EA Engineering, Science, and Technology, Inc., PBC
320 Gold Avenue SW, Suite 1300
Albuquerque, New Mexico 87102
www.eaest.com

May 28, 2025

Ms. Samantha Carver
Ground Water Quality Bureau
New Mexico Environment Department
PO Box 5469
Santa Fe, NM 87502

Dear Ms. Carver:

On behalf of Doña Ana Dairies, Inc., EA Engineering, Science, and Technology, Inc., PBC is submitting this Annual Groundwater Monitoring Report for Doña Ana Dairies located in Mesquite, Vado, and Anthony, New Mexico. The report discusses the annual groundwater sampling event conducted to fulfill requirements of the Stage 2 Abatement Plan for Doña Ana Dairies.

Please let me know if you have any questions regarding the information provided in this report.

Sincerely,

Gina Mullen
Project Manager

Jay Snyder
Senior Hydrogeologist

Enclosure

Cc: Linda Armstrong, Doña Ana Dairies
File

ANNUAL GROUNDWATER MONITORING REPORT DOÑA ANA DAIRIES MESQUITE, NEW MEXICO

Prepared for:

Doña Ana Dairies
Mesquite, New Mexico

Prepared by:

EA Engineering, Science,
and Technology, Inc., PBC
320 Gold Avenue SW, Suite 1300
Albuquerque, New Mexico 87102

May 2025

EA Project No. 1464114.05

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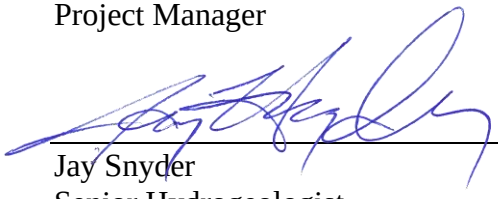
Gina Mullen
Project Manager

Date



05/28/2025

Jay Snyder
Senior Hydrogeologist

Date

May 2025

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1.0 INTRODUCTION

On behalf of Doña Ana Dairies (Dairies), EA Engineering, Science, and Technology, Inc., PBC (EA) has prepared this Quarterly Monitoring Report for the Dairies located south of Las Cruces, New Mexico (Figure 1). The report was completed in accordance with the *Stage 2 Abatement Plan* and the *Sampling and Analysis Plan, Doña Ana Dairies, Doña Ana County, New Mexico* dated November 7, 2013, and August 11, 2008, respectively, and the Conceptual Work Plan (CWP) dated February 1, 2008. All were prepared to satisfy requirements stated in the New Mexico Administrative Code (NMAC), Title 20, Chapter 6, Part 2, Sections 4106 through 4110 (20.6.2.4106 – 20.6.2.4110 NMAC). The Sampling and Analysis Plan was approved by the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) on September 25, 2008 (NMED 2008). On March 25, 2015, the stipulated agreement to additional requirements to the Dona Ana Dairies Stage 2 Abatement Plan was agreed upon by NMED, the Dairies, and the Rio Valle Concerned Citizens (NMED, Doña Ana Dairies, and Rio Valle Concerned Citizens 2015). The Stage 2 Abatement Plan was approved by NMED by Final Order on April 10, 2015. A Stage 2 Abatement Plan Modification was approved by NMED on April 26, 2022 (NMED 2022). Full document references are provided in Section 8.0.

1.1 Objective and Monitoring Scope

The objective of this monitoring program is to satisfy the requirements set forth in the Stage 2 Abatement Plan (EA 2013b) and the Stipulated Agreement (NMED, Doña Ana Dairies, and Rio Valle Concerned Citizens 2015) and to satisfy the requirements set forth in 20.6.2.4110 NMAC. This report also presents discharge plan (DP) monitoring data for those dairies that are members of the Doña Ana Dairies (DAD) consortium. Though no longer part of the consortium, DP monitoring data for Dominguez 2 Dairy is also presented.

The following work was performed to meet the objective of the monitoring program:

- Representatives from D&H Petroleum and Environmental Services, Inc. (D&H) gauged DP monitoring wells, abatement plan (AP) monitoring wells, and Anthony Waste Water Treatment Plant (WWTP) wells on February 10 through February 18, 2025. Glorieta Geoscience, Inc. (Glorieta) gauged Organ Dairy wells on February 3, 2025.

- From February 18 through March 24, 2025, D&H representatives collected groundwater samples from all AP, DP, and irrigation/supply wells that contained sufficient water and were operational. Glorieta sampled Organ Dairy wells on February 3, 2025. Samples were analyzed for nitrate, chloride, total dissolved solids (TDS), and total Kjeldhal nitrogen (TKN). Field parameters including specific conductance, pH, temperature, oxidation reduction potential (ORP), and dissolved oxygen were monitored and recorded on field forms during sampling.

- Analyte trend analyses were updated.

- First order decay rates for nitrate were calculated at wells with decreasing nitrate concentrations.

- Geostatistical analysis of analytes was performed.

Additionally, a performance assessment was performed on the Del Oro pump and reuse system in compliance with the Stage 2 Abatement Plan Modification Performance Plan for Dona Ana Dairies (EA 2022). The performance assessment is provided in Appendix A.

1.2 Background

In correspondence dated April 7, 2006, NMED required a Stage 1 Abatement Plan for 13 dairies in Doña Ana County, based on analytical results from DP monitoring of on-site compliance monitoring wells that showed concentrations of nitrate, chloride and TDS exceeding ground water standards promulgated in New Mexico Water Quality Control Commission (NMWQCC) Regulations (20.6.2.3103 NMAC). The 13 dairies that were part of the original consortium are listed below, with those no longer involved in the consortium marked with a strike-through.

1. Organ Dairy (Former Daybreak and Del Norte Dairy)
2. Mountain View Dairy
3. ~~Buena Vista I Dairy~~
4. Bright Star Dairy
5. ~~Dominguez 2 (Former D&J Dairy)~~
6. Dominguez Dairy
7. ~~Gonzales Dairy~~
8. ~~Buena Vista Dairy II~~
9. ~~River Valley Dairy~~
10. Big Sky Dairy
11. Sunset Dairy
12. Desert Land Dairy
13. Del Oro Dairy

On October 30, 2006, the 13 original dairies notified NMED that they had reached an agreement to work as a group and submit a joint response to NMED's request (Doña Ana Dairies 2006). Currently, the Doña Ana Dairies (DAD) consortium consists of 8 dairies with the departure from the group by Buena Vista I Dairy in 2011, River Valley Dairy in April 2019, and Gonzalez Dairy in October 2020. Buena Vista Dairy II and Dominguez Dairy 2 left the consortium in May 2024.

