

**IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA**

IN THE MATTER OF APPLICATION 59369 FILED)
TO APPROPRIATE THE UNDERGROUND WATERS)
OF THE MUDDY RIVER SPRINGS AREA AKA)
UPPER MOAPA VALLEY HYDROGRAPHIC BASIN)
(219), CLARK COUNTY, NEVADA.)

RULING
#6259

GENERAL

I.

Application 59369 was filed on November 5, 1993, by the Moapa Valley Water District to appropriate 10.0 cubic feet per second (cfs), not to exceed 7,240 acre-feet annually (afa), of groundwater from the Muddy River Springs Hydrographic Basin for municipal use. The proposed point of diversion is described as being located within the NE¼ NE¼ of Section 33, T.13½S., R.64E., M.D.B.&M. The proposed place of use is described as being located within Sections 5, 6, 8, 9, 13, 14, 15, 16, 23, 24, 25, 26, 35 and 36, T.14S., R.65E., M.D.B.&M.; Sections 15, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, T.14S., R.66E., M.D.B.&M.; Sections 1, 2, 3, 4, 5, 6, 9 and 12, T.15S., R.66E., M.D.B.&M.; Sections 6, 7, 8, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26, 27, 28, 34, 35 and 36, T.15S., R.67E., M.D.B.&M.; Section 31, T.15S., R.68E., M.D.B.&M.; Sections 1, 2, 3, 10, 11, 12, 13, 14, 24 and 25, T.16S., R.67E., M.D.B.&M.; and Sections 6, 7, 8, 17, 18, 19, 20, 30 and 31, T.16S., R.68E., M.D.B.&M. The remarks section of the application indicates that the water will be used to help serve 6,000 residents of the Moapa Valley and that the development of new water resources is necessary to meet anticipated shortfalls.¹

II.

The application was timely protested by the U.S. Department of Interior Bureau of Indian Affairs, U.S. Department of Interior Fish and Wildlife Service and U.S. Department of Interior National Park Service on various grounds summarized as follows:¹

1. The water sought to be appropriated conflicts with senior reserved water rights held by the United States on behalf of the Moapa Valley Paiute Tribe.

¹ File No. 59369, official records in the Office of the State Engineer.

2. Use of the water could conflict with and impair the value of Indian reserved water rights and adversely affect the availability of water for present and future uses.
3. The cumulative impact of all pending applications has not been addressed and until such time, approval of this application is not in the public interest.
4. Use of the water will cause a lowering of the water level and desecration of riparian habitats, which would adversely affect wildlife and grazing livestock and likely jeopardize endangered and/or threatened species and is therefore not in the public interest.
5. It would not be in the public interest to impair the water and water-related resources of the Lake Mead National Recreation Area.
6. Use of the water will eventually reduce or eliminate the flows of springs and the Muddy River and springs within the Lake Mead National Recreation Area, which are discharge areas for regional groundwater flow systems, which will impair the senior water rights, water resources and water-related resources of the U.S. National Park Service.
7. It is unclear whether the quantity applied for along with other pending applications is necessary and reasonably required for municipal use.
8. The application does not clearly indicate the place of use, description of proposed works, estimated costs of works, number and types of units to be served or annual consumptive use.
9. Use of the water may threaten to prove detrimental to the public interest because it may adversely affect the resident and migratory fish and wildlife species and their habitats within the Moapa Valley, including the Muddy River, its headwater springs, their outflow channels and the Moapa National Wildlife Refuge, which contains endangered and/or threatened species.

FINDINGS OF FACT

I.

Nevada Revised Statute (NRS) § 533.365(4) provides that it is within the State Engineer's discretion to determine whether a public administrative hearing is necessary to address the merits of a protest to an application to appropriate the public waters of the state of Nevada. The State Engineer finds that in the case of Application 59369 there is sufficient information contained within the records of the Office of the State Engineer to gain a full understanding of the issues and a hearing on this application is not required.

II. Order 1169 and 1169A

In 2001, a hearing was held on various applications in Coyote Spring Valley. Following the hearing, the State Engineer issued State Engineer's Order No. 1169 (Order 1169) on March 8, 2002. In that order, the State Engineer addressed what is known as the carbonate-rock aquifers, which are groundwater aquifers that exist underneath a significant portion of eastern and southern Nevada. The carbonate-rock aquifers have long been recognized as a potential water resource, but for which the water resources are not well defined, the hydrology and geology of the area are complex and data is sparse. The State Engineer noted that since 1984 it has been known that to arrive at some reasonable understanding of the carbonate-rock aquifer system, substantial amounts of money would be required to develop the science, that a significant period of study would be required, and "unless this understanding is reached, the development of carbonate water is risky and the resultant effects may be disastrous for the developers and current users."²

The State Engineer noted that previous studies suggested that confidence in predictions regarding the effect of development was low and would remain low until observations of the initial hydrologic results of development were analyzed. The State Engineer was concerned that the adverse effects of development would overshadow the benefits, and found that the development of the carbonate-rock aquifer system must be undertaken in gradual stages together with adequate monitoring. The State Engineer noted that it is unknown what additional quantity, if any, of groundwater could be appropriated in the Coyote Spring Valley Hydrographic Basin without unreasonable and irreversible impacts. The State Engineer pointed out that the Applicant's own experts were unable to make a suggestion as to what part of the water budget could be captured without a great deal of uncertainty and that the question could not be resolved without stressing the system.

