3.4 Master Response on Springs

3.4.1 Introduction

Overview

This master response addresses the issues commenters raised about springs in the Project area. Commenters express concern that pumping of groundwater from the alluvial and carbonate aquifer in the Fenner Valley at the Fenner Gap as proposed by the Project might impact springs in the Project area.

This master response is organized by the following subtopics:

3.4.2 Springs

Summary of Issues Raised by Commenters

Commenters express concerns regarding the potential impact to springs throughout the Watershed from the Project's groundwater pumping, and the adequacy of evidence to conclude that springs are not hydraulically connected to or fed by groundwater in the aquifer. Commenters express concerns that visual monitoring of springs would only observe impacts after they have occurred, and that a hydraulic connection (should one exist) could not be reestablished once broken. Commenters also request that a study of springs within the Mojave National Preserve be a component of any proposed monitoring and mitigation plan and that more springs over a broader area be monitored as part of the plan.

Response

Potential Impacts to Springs

As discussed in the Draft EIR Vol. 1, Section 4.9.3 Impact and Mitigation Analysis, pp. 4.9-59 to 4.9-61, natural springs within the Watershed were identified to evaluate their proximity to the pumping wellfield. Figure 4.9-3 in the Draft EIR identifies the locations of known springs within the Fenner Watershed. The Society for the Conservation of Bighorn Sheep (Society) provided additional details on locations of springs and guzzlers[1] in the Project area. None are closer than those originally evaluated in the initial studies. The Society regularly monitors over 70 watering features used by the bighorn sheep in the eastern Mojave Desert. Some of these are naturally occurring springs that historically sustained wildlife. However, some are also man-made guzzlers established over the years by the California Department of Fish and Game to capture rain water for year-round use and augment natural water resources and have become an essential resource for bighorn sheep populations. These guzzlers do not rely on groundwater.

[1] Guzzler is a term used to describe self-filling, constructed watering facilities that collect, store, and make water available for wildlife.

Natural Springs occur when precipitation directly infiltrates exposed fractured bedrock in the mountainous terrain and is diverted back to land surface via a fault line or a fracture that intersects the land surface. The flow to a spring represents an isolated flow path that is independent of flow occurring below the spring at lower elevations. Water that does not achieve an outlet at the spring travels downward to the alluvial aquifer system in the lower elevation valley below.

The detailed evaluation of springs found no hydraulic connection between the springs and the alluvial and carbonate aquifers in the groundwater basin (Draft EIR Vol. 1, Section 4.9.3 Hydrology and Water Quality, p. 4.9-59). None of the springs are located in alluvial or carbonate aquifers. The water that supplies these springs is not a part of the carbonate or alluvial aquifer system from which Project wells would withdraw groundwater (Draft EIR Vol. 1, p. 4.9-60). All of the known springs in the Fenner Watershed are located in bedrock in the higher elevations of the mountain ranges and are fed by precipitation that infiltrates into fractured crystalline rocks (such as igneous, volcanic, and metamorphic rocks) of the mountains and then resurfaces as discharge creating the spring. Changes in the lower alluvial groundwater have no effect on the crystalline hard rock formations at the higher elevations. Therefore, Project operations would not impact springs, as discussed in more detail below.

This conclusion is based upon both field observations and modeling from the following sources:

- Reviews and analysis of data compiled beginning in 1908, including United States Geological Survey (USGS) reports;
- Prior and current field investigations of springs in the Watershed, where available;
- GIS Mapping of individual springs in the higher elevations of the mountains, (see Draft EIR Vol. 4, Appendix H1 Cadiz Groundwater Modeling and Impact Analysis, Sub-Appendix A, Figure 2-15); and
- Groundwater modeling of hypothetical connectivity between the springs and alluvial aquifer.

Documentation of area springs has been performed by several sources, including the USGS, which conducted several surveys of area springs starting in 1908, and the current inspection of springs documented in Draft EIR Vol. 4, Appendix H3 Assessment of Effects of the Cadiz Groundwater Conservation Recovery and Storage Project Operations on Springs and Appendix H4 Springs Fieldwork. Some of the springs in the area are naturally occurring while others, including Bonanza Spring, are manmade or enhanced by man’s activities (local railroad and mining operations) beginning in the early part of the century.

As stated above, all of the known springs in the Fenner Watershed discharge from crystalline rocks in the higher elevations of the mountain ranges at elevations well above the deep regional groundwater in the alluvial and carbonate aquifers, which are located in the valley and at lower elevations of the Watershed (see Draft EIR Vol. 1, Section 4.9.1 Hydrology and Water Quality, Figure 4.9-3, p. 4.9-20). For example, the elevation of Bonanza Spring (Figure 4.9-3 [directly above the ALT 66 marker]), the spring closest to the proposed pumping wellfield at 11 miles to the north, is at approximately 2,100 feet National Geodetic Vertical Datum (NGVD) while the adjacent Fenner Valley floor is approximately 1,350 feet NGVD (see Draft EIR Vol. 1, Section 4.9.1 Hydrology and Water Quality, p. 4.9-19). The elevation of the top of the water table in the alluvium in the adjacent Fenner Valley floor is even lower and therefore separated from the spring discharge elevation by approximately 1,000 vertical feet (see Draft EIR Vol. 1, Section 4.9.1 Hydrology and Water Quality, Figure 4.9-6 [groundwater elevation contours]). Spring discharge to the bedrock surface is used by wildlife, plants, or evaporates. Only excess flow (beyond the capacity of the spring) can eventually recharge the groundwater.