The Stage 2 Abatement Plan area is organized geographically into the northern area, central area and southern area. The northern area currently consists of Organ Dairy, Mountain View Dairy, Bright Star Dairy, and Dominguez Dairy. The northern land application is also included in the northern area of DAD. Buena Vista I Dairy, Gonzalez Dairy, and Dominguez 2 Dairy, though no longer members of the DAD consortium, are located within the northern area. The central area consists of Buena Vista Dairy II, Big Sky Dairy, and Sunset Dairy/Desert Land Dairy. Though no longer a member of the DAD consortium, River Valley Dairy is also located in the central area. The southern area includes only the Del Oro Dairy.

On December 11, 2006, on behalf of the Doña Ana Dairies, Golder Associates Inc. (Golder) submitted a Stage 1 and 2 Abatement Plan Proposal to address impacts to groundwater in the area containing the Dairies (Golder 2006)

The first major deliverable in the Abatement Plan Proposal was an Existing Data Report (EDR), created to combine all existing and historical data and practices of the constituent dairies. The EDR, submitted on February 1, 2008 (Golder 2008a), was intended to satisfy the DAD consortiums' commitment for compilation and submission of existing data identified in the Doña Ana Dairies response (Golder 2006) to the NMED requirement for Stage 1 Abatement Plans. Section 9 of the EDR outlined data gaps identified during the preparation of the report, as well as the actions recommended. To facilitate the discussion of the path forward after the submittal of the EDR and concurrent with the EDR submission, a conceptual work plan (CWP) was prepared (Golder 2008b).

A meeting was held on July 15, 2008 between the DAD consortium, Golder and NMED. During that meeting, plume maps presented in the EDR (Golder 2008a), new monitoring data, and knowledge of monitoring well locations and groundwater chemistry results at adjacent DP-regulated facilities were used to identify data gaps with respect to ground water flow direction and plume delineation. The agreed upon data gaps yielded monitoring well locations (including contingency monitoring well locations) recorded in the meeting minutes (Golder 2008c) and depicted in the Sampling and Analysis Plan (SAP) dated August 8, 2008 (Golder 2008d). The SAP outlined the details of the field operations to be implemented for completion of data gaps, such that a Site Investigation Report (§4106.C.6 NMAC) and Stage 2 Abatement Plan (§4106.D NMAC) could be prepared.

Between February 2008 and December 2008, quarterly groundwater gauging was conducted concurrent to discussions with NMED at the DAD consortium to determine the current and historical site groundwater gradient.

In May 2009, field work was conducted as outlined in the SAP and ten AP monitoring wells (DAD-01 through DAD-10) were installed. In July 2009, the Site Investigation Report was submitted to the NMED (EA 2009).

On February 9, 2012, the Final Site Investigation Report was submitted to NMED (EA 2012a). The report summarized field activities that occurred from October 10 through October 14, 2011, and November 10 through 18, 2011, during which eleven soil borings were advanced at the site and converted into monitoring wells DAD-12 through DAD-14, DAD-16 through DAD-22, and DP well 177-03A.

On August 16, 2012, soil boring/monitoring well DAD-15 was installed and on August 20, 2012, well DAD-15 was sampled. An addendum to the Final Site Investigation Report was submitted to NMED on September 9, 2012 (EA 2012b), which summarized DAD-15 field activities.

A Stage 2 Abatement Plan was submitted to NMED on March 13, 2013 (EA 2013a). Based on an NMED response in August 2013, a Revision to the Stage 2 Abatement Plan was submitted on November 7, 2013 (EA 2013b).

On March 25, 2015, the stipulated agreement to additional requirements to the Doña Ana Dairies Stage 2 Abatement Plan was agreed to by NMED Doña Ana Dairies, and the Rio Valle Concerned Citizens. On April 10, 2015, the Stage 2 Abatement Plan with the stipulated agreement was approved by NMED by Final Order (NMED 2015).

EA began implementation of the Stage 2 Abatement Plan and stipulated agreement as directed by the Final Order in December 2015. To meet objectives, four monitoring wells were installed (DAD-23 through DAD-26) and Del Oro Dairy discharge plan (DP) well 692-01 was plugged and abandoned. Details on implementation of these tasks are included *Stage 2 Implementation and Quarterly Groundwater Monitoring Report* dated July 2016 (EA 2016).

In accordance with the approved Stage 2 Abatement Plan and stipulated agreement, a baseline compound specific isotope analysis for nitrogen 14 and nitrogen 15 ($^{15}N/^{14}N$ [$\delta^{15}N$]) and total organic carbon (TOC) was completed for 16 monitoring wells in spring of 2016. Additionally, existing conditions concentrations were recalculated for the contaminants of concern. Results of these analyses are presented in the *Stage 2 Implementation and Quarterly Groundwater Monitoring Report* dated July 2016 (EA 2016). A five-year review containing results of repeated compound specific isotope analysis sampling and recalculated existing conditions concentrations was submitted to NMED in December 2020 (EA 2020a).

Contaminant concentration trend analysis as well as geospatial analysis to evaluate changes in plume behavior are required on an annual basis and are provided in the annual report. Additionally, the results of the annual sampling of irrigation and supply wells and concentration trends of analytes in AP and DP wells are provided in the annual report.

