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

January 29, 2026

Ms. Amanda Otieno
New Mexico Environment Department
Ground Water Quality Bureau
Remediation Oversight Section
2301 Entrada Del Sol
Las Cruces, NM 88001

Dear Ms. Otieno:

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

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

FIVE-YEAR EVALUATION AND QUARTERLY 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

January 2026

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Gina Mullen	1/29/2026
Gina Mullen Project Manager	Date
	1/29/2026
Jay Snyder Senior Hydrogeologist	Date

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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 Five-Year Evaluation and Quarterly Monitoring Report for Doña Ana 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 11.0.

1.1 Objective

The objectives of this report are to comply with the Stage 2 Abatement Plan and the Stipulated Agreement and to satisfy the requirements set forth in 20.6.2.4110 NMAC.

The following work was performed to meet the objectives of the Stage 2 Abatement Plan and the Stipulated Agreement:

- Representatives from D&H Petroleum and Environmental Services, Inc. (D&H) gauged discharge plan (DP) monitoring wells, abatement plan (AP) monitoring wells, and Anthony Waste Water Treatment Plant (WWTP) wells from August 4, 2025 through August 7, 2025.

- From August 11, 2025 through September 16, 2025, D&H representatives collected groundwater samples from all scheduled and sampleable AP and DP wells. Field parameters including specific conductance, pH, temperature, oxidation reduction potential (ORP), and dissolved oxygen were monitored and recorded on field forms during sampling.

- Assessed the performance of 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.

- From October 14, 2025 through October 16, 2025, D&H representatives collected compound specific isotope analysis (CSIA) samples for nitrogen-14 and nitrogen-15 ($^{15}N/^{14}N$ [$\delta^{15}N$]) and oxygen-16 and oxygen-18 ($^{18}O/^{16}O$ [$\delta^{18}O$]) analysis for 16 select wells as part of the five-year review.

- Updated analyte trend analyses as part of the five-year review.
- Analyzed first order decay rate for nitrate at wells with decreasing nitrate concentrations as part of the five-year review.
- Recalculated existing concentrations for chloride and total dissolved solids (TDS).
- Evaluated the effectiveness of the Stage 2 Abatement Plan.

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. Former 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 left the consortium in May 2024. Organ Dairy left the consortium in February 2025.

The current DAD consortium is organized geographically into the northern area, central area, and southern area. The northern area currently consists of Mountain View Dairy, Bright Star Dairy, Dominguez Dairy, and the former Dominguez 2 Dairy. The northern land application is also included in the northern area of DAD. Buena Vista Dairy, Gonzalez Dairy, and Organ 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 15, 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 2021), 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 are sampled semi-annually during August/September and February/March sampling events: DAD-02, DAD-03, DAD-04, DAD-05, DAD-16, DAD-17, and DAD-24. Water levels are 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 scheduled AP monitoring wells and DP monitoring wells for dairies that are a part of the DAD consortium (Section 1.2). Groundwater samples were analyzed for nitrate, chloride, TDS, and Total Kjeldahl Nitrogen (TKN). The resulting data from this groundwater monitoring event are compiled and presented below. Select wells were additionally sampled for compound-specific isotope analysis (CSIA) as part of the five-year review. These groundwater monitoring activities are described below.

2.1 Monitoring Well Gauging

From August 4, 2025, through August 7, 2025, representatives from D&H gauged DP monitoring wells, AP monitoring wells, and Anthony WWTP wells with an electronic water level indicator. Table 1 provides a summary of the 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 available in Appendix B.

2.2 Quarterly Groundwater Sampling

D&H collected groundwater samples from all AP monitoring wells scheduled for sampling from September 4, 2025, through September 16, 2025. D&H collected groundwater from the DP wells from August 11, 2025, through September 4, 2025. Prior to sampling, all AP and DP wells were purged of three well casing volumes, if practicable, by (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. Dominguez 2 well 42-08 was purged of less than three well cashing volumes due to the lack of sufficient water volume in the well. Several DP wells could not be sampled. Bright Star well 340-02 and perched Del Oro well 692-04 were dry. Dominguez 2 wells 42-10 and 42-11 were not sampled because of malfunctioning pumps.

The 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, ORP, and dissolved oxygen were monitored using a water quality meter and data were recorded on field forms. Field parameters are summarized 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, in Albuquerque, New Mexico (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. All analytical laboratory reports are provided in Appendix C.

2.3 CSIA Groundwater Sampling

The following sixteen wells were sampled for CSIA: Mountain View Dairy 70-02, Dominguez Dairy 2 42-03 and 42-06, Dominguez 624-11, Big Sky Dairy 833-02, 833-07, and 833-09, Sunset Dairy 257-01 and 257-02, Del Oro 692-02, and AP wells DAD-08, DAD-09, DAD-14, DAD-21, DAD-23, and DAD-25. To the extent possible, wells that were sampled for CSIA historically were resampled and analyzed for CSIA in 2025; however, several wells were not resampled because the associated dairy is no longer part of the DAD consortium. The wells were originally selected because they were located along the center line of the northern, central, and southern portions of the Dairies. Due to the shift in groundwater flow from southward to eastward in the northern area, these northern wells are often cross-gradient to rather than downgradient from one another. Groundwater samples were collected by D&H October 14, 2025 through October 16, 2025 (Table 6).

All wells were sampled with a decontaminated submersible pump, new disposable tubing, and filtered through a 0.22-micron filter. Three well volumes were purged prior to sampling. All non-dedicated equipment was decontaminated between wells with an Alconox™ solution to ensure sample quality. Field parameters including specific conductance, pH, temperature, ORP, DO, and turbidity were recorded. All meters were calibrated and/or checked with standards in accordance with manufacturer's specifications prior to daily use. Purge water was ground discharged.

All groundwater samples were collected immediately after purging. Sampling was accomplished by pumping groundwater through disposable polyethylene tubing into the 60-milliliter high-density polyethylene sample container. All samples were labeled, and then immediately placed on ice. Samples were stored in a freezer until shipment. Field forms are provided in Appendix B. The laboratory report is available in Appendix C.

