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Observations Of Energy Infrastructure and Operationalizing CARE

Statement

In 2023, Kartorium, Inc. and Alaska Center for Energy and Power (ACEP) documented and mapped microgrid infrastructure in Kotzebue and Galena, AK. This effort updated last known efforts from 2017/2018 for Kotzebue and 2014 for Galena, however for Galena, the imagery collected in 2014 was not made publically available. The last publically available imagery was performed in 2009. While commissioned by grant funding and serving multiple research needs, these datasets ultimately support self determination and sovereignty efforts in both communities as they lead and define their energy futures.

By physically walking the energy infrastructure, ACEP and Kartorium observers documented the state of each power pole (673 in Kotzebue, 647 in Galena). This team devised a comprehensive survey design and data collection process. Kartorium created the final products: drone orthomosaics of each community, point database of poles with metadata fields for each collected attribute, and a photo of each pole for both communities.

Power pole 641 in Galena, *AK. Photo Courtesy of Kartorium*

Screenshot of Kartorium's app for viewing energy infrastructure. Pictured here, Galena, AK imagery and pole inventory updated in 2023.

While this may sound like routine data collection, the goal was to create these datasets for community entities and rights-holders to facilitate their planning and negotiations for energy transitions. Below is a detailed description of how this activity supports ethical and responsibility-laden data governance as outlined in the CARE[1] principles for Indigenous Data Sovereignty: Collective Benefit, Authority to Control, Responsibility, Ethics.

These activities were funded by a blend of funders including the ERDC[2] program, University of Alaska Fairbanks Alaska Center for Energy and Power (ACEP) Data Collection & Management Program, and State of Alaska via Launch Alaska, DOE EPSCoR[3], and Office of Naval Research ARCTIC 2 award[4].

Data Quality & Assurance process:

In both Kotzebue and Galena, collaborative efforts facilitated extensive data collection for power pole inventories. In Kotzebue, Launch Alaska and ACEP conducted separate but

complementary inventories; the former focused on vulnerability assessments, while the latter mapped the grid for modeling purposes. Galena's inventory evolved over multiple years, incorporating and refining past data sets. Although the merging of disparate sources widened the scope of information, it posed challenges in data harmonization. To bolster data quality, each pole's location and attributes were rigorously cross-validated against high-resolution drone imagery. For Kotzebue, (then, currently ACEP web developer) ACEP intern Alora Greer undertook a thorough review and data cleaning, aligning each physical pole with its digital twin generated by Kartorium. Insights gleaned from Kotzebue were instrumental in refining the Galena project.

In addition to ensuring accuracy, the team consulted with both utilities to ensure nomenclature and numbering systems, for example, for the pole identification, aligned with preference and other inventory needs. Our systematic approach guaranteed both accuracy and integrity of the data, which is now securely hosted in the cloud for optimal accessibility and scalability.

Ownership & Licensing:

While UAF commissioned some of this work on behalf of grant awards they have received, the intention is to transfer ownership to community organizations. The transfer of ownership process is yet to be finalized, in the interim these data sets are being licensed for reuse in a manner that reflects the agreement between the community and the data collectors, and projecting forward to future potential uses. In the case of the Galena pole inventory and imagery, the team adopted the Community Data License Agreement - Permissive - Version 2.0 license: https://cdla.dev/permissive-2-0/ and made available to community partners and requestors.

Who Benefits:

In full disclosure, this is a highly mutually beneficial data and observing activity. All parties benefit in different ways, and authors want to be transparent about these different benefits derived from energy infrastructure mapping in Kotzebue and Galena.

ACEP benefits: ACEP benefited from the completion of the inventory projects with an updated base map which can be used to develop infrastructure and asset maps, as well as provide context for environmental monitoring and built environment visualizations. These updated baselines support ACEP's work with Kotzebue and Galena utility partners and community members related to the current state of their microgrid. Additionally, this work can be useful for future scenarios, modeling, derived attributes, and other individual loads within the community.

Kartorium benefits: Katorium, an Alaska-based startup, benefited substantially from the completion of the inventory projects. The projects served as a robust proof-of-concept for Kartorium's methodologies and the use of high-resolution imagery as a validation tool highlighted their ability to integrate advanced technology into traditional infrastructure audits. The successful outcome of these projects provided Kartorium with invaluable insights and lessons learned which were directly applied to streamline processes in future projects. These projects not only expanded

Kartorium's portfolio but also fortified its capabilities and reputation in the state for data gathering, analysis, and digital twin technologies.

Kotzebue Electric Association benefits: A member-owned cooperative, by integrating this imagery and data into their operational maintenance and monitoring systems. This observation activity provides an updated basemap for their own uses, and for use in other technical vendor platforms.

Sustainable Energy Galena Alaska benefits: by receiving updated imagery and pole inventory at no direct cost to the community that they can share, which prior to this effort was previously updated in 2009. For other community members including students in an educational context or community planning efforts.

There are other beneficiaries of this process including Alaska Energy Authority (AEA), Alaska Native Tribal Health Consortium (ANTHC), and Alaska Geospatial Council (AGC).

Who has authority to control:

Presently the utilities and the creators have the authority to control these data: Kartorium, ACEP, and respectively; KEA, SEGA and the City of Galena. The process for receiving permission to share is being determined now as part of an iterative and evolving dialog with utility and community members. These conversations involve multiple phases of data review and imagery review with ACEP seeking a goal of co-developing the framework for distribution and access to these data.

The role of stewardship:

ACEP research teams act as interim stewards of this data by hosting it on their storage platforms and providing access to community partners, and others upon request.

Ethics & Responsibilities

These activities are driven by ethical viewpoints of the data collectors and their organizations. These ethics inform a sense of responsibility to utility partners and community members to ensure that the data is ultimately their property to control as they see fit, and presented in a way that is useful to community-led projects. These beliefs about responsibilities spur a desire for partnership in determining proper access, distribution policies, and other permissions. Additional values influencing this work are in creating quality, up-to-date data that are easy to use by approved parties.