A Stage 2 Abatement Plan Modification proposal was submitted to NMED on August 10, 2018, to address plume instability in the perched aquifer nitrate plume at Del Oro Dairy. Following discussions with NMED, a revised Stage 2 Abatement Plan Modification proposal was submitted on May 1, 2019. A public meeting to discuss the plan was held in Anthony, New Mexico on May 17, 2019. The Stage 2 Abatement Plan Modification proposal was revised based on additional input from NMED and the public and submitted on July 26, 2019 (EA 2019). Public notice for the proposal was initiated on October 23, 2019, and closed on December 31, 2019. An addendum to the Stage 2 Abatement Plan Modification proposal was submitted on July 13, 2020 (EA 2020b). A revised addendum to the Stage 2 Abatement Plan Modification proposal was submitted on July 13, 2021, based on additional comments from the public (EA 2021). An additional virtual townhall meeting was held on December 15, 2021, that presented the current proposal. The performance plan was submitted to NMED on February 15, 2022 (EA 2022). NMED approved the Stage 2 Abatement Plan Modification for Doña Ana Dairies (EA 2019), the accompanying Stage 2 Abatement Plan Addendum for Reuse of Pumped Groundwater at Del Oro Dairy (EA 2021b), and the Stage 2 Abatement Plan Modification Performance Plan (EA 2022) on April 26, 2022 (NMED 2022). Implementation is detailed in the Stage 2 Abatement Plan Modification Completion Report (EA 2023). The quarterly performance assessment of the Del Oro Dairy pump and reuse system, as required by Stage 2 Abatement Plan Modification Performance Plan (EA 2022) is provided in Appendix A.

On September 19, 2024, NMED approved a reduction in monitoring frequency from quarterly to semi-annually for select abatement plan wells (NMED 2024). The following wells will be sampled semi-annually: DAD-02, DAD-03, DAD-04, DAD-05, DAD-16, DAD-17, and DAD-24. They will be sampled during the August/September and February/March sampling events and water levels will be gauged every quarter.

2.0 GROUNDWATER MONITORING ACTIVITIES

Groundwater monitoring activities included gauging AP monitoring wells, DP monitoring wells for dairies that are a part of the DAD consortium, and the Anthony WWTP monitoring wells. Groundwater samples were collected from AP monitoring wells, DP monitoring wells, and irrigation/supply wells for dairies that are a part of the DAD consortium. Data from DP monitoring wells for Dominguez 2, which is no longer part of the consortium, are also reported. Groundwater samples were analyzed for nitrate, chloride, TDS, and TKN. A summary of the groundwater monitoring data from February/March 2025 is presented below.

2.1 Well Gauging

From February 10 through February 18, 2025, representatives from D&H gauged DP monitoring wells, AP monitoring wells, and Anthony WWTP wells with an electronic water level indicator. Organ Dairy wells were gauged by Glorieta on February 3, 2025. Table 1 provides groundwater gauging data collected from the monitoring network. Data obtained during gauging are shown on potentiometric surface maps included as Figures 2, 3, 4, and 5. Well gauging field forms are provided in Appendix B.

2.2 AP and DP Well Groundwater Sampling

D&H collected groundwater samples from AP monitoring wells from March 1 through March 18, 2025. Sampling was conducted at all AP wells except for well DAD-20 which has been damaged and could not be sampled. Groundwater sampling from AP wells was accomplished with new, disposable bailers. Three well casing volumes were purged unless the well contained insufficient water.

D&H sampled DP wells from February 18 through March 6, 2025. Glorieta sampled Organ Dairy DP wells on February 3, 2025. Prior to sampling, the DP wells were purged of three well casing volumes, if practicable, by either (1) hand-bailing with new, disposable bailers and twine, (2) pumping with a submersible pump and new polyethylene tubing, or (3) pumping with a dedicated pump and new polyethylene tubing. Due to a lower water table, several DP wells were dry or contained insufficient water for sampling. Organ Dairy wells 126-04, 126-05, 126-07, and 126-09 contained insufficient water and were not sampled. Bright Star well 340-02 and Del Oro Dairy well 692-04 were dry. Sunset/Desert Land Dairy well 257-03 was not sampled due to an unknown blockage in the well. Dominguez 2 well 42-11 was not sampled due to an inoperable pump.

Wells were sampled from historically clean to dirty to the extent possible to minimize cross-contamination potential. All non-dedicated or disposable equipment was decontaminated between wells with an Alconox™ solution to further ensure sample quality. All meters were calibrated and/or checked with standards in accordance with the manufacturer's specifications prior to daily use. Purge water was ground discharged.

When sufficient water was available, field parameters including specific conductance, temperature, pH, and ORP were monitored using a Myron L Ultrameter II and recorded on field

forms. Dissolved oxygen was measured using a YSI 556 MPS. Dissolved oxygen and ORP were only measured in the first set of readings. Field parameters from August 2015 to present are presented in Table 2. The sampling field forms are presented in Appendix B.

All groundwater samples were collected immediately after purging. Sampling was either accomplished by carefully pouring groundwater from the bailer into the sample containers or by pumping groundwater through new polyethylene tubing into the sample container. Sample containers were provided by Eurofins Environment Testing South Central, LLC (Eurofins). Container size, type, sample preservatives, analytical methods, and holding times are specified in Table 3. All samples were preserved in accordance with method requirements, labeled, then immediately cooled to <6°C with ice and delivered under chain-of-custody to Eurofins in Albuquerque, New Mexico. All analytical laboratory reports are provided in Appendix C.

2.3 Irrigation/Supply Well Groundwater Sampling

Irrigation/supply locations were sampled as part of the annual reporting in accordance with the Stipulated Agreement. Samples were collected March 20 through March 24, 2025, and were analyzed for nitrate, chloride, TDS, and TKN. Supply wells were sampled by collecting a grab aliquot from their holding tanks using new disposable bailers, from taps located on the tank, or from valves located on lines going into the tank. Sample locations located nearest to the pump outlet were selected. Tap samples were collected while the pumps were running; as a result no purging was completed. Irrigation samples were collected from pivots and taps.

In the northern area, samples were collected from one irrigation well in the Northern Land Application Area and from four supply wells located at Mountain View and Dominguez Dairies. Organ Dairy supply well LRG-458 S and Bright Star supply well LRG-953 were not operational and as a result, the wells could not be sampled.

In the central area, four irrigation wells and three supply wells were sampled at Buena Vista Dairy II, Big Sky Dairy, and Sunset Dairy/Desert Land Dairy. Big Sky supply well LRG-4116 was not sampled because the valve was removed and an alternate sampling location was not available.

In the southern area at Del Oro Dairy, three supply wells pumped water into a holding tank; the sample was collected from the holding tank, and as a result is a composite sample.