Order 1169 noted that testimony and evidence indicated approximately 50,000 afa of underflow comes into the Coyote Spring Valley from northern groundwater basins and approximately 53,000 afa of subsurface water flows out of the Coyote Spring Valley. Of that 53,000 afa that flows out of Coyote Spring Valley, approximately 37,000 afa of water discharges

² State Engineer's Order No. 1169, dated March 8, 2002, p. 2, official records in the Office of the State Engineer.

at the Muddy River Springs, which is appropriated under the Muddy River Decree.³ Testimony and evidence indicated another approximately 16,000-17,000 afa is believed to flow to the groundwater basins farther south, including Hidden Valley. Additionally, the State Engineer found that 50,465 afa of groundwater was already appropriated in Coyote Spring Valley and the surrounding basins identified as Black Mountains Area, Garnet Valley, Hidden Valley, Muddy River Springs Area (a.k.a. Upper Moapa Basin) and Lower Moapa Valley Hydrographic Basins. Because very few of these groundwater rights had actually been pumped, and water rights already issued in Coyote Spring Valley alone equaled the estimate of the amount of flow that bypasses the region, the State Engineer ordered additional study before consideration of granting any additional water rights in Coyote Spring Valley.

Order 1169 ordered that all applications for new appropriations from the carbonate-rock aquifer system in Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (Basin 217), Muddy River Springs Area a.k.a. Upper Moapa Valley (Basin 219) and Lower Moapa Valley (Basin 220) would be held in abeyance until further information could be gathered by stressing the aquifer system by way of a pumping test. See, Attachment 1, Location Map of the Order 1169 Hydrographic Basins, Clark County and Lincoln County, Nevada. Unlike other basins in Nevada, the above listed basins were tied together in Order 1169 because it was well established that the spring discharge in the Muddy River Springs Area was produced from a distinct regional carbonate-rock aquifer that underlies and uniquely connects the basins. There is a very high hydraulic transmissivity found in most of this area of the carbonate-rock aquifer, which results in a flat potentiometric surface in these basins. Changes in the potentiometric surface in any one of these basins occur in lockstep directly affecting the other basins, further demonstrating the regional nature of the aquifer across these basins.

In Order 1169, the State Engineer ordered a study under the provisions of NRS § 533.368 that required at least 50% (8,050 afa) of the water rights then currently permitted in Coyote Spring Valley be pumped for at least two consecutive years, and that data be gathered from others who currently held water rights in the Order 1169 area. At the end of the study, the study participants, which included the Las Vegas Valley Water District, Southern Nevada Water

³ Judgment and Decree, *In the Matter of the Determination of the Relative Rights In and To the Waters of the Muddy River and Its Tributaries in Clark County, State of Nevada*, March 12, 1920, Tenth Judicial District Court of the State of Nevada, In and For the County of Clark.

Authority, Coyote Springs Investment, LLC, Nevada Power Company, Moapa Valley Water District, Dry Lake Water Company, LLC, Republic Technologies, Inc., Chemical Lime Company, Nevada Cogeneration Associates or their successors, were required to submit reports identifying the information obtained and any impacts seen to the groundwater or surface water resources of the carbonate-rock aquifer system or alluvial system from the pumping. The State Engineer also ordered the LVVWD to update a model it had presented during the course of its case-in-chief at the LVVWD hearing with the new data. The State Engineer indicated that he would then decide whether sufficient information had been gathered to act on the pending applications. By State Engineer's Ruling No. 5115, dated April 18, 2002, the California Wash Hydrographic Basin (Basin 218) was included in Order 1169 because of its hydrologic connection.

By letter dated May 26, 2010, the Moapa Band of Paiute Indians indicated their concern that the pumping test itself was likely to impact water resources at the Muddy River Springs, which are the source of water for the Muddy River.

At a meeting of the Order 1169 study participants on June 22, 2010, each of the participants agreed that the pumping test would provide sufficient information even if the minimum 8,050 afa was not pumped. In response to that meeting, in a letter dated July 1, 2010, the State Engineer expressed his concern that it had been eight years since the pumping test was ordered, that the pumping requirements of the study had not even begun, and found that decisions regarding future appropriations in the basins subject to the order could not be deferred indefinitely. The State Engineer ordered that the test was to go forward even if the 8,050 afa minimum amount of pumping designated in Order 1169 was not pumped.

On December 21, 2012, the State Engineer issued Order 1169A, wherein he revised the requirements of Order 1169, indicating his belief that sufficient information had been obtained and declaring the pumping test completed as of December 31, 2012. Order 1169A provided the study participants the opportunity to address the information obtained from the study/pumping test, the impacts of pumping, and to opine as to the availability of additional water resources to support the pending applications. These reports were due in the Office of the State Engineer by June 28, 2013. The State Engineer finds that reports were submitted in a timely manner and that all the requirements of Order 1169 and 1169A have been satisfied.

III.

Order 1169 and 1169A Pumping Test

The Order 1169 pumping test originally required the participants to pump 8,050 afa from wells in Coyote Spring Valley for two years. As stated above, the State Engineer ordered on July 1, 2010, that the test go forward with reduced pumping. The test officially began on November 15, 2010. Water pumped from the MX-5 well was piped to the Moapa Valley Water District municipal infrastructure, and ultimately piped to Bowman Reservoir in Lower Moapa Valley. This water was released from Bowman Reservoir in an open channel to Lake Mead. Water pumped from wells operated by CSI was put to beneficial use in Coyote Spring Valley.

The pumping test officially ended on December 31, 2012, after a period of 25½ months. The total amount pumped between the CSI wells and the MX-5 well during the test period was 11,249 acre-feet, which translates to about 5,290 acre-feet per year, well short of the initially intended amount to be pumped in the study. There were a number of mechanical problems encountered during the test that required the MX-5 well to shut down. Even without the mechanical issues, the maximum pumping rate would not have resulted in a total pumpage from Coyote Spring Valley of 8,050 afa.

