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State Geological Survey: Alaska Division of Geological & Geophysical Surveys

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Project Title: ALASKA INVENTORY AND DIGITAL INFRASTRUCTURE FOR ENERGY-RELATED GEOLOGIC FIELD NOTES AND MAPS

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Abstract

During the FY 2015 cycle of the National Geological and Geophysical Data Preservation Program, the Alaska Division of Geological & Geophysical Surveys (DGGS) received funds to facilitate the rescue of energy-related project archive materials produced by former DGGS geologists Gil Mull and Ellen Harris. The at-risk materials include field notes, interpretive geologic field maps, field station location maps, and other project materials, many of which are unpublished and the only copies in existence. To ensure the preservation of these unique materials, DGGS inventoried about 50 bankers boxes from Gil Mull and an assortment of materials from Ellen Harris. Irreplaceable, high-value, and/or unpublished work were identified for metadata creation and scanning. Individual metadata records and sub-collections were described in 283 child items within the *Collection of Field Notes and Unpublished Maps from Alaska* (objective 1). A total of 319 map TIFFs and 114 field notebook PDFs were produced. Individual site-specific metadata were created for field stations, whose locations were digitized from 107 scanned station maps and additional miscellaneous reports, totaling 7,465 child items within the *Collection of Field Station Locations from AK* (objective 3). Collection information and metadata were provided to the National Digital Catalog.

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Introduction

The Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS) has as its statutory mission the responsibility for collecting, archiving, managing, and disseminating geological and geophysical data on the subsurface energy resources, mineral resources, and geologic hazards of the state. DGGS maintains its own statewide databases of this information on servers at its office in Fairbanks, and manages a collection of rock samples and archive materials at the Alaska Geologic Materials Center (GMC) in Anchorage that represents more than 12 million linear feet of exploration and production drilling. DGGS networks with private industry and other agencies that use these data to accept donations, archive, and provide public access to samples, metadata, and analyses. Samples from these collections are examined frequently by private exploration companies, universities, and state agencies as a critical step in resource development and management. DGGS may be engaged in multiple archiving projects at any given time; this technical report describes the *Alaska Inventory and Digital Infrastructure for Energy-Related Geologic Field Notes and Maps* project funded by the National Geological and Geophysical Data Preservation Program in FY 2015, award number G15AP00147.

Objective 1, Inventory of unpublished maps and reports

Unpublished energy-related maps and documents created by former DGGS geologists Gil Mull and Ellen Harris were inventoried and prioritized for preservation. Irreplaceable, high-value, and/or unpublished materials were identified for scanning in the second half of the project. National Digital Catalog (NDC) item was created: *Collection of Field Notes and Unpublished Maps from AK*, 57bb5f55e4b03fd6b7dd0532&.

Methodology

DGGS identified, prioritized, and completed collection inventories of binders of field notes, about 50 bankers boxes generated by Mull, and flat files and plastic containers of documents from Harris. Materials by other authors were intermixed in the containers, and DGGS inventoried all of the materials rather than setting some aside.

Results

Initial estimates in the grant proposal of the amount of materials available for inventory were correct to low, depending on the type of materials (table 1). In total, more than 1,700 documents were reviewed for preservation, destruction, or temporary retention. Most of the documents reviewed were from Mull's collection of bankers boxes, estimated to contain 150 maps with geologic content for preservation, 250 unmarked topographic maps, 250 copies of journal articles and other published work, and 1,000 miscellaneous documents such as reviewer comments, correspondence, DGGS operational memos, and proposals. The Harris collection was smaller (about 50 documents) and had already been winnowed by Harris before she left DGGS's employ. All of the Harris collection was selected for preservation. About 20 percent of total inventoried materials were identified for preservation (figure 1). Other special items were found within the collections, including:

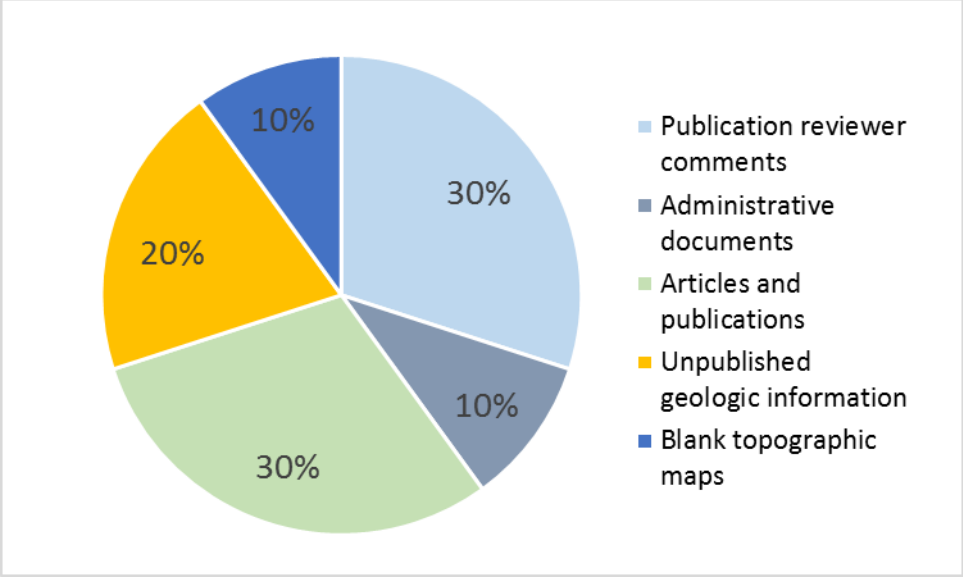
- $250 in cash;
- U.S. Bureau of Mines, "Notes on Northern Alaska supplementing Report of Investigation of Petroleum Seepages, Arctic Slope Area, Alaska", from October 1943;
- Report by Norman Ebbley, Jr. of the U.S. Bureau of Mines titled "Alaska's Arctic Oil Reserve: Melodrama or Farce?", from January 1944;
- Edward J. Webber, USGS, "Report No. 6, Stratigraphy and Structure of the Area of the Meade and Kuk Rivers and Point Barrow, Alaska", from 1947;
- United Geophysical Company, "Final Report on Geophysical Exploration of Naval Petroleum Reserve No. 4, Alaska", from December 1953; and

