number assigned by DLNR, DOFAW |
| NAH | Y = Na Ala Hele Program Trail/Access; O = Other Managed Area |
| ISLAND | Island where trail is located |
| QUAD | USGS Quad Map Number(s) upon which trail falls/is mapped |
| DISTRICT | District through which trail runs |
| YRCREATED | Year Trail was created |
| LENGTH_MI | Length of trail in miles |
| ELEV_RANGE | Highest elevation on trail |
| ST_ACCESS | How to get to trail starting point (e.g., Foot, 2 WD, 4 WD, Bus, etc.) |
| START_PT | Location of trail starting point |
| END_PT | Location of trail ending point |
| STANDARD | Development Standard of Trail (e.g., Easy, Moderate, Difficult, N/A) |
| CLIMATE | Trail Climate |
| TSPT_TYPE | Transportation Type allowed/recommended (e.g., Foot, Bicycle, etc.) |
| FEATURES | Trail Features (e.g., Culture, Hunt, Swim, etc.) |
| AMENITIES | Trail Amenities (e.g., Parking, Tables, Camping, etc.) |
| USE_REST | Restrictions that apply to trail (e.g., prior landowner approval, day only, etc.) |
| HAZARDS | Trail Hazards (e.g., waves, cliffs, hunters) |
| COMMENTS | Comments |
| TRAIL_NAME | Trail Name |
| SHAPE_LENGTH | Length of trail, in meters, as calculated by GIS |

Layer Name:     Hawaii Police Stations

File Name:      policestations_state

Layer Type:     Point

Status:         Complete

Geog. Extent:   Main Hawaiian Islands

Projection:     Universal Trans Mercator, Zone 4 (Meters)

Datum:          NAD 83 HARN

Description:    Locations of police stations within the State of Hawaii.

Source:         Hawaii, Honolulu, Maui and Kauai Counties.

History:        Received from and/or verified by counties, August 2017.

                Per County GIS Personnel, layers are current as of August 2017.
                Kauai, Maui, Hawaii Counties – received from county GIS staff
                Oahu – downloaded from CCH Open Data Portal

                OP GIS staff merged county layers into one statewide layer, keeping only the name
                field from each county layer, and adding an island field.  Complete attributes for each
                county police department layer can be found in the individual county police station
                layers.


Attributes:     Points:

                NAME        Station Name
                ISLAND      Island Name


Contact:        Statewide GIS Program, Office of Planning, State of Hawaii,
                PO Box 2359, Honolulu, Hi.  96804; (808) 587-2846.
                email:  gis@hawaii.gov

Layer Name:    Preschools

Layer Type:    Point

Status:        Complete

Geog. Extent:  Main Hawaiian Islands

Projection:    Universal Trans Mercator, Zone 4 (Meters)

Datum:         NAD 83

Description:   Locations of preschools in the State of Hawaii.

Source:        The Executive Office on Early Learning (EOEL) compiled the data from the following sources:

- DOE Preschools:  State Department of Education website - addresses of the elementary schools offering PreKindergarten classes
- Headstart, Kamehameha Schools and private preschools:  Patch are all licensed by the Department of Human Services (DHS) and the list of these programs, with addresses, is maintained by PATCH, a nonprofit organization under contract to DHS.
- List of preschools on military installations, along with their addresses, were compiled by EOEL.

. Received listing of all
                preschools in Hawaii.

History:       The Executive Office on Early Learning (EOEL) compiled the data from the following sources:

- DOE Preschools – DOE website (http://165.248.6.166/data/schoollist.asp)
- HS, KS, and private preschools:  People Attentive to Children (PATCH) (http://www.patchhawaii.org/)
- Preschools on military installations were compiled by EOEL.


This dataset was created from a table in Excel format
                from the governor's office, September 2012.
                Locations were geocoded by the given addresses
                using ArcGIS 10 along with the ArcGIS online Address
                Locator "TA_Streets_US_10.GeocodeServer."  Addresses
                that were not geocoded were further researched and
                manually digitized.

Layer Name: Hawaii Private Schools

Coverage Name:   private_schools

Layer Type: Point

Status:          Complete

Geog. Extent:    Main Hawaiian Islands

Projection: Universal Trans Mercator, Zone 4 (Meters)

Datum:           NAD 83

Description:     Private School locations for the main Hawaiian Islands.
          Preschool-only private schools are not included.

Sources:    HAIS.org (Hawaii Association of Independent Schools), 2011.