In addition to measuring pumping from wells in Coyote Spring Valley, pumpage was also measured and reported from 30 other wells in the Muddy River Springs Area, Garnet Valley, California Wash, Black Mountains Area, and Lower Meadow Valley Wash. Stream diversions from the Muddy River to the Reid Gardner power plant were reported by NV Energy. Measurements of the natural discharge of the Muddy River and of several of the Muddy River's headwater springs were collected daily. Water-level data were collected for 79 monitoring and pumping wells. Barometric data were collected at three sites; two sites in Coyote Spring Valley and one site in California Wash. The State Engineer finds the pumping test proceeded as required and all of the required data was collected and made available to each of the parties and the public.

IV.

Pumping Test Reports

Order 1169A provided the study participants the opportunity to file reports and requested they address three questions: (1) what information was obtained from the study/pumping test; (2) what were the impacts of pumping under the pumping test; and (3) what is the availability of additional water resources to support the pending applications. Reports or letters were submitted by the Southern Nevada Water Authority (SNWA), the U.S. Department of Interior Bureaus of Fish and Wildlife Service, National Park Service and Land Management (DOI Bureaus), Moapa Band of Paiute Indians (MBOP), Moapa Valley Water District (MVWD), Coyote Springs Investment, LLC (CSI), Great Basin Water Network (GBWN) and Center for Biological Diversity (CBD).

1. Southern Nevada Water Authority

SNWA prepared a comprehensive report that discusses water levels in monitoring wells throughout the Order 1169 basins and stream flows in the Muddy River Springs Area. As to Question 2, SNWA did not differentiate water-level decline due to pumping at the MX-5 well from other pumping in the area.

SNWA recognized that declines in spring flow occurred at Pedersen and Pederson East springs, and that the spring flows declined as a result of new pumping at the MX-5 well. Decline in flow at Warm Springs West was characterized as minimal, and it did not recognize any other surface flow reductions caused by groundwater pumping at the MX-5 well. SNWA provided figures that illustrate how groundwater levels and some spring flows are highly correlated with climate. Figure 12 of SNWA's report clearly shows how the long-term declining trend in groundwater levels recovered after the wet winter of 2005.⁴ A similar correlation is noted for flows at the Warm Springs West gage, where a declining trend in spring discharge reversed after the winter of 2005.⁵ SNWA points out that the flows of the Muddy River at Moapa did not decline during the period of the pumping test and asserts that the river flows are primarily impacted by valley fill pumping, primarily by NV Energy, and not carbonate pumping.

As to the availability of additional water for appropriation, SNWA states that:

It remains unclear if additional resource development beyond existing permitted rights could take place in Coyote Spring Valley at locations north of the Kane

⁴ Southern Nevada Water Authority, *Nevada State Engineer Order 1169 and 1169A Study Report*, pp. 23 – 25, June 2013, official records in the Office of the State Engineer.

⁵ *Id.* at 26.

Spring fault in the area near CSMV-3. However, the presence of boundaries and variations in hydraulic conductivity suggest that, at a minimum, these areas may have the potential to be used for redistributing development of existing rights. Whether pending applications in Coyote Spring Valley are approved or denied, in whole or in part, they should be considered in order of priority with all other groundwater applications held in abeyance by Order 1169.⁶

2. Coyote Springs Investment, LLC

CSI submitted a letter in which they stated that they agree with the SNWA report. CSI believes water can be developed in Coyote Spring Valley north of the Kane Springs fault without impacting the Muddy River Springs and that pending applications of both CSI and SNWA should be granted in whole or part.

3. U.S. Department of Interior Bureaus

DOI Bureaus provided documentation and interpretations of the effects of the pumping test as well as predictions of the effects of various pumping scenarios. They analyzed water levels, spring and stream flows, and climate in the Order 1169 basins and some adjacent areas.

The DOI Bureaus found the pumping test was sufficient to document the effects of the pumping, identify regional drawdown, predict future effects of pumping on water levels and spring flow, and to determine the availability of water pursuant to the applications. Their analyses of impacts under the test were extensive. They used SeriesSEE⁷ to discern and partition the effects of pumping at the MX-5 well from pumping at other locations. Their reported findings are that water-level decline due to MX-5 pumping (drawdown) encompasses 1,100 square miles and extends from northern Coyote Spring Valley through the Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and the northwestern part of the Black Mountains Area. Drawdown due to MX-5 pumping is estimated to be 1 to 1.6 feet in this area. They also found minor drawdown of 0.5 feet or less in the northern part of Coyote Spring Valley north of the Kane Springs Wash fault zone, in disagreement with SNWA. They found that water-level decline did not extend into Lower Moapa Valley. They estimate 80-90% of the

⁶ *Id.* at 57 - 58.

⁷ Halford, K., Garcia, C.A., Fenelon, J., and Mirus, B., 2012, *Advanced methods for modeling water-levels and estimating drawdowns with SeriesSEE, an Excel add-In*, U.S. Geological Survey Techniques and Methods 4-F4, 29 pp.

pumped groundwater was derived from storage (hence the drawdown) and the remainder from capture of spring flow or from reductions in the flow of the Muddy River.⁸

They completed an in-depth analysis of spring flows in relation to nearby carbonate water levels and found a direct correlation. Measurable flow decline at Pedersen, Plummer and Apar units and Baldwin Spring are highly correlated with water levels in adjacent carbonate wells. If linear trends continue, spring flow can be estimated as a function of water levels in the adjacent carbonate aquifer. They argue that all pumping from carbonate aquifers will ultimately capture spring flow.

They also compared observed water level changes to water levels simulated in a groundwater flow model of the region.^{9,10} The model was updated to include pumping through 2012.¹¹ If the applications, which are the subject of Ruling No. 6254, were pumped along with current water rights, they predict springs in the headwaters of the Muddy River, and the Muddy River itself above Moapa, would cease to flow in less than 200 years. The effects would occur much sooner if all of the pending applications held in abeyance pursuant to Order 1169 were granted and pumped. They report that the model under-predicts drawdown and also would therefore under-predict flow losses in the springs. After analyzing model results and observations made from monitor wells and springs, they believe that pumping at current (Order 1169) rates of less than one-half of existing permits, will result in both of the Pedersen springs going dry in 3 years or less.¹²

⁸ U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, June 28, 2013, official records in the Office of the State Engineer.