Groundwater samples for CSIA were packed in coolers with dry ice and delivered under chain-of-custody to University of California, Davis Stable Isotope Facility in Davis, California. All groundwater samples were analyzed for nitrogen-14 and nitrogen-15 stable isotopes ($^{15}N/^{14}N$ [$\delta^{15}N$]), as well as oxygen-18 and oxygen-16 isotopes (O^{18}/O^{16} [$\delta^{18}O$]).

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 13.43 feet below top-of-casing (ft btoc) in Sunset well 257-03 to 138.41 ft 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, the groundwater elevation for this well is not used in contouring for the central area potentiometric surface map. Additionally, vertical delineation wells were not used for contouring.

Potentiometric surface maps of groundwater elevations were completed using monitoring well gauging data for the northern, central, and southern areas (perched and regional aquifers) of the Dairies. Groundwater elevation data are provided in Table 1 and potentiometric surface maps are provided as Figures 2 through 5. Hydrographs were completed for select monitoring wells in each area and are provided in Appendix D.

On average, water levels decreased in the northern area (0.12 foot), central area (0.17 foot), and southern area (0.03 foot) of the regional aquifer. In the southern perched aquifer, groundwater elevations increased by an average of 0.14 feet.

During the most recent gauging event, groundwater flow direction of the northern regional aquifer varied from east-northeast to southeast. Flow direction in the central and southern portions of the regional aquifer were generally to the southeast. Groundwater flow direction in the southern perched aquifer was to the south-southwest.

The hydraulic gradient across the Dairies in the regional aquifer is 0.001 ft/ft. The hydraulic gradient in the perched aquifer in the southern area was approximately 0.006 ft/ft.

Changes in groundwater flow have been observed in the regional and perched aquifers of the southern portion. Groundwater mounding can first be observed in the perched aquifer in November 2024 and in the regional aquifer in February 2025. Groundwater gradients have been consistent in the regional aquifer but have increased in the perched aquifer from 0.004 ft/ft in November 2024 to its current gradient of 0.006 ft/ft.

3.2 Groundwater Field Parameters

Field parameters from the most recent monitoring event (specific conductance, pH, temperature, ORP, and dissolved oxygen) were recorded on the sampling field forms provided in 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. Dissolved oxygen and ORP are only recorded in the first set of readings since hand bailing agitates the aquifer and the ORP and dissolved oxygen measurements are not considered representative once agitation begins.

3.3 Groundwater Analytical Results for Quarterly Sampling

Groundwater analytical results from AP wells are presented in Table 4. Groundwater analytical results from DP wells are presented in Table 5. Nitrate, chloride, and TDS concentration trends for the AP wells by area are presented in Appendix F. Analytical data for all sampled wells are displayed on Figures 6 through 9. Analytical laboratory reports are included in Appendix C. Discussions of upgradient/downgradient conditions in the following section are based on groundwater flow directions presented in Section 3.1.

3.3.1 Abatement Plan Monitoring Well Analytical Results

Nitrate concentrations were below the 10 milligrams per liter (mg/L) NMWQCC standard in groundwater collected from 13 of the 27 AP monitoring wells sampled.

Groundwater collected from the following 14 AP wells had nitrate concentrations at or above the standard: DAD-06R, DAD-07, DAD-08, DAD-09, DAD-11 (vertical delineation well), DAD-12 (vertical delineation well), DAD-14, DAD-15, DAD-18 (vertical delineation well), DAD-19 (vertical delineation well), DAD-20, DAD-21, DAD-22, and DAD-23.

Nitrate remained undetected in AP wells DAD-03, DAD-04, DAD-05, DAD-10, DAD-16, and DAD-17. Nitrate concentrations decreased or were the same relative to the previous sampling event in groundwater collected from AP wells DAD-01, DAD-02, DAD-08, DAD-09, DAD-11 (vertical delineation), DAD-12 (vertical delineation), DAD-14, DAD-15, DAD-18 (vertical delineation), DAD-20, DAD-22, DAD-25, and DAD-26. The largest decrease in nitrate concentration was observed in well DAD-20, which decreased from 50 mg/L in June 2025 to 26 mg/L in September 2025. DAD-20 is located in the southern portion and completed in the perched aquifer.

The largest nitrate concentration increase was observed in groundwater collected from well DAD-21. This well is also located in the southern portion and completed in the perched aquifer. The concentration increased from 36 mg/L in June 2025 to 60 mg/L in September 2025. In June 2025, nitrate was detected above the standard for the first time since August 2017 in DAD-25 at a concentration of 11 mg/L. The nitrate concentration in this well returned to a below-standard concentration of 3.9 mg/L in September 2025.

During this sampling event, detected nitrate concentrations in groundwater collected from AP wells ranged from 77 mg/L in well DAD-14 to 2.0 mg/L in well DAD-26. AP wells DAD-06R, DAD-07, DAD-11 (vertical delineation well), and DAD-18 (vertical delineation well) were being observed due to increasing nitrate concentrations; however, concentrations have stabilized in recent monitoring events.

Both chloride and TDS concentrations equaled or exceeded their respective NMWQCC standards in most AP wells. Exceptions include chloride groundwater concentrations below the standard in wells DAD-05, DAD-06R, DAD-17, and DAD-25. TDS concentrations were below the standard in DAD-05, DAD-06R, DAD-17, and DAD-25. The chloride and TDS concentrations in AP well DAD-25 were anomalously low during this sampling event. The highest chloride concentration of 1,600 mg/L was detected in groundwater collected from central portion well DAD-08. The highest TDS concentration of 4,300 mg/L was detected in groundwater collected from AP wells DAD-07 and DAD-08. 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 Analytical Results by Area

The following sections discuss AP and DP analytical results in the northern, central, and southern portions of Dona Ana Dairies.

<u>*Northern Portion*</u>

The northern extent of the plume is defined by wells 86/340-01 and 70/86/340-01. 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; prior to that time, 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 23 mg/L during this sampling event. The southern extent of the plume was defined by AP well DAD-02 at a groundwater nitrate concentration of 5.7 mg/L. Historically, the western upgradient edge of the nitrate plume was delineated by Dominguez Dairy well 624-02, however, this quarter nitrate was detected at a concentration above the standard at 14 mg/L. The nitrate plume is defined to the east by AP well DAD-01 (6.8 mg/L), AP well DAD-13 (7.7 mg/L), and Dominguez Dairy 2 well 42-12 (<1.0 mg/L). The highest nitrate concentration in the northern portion was observed in groundwater collected from well DAD-14 (77 mg/L); this well is located at the southern boundary of the northern AP area and is downgradient of the former Gonzalez Dairy and land application areas to the west.