3.0 GROUNDWATER MONITORING RESULTS

3.1 Hydraulic Gradient and Direction of Groundwater Flow

During the past quarter, groundwater was present beneath the site at depths ranging from 13.85 feet below top-of-casing (btoc) in Sunset well 257-03 to 137.55 feet btoc in Dominguez 2 well 42-12. Groundwater was encountered at shallower depths near the Mesquite Drain and at greater depths near I-10 where the topographic elevation increases.

AP monitoring well DAD-25 may have been completed in a perched aquifer, as groundwater elevations have consistently measured several feet higher than groundwater elevations in surrounding wells. As a result, this groundwater elevation was not used in contouring for the central area potentiometric surface map.

Potentiometric surface maps were completed using the monitoring well gauging data for the northern, central, and southern portions (perched and regional aquifers) of the Dairies. Groundwater elevation data are provided in Table 1 and potentiometric surface maps are provided as Figures 2, 3, 4, and 5. Hydrographs were completed for select monitoring wells in each area and are provided in Appendix D. In comparison to November 2024, groundwater levels increased by an average of 0.21 foot in the northern area, though groundwater levels decreased in the vicinity of Bright Star Dairy, Dominguez Dairy, and the former Dominguez Dairy 2. The largest decreases were observed in former Dominguez Dairy 2 wells. Groundwater levels increased by an average of approximately 0.32 foot in the central area.

In the southern area, average groundwater levels increased by 0.20 foot in the regional aquifer, though the groundwater level at 692-07 increased by 1.25 feet. Average groundwater levels in the perched aquifer increased by 0.38 foot, but wells in the northern portion (Del Oro 692-02, AP DAD-09, and AP DAD-26) increased by nearly a foot or more. The anomalous rise in groundwater levels in portions of the perched and regional aquifer may be explained by a leak in a water line near Del Oro well 692-07. The leak was identified and repaired in March 2025.

During the most recent gauging event, groundwater flow direction of the regional aquifer (Figures 2 through 4) was to the southeast except in the northern and central portions of the northern area where groundwater flowed to the east and northeast, respectively (Figure 2). Flow direction in the southern perched aquifer was to the south-southwest (Figure 5).

The hydraulic gradient across the Dairies in the northern, central, and southern regional aquifer was approximately 0.001 foot per foot. The hydraulic gradient in the perched southern aquifer was approximately 0.005 foot per foot.

3.2 Groundwater Field Parameters

Field parameters from the most recent monitoring event including specific conductance, pH, temperature, ORP, and dissolved oxygen were recorded on the sampling field forms (Appendix B) and are summarized in Table 2. Specific conductance, dissolved oxygen, and ORP trends for select wells are presented in Appendix E. Though dissolved oxygen and ORP

measurements from wells containing a dedicated pump were recorded, these measurements are not considered representative of aquifer conditions.

3.3 Groundwater Nitrate, Chloride, and TDS Analytical Results

3.3.1 Abatement Plan Monitoring Well Analytical Results

Groundwater analyte concentrations were below the 10 milligrams per liter (mg/L) NMWQCC standard for nitrate as nitrogen in 13 of the 26 AP monitoring wells sampled. AP monitoring well DAD-20 was unable to be sampled due to well damage. The well is located on Anthony Waste Water Treatment Plant property and was damaged along with the protective bollards around it. Groundwater collected from the following 13 AP wells had nitrate concentrations at or above the standard: DAD-06R, DAD-07, DAD-08, DAD-09, DAD-11 (vertical delineation), DAD-12 (vertical delineation), DAD-14, DAD-15, DAD-18 (vertical delineation), DAD-19 (vertical delineation), DAD-21, DAD-22, and DAD-23.

Nitrate concentrations decreased or were the same in groundwater collected from AP wells DAD-03, DAD-04, DAD-05, DAD-06R, DAD-07, DAD-08, DAD-09, DAD-11 (vertical delineation), DAD-16, DAD-17, DAD-18 (vertical delineation), DAD-19 (vertical delineation), DAD-22, DAD-23, DAD-26, and DAD-27 compared to the previous sampling event. The largest decrease in nitrate concentration was observed in well DAD-09, which decreased from 51 mg/L in December 2024 to 18 mg/L in March 2025. The largest nitrate concentration increase was observed in groundwater collected from well DAD-25, where the concentration increased from 0.40 mg/L in December 2024 to 9.6 mg/L in March 2025; however, the 0.40 mg/L concentration in this well was marked as an historical anomaly in December 2024. During this sampling event, nitrate concentrations in groundwater collected from AP wells ranged from 85 mg/L in well DAD-14 to below the laboratory reporting limit of 1.0 mg/L in wells DAD-03, DAD-04, DAD-05, DAD-10, DAD-16, and DAD-17.

Both chloride and TDS concentrations equaled or exceeded their respective NMWQCC standards in most AP wells. Exceptions include wells DAD-06R and DAD-17, where both chloride and TDS groundwater concentrations were below the 250 mg/L and 1,000 mg/L standards, respectively. Chloride was also below the standard in well DAD-09. The highest chloride concentration in AP wells was observed in well DAD-08 at a concentration of 1,500 mg/L. The highest TDS concentration in the AP wells was 4,100 mg/L in well DAD-07.

Table 4 and Figures 6 through 9 present the analytical results for AP monitoring wells. Analytical laboratory reports are provided in Appendix C. Nitrate, chloride, and TDS concentration trends for select AP wells are presented by area in Appendix F.

3.3.2 Abatement Plan and Discharge Plan Well Analytical Results by Area

DP groundwater analytical results are presented in Table 5. Nitrate, chloride, and TDS concentration trends for the DP wells by area are presented in Appendix G. Analytical data for all sampled DP wells are also presented in Figures 6 through 9. Analytical laboratory reports are included in Appendix C. Discussions of upgradient/downgradient conditions reflect current

groundwater flow directions discussed in section 3.1. The following discussions summarize the results by area at the Dairies.

