

MEMORANDUM
OFFICE OF THE STATE ENGINEER
Hydrology Bureau

DATE: September 14, 2023

TO: Kevin Barnes, Permit Lead, Mining Act Reclamation Program (MARP)
Martin McMillan, Water Resources Manager, Water Rights Division
Lloyd Valentine, District III Manager, Water Rights Division

THROUGH: Katie Zemlick, Ph.D., Hydrology Bureau Chief *KZ*
Laura Petronis, Water Resources Manager I, Hydrology Bureau *LJP*

FROM: Max Gersh, Water Resources Professional III, Hydrology Bureau *mg*
Christopher E. Angel, PG, Senior Hydrologist, Hydrology Bureau *CEA*

SUBJECT: Additional Review and Comments, Minimal Impact Exploration Permit
Application, Hermanas Exploration Project, Luna County, New Mexico.
Permit No. LU048EM

INTRODUCTION

On May 2, 2023, the New Mexico Office of the State Engineer (NMOSE) Hydrology Bureau submitted review and comments (Gersh, 2023), as requested from the State of New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), on the Mining and Mineral Division (MMD) Permit No. LU048EM Part 3 Minimal Impact Exploration Operation Permit Application (application) for the Hermanas Exploration Project (project). Furthermore, on August 16, 2023, the MMD received a public comment from Johnson Ranches, LLC (Appendix A), regarding the permit application, in which Johnson Ranches, LLC, communicated their concern for the potential for adverse effects to a local spring named Carazalillo Spring (also known as Corrizalillo Spring and Carrizalillo Spring) due to the proposed drilling activities. The party states, *“This core drilling by Southern Silver Exploration Corporation could and most probably [will] harm the production of water that is used by my ranch in furnishing drinking water for over 1300 head of cattle and also is the residential water source for my home.”* On August 18, 2023, EMNRD requested the NMOSE Hydrology Bureau provide additional comments specifically addressing whether the project is expected to have a direct surface impact on Carazalillo Spring.

Carazalillo Spring is located in the southwest corner if Luna County, New Mexico, approximately 0.6 miles northwest of the proposed Drill Pad E. The location of Carazalillo Spring, in relation to the proposed Drill Pads, is shown in Figure 1 as well as the map provided on page 3 of Appendix A.

COMMENTS

The NMOSE Hydrology Bureau has completed a secondary review of the application and provides the following comments specifically addressing Carazalillo Spring and the potential for adverse effects due to the proposed exploratory drilling activities.

The NMOSE comments made in the original review, stated in the Hydrology Bureau memorandum dated May 2, 2023 (Gersh, 2023), shall remain effective and still be considered when not directly discussed in the following sections.

Carazalillo Spring

Springs sustain groundwater-dependent ecosystems and provide water for human consumption and beneficial use. They often occur because faults modify the groundwater flow pathways, which can force the discharge from aquifer systems to the surface. Darton (1916) identifies Carazalillo Spring (referred in the report as Carrizalillo Spring) as the following, “*Carrizalillo Spring rises from the bottom of a small valley a short distance west of Hermanas and is caused by a rock dam which crops out near[by]. The spring is a large one and its water has been utilized for stock for many years.*” (pg. 113).

The Cedar Grove Mountains cross the southwest corner of Luna County, located immediately northwest of Carazalillo Spring. The Carazalillo Hills (referred to again in Darton (1916) as the Carrizalillo Hills) are a southern continuation of these mountains (Darton, 1916). Faulting is present in the Cedar Grove Mountains and described in the Carazalillo Hills as follows, “*There is some faulting, but the relations of the faults were not ascertained.*” (Darton, 1916, pg. 94). Additionally, Darton (1916) identifies a dike that follows the valley below Carazalillo Spring and, “*doubtless it is the presence of this barrier to the underflow that brings the water to the surface* (pg. 94)”. The geologic map published in Seager and Clemons (1988), which is represented in Figure 1, shows the complex geology of the project area.

The proposed locations of Dill Pads E through H may follow the identified dike southeast of Carazalillo Spring into the Carazalillo Hills, which is, essentially, where the Johnson Ranches, LLC, concern stems from. However, there is limited hydrologic data near the Hermanas Exploration project area and the nature of the hydraulic connection between Carazalillo Spring and the areas of proposed drilling activities is unknown.

Southern Silver Exploration Potential Effects on Carazalillo Spring

While it is recognized that the proposed exploratory boreholes located at Drill Pads E through H may be drilled through a single or multiple water bearing unit(s) that have the potential to be hydraulically connected to Carazalillo Spring, it is not expected that said boreholes will have significant adverse effects on Carazalillo Spring.