The chloride and TDS concentrations in DP wells were at or above standards in all wells sampled within the northern portion except for Bright Star Dairy well 340-01 where chloride and TDS were detected below standards at anomalously low concentrations of 55 mg/L and 870 mg/L, respectively. The highest concentration of chloride was observed in northern land application well 70-03 at 2,000 mg/L. The highest concentration of TDS was detected in northern land application well 70/86/340-01 at a concentration of 5,500 mg/L.

<u>*Central Portion*</u>

The respective northern and southern extent of the central portion nitrate plume is defined by Buena Vista Dairy II well 74-03 and by Las Cruces Community Farms (formerly McAnally Enterprises) well MW-4, where nitrate was not detected in either well above the laboratory reporting limit of <1.0 mg/L. The western extent is defined by Big Sky Dairy well 833-10 (2.3 mg/L), Sunset Dairy well 257-02 (8.9 mg/L), and AP well DAD-16 (<1.0 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 16 mg/L, 56 mg/L and 24 mg/L, respectively. The highest nitrate concentration in the central portion was 410 mg/L, observed in Big Sky Dairy well 833-09. This nitrate concentration is significantly higher than historical concentrations.

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 AP wells DAD-05 (72 mg/L), DAD-06R (110 mg/L), DAD-17 (160 mg/L), and DAD-25 (84 mg/L), Buena Vista well 74-03 (240 mg/L), and Sunset Dairy well 257-03 (72 mg/L). TDS was below the standard in AP wells DAD-05 (650 mg/L), DAD-06R (710 mg/L), and DAD-17 (740 mg/L), and Sunset Dairy well 257-03 (810 mg/L). The highest chloride concentration was detected at Las Cruces Community Farms well MW-4 at a concentration of 1,700 mg/L. The highest TDS concentration was observed at Big Sky well 833-09 at a concentration of 6,900 mg/L. Chloride and TDS concentrations were anomalously low in AP well DAD-25 and Sunset Dairy well 257-03. Chloride and TDS were anomalously high in Big Sky Dairy well 833-09.

<u>Southern Portion – Regional Aquifer</u>

Wells completed in the southern portion's regional aquifer include AP well DAD-10 and Del Oro wells 692-05 through 692-10 (Figure 8). All of the groundwater collected from wells in the regional aquifer contained nitrate below the NMWQCC standard except for Del Oro well 692-05 (17 mg/L) and Del Oro well 692-08 (100 mg/L). This sampling event is the first time nitrate has been detected over standard in Del Oro well 692-08; this quarter's nitrate concentration is anomalously high.

Chloride concentrations were detected above the NMWQCC standard and ranged from 450 mg/L in Del Oro well 692-09 and AP well DAD-10 to 890 mg/L in Del Oro Dairy well 692-08. TDS concentrations ranged from 1,400 mg/L in Del Oro well 692-09 and AP well DAD-10 to 3,100 mg/L in Del Oro Dairy well 692-08; this quarter's chloride and TDS concentrations were anomalously high.

<u>Southern Portion – Perched Aquifer</u>

Wells completed in the perched aquifer in the southern portion include wells 692-02, 692-04 (dry), DAD-09, DAD-20, DAD-21, DAD-22, DAD-26, and DAD-27 (Figure 9). Groundwater nitrate concentrations were above the standard in all monitoring wells in the perched aquifer except for DAD-26 (2.0 mg/L) and DAD-27 (5.1 mg/L), which are located downgradient of the AP area. The highest nitrate concentration was detected at AP well DAD-21 (60 mg/L). The edge of the nitrate plume is delineated to the southwest by AP well DAD-26 (2.0 mg/L).

Chloride concentrations in the perched aquifer monitoring wells ranged from 390 mg/L in Del Oro Dairy well 692-02 to 850 mg/L in AP well DAD-21. TDS in the perched aquifer ranged from 1,400 mg/L in Del Oro Dairy well 692-02 to 2,800 mg/L in AP well DAD-21.

There are multiple influences on analyte concentrations at Del Oro Dairy. A pump and reuse system became operational in April 2023 and is currently running. The system performance assessment is provided in Appendix A. 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 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 resulting in a lack of baseline concentrations. Additionally, there appears to be a subsurface release of water which may be currently impacting analyte concentrations. Groundwater mounding can first be observed in the perched aquifer in November 2024 and in the regional aquifer in February 2025.

3.3.3 Anomalous Results

There are five wells spread throughout the AP plan area with analytical results significantly outside of historical ranges. Three wells had anomalously low concentrations of nitrate, chloride, and/or TDS (Bright Star Dairy well 257-03, Sunset Dairy well 340-01, and AP well DAD-25). Two wells had anomalously high concentrations of nitrate, chloride, and TDS (Big Sky well 833-09, and Del Oro well 692-08). Results were checked by the laboratory and confirmed. Checks were conducted to ensure that samples were not switched in the field. TDS concentrations that were outside of normal ranges were compared to calculated TDS concentrations based on specific conductivity measurements collected in the field. The calculated TDS results were similar to laboratory TDS results in three of the five wells (AP well DAD-25, Bright Star well 340-01, and Big Sky well 833-09). TKN concentrations were consistent with historical results in all five wells suggesting that surface water infiltration at the well head is not a likely explanation for the anomalous results. Analytical results from these wells will be observed in future monitoring events.

3.4 Groundwater CSIA Results

CSIA is an analytical method that measures the ratio of naturally occurring stable isotopes (Interstate Technology Regulatory Council 2011). CSIA of groundwater can estimate the extent to which microbial respiration is occurring. Denitrification will preferentially remove the light isotopes of both nitrogen and oxygen from the nitrate pool, resulting in a coupled increase in both the $\delta^{15}N$ and the $\delta^{18}O$ (Kendall et al. 2007). Groundwater should become enriched in the heavier isotope if denitrification is occurring.