Northern Portion

Groundwater collected from upgradient well 86/340-01 (located north of the abatement area) has been below the nitrate NMWQCC standard of 10 mg/L since February 2018; between April 2011 and November 2017, groundwater concentrations in this well were consistently above the nitrate standard. Northern Land Application Area well 70/86/340-01, located at the northern-most boundary of the abatement area, contained groundwater above the nitrate standard at a concentration of 24 mg/L. Organ Dairy well 126-12 and Dominguez Dairy 2 well 42-02 delineate the western edge of the plume. Dominguez Dairy 624-02 has historically delineated the western edge of the plume, but was detected at or above the nitrate standard for the second time since November 2024 at a concentration of 11 mg/L. The nitrate plume is defined to the east by Dominguez Dairy wells 42-10 and 42-12 (both below the 1.0 mg/L laboratory reporting limit) and AP wells DAD-01 (8.9 mg/L) and DAD-13 (8.0 mg/L). AP well DAD-02 (5.9 mg/L) delineates the southern end of the nitrate plume. The highest nitrate concentration in the northern portion was 85 mg/L in well DAD-14.

The chloride and TDS concentrations in DP wells were generally at or above their standards in the northern portion of the Dairies, except for chloride in Dominguez 624-09 (230 mg/L). The highest concentrations of chloride and TDS were observed in the Northern Land Application area well 70/86/340-01 at concentrations of 2,000 mg/L and 5,800 mg/L, respectively.

Central Portion

The northern extent of the central nitrate plume is defined by Buena Vista Dairy II well 74-03 where the nitrate concentration was not detected above the reporting limit of 2.0 mg/L. The southern extent is defined by Las Cruces Community Farms (formerly McAnally Enterprises) well MW-4, where nitrate was detected at a concentration of 1.3 mg/L. Historically, the eastern extent of the plume was defined by wells DAD-06R, DAD-07, and DAD-15. In the most recent sampling event, nitrate concentrations in groundwater collected from these wells exceeded the standard with concentrations of 13 mg/L, 52 mg/L and 25 mg/L, respectively. The western extent is defined by Buena Vista Dairy well 74-02 (10 mg/L), Big Sky Dairy 833-10 (1.1 mg/L), Sunset well 257-02 (8.3 mg/L), and AP wells DAD-04 and DAD-16 (both below the 1.0 mg/L reporting limit). The highest nitrate concentration in the central portion was 82 mg/L in Big Sky Dairy well 833-07.

Chloride and TDS concentrations were generally at or above standards in wells within the central portion of the Dairies. Chloride was below the standard in Buena Vista Dairy II well 74-03 (220 mg/L), AP wells DAD-06R (110 mg/L) and DAD-17 (120 mg/L). TDS was below the standard in AP wells DAD-06R (700 mg/L) and DAD-17 (670 mg/L). The highest chloride concentration was 1,500 mg/L in AP well DAD-08. The highest TDS concentration of 4,100 mg/L was detected at AP well DAD-07.

Southern Portion – Regional Aquifer

Wells completed in the regional aquifer in the southern portion of the dairies include AP well DAD-10 and Del Oro wells 692-05 through 692-10 (Figure 8). All groundwater collected from wells in the regional aquifer contained nitrate below the NMWQCC standard except for Del Oro well 692-05 (17 mg/L).

Chloride concentrations were detected above the NMWQCC standard and ranged from 440 mg/L in AP well DAD-10 and well 692-09 to 780 mg/L in Del Oro Dairy well 692-10. TDS concentrations ranged from 1,400 mg/L in AP well DAD-10 and DP well 692-09 to 1,900 mg/L in Del Oro Dairy well 692-10.

Southern Portion – Perched Aquifer

Wells completed in the perched aquifer in the southern portion include wells 692-02, 692-04, DAD-09, DAD-20, DAD-21, DAD-22, DAD-26, and DAD-27 (Figure 9). However, during the most recent sampling event, AP well DAD-20 and Del Oro well 692-04 were unable to be sampled; DAD-20 was damaged and 692-04 was dry. Groundwater nitrate concentrations were above the standard in all wells except for downgradient wells 692-02 (7.3 mg/L), DAD-26 (2.8 mg/L), and DAD-27 (6.3 mg/L); the nitrate plume is delineated to the southwest by Del Oro well 692-02 (7.3 mg/L). The highest nitrate concentration was 39 mg/L detected at AP well DAD-21.

Chloride concentrations in the perched aquifer monitoring wells ranged from 230 mg/L in AP well DAD-09 to 890 mg/L in AP well DAD-21. TDS in the perched aquifer ranged from 1,000 mg/L in AP well DAD-09 to 2,900 mg/L in AP well DAD-21.

There are multiple influences on the analyte concentrations at Del Oro Dairy. A pump and reuse system became operational in April 2023 and is currently running. Also influencing the area is the rebound of analyte concentrations after a suspected municipal water line leak. The suspected leak was located at the southwest corner of the Del Oro Dairy. Based on groundwater elevation and groundwater concentration data, it is likely the water line near the southwest corner of Del Oro Dairy started to leak before May 2019 and may have been repaired during the winter of 2020/2021. Concentrations of analytes decreased with the introduction of municipal water to the perched aquifer, and concentrations increased after the suspected repair. Concentrations were still increasing when the pump and reuse system became operational. The performance assessment of the system is provided in Appendix A.

3.3.3 Irrigation/Supply Well Results

Groundwater analytical results for the sampled irrigation/supply wells are presented in Table 6. Analytical results are included in Figures 6, 7, and 8. Analytical laboratory reports are provided in Appendix C.

Nitrate concentrations were at or above the NMWQCC standard for nitrate in three of the 13 irrigation/supply well samples. Groundwater collected from supply wells LRG-3348-AS (Sunset Dairy, 10 mg/L), LRG-00591-S (Dominguez Dairy, 27 mg/L), and LRG-00591-S-2 (Dominguez Dairy, 26 mg/L) contained nitrate at concentrations at or above the standard. The Dominguez

supply wells are located in the northern area and the Sunset supply well is located in the central area.

Chloride and TDS concentrations were above the NMWQCC standards in all sampled irrigation/supply wells. The highest chloride concentration of 1,100 mg/L was detected at Dominguez Dairy supply wells LRG-00591-S and LRG-00591-S-2. The highest TDS concentration of 3,500 mg/L was detected in the sample collected from Dominguez Dairy supply well LRG-00591-S. Chloride and TDS concentration ranges in the irrigation/supply wells are generally similar to the concentrations observed in DP and AP monitoring wells, further indicating that chloride and TDS concentrations are observed above NMWQCC standards regionally.