- Report by J.T. Dutro, Jr., USGS, "A new Permian formation in northern Alaska: Navy Oil Unit Report" from 1953 that was not referenced in the U.S. Geological Survey Geolex application (http://ngmdb.usgs.gov/Geolex/search).

Table 1. *Initial estimate of documents needing inventory compared with documents that were inventoried during the project.*

Type of document	Preliminary Estimate	Final Estimate
Unpublished maps	175 maps	~1,700 documents, of which 570 were maps
Summary field reports	8 binders	13 binders, mostly containing field notes

Figure 1. *Estimate of the percentage and type of materials inventoried during the project.*



Objective 3, Paper-to-digital conversion and metadata creation

Unpublished maps and documents created by former DGGS geologists Gil Mull and Ellen Harris were inventoried and prioritized for preservation during the completion of objective 1. Objective 3, "Create or update digital infrastructure", involved the scanning and subsequent metadata creation of irreplaceable, high-value, and/or unpublished materials identified in the collections. Metadata records were created using DGGS's archiving application "Alaska Geologic Data Index" (AGDI; http://maps.dggs.alaska.gov/agdi/) and then scripted as XML to update the NDC: *Collection of Field Notes and Unpublished Maps from AK*, Item 57bb5f55e4b03fd6b7dd0532&. Field station locations were digitized and station metadata were loaded into the NDC in *Collection of Field Station Locations from AK,* Item 57c71fb3e4b0f2f0cebed0f0&.

Methodology

- *Scanning.* Although DGGS intended to have a local reprographic company conduct the scanning of the maps, DGGS personnel and job-duty changes made it possible for the maps to be scanned in-house. Maps were scanned to 300–500 dpi TIFF format using an HP DesignJet Large Format HD Scanner. The resolution at which an individual map was scanned was determined by the physical size of the map. Larger maps were scanned at a lower resolution to ensure that the resulting TIFF file size was reasonable, and the file could be opened by a DGGS computer. Each map was reviewed for legibility. There was no difference in legibility between the digitized map file and the hardcopy map. If there were difficulties reading the digital map, the hardcopy map was just as difficult to read.

The quality of the original maps affected the quality of the scanned product. While most of the maps that were digitized were originals that were used in the field, a few maps had been photocopied and the original lost. Fewer than five of these photocopied maps were nearly impossible to read, even in hardcopy.

Field notes were scanned to 300 dpi PDF format using a Fujitsu fi-5750C Industrial Flatbed Image Scanner. Most of the field notes available for scanning were copies of the original field notebooks. About 95 percent of the copies were legible. In some cases, two copies of notes were found and care was taken to evaluate and scan the copy that was most legible. PDF files were spot checked to ensure all pages were correctly scanned.

- *Digitization.* Map TIFFs were georeferenced with Esri ArcGIS software by locating the four corners of the quadrangle. When this was not feasible, PLSS boundaries or latitude/longitude degree-minute-second tic marks were used. The datum and projection of the maps were assumed to correspond with the datum (NAD27) and projection (UTM Zone X) of USGS topographic maps for the area. Two aerial photographs were georeferenced by locating land features, such as stream bends or hilltops. An empty feature dataset was created from a template for each map, and locations were digitized into the feature dataset. Unique stations in the feature datasets were then appended into a master feature dataset of all field stations. The appended records in the master file were reviewed to ensure that all of the unique records and data were merged successfully. Duplicate field stations are discussed below.

  The semi-quantitative location error noted for each digitized station is a combination of the size of the location notation (i.e., dot or other mark measured from its center to its edge) in relation to the scale of the map and the Root Mean Square (RMS) georeferencing error, which is provided by Esri ArcGIS software. Most RMS georeferencing errors were less than 50 meters while station notation size averaged 100–200 meters on 1:250,000-scale quadrangle maps. The station notation size accounted for most of the error unless the map was severely damaged. In general, digitized station location error was less than 300 meters for 250,000-scale maps and less than 100 meters for 63,360-scale maps. Station locations with incomplete information were assigned the centroid of a PLSS township, range, and section or quadrangle.

