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January 10, 2020

Ms. Michelle Hunter
Bureau Chief
Ground Water Quality Bureau
1190 South St. Francis Drive
Santa Fe, New Mexico, 87502

RE: Stage 1 Abatement Plan Proposal for Rockhill Dairy, DP-952

Dear Ms. Hunter:

Attached please find the above referenced Stage 1 Abatement Plan Proposal prepared by Glorieta Geoscience, Inc. submitted on behalf of Rockhill Dairy, DP-952, in accordance with the Settlement Agreement of August 13, 2019 between Villalpando Diaries and NMED.

If you have any questions on this matter, please contact me at 505/983-5446, ext. 111.

Sincerely,

Paul Drabos, V.P. for

Jay Lazarus
Pres./Sr. Geohydrologist

cc: Carol Irvin, Rockhill Dairy

STAGE 1 ABATEMENT PLAN PROPOSAL
ROCKHILL DAIRY DP-952
CHAVES COUNTY, NEW MEXICO

Prepared for:

Rockhill Dairy
104 East Ojibwa Road
Dexter, New Mexico

Prepared by:

GLORIETA GEOSCIENCE, INC.

January 10, 2020

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TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

LIST OF ABBREVIATIONS

ac-ft – acre-feet
ags – above ground surface
amsl – above mean sea level
AP – Abatement Plan
bgs – below ground surface
Cl – chloride
DP – Discharge Permit
DQO – Data Quality Objectives
CSM – conceptual site model
EPA – United States Environmental Protection Agency
ft – foot or feet
ft^2 – square feet
GGI – Glorieta Geoscience, Inc.
GWQB – Ground Water Quality Bureau
gpd – gallons per day
HASP – health and safety plan
in – inch(es)
k – hydraulic conductivity
LAA – land application area
mg/kg – milligram(s) per kilogram
mg/L – milligram(s) per liter
N - nitrogen
NMAC – New Mexico Administrative Code
NMED – New Mexico Environment Department
NMOSE – New Mexico Office of the State Engineer
NMWQCC - New Mexico Water Quality Control Commission
NO_3 – nitrate
NRCS – Natural Resource Conservation Service
PQL – practical quantification limit
ppm – parts per million
PVC – polyvinyl chloride
QA/QC – Quality Assurance/Quality Control
QAPP – Quality Assurance Project Plan
S – storage
SA – Settlement Agreement
SAP – Sampling and Analysis Plan
SO_4 – sulfate
T – transmissivity
TDS – total dissolved solids
TKN – total Kjeldahl nitrogen
USGS – United States Geological Survey

1.0 INTRODUCTION

Glorieta Geoscience, Inc. (GGI) submits this Stage 1 Abatement Plan (AP) Proposal on behalf of Rockhill Dairy, DP- 952 (Dairy), to satisfy requirements with the New Mexico Environment Department (NMED) as required under Title 20 New Mexico Administrative Code (NMAC) 6.2 §4106 through §4110 regarding impacts to groundwater quality at the Dairy. This Stage 1 Abatement Plan Proposal is submitted in response to the AP required under the Settlement Agreement (SA) between the Dairy and the NMED, approved by the Water Quality Control Commission on August 13, 2019. This AP includes components of a Field Investigation, Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), a site-specific Health and Safety Plan (HASP) and satisfies Stage 1 AP Proposal requirements cited in Title 20 New Mexico Administrative Code (NMAC) 6.2 §4106 through §4110. GGI has researched historical data available at the time this document was produced. Some historical data were collected by consultants and individuals not affiliated with GGI. GGI reserves the right to modify information within this AP as new or more accurate information is discovered or made available.

1.1 GENERAL PROJECT BACKGROUND

Rockhill Dairy is located at 104 East Ojibwa Road, south of Dexter, New Mexico, within Chaves County (Figure 1). The Dairy is situated within the greater Pecos River Valley in an agricultural area where irrigated farmland and dairies predominate. Irrigated farmland is located immediately adjacent to the east, south and southeast of the Dairy. Operating dairies are located to the east, northeast and southeast of the Dairy, with non-irrigated pasture land adjacent to the north and south. A small-scale cattle feed yard is located northeast of the dairy. Within a one-mile radius of the Dairy there are two operating dairies, Dexter/Starry Night Dairy and Dan Dee Dairy. Numerous septic tanks are in use within a one-mile radius of the Dairy.

The August 13, 2019 SA specified that the Dairy submit a complete Stage 1 Abatement Plan proposal, stating in part:

> "Dairy Stage 1 Abatement Plans: Rockhill, Creekside, Dexter, Starry Night and Orchard Park shall each prepare and submit a Stage 1 Abatement Plan to NMED by the deadlines in this Section 4. Dexter and Starry Night will submit a joint Stage I Abatement Plan based on NMED's request that the two facilities apply for a joint permit, and once combined, both dairies will share NMED Discharge Permit DP-606. In consideration of the limited resources of the Dairies' contactors to prepare and submit the Stage I Abatement Plans, and NMED personnel to review and administer the Stage 1 Abatement Plans, the following deadlines shall apply:
>
> a. Rockhill shall file a Stage 1 Abatement Plan no later than 150 days after the Effective Date of this Settlement Agreement.
>
> (SA, pages 3 and 4)

The intent of this AP is therefore to define the extent of any elevated concentrations originating from the site caused by past discharges related to the facility and to provide the data necessary to select and design an effective abatement option.

The Dairy is permitted under Groundwater Discharge Permit (DP), DP-952 issued September 26, 2010 and subsequently re-applied for on March 5, 2018. The Dairy is permitted to discharge up to 80,000 gallons per day (GPD) of dairy greenwater. Greenwater is stored within a synthetically lined lagoon system of four impoundments and is land applied to eight Land Application Area (LAA) Fields totaling 360 acres. Groundwater quality at the Dairy is monitored quarterly, as required by the DP. The Dairy's monitoring and production wells are included within Rockhill Dairy's Abatement monitoring. There are currently four monitoring wells specifically designated as the Dairy monitoring wells (Figure 2).

However, MW-2 and MW-3 have recently been reported as dry and no water quality results have been available since the first quarter of 2018 for both wells. No other monitoring wells at other locations in the immediate area of the Dairy are reasonably close to provide meaningful proxy data for these two wells for the purposes of this AP.

The Dairy has four monitoring wells that have been shown to exceed 10 mg/L nitrate within the last five years. MW-1 has ranged from 11 to 18 mg/L nitrate, MW-2 has ranged from 50 to 90 mg/L nitrate and has since been reported to be dry beginning in May 2018, MW-3 has ranged from 10 to 17 mg/L nitrate and has also been reported to be dry beginning in May 2018, and MW-4 has ranged from 22 to 44 mg/L nitrate.

Chloride concentrations remain low at MW-1, MW-3 and MW-4, well with the NMWQCC standard of 250 mg/L, while MW-2 has exceeded the standard over the last five years ranging from 370 to 400 mg/L.

Sulfate at MW-1 has ranged from 290 to 710 mg/L, at MW-2 from 1000 to 1400 mg/L, for MW-3580 to 740 mg/L and for MW-4 from 640 to 900 mg/L, over the last five years.

TDS has ranged from 659 to 1500 mg/L at MW-1, from 2810 to 3490 mg/L at MW-2, from 1420 to 2360 mg/L at MW-3 and from 1540 to 2440 mg/L at MW-4, for the last five years.

The monitoring wells are sampled quarterly for nitrate, total Kjeldahl nitrogen (TKN), chloride, sulfate and total dissolved solids (TDS). A summary of analytical data is presented in Table 1.

1.2 SUSPECTED CHEMICALS OF CONCERN

Constituents described within NMED abatement requirements and associated with the Dairy include those listed within the Discharge Permit: nitrogen as nitrate (NO_3), chloride (Cl), Total Dissolved Solids (TDS) and sulfates (SO_4). Nitrate, chloride, TDS and sulfate have been found to exceed NMWQCC standards for groundwater. Elevated TDS, chloride and sulfate concentrations in groundwater are not generally considered to be threats to human health. Extremely high concentrations of nitrate in drinking water have been seen to be a health risk to humans. High sulfate and nitrate concentrations in drinking water can be a health risk to livestock.

2.0 SITE SETTING

The following subsections provide the general setting for the Dairy including geology, hydrogeology, and potential receptors as related to this Modified Stage 1 AP proposal.

2.1 TOPOGRAPHY

Topographical information was obtained from review of topographic maps. Figure 1 shows that the property is located at approximately 3,537 feet above mean sea level (msl). The land surface slopes very gently (approximately 20 feet/mile) generally to the east. There appears to be an arroyo or riverbed along the southern edge of the property.

2.2 GEOLOGIC AND HYDROLOGIC SETTING

The Dairy property is located within the Roswell Artesian Basin. The aquifers beneath the Dairy include an unconfined alluvial aquifer that ranges from 10 to 300 feet in thickness, commonly referred to as the "shallow" aquifer and a confined artesian aquifer. The shallow alluvial aquifer overlies the San Andres confined or artesian aquifer. The San Andres artesian aquifer is up to 1,200 feet thick in some locations.

The artesian system is recharged from snow melt and rainfall in the Sacramento Mountains to the west. Shallow groundwater has historically been recharged from an upward leaking artesian aquifer (Welder, 1983), however due to heavy artesian aquifer pumping, upward recharge of the shallow aquifer may not be as significant and widespread as it once was in the area. The largest use of groundwater in the basin, both shallow and artesian, is irrigation.

The hydrology beneath the Dairy and throughout the general area is complex. Many of the monitoring wells located within just over one-mile of the dairy are completed in what is considered to be a perched saturated zone, and not the true alluvial aquifer. A potentiometric surface map is included within this Proposal. Data thus far suggests that the perched saturated zone originates from irrigation return flow, and is not part of the original, natural shallow aquifer system in the region.

Recent water level measurements indicate that shallow groundwater at the Dairy currently ranges from approximately 78 to 137 feet below ground surface (bgs), with the regional groundwater flow direction to the east-southeast. Groundwater flow at Rockhill is moving to the west-northwest. Water levels in both the shallow aquifer and perched saturated zone under the Dairy have trended downward in recent years (although depth to groundwater in MW-4, the most upgradient well, has risen in elevation between 2012 and 2018). Hydrographs will be prepared as part of Stage 1 reporting.

Geologic Units

A general geologic map based on the state geologic map is provided in Figure 3. This map shows that the Rockhill Dairy property is underlain by units *Qa* and *Qp* which are Quaternary age (Holocene to Upper Pleistocene) alluvial and piedmont alluvial deposits, respectively. Lithologic unit *Qa* is alluvium (stream deposits). Lithologic unit *Qp* includes deposits of higher gradient tributaries bordering major stream valleys, alluvial veneers of the piedmont slope, and alluvial fans; and may locally include uppermost Pliocene deposits. Lithologic unit *Qoa*, to the west of the property, is older alluvium deposits of the middle to lower Pleistocene (Scholle, 2003).

Also to the west of the property are lithologic unit *Qep*, eolian and piedmont deposits, and the San Andres Formation (*Psa*) which is limestone and dolomite with minor shale (Scholle, 2003). To the east of the property is the Artesia Group (*Pat*) and the Santa Rose Formation (*Trs*). The Artesia Group is marine shelf facies forming broad south-southeast trending outcrops from Glorieta to Artesia area. The Group includes the Tansill, Yates, Seven Rivers, Queen and Grayburg Formations (sandstone, siltstone, limestone, dolomite, anhydrite, gypsum, and red mudstone, respectively). The Santa Rosa Formation is a sandstone that includes the Moenkopi Formation in this location of the state (Scholle, 2003). The Salado Formation (*Psl*) is an evaporate sequence that is predominantly halite, and the Rustler Formation (*Pr*) is an interbedded siltstone, gypsum, sandstone and dolomite. Both crop out to the southeast of the Dairy property (Figure 5).

The Dairy property lies within a distal alluvial slope east of the San Andres Mountains and west of the Pecos River. This corridor is underlain by a shallow alluvial aquifer consisting of unconsolidated sand and gravel derived from the eroding slopes of limestone and sandstone on the east side of the Sacramento Mountains. This aquifer is generally less than 250 feet thick (Barroll and Shomaker, 2003).

The shallow alluvial aquifer is separated from the deeper artesian aquifer by the low permeability beds of mudstone and evaporites in the Artesia Group in this area. The San Andres artesian aquifer is 300 to 500 feet thick and extends under the Pecos River where the top of the aquifer is reached at a depth of approximately 1,100 feet.

There are several northeast trending faults and fracture zones, part of the Pecos Buckles, through the San

Andres Formation west of the property. There are no mapped faults through the Dairy property.

The nearest surface water is the Pecos River, located approximately 6 miles to the east of the Dairy.

2.3 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was compiled to assist in the design of the sampling activities to be performed at the Dairy. This CSM will be refined as more data become available from the on-going site investigation. These data will include investigation derived, site-specific hydrogeologic parameters, and additional groundwater and soil data to better define the extent of any soil and/or elevated concentrations of groundwater at the Dairy.

Potential Contaminant Sources
Greenwater and stormwater lagoons, chemical fertilizer, manure-based fertilizer, septic systems and cesspools can be potential contaminant sources for nitrate impacts to groundwater. These are the principal sources that are being reviewed in the modified Stage 1 AP. Table 5 provides a summary of site-specific potential sources and the assessment efforts to determine the probability that the sources are contributing to the elevated groundwater concentrations. Chloride and TDS found in samples collected from the Dairy monitoring wells in levels exceeding NMWQCC standards are possibly due to existing or background concentrations in areas of shallow groundwater. Sources of these constituents are geologic units within water bearing strata, soils and shallow aquifer recharge from irrigation with groundwater naturally high in those constituents. For example, MW-4, the most upgradient monitoring well has elevated concentrations of SO_4 (ranging from 140 to 900 mg/L and trending upward, between 2012 and 2018), NO_3 (ranging from 22 to 44 mg/L and trending upward, between 2012 and 2018) and TDS (ranging from 1540 to 2010 mg/L between 2012 and 2018).