4.0 TREND ANALYSIS

Trend analysis can indicate whether concentrations of constituents such as nitrate, chloride and TDS are stable, increasing, or decreasing at a particular well (Gilbert 1987). Analytical data collected from all AP and DP wells sampled in 2025 were included in a statistical trend analysis using the Mann-Kendall test. The trend analysis is based on analytical data collected from November/December 2015 through the current quarter. Concentration trend graphs for nitrate, chloride, and TDS are found in Appendices E and F. The statistical trend analysis is provided in Appendix H. Table 7 provides a summary of the trend analysis for the AP and DP wells.

4.1 Northern Portion

Trend analysis was conducted on 29 wells within the northern portion. Twelve DP wells were not analyzed for trend because they were dry or plugged and abandoned. Of the 29 wells analyzed, four wells had increasing trends for chloride and TDS: Dominguez 2 Dairy wells 42-08 and 42-11, and Dominguez Dairy wells 624-10 and 624-11. None of the wells analyzed had increasing trends for all three constituents. Stable or decreasing trends were present for all three constituents in 14 of the 29 wells.

A decreasing to stable nitrate trend was present in all six wells located downgradient of lagoons located in the northern area. It is expected that similar trends will occur downgradient of all synthetically lined lagoons in the future. Note that groundwater flow direction in the northern area shows changes over time. The following wells were determined to be downgradient of lagoons in February 2025: Organ Dairy well 126-13, Mountain View Dairy wells 70-02 and 70-04, Dominguez 2 Dairy 42-08 and 42-11, and Dominguez Dairy well 624-11.

Nitrate decreasing and increasing concentration trends are as follows:

- Decreasing Nitrate Trend: Northern Land Application Area wells 70-03 and 86/340-01, Organ Dairy wells 126-12 and 126-13, Mountain View Dairy wells 70-01, 70-02, and 70-04, Dominguez 2 Dairy wells 42-02, 42-03, and 42-13, Dominguez Dairy well 624-11, and AP wells DAD-02 and DAD-12.

- Increasing Nitrate Trend: Northern Land Application Area well 70/86/340-01, Bright Star Dairy well 340-01, Dominguez 2 Dairy wells 42-10 and 42-12, and AP wells DAD-01, DAD-11, and DAD-23.

Chloride decreasing and increasing concentration trends are as follows:

- Decreasing Chloride Trend: Northern Land Application Area wells 70-03 and 86/340-01, Organ Dairy well 126-13, Mountain View Dairy well 70-02, Dominguez 2 Dairy wells 42-03 and 42-12, and AP wells DAD-12 and DAD-23.

- Increasing Chloride Trend: Northern Land Application Area well 70/86/340-01, Organ Dairy well 126-12, Bright Star Dairy well 340-01, Dominguez 2 Dairy wells 42-08 and 42-11, and Dominguez Dairy wells 624-10 and 624-11.

TDS decreasing and increasing concentration trends are as follows:

- Decreasing TDS Trend: Northern Land Application Area well 70-03, Organ Dairy well 126-12, Mountain View Dairy well 70-02, Dominguez 2 Dairy wells 42-03, 42-12, and 42-13, and AP wells DAD-01, DAD-12, and DAD-23.

- Increasing TDS Trend: Northern Land Application Area well 86/340-01, Mountain View Dairy wells 70-01 and 70-04, Dominguez 2 Dairy wells 42-08, 42-10, and 42-11, Dominguez Dairy wells 624-10 and 624-11, and AP well DAD-11.

Upgradient Land Application Area well 70/86/340-01 had increasing concentrations of nitrate and chloride and stable concentrations of TDS. Upgradient well 86/340-01 had decreasing concentrations of nitrate and chloride and increasing concentrations of TDS.

The Dominguez 2 eastern boundary wells 42-10, 42-11, and 42-12 had mixed concentration trends; however, nitrate concentrations are below the standard. Nitrate concentrations were increasing in wells 42-10 and 42-12, but stable in well 42-11. Chloride concentrations were stable in well 42-10, increasing in 42-11, and decreasing in 42-12. TDS concentrations were increasing in wells 42-10 and 42-11 and decreasing in well 42-12. AP eastern boundary well DAD-01 showed an increasing nitrate trend, stable chloride trend, and decreasing TDS trend. The other AP eastern boundary well, DAD-13, showed stable trends for nitrate, chloride, and TDS concentrations.

The western boundary well Dominguez Dairy 2 well 42-02 had a decreasing trend in nitrate concentrations. Chloride and TDs concentrations were stable. Dominguez Dairy well 624-02, also located at the western boundary, had stable concentration trends for nitrate, chloride, and TDS. Organ Dairy well 126-12 had decreasing concentrations of nitrate and TDS and stable concentrations of chloride.

The southern boundary wells for the northern area are AP wells DAD-02, DAD-14, and DAD-23. DAD-02, DAD-14, and DAD-23 had nitrate trends that were decreasing, stable, and increasing, respectively. DAD-02 and DAD-14 had stable chloride and TDS trends. DAD-23 had decreasing concentrations of chloride and TDS.

4.2 Central Portion

A trend analysis was conducted on 29 wells within the central portion. Decreasing or stable trends for all three constituents were present in 15 of the 30 wells analyzed. Increasing trends for all three contaminants (nitrate, chloride, and TDS) were only present in Buena Vista Dairy II well 74-05 and AP well DAD-15.

A decreasing to stable nitrate trend was present in eight of the nine wells downgradient of the lagoons in the central area. The following wells are downgradient of lagoons in the central area: Buena Vista Dairy wells 74-01, 74-02, and 74-05, Big Sky Dairy wells 833-05, 833-07, 833-08, 833-09, and 833-10, and Sunset Dairy well 257-01. It is expected that similar trends will occur

downgradient of all synthetically lined lagoons in the future.