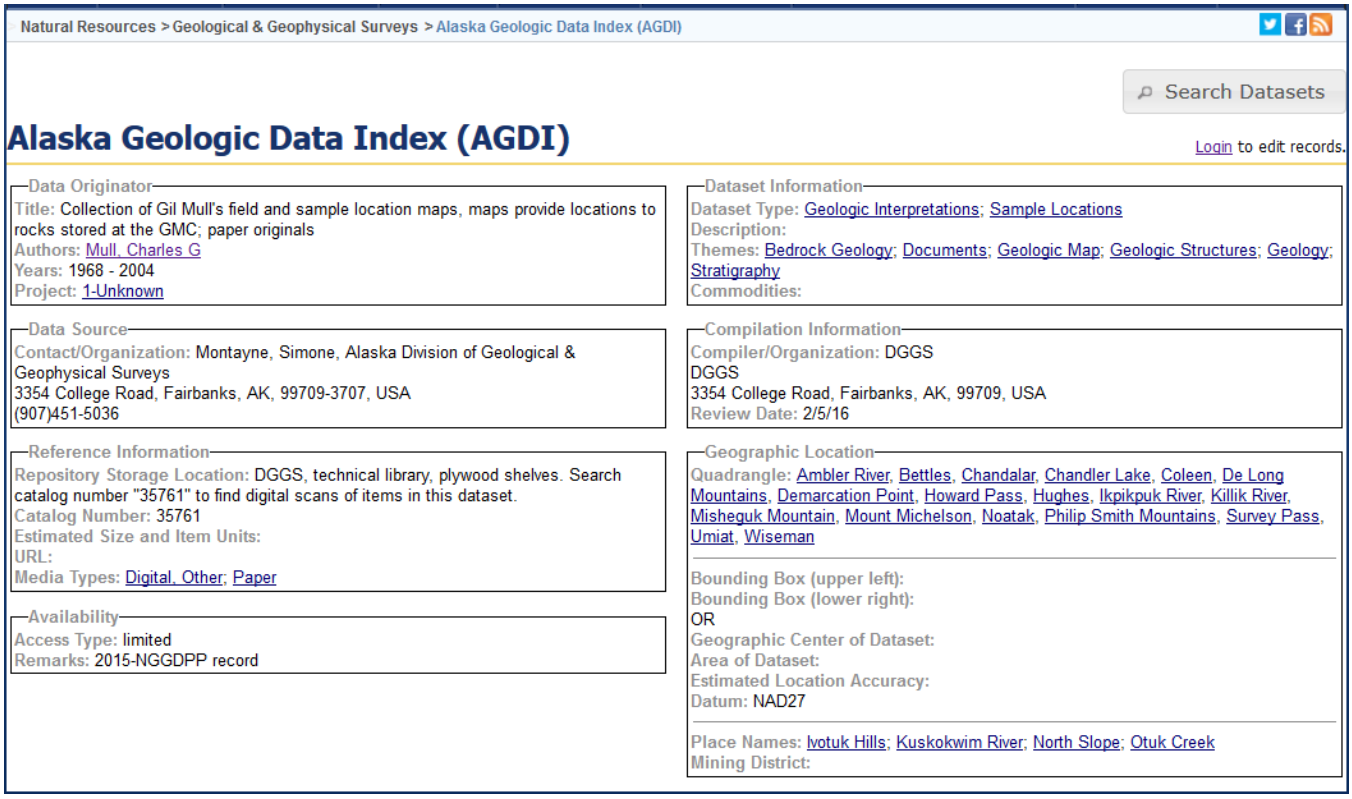
- *Duplicate field stations and error checking.* Audits were regularly performed on the data to identify duplicates and incorrect information such as misspellings. Points labeled with the same station number were often found on multiple maps, particularly if the map had been copied and used in subsequent field seasons. Field stations with the same station number in approximately the same location (within about 3 miles) were not described as a new point. Instead, the station's existence, location, and AGDI record number was recorded in the Notes field of the first occurrence of the station number. However, the same station number was sometimes used to describe two or more different field stations. Notes were included on each of these and the station number was appended with "-dupe1" or "-dupe2" to make the field identification numbers unique.

  Station identification numbers describing the same station on different maps were not always written the same way. For example, one person may write a station as "Amu14", another as "89Mu14", and yet another as "89AMu14." The correct identification number is the last one "89AMu14", but the most common form was the second. All three versions of the identification number were recorded in the correct notation, as their locations were the same within error.

  When a common station location existed among topographic maps, field notes, and reports, only one location was kept. GPS locations from field notes were prioritized above other data. Locations on maps were assumed to be of higher accuracy than locations in reports or tables, as the topography on the map would make the location easier to locate more precisely. Locations in tables, reports, and older field notes were often of low precision, and many were portrayed in degrees-minutes or associated with a geomorphologic feature.

- *Metadata creation and XML submittal*. Metadata for the physical collections were created using DGGS's archiving application AGDI (figure 2). Metadata were determined by examining each document or map, and inputting data and keywords to help with data retrieval (http://maps.dggs.alaska.gov/agdi/help/). A Java-based script queried the AGDI database for existing 2015-NGGDPP records to create an XML document according to the NGGDPP metadata requirements (table 2, Physical collection record mapping).