The applicant has submitted the proper forms to the NMOSE WRD District III Office for drilling the exploratory boreholes (*WR-07 Application for Permit to Drill a Well with No Water Right*). At this time, the applicant will not be performing any dewatering activities or diverting water for beneficial use. The applicant shall ensure that a *Well Record and Log (WR-20)* be submitted for each borehole to provide the NMOSE WRD. The well record shall include a complete lithologic log. The lithologic log shall include detailed information on the depth, thickness, and lithology of

all strata penetrated. The documented information shall include which intervals are porous including, but not limited to, intergranular porosity and fracture porosity. If the porous interval is saturated, then the yield shall be estimated for each interval.

Additionally, regarding protection to groundwater and Carazalillo Spring, no toxic chemicals are listed as being used during drill activities.

Exploration Borehole Abandonment

The proposed exploratory boreholes are still expected to encounter groundwater. Additionally, the applicant has submitted the proper forms to the NMOSE WRD District III Office for plugging the exploratory boreholes (*WR-08 Well Plugging Plan of Operations*) immediately following completion and collection of cores. However, due to the additional information provided, it is recommended that the applicant plug the exploratory boreholes with a cement grout that is capable of withstanding hydrostatic pressure in the borehole and not a high-density bentonite clay, as originally proposed on page 17 of the Minimal Impact Exploration Operation Permit Application under the **Wet Boreholes** section. The cement grout mixture can be a neat cement slurry, cement-bentonite-slurry, or a sanded-cement slurry in accordance with OSE guidelines (OSE, 2020). To clarify, the applicant shall utilize **Wet Hole Abandonment (option 1)** being a form of, “*Neat cement slurry, mixed according to the manufacturer’s recommendations, emplaced with a tremie pipe from total depth to within 2 feet of the original ground surface, followed by 2 feet of topsoil/topdressing*” (Part 3 Minimal Impact Exploration Operation Permit Application, pg. 17). This recommendation should also be considered in examination on the Plugging Plans submitted to the NMOSE WRD District III Office to ensure the applicant is permitted similarly by the NMOSE and EMNRD to plug the proposed exploratory boreholes. The reason being that, although unlikely, if the drilling activities cause adverse effects on Carazalillo Spring, or the source supplying the spring, the applicant must restore conditions, to the best of their ability, to the conditions prior to the commencement of drilling activities. A cement slurry is the most effective way to restore conditions and provide an adequate seal of a borehole and any potential fractures caused by drilling activities to ensure source water to Carazalillo Spring is not lost and inter-aquifer exchange does not occur. A Well Plugging Record shall be submitted for every and all plugged boreholes, in accordance with NMOSE regulation 19.27.4.30.C.(3) NMAC.

CONCLUSION

The proposed exploratory drilling activities, with no dewatering or intent to divert water, followed by an OSE approved method of appropriately plugging, being a neat cement slurry, cement-bentonite-slurry, or a sanded-cement slurry in accordance with OSE guidelines (OSE, 2020), are not expected to impact Carazalillo Spring or the source water supplying it. The NMOSE Hydrology Bureau recommends the applicant, Southern Silver Exploration Corp., plug the exploratory boreholes with a form of cement slurry, as described above, in order to adequately seal the boreholes and any fractures that may be caused by drilling activities.

Finally, if further mining activities are to take place within the project area, a reevaluation should be considered.

REFERENCES

- Darton, N.H., 1916, Geology and Underground Water of Luna County, New Mexico, USGS Report, Bulletin Series 618, <https://doi.org/10.3133/b618>.
- Gersh, M., 2023, Review and Comments, Minimal Impact Exploration Permit Application, Hermanas Exploration Project, Luna County, New Mexico, Permit No. LU048EM. Office of the State Engineer Hydrology Bureau Memorandum, dated May 2, 2023.
- Mining and Minerals Division, 2011, Guidance Document for Part 3 Permitting Under the New Mexico Mining Act Energy, Minerals and Natural Resources Department, Mining Act Reclamation Program October 2011.
- Mining and Minerals Division, 2012, Part 3 Minimal Impact Exploration Operation: PERMIT APPLICATION INSTRUCTIONS. Energy, Minerals and Natural Resources Department.
- OSE (2020), Office of the State Engineer Sealant Guidelines for Well Construction and Plugging (for use in non-contaminated conditions), June 9, 2020.
- Seager, W. R., and Clemons, R. E., 1988, Geology of Hermanas Quadrangle, Luna County, New Mexico, New Mexico Bureau of Geology and Mineral Resources, Geologic Map 63, <https://doi.org/10.58799/GM-63>.