Nitrate decreasing and increasing concentration trends are as follows:

- Decreasing Nitrate Trend: Buena vista Dairy well 74-04, Big Sky Dairy wells 833-02 and 833-10, Sunset Dairy wells 257-01 and 257-02, and AP well DAD-05.
- Increasing Nitrate Trend: Buena Vista Dairy II well 74-05, and AP wells DAD-04, DAD-06R, DAD-07, and DAD-15.

Chloride decreasing and increasing concentration trends are as follows:

- Decreasing Chloride Trend: Buena Vista Dairy II well 74-03, and AP wells DAD-03, DAD-05, DAD-08, and DAD-16.

- Increasing Chloride Trend: Buena Vista Dairy II wells 74-02, 74-04, and 74-05, Big Sky Dairy wells 833-06, 833-07, 833-08, and 833-10, Sunset Dairy well 257-01, and AP wells DAD-15 and DAD-24.

TDS decreasing and increasing concentration trends are as follows:

- Decreasing TDS Trend: Buena Vista Dairy II well 74-03, Big Sky Dairy well 833-02, Sunset Dairy well 257-01, and AP wells DAD-03, DAD-05, DAD-08, DAD-16, and DAD-18.

- Increasing TDS Trend: Buena Vista Dairy II wells 74-02, 74-04, and 74-05, Big Sky wells 833-06 and 833-10, and AP wells DAD-04, DAD-07, DAD-15, DAD-19 (vertical delineation), and DAD-24 (vertical delineation).

Upgradient wells Buena Vista Dairy well 74-03 and AP well DAD-03 had stable nitrate trends and decreasing trends for chloride and TDS. Eastern cross-gradient AP wells DAD-07 and DAD-15 had increasing trends for all constituents except for chloride in DAD-07, which was stable. Western cross-gradient wells 833-10 (Big Sky), DAD-04 (AP), and DAD-16 (AP) showed variable trends. Big Sky well 833-10 had a decreasing nitrate trend and increasing trends for chloride and TDS. AP well DAD-04 had increasing nitrate and TDS trends and a stable trend for chloride. AP well DAD-16 had a stable trend for nitrate and decreasing trends for chloride and TDS.

Downgradient wells 257-02 (Sunset Dairy) and MW-4 (Former McAnally Enterprise) had stable trends for all three constituents, except for a decreasing nitrate trend in well 257-02. AP well DAD-25 had a stable trends for nitrate, chloride, and TDS.

4.3 Southern Portion

The southern portion statistical trend analysis was completed on all wells within the regional and perched aquifers sampled in the last year. Of the 13 wells analyzed in the southern portion of the Dairies, eight had decreasing or stable concentrations of nitrate, chloride, and TDS. Regional

aquifer well 692-07 is located downgradient of the lagoon and shows stable concentrations of nitrate.

Within the regional aquifer, an increasing nitrate trend was observed in Del Oro Dairy wells 692-05, 692-06, and 692-09. Chloride trends were decreasing or stable in all regional wells, except for Del Oro well 692-10. TDS trends were increasing in Del Oro Dairy wells 692-05, 692-06, 692-07, and 692-09. In the perched aquifer, statistical trend analysis indicated all six wells had stable or decreasing trends for all analytes.

5.0 FIRST ORDER DECAY RATE

First order nitrate decay rates were calculated for wells where 1) nitrate was detected at or above the standard in the last year and 2) nitrate concentrations were exhibiting decreasing trends according to the Mann-Kendall trend analysis discussed in Section 4.0. The 1st order decay rates for monitored natural attenuation were calculated using an excel spreadsheet developed by the Utah Leaking Underground Storage Tank program and is based on EPA's Ground Water Issue paper EPA/540/S-02/500, *Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies* (Newell, Rifai, Wilson, Connor, Aziz and Suarez 2002). Decay rate spreadsheets are presented in Appendix I.

Decay rates were calculated for a total of 13 monitoring wells: eight wells from the northern area, three wells from the central area, and two wells from the southern area (perched aquifer). A summary of the results of the decay rate analysis is presented in Table 8.

- Northern Area: Nitrate decay rates ranged from 0.0289 $years^{-1}$ to 0.1136 $years^{-1}$. These rates correspond to an average half-life of approximately 11 years. In these northern locations where groundwater attenuation is occurring, cleanup times averaging 22 years are expected.

- Central Area: Nitrate decay rates ranged from 0.0538 $years^{-1}$ to 0.0793 $years^{-1}$. The predicted average half-life was calculated as approximately 11 years and the average predicted cleanup time was calculated as approximately 23 years.

- Southern Area (Perched Aquifer): The nitrate decay rates for Del Oro well 692-02 and AP well DAD-26, were calculated as 0.2096 $years^{-1}$ and 0.2398 $years^{-1}$, respectively. The predicted average half-life was calculated as approximately 3 years and the average predicted cleanup time was calculated as approximately 10 years.

6.0 GEOSTATISTICAL ANALYSIS

A geostatistical analysis was completed to estimate analyte distribution and calculate contaminant plume area changes over time. Nitrate plumes were defined as areas where concentrations exceed the NMWQCC nitrate standard of 10 mg/L. Consistent with the Five-Year Review (EA 2020), chloride and TDS plumes were defined as areas exceeding the 2016 calculated background concentration. The 2016 chloride background concentration is 1,015 mg/L for the northern area, 1,781 for the central area, and 503 mg/L for the southern area. The 2016 TDS background concentration is 3,178 mg/L for the northern area, 5,328 mg/L for the central area, and 2,552 for the southern area. This historical background concentration is used to provide a consistent baseline from initiation of abatement for comparison of year over year changes.

Interpolation by kriging was applied to nitrate, chloride, and TDS concentrations from the February/March 2025 sampling event. Elements of the plume generated through kriging are displayed with solid lines. Isopleth lines that were manually drawn using professional judgment are displayed as dashed lines. The minimum polygon size is a half-acre.

Monitoring and extraction wells were excluded from the model for a variety of reasons. Bright Star Dairy well 340-02, Organ Dairy wells 126-04, 126-05, 126-07, and 126-09, Del Oro well 692-04, and Del Oro extraction well EW-03 were not included due to insufficient water for sampling. AP well DAD-20 was damaged before the December 2023 sampling event and can no longer be sampled. Sunset Dairy well 257-03 could not be sampled in the last year due to a well obstruction. Dominguez 2 well 42-11 could not be sampled during the last sampling event due to a malfunctioning pump; as a result, data from November 2024 was used for that location. Vertical delineation wells and AP well DAD-25, which was likely completed in a perched aquifer, were excluded from the data set. Dominguez Dairy 624-09 was not used for modeling because it is located across the Mesquite Drain.