Figure 2. *Alaska Geologic Data Index detail page for record 35761, which is a sub-collection of Mull's archived materials.*


Natural Resources > Geological & Geophysical Surveys > Alaska Geologic Data Index (AGDI)

Search Datasets

Alaska Geologic Data Index (AGDI)

Login to edit records.

Data Originator
Title: Collection of Gil Mull's field and sample location maps, maps provide locations to rocks stored at the GMC; paper originals
Authors: Mull, Charles G
Years: 1968 - 2004
Project: 1-Unknown

Dataset Information
Dataset Type: Geologic Interpretations; Sample Locations
Description:
Themes: Bedrock Geology; Documents; Geologic Map; Geologic Structures; Geology; Stratigraphy
Commodities:

Data Source
Contact/Organization: Montayne, Simone, Alaska Division of Geological & Geophysical Surveys
3354 College Road, Fairbanks, AK, 99709-3707, USA
(907)451-5036

Compilation Information
Compiler/Organization: DGGS
DGGS
3354 College Road, Fairbanks, AK, 99709, USA
Review Date: 2/5/16

Reference Information
Repository Storage Location: DGGS, technical library, plywood shelves. Search catalog number "35761" to find digital scans of items in this dataset.
Catalog Number: 35761
Estimated Size and Item Units:
URL:
Media Types: Digital, Other; Paper

Availability
Access Type: limited
Remarks: 2015-NGGDPP record

Geographic Location
Quadrangle: Ambler River, Bettles, Chandalar, Chandler Lake, Coleen, De Long Mountains, Demarcation Point, Howard Pass, Hughes, Ikpikpuk River, Killik River, Misheguk Mountain, Mount Michelson, Noatak, Philip Smith Mountains, Survey Pass, Umiat, Wiseman

Bounding Box (upper left):
Bounding Box (lower right):
OR
Geographic Center of Dataset:
Area of Dataset:
Estimated Location Accuracy:
Datum: NAD27

Place Names: Ivotuk Hills; Kuskokwim River; North Slope; Otuk Creek
Mining District:

  - Metadata for digitized field station locations were collected using Esri ArcGIS software. The following fields and information were collected.
    - SAMPLE_ID: Station identification number. Sometimes samples were collected at the station, and identifier is also used as a sample identification number.
    - AGDI_ID: AGDI identification number.
    - NOTES: May contain information on station location error, digitization abnormalities, station number duplicates, station mislabeling, and type of sample collected (i.e., lithology, megafossil, geochemistry).
    - LITHOLOGY: May contain lithologic information if available, including description, age, and formation.
    - LAT: Latitude in decimal degrees.
    - LONG: Longitude in decimal degrees.
    - SOURCE: Description of the source of the digitized field stations, e.g., various maps, reports, spreadsheets, and GPS devices.

  Field station data were uploaded into DGGS's enterprise database. A Java-based script created an XML document according to the NGGDPP metadata requirements (table 2, Field station locations mapping).

Table 2. *Map of NGGDPP metadata fields to DGGS database fields for both collections submitted to the NDC.*

NGGDPP metadata	Physical collection record mapping	Field station locations mapping
itemID	AGDI identification number	Sample ID
collectionID	NGGDPP collection_id number provided by NDC	NGGDPP collection_id number provided by NDC
title	AGDI Title + AGDI identification number	Field station number
alternateTitle	NULL	NULL
abstract	Data Types + Authors + Quadrangle + Place Names	Field station number + geologist name + project name (if available)
dataType	"Field Notes" or "Map" (based on information from the Data Description field)	"Field Station Location"
supplementalInformation	Text on use constraints and how to access the physical items at DGGS	URL of AGDI record from which the location was digitized, if applicable
coordinates	Centroid value calculated from geospatial footprint (polygons and/or points) of AGDI record	Coordinates of the field station
alternateGeometry	The datum of the coordinates	The datum of the coordinates
onlineResource	URL of AGDI record	URL to the sample web page
browseGraphic	NULL	NULL
temporalExtentDate	Year or range of years represented by the AGDI record	Date collected
datasetReferenceDate	Review date: the date the AGDI record was entered into the DGGS system	Date the record was loaded into the system
verticalExtent	NULL	NULL

Results

Documents, maps, and field station locations were successfully rescued and archived. The amount of materials preserved exceeded all initial estimates in the proposal (table 3). A total of 198 maps and 85 field notebook records were submitted in collection item 57bb5f55e4b03fd6b7dd0532&, and 7,465 field station locations in collection item 57c71fb3e4b0f2f0cebed0f0&. Documents and field stations from more than 50 other researchers were intermixed with the Mull and Harris collections, and these additional materials and field stations were processed at the same time.

Table 3. *Metadata records estimated in proposal as compared to actual metadata records created during the project. Numbers of records and scans created are close estimates but may not be exact due to multiple authors on one map, sub-collections of multiple maps, and other complexities. Each record may contain multiple scanned documents. NA = not applicable.*

Material or item	*Proposal estimate*	Total records created	Mull collection records	Harris collection records	Other researcher records	Individual scanned documents
Field notebooks	*50*	85	30	20	35	114
Total maps	*110*	198	142	25	31	319
Geologic maps	*40*	76	32	13	31	71
Station maps	*70*	122	110	12	--	248
Field station locations	*1,800*	7,465	2,844	378	4,243	NA

The 400–600 DPI scanned map files were extremely cumbersome to work with through the AGDI application, GIS, and image software. Consequently the high-resolution TIFFs were archived, and lower-resolution versions were created by reducing pixels by one-third, followed with LZW compression. The lower-resolution files facilitate accessibility because they are smaller and easier to manipulate, but they are just as legible

as the high-resolution files. The scans are now available to DGGS personnel and on a limited case-by-case basis to the public. DGGS geologists will be reviewing the unpublished data in the files to assess whether the scans can be released to the public through the AGDI application.

