

Midway City Council
16 November 2021
Regular Meeting

Age of Water /
Project

To: Midway City Council
From: Wes Johnson 
Date: November 16, 2021
Subject: Midway City Water System Groundwater Age Evaluation

Memorandum

Dear Mayor and City Council,

During a recent City Council meeting we were asked to contact the United States Geological Survey, (USGS) to discuss the possibility of determining the age of our groundwater sources. I would like to discuss the proposed Scope of Work to determine if the Council would like to move forward and enter into a contract with the USGS.

We are proposing six different sources. The first four sources are active sources within our water system. The six sources are as follows:

- Mahogany Springs
- Gerber Springs
- Alpenhof Well
- Alpenhof-Weber Well
- Indian Springs
- The Proposed Highlands at Soldier Hollow Well

Indian Springs

Indian Springs is currently not active within our water system. The spring is listed with the Division of Drinking as a municipal source. However, approximately 15 years ago the spring tested positive for coliform. Because there wasn't a nearby power source to chlorinate the spring, we listed the source as inactive. The source is listed with the State as producing 50 gpm. I feel there is a value in testing the spring to help determine its future. Is the spring a source we completely abandon or is the source worth investing money to further develop and improve?

Highlands at Soldier Hollow Well

As the proposed Highlands at Soldier Hollow well is further developed a decision would be made regarding the Groundwater Age Evaluation of this source.

The current proposed cost of the six sources is \$133,000 with USGS providing a 20% cost share. After the cost share, our portion would be approximately \$107,000. During a recent phone conversation with Scott Hynek of the USGS, Scott indicated he would look at options to possibly lower the cost. As of today, I have not received a modified proposal.

Midway City Water Supply:

Source, age and resilience of groundwater supplied from springs and wells

USGS Utah Water Science Center

Midway City would like preliminary characterization of groundwater age as it relates to strategic management of municipal water sources.

Study Objectives:

Sample groundwater for a suite of elemental, isotopic, and molecular analyses. Focus will be on a wide range of groundwater age tracers capable of constraining the transit time of groundwater from its recharge point until the point of sampling. The goal is to understand mean groundwater age across the range from less than 10 to more than 10,000 years. This information is key to assessing the reliability of these water supply sources during intervals of decreased groundwater recharge, a scenario consistent with multi-decadal drought. Geochemical tracers may also constrain recharge elevations and characterize key aquifer units such that understanding of source and flowpaths may also be improved. Such insight may also enable more effective source protection measures to be undertaken by Midway city.

All data collected will become publicly available either on the USGS National Water Information System ([NWIS](#)) or as a USGS [ScienceBase](#) Data Release.

Complete datasets will also be transmitted to Midway City electronically along with groundwater age interpretations.

Study Sites and Approach:

Six total sites will be sampled for a comprehensive suite of groundwater tracers:

- Mahogany Springs
- Gerber Springs
- Alpenhof-Weber Well
- Alpenhof Well
- Indian Springs
- Proposed Highlands Well

The proposed budget includes resources for 7 sampling events, such that results could be replicated at one site. Depending upon approach this may mean replicating results as a measure of accuracy and precision, or assessing one site for temporal variability.

The proposed timeframe for sampling activities is Fall 2021 through March 2022, ideally all samples will be taken within an interval of several weeks. This is targeted toward a period in which surface and near surface water hydrologic activity will be minimal and results will be most representative of the deeper groundwater supplying the wells and springs of interest.

Key analytes will include:

- radioactive (tritium; ^3H) and stable isotope composition of water ($\delta^2\text{H}$, $\delta^{18}\text{O}$)
- dissolved noble gasses (^3He , ^4He , Ne, Ar, Kr, Xe)
- dissolved reactive gasses (N_2 , O_2 , CH_4 , CO_2)
- sulfur hexafluoride (SF_6)
- chlorofluorocarbons (CFC-11, CFC-12, CFC-113)
- radioactive (^{14}C) and stable ($\delta^{13}\text{C}$) isotopes of dissolved inorganic carbon (mostly CO_2)
- strontium isotopes ($^{87}\text{Sr}/^{86}\text{Sr}$)
- major, minor, and trace element concentrations of dissolved species
- nutrients (N species, P species)

Tasks and Timeline:

Three key tasks will be accomplished over a 12–18 month timeframe.

Task 1: Site reconnaissance, coordination, planning, organize/obtain key equipment.

Fall 2021, ideally October or November. Work with Midway City to secure site access, and coordinate sampling events.

Task 2: Sample groundwater, coordinate laboratory work, assure data quality

Fall 2021 through Winter 2022, ideally late fall within a 1-2 week window of cool dry weather.

Sample one site per day, with contingency days for unanticipated sampling challenges.

Samples submitted to various labs immediately upon collection (same day or next day).

Cost might be trimmed here by cutting 7th site/sampling event (each event, with supplies, staff and, analytical costs is just under \$10,000).

Task 3: Data analysis and reporting.

Winter 2022 through Winter 2023, many analysis will be available within weeks to months;

however turnaround times for tritium, radiocarbon, and noble gasses often exceed 6 months.

Progress updates, incremental data delivery, and consulting conversations culminating in basic groundwater age interpretation. Publish USGS Open File Report.

Deliverables:

-Data reported to USGS National Water Information System (as analyses are completed).

- ScienceBase data release (all data not reported to NWIS, finalized Fall 2022).

-USGS Open File Report. Detailed description of sample collection, laboratory methods, and groundwater age interpretation. *Cost might be trimmed here by reporting groundwater ages in an administrative letter (read: low publication/reporting costs), but there may be limits to interpretation in such a memo. Data and basic interpretations can be provided in a memo and followed up with further conversations.*

Budget for groundwater sampling and age tracer interpretation of Midway City water supply wells and springs

Task 1: ~\$18,000

Task 2: ~\$67,000

Task 3: ~\$48,000

I've planned to undertake the requested groundwater age tracer sampling late Fall of 2021 with the aim of providing full results late in calendar year 2022. This is still on track, but before we begin I want to confirm scope and cost and we will need to sign a joint funding agreement prior to any work.

I've run a detailed cost analysis. I can provide this cost breakdown, but first I wanted to look at the big picture. We can discuss any details of interest as we narrow in on final scope and cost.

At present, I've got a total of ~\$133,000 with USGS providing 20% cost share. This leaves a total cost of **~\$107,000**. *In the task description above I've highlighted some areas in Task 2 and Task 3 where cost savings might be easily achieved.* I would like to discuss this soon, and see if we can find an agreeable scope. I don't think I have access to the full 20% matching, but if we trim a little, I may still be able to match at 20%.

I am in the field until Sept 26, but will reach out again on Sept 27 to discuss.

Scott Hynek

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