⁹ Tetra Tech, *Development of a Numerical Groundwater Flow Model of Selected Basins within the Colorado Regional Groundwater Flow System, Southeastern Nevada*, September 28, 2012. References provided along with the DOI Report, official records in the Office of the State Engineer.

¹⁰ Tetra Tech, *Predictions of the Effects of Groundwater Pumping in the Colorado Regional Groundwater Flow System Southeastern Nevada*, September 28, 2012. References provided along with the DOI Report, official records in the Office of the State Engineer.

¹¹ Tetra Tech, *Comparison of Simulated and Observed Effects of Pumping from MX-5 Using Data Collected to the End of the Order 1169 Test, and Prediction of the Rates of Recovery from the Test*, June 10, 2013. References provided along with the DOI Report, official records in the Office of the State Engineer.

¹² U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, p. 85, June 28, 2013, official records in the Office of the State Engineer.

The overall conclusions of the DOI Bureaus' report are that the effects of pumping from the MX-5 well are spread out over a 1,100 square-mile area. They suggest that five basins within that area, Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley, and California Wash should be managed as one hydrographic area because of their uniquely immediate hydrologic connection. Pumping within any of these five basins, with the possible exception of the northernmost part of Coyote Spring Valley, will have substantially similar effects on groundwater levels throughout the area because of the hydrologic connection, and will eventually capture water that discharges in the Muddy River Springs Area.¹³

As to the availability of water pursuant to the pending applications, the DOI Bureaus indicated that their review of the water budget and perennial yield information leads to the conclusion that there is no water available for new appropriation within the five-basin area delineated through their groundwater analyses. The five-basin area that the DOI Bureaus referenced includes Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley and California Wash. Additionally, the groundwater modeling simulation results, which examined progressively greater pumping of pending water right applications in these five basins, provide supporting evidence of the wide-ranging effects that can be expected in these five basins with increased pumping in a very short period of time.

The DOI Bureaus point out that groundwater that was withdrawn in the Coyote Spring Valley over the period of the pumping test is only one-third of the groundwater rights that already exist in the basin. The DOI Bureaus assert that the pumping test provides evidence that even this reduced volume of groundwater pumping cannot be developed long-term without adverse impacts to springs, endangered fish, Federal trust resources, and downstream senior water rights. They argue that the five-basin area uniquely behaves as one connected aquifer, and pumping in any of the basins will have similar effects on the whole. Consequently, they conclude that no additional groundwater is available for appropriation to satisfy the pending water right applications that are currently being held in abeyance for this portion of the carbonate-rock aquifer.¹⁴

4. Moapa Band of Paiute Indians

MBOP provided a report that analyzed varying lines of evidence in addition to data collected during the pumping test. They analyzed water budgets, climatic effects, stream base

¹³ *Id.* at 84.

¹⁴ *Id.* at 5.

flow identification, water demand for power generation, and water temperature-electrical conductivity and mixing models. MBOP argues that the drawdown due to MX-5 pumping was significantly less than that cited by the DOI Bureaus, and that the limit of detection of drawdown due to MX-5 pumping extended only five miles from the MX-5 well.¹⁵ Nevertheless, they contend that carbonate pumping in Coyote Spring Valley and Muddy River Springs Area will have a 1:1 impact on Muddy River flows. They interpret total flux of the system in the Muddy River Springs Area as variable, ranging from about 35,000 afa to 42,000 afa, with the average being about 38,000 afa. Their average annual estimate is similar to Eakin's estimate of 36,000 afa.¹⁶ MBOP asserts that some of the regional water-level decline during the period of the pumping test, and much of the annual fluctuation, is attributed to changes in the water level in Lake Mead. MBOP argues that crustal loading and deformation is associated with the rising and falling Lake Mead surface, which in turn causes pore-pressure changes and pore-volume reductions in the carbonate aquifer. They argue that these crustal effects cause carbonate water levels to rise and fall in near tandem with lake levels. They assert that these conditions have resulted in the water-level decline on the MBOP reservation that others have attributed to pumping at well MX-5. They also argue for the existence of a southern carbonate aquifer flow field separated from Coyote Spring Valley and the Muddy River Springs Area by a northeasterly-trending barrier. This barrier extends from just north of Garnet Valley through the Muddy River Springs to the northern edge of the Lower Moapa Valley Hydrographic Area. MBOP argues this southern flow field, which includes California Wash, Hidden and Garnet valleys, and portions of the Black Mountains Area, is hydrologically isolated and could be developed without impacting spring flows. They estimate that groundwater supply to the southern flow field is 15,000 to 20,000 afa.¹⁷

As to the availability of additional water resources, the MBOP asserts that the Order 1169 test results indicate that the 1989 LVVWD applications for approximately 27,000 afa should be denied. Their rationale is that these applications equal about 72% of the flux in the carbonate-rock aquifer that discharged as pre-development base flows of the Muddy River and that all the

¹⁵ Johnson and Mifflin, *Summary of Order 1169 Testing Impacts, per Order 1169A*, p. 25, June 28, 2013, official records in the Office of the State Engineer.

¹⁶ T.E. Eakin, *A Regional Interbasin Ground-water System in The White River Area, Southeastern Nevada*, Water Resources Bulletin No. 33, (Department of Conservation and Natural Resources, Division of Water Resources and U.S. Department of Interior, Geological Survey), p. 264, 1966.