During field station digitization, 8,920 station locations were identified—7,370 from 248 georeferenced station location maps, 106 from seven scanned field notebooks, and 1,444 from reports or tables. While the average number of station locations per map was 47, the number on each map varied greatly—from 1–2 on some maps to more than 500 on others (proposal assumed 25 field stations per map). Approximately 3,000 additional duplicate field stations were found and rejected during the digitization process. Further, of the 248 station maps that were scanned, 62 maps were entirely composed of duplicates that were neither digitized nor recorded in the notes. During the loading of the field station metadata into the DGGS database, an additional 1,455 field stations were rejected. These field stations were either not associated with enough context to be deemed valuable or were also identified as duplicates.

Conclusion

As DGGS builds the premier disciplinary repository focused on Alaska Geology, we are concentrating on the three essential functions of a repository: data archiving, ensuring data integrity, and providing public access. The NGGDPP program is an important funding vehicle for data preservation projects. DGGS has many datasets that need physical or digital preservation, and we continue to make inroads and expand our repository as time, staffing, and funding allow. Information about DGGS archiving efforts is available in the Appendix.

The FY 2015 NGGDPP energy-related document and map preservation project successfully archived high-value unpublished geologic information by Mull, Harris, and other researchers. This information will be searchable through both the Alaska Geologic Data Index and the National Digital Catalog. The DGGS Energy Section's spatially aware database of energy-related information and analyses currently under construction will pull information about the scanned field notes and maps directly from the AGDI application.

The 7,465 field station locations captured through this project will be matched up with samples and analysis in the DGGS and Geologic Materials Center databases. Overall, DGGS has about 60,000 legacy physical samples that do not have locations and are essentially useless. Staff anticipate that about 4,000 of the newly captured field station locations will correspond with unlocated samples at the Geologic Materials Center, where Mull's physical samples reside. The field station locations will also correspond with geochemical and geochronologic analyses, fossil identifications, and other work in DGGS's various databases. Eventually DGGS will link all Alaska analyses, physical samples, and field observations to field locations to integrate our geologic data holdings and provide additional depth to our repository. The FY 2015 NGGDPP data preservation project directly addresses this long-term goal.

While great strides were made in preserving Mull's and Harris's work, there remains much preservation of similar types of materials to be conducted at DGGS. More than 90 field books from Mull, Harris, and many others were scanned, but sample locations have not yet been retrieved from these books. There are many maps and other documents that still need to be scanned, such as the unpublished documents related to the Tingmerkpuk project from the late 1990s. Additionally, DGGS has received two uncatalogued collections for the careers of retired DGGS employee Milt Wiltse and deceased University of Alaska Fairbanks Department of Geosciences faculty member Wes Wallace.

As the NGGDPP program continues to evolve, DGGS would be interested in exploring other options for the Data Preservation program to harvest the metadata details of the field photos, in addition to any other applicable metadata records in the DGGS division-wide database. DGGS programming and IT staff have experience with a variety of OGC-compliant data formats and data-serving methodologies, which enables us to be flexible when planning future tools to serve DGGS data.

Appendix. Overview of DGGS archiving efforts, needs, and success stories.

DGGS's Geologic Communications Section creates, preserves, and provides access to the state's geologic data repository from which the Section develops and serves all DGGS geologic data products to the public to answer questions about land management, resources, and natural hazards. The repository is continuously growing and evolving. Most of the data management projects listed below are designed to accommodate future data collection, for which DGGS is committed over the long term to providing resources such as staff time for maintenance and IT infrastructure. DGGS strives to appropriately apportion available resources among rescuing legacy data, preserving new data, and maintaining current archiving systems.

In 2016 the Alaska Geologic Mapping Advisory Board (GMAB) reviewed DGGS's archiving needs. After being presented with 17 potential data preservation projects at the October 11, 2016 meeting, the Board requested additional time to review the projects. Of the 17 projects, DGGS selected its highest priorities, grouped the projects into seven categories, and created a poll to have the categories be prioritized by the Board. Feedback from the Board is still being received.

Alaska's Geologic Mapping Advisory Board comprises a balanced group of representatives encompassing State, Federal, engineering geology, geologic hazards, energy, minerals, academia, and Alaska Native issues. The Board meets with DGGS three times each year to review our entire program, discuss strategic and legislative issues, and advise us on our future programs, including U.S. Geological Survey STATEMAP projects. Future archiving projects will be undertaken with consideration for the Board's suggested archiving activities.