Several statistical methods can be used to evaluate denitrification in groundwater. A linear relationship between $\delta^{18}O$ and $\delta^{15}N$ during denitrification has been established in the scientific literature (Fukada et al., 2003; Chen and MacQuarrie, 2005; Young et al. 2013). In addition, the fractionation ratio between $\delta^{18}O$ and $\delta^{15}N$ described by Chen and MacQuarrie (2005) can be examined to determine if the data correspond to published values indicative of denitrification. Furthermore, when denitrification is occurring a linear relationship exists between $\delta^{15}N$ values and the logarithm of the nitrate concentration (Fukada et al., 2003; Chen and MacQuarrie, 2005).

Evaluation of collected data following these indicators does not provide evidence that denitrification is occurring in a widespread manner, though analysis of the fractionation ratio indicates that it may be occurring in select locations.

Analytical laboratory results for the CSIA are included in Appendix B. A more detailed discussion of the statistical CSIA evaluation is presented in Appendix G.

4.0 EXISTING CONDITION/BACKGROUND CONCENTRATION FOR CHLORIDE AND TDS

Background or existing concentrations for chloride and TDS at the Dairies have been recalculated using upgradient well(s) in each portion of Doña Ana Dairies. The recalculation is based on groundwater data collected from selected wells between November 2020 and September 2025. Existing conditions were last calculated in 2020; the Stipulated Agreement requires that the existing conditions be recalculated for the northern, central, and southern portions every five years.

Tables 4 and 5 present historical and current existing conditions as well as the wells that exceed the current existing conditions. A summary of the statistical analysis performed is included in Appendix I. Data identified as anomalous in Tables 4 and 5 were not included in the calculation of existing conditions.

Existing conditions for the northern portion were recalculated using the following wells:

- Northern Land Application Area wells 70/86/340-01 and 70-03
- Dominguez 2 Dairy well 42-10

These wells are consistent with those used to calculate the existing conditions in 2020, except that Northern Land Application well 86/340-01 was replaced with Northern Land Application Area well 70-03. Northern Land Application well 86/340-01 could not be included in the 2025 recalculation due to increasing chloride and TDS concentrations which made the data unsuitable for statistical analysis.

The existing concentrations as established by the upper prediction limits (UPLs) at an upper confidence level of 95% for chloride and TDS are as follows:

- Northern portion - chloride 1,920 milligrams per liter (mg/L) and TDS 5,653 mg/L.

The existing condition concentration of chloride increased from 1,800 mg/L in the 2020 calculation to 1,920 mg/L in 2025. The existing concentration of TDS increased from 1,598 mg/L in the 2020 calculation to 5,653 mg/L. The existing condition for TDS in 2020 was based only on concentrations from former Dominguez 2 well 42-10, which had lower TDS concentrations than other upgradient wells. That was the only well used in the 2020 calculation because other upgradient wells in the northern area had increasing or decreasing TDS trends which made them unsuitable for UPL analysis. In 2025 all three of the listed upgradient wells were appropriate for UPL analysis.

In the central portion, average existing conditions were calculated using Buena Vista II well 74-03 and AP well DAD-03. In the southern portion, existing conditions were calculated using upgradient Del Oro well 692-08. The average existing concentrations as established by the UPL for chloride and TDS from November 2020 to August 2025 is as follows:

- Central portion - chloride 327 mg/L and TDS 1,889 mg/L.

- Southern portion - chloride 449 mg/L and TDS 1,454 mg/L.

Existing conditions for chloride in the central and southern areas decreased slightly and TDS in the central and southern areas increased slightly relative to existing conditions calculated in 2020.

5.0 CONCENTRATION TREND ANALYSIS

A statistical trend analysis using the Mann-Kendall test was conducted to evaluate nitrate, chloride, and TDS trends from the past five years. 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). The trend analysis is drawn from analytical data collected over the last five years spanning from November 2020 through September 2025. Analytical data collected from all AP and DP wells in 2025 that were not identified as suspect in Tables 4 and 5 were included. Concentration trend graphs for nitrate, chloride, and TDS in AP wells are found in Appendix F. The statistical trend analysis is provided in Appendix I. Table 7 provides a summary of the trend analysis for the AP and DP wells. The following is a discussion of the trend analysis for each portion of the Dairy.

5.1 Northern Portion

Trend analysis was conducted for 28 wells within the northern portion. Stable or decreasing trends were present for nitrate, chloride, and TDS in 11 of the 28 wells. Decreasing trends for all three analytes were present at the former Dominguez 2 42-06, AP well DAD-01, and AP well DAD-12 (vertical delineation well). The majority of analyte trends in the northern portion were stable or decreasing.

Nitrate concentration trends are as follows:

- Decreasing Nitrate Trend: Northern Land Application Area well 86/340-01, Organ Dairy well 126-13, Mountain View wells 70-01 and 70-02, former Dominguez 2 wells 42-02 and 42-06, Dominguez well 624-11, and AP wells DAD-01, DAD-02, and DAD-12.

- Increasing Nitrate Trend: Northern Land Application Area well 70/86/340-01, Bright Star well 340-01, former Dominguez 2 wells 42-03 and 42-10, Dominguez wells 624-01 and 624-02, and AP wells DAD-11, DAD-14, and DAD-23.

Chloride concentration trends are as follows:

- Decreasing Chloride Trend: former Dominguez 2 wells 42-03, 42-06, and 42-13, and AP wells DAD-01, DAD-12, and DAD-23.

- Increasing Chloride Trend: Northern Land Application Area well 86/340-01, Organ well 126-12, Bright Star well 340-01, former Dominguez 2 wells 42-02 and 42-08, Dominguez wells 624-01, 624-02, 624-10, and 624-11, and AP wells DAD-02, DAD-11, DAD-13, and DAD-14.

TDS concentration trends are as follows:

- Decreasing TDS Trend: Organ Dairy well 126-13, former Dominguez 2 wells 42-03, 42-06, and 42-13, and AP wells DAD-01, DAD-12, and DAD-23.

- Increasing TDS Trend: Northern Land Application Area well 86/340-01, and former Dominguez 2 Dairy well 42-08, Dominguez Dairy wells 624-01, 624-10, and 624-11, and AP wells DAD-02, DAD-11, and DAD-14.

Three wells are located in the Northern Land Application Area. Northern Land Application well 86/340-01 is located furthest north and had decreasing nitrate concentrations but increasing chloride and TDS concentrations. Northern Land Application well 70/86/340-01 and Mountain View well 70-03 generally had stable trends though well 70/86/340-01 had increasing nitrate concentrations.