Release Mechanisms
Regulated constituents in manure or greenwater may be released to groundwater by two principal means: primary release mechanisms and secondary release mechanisms.

Primary release mechanisms at the Dairy include:

- Stormwater run-off that discharged to unlined stormwater lagoons;
- Infiltration of stormwater or greenwater from manure/soil-lined lagoons; and
- Infiltration of stormwater or greenwater from spill(s) or breaching of lagoons.

Secondary release mechanisms include:

- Soil leachate migrating vertically to groundwater.

Transport of nitrate, chloride and TDS once released, is by infiltration (e.g., leaching to groundwater), and groundwater transport. Potential pathways include soil leaching to groundwater and, in turn, migration to wells by natural gradient transport and localized pumping effects.

An in-depth study of potential receptors in and around the Dairy is currently being conducted by GGI. A preliminary search of the New Mexico Office of the State Engineer (NMOSE) records for wells located within at least one mile of the Dairy boundaries has been performed, identifying the permitted points of

diversion, and is summarized in Appendix B. Wells completed within the shallow aquifer, and situated down-gradient of the Dairy may be considered as potential receptors for the elevated nitrate, TDS, sulfate and chloride currently impacting the Dairy.

Upon completion of the potentiometric surface and isoconcentration maps focused on the Dairy, GGI will identify potential downgradient receptors using Office of the State Engineer (OSE) well completion records, and will then propose sampling of relevant receptors. A map showing all potential receptors within a one-mile radius of the site will be prepared as part of Stage 1 AP Activities.

3.0 EXISTING DATA SUMMARY AND HISTORICAL OPERATIONS

Existing historical operations of the Dairy and monitoring data have been compiled and summarized, below. Additional information relevant to Dairy operations will be continually compiled during ongoing research of the facility and will be included within the Stage 1 Abatement Report.

3.1 OPERATIONAL HISTORY

Rockhill Dairy is an animal feeding operation (AFO) with approximately **2,200 milking cows and an additional 200 heifers and dry cows.** The Dairy is currently permitted for a discharge of 80,000 gallons per day (gpd), and has applied for 80,000 gpd discharge within its DP Application Renewal and Modification, submitted to NMED on March 5, 2018. Current flows from the Dairy has been somewhat higher (>250,000 gpd).

The Dairy has a single milking barn which discharges greenwater through a flush alley system and ultimately to a sump located southeast of the milking barn (see Figure 2, and Historical Aerial Photos and Site Maps, Appendix C). The greenwater is pumped from the sump to a screen separator located on the east side of the greenwater lagoon system. The separator is used to remove bulk manure solids from the greenwater prior to discharge into the greenwater lagoon system that includes three separate cells. Lagoon WW-1 and WW-2 provide additional settling of solids prior to transfer of the greenwater to the larger Lagoon WW-3 which is south the two smaller cells. Each of the cells in the lagoon system is lined with 40 mil high-density polyethylene (HDPE) membranes.

A free stall corral system is used in the Dairy operation. The six main corrals used for the milking cows, are oriented north, south, east and west from the milking parlor and generally surround the milking parlor, which is oriented west to east. Dry cows and heifers are housed in corrals located west of the milking cow corrals. There is a commodity/hay storage area and green silage storage along the south side of the facility, between the corrals and the lagoon system.

Stormwater runoff from the corrals and the production area drain primarily to the southeast and have surface flow toward a runoff pond south of the corrals. One stormwater impoundment, SW-1, is described within the current Discharge Permit. Stormwater is pumped from the permitted impoundment into the synthetically lined lagoon system. An additional stormwater impoundment is located on the southwest corner of the Dairy and capture flow from the corrals immediately to the north. This RSC is clay-lined and is evaporative in method of disposal.

The Dairy currently uses eight land application areas for irrigation with greenwater from the lagoon system; two are large center pivot irrigated fields of 120 and 150 acres, and the rest are flood irrigated fields between six and 25 acres, located east of the dairy toward Alsea Drive. These fields were installed in approximately 1998 for the delivery of the greenwater blend. The current groundwater Discharge Permit for the Dairy lists a total of 360 acres of pivot irrigated and flood field lands as used for land

application of greenwater from the Dairy. As part of Stage 1 AP activities, a complete history of the land application area will be compiled and reported within the Stage 1 Report.

Based on the most recent groundwater analytical results of September 2019, samples collected from two of the four monitoring wells were shown to contain nitrate concentrations in excess of the WQCC standard of 10 milligrams per liter (mg/L); the other two wells were dry. Monitoring well MW-4, the most upgradient well, the monitoring well east of the stormwater impoundment and the lagoons, contained the highest nitrate concentration of 42 mg/L. The sample collected from well MW-1, which is located on the western edge of the dairy property and the most down gradient, was shown to contain 18 mg/L of nitrate.

In order to attempt to define existing plume boundaries for nitrate, chloride, sulfate and TDS, GGI will construct isoconcentration maps for the Stage 1 AP Report, using the most recent two quarters and future two quarters of analytical data collected at the Dairy. The construction of these maps, along with direction of groundwater flow and gradient determinations, will provide the basis for making additional abatement decisions for the Dairy. Without these maps, it is not possible to properly locate or propose any deep soil sampling, soil borings or monitoring well installations. Therefore, recommendations for such intrusive investigations will be made within the Stage 1 Abatement Plan. Soil sampling to three feet bgs is included within the scope of this Stage 1 AP proposal.

3.2 LINER UPGRADES

The greenwater lagoon system at the Dairy was upgraded to a three-celled synthetically lined lagoon system in 2008 or 2009. At that time, the new system was installed south of the corrals and commodities storage areas. The existing lagoons have not been brought to grade nor has grading around the former lagoons been accomplished to prevent runoff from collecting within the former lagoon.

3.3 LAND APPLICATION AREAS

The Dairy currently uses six land application areas (LAAs) for irrigation with greenwater from the lagoon system. The fields consist of a single flood field, two 30 acre center pivot fields, two120 acre fields and one 70 acre half-pivot for delivery of the greenwater blend. Monitoring wells MW-2 (recently reposted as dry) and MW-4 are currently located down gradient of land application.

The Dairy is prepared to install a monitoring well down gradient of the land application areas as part of the pending Discharge Permit renewal.

3.4 POTENTIAL FLUID ACCUMULATION AND INFILTRATION AREAS

The Dairy property is graded to drain rainfall toward the runoff impoundments (Figure 2). The corrals and sections of the property boundary are bermed to prevent runoff from leaving the property. Manure is not stored on-site except for short periods of time prior to land application of the solids. The Dairy is contracted with manure haulers and solids are used on-site at selected fields or is taken off-site on bi-weekly to monthly basis. The sump located at the back (south) of the milking parlor is the only sump that has been used at the Dairy. The sump has had minor overflows at periods of intense precipitation, however clean-up and pumping of the over-flow was quickly accomplished. Most overflows would have drained to the stormwater impoundment located northeast of the sump. There are no records or recollection of significant/prolonged over-flows at any water troughs at the Dairy. Pumps used to fill water troughs are a considerable source of electrical usage at the Dairy, and therefore a significant operations cost. Leaks and malfunctions at watering troughs are remedied as soon as they are discovered. Green silage is stored along the western side of the Dairy, but is not considered to be a significant

potential source of elevated concentrations. Cow pens are graded on an almost daily basis, so any low spot within the pens are eliminated on that same timeframe.

3.5 SOURCE CONTROLS

The Dairy installed a synthetically lined lagoon in 2008 or 2009 to store greenwater, thereby technically taking the clay/manure lined lagoon out of operation. However, the former lagoons were not closed or re-graded and they continue to collect runoff. As part of Stage 1 Abatement Activities, the Dairy will work with the Natural Resources Conservation Service (NRCS) to acquire EQUIP Funding to re-grade the production areas, to improve drainage patterns and runoff control, to permanently close the former lagoons and any other depressions that regularly collect runoff. A summary of proposed Abatement actions for the Dairy is provided within Table 2.

Initial observations at the Dairy indicate that the flows from the dairy parlor and immediately surrounding corrals and shade structures contribute stormwater to the sump in excessive amounts during large rain events. Additional study of the drainage and collection system are in order. As a separate issue, added oversight and control of the hose lines in the milking parlor are also necessary. Both stormwater and uncontrolled hoses may be significant contributors of flow to the lagoon and to land application fields.

The Dairy manages surface runoff in accordance with its Discharge Permit and does not have any recorded incidents of spills. The lagoons are, and will continue to be, cleaned and maintained on a regular basis. Manure solids are, and will continue to be used on-site or hauled off-site, with only temporary, minor stockpiling on-site. Abatement efforts will be focused on source control and source identification.

3.6 MONITORING WELL DATA

Historical water level measurements and analytical laboratory data for the Dairy are summarized in Table 1. All available historical water level and analytical laboratory sampling data for the Dairy were reviewed for reliability. Data presented within this proposal are considered reliable as they were submitted to NMED as part of DP requirements; however, GGI did not collect all data reported within Table 1. Beginning in May 2018 for the first quarter sampling, MW-2 and MW-3 have been reported as dry or containing insufficient water for sampling. MW-1 is a domestic well used for monitoring purposes.

Nitrate Data

Reported nitrate concentrations, from the groundwater sampling events conducted between 2012 and 2018 show samples collected from wells MW-1, MW-2 and MW-4 with concentrations ranging from <1.0 mg/L to 90 mg/L, with all three wells showing exceedances above the NMWQCC standard. In addition, it should be noted that nitrate concentrations in MW-1, MW-2 and MW-4 over that same period have been decreasing. MW-1 and MW-3 have been sporadically below and above the standard in that period. MW-3 was above the standard when sampling began in the second quarter of 2012, but has been below the standard since the second quarter of 2015. MW-2 and MW-4 have been consistently above the standard in the range of 50 to 90 mg/L at MW-2, with MW-4 in the 20 to 44 mg/L range. Monitoring wells MW-2 and MW-4 during this period began with result for NO_3 above the standard. MW-4 is the most upgradient well. MW-2 is located within LAA Field 3, upgradient of the former lagoon and screen separator.

Chloride Data

For the 2012 to 2018 sampling period, chloride concentrations were below the NMWQCC standard for

MW-1, MW-3 and MW-4. MW-2 has been consistently above the standard beginning in 2012 (MW-2 now has insufficient water to sample).

Sulfate Data

For the 2015 to 2018 sampling period that was conducted for sulfate analysis, sulfate has been found above the NMWQCC standard periodically at MW-1 and consistently above the standard for MW-2, MW-3 and MW-4, although the most recent result for MW-3 in early 2018 was found to be in compliance (MW-3 has since had insufficient water to sample). The sulfate concentrations in MW-3 and MW-4 have been relatively consistent within this period. Sample results for MW-2 have been much high than the other wells (MW-2 is has had insufficient water for sampling in recent quarters).

TDS Data

Analytical results from 2012 to 2018 sampling events show TDS concentrations in exceedance of the NMWQCC standard at all four monitoring wells although MW-1 and MW-2 have alternated with concentrations above and below the standard. All wells during this period began with result for TDS above the standard.

None of the samples collected from the four dairy monitoring wells were shown to consistently contain method detectable levels of TKN. Historically, TKN has not been a concern in groundwater at the Dairy.

GGI will use groundwater flow direction data and the most recent groundwater analytical data from each of the Dairy monitoring wells to construct four quarters of Rockhill Dairy-focused isoconcentration maps for nitrate, chloride, sulfate and TDS data.

3.7 SOIL DATA

Analytical data for soil samples collected within Land Application Areas was not found within NMED files for DP-952. GGI is attempting to locate historical soil sampling results for the Dairy. NMED files will be researched again, along with Dairy files, former and currently involved consultants to the dairy and soil sampling contractors known to have provided soil sampling services to the Dairy. Historical and current soil sampling results will be tabulated and included within the Stage 1 AP Report. Soil sampling has been conducted in September 2019. Results from this event will be used to determine if any deep soil sampling is required to delineate nitrate and chloride within the soil profiles at the Dairy.

3.8 HISTORICAL GROUNDWATER GRADIENT AND FLOW DIRECTION

Historical data from quarterly monitoring reports show shallow groundwater flow direction at the Dairy is generally toward the west-northwest, with flow in the regional aquifer more towards the east-southeast. Historical groundwater levels and monitoring well survey information for the Dairy monitoring wells were used to create potentiometric surface maps included within this proposal. Data from 2012 to 2018 were used to generate the groundwater flow isocontours. Using MW-2 and MW-4, for which most of the groundwater elevation data exists for this site, a groundwater gradient was determined to be 0.01729 ft/ft. It is uncertain if the gradient actually turns 180-degrees to the southeast at the Dairy, or if there is a change in hydrology within the subsurface under the former stream bed to the south of the Dairy that might be impacting groundwater flow to a lesser degree, but is magnified by the existing monitoring well network. It is also possible that local flow direction is controlled by the numerous wells at and near the Dairy.

Water level data will be further examined and findings presented as part of the Stage 1 AP to evaluate seasonal trends and impacts from irrigation. Data from Dexter/Starry Night Dairy to the east of Rockhill Dairy may be evaluated as part of the regional groundwater flow mapping efforts. The direction of

groundwater flow at Rockhill Dairy is crucial to proper monitoring well placement planned under Discharge Permit renewal activities.