Central area chloride and TDS and southern area TDS in the regional aquifer were not modeled because concentrations were below 2016 regional background levels.

Table 9 provides the calculated areas of plumes in the north, central, and south portions for 2016 through 2025. Distributions of contaminants modeled from 2025 data are displayed in Figures 10 through 18. Note that the contaminant plume geometries were statistically modeled, and as a result, modeled concentrations may be offset from or inconsistent with measured concentrations at individual monitoring locations.

The following is a discussion of the geostatistical analysis of analyte distribution for each portion of the Dairy:

- Northern portion - The cumulative size of the nitrate plume was stable in 2025 as compared to 2016. Chloride and TDS plume sizes increased by over 50% and 30%, respectively, between 2016 and 2025. The modeled chloride plume area increased slightly compared to 2024, and the TDS and nitrate plume areas decreased slightly.

- Central portion - The cumulative size of the 2025 nitrate plume decreased relative to 2016. The chloride and TDS have decreased to concentrations below existing conditions; as a result the current plume size is zero acres.

- Southern portion (regional aquifer) – The nitrate plume size has increased between 2016 and 2025 though has decreased relative to the size of the 2021, 2022, and 2023 nitrate plume sizes. The chloride plume size has increased since 2016. TDS has never been detected above existing conditions, and therefore, the plume size has been stable between 2016 and 2025.

- Southern portion (perched aquifer) – Nitrate and chloride plume sizes were stable between 2016 and 2025; plume sizes have decreased relative to 2024. The TDS plume size has decreased between 2016 and 2025 and has also decreased relative to 2024. Because of the distribution of contamination and monitoring wells, the modeled plume geometries in the perched aquifer have required manual interpretation for large areas and are therefore limited in their ability to offer accurate comparisons from year to year.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The groundwater monitoring event included the gauging of all accessible DP and AP wells and the sampling of 26 AP wells and the DP wells that were accessible and contained sufficient water to sample. Additionally, irrigation and supply wells were sampled at 13 locations. Based on the data collected, the following conclusions and recommendations are presented:

7.1 Hydraulic Gradient and Direction of Groundwater Flow

- The depth to groundwater at the site ranged from 13.85 to 137.55 feet btoc.
- On average, groundwater levels increased relative to last quarter in the regional and perched aquifers.
- There was an anomalous rise in groundwater levels in portions of the perched and regional aquifer in the southern portion of the Dairies. This may be explained by a leak in a water line near Del Oro well 692-07. The leak was identified and repaired in March 2025.
- Groundwater flow direction in the northern area varied from northeast to southeast during the most recent gauging event. Groundwater flow patterns shifted in the northern portion within the last several months. This appears to be the result of pumping at the former Dominguez Dairy 2.
- Flow in the central and southern regional aquifer was to the southeast and flow in the southern perched aquifer was generally to the south-southwest.
- Hydraulic gradient in the regional aquifer was 0.001 foot per foot.
- The perched aquifer at Del Oro Dairy has a groundwater flow direction toward the south-southwest. The hydraulic gradient in the perched aquifer was 0.005 foot per foot.

7.2 Groundwater Nitrate, Chloride, and TDS Analytical Results

- Nitrate was below the NMWQCC standard of 10 mg/L in 13 of the 26 groundwater samples collected from the AP wells.
- Chloride was above the NMWQCC standard of 250 mg/L in all AP monitoring wells sampled, except for wells DAD-06R, DAD-09, and DAD-17.
- TDS was above the NMWQCC standard of 1,000 mg/L in all monitoring wells sampled except for wells DAD-06R and DAD-17.
- Chloride and TDS remain near or above NMWQCC standards in wells upgradient of the northern, central, and southern portions of the plume at the Dairies. Chloride and TDS are regionally elevated above standards and not necessarily attributed to the Dairies.

7.3 Trend Analysis

- Trend analysis indicates that the majority of the analyte trends in the northern, central, and southern portions were decreasing or stable.

7.4 First Order Nitrate Decay Rates

- Nitrate decay rates in the northern area ranged from 0.0289 $years^{-1}$ to 0.1136 $years^{-1}$. These rates correspond to an average half-life of approximately 11 years. In these northern locations where groundwater attenuation is occurring, cleanup times averaging 22 years are expected.

- Nitrate decay rates in the central area ranged from 0.0538 $years^{-1}$ to 0.0793 $years^{-1}$. The predicted average half-life was calculated as approximately 11 years and the average predicted cleanup time was calculated as approximately 23 years.

- In the southern perched aquifer, nitrate decay rates ranged from 0.2096 $years^{-1}$ to 0.2398 $years^{-1}$. The predicted average half-life was calculated as approximately 3 years and the average predicted cleanup time was calculated as approximately 10 years.

7.5 Geostatistical Analysis

- Northern portion - The total size of the nitrate plume was stable in 2025 as compared to 2016. Chloride and TDS plume sizes increased by over 50% and 30%, respectively, between 2016 and 2025. The modeled chloride plume area increased slightly compared to 2024, and the TDS and nitrate plume areas decreased slightly.

- Central portion - The size of the 2025 nitrate plume decreased relative to 2016. The chloride and TDS plumes are no longer present.

- Southern portion (regional aquifer) – The nitrate plume size has increased between 2016 and 2025 though has decreased relative to the size of the 2021, 2022, and 2023 nitrate plumes. The chloride plume size has increased since 2016. TDS has never been detected above existing conditions.

- Southern portion (perched aquifer) – Nitrate and chloride plume sizes were stable between 2016 and 2025 and both plumes have decreased relative to 2024. The TDS plume size has decreased between 2016 and 2025 and has also decreased relative to 2024. Because of the distribution of contamination and monitoring wells, the modeled plume geometries in the perched aquifer have required manual interpretation for large areas and are therefore limited in their ability to offer accurate comparisons from year to year.

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