

## **COVER PAGE**

**AWARD NUMBER:**

G18AC00085

**SPONSORING ORGANIZATION:** Utah Geological Survey

**PROJECT TITLE:** Persistent Portal Connection and Maintaining Existing Well Data to the NGWMN by the Utah Geological Survey

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**TERM COVERED:** July 1, 2018, to June 30, 2020

**MAJOR GOALS:** Continue the flow of data to the National Groundwater Monitoring Network (Objective 2- support persistent data services); adding lithologic data to the Portal (Objective 3-Filling gaps in information).

**PROJECT SUMMARY:** The Utah Geological Survey (UGS) continued the flow of data from the UGS Water-Quality Network to the National Ground-Water Monitoring Network (NGWMN). This project establishes a long-term goal to continue integrating our state-level data with a national-level database. The funding available for this project was \$20,594.78

## **OVERVIEW OF WORK**

The Utah Geological Survey (UGS) cooperated with the USGS to provide a continued connection between the UGS Water-Quality Network and the NGWMN, providing the NGWMN with selected sites and related quality-controlled data. The UGS linked a database from our network for entry and integration of data to the NGWMN portal. The UGS provided ongoing maintenance by updating the list of UGS network sites, populating data elements for new sites acquired, substituting for a previous site that was not accessible at a later sampling date, and ensuring the NGWMN Portal connection to the databases stayed operational. Geologists and GIS Specialists in the Groundwater and Wetlands Program of the UGS performed all tasks in cooperation with the USGS, and provided web services for database integration.

Data flow maintenance by the UGS consisted of the following four tasks:

1. **Ongoing network maintenance (persistent data services)**
  - Janae Wallace, Paul Inkenbrandt, Nathan Payne, and Martha Jensen
    - a. administered and maintained the UGS database
    - b. performed regular manual and automated quality assurance and quality control (Paul Inkenbrandt and Martha Jensen);
    - c. maintained a user interface (UI) application that allows for upload of site and field chemistry information (Nathan Payne);
    - d. Created and maintained data services for water level and well construction information;

## **2. Updating network site list (Objectives 2 and 3)**

Janae Wallace coordinated with other groundwater geologists at the UGS to check station data, and add data where necessary. The groundwater geologists inspected records related to their respective sample sites and verified the accuracy of the information of each location to ensure that it is correct and current. Under the direction of Janae, the geologists entered new data related to the NGWMN sites into the UGS database, which allowed for the flow of that data to the NGWMN.

## **3. Populating data elements (Objective 3)**

The UGS populated data elements for many of its sites, mostly well construction and lithology data. Because almost all of the sites in our network are existing, privately-owned wells, we use the Utah Division of Water Rights' records to populate our site data. The extensive database offered by the Utah Division of Water Rights contains most of the data elements listed in the NGWMN framework document. Drillers' logs may provide inaccurate or inadequate lithologic reporting; such deficiencies can be verified using local geologic maps, cross sections, and published stratigraphic columns (available statewide [Hintze, 1988]; and through our Utah Geological Survey website map products for various locations throughout the state through <http://geology.utah.gov/apps/intgeomap/index.html>).

Sites updated for lithology, screen, and casing information include:

- (D-25-23)7ada (383854109242901)
- 01 CASTLE VALLEY OPEN LANDS (383709109230701)
- 02 CASTLE VALLEY BAILEY LN (383832109243901)
- 06 CASTLE VALLEY LOOP RD (383746109214001)
- (D-19-10)15bab Buckhorn (391026110472401)
- Monroe Monitoring Well 2 (383823112070901)
- Beryl Junction (374235113391701)

- Church Well (405456111522501)
- Woodenshoe Well (404259111202301)

Paul Inkenbrandt compiled water-quality laboratory results returned from the EPA laboratory related to NGWMN sites and submitted those data through the CDX (Central Data Exchange) into the EPA WQX. The WQX data flow to the NGWMN.

