

Cover Page

Award Number: G23AC00310-00

New Mexico Bureau of Geology and Mineral Resources at New Mexico Tech
New Mexico Bureau of Geology and Mineral Resources Groundwater Level Monitoring
Network Year 7

Authors:

Ethan Mamer, Hydrogeologist
Laila Sturgis, Aquifer Mapping Program Manager

Primary contact: Ethan Mamer, Hydrogeologist
575-835-5118
ethan.mamer@nmt.edu

New Mexico Bureau of Geology and Mineral Resources
New Mexico Institute of Mining and Technology
801 Leroy Place
Socorro, NM 87801

Term of award: September 15, 2023, to September 14, 2024

Date: January 14, 2025

Major Goals 2023–2024:

To support persistent data services as an existing data provider for the National Ground Water Monitoring Network (NGWMN) by adding new sites, maintaining current sites, maintaining web services, keeping the site list up to date, keeping metadata current, and providing updates to the NGWMN Data Provider page for the New Mexico Bureau of Geology and Mineral Resources (NMBGMR).

To continue serving continuous monitoring data to the NGWMN portal via the GroundwaterML2 (GWML2) XML schema.

To visit and download pressure transducer data loggers and barometer data loggers at selected NGWMN sites, maintaining continuous water level data throughout our network.

Using a well camera, we proposed to survey 4 wells currently in our network that lacked the minimum data requirements. This survey aimed to identify well information such as screened interval, well depth and casing material.

To review active and ‘pumping’ wells measured by the NMBGMR’s Healy Collaborative Groundwater Monitoring Network to determine which wells are appropriate to add to the NGWMN as ‘surveillance’ sites. The wells selected will meet minimum data requirements; their well depth and well construction information and the lithology of the subsurface must be known for inclusion in the NGWMN.

Project Summary:

The NMBGMR was awarded Grant No. G23AC00310 to support persistent data services, update the data service format, and purchase continuous monitoring equipment. The period of work was between September 15, 2023, and September 14, 2024. Work included selecting additional sites for network inclusion, obtaining construction information, maintaining existing NGWMN sites, performing bore-hole camera surveys on several wells to meet minimum data requirements pertaining to well construction and keeping metadata current, and carrying out updates to the NGWMN Data Provider page for the NMBGMR.

Work done to support the NGWMN as a data provider:

For the year 2023–2024, our team focused on Objective 2 (supporting persistent data services) and Objective 3 (filling gaps in information at NGWMN sites). For Objective 2A, our team consisted of an IT manager, database administrator, software engineer, hydrogeology program manager, hydrogeologist, and research scientist. With U.S. Geological Survey (USGS) funds, the hydrogeology program manager worked with our in-house Aquifer Mapping Program (AMP) database to keep the NGWMN sites up to date. The program manager helped identify prospective wells, assisted with quality assurance/quality control procedures, and reviewed the final report. The hydrogeologist identified prospective sites for potential inclusion in the network, processed data collected from the sites with continuous data loggers installed, contacted owners of prospective wells, and compiled the final report. Their time was supported by federal USGS funding.

For Objective 3, our team conducted 3 downhole well camera surveys. Using a 1,000-foot-length Laval Underground borehole camera (R-CAM 1000 TLE Level Wind), owned by the NMBGMR, screened interval and depth of well was successfully determined for sites PC-0020, WL-0191, and WL-0227 (Fig. 1). With this data these sites meet the minimum data requirements and we were able to activate them on our data provider page. NM-23292 was not able to be surveyed as major alterations to the casing and well cap would be required and the owner was not comfortable with the changes.



Figure 1. Examples of well images and data captured with the bore-hole camera. Top extent of screened interval in WL-0191 imaged using the Laval Underground Surveys R-Cam Model 1000 TLE Level Wind.

We added 9 new sites to the monitoring network this year (Table 1, Fig. 2). Previously, all of the sites in the NGWMN that were provided by the NMBGMR have been open casing wells with no pumps. This year we are adding sites that, while they are equipped with pumps, are considered low-use production wells. These sites demonstrate little or no impact to the overall static level in the aquifer. Five of these sites will be classified as ‘surveillance’ sites as they are wells that are already within NMBGMR statewide network that are pumped. Of the nine new sites, four are within the Rio Grande aquifer system, one is within the Basin and Range aquifer system, and 4 are located in ‘other aquifer systems.’ All of the new sites meet the minimum data requirements except for NM-01941, which we hope to collect more data on next year with the borehole camera. The pumps in these wells will be shut off for the time required for the water level to return to the static water level of the local aquifer, after which the depth to water below the ground surface will be measured manually on an annual frequency.