¹⁷ Johnson and Mifflin, *Summary of Order 1169 Testing Impacts, per Order 1169A*, p. 26, June 28, 2013, official records in the Office of the State Engineer.

hydrogeological evidence indicates such production would reduce the flux to the discharge area by a similar amount over a relatively short time. They assert that almost one-third of pre-development Muddy River flows are currently consumed before reaching the Moapa gage, and these applications should be denied on the grounds that they would impact senior rights by the full amount.¹⁸

The MBOP argue for the creation of a new water management unit that would include upgradient basins including at least the Muddy River Springs Area, Coyote Spring Valley and Kane Springs Valley. They assert to prevent future desiccation of the headwater springs, the currently undeveloped permits within the proposed management unit must be largely revoked, restricted, or otherwise creatively managed because they total up to a similar order of magnitude the current flows of the Muddy River.¹⁹ They indicate that the water-resource potential of the southern flow field should be evaluated with a large interim pumping experiment in the northern portion of the southern flow field near the MBOP reservation.²⁰

5. Moapa Valley Water District

MVWD evaluated only data for water levels and flows in the Muddy River Springs Area. MVWD's report recognizes that water-level declines are attributable to MX-5 pumping, as are spring flow decreases at the two Pedersen springs, Warm Springs West gage, and Baldwin Spring, but it does not recognize effects at Jones Spring or Muddy Spring at LDS.

As to the availability of additional water resources, MVWD did not provide a direct response. However, MVWD submitted a supplemental report analyzing its applications in the Lower Moapa Valley, coming to the conclusion that those applications could be developed without impacting the springs.

6. Great Basin Water Network

GBWN provided both a technical report by Dr. Tom Myers and a letter summarizing their position and interpretation of the test. Their report recognized a water-level decline in Coyote Spring Valley and the Muddy River Springs Area and decreases in spring flow that they assert are directly attributable to the MX-5 well pumping. The report states that the test did not provide adequate data to analyze water availability in the other Order 1169 basins. As to the availability of additional water resources for the pending applications, GBWN argues against

¹⁸ *Id.* at 30.

¹⁹ *Ibid.*

²⁰ *Id.* at 31.

granting any of the pending applications and states that pumpage of even the existing water rights in Coyote Spring Valley and the Muddy River Springs Area will result in spring flow reductions to rates that are insufficient to maintain a known endangered species.

GBWN somewhat contradicts their own report with a statement that the test did not provide adequate data to analyze water availability, and asserts that the information obtained was sufficient to make determinations on the effects of the pumping and of the availability of water not just in Coyote Spring Valley, but in all of the Order 1169 basins. The letter also argues that their report supports a conclusion that full pumping of existing rights in the Order 1169 basins will unacceptably decrease spring discharge.

7. Center for Biological Diversity

CBD used the same report from Dr. Myers that was filed by the GBWN. CBD believes that pumping of existing water rights will have unacceptable effects on the springs, and, therefore, all pending applications in the Order 1169 basins should be denied. Furthermore, they assert that all applications in the entire White River Flow System up to Cave Valley should be denied. CBD also recommends that the State Engineer take administrative action to reduce permits in the Order 1169 basins to sustainable levels.

Based on the responses received and the State Engineer's own interpretations of the test, the State Engineer finds that sufficient information has been obtained from the Order 1169 pumping test to rule on the pending applications.

Based on reports filed pursuant to Orders 1169 and 1169A and the State Engineer's analysis of the pumping test, the State Engineer finds:

1. The information obtained from the pumping test satisfied the goal of the test and is sufficient to document the effects of pumping on water levels and spring flows in the Order 1169 basins. The information obtained from the test and reports is adequate to formulate an informed opinion as to the future impacts from groundwater pumping and the availability of groundwater in Muddy River Springs Area pursuant to the applications.
2. The impacts of pumping from the MX-5 well, and other existing wells, during the pumping test are widespread, and extend north in Coyote Spring Valley at least to Kane Springs Valley, south to Hidden Valley and Garnet Valley, and southeast to the Muddy River Springs Area and California Wash. Pumping effects were seen in the northwestern part of the Black Mountains Area, but were not observed in Lower Moapa Valley.

Groundwater-level declines attributable to MX-5 pumping range from less than one foot in northern Coyote Springs Valley, two feet or more in central Coyote Spring Valley, and one foot or more in the carbonate aquifer in the Muddy River Springs Area, Hidden Valley and California Wash. The additional pumping at the MX-5 well contributed significantly to decreases in spring flow at high-elevation spring (Pedersen Springs) sources of the Muddy River, and contributed to measurable decreases in flow at Baldwin and Jones Springs and to the numerous springs whose combined flows are measured at the Warm Springs West and Iverson gages. The pumping test effects documented in Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and part of Black Mountains Area provide clear proof of the close hydrologic connection of the basins that distinguishes these basins from other basins in Nevada.

3. As to the availability of water pursuant to pending applications, the request in Order 1169A referred to pending applications in Coyote Spring Valley that were addressed in Ruling No. 6254. Several of the respondents also replied with an opinion concerning available groundwater in the remainder of the Order 1169 basins. As discussed above, the parties were not unanimous in their interpretation of the test and whether additional water is available to appropriate in the basins. The DOI Bureaus, GBWN and CBD agree that there is no unappropriated groundwater in any of the basins. The MBOP found there is no additional water available to appropriate in Coyote Spring Valley or Muddy River Springs Area, but that unappropriated water exists California Wash, and perhaps in Hidden and Garnet valleys. They are silent on the Black Mountains Area and Lower Moapa Valley. The SNWA did not directly answer the question; rather they suggest groundwater might be developed in western or northern Coyote Spring Valley. The results of the pumping test, together with the submitted technical reports and existing records of the State Engineer's office have provided sufficient information to make a determination on the availability of water pursuant to pending applications in all of the Order 1169 basins.