Western boundary wells include Dominguez wells 624-01, 624-02, and 624-10, and former Dominguez 2 well 42-02. These wells are upgradient of the DAD dairies and generally have increasing or stable nitrate, chloride, and TDS concentrations. The exception is the former Dominguez 2 well 42-02 where there is a decreasing nitrate concentration.

Wells on the eastern boundary generally exhibit decreasing or stable nitrate, chloride, and TDS trends. The eastern boundary currently represents downgradient groundwater conditions. The AP eastern boundary well DAD-01 shows decreasing nitrate, chloride, and TDS trends. The former Dominguez 2 eastern boundary wells 42-10 and 42-12 generally have low concentrations of nitrate, chloride, and TDS that are stable. Nitrate is statistically increasing in well 42-10, though concentrations remain near the reporting limit of 1 mg/L and nitrate is often not detected.

Wells to the south include AP wells DAD-14, DAD-23, and DAD-02. DAD-14 has increasing concentrations of nitrate, chloride, and TDS. AP well DAD-23 has increasing nitrate but decreasing chloride and TDS. AP well DAD-02 has decreasing nitrate but increasing chloride and TDS. These wells are south of the former Gonzalez Dairy which left the consortium in 2020. Although these wells are downgradient of the former Gonzalez Dairy, they are not currently hydrologically downgradient of the dairies remaining in the DAD consortium.

Three wells in the northern area have increasing nitrate, chloride, and TDS concentrations: Dominguez well 624-01, AP well DAD-11 (vertical delineation), and AP well DAD-14. Dominguez well 624-01 is at the western boundary of the AP area and is considered an upgradient well. DAD-11 and DAD-14 are on the former Gonzalez Dairy and are no longer downgradient of the dairies participating in the DAD consortium.

Vertical delineation well DAD-12 has decreasing concentrations of nitrate, chloride, and TDS over the last five years. DAD-12 is located in the middle of the northern portion of DAD on the former Dominguez Dairy 2 property.

5.2 Central Portion

A trend analysis was conducted on all 30 wells with adequate water for sampling within the central portion. Nitrate trends could not be analyzed for AP wells DAD-03, DAD-05, or DAD-16 since nitrate is usually below reporting limits in these wells. Decreasing or stable trends for all constituents analyzed were present in 17 of the 30 wells. Increasing trends for all three contaminants (nitrate, chloride and TDS) were present in Big Sky Dairy well 833-07, and AP wells DAD-07, DAD-15, DAD-24, and DAD-25. The majority of analyte trends in the northern portion were decreasing or stable.

Nitrate concentration trends are as follows:

- Decreasing Nitrate Trend: Big Sky Dairy wells 833-02 and 833-05, Sunset Dairy wells 257-02 and MW-4, and AP well DAD-08.

- Increasing Nitrate Trend: Buena Vista Dairy wells 74-01 and 74-05, Big Sky Dairy wells 833-07, 833-08, and 833-10, and AP wells DAD-06R, DAD-07, DAD-15, DAD-18, DAD-24, and DAD-25.

Chloride concentration trends are as follows:

- Decreasing Chloride Trend: Big Sky Dairy well 833-10, and AP wells DAD-08 and DAD-16.

- Increasing Chloride Trend: Buena Vista II Dairy wells 74-02 and 74-04, Big Sky Dairy well 833-07, and AP wells DAD-04, DAD-07, DAD-15, DAD-19, DAD-24, and DAD-25.

TDS concentration trends are as follows:

- Decreasing TDS Trend: Big Sky Dairy well 833-10, Sunset Dairy wells 257-02 and 257-03, and AP wells DAD-05, DAD-08, and DAD-16.

- Increasing TDS Trend: Buena Vista II Dairy wells 74-02 and 74-05, Big Sky wells 833-04 and 833-07, and AP wells DAD-04, DAD-07, DAD-15, DAD-19, DAD-24, and DAD-25.

Upgradient Buena Vista Dairy well 74-03 had stable trends for nitrate, chloride and TDS. Nitrate in upgradient AP well DAD-03 is generally below the laboratory detection limit, and as a result the trend could not be analyzed; this well’s chloride and TDS trends were stable. Western cross-gradient wells include DAD-04 (AP), DAD-16 (AP) 833-10 (Big Sky). Nitrate was stable in DAD-04, was not assessed at DAD-16, and was increasing in Big Sky Dairy well 833-10. Chloride and TDS had increasing trends in AP well DAD-04 but decreasing trends at AP well DAD-16 and Big Sky Dairy 833-10. Eastern cross-gradient AP wells DAD-06R, DAD-07 and DAD-15 generally had increasing trends. DAD-06R had stable trends for chloride and TDS over the last five years.

Nitrate, chloride, and TDS concentrations were either stable or decreasing at downgradient wells 257-02 (Sunset Dairy) and MW-4 (Las Cruces Community Farms). AP well DAD-25 had increasing trends for nitrate, chloride, and TDS. This well is suspected to have been completed in a perched aquifer.

Three vertical delineation wells are in the central area (DAD-18, DAD-19, and DAD-24). Vertical delineation AP wells DAD-19 and DAD-24 are immediately adjacent to each other. DAD-19 is screened from 26-30 ft bgs and has stable nitrate concentrations but increasing chloride and TDS. Vertical delineation AP well DAD-24 is screened at 120 to 128 ft bgs and has increasing nitrate, chloride, and TDS trends. DAD-18, located further south, has increasing nitrate concentrations but stable chloride and TDS concentrations.

5.3 Southern Portion – Regional Aquifer

A trend analysis was conducted with data from 7 monitoring wells with adequate water for sampling within the southern portion's regional aquifer. Decreasing or stable trends for all constituents analyzed were present in 6 of the 7 wells. Increasing trends for all three contaminants (nitrate, chloride and TDS) were present in Del Oro well 692-06. The majority of analyte trends were decreasing or stable.

Nitrate concentration trends are as follows:

- Decreasing Nitrate Trend: AP wells DAD-10
- Increasing Nitrate Trend: Del Oro Dairy 692-06

Chloride concentration trends are as follows:

- Decreasing Chloride Trend: none
- Increasing Chloride Trend: Del Oro Dairy 692-06 and 692-10

TDS concentration trends are as follows:

- Decreasing TDS Trend: none
- Increasing TDS Trend: 692-06 (regional aquifer).