The NMBGMR staff use standardized field methods to make sure that static-water levels are measured consistently, but some wells produce data that at times are influenced by nearby pumping or other factors. If a well is pumping or in recovery at the time of a site visit, measurements are flagged as non-static. Many of these wells have acoustic data loggers attached. While we acknowledge that the acoustic measurements don't meet the accuracy standards to submit this data to the NGWMN, they do provide a good check to see how long the well takes to recover to static water levels and if the manual measurement is in line with previous static readings.

This year we had to remove three existing sites from the NGWMN. We believe SA-0034 experienced a casing collapse, but we anticipate checking it with the borehole camera in February, 2025. The owner of the well at SA-0174 withdrew permission to access the site. QU-100 was plugged before we could be informed and the instrument in the well was lost.

Table 1. Updates to NGWMN sites.

Point ID	Principal Aquifer	Well Depth (ft)	Subnetwork	Monitoring Category	Monitoring Frequency	Action
SA-0134	Rio Grande aquifer system	215	Background	Surveillance	Manual annual (acoustic data logger installed)	added, awaiting further study before being activated
NM-01941	Rio Grande aquifer system	200	Documented	Surveillance	Manual annual	added, awaiting further study before being activated
WL-0007	Other aquifer system	925	Suspected	Surveillance	Manual annual (acoustic data logger installed)	added, awaiting further study before being activated
WL-0016	Other aquifer system	240	Suspected	Surveillance	Manual annual (acoustic data logger installed)	added, awaiting further study before being activated
WL-0072	Other aquifer system	690	Suspected	Surveillance	Diver/ annual	added, awaiting further study before being activated
WL-0177	Basin and Range aquifers	300	Background	Surveillance	Manual annual (acoustic data logger installed)	added, awaiting further study before being activated
WL-0236	Rio Grande aquifer system	300	Suspected	Surveillance	Manual annual (acoustic data logger installed)	added, awaiting further study before being activated
WL-0085	Other aquifer system	165	Background	Surveillance	Diver/ annual	added, awaiting further study before being activated
WL-0250	Rio Grande aquifer system	293	Background	Surveillance	Diver/ annual	added, awaiting further study before being activated
SA-0034	Rio Grande aquifer system	Potentially caved in	removed	-	Manual/ annual	pending removal, potentially collapsed casing
SA-0174	Rio Grande aquifer system	324	removed	-	Manual/ annual	removed upon owner's request
QU-100	Rio Grande aquifer system	Well was plugged	removed	-	Diver/ annual	removed, well was plugged

