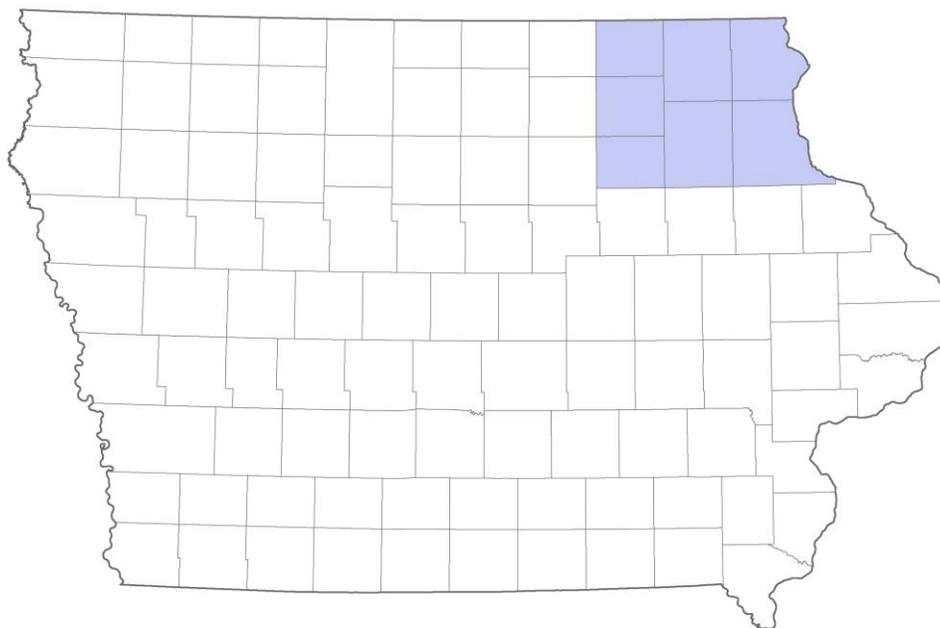


# Digital Infrastructure and Metadata for Geologic Collections, NE Iowa



**Award Number G12AP20145.**  
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## Introduction

This report documents work performed by the Iowa Geological and Water Survey (IGWS) for the National Geological and Geophysical Data Preservation Program under award number G12AP20145 for 2012. The primary objectives of preserving and documenting paper documents held for the IGWS collection of well data were met for the Northeast Iowa study area. Metadata was also developed for 69 newly scanned maps and for existing scans of maps that partially document Iowa's coal mining history.

## IGWS and Geologic Data Storage

The IGWS was established as the Iowa Geological Survey (IGS) in 1892. After periods of being part of the University of Iowa and later an independent state agency, IGS became part of the newly formed Iowa Department of Natural Resources in 1986. In 2008, the survey changed its name to Iowa Geological and Water Survey to reflect the agency's long-term role as the state's lead earth and water science agency. In early 2014, the Iowa Geological Survey will move to the Iowa Institute of Hydraulic Research at the University of Iowa.



**Figure 1.** Well and other document storage the IGWS Oakdale Research Facility.

IGWS occupies two buildings on the University of Iowa Campus. Most staff offices are located on the main campus of the University in Trowbridge Hall, which is shared with the Department of Geosciences. The research facility and rock library building is located on the University's satellite Oakdale Campus. The 11,000-square foot Oakdale facility, built in 1983 then expanded to 12,250 square feet in 2000, functions as the repository for

most physical geologic material storage, such as cores, cuttings, and hand samples. Sample preparation, cataloging, and descriptions as well as a variety of laboratory work are carried out at the Oakdale building. The Oakdale facility provides storage space for the bulk of the paper files that document the physical collections. In addition a wide variety of older paper files and unpublished and archived maps are stored at the Oakdale facility (fig. 1).

The majority of the most critical and widely used information for the state, mainly from cores and well cuttings, logs, and construction data, are electronically held in the IGWS Geologic Sample Database (GEOSAM) as a combination of a relational database developed to reflect the site-based nature of the data and electronic documents. Access is free and available to the general public and is provided through a web-based interface (<http://www.igsb.uiowa.edu/webapps/geosam>), which also provides tools to query the database and view the electronic documents. GEOSAM and GEOSAM-compatible databases form the backbone of the current IGWS data preservation system and its ongoing preservation plan.

### **Summary of 2012 Grant Activities**

IGWS included the following in its 2012 NGGDPP grant proposal:

- Develop metadata, in accordance with National Catalog standards, for all current GEOSAM sites for the following data collections:
  - Rock cuttings
  - Rock cores
  - Field notes
  - Well logs
- Establish locations as needed for physical and paper data collections from seven counties in northeastern (NE) Iowa (fig. 2) that were not previously held in GEOSAM
- Scan and georeference or develop location data compatible with the National Catalog for other documents including maps and paper reports.
- Submit all developed metadata to the National Catalog to update existing services.