In the regional aquifer, concentrations of nitrate, chloride, and TDS are primarily stable. Del Oro well 692-06 has increasing trends for nitrate, chloride, and TDS over the last five years. Nitrate remains below the standard. Chloride and TDS are slightly elevated over existing conditions. DAD-10 is downgradient of Del Oro Dairy and is showing decreasing nitrate concentrations and stable chloride and TDS concentrations.

5.4 Southern Portion – Perched Aquifer

A trend analysis was conducted with data from 7 monitoring wells with adequate water for sampling within the southern portion's perched aquifer. Decreasing or stable trends for all constituents analyzed were present in 4 of the 7 wells. The majority of analyte trends in the perched aquifer were decreasing or stable.

Nitrate concentration trends are as follows:

- Decreasing Nitrate Trend: AP wells DAD-21 and DAD-26

- Increasing Nitrate Trend: AP wells DAD-09 and DAD-22.

Chloride concentration trends are as follows:

- Decreasing Chloride Trend: AP wells DAD-20 and DAD-21
- Increasing Chloride Trend: Del Oro Dairy well 692-02.

TDS concentration trends are as follows:

- Decreasing TDS Trend: AP wells DAD-20 and DAD-21
- Increasing TDS Trend: Del Oro Dairy 692-02.

In the perched aquifer downgradient of the extraction system, AP wells DAD-20, DAD-21, DAD-26, and DAD-27 have decreasing or stable trends for all analytes. Nitrate concentrations in DAD-26 have steadily decreased since the start of the system in 2022. Nitrate concentrations in DAD-21 decreased precipitously in 2021. During this time, a water line release occurred near the intersection of East O'Hara Road and Anthony Drive from 2019-2021 and nitrate concentrations in nearby wells decreased due to dilution. Since then, concentrations fluctuate but are generally decreasing. Nitrate concentrations in DAD-20 and DAD-27 have been stable.

Also in the perched aquifer downgradient of the extraction system, Del Oro well 692-02, AP well DAD-09, and AP well DAD-22 have had increasing or stable concentrations over the last five years. These trends likely reflect the influences of both the water line leak and repair as well as the installation of the extraction system. DAD-09 is immediately downgradient of the water supply release. Concentrations began to rebound after the repair but remained much lower than the pre-leak concentrations. In 2019, nitrate at DAD-09 had a historically high concentration of 120 mg/L. The highest concentration detected in DAD-09 since the extraction system has been operating is 53 mg/L, far lower than previous record high. Del Oro 692-02 and AP well DAD-22 were also significantly impacted by the water line release and have similar nitrate trends.

6.0 CONTAMINANT PLUME ANALYSIS

In the 2025 Annual Report, a geostatistical analysis was completed to estimate analyte distribution and calculate contaminant plume area (EA 2025). Nitrate plumes were defined as areas where concentrations exceed the NMWQCC nitrate standard of 10 mg/L. Chloride and TDS plumes were defined as areas exceeding the 2016 calculated existing concentrations. Plumes are modeled using 2016 existing condition values rather than updated values in order to maintain a consistent baseline for comparison of year-over-year changes.

Table 8 provides the calculated areas of plumes in the north, central, and south portions for 2016, 2020, and 2025. The following is a discussion of the trend analysis for each portion of the Dairy:

- Northern portion – The cumulative size of the nitrate plume increased in size relative to 2020. Chloride and TDS plume sizes have also increased between 2020 and 2025. The increase in plume size appears to be the result of two factors. The first is an increase in concentrations in the southern portion of the northern area. Many of these wells are to the south of the AP area and as a result are no longer downgradient of DAD dairies due to the shift in groundwater direction to the east. The second is the loss of a northeast delineating well (Organ Dairy 126-09) which is no longer monitored because the dairy is no longer part of the DAD consortium. Although total plume sizes have increased, this does not appear to be the result of groundwater contamination from the dairies. Additionally, the portions of the nitrate and chloride plumes with the highest concentrations have decreased in the last five years.

- Central portion – The cumulative size of the nitrate and TDS plumes are stable relative to the plume sizes in 2020. The cumulative size of the 2025 chloride plume decreased relative to 2020. There are no chloride or TDS plumes as defined by the 2016 existing conditions.

- Southern portion (regional aquifer) – The modeled nitrate plume size increased between 2020 and 2025, although it has decreased relative to the size of the 2021, 2022, and 2023 nitrate plume sizes (EA 2025). The modeled chloride plume size has increased since 2020. TDS has never been detected above existing conditions, and therefore, the plume size has been stable since 2016.

- Southern portion (perched aquifer) – Nitrate, chloride, and TDS plume sizes decreased between 2020 and 2025. The plume sizes may be artificially reduced by the lack of available data for modeling at DAD-20 in February/March 2025. Additionally, modeled plume geometries in the perched aquifer require manual interpretation for large areas and are therefore limited in their ability to offer accurate comparisons from year to year.

7.0 FIRST-ORDER DECAY RATE

First order nitrate decay rates were calculated for wells where nitrate was detected above the standard and nitrate concentrations were exhibiting decreasing trends according to the Mann-Kendall trend analysis discussed in Section 5.0. 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," by Newell, Rifai, Wilson, Connor, Aziz and Suarez, November 2002. Decay rate spreadsheets are presented in Appendix J.

First order decay rates were calculated for a total of eight monitoring wells using data collected between November 2020 and September 2025.

Decay rates are presented for five wells from the northern area and three wells from the central area. Decay rates were not calculated for southern perched aquifer wells located downgradient of the extraction system since reduction in nitrate concentrations may reflect source removal as well as natural degradation. Nitrate decay rates in the southern area’s regional aquifer were not calculated because there were no wells that met the analysis criteria of having concentrations above the standard with decreasing trend. A summary of the results of the decay rate analysis is presented in Table 9.

- Northern Area: Nitrate decay rates ranged from 0.0251 $years^{-1}$ to 0.4095 $years^{-1}$ in Organ well 126-13, Mountain View wells 70-01 and 70-02, Dominguez 2 well 42-06, and AP well DAD-12. These rates correspond to an average half-life of approximately 9.5 years. In the northern locations where the decay rate was calculated, cleanup times averaging nine years are expected.