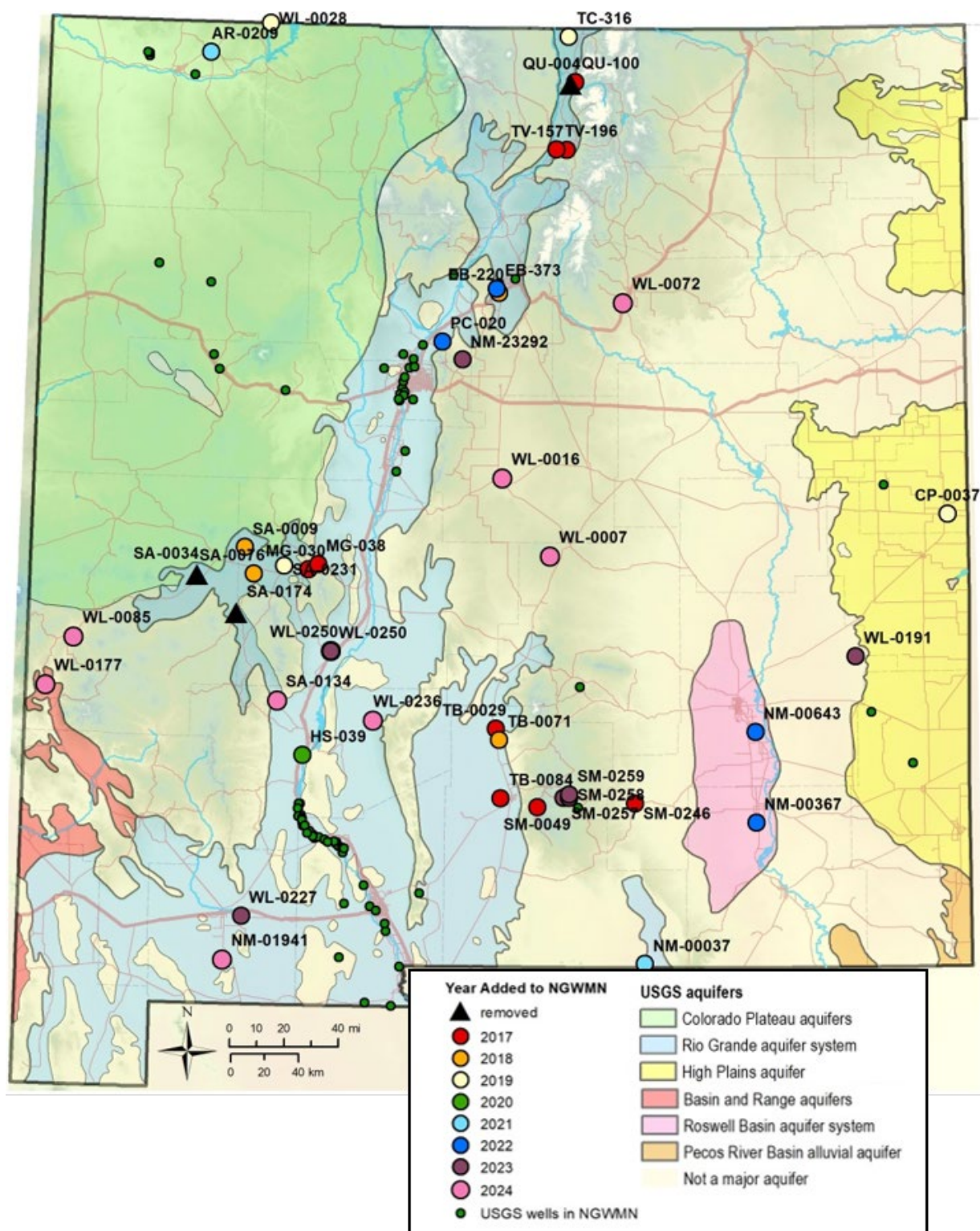


Figure 2. Principal aquifers, USGS NGWMN sites, and NMBGMR sites selected for inclusion in the NGWMN in 2023–2024.

The IT manager and database manager provided persistent web services, backups, and database support. The software developer ensured correct data transfers from the AMP database to the NGWMN portal and periodically checked user load on the network. Their time was supported by federal USGS funding. This team structure proved effective in maintaining a high-quality standard of data submitted to the NGWMN.

Completed data collection:

A variety of data collection and database maintenance tasks were performed. Fieldwork was performed to collect manual measurements using standardized methods. Field sheets and notebooks were copied or scanned upon returning to the office and stored on the NMBGMR network server, where they are backed up daily. Within two weeks, quality checks were completed and the data were entered into the AMP database. All well locations, well construction information, and manual water level data are maintained in the AMP database, and the data fields are aligned with those in the NGWMN database. We maintained a reliable database link between the AMP database and the NGWMN database. All efforts to provide data to the NGWMN complement the NMBGMR's mission to provide water level data to the public.

Borehole camera surveys were reviewed by the Hydrogeologist and well construction information was updated in the database.

The NMBGMR's current hydrologic team contributing to the NGWMN consisted of a program manager and a hydrogeologist. USGS funds supported selection and classification of wells in the network, upgrades and expansion of web services, and documentation of work in the final report.

Updates made to web services:

The NMBGMR has a custom WebAPI for sharing data with the NGWMN. The WebAPI has specific endpoints, allowing seamless data transfer from the AMP internal database to the NGWMN database. Three full-time staff are dedicated to providing support for core IT infrastructure for the NMBGMR. IT staff worked with the AMP team on the NGWMN thanks to financial support provided by the USGS.

Problems encountered in serving data to the NGWMN data portal:

None.

Notice of changes in databases or web services that would impact future integration with data portal:

The AMP SQL Server database underwent a major redesign and refactoring in early 2024. Data entry moved from an Access front end to web-based forms and reports.

Conclusions:

The NMBGMR is successfully connected to the USGS NGWMN, and is now showing 30 sites on the USGS website and has a total of 41 sites serving data to the NGWMN portal. The NMBGMR will continue to grow and add new sites, as well as improve data quality at existing sites. We look forward to continuing to work with the USGS toward this important endeavor for a national coverage of groundwater monitoring.