3.9 EXISTING MONITORING WELL AND PRODUCTION WELL LITHOLOGIC LOGS

There are four existing groundwater monitoring wells installed at the Dairy. Well completion logs for MW-1, MW-2, MW-3 and MW-4 are included within Appendix A. The Dairy is provided fresh water by three on-site dairy production/irrigation wells.

The monitoring wells are completed into valley fill alluvial deposits, primarily silty and clayey sands with some gravel. The well logs for MW-2, MW-3 and MW-4 show that the wells were completed to 140 feet, 136.60 and 120 feet below ground surface (bgs), respectively, and the static water levels at the time of installation were 123.46, 122.65 and 105.54 ft bgs, respectively. None of the four monitoring wells are equipped with permanent pumps.

3.10 SUBSURFACE CROSS SECTION

Figure 3 depicts the geology of the areas surrounding the Dairy. Geologic/alluvium cross-sections will be completed as part of the Stage 1 AP Report. A focused effort will be made on the wells situated within and around the former stream bed. At least one North-South and at least one East-West cross section will be completed for the area, including wells located on the Dairy property.

4.0 SAMPLING AND ANALYSIS

The following sections discuss the purpose of the investigation (Section 4.1), the associated sampling design (Section 4.2), the supporting sampling procedures to be implemented (Section 4.3), and the evaluation of site surface hydrology (Section 4.4).

4.1 PURPOSE OF THE INVESTIGATION

The purpose for this investigation is to satisfy the requirements set forth in NMAC 20.6.2 4106 C, Stage 1 AP, and will assist in providing the data necessary to select and design an effective and appropriate abatement option for Rockhill Dairy. The data will be collected for the purpose of: (1) performing the hydrogeologic characterization of the abatement plan area, (2) completing contaminant plume delineation, (3) examining the vertical and horizontal extent of elevated soil concentrations, (4) defining the rate and direction of contaminant migration, and (5) researching and identifying area activities that may have impacted groundwater quality at Rockhill Dairy.

4.2 SAMPLING DESIGN

The following sections outline the rationale and goals for data collection. Table 2 provides a summary of the field operations and actions included with the proposed Stage 1 AP proposed activities. All existing monitoring wells (MW-1, MW-2, MW-3 and MW-4) and the three production/irrigation wells for the production area and the Land Application Areas will be sampled for the listed contaminants of concern. Potential receptors of contaminants will be assessed to identify relevant off-site wells, if any, to be sampled in Stage 1 of the abatement process, with permission to access and sample the identified groundwater wells. These locations, the rationale for the types of activities to be performed, and details on the activities are presented in Table 2.

4.2.1 Hydrogeologic Characterization

The hydrogeologic characterization will use the previously described four monitoring wells and three production wells on the Dairy property, and the wells from the adjacent Dexter/Starry Night Dairy. Well logs of nearby off-site wells will be researched for hydrogeologic information pertinent to delineating the sources of nitrate, TDS, sulfate and chloride impacting the Dairy.

The following subsections describe the activities necessary to complete the hydrogeologic characterization, including site-specific stratigraphy and ascertaining basic aquifer properties, verifying groundwater flow direction, determining up-gradient and down-gradient water quality, and performing plume delineation.

4.2.1.1 Site Stratigraphy

Boring/well construction logs from monitoring well borings will be utilized to determine the site-specific subsurface stratigraphy and generate hydrogeologic cross-sections across the facility. These logs will be correlated with information from logs for on-site domestic and production wells, as applicable.

4.2.1.2 Direction of Shallow Groundwater Flow

Data that can be used to develop potentiometric surface maps focused on the Dairy will be completed for at least the past five years or to the extent that sufficient data allows. None of the four Rockhill Dairy wells are completed within the perched saturate zone, so only the alluvial potentiometric surface will be re-evaluated for a Rockhill Dairy focus. If data show a focus on the Dairy to be different from the regional groundwater flow, a separate map will be prepared. Based on the December 2018 quarterly data, shallow, alluvial groundwater at the site ranges from approximately 78 feet bgs in MW-4 to 135 feet bgs in MW-2. The groundwater flow direction at the Dairy appears to be to the west-northwest; however a gradient cannot be reliably determined from the data available.

4.2.1.4 Production Well Information

Permitted wells within at least a 1-mile radius of the Dairy have been identified using the NMOSE database, are included within Appendix B. Well records for at least one of the Dairy production wells have been identified and all available records will be located and included with the Stage 1 AP Report. Upon completion of the monitoring well survey and construction of potentiometric surface maps, any potential down-gradient receptors will be identified. For the Stage 1 AP investigation, only wells completed within the shallow alluvial aquifer will be considered as possible receptors of elevated levels of contaminants of concern impacting the Dairy.

NMED has conducted sampling activities of groundwater wells within the Roswell and Dexter areas. NMED files will be researched for well water quality data collected within the vicinity of the Dairy. Once those records are compiled, wells potentially suitable for sampling as off-site receptors will be determined and well owners will be contacted to discuss whether they are using their domestic well for drinking water. It is not likely that homes within the down-gradient area of the Dairy derive their potable water from the shallow aquifer.

4.2.1.5 Groundwater Quality and Plume Delineation

The four existing monitoring wells at the Dairy, along with monitoring wells at Dexter/Starry Night, will be inspected and will form a monitoring well network utilized for plume delineation (Figure 2).

Groundwater samples will be collected from existing monitoring wells in accordance with Table 3. The concentrations for nitrate, chloride, TKN, sulfate and TDS will be plotted on site maps in isoconcentration contours based on the direction of groundwater flow. Isoconcentration maps will be produced for the most recent four quarters of groundwater data. The groundwater sample results and locations of elevated concentrations will be used to define the rate and direction of contaminant migration.

4.2.1.6 Plugging and Abandonment

After completion of the hydrogeologic characterization described in the sections above, it will be determined if any existing monitoring wells need to be plugged and abandoned according to NMED guidelines. MW-3 is dry and there is insufficient water in MW-2 to provide water for sampling. These wells will be evaluated for the need to plugging and abandoning.

4.2.1.7 Delineation of Vertical and Horizontal Extent of Elevated Soils Concentrations

Soil sampling has been conducted within the land application areas. Fifteen soil samples per field will be collected at depths of 0-12 inches and will be combined into one composite sample for analysis for nitrate and TKN. Six soil cores per field will be collected at a depth of 24-36 inches and will be combined into one composite sample for analysis for nitrate and TKN. Data will be used to determine if deep soil sampling is necessary for any LAA Fields or other potential sources.

4.3 FIELD ACTIVITIES AND SAMPLING PROCEDURES

The following sections outline field activities and sampling procedures that will be conducted to fulfill the goals of the investigation.

4.3.1 Obtain Access Agreements for Private Well Sampling and Monitoring Well Installation

Preliminary research has not identified any off-site domestic wells that are at risk from nitrate, TDS or chloride plumes impacting the Dairy. There is one well, MW-1, that is used as a domestic water supply, for which data indicate that NO_3, SO_4 and TDS are above the standards. If upon determination of the localized gradient at the Dairy and completion of the Point of Diversion record search of NMOSE files/database it is determined that a domestic well is in need of sampling, an access for agreement will be pursued at that time.

4.3.2 Health and Safety Plan and Utility Locations

As part of any drilling or sampling activities, a site-specific Health and Safety Plan (HASP) will be developed and maintained for the investigation tasks at the Dairies. The HASP will contain all the elements described in Occupational Safety and Health Administration (OSHA) Code of Federal Regulations (CFR) Title 29 Part 1910.120(b)(4)(ii). The HASP will be reviewed by the designated Health and Safety Coordinator and Project Manager to ensure the work plan for the field activities conform to the tasks in the HASP, to address any changes in chemicals or physical hazards that were not part of the original risk assessment, and to allow for proper training of field personnel to perform assigned tasks.

For subsurface portion of the investigations, New Mexico One-Call and local utility services will be contacted to identify buried utilities to ensure that drilling locations are cleared and that activities will not interfere with services provided in the area.

4.3.3 Hollow Stem Auger Drilling and Soil Sampling

Drilling for boring and monitoring well installation will be performed using hollow stem auger drilling methods. A minimum 6 ¾ -inch diameter auger will be used. Split spoon samples will be collected every five feet. Drilling and sampling equipment (split spoons) will be decontaminated prior to use and between samples using a laboratory-grade detergent and deionized water rinse.

All soil borings will be logged by the on-site geologist. Soils will be described based on grain size, sorting, lithology and color (using a Munsell color chart). Additional properties including estimates of percent gravel, percent sand, percent silt, percent clay, and effervescence in hydrochloric acid (10% HCl) will be noted as is applicable.

Protective equipment will be worn as specified in the HASP. Management of drill cuttings is addressed in the investigation-derived wastes section (4.3.10) of this plan.

4.3.4 Monitoring Well Construction

All information, including the abandonment plan and the abandonment record, will be filed with NMOSE by a licensed driller, as required by 19 NMAC 27.4.30.B(3).

Monitoring Well Construction

Any monitoring wells proposed for the Stage 1 AP will be constructed according to the following specification and in accordance with NMED guidelines and NMOSE rules (19 NMAC 27.4.29 and 19 NMAC 27.4.30):

1. Well bores will be drilled by hollow stem auger with a minimum 6 ¾-inch diameter auger.

2. Well materials will consist of Schedule 40 polyvinyl chloride (PVC) flush-thread jointed screen and blank casing. Flush thread jointed materials shall be nominal 4-inch diameter.

3. To accommodate long-term water level declines at the site, screen will consist of 25 feet of 0.020-inch machine slotted screen. The screen will be submerged 20 feet and extend five feet above water table.

4. Filter pack will consist of 10-20 mesh silica sand placed from total depth to two feet above the top of screen.

5. A two-foot thick hydrated bentonite pellet seal will be placed above the filter pack.

6. The remainder of the annulus between blank casing and surface will be grouted with a cement bentonite grout containing 95% cement and 5% bentonite.

7. Surface completion shall consist of above grade steel locking shroud with a minimum two-foot stick up. Monitor well shrouds shall be painted yellow for visibility. Shrouds shall be set in concrete well pads (two feet by two feet by four-inch thick) sloped towards the outside edges in order to drain.

8. In trafficked areas or locations susceptible to farm machinery, three bollards (4-inch diameter posts of steel) set in two-foot deep post holes, secured and filled with concrete, and painted yellow will be installed around the well head to protect the monitoring well.

Monitoring well construction information will be documented on Boring/Monitoring Well Construction Logs. Well records will be filed with the NMOSE by the licensed driller according to 19 NMAC 27.4.29 K.

After installation, the wells will be surveyed by a licensed surveyor to a permanent benchmark common to the wells already surveyed (Section 4.3.9).

4.3.5 Monitoring Well Development

No earlier than 24 hours after the wells are completed, they will be developed. Development will be conducted by bailing and/or air lifting using the auger rig. Wells will be surged and bailed to the extent practicable until the well yields clear water. A minimum of 10 casing volumes will be removed during development. Development shall be under the direct supervision of the site geologist who will document the development activities.

4.3.6 New Mexico Office of State Engineer

All information, including the well installation and abandonment plan and the abandonment record, will be filed with NMOSE by a licensed driller, as required by 19 NMAC 27.4.30.B(3).

4.3.7 Water Level Measurements

An electronic water level indicator will be used to measure the depth to water in the well. The monitoring wells will be measured quarterly. This measurement will serve several purposes: to calculate a potentiometric surface, assess water level fluctuations, and to calculate the column of standing water in the well for purging prior to sampling. The depth to groundwater will be measured from a marked measuring point on the top of casing.

The depth to groundwater measurement will be made to the precision of one hundredth of a foot.
The distance to the bottom of the well will be measured annually to the same precision, to determine if silting has taken place.

The total depth of the well will be measured using the same reference point used for the water level measurement. A weighted tape measure may be used for total depth gauging. The water level indicator will be decontaminated between wells. Decontamination shall consist of washing the indicator probe and measuring tape that was submerged with non-phosphate detergent (e.g., Alconox™) and rinsing with distilled or DI water.

4.3.8 Groundwater Sampling

Groundwater sampling will be performed to establish whether or not impacts to groundwater are observed.

4.3.8.1 Monitoring Well Sampling

The following monitoring well sampling procedure will be followed:

1. Measure Water Level. Measure the depth to water to the precision of one hundredth of a foot in the well from the marked measuring point on the PVC well casing (same point from where the well casing was surveyed). Decontaminate the electronic tape after each well gauging in Alconox™ solution and then

rinse with distilled or DI water.

2. *Calculate Purge Volume.* GGI personnel will follow the procedure outlined below, excerpted from GGI's Standard Operating Procedure (SOP) on monitoring well sampling:

The accepted volume for successful purging of the well prior to sampling is three (3) bore volumes. There are 0.163 gallons per vertical foot of water in a well with 2-inch (ID) well casing and 0.653 gallons per vertical foot of water in a well with 4-inch (ID) well casing. If the monitoring well casing has an inner diameter other than the standard 2 or 4 inches, you will need to make a calculation of the volume per foot for that particular well ID based on the following equation for the column of a one-foot tall cylinder:

Volume of a cylinder = $\pi \times r^2 \times h$
Where r = inner radius of the casing in feet (½ x ID ÷ 12 (inches per ft)), h = height of 1 ft, π = 3.1416

Equation Becomes:

V (gallons per ft) = $(3.1416 \times (D \div 24)^2) \times 7.48$
Where D = well casing inner ID in inches, and there are 7.48 gallons in 1 ft^3

To calculate the purge volume, first multiply the height (h) of the water column [total depth of well – depth to water in feet] by 0.163 (for a 2-inch well) to get the total volume of water in the well casing. Then multiply this calculation by three to get the required three well bore volumes for purging.