Minerals Data and Information Rescue in Alaska (MDIRA) program

The State of Alaska received Federal funds through congressional appropriations to the U.S. Geological Survey (USGS) and Bureau of Land Management (BLM) from FY1998 through FY2004 and FY2011 through FY2013 to recover, archive, catalog, and make publicly accessible minerals-related geologic data and publications that were in danger of being lost or destroyed following the cancellation of Federal minerals programs such as the U.S. Bureau of Mines, and the closing of many private mineral-exploration companies over the past few decades. Through the Minerals Data and Information Rescue in Alaska (MDIRA) program, DGGS has made available to the public, via the internet, many geologic reports, maps, and data that were previously unavailable or difficult to find. The following are just a few of DGGS's notable accomplishments through MDIRA:

- Completed a full data assessment focusing (but not exclusively) on non-fuels solid-mineral resources data and samples.
- Built a public web-accessible catalog for searching and accessing the scanned maps and reports (http://dggs.alaska.gov/pubs). Scanned all previously published DGGS and pre-digital USGS reports and maps with subject material relating to Alaska geology. DGGS currently serves about 1,000 USGS publications that are not available through the USGS Publications Warehouse.
- Designed and built a database-driven internal application to distribute DGGS GIS data via the internet. Documented available DGGS digital GIS data with FGDC-compliant metadata.
- Recovered geochemical datasets published in multiple DGGS reports and integrated them into a web-accessible database system (http://dggs.alaska.gov/webgeochem/). The application and database are currently being redesigned with State funds.

User successes: In 2014 a consultant from Jacobs Engineering Group requested rock geochemical data to provide background arsenic levels in Interior Alaska. She was able to query the data she needed directly through the application.

- Captured outlines or spatial extents of published geology-related maps in Alaska authored by multiple agencies, and developed an online, interactive web mapping application that provides access to the publications (http://dx.doi.org/10.14509/25601).
- Began cataloging and archiving field project files and unpublished geologic compilations by DGGS and predecessor agencies. The index now includes unpublished industry and other geoscience data and is available online through a searchable web mapping application (http://dx.doi.org/10.14509/25601). This application is DGGS's primary archiving tool for paper collections.

USER SUCCESSES: In 2014 an anonymous geologic consultant reported the value of data discovered in the unpublished data index and stored at the GMC: "Scans of the CIRI–Anaconda maps acquired from the GMC will save my client over a hundred thousand dollars worth of helicopter-supported geological mapping this field season, allowing us to focus our efforts and free-up more funds for drilling and potential discovery."

In 2011, the Geologic Materials Center (GMC) received additional funds from the MDIRA program to allow GMC staff to finish indexing and detailing the remaining 30 percent of the facility's hard-rock core inventory. The funds were used to (1) research and identify missing information related to the hard-rock mineral core, such as unknown prospect or property locations, missing borehole numbers, and unknown property owners, consultants, or drill companies by working with staff, scientists and geologists at DGGS, BLM, ARLIS, and Alaska Earth Sciences; (2) perform a major re-boxing effort (in conjunction with NGGDPP funds) for core samples to prevent major data loss due to substantial box deterioration; and (3) research and understand the potential radiation impacts of several prospects.

NGGDPP program

FY 2007: DGGS requested and received funding to provide collection-level information on its data holdings. DGGS completed evaluations for 12 of its geologic data and sample collections, and entered detailed information about each one into the NGGDPP online inventory system. See the updated summary table of DGGS collections in Appendix B.

DGGS also received funding to participate in the design and testing of the National Digital Catalog. DGGS helped establish standards for the content, quality, and consistency of metadata describing digital data and physical samples; protocols for searching, transferring, and presenting metadata; clear and consistent ways to explain how users can request access to physical materials; and the extent to which the user interfaces convey branding or meet other organizational needs.

FY 2008: DGGS received funding to implement a Web Feature Service (WFS) interface to deliver site-specific metadata files to the National Digital Catalog for six of its geologic data collections: (1) core samples and drill cuttings stored at the Alaska Geologic Materials Center (GMC), (2) glass slide collection of processed samples at the GMC, (3) data reports on core samples that have been borrowed from the GMC for analysis, (4) geochemical analyses of rock, soil, and stream-sediment samples collected during projects involving DGGS geologists, (5) geochronology analyses of samples collected during projects involving DGGS geologists, and (6) hard-rock surface samples collected by DGGS staff.

The database development team installed GeoServer, a Java-based, Open Source server software that allows publishing of geospatial data to the web, on DGGS's web server to provide a Web Feature Service (WFS) interface. DGGS collection information, generated from the database with a unique dynamic URL identifier for each sample or location, was made available to the National Digital Catalog through the WFS. As DGGS and NDC technologies have evolved, the WFS is no longer generated or harvested in this manner. Once NDC has migrated to the new inventory system, DGGS will consider creating services to repopulate these collections.

USER SUCCESSES: DGGS received multiple requests for geochronological data compiled through the MDIRA program and made available through WFS to the National Digital Catalog. For example, in 2015

a UAF graduate student wrote, "I'm… studying age relationships of the Talkeetna Arc in south-central AK. I spoke with Evan Twelker and he mentioned you're distributing the DGGS geochronology database. It could potentially be a great resource to use for my project…"

FY 2010: DGGS received funding to create site-specific metadata for two geologic data collections: (1) organic geochemistry analyses published by DGGS, and (2) valuable hard-rock mineral core and coalbed methane core samples stored in deteriorating boxes at the Alaska Geologic Materials Center (GMC). In addition, decaying core samples were re-boxed into new core boxes and relocated to an environmentally controlled area in the GMC. To serve the metadata records to the National Digital Catalog, DGGS created a Web Feature Service and SiteMap for each dataset. The WFSs are no longer available due to DGGS's evolving IT infrastructure but could be recreated in the future.