#### **4. Ensured an operational connection between the UGS and the NGWMN Portal**

##### **(Objectives 2 and 3)**

Working closely with the USGS, the UGS continued to provide data to the NGWMN. The UGS:

1. ensured that the data is flowing from UGS to WQX to NGWMN;
2. maintained data integrity and proper flow of results data;
3. established best practices for data transfer and upkeep;
4. maintained a schema/field mapping and conversion in cooperation with USGS;
5. maintained REST service to serve data via web service in cooperation with USGS;
6. Communicated with Candice Hopkins (USGS) to ensure data were mapping correctly.

## **WEB SERVICES**

The UGS uses an ESRI-based ArcGIS SDE (spatial database engine) to store data collected for the UGS networks. The ArcGIS platform allows us to serve data via REST-based public web services. The schema of the database was modeled after the EPA's WQX database under the guidance of the USGS, where the primary tables are a Results table that holds measured data and a Stations table that holds monitoring location/site information. Many of the field names are different from those of the WQX to meet field name limitations of the SDE and some fields have been added to comply with the minimum data requirements (Subcommittee on Ground Water, 2013) of the NGWMN. We also have well owner information, well

construction information, and lithology information tables. Well owner information is not made publicly available by the UGS.

All of the data we transmit and services we provide follow existing federal schemas, specifically the WQX schema. The UGS provides services that contain the following tables:

1. Stations

- a. unique identification is the station identification number
- b. contains minimum data requirements for sites

2. Results

- a. many to one relationship with stations
- b. joined to stations using station identification number
- c. parameter per row format
- d. contains results returned by the U.S. EPA laboratory and the Utah Department of Epidemiology and Lab Services
- e. contains measured field parameters

3. Lithology

- a. lithology describes the geology from the well driller's record
- b. this information is connected to the station table via the station identification number

4. Well Information

- a. this table includes completion and well construction
- b. it is derived from the Utah Division of Water Rights database

The current UGS services can be found at the following web addresses:

- REST URL:  
[https://webmaps.geology.utah.gov/arcgis/rest/services/Groundwater/NGWMN\\_USGS\\_V2/MapServer](https://webmaps.geology.utah.gov/arcgis/rest/services/Groundwater/NGWMN_USGS_V2/MapServer)
- SOAP URL:  
[https://webmaps.geology.utah.gov/arcgis/services/Groundwater/NGWMN\\_USGS\\_V2/MapServer](https://webmaps.geology.utah.gov/arcgis/services/Groundwater/NGWMN_USGS_V2/MapServer)

The state of Utah provides technical assistance to various state agencies through its Department of Technology Services (DTS). In addition, UGS employee Martha Jensen is a designated data manager who maintains and builds our databases that feed our website. The UGS also has many technically experienced staff that maintain databases and web pages. We are currently working with the EPA on an Exchange Network grant to enhance the flow of water chemistry and wetland data from Utah to the EPA. With the Exchange Network support the UGS is actively developing an ESRI Collector based application to interface with the database, allowing UGS staff to enter station and field data anywhere that the internet is available. The interface is still being beta-tested, but will be the main platform for entering data into the UGS database. Data entry on the application limits users to specific domains for each field, to ensure that the entered data follows the schema required by the EPA WQX and NGWMN.

## **REFERENCES**

Hintze, Lehi, 1988, Geologic History of Utah, Brigham Young University, Provo, Utah, 202 p.

Johnson, T. and Harris, J., 2014, Utah Division of Water Quality Quality Assurance Program Plan (QAPP) for Environmental Data Operations: Utah Division of Water Quality, accessed online  
[http://www.deq.utah.gov/Compliance/monitoring/water/docs/2014/05May/DWQ\\_QAPP\\_5.1.14\\_Rev0.pdf](http://www.deq.utah.gov/Compliance/monitoring/water/docs/2014/05May/DWQ_QAPP_5.1.14_Rev0.pdf)

Subcommittee on Ground Water, 2013, A National Framework for Ground-Water Monitoring in the United States: Prepared by The Subcommittee on Ground Water of The Advisory Committee on Water Information, accessed online  
[http://acwi.gov/sogw/ngwmn\\_framework\\_report\\_july2013.pdf](http://acwi.gov/sogw/ngwmn_framework_report_july2013.pdf)