The data collections planned for addition to GEOSAM from NE Iowa included:

- New well logs and field notes.
- Updated information on existing well logs and field notes.
- Information on cuttings and cores received during the period

Efforts were made to capture data from archived collections of drillers logs provided by well drillers who had either retired or determined that they no longer needed to retain the materials. Most of the information contained in these drillers' logs not been previously entered into Geosam. Emphasis was placed on records that included locations that could be readily determined using PLSS descriptions or a variety of external resources

including county auditors' websites or older plat books. While these records included wells in the seven-county NE Iowa region, many were also from outside the area.

Locations were determined and metadata developed for individual chapters contain in IGS Annual Report Series from 1894 through 1941. These volumes has previously been scanned and made available on line by the University of Iowa Library at <http://ir.uiowa.edu/igsar/>.

In addition 25 IGWS Open File Reports and two other documents were converted to digital format and added to the IGWS publications database and website. No location data was created for these materials and therefore no metadata was developed.

Significant data from outside of the NE Iowa area was also preserved this year. The reasons for this are two-fold. First, current IGWS projects and interests in Northeast Iowa required the digitization of some data in that area. Second, a variety of data sets and spatial data aren't amenable to a regional approach. As it was more time-efficient to process these materials together, we did so. Totals reported below for this year's project are broken into NE Iowa and statewide addition.

## **Summary of Project Results**

### NGGDPP Metadata Development

The IGWS collections defined for NGGDPP include physical samples, derived data, and maps and other documents. Metadata records were prepared for all items associated with a geographic location. Items such as rock cuttings, well logs, field notes, etc. have been assigned a point location and horizontal accuracy in Geosam. In the case of maps, bounding coordinates were calculated for the georeferenced document and converted to geographic coordinates as needed.

Iowa's data was prepared in XML format using views and queries from SQL Server databases. The XML format was selected as simpler to develop and validate from the native SQL Server format used to managed Geosam and other data sets.

Metadata preparation was carried out as follows:

- 1) SQL server tables, views, and custom functions needed to produce the necessary text strings were developed.
- 2) Developed queries to select the data from the views prepared in step one to a temporary XML-type data item then exported this data item to a text-based XML file
- 3) When the text-based XML was successfully exported it was validated against the NGGDPP schema using XML Notepad.
- 4) When the local validation was successful, the file was uploaded to the NGGDPP site.
- 5) The final step was to request NGGDPP staff to load the data into the catalog, replacing previously submitted data sets.

The NGGDPP metadata elements, along with a description of the data items provided for each element, are listed in table 1. In instances where required data elements were not available, metadata records were not prepared, e.g. if latitude and longitude had not been stored for a data item, the item was omitted from the metadata.

The IGWS metadata supplies data for the optional items in some cases. For most collections, optional items were either populated for all records or no records. For example, the optional item, verticalExtent, is populated for most collections but was omitted for the Geochemical Samples collection (water quality) as not relevant to the data being presented. In other cases, the optional items were populated where the data to be supplied was available.