- Central Area: Nitrate decay rates ranged from 0.0156 $years^{-1}$ to 0.1567 $years^{-1}$ in Big Sky wells 833-02 and 833-05, and AP well DAD-08. The predicted average half-life was calculated at approximately 22.8 years and the average predicted cleanup time was calculated as approximately 42.3 years for the locations where decay rate was calculated. The average is significantly impacted by the cleanup time for DAD-08 which is projected to take 92 years. Without this well, the estimated cleanup time is 17.5 years.

8.0 EFFECTIVENESS OF SELECTED REMEDIES

8.1 MONITORED NATURAL ATTENUATION IN THE REGIONAL AQUIFER

Monitored natural attenuation was selected as the remedy for in the Dona Ana Dairies S2AP and currently applies to the northern, central and southern areas of the regional aquifer. MNA refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time-frame that is reasonable compared to that offered by other more active methods (USEPA 1999). The MNA process includes biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay, and chemical or biological stabilization, transformation, or destruction of contaminants (USEPA 1999).

MNA is appropriate where it can be demonstrated as capable of achieving remediation goals within a reasonable time-frame when compared to other technically appropriate alternatives, as stated by the Office of Solid Waste and Emergency Response Directive (USEPA 1999).

The upcoming discussion will use the evidence presented in this report to show that nitrate is being reduced through natural attenuation within a reasonable timeframe in the regional aquifer.

Evidence for the Occurrence of Natural Attenuation

The majority of nitrate, chloride, and TDS concentration trends in regional aquifer wells were decreasing or stable between 2020 and 2025. In the northern area, downgradient wells on the eastern boundary generally exhibit decreasing or stable nitrate, chloride, and TDS trends. In the central area nitrate, chloride, and TDS concentrations were either stable or decreasing at downgradient wells. These downgradient wells have nitrate concentrations below the standard and chloride and TDS concentrations below existing conditions.

Within the southern area of the regional aquifer, the vast majority of analyte trends are stable. Also, all southern regional wells have nitrate concentrations below the standard except for Del Oro well 692-05, which has stable concentrations of nitrate, chloride, and TDS. Downgradient well DAD-10 has decreasing nitrate concentrations that are below the standard and often below laboratory reporting limits.

Despite the lack of evidence that denitrification is occurring at a site-wide scale, natural attenuation is occurring at the Dairies. Evidence suggests that the mechanisms are primarily dilution and dispersion.

Reasonable Time Frame

The Stage 2 Abatement Plan estimated a cleanup time at 13 to 35 years (EA 2013b). With this estimate, site cleanup would be achieved by the year 2048. The estimated cleanup times assumed a decade or two for the completion of transient drainage combined with an average of 3 to 15 years for estimated time to reach cleanup. As stated above in Section 7.0, an average post-transient drainage cleanup time is now estimated at an average of nine years in the northern area and an average of 42 years in the central area. While the timeframe estimate from the central area exceeds the estimated timeframe stated in the Stage 2 Abatement Plan, the average is significantly impacted by the estimated time to cleanup for one well at 92 years. Excluding that well, the average estimated cleanup time for wells with decreasing nitrate in the central area is 17.5 years.

It should be noted that "actively cleaning up" contamination in the vadose zone is not practicable since no technologies are readily available to remove nitrate, chloride, and TDS from the soil beneath the lagoons. Therefore, the cleanup time for any groundwater technology employed is limited by the transient drainage of contaminants from the vadose zone, and comparison of groundwater cleanup times should be for that portion of the total cleanup after the drainage (and hence the sourcing of contaminants to groundwater) is complete. In this context, the estimated cleanup times are quite favorable relative to active remediation and are "within a reasonable timeframe" compared to active remediation as per guidance (USEPA 1999).

Additionally, nitrate contamination is technically and economically impracticable to remediate with an engineered remediation system (McQuillan et al. 2005). In a study of septic tanks that have caused nitrate contamination in Corrales, New Mexico, the NMED recommended approach has been MNA. Natural attenuation and source control are the only practicable means of aquifer restoration (McQuillan et al 2005).

8.2 PUMP AND REUSE SYSTEM IN THE SOUTHERN AREA PERCHED AQUIFER

The pump and reuse system at Del Oro Dairy has removed over 2,000 pounds of nitrate from the perched aquifer. Additionally, several wells completed in the perched aquifer downgradient of the extraction system have decreasing or stable trends for all analytes which may be attributed to extraction system operation.

As discussed in Section 3.3.2, confounding factors exist that complicate interpretation of analyte trends. A water line release occurred near the intersection of East O'Hara Road and Anthony Drive from 2019-2020/2021. The release decreased analyte concentrations and then concentrations rebounded after the water line repair. Concentrations had not stabilized before the extraction system operation began in 2023 resulting in a lack of clear baseline concentrations that can be used to evaluate the effectiveness of the extraction system. Additionally, there is evidence of a recent subsurface water release which may have impacted recent analyte concentrations. Groundwater mounding can first be observed in the perched aquifer in November 2024 and in the regional aquifer in February 2025.

9.0 DATA GAPS

Nitrate concentrations exceed the NMWQCC standard of 10 mg/L at the eastern boundary of the central abatement plan area in three wells. Two of the wells (AP wells DAD-06R and DAD-15) have relatively low nitrate concentrations at less than three times the NMWQCC standard. This suggests that the estimated plume provides a reasonable estimate of the true plume extent in this area. The third well, AP well DAD-07, is the furthest south and had the highest nitrate concentration in September 2025 at 56 mg/L. Although the central area nitrate plume is not delineated east of AP well DAD-07, installation of a new well is not recommended due to the lack of roads and sandy terrain east of I-10 that would prevent drill rig access. Although a well could be installed in the I-10 corridor, this is not recommended due to the short distance between the DAD-07 and a potential new well (approximately 400 ft). Additionally, risk to nearby potential receptors is low. According to the New Mexico Office of the State Engineer database, the nearest well east of DAD-07 is approximately one mile away in a cross-gradient direction.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This groundwater monitoring event included the gauging of all accessible DP and AP wells and sampling of all accessible wells that contained sufficient water. Based on the data collected this quarter and over the last five years, the following conclusions and recommendations are presented:

10.1 Hydraulic Gradient and Direction of Groundwater Flow

- Depth to groundwater ranged from 13.43 ft btoc in Sunset well 257-03 to 138.41 ft btoc in Dominguez 2 well 42-12.