V.

Perennial Yield

Nevada Revised Statute § 533.370(2) requires that the State Engineer reject an application to appropriate water where there is no unappropriated water at the source of supply.

For groundwater appropriations, the State Engineer uses the perennial yield of a basin as the measure of water availability. The perennial yield is based on water budgets for the basin in question. Water budgets and perennial yield were significant issues raised in the 2001 hearings on the pending applications that needed additional information.

The perennial yield of a groundwater basin has been defined in numerous State Engineer rulings. It can be defined as the maximum amount of groundwater that can be withdrawn each year over the long-term without depleting the groundwater reservoir. Perennial yield is ultimately limited to the maximum amount of natural discharge that can be utilized for beneficial use. The perennial yield cannot be more than the natural recharge to a groundwater basin and in some cases is less. If the perennial yield is exceeded, groundwater levels will decline and steady state conditions will not be achieved, a situation commonly referred to as groundwater mining. Additionally, withdrawals of groundwater in excess of the perennial yield may contribute to adverse conditions such as water quality degradation, storage depletion, diminishing yield of wells, increased pumping costs, and land subsidence.

In the eleven years since Order 1169 was issued, much additional hydrologic information has been made available, including publications by the U.S. Geological Survey and others. There have also been hearings before the Office of the State Engineer for water rights in nearby hydrographic basins. Technical exhibits and expert testimony in those hearings include hydrological analyses of the carbonate aquifers and water budgets in the Order 1169 basins. This information significantly expands on the available knowledge of the hydrology and water resources of the Lower White River Flow System in Coyote Spring Valley, the Muddy River Springs Area and the surrounding basins. In hearings held in the fall of 2011 concerning SNWA applications in Delamar Valley, Dry Lake Valley, and Cave Valley, several exhibits and expert testimony were presented that revise and update information presented at the Coyote Spring Valley water rights hearings.²¹

SNWA Exhibit No. 452 from the 2011 hearing on Delamar, Dry Lake and Cave valleys, is an Excel workbook that is designed to estimate groundwater recharge for all of the basins contributing to the White River Flow System from the Muddy River Springs Area northward.

²¹ SNWA Exhibit Nos. 258 and 452, In the Matter of Applications 53987 through 53992 filed by the SNWA to Appropriate the Groundwater in Spring Valley, Cave Valley, Dry Lake Valley and Delamar Valley Hydrographic Basins (180, 181, 182, 184), September 26 through October 14 and October 31 through November 18, 2011, official records in the Office of the State Engineer.

The exhibit was accepted by the State Engineer with some revisions,²² and basin recharge and interbasin flows are specified for both Coyote Spring Valley and the Muddy River Springs Area hydrographic basins. From that exhibit, the supply of water to the Muddy River Springs Area is estimated to be approximately 50,000 afa, almost all of which is subsurface inflow from upgradient basins and approximately 50 afa is derived from in-basin recharge from precipitation. An estimated 4,000 to 6,000 afa transpires from vegetation in the basin, and the remainder exits via the Muddy River, wells, or subsurface outflow. Prior to groundwater development, the Muddy River flows at the Moapa Gage were approximately 34,000 afa.²³

The perennial yield of the Muddy River Springs Area Hydrographic Basin was established in 1971 at 37,000 afa.²⁴ Where 37,000 afa was the total estimated discharge of the Muddy River (surface flow plus plant evapotranspiration), all of the water was appropriated. Because the Muddy River was already fully appropriated, clearly the full perennial yield could not be appropriated without conflicting with those senior rights. At the time Order 1169 was issued, groundwater appropriations in the basin totaled about 14,700 afa. Currently there are 14,535 acre-feet of groundwater rights appropriated in the basin.²⁵

The vast majority of the scientific literature supports the premise that, unlike other separate and distinct basins in Nevada, all of the Order 1169 basins share virtually all of the same supply of water. The Order 1169 pumping test further supports the conclusion that pumping from any of the five basins with a close hydrologic connection (Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley and California Wash) will have a similar impact on water levels in the five-basin area and on the Muddy River spring flows. These basins share a unique and close hydrological connection, and share virtually all of the same source and supply of water, unlike other basins in Nevada. In the future, these five basins will be jointly managed. The perennial yield of these basins cannot be more than the total annual supply of 50,000 acre-feet. Because the Muddy River and Muddy River springs also utilize this supply, and are the most senior water rights in the region, the perennial yield is further reduced to an amount less than 50,000 acre-feet. Current groundwater rights in the seven Order 1169 basins total approximately 49,000 acre-feet. For the five basins to be jointly managed, there are

²² State Engineer's Ruling No. 6166, dated March 22, 2012, pp. 72 – 73, official records in the Office of the State Engineer.

²³ Eakin, T.E., *Ground-water Appraisal of Coyote Spring and Kane Spring Valleys and Muddy River Springs Area Lincoln and Clark Counties, Nevada*, Groundwater Resources - Reconnaissance Series Report 25, p. 14, 1964.

²⁴ Office of the State Engineer, *Water for Nevada, State of Nevada Water Planning Report No. 3*, p. 25, Oct. 1971.

²⁵ Official records of the Office of the State Engineer.

approximately 37,000 acre-feet of groundwater rights. The State Engineer finds that the amount and location of groundwater that can be developed without capture of and conflict with senior water rights on the Muddy River and springs remains unclear, but the evidence is overwhelming that unappropriated water does not exist in any of the basins.

VI.