**Table 1.** Description of metadata elements developed from IGWS data. Bolded elements indicate required data.

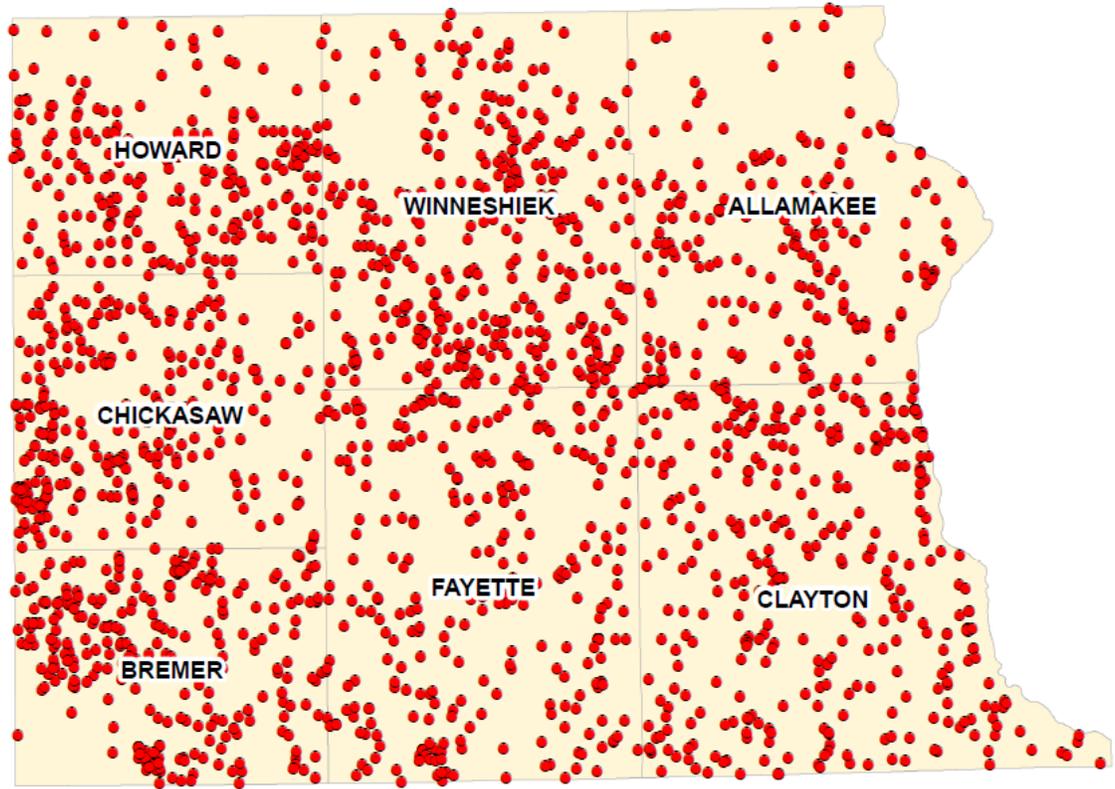
<b>Tag/Data Element</b>	<b>Description of data supplied</b>
<b>collectionID</b>	Collection ID from previously defined Iowa NGGDPP collections
<b>title</b>	Name of collection and IGWS identifier for the item. Untitled documents were given a descriptive title.
alternateTitle	Subtitles if used for documents or alternate identifiers.
<b>abstract</b>	General descriptive information about the site and/or data item including identifier and site type; other information, depending on the collection being documented, includes total depth, sample depth, completion date, collection date, aquifer, and author.
<b>dataType</b>	NGGDPP catalog supplied values
<b>supplementalInformation</b>	Statement concerning archive location of samples/logs and a URL where additional information may be accessed if available.
<b>coordinates</b>	Longitude and latitude in decimal degrees (NAD83) derived from coordinates stored in Geologic Sample Database (GEOSAM). For maps, bounding coordinates are provided.
alternateGeometry	County, tier, range, section, and quarter sections for sites where this information is available. Map area centroids were supplied where these had been calculated.
onlineResource/resourceURL	Hyperlinks are provided where available. For metadata collections deriving from Geosam, this is a hyperlink to the record for the well.

browseGraphic/resourceURL	not used
dates/date	Last update of the record for some collections; sampling date for some collections
<b>datasetReferenceDate</b>	The date the metadata for the collection was prepared
verticalExtent	Total depth supplied for wells, length of section measured/described for field notes, cored interval for cores.

### Additions to IGWS Collections for NE Iowa and statewide

Seven counties in NE Iowa (fig. 2) were selected for more focused development of digital data from samples not yet completely cataloged in IGWS databases or from archived documents. Additionally, large-format maps and other geologic documents were scanned, archived drillers logs were scanned and entered into GEOSAM, and metadata was developed for previously scanned and georeferenced maps. Documents that were scanned and cataloged from the focus area and other preservation projects completed in 2012 include the following:

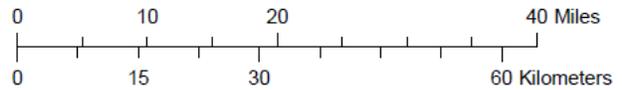
- 3,832 well file folders from NE Iowa were examined, with relevant information from 2,202 (Fig. 2) scanned and attached as PDF's to the existing well data in GEOSAM.
- 473 maps were scanned and georeferenced and metadata developed for the NGGDPP catalog.
- As described in the report for the 2011 project year, the University of Iowa Libraries scanned and added to their online collection 38 “early series” IGS Annual Reports at: <http://ir.uiowa.edu/igsar/>. In the 2012 project year locations were assigned and metadata was developed for 235 chapters in the reports. Metadata was prepared and submitted as a paper reports collection.