USER SUCCESSES: Addition of coalbed methane core metadata into the GMC database has improved the ability to answer user questions about available core samples in southwestern Alaska. USGS researchers reviewed several coalbed methane wells over several visits. USGS, Purdue University, and University of Cincinnati researchers traveled to the GMC to review the well documented coalbed methane core and finished their work in one day due to easy access to materials.

FY 2013: GMC staff and the DGGS database development team created site-specific metadata for two DGGS geologic data collections: (1) U.S. Bureau of Land Management (BLM) surface pulp samples and (2) valuable U.S. Bureau of Mines (BOM) hard-rock mineral core samples. All BOM core samples were reboxed into new core boxes. In addition, more than 14,000 BLM pulp samples were reboxed. Both collections of samples are now relocated to an environmentally controlled area in the new GMC facility. Inventory of surface pulps has progressed through more than 94,000 of an estimated 104,000 potential samples. Slightly over 8,000 of the inventoried surface pulps were tied to specific locations in Alaska, and in total, 8,831 metadata records for the BOM and BLM collections were submitted to the National Data Catalog as XML files.

USER SUCCESSES:

1. In August 2015, 90 newly reboxed U.S. Bureau of Mines mineral core boxes were made available to Southern Methodist University for analysis of crustal heat flow across the southeastern panhandle of Alaska.
2. Improvement of the U.S. Bureau of Land Management surface sample collection, including the BLM pulp samples of this project, is a continuing and long-term priority of the GMC. Beginning in August 2015, detailed examination of BLM heavy sands along the Gulf of Alaska resulted in high-quality metadata for 2,300 samples, the discovery of 311 new samples, and likely locations for about 2,000 samples, including 474 pulp samples. These data are currently undergoing analysis by the Alaska Trust Land Office to better delineate the mineral potential of the region.

FY 2014: DGGS conducted a collection-level inventory of the vast number of legacy field photographs taken by current and former DGGS geologists, and created metadata for deceased DGGS geologist Rocky Reifenstuhl collection of digitized legacy field photos. As a result of this project, 2,231 metadata records for individual Reifenstuhl photographs were submitted to the National Digital Catalog and three collections of an estimated total of 220,038 photographs were identified and inventoried through interviews of present and former DGGS geologists. DGGS created a tool that programmatically associates and archives photos with locations and other pertinent data to facilitate the creation of metadata for field photographs.

Other Active Data-Rescue and Archiving Projects

Elevation data: Distribution, management, and archiving of all publicly available elevation data (LiDAR, IfSAR, etc.) in Alaska through a custom web application used by workers at the State, Federal, and

municipal level, along with private businesses and individuals. Current data holdings exceed 392 thousand square miles of elevation data and are accessed at http://dx.doi.org/10.14509/25239.

USER SUCCESSES:

1. In 2015 the Municipality of Anchorage decided to release their LiDAR data through DGGS's data delivery system to decrease their data management time and facilitate easy user access to the data.
2. DGGS has received interest in the technical data management side of our custom web application for elevation data from other state and federal agencies that has led to working relationships with these agencies in 2016.

GMC Inventory Management: Created the Geologic Materials Center's spatially-aware, end-to-end, inventory management tool to track the center's priceless collection of core, cuttings, slides, geologic samples and analyses, and more (500,000-plus item inventory). The database generates reports, allows easy searching of the inventory database, performs auditing functions, and manages quality assurance.

USER SUCCESSES: In 2015 a consultant for the Alaska Trust Land Office wrote:

> "Mr. Kurt Johnson proved himself to be an irrefutable asset to our directive. In the weeks leading up to our visit, he offered invaluable support via email and telephone. He was thorough, pleasant, and proactive in ensuring that the samples were accounted for and ready prior to our arrival. Without his efforts in sample retrieval, data matching, and communication, our work could have easily taken twice as long. Thanks to his foresight and preparation, we were able to work ahead of schedule and find time to enjoy your beautiful state.
>
> The staff outperformed our expectations and raised our standard for warehouse teams. Kurt, Jean, Alex the intern, and Mary at the front desk made this retrieval mission pleasant, easy, and an all-around best-case scenario."

Airborne Geophysical Data: Online text- and map-based search interface for publicly available airborne geophysical surveys conducted in Alaska since 1993 by the Division of Geological & Geophysical Surveys (DGGS), U.S. Geological Survey (USGS), and Bureau of Land Management (BLM). The application provides access to DGGS's geophysical publications where users may view and download data and maps (http://dx.doi.org/10.14509/27222).

Alaska Coastal Data: Two online tools that provide access and archiving for beach elevation profile measurements collected throughout Alaska since the 1960s (http://dx.doi.org/10.14509/27359) and historic and predicted shoreline position throughout Alaska (http://dx.doi.org/10.14509/29504).