Use the following formulas:

Height of water column
(**h**)= total depth of well – depth to water

One Well Bore Volume
(**BV**)= (**h**) x 0.163 (gal/ft) = Gallons (for 2-inch ID well casing)

Minimum purge amount:
BV x 3 = 3 **BV**

Complete a table similar to the following example:

Monitoring Well ID	Total depth of well (in ft) **A**	Depth to water (in ft) **B**	Water column height (in ft) **h = (A-B)**	One well bore volume (in gal) **BV = (h x gal/ft)**	Total purge volume (in gal) **3 x BV**	Actual volume purged (in gal) or Purge Time	Sample Time or Pump Depth
MW 1							
MW 2							

Calculate the required purge volume for each well prior to pumping. You will need to pump out three times the volume of water calculated to be in the casing.

Well Purging Procedures

a. *Purging with a bailer*: On shallow, small-diameter wells, or if equipment failure does not permit pump use, a single-use (disposable) bailer can be used. Attach a single-use bailer to an unused, clean rope or strong string (white nylon braided mason's twine or equivalent) with an appropriate length to reach below the static water level and capable of suspending the full bailer's weight. A weighted bailer is preferred for purging. A recommended step is to wind the rope on a reel used for lawn hoses or extension cords. Make sure that the bailer rope is attached to the reel or some other surface feature prior to bailing. Try to keep the bailer rope from becoming contaminated by surface debris or other materials that could impact the sample.

b. *Purging with a pump*: Place pump in well casing and lower to the water column. Placement of the pump below the middle of the screen and above the bottom of the well casing is critical for proper purging. The purge pump may be placed near the very bottom of the well if the observed conditions require this position (e.g. small water column, a history of poor recharge). Start the purging and monitor the pumping time and measure flow (gallons per minute) with a five-gallon bucket or other known volume container. Adjust the flow of the purge pump as needed to ensure a steady rate of flow.

   Divide required purge volume (gallons) by flow (gallons per minute) to figure time needed to pump three well bore volumes. Pump well until the required amount has been purged. Purging more than three well bore volumes is acceptable, but will not necessarily improve the quality of the sample.

c. *Purging of domestic or production (irrigation) wells:* Domestic or irrigation wells usually have their own dedicated pump either submersed in the well or attached to the top of the well with piping and drive shaft extending down below the groundwater (turbine-shaft pump). The turbine shaft pumps are used in large production applications such as irrigation wells and municipal wells.

   Arrange for access to the well and obtain a water level if possible following the procedures used in a monitoring well. Document the measuring point and other information regarding elevation of the measuring point and well conditions.

   Purging times of domestic wells will vary based on pump size, depth to water, and the associated domestic pipe system. As a general rule, a minimum of 20 minutes of active pumping and discharging of domestic wells is sufficient to purge the original well volume and additional bore volumes. Individual assessment of domestic wells may be required to determine if a sufficient purge volume has been completed.

   Purging times of the larger wells will depend on schedules for irrigation or for production for storage in surface containers (tanks, lagoons, etc.). Contact the well operator (e.g. property owner, dairy manager, water system technician) and determine an appropriate time for sampling that conforms to the pumping schedule. These pumps may operate over significant periods and the ability to obtain a static water level may not be possible at the time of sampling.

   Do not attempt to operate any pump or sample without a property owner or designated

representative present.

Safety Note: Be careful regarding sampling operations around turbine wells. The motors for this type of well run with high voltage and high revolutions. If there is a concern for personal safety or equipment safety, do not sample and arrange for another day for sampling. This is especially true in the vicinity of lightning storms during summer months.

4. Temperature, pH, and electrical conductivity will be measured in the field during initial well construction and development, but will not be part of routine sampling.

5. Sample Well. After three casing volumes have been purged/developed, the well is ready to sample. Fill sample containers according to Table 4. The analysis, time of collection, date, and monitoring well number shall be recorded on sample bottle label and in the sampler's field notebook. The sample containers will be placed in a cooler on ice as soon as they are filled and labeled.

4.3.8.2 Domestic/Production Well Sampling

The location and identification of the off-site domestic or production wells will be determined as a part of the Stage 1 AP. The same general procedures for groundwater samples will be applied to domestic and production well samples. A sample location will be selected that does not include either one of the following problems:

- *A sample location that may be at the end of a significant distance of piping.* Find a sample location that is close to the pump source. This reduces the potential for stagnant water to be included in the sample.
- *On irrigation wells, a sample location downstream of lines and systems that add fertilizers to pipe systems.* Many irrigation wells combine greenwater and/or chemical fertilizers as part of the delivery system such as a center pivot. Again, the closer to the pump source, the less likely for contamination from sources outside the well.

When the minimum time for purging has been completed, the water sample will be collected, and the field technician will complete the same labeling and chain of custody procedures as a groundwater sample. Documentation will include a description of the sample location and any other pertinent information about the sample.

4.3.9 Surveying

New and existing monitoring wells will be surveyed by a licensed surveyor. The survey will be done in New Mexico State Plane Coordinates, Central Zone, NAD 27 and will include northing and easting to a tenth of a foot accuracy. Elevations of top of casing elevations for wells will be surveyed to the nearest hundredth of a foot.

4.3.10 Investigation-Derived Waste Management

The implementation of the activities outlined in this Stage 1 AP will generate cuttings from drilling of boreholes, water from wells purging for development and prior to sampling, and personal protective equipment (PPE) used by field personnel.

The cuttings generated during drilling boreholes using HSA equipment will be spread in the vicinity of the borehole, directly on the ground.

Purge water from well development and sampling will be ground discharged. Purging from sampling of

new wells will generate a limited quantity of water which will be released to the ground, a practice consistent with compliance monitoring routine procedures. Water generated during short-term, low-volume pumping tests will also be discharged to the ground surface.

PPE generated during this investigation includes protective gloves, paper towels, and general solid waste. None of this waste will require special handling and will be disposed as solid waste.

4.4 SURFACE HYDROLOGY EVALUATION

The interaction between groundwater and surface water will be evaluated based on information gathered from published sources. The NMOSE has conducted extensive hydrogeologic studies in the Pecos Valley that can be used to determine if elevated groundwater concentrations at the Dairy has the potential to reach any nearby surface water. NM Department of Game and Fish conducts surveys of fish, invertebrates and wildlife populations and health in the Pecos Valley. Public reports from this state agency can be used to evaluate impacts from the dairy.

5.0 QUALITY ASSURANCE PROJECT PLAN

This section of the SAP includes the Quality Assurance Project Plan (QAPP) for executing the sampling described in Section 4.0. This QAPP includes elements of the Guidance Quality Assurance Project Plans (QA/G-5) (EPA 2002) and Guidance on Systematic Planning using the Data Quality Objectives Process (QA/G-4) (EPA 2006b).

5.1 DATA QUALITY OBJECTIVES

In summary, the overall data quality objectives (DQOs) for this project are shown in Table 4 and include: defining the potential contaminant sources, performing the hydrogeologic characterization of the area according to the requirements of 20 NMAC 6.2.4106.C, and to gain knowledge about the Rockhill Dairy property groundwater quality conditions including plume delineation. The data decisions defined herein are applicable to the Stage 1 Abatement Plan.

5.2 PROJECT MANAGEMENT

Project organization, roles and responsibilities, training, record keeping, and documentation are discussed in the subsections that follow.

5.2.1 Project Organization

- Vanessa Ward – Technical Lead, Quality Assurance/Quality Control (QA/QC) Manager
- Bruce Yurdin – Project Manager and Field Operations Manager
- Paul Drakos – Health and Safety Coordinator
- Jeremiah Star and Doug Idsinga – Environmental Field Technicians

5.2.2 Responsibilities

Technical Lead, QA/QC Manager – Project oversight, communication with clients and NMED personnel, evaluate employee experience and certify they are qualified to work at the site, technical review of report(s), which will include QA/QC of technical data and verification of data usability.

Project Manager – Liaison between client and NMED, abatement plan preparation, assignment of personnel to appropriate positions, report(s) preparation—including initial evaluation of data usability and data quality, communication with laboratory, coordination of sampling. Duties may include: securing utility locations, notifications, site supervisor, and health and safety.

Health and Safety Coordinator – Responsible for Health and Safety Plan (HASP) review and approval.

Field Sampling Crew – Responsible for field sampling and measurement activities in accordance with approved SAP and implementing proper sampling and sample handling procedures.

5.2.3 Training Requirements

This section outlines the training and certification required to complete the activities described in this SAP. The following sections describe the requirements for personnel working on site.

Health and Safety Training

The Dairy (or a combination of two Dairies) has been identified to conduct voluntary corrective actions that include site investigation and sampling of contaminated groundwater. Field personnel who are conducting investigative or sampling work at the Dairy do not qualify under one of the five activities detailed in OSHA's 29 CFR Part 1910.120(a)(i) *Scope* and are exempt from the requirements for training under 29 CFR 1910.120(e).

The basis of this exclusion is the assessment of the "hazardous waste" and hazardous substances listed as the contaminants of concern for the field activities under this work plan. Nitrate, chloride, total dissolved solids, and related animal waste products are not classifiable as a hazardous substance and are not found in the various defined lists in the Comprehensive Environmental Response, Compensation, and Liability Act (40 CFR 302.4), the Clean Water Act (40 CFR 110, 116.4, 117, 122, and toxic pollutants listed under Section 307(a)), the Resource Conservation and Recovery Act (40 CFR 261 through 262), the Clean Air Act (40 CFR 68) or the Toxic Substance Control Act (40 CFR 760.120). However, the health safety of field personnel is still a primary goal and requires the sufficient training and monitoring to maintain a safe work environment.

Therefore, to ensure adequate monitoring of health and safety issues at the Dairy, the staff geologist or environmental scientist who supervises field personnel for field activities will be qualified under 29 CFR 1910.120(e)(4). Additionally, the staff geologist/environmental scientist will also have completed the additional eight hours of specialized supervisor training. The supervisor training covers health and safety program requirements, training requirements, PPE requirements, spill containment program, and health-hazard monitoring procedures and techniques. Before work begins at the Dairy, field personnel will be required to complete reviews of the following topics:

- Names of personnel and alternates responsible for health and safety at the site;
- Health and safety hazards present on site;
- Selection of the appropriate personal protection levels;
- Correct use of PPE;
- Work practices to minimize risks from hazards; and
- Contents of the site-specific health and safety plan (HASP).

Field personnel are not authorized to participate or supervise any activities that are considered to be emergency responses to spills or release of a hazardous substance. The work plan and associated HASP

will be periodically reviewed for changes in operation or contaminants of concern to that may change the training requirements to satisfy 29 CFR 1910.120.

5.2.4 Documentation and Records

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages. Section 6 describes reports that will be submitted as a result of this project.

Field Documentation

Field personnel will compile field boring logs as described above and will document field activities in bound field notebooks with numbered pages. Field notebooks are maintained according to GGI's field notebook SOP as follows:

Standard Operating Procedure (SOP)
for
FIELD NOTEBOOK MAINTENANCE

Author: J. Riesterer
Reviewed by: J. Lazarus, P. Drakos
Date: 2/9/09

Purpose and Scope

The purpose of this SOP is to instruct field personnel in proper field notebook maintenance and to provide an overview of information that should be recorded in the field notebook for all projects, regardless of the type of work being conducted.

General Notebook Guidelines

All field notebooks should include the following information:

- Owner information inside front cover, including owner's name, GGI name, address, and telephone number
- Index of projects included in the field notebook. If a notebook does not have pre-numbered pages, page numbers should be added manually and used to create the index
- Write the start date and end date for each notebook on the field notebook binder (a sharpie works well for this)

Guidelines for Field Data Entries

The following guidelines apply to all field notebook entries, regardless of project type. Information that should be recorded for every project include:

- Date at the top of each page
- Project name at the top of each page
- Location information (where the field work is being conducted)
- Field team members
- Weather conditions
- New projects should be started on a fresh page
- New days, even for a continuing project, should be started on a fresh page
- All data should be entered using black or blue ink
- Corrections should be made by drawing a single line through the error and then entering the corrected information

- Document phone calls to a project manager for a change in scope or procedure not in the original project (note time; person contacted; subject matter; final resolution)
- Review the field notes for clarity and legibility at the end of the field day
- Make sure field notes are legible
- Review field notes at the end of each day for completeness/legibility

Guidelines for Collection of GPS Points

- Under most circumstances, GPS coordinates should be collected using UTM coordinates, NAD 1927. The coordinate system (UTM) and datum (NAD 1927) should be recorded in the field notebook. If a different coordinate system is used, the pertinent information must be recorded.
- All GPS points collected should be recorded in the field notebook, even if they are added as waypoints to a GPS

Guidelines for Field Sketches

- Where possible, sketches should be drawn to scale, with the scale indicated on the drawing
- If it is not possible to make a scale drawing, it should be noted that the drawing is not to scale
- All sketches should include a directional reference (i.e. north arrow if it is a plan view sketch, direction labels at ends if the drawing is a cross-section)
- All drawings should include a text description of the location of the drawing, ideally including GPS coordinates
- If photographs are taken of the sketched location, this should be indicated in the field notes, including the number and orientation of the photos (for example: one photo taken looking east at sketch location, two photos taken looking north at sketch location)

Post-Field Control of Field Data

- Upon return from the field, all notes are to be photocopied, scanned into the appropriate project folder on the server, and provided to the project manager for filing.
- If photographs were taken during the field work, the photographs should be downloaded from the camera to an appropriate directory on the server and assigned descriptive names as soon as possible to avoid confusion in the future about the photos' subjects.