FIGURES

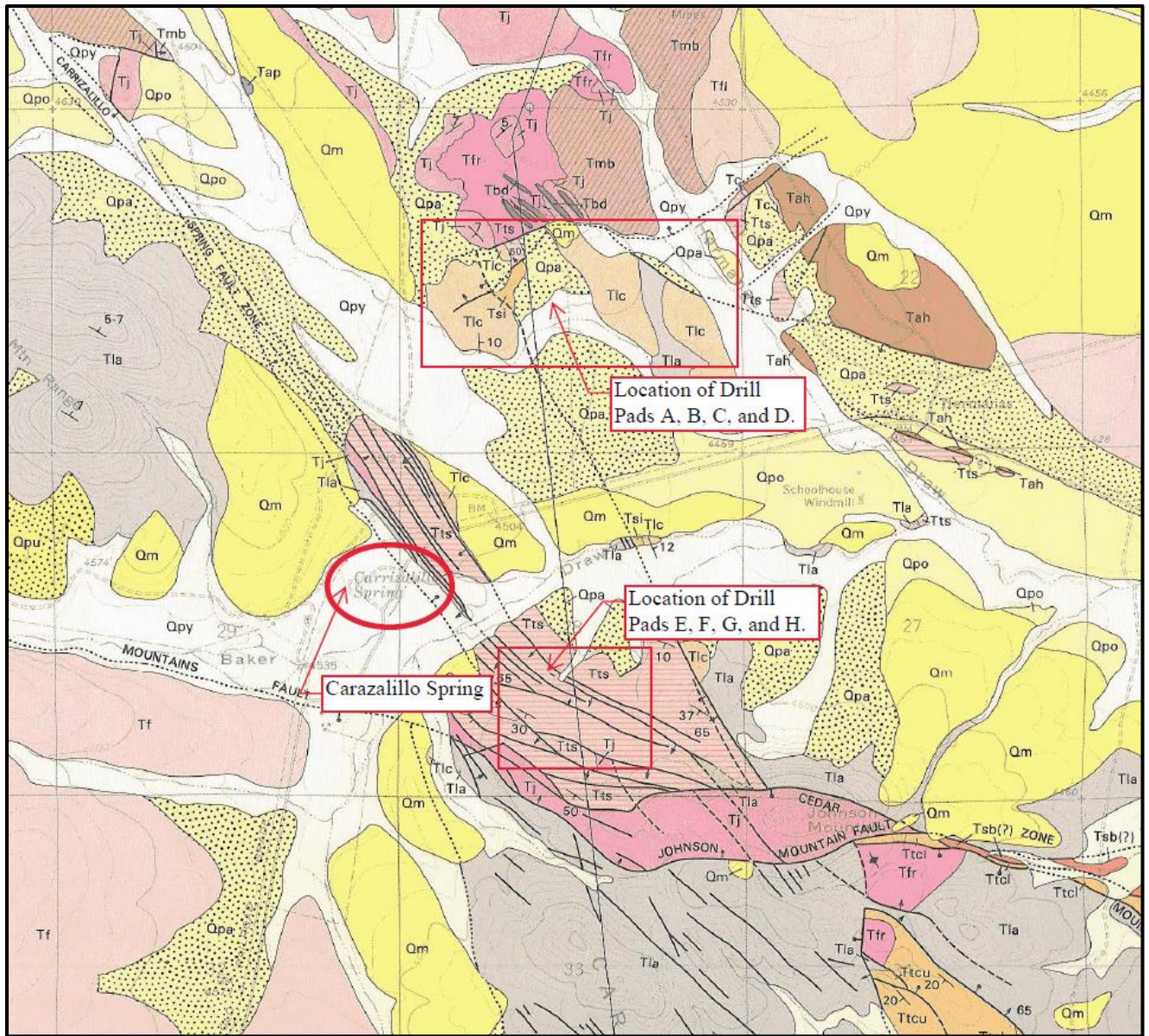


Figure 1. A partial section of Seager and Clemons (1988) Geologic Map 63 – Proposed Drill Pad Location Areas along with Carazalillo Spring.¹

¹ Geologic key from Seager and Clemons (1988) is included on the following page.