History:    Created by Office of Planning, 2011, using data from
          HAIS's list of private schools in Hawaii.
          1.  Geocoded addresses from list using ArcGIS Online
          Address Locator (TA_Streets_US_10.GeocodeServer).
          2.  Unmatched addresses were further researched using
          various sources using TMK parcels, County Street data,
          Google Maps, etc.
          3.  All locations were further verified using TMK ownership
          data and satellite aerial photos.


Attributes: Points:

          School          School Name
          Address         Address
          City       City
          Zipcode         Zip Code
          Website         Website URL
          Grades          Grade Levels
          Gender          Girls, Boys or Coed
          Island          Island
          Students11 Student Enrollment in 2011
          Faculty11   Number of Faculty in 2011
          Tuition11   Tuition in 2011


Contact:    Joan Delos Santos, Office of Planning, State of Hawaii,
          PO Box 2359, Honolulu, Hi.  96804; (808) 587-2895.
          email:  JDelos_Santos@dbedt.hawaii.gov

| Layer Name: | Department of Education Public Schools |
|---|---|
| File Name: | Public_Schools |
| Layer Type: | Point |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands |
| Projection: | UTM Zone 4, Meters |
| Datum: | NAD 83 HARN |
| Description: | Public Schools |
| Source: | State Department of Education (DOE) |
| History: | Downloaded in Excel format from State DOE website, geocoded by Statewide GIS Program, June, 2017 |

Attributes:

| Code: | DOE Numeric School Code |
|---|---|
| Name: | Short School Name |
| Address: | School Address |
| City: | School City |
| Zip: | School Zip |
| Phone: | School Phone Number |
| Fax: | School Fax Number |
| Principal: | Name of School Principal |
| Grade_From: | Lowest Grade at School |
| Grade_To: | Highest Grade at School |
| Type: | Type of School: |

      Elementary
      Elementary-Middle
      Elementary-Middle-High
      High
      Intermediate
      Middle

| Website: | School Website |
|---|---|
| Complex: | Complex School is in |
| Complex_Area: | Complex Area School is in |
| District: | District School is in |
| Island: | Island |
| Charter: | 0: School is not a Charter School |
| | 1: School is a Charter School |
| ESIS_Name: | Name of School as listed in DOE Electronic Student Information System |

| Contact: | Hawaii Statewide GIS Program |
|---|---|
| | Office of Planning, State of Hawaii |
| | PO Box 2359, Honolulu, Hi. 96804 |
| | Phone: (808) 587-2846 |
| | email: gis@hawaii.gov |

Revised September 14, 2012

| | | |
|---|---|---|
| Name: | COH_Centerlines | |
| Layer Type: | Line | |
| Description: | Names and addresses of Streets and Roadways (major and minor) for the Island of Hawaii by the County of Hawaii, Planning Department. These road features originally derived from Tiger Line files created for the Year 2000 Census data. | |
| Source: | State of Hawaii, Office of Elections, January 2002; rectified by the County of Hawaii, Planning Dept., November 2005.  Revised September 2012. | |
| History: | Derived from 1:100,000 Tiger Line Files.   Data originally downloaded from the Office of Planning's website (Roads - Major, TIGER and Roads - Other, TIGER). Rectified by the County of Hawaii, Planning Dept., 2003; using ArcEdit of the Arc/Info version 7.2.1 and ArcView GIS version 3.2a software program. The County of Hawaii's Tax Assessor Parcel Data layer was used as a background to define its' location.   Street names were researched using an official list compiled by the Planning Dept. and cross-referenced to County Council resolutions, Subdivision files, and The Ready Mapbook of East and West Hawaii. | |
| Overview: | The County of Hawaii centerlines layer depicts the street network as it exists on the ground, as opposed to official roadways from paper documents.   Likewise street names are the ones in use, meaning the ones that the County uses to assign addresses. This is true even if the name in use differs from the official name of the street.<br><br>The entity is the street segment: the portion lying between two adjacent intersections. Each centerline has a street name attribute and an address range.   All segments of a street are included if any buildings are addressed anywhere on the street.   Streets are included regardless of ownership (County, State, Federal or private).   Centerlines include, but are not limited to, those streets that have addressable buildings. | |
| Attributes: | SEGID | Segment ID number. |
| | FULLNAME | Full "primary" street name.   Street name that the County uses for a street.   This street name is used for assigning addresses. |
| | SDIRPRE | Prefix street direction for "primary" street name (e.g., "E" in "E Kawailani St"). |

| Layer Name: | Neighbor Island Parcels |
|---|---|
| Coverage Name: | <isl>tmk |
| Layer Type: | Polygon |
| GDB Location: | SOH\ParcelsZoning\<isl>tmk |
| Status: | Complete |
| Geog. Extent: | Main Hawaiian Islands, except Oahu |
| Projection: | Universal Trans Mercator, Zone 4 (Meters) |
| Datum: | NAD 83 HARN |
| Description: | Parcel/TMK maps for Neighbor Islands |
| Source: | Counties of Kauai, Maui and Hawaii |
| History: | Originally created by Geographic Decision Systems International (GDSI); maintenance assumed by counties in 2004 and 2005. |