Recent rulings by the State Engineer for groundwater applications in other basins within the White River Flow System allowed for the appropriation of additional water.²⁶ These basins, Cave Valley, Dry Lake Valley, and Delamar Valley Hydrographic Basins, lie 40 to 100 miles north of the Muddy River Springs. Groundwater from both Dry Lake Valley and Delamar Valley is believed to contribute to discharge from the springs. Water rights were granted in the Cave Valley, Dry Lake Valley and Delamar Valley basins based on two critical points that do not exist in the basins in Order 1169. First, the groundwater appropriated in the Cave Valley, Dry Lake Valley and Delamar Valley basins is recharged within the basins. Water is available at the source and can be developed without depleting the supply. Second, the water can be developed without conflicting with any existing right for hundreds of years. In contrast, neither of these conditions is met in the Order 1169 basins. Recharge in each of the Order 1169 basins is already appropriated. Subsurface inflow is appropriated as well. Development of additional water will conflict with existing rights in months to years. The State Engineer finds the basins of Order 1169 fail on both statutory requirements.

VII.

Existing Rights

Nevada Revised Statute § 533.370(2) requires that the State Engineer reject an application to appropriate water where the use of the water conflicts with existing rights or with protectable interests in existing domestic wells. There are 14,535 acre-feet of senior groundwater rights in the Muddy River Springs Area as well as approximately 34,000 acre-feet of senior groundwater rights in the other Order 1169 basins. Moapa Valley Water District's groundwater rights in the basin total 6,792 acre-feet. The Muddy River and springs, the discharge location of the bulk of the region's water, have approximately 30,000 afa of decreed and appropriative rights.

²⁶ State Engineer's Ruling Nos. 6165, 6166 and 6167, dated March 22, 2012, official records in the Office of the State Engineer.

One of the main goals of Order 1169 and the associated pumping test was to observe the effects of increased pumping on groundwater levels and spring flows. The Pedersen and Pedersen East springs, the highest elevation springs in the area and which are considered to be the "canary in the coal mine" with respect to impacts from pumping, showed an unprecedented decrease in flow during the pumping test. Pedersen spring flow decreased to 0.08 cfs, down from its average of about 0.22 cfs prior to the test. Pedersen East decreased to 0.12 cfs, down from its average flow of 0.2 cfs prior to the test.^{27,28} The Warm Springs West gage, the site at which trigger levels have been set among parties to a memorandum of agreement,²⁹ declined from 3.6 to 3.3 cfs during the test.³⁰ Baldwin and Jones Springs declined about 4% during the test.³¹ The Muddy River at the Moapa gage did not display any decrease in flow,³² although the MBOP report points out that total flux of the system is variable, and argues that flows in the river would have been even higher if Order 1169 pumping had not occurred.³³

The State Engineer finds that pumping under the Order 1169 test measurably reduced flows in headwater springs of the Muddy River, and it is clear that if pending water right applications were permitted and pumped in addition to existing groundwater rights in Coyote Spring Valley and the other Order 1169 basins, headwater spring flows would be reduced in tens of years or less to the point that there would be a conflict with existing rights. The State Engineer finds the Muddy River and the Muddy River springs, the discharge location of the bulk of the region's water, is fully appropriated. The State Engineer finds that evidence submitted by the DOI Bureaus is convincing that pumping of groundwater under the pending applications in addition to existing rights would reduce the flow of the Muddy River in tens of years or less to the point where there would be a conflict with existing rights.

²⁷ U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, pp. 43 – 46, June 28, 2013, official records in the Office of the State Engineer.

²⁸ <http://waterdata.usgs.gov/nv/nwis/>.

²⁹ In 2006, a Memorandum of Agreement (MOA) was signed by the Southern Nevada Water Authority, U.S. Fish and Wildlife Service, Coyote Springs Investment, LLC, Moapa Band of Paiute Indians, and Moapa Valley Water District pursuant to which, the parties agreed to certain conservation measures for the protection and recovery of the Moapa dace, an endangered species found in the Moapa Valley National Wildlife Refuge.

³⁰ <http://waterdata.usgs.gov/nv/nwis/>.

³¹ U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, pp. 50 – 51, June 28, 2013, official records in the Office of the State Engineer.

³² Southern Nevada Water Authority, *Nevada State Engineer Order 1169 and 1169A Study Report*, p. 41, June 2013.

³³ Johnson and Mifflin, *Summary of Order 1169 Testing Impacts, per Order 1169A*, pp. 5 - 8, June 28, 2013, official records in the Office of the State Engineer.

There are some domestic wells in the Muddy River Springs Area. Even though proposed pumping would conflict with existing surface water rights, the groundwater decline due to projected pumping at the nearest wells would be less than 50 feet after 100 years of pumping.³⁴ The State Engineer finds that the applications would not conflict with existing domestic wells.

VIII.

Public Interest

Nevada Revised Statute § 533.370(2) requires the State Engineer reject an application if the use of the water threatens to prove detrimental to the public interest. The State Engineer views this requirement in terms of Nevada water law and management of the public's water, but not to areas that are outside of his purview. The State Engineer finds to approve applications that will within a short period of time conflict existing water rights threatens to prove detrimental to the public interest.

The Moapa dace is an endangered species that lives only in the headwater springs of the Muddy River. The USFWS holds water rights on some of the springs in the Muddy River Springs Area that were appropriated specifically for the protection of the dace. The State Engineer finds to permit the appropriation of additional groundwater resources in the Muddy River Springs Area would impair protection of these springs and the habitat of the Moapa dace and therefore threatens to prove detrimental to the public interest.

CONCLUSIONS

I.

The State Engineer has jurisdiction over the parties and the subject matter of this action and determination.³⁵

II.

The State Engineer is prohibited by law from granting a permit under an application to appropriate the public water where:³⁶

- A. there is no unappropriated water at the proposed source;
- B. the proposed use or change conflicts with existing rights;
- C. the proposed use or change conflicts with protectable interests in existing domestic wells as set forth in NRS § 533.024; or

³⁴ Tetra Tech, September 28, 2012, *Predictions of the Effects of Groundwater Pumping in the Colorado Regional Groundwater Flow System Southeastern Nevada*. References provided along with the DOI Report, official records in the Office of the State Engineer.