5.3 DATA ACQUISITION

This section describes the requirements for the following:

- Sample Design (Section 5.3.1)
- Sampling Method Requirements (Section 5.3.2)
- Sample Handling and Custody (Section 5.3.3)
- Analytical Methods (Section 5.3.4)
- Quality Control Sampling (Section 5.3.5)
- Instrument / Equipment Testing, Inspection, and Maintenance (Section 5.3.6)
- Instrument Calibration Procedures (Section 5.3.7)
- Inspection and Acceptance Requirements for Supplies and Consumables (Section 5.3.8)
- Management of Stage 1 AP Deviations (Section 5.3.9)

5.3.1 Sample Design

The sampling design for the general investigation is described in detail in Section 4.2. The final sample design will reflect the information acquired in the inventory of domestic wells.

5.3.2 Sampling Method Requirements

Sample method requirements for the project are specified in Table 4. The current sampling methods are consistent with the suite defined in the Discharge Permit.

5.3.3 Sample Handling and Custody Requirements

The following subsections describe sample handling procedures, including sample identification and labeling, documentation, COC, and shipping.

Sample Identification

Each sample collected during site assessment activities will be identified using a unique sample identification (ID) number. The description of the sample type and the monitoring well name, as well as depth of the sample collection point, will be recorded on the COC forms, as well as in the field notebook.

Sample IDs will be listed on the sample labels and the COC forms submitted to the laboratory, and will be cross-referenced to the point name in field notebook.

Sample Labels

A sample label will be affixed to each sample container. The label will be completed with the following information written in indelible ink:

- Project name and location
- Sample identification number
- Date and time of sample collection
- Preservative used
- Sample collector's initials
- Each sample will be refrigerated or placed in a cooler containing ice.

Sample Documentation

Documentation during sampling is essential to promote proper sample identification. Field personnel will adhere to the following general guidelines for maintaining field documentation:

- Documentation will be completed in permanent black or blue ink.
- All entries will be legible.
- Errors will be corrected by crossing out the entry with a single line and then dating and initialing the lineout.

Chain of Custody

Field personnel will use standard sample chain of custody (COC) procedures to maintain and document sample integrity during collection, transportation, storage, and analysis.

A sample will be considered to be in custody if one of the following statements applies:

- It is in a person's physical possession or view.
- It is in a secure area with restricted access.
- It is placed in a container and secured with an official seal in such a way that the sample cannot be reached without breaking the seal.

COC procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. The COC form will be used to document all samples collected and the analyses requested.

Information that the field personnel will record on the COC form includes:

- Project name and number
- Sampling location
- Name and signature of sampler
- Destination of sample (laboratory name)
- Sample ID
- Date and time of collection
- Number and type of containers filled
- Analyses requested
- Preservatives used
- Filtering (if applicable)
- Signatures of individuals involved in custody transfer, including the date and time of transfer
- Air bill number (if applicable) or courier information
- Project contact and phone number

Signed air bills will serve as evidence of custody transfer between field personnel and the courier, and between the courier and the laboratory. Copies of the COC form and the air bill will be retained and filed by field personnel before the containers are shipped.

The laboratory sample custodian will receive all incoming samples, sign the accompanying COC forms, and retain copies of the forms as permanent records. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks), the sample IDs, and any unique laboratory identification numbers for the samples. When the sample transfer process is complete, the custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory will provide a secure storage area for all samples. Access to this area will be restricted to authorized personnel. The custodian will ensure that samples requiring special handling, including samples that are heat- or light-sensitive, radioactive, or have other unusual physical characteristics, will be properly stored and maintained prior to analysis.

5.3.4 Analytical Methods

Analytical methods for the project are specified in Table 4. This table also specifies the sample quantities, sample container, holding times, and preservatives.

5.3.5 Quality Control Sampling

The subsections below specify QC protocols for field samples and laboratory samples. Two types of field samples are proposed.

Duplicate Sample

Duplicate samples will be obtained as part of the sampling plan. One duplicate sample will be obtained either for every ten (10) water samples collected at the combined Dairies or, at a minimum, from one sample location for Dairies with less than a total of ten sample locations. The duplicate sample will be collected at location to be determined later. The sample will be submitted for analyses for nitrate, TKN, TDS, and chloride. The results will be included in the data validation review of the quarterly reports.

Equipment Rinsate Sample

A single equipment rinsate sample will be obtained from the submersible pump after the sampling is completed at the Dairy. The sample will be submitted for analyses for nitrate, TKN, TDS, and chloride. The results will be included in the data validation review of the quarterly reports.

No additional quality control samples such as trip blanks, field blanks, spike samples, or surrogate samples will be performed. The contract laboratory will be required to provide internal QA/QC samples with protocols and results.

5.3.6 Instrument/Equipment Testing, Inspection and Maintenance

All equipment used during the site assessment will be properly tested, inspected, maintained, and calibrated. Samples collected during this investigation will be analyzed only by laboratory equipment.

The laboratory's QA plan and written operating procedures describing specific testing, inspection, maintenance, and calibration procedures for equipment will be followed.

5.3.7 Instrument Calibration Procedures

The equipment utilized for this project is a water quality multi-meter. The calibration of this instrument will be performed according to the manufacturer's Operation Manual.

5.3.8 Inspection and Acceptance Requirements for Supplies and Consumables

The project manager has the primary responsibility for identifying the types and quantities of supplies and consumables needed to complete the project and is responsible for identifying acceptance criteria for these items.

Supplies and consumables can be received either at GGI's office or at a work site. When supplies are received at an office, the project manager or field personnel will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the project manager or field personnel will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards described in *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers* (EPA, 1992). The analytical laboratory will be contracted to provide the appropriate chemical preservation in the specified container type based on the required analysis. The analytical laboratory will label the prepared container to ensure that the field technician is aware of the content.

5.3.9 Management of Stage 1 AP Deviations

Minor deviations, including field instrument malfunction (pH meter, etc.) will be addressed by field crew and the project manager and professional judgment will be utilized. Any deviation from the SAP will be

detailed in the field notebook and included in the final report to NMED. Any deviation considered significant will be addressed by the field crew, project manager and NMED Project Managers. A consensus on correcting the deviation will be achieved prior to executing any work plan changes, if at all possible. It is expected that the NMED GWQB Project Manager or other agency representative will be available for communication during fieldwork. If a situation arises that requires work plan deviation, every attempt will be made to reach an NMED-GWQB representative. If attempts are unsuccessful and a deviation from the work plan must be made in a timely manner, the project manager will use professional judgment to adjust work plan specifications as needed.

5.4 DATA VALIDATION AND USABILITY

This section describes the procedures that are planned to review and evaluate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet DQOs for the project.

5.4.1 Data Review, Validation and Verification Requirements

For this project GGI will perform data review on 100 percent of the laboratory results. No validation will be performed. Data will be reviewed for holding times, handling and preservation procedures, chain of custody, acceptance within control limits, and to ensure data meet method control limits for project goals.

5.4.2 Laboratory Data Evaluation and Usability

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any non-conformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

All laboratory data will be reviewed to ensure usability. The data evaluation strategy will not be a full data validation process, but will determine if the analytical results are within the QC limits set for the project. In this process, the data usability will be assessed. Specifically, sample handling requirements, holding times, duplicate results, and QC control limits will be reviewed.

5.4.3 Reconciliation with DQOs

After environmental data have been reviewed and evaluated in accordance with the procedures described above, the data must be further evaluated to assess whether DQOs have been met.

To the extent possible, EPA's data quality assessment (DQA) process will be followed to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in EPA's *Data Quality Assessment, A Reviewer's Guide* (EPA, 2006a). The DQA process includes five steps: (1) review the DQOs and sampling design; (2) conduct a preliminary data review; (3) select a statistical test; (4) verify the assumptions of the statistical test; and (5) draw conclusions from the data. In the case of this project, no statistical analysis is planned.

When the five-step DQA process is not completely followed because the DQOs are qualitative, data quality and data usability will be systematically assessed. This assessment will include:

- A review of the sampling design and sampling methods to verify that these were implemented as

planned and are adequate to support project objectives;
- A review of project-specific data quality indicators and project reporting limits to evaluate whether acceptance criteria have been met;
- A review of project-specific DQOs to assess whether they have been achieved by the data collected; and
- An evaluation of any limitations associated with the decisions to be made based on the data collected.

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

5.5 DATA MANAGEMENT

Field data will be recorded in field notebooks or field forms and will be included in the appendices of the Site Investigation report. Analytical data will be received in electronic form and will be summarized, tabulated, analyzed, and provided in the body of the report. The original laboratory data will also be provided in the appendices, or electronically on CD. As appropriate, some data will be presented graphically. GGI will oversee collection of environmental data using the appropriate assessment and audit activities.

Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. Any problems and the associated corrective action will be noted in the annual summary report.

5.6 PLANNED DATA EVALUATION

This section discusses procedures for verifying that the data are sufficient to meet DQOs for the project. Nitrate, chloride, and TDS in groundwater will be evaluated against the WQCC Standards as well as against up-gradient (background) concentrations, if necessary. TKN will be evaluated as an indicator of recent elevated concentrations of groundwater or soil. Practical quantification limits for these compounds will be sufficiently low that a comparison to the standards will be possible (see Table 4).

6.0 REPORTING

The outcome of this Stage 1 AP will be documented in a Stage 1 AP Site Investigation Report (§4106.C.6.). This report will include a description of field operations, any deviations from the Stage 1 AP, the raw and processed analytical data, as well as graphical representations of all spatial data including cross section(s) and a potentiometric surface map.

Supporting information such as an evaluation of analytical data from other facilities operating under discharge permits will be included. The report will include a section on data gaps, if any are identified, and recommendations for subsequent data collection.

7.0 MONITORING PLAN

Any Stage 1 AP monitoring wells installed under this plan, once deemed necessary, will be sampled on a quarterly basis along with sampling existing monitoring wells so that water level and chemistry data is contemporaneous. Any off-site wells sampled during this investigation that showed elevated levels of the contaminants of concern will continue to be sampled on a quarterly basis, pending permission of well owners.

If for any reason sample analyses indicate that any well sampling should cease, a formal request

documenting the reason for the change should be submitted to NMED. The abatement plan wells will be sampled in accordance with procedures outlined in this Stage 1 AP. Sampling results and water level data will be provided to NMED on a quarterly basis. Annually, a monitoring report will be compiled and it will include potentiometric surface maps for all four sampling events along with cumulative data for the analytical results.

8.0 IMPLEMENTATION SCHEDULE

The schedule for the implementation of this Stage 1 AP, as per requirements of 20 NMAC 20.6.2.4106.C.6, is presented below. The quarterly monitoring reports shown in this schedule will follow the sampling performed for the Investigation Report and will continue until other monitoring requirements will be established in collaboration with NMED. Summary quarterly progress reports will be submitted for the duration of the abatement activities. This schedule is predicated on NMED review cycle.

Days	Task	20.6.2 NMAC
	PHASE I	
0	Submit Modified Stage 1 Abatement Plan Proposal	§4106.C
30	Public Notice Requirements (NMED News Release)	§4108.A
60	Modified Stage 1 Abatement Plan Proposal Approval by NMED	§4109.A
90	Summary Progress Report 1 – Estimated date; TBD based on approval of NMED approval of Proposal Plan elements.	§4106.C.6
97	Meeting with NMED to discuss comments	-
110	Site Investigation Activities Begin	§4110
180	Site Investigation Activities Completed	-
240	Summary Quarterly Progress Report 2 – Estimated date; TBD based on approval of NMED approval of Proposal Plan elements.	§4106.C.6
270	Site Investigation Detail Report Submittal for NMED approval	§4106.C.6
330	Meeting with NMED to discuss any additional investigation work required.	
	PHASE II	
0	NMED Comments on Final Site Investigation	§4109.A
30	Updates to Final Site Investigation	§4106.C.6
40	Meeting about Stage 2 Plan and Monitoring requirements (If required)	§4106.D
90	Summary Quarterly Progress Report 3 – Estimated date; TBD based on approval of NMED approval of Proposal Plan elements.	§4106.C.6
TBD	Begin Stage 2 Abatement activities or implement long-term monitoring	§4106.E
180	Summary Quarterly Progress Report 4 – Estimated date; TBD based on approval of NMED approval of Proposal Plan elements.	§4106.C.6

9.0 REFERENCES

Barroll, P., and J. Shomaker, 2003, Regional Hydrology of the Roswell Artesian Basin and the Capitan Aquifer, *in* Johnson, P. S., L. A. Land, L. G. Price, and F. Titus, *eds*., Water Resources of the Lower Pecos Region, New Mexico - Science, Policy, and a Look to the Future, Decision-Makers Field Guide: Socorro, New Mexico Bureau of Geology and Mineral Resources, pp. 22-27.

New Mexico Water Quality Control Commission, Settlement Agreement, August 13, 2018, between the New Mexico Environment Department, Ground Water Quality Bureau, Abel Villalpando, Creekside Dairy, LLC, Rockhill Dairy, LLC, Dexter Dairy, LLC, Starry Night Dairy, LLC a/k/a El Vista Dairy II, Orchard Park Dairy, LLC, J&M Dairy, Greenfield Dairy, Epicenter Dairy, Cottonwood Dairy, Willard Dairy, LLC, and Valley View Dairy, LLC.

Scholle, Peter A., 2003, Geologic Map of New Mexico, 1:500,000, NMBGMR.

U.S. Environmental Protection Agency, 1992. *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers*. OSWER Directive No. 9240.0-05A. April.
EPA. 2002. Guidance for Quality Assurance Project Plans. Office of Environmental Information., Washington, DC. EPA QA/G-5, EPA/240/R-02/009. December.

U.S. Environmental Protection Agency, 2006a. Data Quality Assessment: A Reviewer's Guide. EPA QA/G-9R, EPA/240/B-06/002, February.

U.S. Environmental Protection Agency, 2006b. Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4, EPA/240/B-06/001. February.