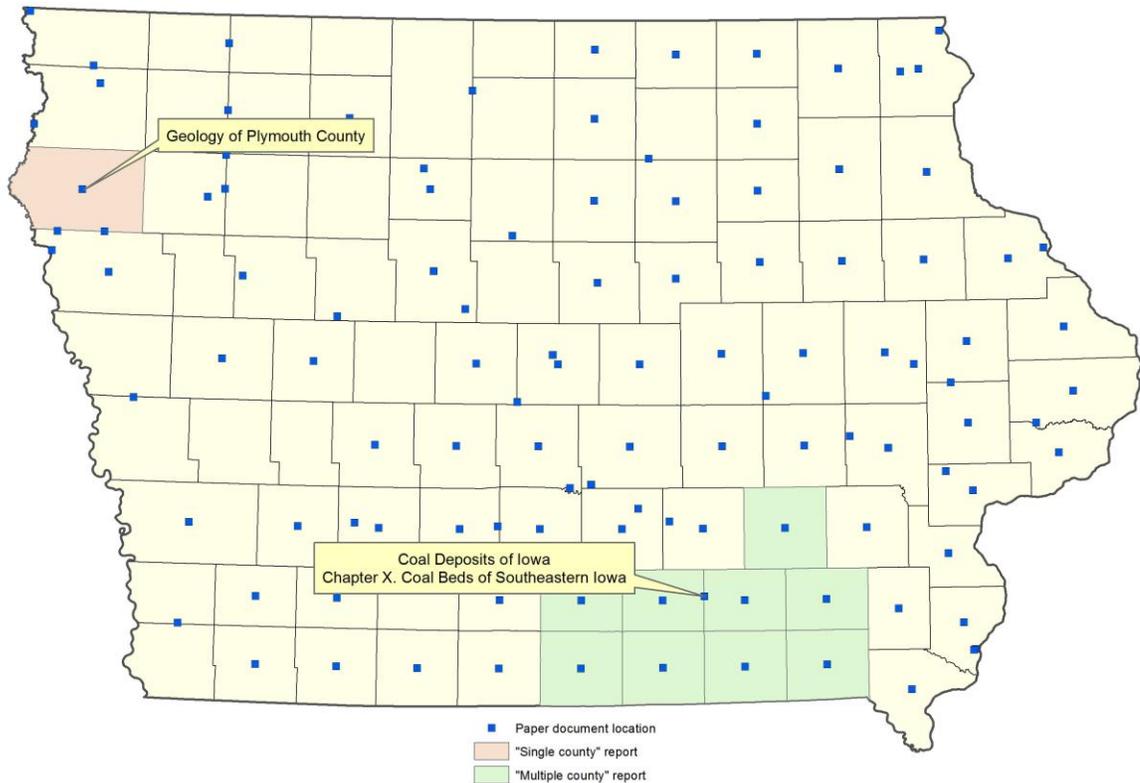
## Well Folders Scanned 2012

*Geologic Data Repository Project*

• Locations of scanned files



**Figure 2.** Map of NE Iowa study area showing the location of 3,700 well sites (of 4,761 well folders examined) with relevant information scanned and added to GEOSAM.



**Figure 3.** Map of Iowa showing the locations assigned to 235 paper reports that were inventoried during 2012 as a part of this National Geological and Geophysical Data Preservation grant. The paper reports in this part of the collection consist of Iowa Geological Survey Annual Reports published from 1894 through 1941. The reports have been scanned and made available on line by the University of Iowa Library. The shaded areas show examples of coverage areas for the individual reports.

### Archived Drillers' Logs Scanned and entered in GEOSAM

In the course of organizing archived material at the IGWS over the past few years, a number of boxes of drillers' logs were discovered. Initial investigation disclosed that these logs had never been entered into the IGWS GEOSAM database. As a part of this National Geological and Geophysical Data Preservation grant, approximately 250 driller's logs were entered into GEOSAM in 2011. Additionally, the logs were scanned and uploaded to GEOSAM. These logs contain valuable geologic, hydrogeologic, casing, and location data that is now accessible electronically.

### Preservation and Cataloging of Paper Documents

Throughout its 120-year history, IGWS has generated an extensive collection of paper reports documenting geologic studies ranging in scope from statewide to very narrowly focused in geographic area and subject. In recent years most of the IGWS reports on the geology of Iowa are created as electronic documents or as electronic and paper

documents. The electronic versions are freely available as downloads from the IGWS website or document application.