FIGURE 1 – GEOLOGIC UNITS
Derived from Seager and Clemons (1988)

Label	Geologic Unit	Period
Qpy	Younger piedmont-slope alluvial	<i>Holocene</i>
Qpo	Older piedmont-slope alluvial	<i>Late Pleistocene</i>
Qpa	Qpo and Qpy undifferentiated	<i>Holocene to Late Pleistocene</i>
Qm	Mimbres Formation	<i>Late Pliocene and early to middle Pleistocene</i>
Qpu	Qpo and Qm undifferentiated	<i>Pleistocene to late Pliocene</i>
Tb	Basalt plug	<i>Miocene</i>
Tf	Fanglomerate	
Tba	Basaltic-andesite flows	<i>Late Oligocene or earliest Miocene</i>
Tfl	Lower fanglomerate	
Ttb	Rhyolitic-tuff breccia	<i>Oligocene</i>
Tmb	Megabreccia	
Tbd	Basaltic-andesite dikes	
Tfr	Flow-banded rhyolite	
Tap	Andesite porphyry	
Tj	Tuff of Johnson Mountain	
Tah	Andesite of Hermanas siding	
Tc	Volcanic conglomerate	
Tts	Tuffaceous epiclastic rocks, breccia, fresh-water limestone, and intermediate-composite flows	
Tlc	Limestone conglomerate	
Tsi	Volcaniclastic sedimentary rocks	
Tla	Intermediate-composition flows	
Ttcu	Tuff of Carrizalillo Hills – upper member	
Ttcl	Tuff of Carrizalillo Hills – lower member	
Tal	Lower andesite	
Ttl	Lower rhyolite tuff	
Tsb	Rhyolite tuffaceous breccia and epiclastic rocks	

APPENDIX

Appendix A.

Johnson Ranches, LLC
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Columbus, NM 88029
575-531-2571
johnsonranchesllc@hotmail.com
AUGUST 16, 2023

TO WHOM IT MAY CONCERN:

As successor-in-interest to Carazalillo Spring, located in the southwest corner of Luna County, New Mexico, I am taking the opportunity to express my opinion as to the proposed core drilling scheduled in the immediate vicinity of the Spring. This core drilling by Southern Silver Exploration Corporation could and most probably harm the production of water that is used by my ranch in furnishing drinking water for over 1300 head of cattle and also is the residential water source for my home.

This Spring and the land upon which it is located is a historical water source and has been used for centuries by Native Americans, Spanish and Mexican explorers and American ranchers as the country was settled in the 19th century. The line of title traces back (long before New Mexico became a state). As I have stated I am the owner of the surface estate, the subsurface estate and all of the water produced as defined in relation to a natural spring with the water percolating to the surface. My ranch is heavily dependent on this natural water remaining available in its present form with no diminishment of quantity or quality.

Natural water appearing at the surface and in the quantity that this Spring produces is rare and almost non-existent in this corner of New Mexico. The debacle that occurred at the San Simon Cienega stands as an example of the danger of tampering with such rare water sources. San Simon Cienega is located just over the state line in Cochise County, Arizona. This water source was lost when "qualified experts" decided they could increase and manipulate the quantity of water by drilling and dynamiting the immediate sub-strata of the pool of water. This resulted in a loss of this magnificent historical spring. The fracturing of the underground strata allowed the water that heretofore percolated to the surface, to flow downward and not surface. The imposing remains of giant cottonwood trees that have died testify to the mistake of tampering with this natural spring.

I am asking any and all individuals and agencies receiving this letter to address my concerns over these proposed actions and to allay my fears. The drilling is to be conducted on staked federal mining claims so I assume the Bureau of Land Management and the Department of Interior will govern the use and type of exploration of the claims. Also, the New Mexico Office of State Engineer should be concerned as deep core drilling is nonetheless drilling and perforating the subsurface. It is feasible that the core drill may reach extreme depth and encounter various strata of water aquifers, fissures and pressurized spring water. Also, liability as to the loss of Carazalillo Spring and/or the quantity and quality of water (ie. production measured in gallons per minute) should be allocated to the appropriate party causing the harm. If

the drilling is allowed, great care must be taken to guarantee that the core is sealed as it is drilled to prevent any loss of the natural percolating water and the sustaining pressure.

This spring and ranch, has been in my family since 1918. I am the third generation to live and work on this magnificent ranch. Not only does my family and my livestock rely on this water source, but multiple species of wildlife. It would be completely and utterly devastating and most likely irreparable if this water source was damaged by the proposed drilling by Southern Silver Exploration Corporation.

In closing, everything I have stated here is within the realm of probability and should not be taken lightly. I am not taking my concerns lightly and would appreciate a response from all.

Respectfully,

A handwritten signature in black ink, appearing to read 'Joe Johnson', with a long horizontal line extending to the right.

Joe Johnson, Member-Manager

cc: Office of New Mexico State Engineer-Deming, New Mexico
Bureau of Land Management-Las Cruces, New Mexico
Southern Silver Exploration Corporation
Joseph Anothony Kizis, Jr., Consulting Geologist