Welder, G. E., 1983, Geohydrologic framework of the Roswell Ground-Water Basin, Chaves and Eddy Counties, New Mexico: New Mexico State Engineer Technical Report 42, 28 p.

Rockhill MW-1

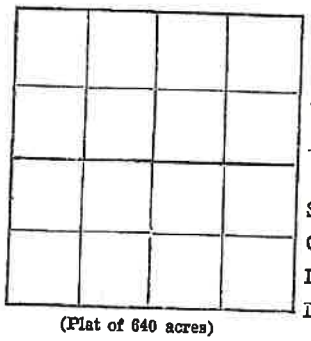
Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this ... ed as a plugging record, only Section 1A and Section 5 need be complet...

Section 1



(Plat of 640 acres)

Rockhill AP

(A) Owner of well ...

Street and Number ...

City ... y Mexico

Well was drilled under ... located in the

NW Co¼ NW ¼ ... Rge. 25

(B) Drilling Contractor ... No. ...

Street and Number ...

City ...

Drilling was commenced ... 19 37

Drilling was completed ... 19 37

Elevation at top of casing in feet above sea level ... Total depth of well 187 ft.

State whether well is shallow or artesian ... Depth to water upon completion ...

Section 2 — PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1				
2				
3				
4				
5				

Section 3 — RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To
12¾					187			

Section 4 — RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in In.	Tons Clay	No. Sacks of Cement	Methods Used

Section 5 — PLUGGING RECORD

Name of Plugging Contractor ... License No. ...

Street and Number ... City ... State ...

Tons of Clay used ... Tons of Roughage used ... Type of roughage ...

Plugging method used ... Date Plugged ... 19...

Plugging approved by:

... Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

Date Received ...

NEW RA3671 Dom.

File No. RA-1542 (BS-19) Use ... Location No. 11.25.27.100

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered
0	4			Soil
4	20			Caliche rock
20	43			Concrete
43	50			Lime rock
50	55			Clay
55	90			Coarse gravel
90	96			Clay
96	101			Sand and gravel
101	112			Lime rock
112	140			Sand and gravel
140	150			Rock
150	154			Gravel
154	180			Clay
180	180			Sandy clay
180	185			Sand
185	187			Red clay

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

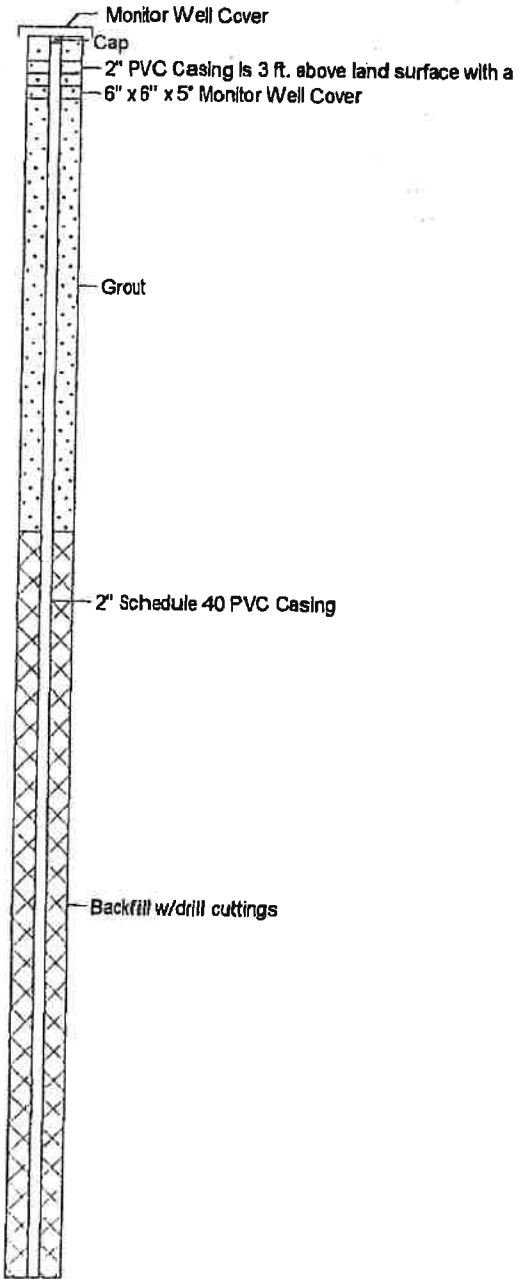
R. L. Willson
Well Driller

Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy MW - 2 (Page 1 of 3)
Rock Hill Dairy 104 Ojibwa Rd. Dexter, NM Contact: Abel Villalpando Job #98122	Date : 2-11-98/2-13-98 Drill Start : 10:00 A.M./7:00 A.M Drill End : 5:00 P.M./11:00 A.M Boring Location : E. of Dairy Pens, SE Corner of Holding Pond Site Location : Sec. 27, T13S, R25E Auger Type : Hollow Stem Logged by : Mori Bates

Depth In feet	GRAPHIC	USCS	DESCRIPTION
0		CL	Silty Clay, Brown, Stiff, Damp
5		CL	Clay, Tan, Stiff, Damp
10			Caliche w/Clay, Tan, Stiff, Damp
15			
20		CL	Clay w/Caliche, Tan, Stiff, Moist
25			Clay, Tan, Stiff, Moist
30		CL	
35			
40		GP	Gravel w/Clay, Tan, Stiff, Damp
45		GP	Gravel w/Clay, Tannish-Gray, Hard, Dry
50		CL	Clay w/Gravel, Tan, Stiff, Damp

Well: MW-2

Elev.:



02-26-1998 c:\mtech46\rockhill\mw2.bor

Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy MW - 2 (Page 2 of 3)
Rock Hill Dairy 104 Ojibwa Rd. Dexter, NM Contact: Abel Villalpando Job #98122	Date : 2-11-98/2-13-98 Drill Start : 10:00 A.M./7:00 A.M Drill End : 5:00 P.M./11:00 A.M Boring Location : E. of Dairy Pens, SE Corner of Holding Pond Site Location : Sec. 27, T13S, R25E Auger Type : Hollow Stem Logged by : Mort Bates

Depth in feet	GRAPHIC	USCS	DESCRIPTION
50		CL	Clay w/Gravel, Tan, Stiff, Damp
		SC	Clayey Sand w/Gravel, Tan, Stiff, Moist
55		SC	Clayey Sand, Tan, Loose, Moist
60			
65		GP	Gravel w/Sandy Clay, Tan, Stiff, Moist
70		SC	Clayey Sand, Tan, Stiff, Moist
75		GP	Gravel w/Sandy Clay, Tan, Stiff, Moist
80			
85		CL	Sandy Clay, Tan, Stiff, Damp
90			
95			
100			

Well: MW-2

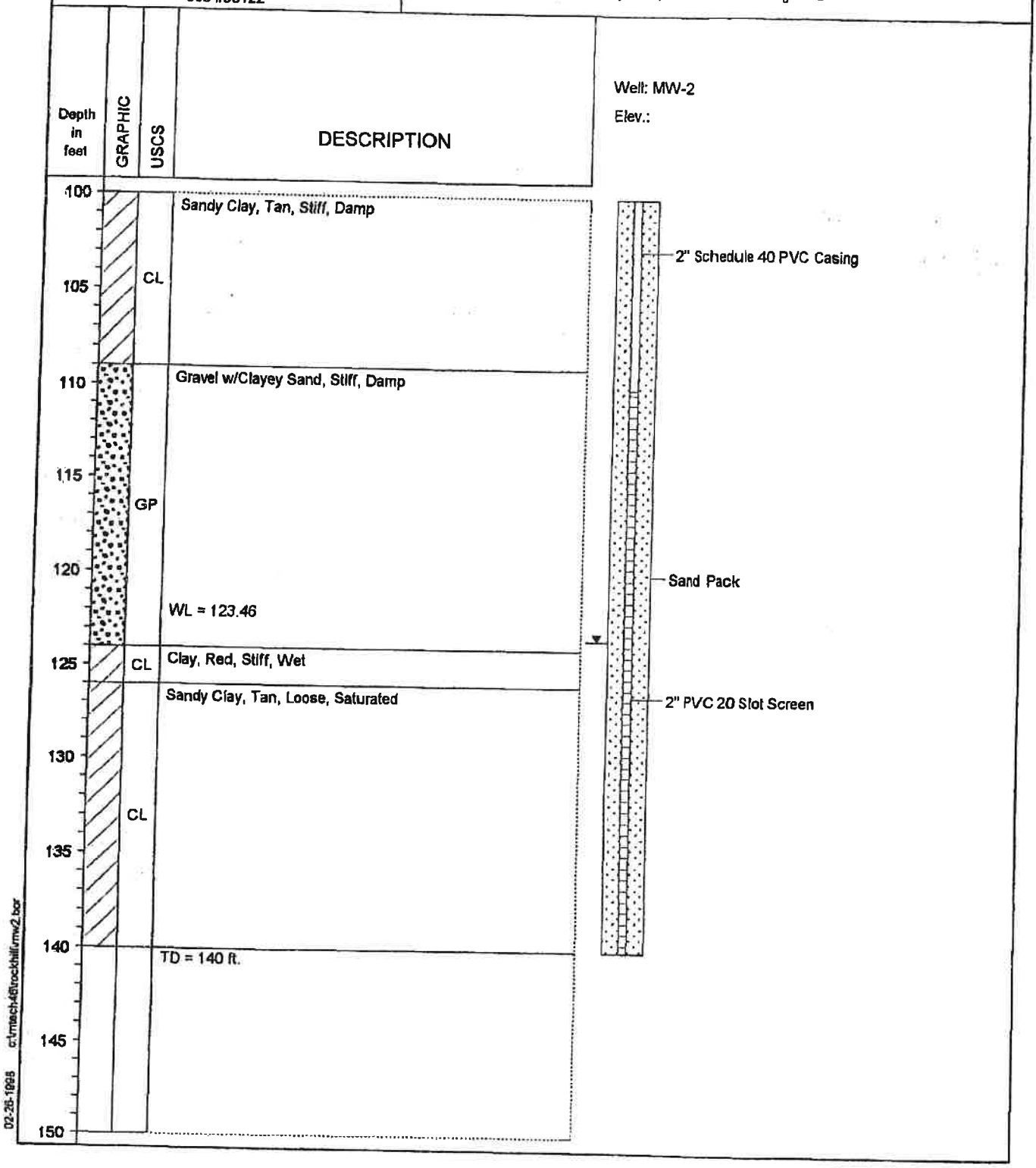
Elev.:

02-26-1998 c:\mtech48\rockhill\mw2.bor

Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy MW - 2 (Page 3 of 3)

Rock Hill Dairy
104 Ojibwa Rd.
Dexter, NM
Contact: Abel Villalpando
Job #98122

Date	: 2-11-98/2-13-98	Site Location	: Sec. 27, T13S, R25E
Drill Start	: 10:00 A.M./7:00 A.M	Auger Type	: Hollow Stem
Drill End	: 5:00 P.M./11:00 A.M	Logged by	: Mort Bates
Boring Location	: E. of Dairy Pens, SE Corner of Holding Pond		



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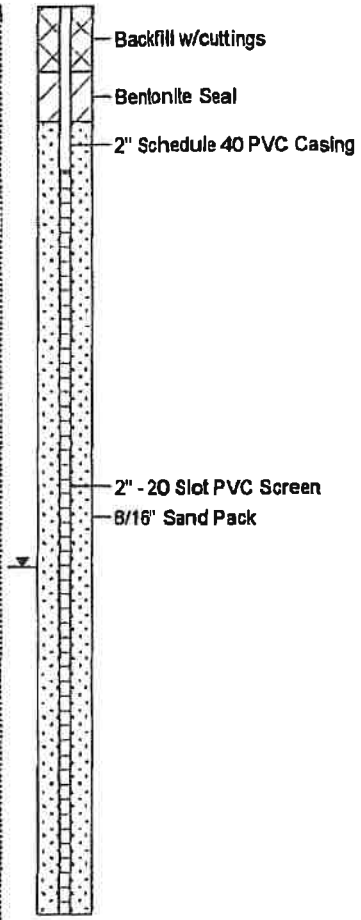
Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy MW - 3 (Page 3 of 3)

Rock Hill Dairy 104 Ojibwa Rd. Dexter, NM	Date	: 2-13-98/2-16-98	Site Location : Sec. 27, T13S, R25E
	Drill Start	: 11:15 A.M./7:00 A.M	Auger Type : Hollow Stem
	Drill End	: 5:30 P.M./9:00 A.M	Logged by : Mort Bates
Contact: Abel Villalpando	Boring Location	: S. of Dairy, SE Corner of Drainage Pit	
Job #98122			