In other words, the springs do not rely on any water from the alluvial or carbonate aquifers to remain wet and are not affected by changes in the groundwater table. Instead, as discussed in Draft EIR Vol. 4, Appendix H3 Assessment of Effects of the Cadiz Groundwater Conservation Recovery and Storage Project Operations on Springs, various studies indicate that the springs are fed by precipitation falling at higher elevations. As a result, pumping at lower elevations would not affect springs. Any changes in the flow of springs over the life of the Project would be the result of climatic conditions such as changes in local rainfall that are unrelated to Project operation.

From a hydrologic standpoint, bedrock springs occur when groundwater flows by gravity along a fault line or a fracture zone that either (1) directly extends to the surface (at a lower elevation) or (2) is impeded by a change in the migration pathway along this fault zone or fracture zone and is forced to the surface. The water that flows to the surface forms a spring. Springs in the Project area are all within crystalline bedrock, independent of the alluvial aquifer at lower elevations. Water that does not achieve an outlet as the spring travels underground downward to the alluvial aquifer system. The difference in elevations between water levels at the springs in the crystalline bedrock and at the wellfield within the alluvium demonstrates the independence of the two water bodies. The lower alluvial groundwater cannot pressurize these higher springs because the groundwater cannot flow uphill against the pull of gravity without any pressure to overcome that gravity. In the Project's watershed system, water that has made it into storage in the alluvial aquifers is at depths of up to hundreds of feet below the ground surface and only achieves an outlet at the Bristol and Cadiz Dry Lakes, where the depth to groundwater becomes shallow and discharges by evaporation. See Draft EIR Vol. 1, Section 4.9.3 Hydrology and Water Quality, p. 4.9-59, and Appendices H3 Assessment of Effects of the Cadiz Groundwater Conservation Recovery and Storage Operations on Springs and H4 Springs Fieldwork.

The Draft EIR Vol. 1, Section 4.9.1 Hydrology and Water Quality, p. 4.9-23 states that the full extent of the carbonate aquifer, as identified in the Fenner Gap, is unknown. However, the field mapping and subsurface geophysical data indicates that the carbonate rocks are not uniformly present throughout the Watershed due to faulting, folding, and erosion. The extent of the carbonate unit is discussed further in **Master Response 3.3** Groundwater Pumping Impacts. Based on geologic data, the carbonate aquifer that underlies a portion of the alluvial aquifer is limited to the vicinity of the Fenner Gap. In other words, the fractured carbonate aquifer that runs parallel to the Fenner Gap is unconnected to the higher elevation mountain bedrock that forms the springs.

As discussed above and in the Draft EIR Vol. 1, Section 4.9 Hydrology and Water Quality, pp. 4.9-19 and 4.9-59 to 4.9-61, the physical evidence indicates that the groundwater in the alluvial and carbonate aquifers is not hydraulically connected to the springs within the Watersheds and thus, pumping of groundwater under the proposed Project would not affect these springs. Key evidence for this conclusion is as follows:

- The closest springs in the area are more than 10 miles upgradient from the Project area and in different geological formations than the Project wells.
- Springs at the surface that are known to support wildlife do not depend on the regional groundwater system; they are fed from precipitation that occurs in the highest elevations of the surrounding mountains of the Watershed.
- The springs cannot pull water against gravity to the surface from the groundwater basin many hundreds of feet below ground. Some of the precipitation that makes it into the deeper soil/rock column in the higher elevations resurfaces as springs in the mountains and the rest of the water percolates by gravity drainage downward to the regional groundwater system. The groundwater remaining in the system continues to migrate downhill, enters the subsurface aquifer system, eventually migrates to the Dry Lakes becoming saline, and ultimately evaporates, resulting in a loss of the beneficial use of water.

Nonetheless, even though the historical data and field observations show no hydraulic connection, in order to address concerns and to conservatively analyze any potential impacts, some connectivity was assumed to exist between the groundwater feeding the springs and groundwater in the alluvial aquifer for hypothetical modeling (see the Draft EIR Vol. 4, Appendix H3 Assessment of Effects of the Cadiz Groundwater Conservation Recovery and Storage Project Operations on Springs, p. 12, Concept 2). The modeling findings showed, as a result of this hypothetical assumption, that any impact would be less than significant due to the distance between drawdown in the aquifer and mountain springs, the significant difference in elevation, and the inability of water to pass through fractured bedrock.