However, older reports exist as paper documents only. In many cases the reports have been superseded by newer work, but the older reports represent foundation work and thus are important from a historical perspective. Prominent among this group of documents are the Iowa Geological Survey Annual Reports V. 1-38 were published from 1893 through 1941. The Reports include 239 separate chapters. The Reports were scanned by the University of Iowa Library in 2011 and made available at <http://ir.uiowa.edu/igsar/>. In the current project year, locations were assigned where possible and metadata prepared for the documents (figure 3). In many cases a county-level location could be assigned; however, in others locations were assigned to multiple counties or the entire state depending on the content of the report. Geographic locations were assigned to 235 of the 239 reports for this purpose

IGWS maintains a document catalog database and web application (<https://programs.iowadnr.gov/igspubs/>) that allows users to download documents in electronic format or purchase documents that are in print. Out-of-print documents may be examined at the IGWS office.

An informal survey of IGWS staff to find out what more recent publications they referred to most often or referred their clients to most often provided a rough hierarchy for conversion of newer paper documents to digital formats. As a result of this informal poll, 25 Open File Reports from the 1980's and 1990's were scanned and added to the digital document collection and database that support the IGS Publications application. Most reports after this period were created as digital documents or converted soon after printing. In addition, two documents from Miscellaneous Publications and Aeromagnetic Surveys were scanned and added to the application. Metadata has not been developed for this last group of scanned paper documents.

#### Maps scanned and georeferenced

##### *IGWS published and working maps.*

IGWS continued to preserve maps and other oversize documents by scanning and georeferencing, where appropriate, for inclusion in NGGDPP collections. During this project year metadata was developed for sixty-nine additional maps that were scanned and georeferenced.

##### *State Mine Inspectors' Township Map.*

These maps were developed by the State of Iowa Mine Inspector in the late 1960's in order to collate the information from Iowa's collection of historic mine maps. The maps consist of sketches of known mining taken from mine maps and other information sources compiled on 140 Iowa Department of Transportation township highway maps. Also included are notes about the location of the mine, shaft depth where this information was available, and the storage location of the mine map if one was available. This collection of maps has served as a basic data source for all subsequent attempts to compile historic coal mine locations. The maps and notes were scanned for preservation and 140 township maps were georeferenced.

*Historic Coal Mine maps georeferenced.*

IGWS has a collection of over 1500 scanned historic coal mine maps that were created to minimize the need to handle the original maps and the scanned images georeferenced where possible. As part of an Office of Surface Mining project, the most recent version of the maps was identified for georeferencing. During the 2012 NGGDPP project year, 264 additional maps were georeferenced bringing the total number of georeferenced mine maps to 407 of the approximately 800 maps identified for georeferencing.

Metadata Records from GEOSAM Added to the National Catalog

Metadata describing the information held in GEOSAM were loaded into the National Catalog in January 2012. This number of data items included in the metadata are summarized by collection as follows:

**Table 2. Summary of metadata provided to NGGDPP catalog for 2012 project year.**

<b>Metadata Records for NE Iowa</b>	<b>FY 2012</b>	<b>NE Iowa totals</b>
Rock Cores	2	56
Well Cutting Samples	104	8,715
Well Logs (Strip & Drillers)	3,700	16,586
Field Notes and Sections	12	909
<b>Totals</b>	<b>3,818</b>	<b>26,266</b>

<b>Metadata Records for All Iowa Regions</b>	<b>FY 2012</b>	<b>Iowa totals</b>
Rock Cores	480	1,672
Well Cutting Samples	4,892	30,416
Well Logs (Strip & Drillers)	5,459	99,238
Scanned, georeferenced maps	473	1,549
Other scanned oversize documents	0	1,732
Field Notes and Measured Sections	27	4,199
Paper reports	235	239
<b>Total</b>	<b>11,566</b>	<b>139,045</b>

**Award 2012 Summary and Award 2013 Plans**

The goals proposed for the 2012 project year were met and exceeded with the inclusion of additional map data and previously “undiscovered” drillers logs. The 2012 project year saw the addition of paper documents for the first time in the Iowa metadata collections.

The project was scaled back to seven Northeast Iowa counties from the initial eleven proposed. Since Northeast Iowa is a relatively data-rich area, the numbers of new items referenced to a single site (e.g. well, outcrop) cataloged is roughly comparable to past years. A total of 2,320 items were added for Northeast Iowa and 11,566 items overall for the State. Twenty-seven paper documents were added to digital collections, but since they lack locations at this point, they are not represented in the metadata collections.

For the 2013 project year, data will be examined and preserved for twelve counties in East-central Iowa. As with the 2012 project area, this is a relatively data-rich area of the state so it is anticipated that significant additions will be made to the Iowa catalogs.

Early in 2014, IGWS will undergo significant reorganization when it is moved from its current organization, the Iowa Department of Natural Resources, into the University of Iowa-Iowa Institute for Hydraulic Research. This move will result in significant change to staff and duties. Currently, plans are to continue with the NGGDPP project for 2013 as agreed, although some adjustments are inevitable.