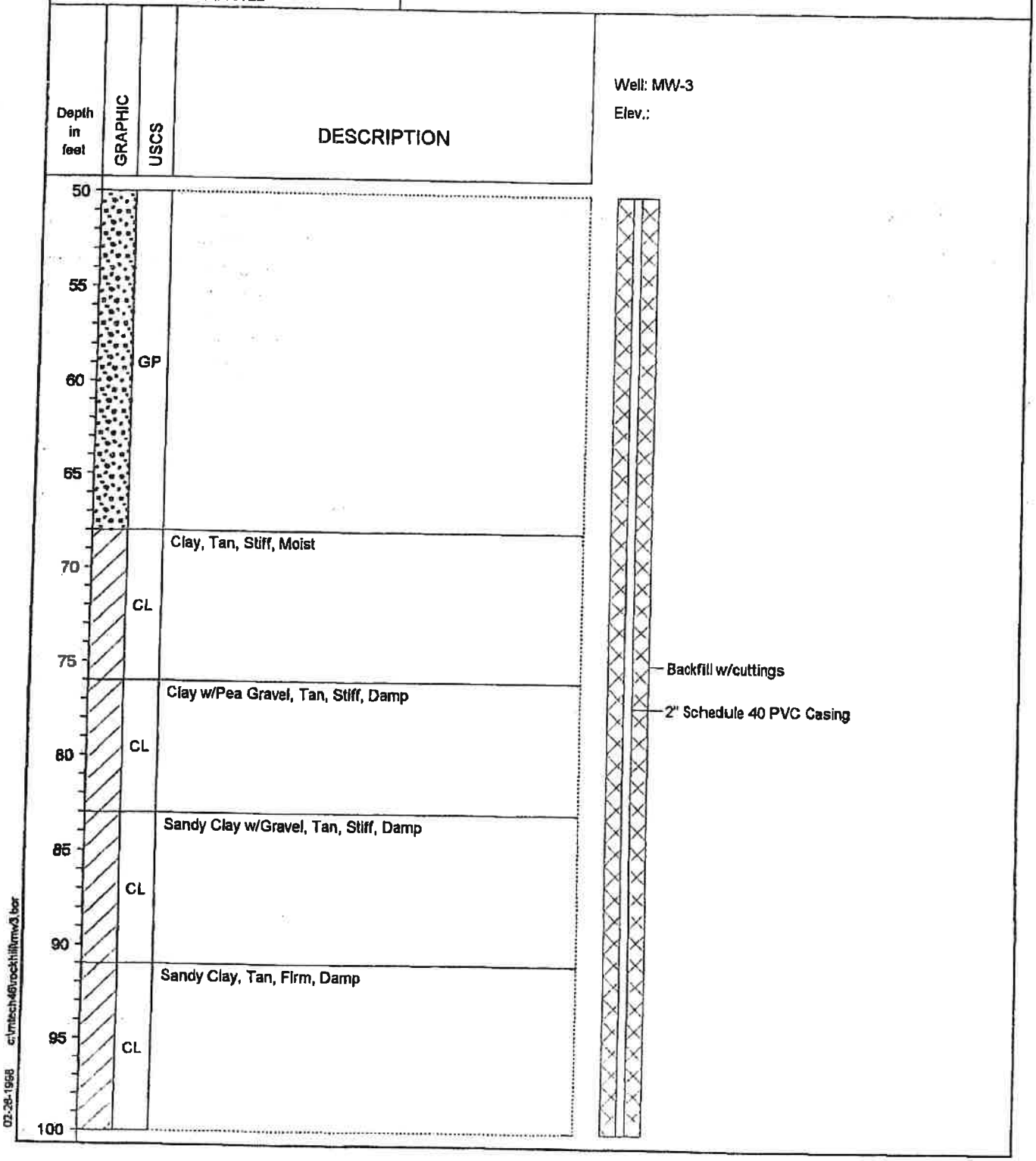
Depth in feet	GRAPHIC	USCS	DESCRIPTION
100			
105		CL	
110			
115			
		CL	Sandy Clay w/Gravel, Tan, Stiff, Damp
120			Silty Sand, Tan, Loose, Wet to Saturated
			WL = 122.65
125		SM	
130			
135			
			TD = 136.60 ft.
140			
145			
150			



02-26-1998 c:\mtech46\rockhill\mw3.bor

Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy MW - 3 (Page 2 of 3)

Rock Hill Dairy 104 Ojibwa Rd. Dexter, NM	Date	: 2-13-98/2-16-98	Site Location : Sec. 27, T13S, R25E
	Drill Start	: 11:15 A.M./7:00 A.M	Auger Type : Hollow Stem
Contact: Abel Villalpando	Drill End	: 5:30 P.M./9:00 A.M	Logged by : Mort Bates
Job #98122	Boring Location	: S. of Dairy, SE Corner of Drainage Pit	



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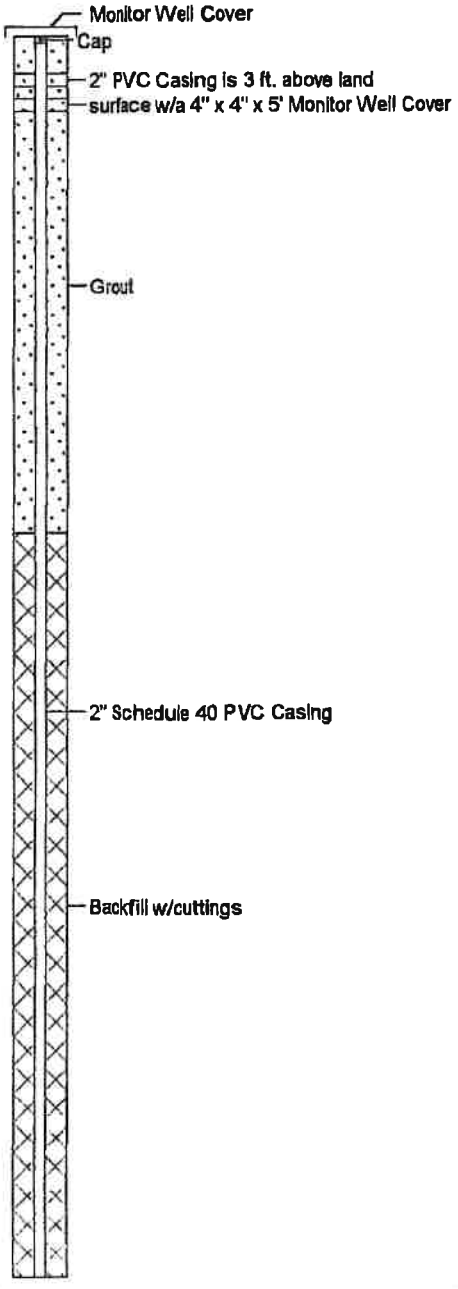
Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy MW - 3 (Page 1 of 3)
Rock Hill Dairy 104 Ojibwa Rd. Dexter, NM Contact: Abel Villalpando Job #98122	Date : 2-13-98/2-16-98 Drill Start : 11:15 A.M./7:00 A.M Drill End : 5:30 P.M./9:00 A.M Boring Location : S. of Dairy, SE Corner of Drainage Pit Site Location : Sec. 27, T13S, R25E Auger Type : Hollow Stem Logged by : Mort Bates

Depth in feet	GRAPHIC	USCS	DESCRIPTION
0		CL	Silty Clay, Brown, Stiff, Damp
5		GP	Gravel w/Clay, Tan, Firm, Damp
10			
15			
20		CL	Silty Clay, Tan, Stiff, Damp
25			
30		CL	Clay, Reddish-Tan, Stiff, Moist
35		GP	Gravel w/Clay, Tan, Firm, Damp
40			
45			
50			

Well: MW-3

Elev.:



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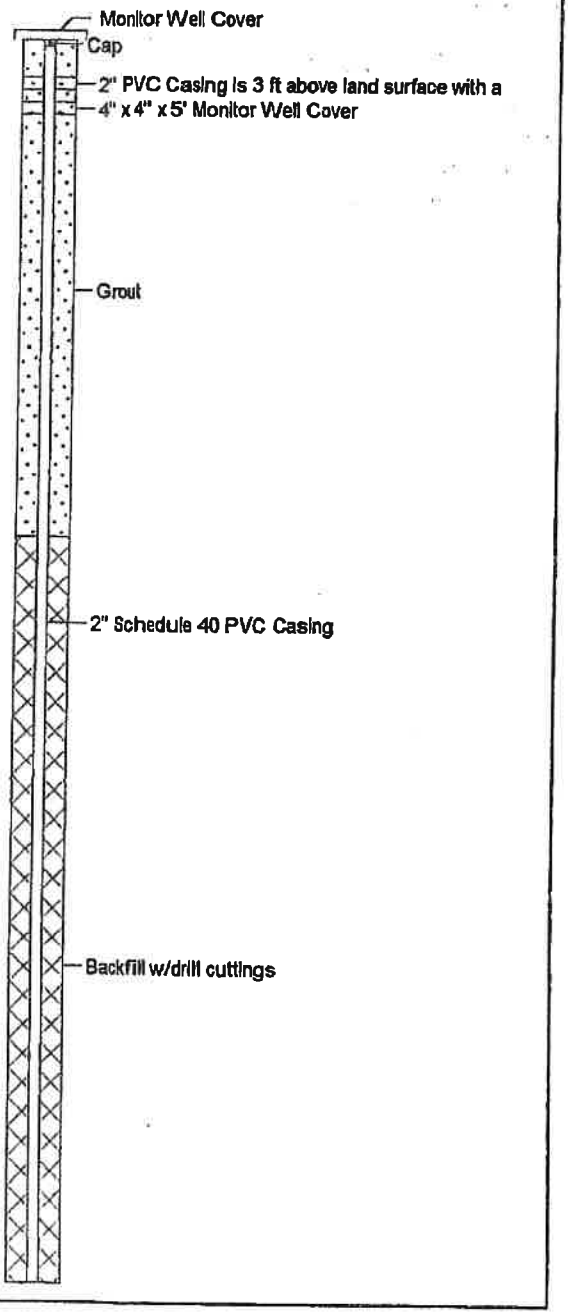
RENUMBERED MW-4

Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy ~~MW-1~~ (Page 1 of 3)
Rock Hill Dairy 104 Ojibwa Road Dexter, NM Contact: Abel Villalpando Job #98122	Date : February 16, 1998 Drill Start : 9:30 A.M. Drill End : 4:00 P.M. Boring Location : E. of MW #3, .5 mi., @ SE Corner of Farm Site Location : Sec. 27, T13S, R25E Auger Type : Hollow Stem Logged by : Mort Bates

Depth in feet	GRAPHIC	USCS	DESCRIPTION
0			
5		GP	Gravel w/Silty Clay, Brown, Stiff, Damp
10			
15		CL	Silty Clay, Tan, Stiff, Damp
20			
25		CL	Clay w/Gravel, Brown, Stiff, Damp
30		GP	Gravel w/Clay, Tan, Firm, Dry
35		CL	Clay, Tan, Stiff, Damp
40			
45		GP	Gravel w/Clay, Tan, Firm, Dry
50			

Well: MW-1

Elev.:



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RENUMBERED MW-4

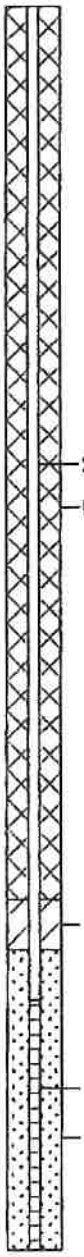
Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy ~~MW-1~~ (Page 2 of 3)

Rock Hill Dairy 104 Ojibwa Road Dexter, NM	Date	: February 16, 1998	Site Location	: Sec. 27, T13S, R25E
	Drill Start	: 9:30 A.M.	Auger Type	: Hollow Stem
	Drill End	: 4:00 P.M.	Logged by	: Mort Bales
Contact: Abel Villalpando	Boring Location	: E. of MW #3, .5 mi., @ SE Corner of Farm		
Job #98122				

Depth in feet	GRAPHIC	USCS	DESCRIPTION
50			
55			
60			
65			
70		GP	
75			
80			
85			
90			Clay, Tan, Loose, Damp
95		CL	
100			

Well: MW-1

Elev.:



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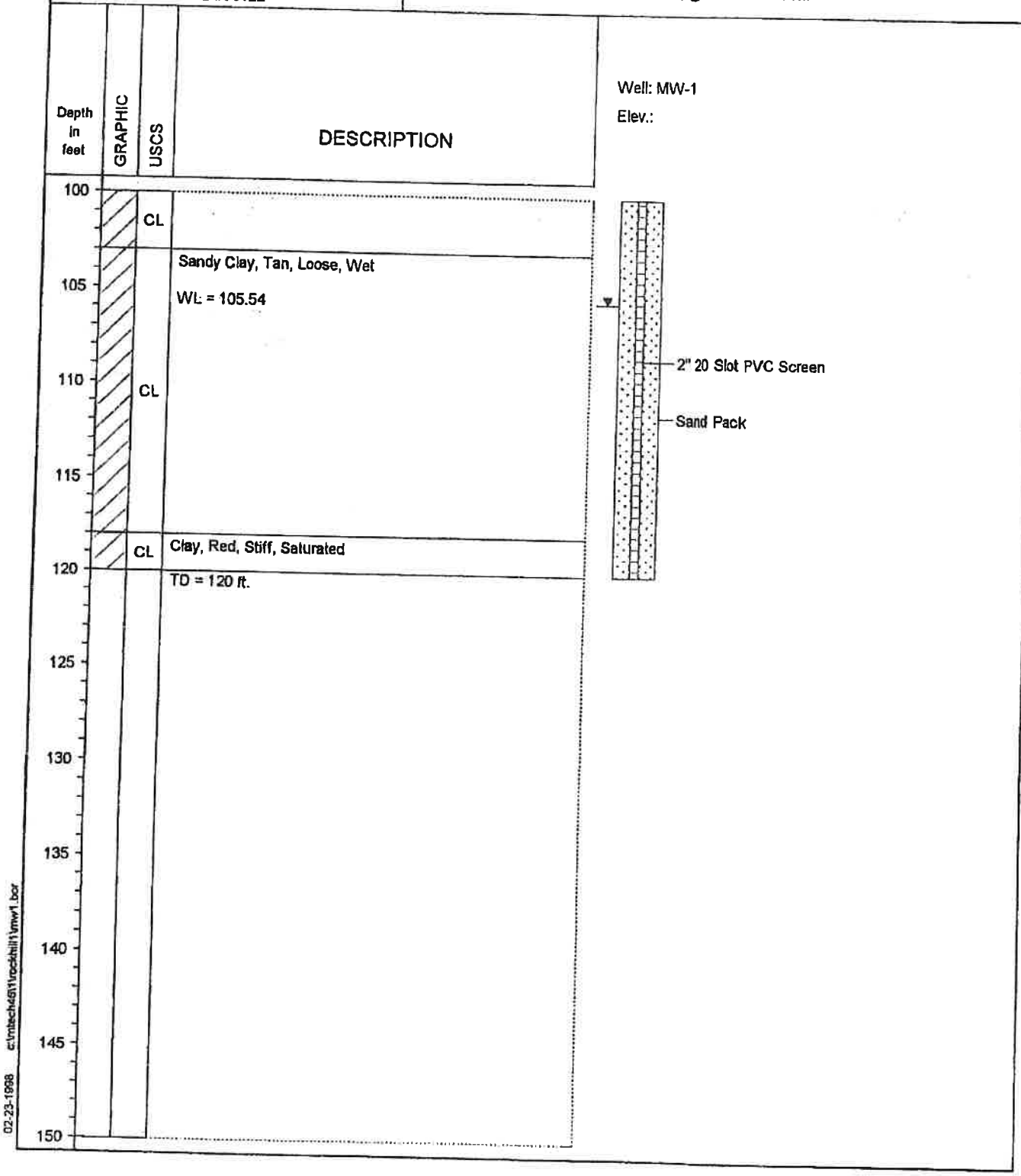
RENUMBERED MW-4