Monitoring Network

In addition to the mitigation measures recommended in the Draft EIR to ensure that impacts related to the Project are less than significant, the Project would also be subject to a Groundwater Management Monitoring and Mitigation Plan (GMMMP) to be approved by San Bernardino County (County) pursuant to its Desert Groundwater Ordinance. The Groundwater Stewardship Committee (GSC) recommended that Project design features be included in the GMMMP; the design features have been included in the Updated GMMMP to protect critical resources in the Watershed (see Final EIR Vol. 7, Appendix B1Updated GMMMP and Sub-Appendix A Groundwater Stewardship Committee April 2012 Summary of Findings and Recommendations). The design features include the monitoring of springs within the Watershed. The spring monitoring features are not required by CEQA as measures to mitigate significant impacts, but rather will be implemented to satisfy the requirements of the Desert Groundwater Ordinance and the May 11, 2012 Memorandum of Understanding approved by Santa Margarita Water District (SMWD), Cadiz Inc., Fenner Valley Mutual Water Company (FVMWC), and the County.

The monitoring called for in the Updated GMMMP consists of the periodic visual, non-invasive monitoring of spring flows from Bonanza Spring, Whiskey Spring, and Vontrigger Spring, as shown in the Draft EIR Vol. 1, Section 4.9.1 Hydrology and Water Quality, Figure 4.9-1, p. 4.9-20. Bonanza Spring is considered an "indicator spring" because it is in closest proximity to the Project wellfield (approximately 11 miles from the center of the Fenner Gap). Therefore, were any of the springs within the Fenner Watershed to be affected, the first one to be affected by the Project operations would be Bonanza Spring (though this is not expected as previously explained). The Whisky and Vontrigger Springs, located far beyond the Project's projected effects on groundwater levels in the alluvial aquifers, would also be monitored to compare variations in spring flow from those springs to variations in spring flow from the Bonanza Spring. This comparison would assist in documenting the cause of any material reduction of flow at the Bonanza Spring such as reductions attributable to regional climate conditions.

The monitoring measures to be implemented for springs and the evaluation of that monitoring data fulfill the commenters' request for monitoring of springs. The Updated GMMMP also explains why the number and location of springs to be monitored were chosen.

Some commenters recommended the inclusion of additional unspecified springs in the monitoring network, such as springs located in the Mojave National Preserve. Whiskey and Vontrigger Springs are located within the Mojave National Preserve and are the closest to the wellfield. Other springs within the Preserve are located farther away than Bonanza, Whiskey, and Vontrigger Springs and would not provide as early a warning of changes to springs, regardless of the potential cause (Project pumping or climate conditions). Consequently, springs located even farther away would be less effective as monitoring locations. Furthermore, it is not possible for springs located outside of the Fenner, Orange Blossom Wash, Bristol, and Cadiz Watersheds to be affected by the Project because these watersheds form a closed drainage basin, preventing water flow across that boundary. Finally, the Draft EIR Vol. 4, Appendix H1 Cadiz Groundwater Modeling and Impact Analysis, Figures 64 through 69 show the maximum extent of model-predicted groundwater drawdown. Springs located outside of this limited footprint could not be affected by the Project pumping. Consequently, the monitoring of springs outside this footprint would not provide data relevant to this Project.

Notwithstanding the lack of a hydraulic connection between the alluvial and carbonate aquifers serving the Project and springs, the Updated GMMMP includes a springs management feature. See Final EIR Vol. 7, Appendix B1, Updated GMMMP, Chapter 6, Section 6.7. Flow levels will be monitored at Bonanza Spring and if average annual or seasonal flow drops below baseline flow conditions, the cause of the reduction will be assessed and, if attributable to the Project, corrective measures implemented to re-establish baseline flows. The Updated GMMMP also includes a groundwater "floor" (initial maximum 80 feet of drawdown in the wellfield area) that will provide the County the opportunity to evaluate effects of Project drawdown (including effects on springs, should there be any) and potentially require the modification or suspension of Project operations to protect these resources. The "floor" is within the model-predicted drawdown under the Project Scenario (based on 32,000 AFY of recharge) (see Draft EIR Vol. 1, Section

4.9.3 Hydrology and Water Quality, Figure 4.9-12) and, therefore, provides an additional early warning management feature.

Because the EIR found that the physical evidence indicates that the groundwater in the alluvial and carbonate aquifers is not hydraulically connected to the springs within the Watersheds and thus, pumping of groundwater under the proposed Project would not affect these springs (Draft EIR Vol. 1, Section 4.9 Hydrology and Water Quality, pp. 4.9-19 and 4.9-59 to 4.9-61) no mitigation measures are required under CEQA with regard to springs. As such the Updated GMMMP management features concerning springs are not included as mitigation measures, and are not included in the Project's Mitigation Monitoring and Reporting Program.