Geothermal Data: DGGS serves data to the National Geothermal Data System (NGDS), a U.S. Department of Energy-funded distributed national network of databases and data sites that collectively form a system for the acquisition, management, and maintenance of geothermal-based data (http://www.geothermaldata.org/). DGGS is developing an online digital Geothermal Sites of Alaska map using the content model templates developed for and archived in the NGDS.

Summary of DGGS data preservation progress and needs

Shaded collections have received funding from the USGS National Geological and Geophysical Data Preservation Program (NGGDPP) in the past to briefly assess or preserve part or all of the collection. Completeness is defined in terms of physical preservation, available contextual metadata including location of sample, and public accessibility. Status describes the current state of work and maintenance being performed on the collection.

Publication collections	***Media***	***Completeness***	***Status***
DGGS publications	Paper, digital	Complete	Active
GMC data reports	Digital	Complete	Active
USGS Alaska publications	Paper, digital	Complete	Active
U.S. BLM/BOM Alaska publications	Paper, digital	70% complete	Active
UAF MIRL publications	Paper, digital	99% complete	Active
Bibliography of Alaska volcanism (AVO)	Paper, digital	Complete	Active
Alaska theses	Paper, digital	Complete	Passive
Map Index outlines	Paper, digital	Complete	Active
Published GIS files	Digital	Complete	Active
Legacy GIS files	Digital	Not funded	None
Reference Library	Paper, digital	90% complete	Active

Published and unpublished data collections	***Media***	***Completeness***	***Status***
Minerals-related inorganic geochemical data	Paper, digital	Complete	Active
Energy-related inorganic geochemistry	Paper, digital	Not funded	None
Alaska Quaternary volcanic whole rock geochemical data (AVO)	Paper, digital	Complete	Active
DGGS Tephra analyses	Paper, digital	Not funded	None
AVO Tephra/glass analyses	Paper, digital	50% complete	Active
Organic geochemical data	Paper, digital	98% complete	Inactive
Geochronology (Ar-Ar, K-Ar, conventional U-Pb)	Paper, digital	80% complete	Inactive
U-Pb detrital zircon analyses	Paper, digital	Not funded	None
Apatite fission track analyses	Paper, digital	Not funded	None
Porosity and permeability data	Paper	Not funded	None
Sandstone composition reports	Paper	Not funded	None
Sediment grain-size analyses	Paper, digital	Not funded	None
Pebble counts	Paper, digital	Not funded	None
Measured stratigraphic sections	Paper, digital	Not funded	None
Petrographic analyses	Paper, digital	Not funded	None
Paleontology reports	Paper, digital	20% complete	Inactive
Microfossil reports	Paper, digital	Not funded	None
Seal capacity analyses (MICP)	Digital	Not funded	None
Geothermal data	Paper, digital	Complete	Active
Permafrost depth and ice content	Paper, digital	Not funded	None
Radiocarbon ages	Paper, digital	Not funded	None
Slope stability data	Paper	Not funded	None
Paleoseismic data	Paper	Not funded	None
DGGS field photographs	Slide, paper, digital	2% complete	Active
Gil Mull field photograph collection	Slide	10% complete	Active
AVO field photographs	Paper, digital	Complete	Active
AVO vent features	Paper, digital	Complete	Active
AVO historical eruption data	Paper, digital	Complete	Active
Minerals Industry tracking and resources data	Paper, digital	20% complete	Inactive
Unpublished field data and project files	Paper	80% complete	Active
Unpublished field data and project files	Digital	Not funded	None
DGGS digital field station and sample locations	Paper, digital	25% complete	Active

Alaska Quaternary volcanism field station and sample locations (AVO)	Paper, digital	Complete	Active
Wes Wallace field data collection	Paper, digital	Not funded	None
Geophysical data	Paper, digital	50% complete	Active
VHS geophysical flight line video	Film	40% complete	Active
AMS/AOF geophysical flight line film	Film	Not funded	None
Gravity data	Paper, digital	Not funded	None

Physical sample and legacy paper collections	***Media***	***Completeness***	***Status***
Oil & gas well samples (GMC)	Physical samples	95% complete	Active
Processed slides (GMC)	Physical samples	84% complete	Active
DGGS surface samples (GMC)	Physical samples	16% complete	Active
Non-DGGS surface samples (GMC)	Physical samples	1% complete	Inactive
Megafossils (GMC)	Physical samples	7% complete	Active
Mineral exploration core (GMC)	Physical samples	66% complete	Active
U.S. BLM pulps (GMC)	Physical samples	8% complete	Active
U.S. BOM core (GMC)	Physical samples	89% complete	Active
U.S. BLM surface samples (GMC)	Physical samples	10% complete	Active
DGGS petrographic slides	Physical samples	Not funded	None
AVO petrographic slides	Physical samples	50% complete	Inactive
AVO rock samples	Physical samples	80% complete	Active
AVO processed samples	Physical samples	80% complete	Active
UAF Tectonics and Sedimentation Group samples	Physical samples	Not funded	None
Geo-engineering core samples	Physical samples	Not funded	None
Legacy analog geophysical data rolls	Paper, mylar	Not funded	None
Legacy paper air photos	Paper	Not funded	None
Legacy mineral industry data (AKMIDI)	Paper, digital	Complete	Passive
Szumigala defunct minerals company files	Paper	Not funded	None