Supporting persistent IGS data services to the NGWMN – 2020

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INTRODUCTION

The National Ground-Water Monitoring Network (NGWMN), which was established to assess long-term water-level and water-quality trends at a national scale, provides a unique opportunity to collect and share date from different states, agencies, and others. The Iowa Geological Survey (IGS) at the University of Iowa joined the NGWMN in 2017. The IGS contributes 40 wells, completed in the Cambrian-Ordovician (USGS national code S300CAMORD), Cretaceous (N300lLCRTCS), Mississippian (N500MSSPPI), and Silurian-Devonian (N400SLRDVN) aquifers, where quarterly static water level measurements are made to the NGWMN.

Through U.S. Geological Survey (USGS) Award # G19AC00275, the IGS received funding that allowed the IGS to maintain the NGWMN Well Registry, maintain web service connections to the NGWMN Portal, and begin developing web services that use WaterML2 and GWML2 data standards. This report describes the work performed and results obtained under this award.

WELL REGISTRY

The NGWMN contains data from 40 IGS network wells. Figure 1 shows the location of the NGMWN wells. Twenty-four of the wells are completed in the Silurian-Devonian aquifer, ten completed in the Cretaceous aquifer, four completed in the Mississippian aquifer, and two completed Cambrian-Ordovician aquifer.
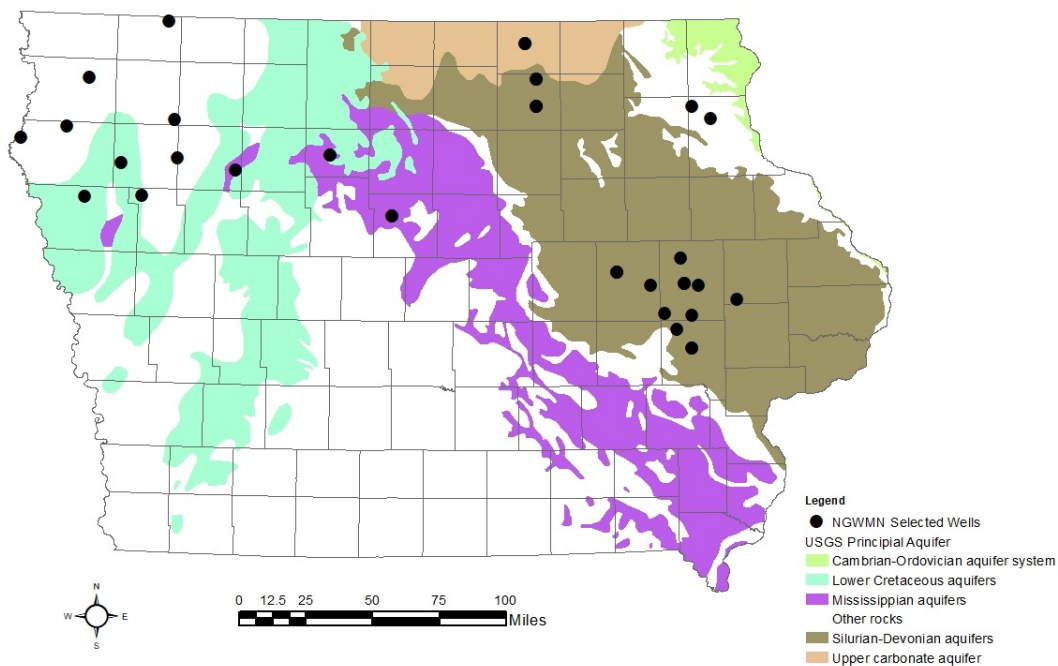

Figure 1. Location of IGS' NGWMN wells.

IGS geologist Richard Langel compared the information in the Well Registry to the IGS' databases and paper archive records to ensure data for all sites is current and accurate. More accurate latitude and longitude coordinates existed in the IGS' databases for two sites (NGWMN IDs 50000 and 54285). The coordinates for these sites were updated in the Well Registry. The

IGS collects well depth measurements using a tag line as part of its procedures for testing hydraulic conductivity of the NGWMN wells. The newly measured depths were recorded in both the IGS' databases and paper archive records. The well depth for multiple wells were updated in the Well Registry to reflect the newly collected data. All other information in the Well Registry is still current and accurate.

WEBSERVICE AND DATABASES

The IGS' web services are developed as an extension to the GeoSam application and created on a custom platform of PHP. The workload is handled by multiple apache servers that return the resulted query in five difference components (e.g. casing, screens, construction, lithology, and water levels). The web service supports REST protocol, and returns XML-formatted web documents.

The IGS did not encounter any problems with its web services transferring data to the NGWMN data portal in this contract period. However, IIHR Research Computing (RCS) staff noted the systems the IGS uses to manage, display, and transfer data were out-of-date. RCS staff upgraded IGS systems from PHP5.1, which was no longer supported, to PHP7.2 and upgraded the web server to Apache 2.4, to be compatible with PHP7, in December 2020. The upgrade ensures the IGS will have a reliable databases and web servers to serve data for years to come. The IGS verified all existing NGWMN web services functioned after the upgrade, ensuring data transfers to the NGWMN continues without incident.

The IGS developed a new water-level web service using the WaterML2 data standard. A new version of a water-level web service was submitted to the USGS for review in December 2020. Figure 1 shows a comparison of the current in use and newly created web-service. The USGS review noted that the NGWMN required 'method' element was missing in the web service.

Figure 1. Comparison of the IGS' water-level web service: a) current; and b) using the WaterML2 standard.

The IGS further researched the WaterML2 standards and believes it has identified the elements needed to store the method within its web service. The IGS is awaiting RCS staff to program these elements into the web service. The IGS hopes to submit the updated web service to the USGS for review and be made operational in the first quarter of 2021.

SUMMARY

The IGS has achieved all of the project goals. Specifically, the NGWMN Well Registry was updates so the IGS NGWMN well sites are displaying the most current data. The IGS created a new water-level web service in WaterML2 standards that was submitted for review. The review noted that one NGWMN required element, the collection method, was missing in the new web service. An updated water-level web service containing all NGWMN required elements is being developed and planned to be submitted to the USGS for review in the first quarter of 2021.