- On average, water levels decreased in the northern area (0.12 foot), central area (0.17 foot), and southern area (0.03 foot) of the regional aquifer. In the southern perched aquifer, groundwater elevations increased by an average of 0.14 feet.

- During the most recent gauging event, groundwater flow direction of the northern regional aquifer varied from east-northeast to southeast. Flow direction in the central and southern portions of the regional aquifer were generally to the southeast. Groundwater flow direction in the southern perched aquifer was to the south-southwest.

- The hydraulic gradient across the Dairies in the regional aquifer is 0.001 ft/ft. The hydraulic gradient in the perched aquifer in the southern area was approximately 0.006 ft/ft.

- Groundwater flow has been evolving in the regional and perched aquifers of the southern portion. Groundwater mounding can first be observed in the perched aquifer in November 2024 and in the regional aquifer in February 2025. Groundwater gradient has been consistent in the regional aquifer, but has increased in the perched aquifer from 0.004 ft/ft in November 2024 to its current gradient of 0.006 ft/ft.

10.2 Groundwater Nitrate, Chloride, and TDS Analytical Results

- Nitrate concentrations were below the NMWQCC standard of 10 mg/L in 13 of the 27 AP monitoring wells sampled this quarter.

- Chloride and TDS generally remain at or above standards in wells across the site, including upgradient of the northern, central, and southern portions at the Dairies.

- Anomalous analytical concentrations were detected in groundwater collected from five wells spread throughout the DAD AP area in August/September 2025. Unusually high concentrations of nitrate, chloride, and/or TDS were present in some wells and unusually low concentrations were present in others. TKN concentrations were consistent with historical results in all wells. Analytical results from these wells will be observed in future monitoring events.

10.3 CSIA Results

- CSIA analysis was completed for groundwater from 16 wells in 2025. Analysis does not indicate that denitrification is occurring, except in select locations.

10.4 Calculation of Existing Conditions

- Existing conditions were calculated for chloride and TDS for the northern, central, and southern portions of the Dairies based on data collected between November 2020 and September 2025.

10.5 Trend Analysis

- Trend analysis indicates that 11 of the 28 wells analyzed in the northern portion had decreasing or stable trends for nitrate, chloride, and TDS.

- Trend analysis indicates that 17 of the 30 wells analyzed in the central portion had decreasing or stable trends for nitrate, chloride, and TDS.

- Trend analysis indicates that 6 of the 7 wells analyzed in the southern area of the regional aquifer had decreasing or stable trends for nitrate, chloride, and TDS.

- Trend analysis indicates that 4 of the 7 wells analyzed in the southern area perched aquifer had decreasing or stable trends for nitrate, chloride, and TDS.

10.6 Contaminant Plume Analysis

- Northern portion - The total size of the nitrate, chloride, and TDS plumes increased between 2020 and 2025. The increase in plume size is likely due to factors unrelated to activities on the DAD consortium dairies. The highest concentrations within the nitrate and chloride plumes have decreased in the last five years.

- Central portion - The cumulative size of the nitrate and TDS plumes are stable relative to the plume sizes in 2020. The cumulative size of the 2025 chloride plume decreased relative to 2020. Chloride and TDS concentrations are below the 2016 existing conditions, resulting in plume sizes of zero acres.

- Southern portion (regional aquifer) – The modeled nitrate plume size increased between 2020 and 2025 but has decreased relative to the size of the 2021, 2022, and 2023 nitrate plume sizes (EA 2025). The modeled chloride plume size has increased since 2020. TDS has never been detected above existing conditions, and therefore, the plume size has been stable since 2016.

- Southern portion (perched aquifer) – Nitrate, chloride, and TDS plume sizes decreased between 2020 and 2025. The plume sizes may be artificially reduced by the lack of available data for modeling at DAD-20 in February/March 2025. Additionally, modeled plume geometries in the perched aquifer require manual interpretation for large areas and are therefore limited in their ability to offer accurate comparisons from year to year.

10.7 First Order Nitrate Decay Rates

- Nitrate decay rates in the northern area ranged from 0.0251 $years^{-1}$ to 0.4095 $years^{-1}$. These rates correspond to an average half-life of approximately 9.5 years. In the northern locations where the decay rate was calculated, cleanup times averaging nine years are expected.

- Nitrate decay rates in the central area ranged from 0.0156 $years^{-1}$ to 0.1567 $years^{-1}$. The predicted average half-life was calculated at approximately 22.8 years and the average predicted cleanup time was calculated as approximately 42.3 years for the locations where decay rate was calculated. The average is significantly impacted by the cleanup time for DAD-08 which is projected to take 92 years. Without this well, the estimated cleanup time is 17.5 years.

- Nitrate decay rates in the southern area's regional aquifer were not calculated because there were no wells that met the analysis criteria of having concentrations above the standard with decreasing trend.

- Nitrate decay rates in the southern area's perched aquifer were not calculated because a reduction in nitrate concentrations is likely be the result of source removal by the extraction system rather than natural degradation.

10.8 Effectiveness of Selected Remedies

- Evidence suggests that natural attenuation is generally occurring at the site and that cleanup will occur within a reasonable timeframe. Continuation of MNA for the regional aquifer is recommended for the site.

- In the southern perched aquifer, the extraction system has removed over 2,000 pounds of nitrate since the system has started. Additionally, several wells completed in the perched aquifer downgradient of the extraction system have decreasing or stable trends for all analytes which may be attributed to extraction system operation. Continued operation of the extraction system is recommended.

10.9 Data Gaps

- The central area nitrate plume is not delineated east of AP well DAD-07. However, installation of a new well is not recommended due to the lack of roads and sandy terrain east of I-10 that would prevent drill rig access. Although a well could be installed in the I-10 corridor, this is not recommended due to the short distance between the DAD-07 and a potential new well (approximately 400 ft). Additionally, risk to nearby potential receptors is low. According to the New Mexico Office of the State Engineer database, the nearest well east of DAD-07 is approximately one mile away in a cross-gradient direction.

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