³⁵ NRS Chapters 533 and 534.

³⁶ NRS § 533.370(2).

- D. the proposed use or change threatens to prove detrimental to the public interest.

III.

The State Engineer concludes that there is no additional groundwater available for appropriation in the Muddy River Springs Area Hydrographic Basin without conflicting with existing water rights in the Order 1169 basins.

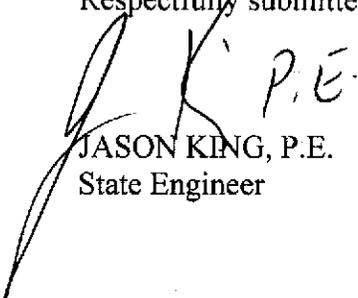
IV.

The State Engineer concludes that approval of the applications would threaten to prove detrimental to the public interest by removing water that in the past has been available for the endangered species in the Muddy River Springs Area. The State Engineer concludes that while the use of the water under these applications may have a public benefit, removing the water from the springs would threaten the water resources upon which the endangered Moapa dace are dependent.

RULING

The protests to Application 59369 are hereby upheld in part and the application is hereby denied on the grounds that there is no unappropriated groundwater at the source of the supply, the proposed use would conflict with existing rights in the Order 1169 basins and the proposed use of the water would threaten to prove detrimental to the public interest in that it would threaten the water resources upon which the endangered Moapa dace are dependent. No ruling is made on the merits of the remaining protest grounds.

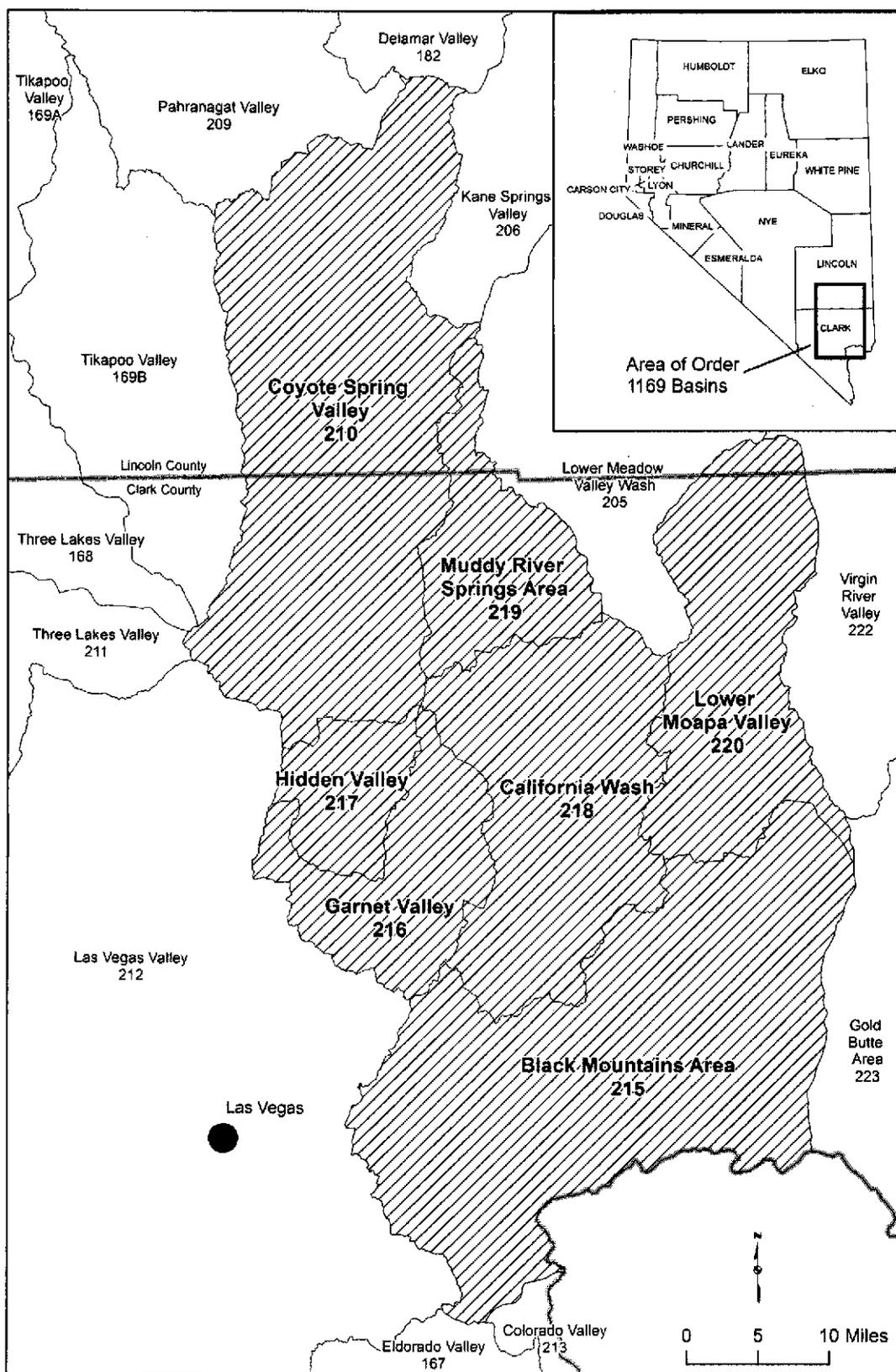
Respectfully submitted,


JASON KING, P.E.
State Engineer

Dated this 29th day of

January, 2014.

ATTACHMENT 1



Location Map of the Order 1169 Hydrographic Basins, Clark County and Lincoln County, Nevada.