Latest Updates:
Hawaii County – April, 2017
Kauai County – September, 2017
Maui County – April, 2017

State GIS Program projected all county tmk layers to UTM Zone 4, NAD 83 HARN

August, 2017 - GIS_Acres fields recalculated to reflect conversion to NAD 83 HARN datum.

December, 2017 – Statewide GIS staff added QPUB_LINK attribute

| Note1: | Records for Maui County TMK 211002002, 212004005 and 212004007 were corrected to OWNER = "State of Hawaii," MAJOROWNER = "Govt. State", and BIGSTOWNER = "Govt. State," May, 2017. |
|---|---|
| Note2: | There is a shift in Maui County parcels on some areas on the islands of Maui, Molokai and Lanai; some examples are shown in the graphics below. According to Maui County GIS staff, the County is in the process of better aligning their parcel layer with their Pictometry imagery layer, which is resulting in shifts in some areas. This is an ongoing project, with an unknown completion date. |
| Note 3: | 2013 Update of the Kauai TMK Parcel Layer - Spatial Shift using NavTeq Roads, NOAA Charts and Imagery to anchor shift with 1100 displacement points and Affine Shift. After original shift it was done as a spatial rubbersheet natural Neighbor shift. |
| Note 4: | Kauai parcels: The assessment values in the attribute tables are "for assessment purposes only" per Kauai Real Property Department. |

| | |
|---|---|
| Name: | **ZONING** |
| Layer Type: | **Polygon** |
| Projection: | **UTM Zone 4, Meters, Datum NAD83** |
| Description: | **Hawaii County Code, Chapter 25, Zoning Code** |
| Source: | **County of Hawaii, Planning Dept.; Various District and Urban Zone Maps (hard-copies), using the Parcel Data layer current as of November 2015.** |
| History: | **Created by the staff of the County of Hawaii, Planning Dept., using the 'PUT' command in ArcEdit of the Arc/Info software, version 7.2.1 program. Where zoning lines follow along parcel boundaries, the Parcel Data Layer, was used as a background. Updates to the Zoning Layer are done in ArcInfo\ArcEdit coverage, version 9.3.1.** |

**Attributes:**

**Polygons:**

| | |
|---|---|
| **FID** | Polygon internal number (for ArcMap use) |
| **SHAPE** | Polygon |
| **DISTRICT** | Judicial District |
| **FROM** | Previous Zoning |
| **TO** | New Zoning |
| **DATE** | Effective Date |
| **TAXACRES** | actual acreage |
| **ORDINANCE** | Ordinance Number |
| **ZONE_MAP** | Code number |
| **ZONE** | Definition |
| (breakwater) | (Non-zoned area of breakwaters) |
| (F\R or Conservation) | (Non-zoned area of Forest Reserves) |
| (flood) | (Non-zoned area of floodways or canals) |
| (pier) | (Non-zoned area of piers) |
| (pond) | (Non-zoned area of ponds) |
| (river) | (Non-zoned area of rivers or streams) |
| (road) | (Non-zoned area of roads or trails) |
| A-10a | Agricultural District (minimum building site of 10 acres) |
| A-1a | Agricultural District (minimum building site of 1 acre) |
| A-200a | Agricultural District (minimum building site of 200 acres) |
| A-20a | Agricultural District (minimum building site of 20 acres) |
| A-255a | Agricultural District (minimum building site of 255 acres) |
| A-2a | Agricultural District (minimum building site of 2 acres) |
| A-35a | Agricultural District (minimum building site of 35 acres) |
| A-3a | Agricultural District (minimum building site of 3 acres) |
| A-400a | Agricultural District (minimum building site of 400 acres) |
| A-40a | Agricultural District (minimum building site of 40 acres) |
| A-500a | Agricultural District (minimum building site of 500 acres) |
| A-5a | Agricultural District (minimum building site of 5 acres) |
| A-600a | Agricultural District (minimum building site of 600 acres) |
| A-7a | Agricultural District (minimum building site of 7 acres) |