Atkins Engineering Associates, Inc. P.O. Box 3156 Roswell, New Mexico 88202	LOG OF BORING Rock Hill Dairy ~~MW-1~~ (Page 3 of 3)
Rock Hill Dairy 104 Ojibwa Road Dexter, NM Contact: Abel Villalpando Job #98122	Date : February 16, 1998 Drill Start : 9:30 A.M. Drill End : 4:00 P.M. Boring Location : E. of MW #3, .5 mi., @ SE Corner of Farm Site Location : Sec. 27, T13S, R25E Auger Type : Hollow Stem Logged by : Mort Bates



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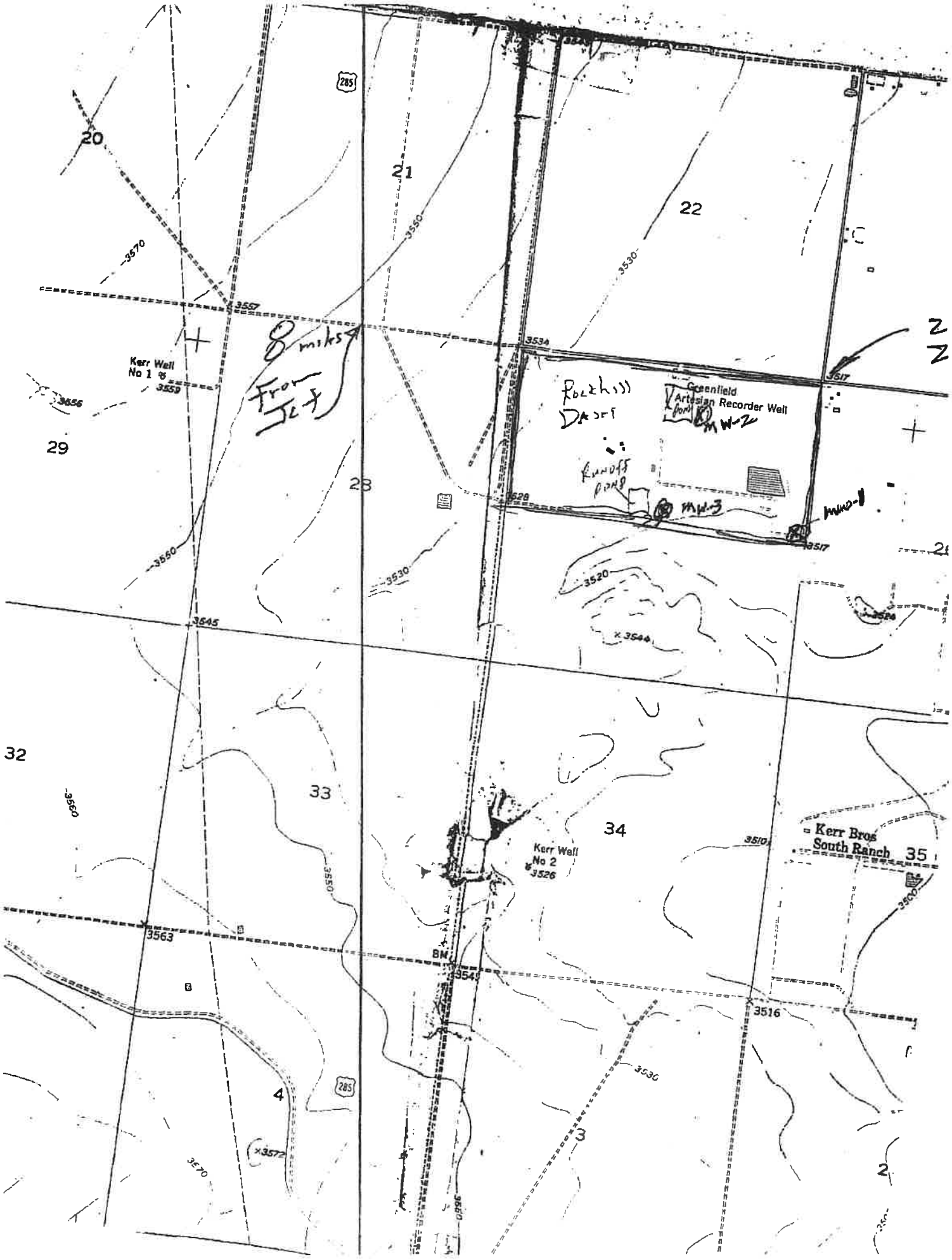
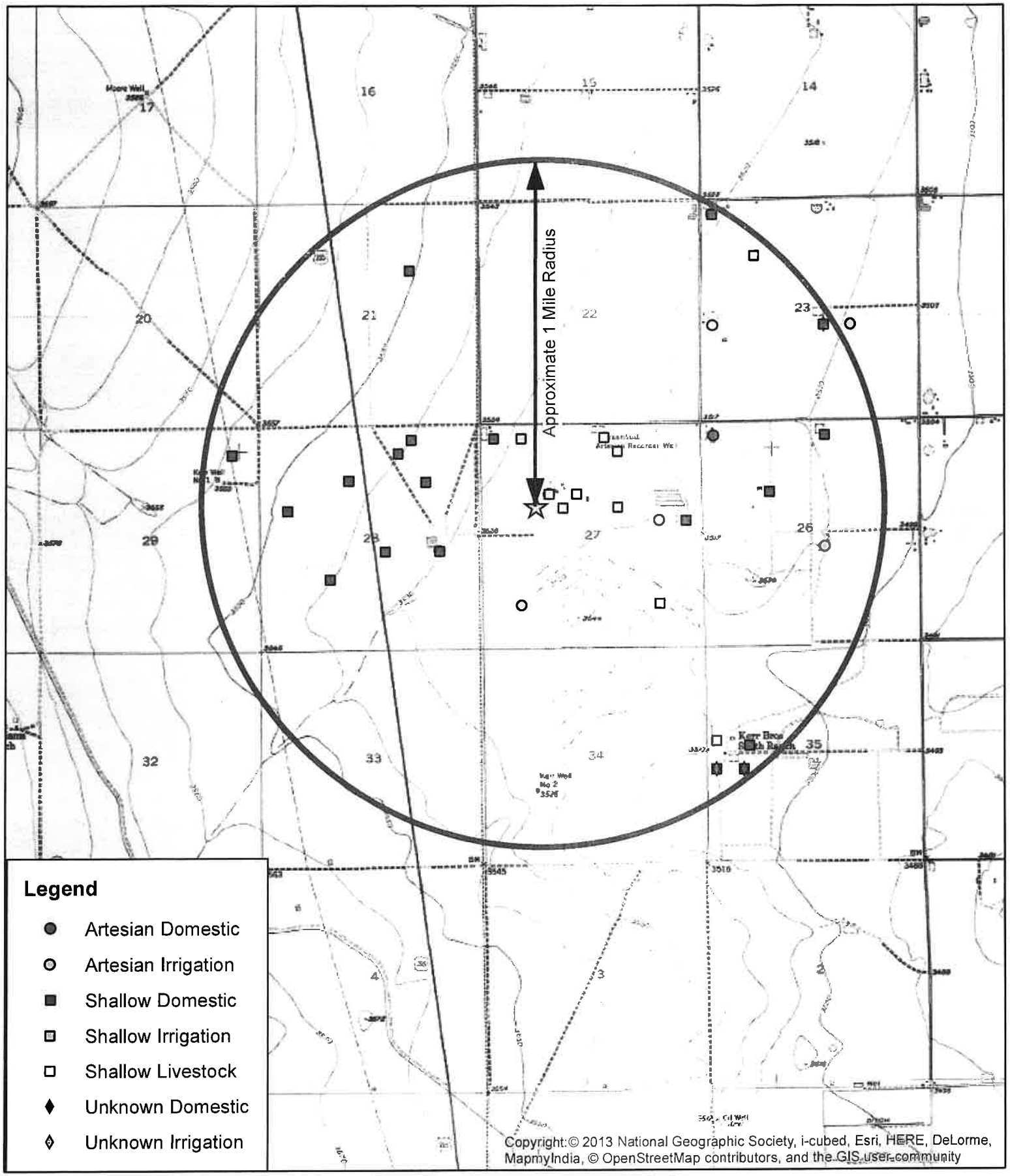

20
21
22
29
28
33
34
32
4
3
2
285
Kerr Well No 1
3559
Greenfield Artesian Recorder Well
Kerr Well No 2
3526
Kerr Bros South Ranch
35
3557
3553A
3517
3528
3520
3545
3544
3563
3549
3516
3572
3570
3560
3550
3530
3510
8 miles
From
Runoff pond
MW-1
MW-2
MW-3



N

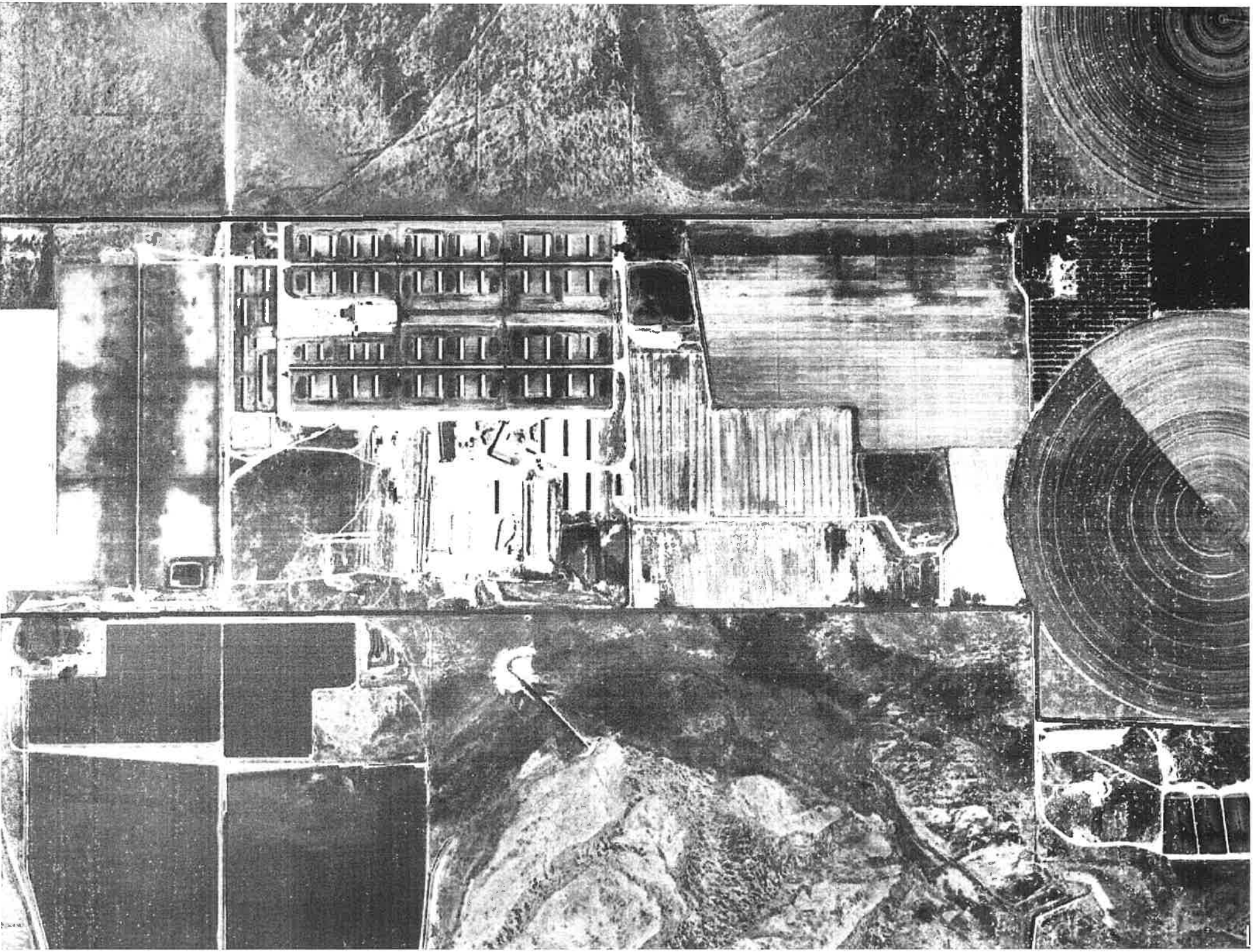
0 1,500 3,000 6,000 Feet

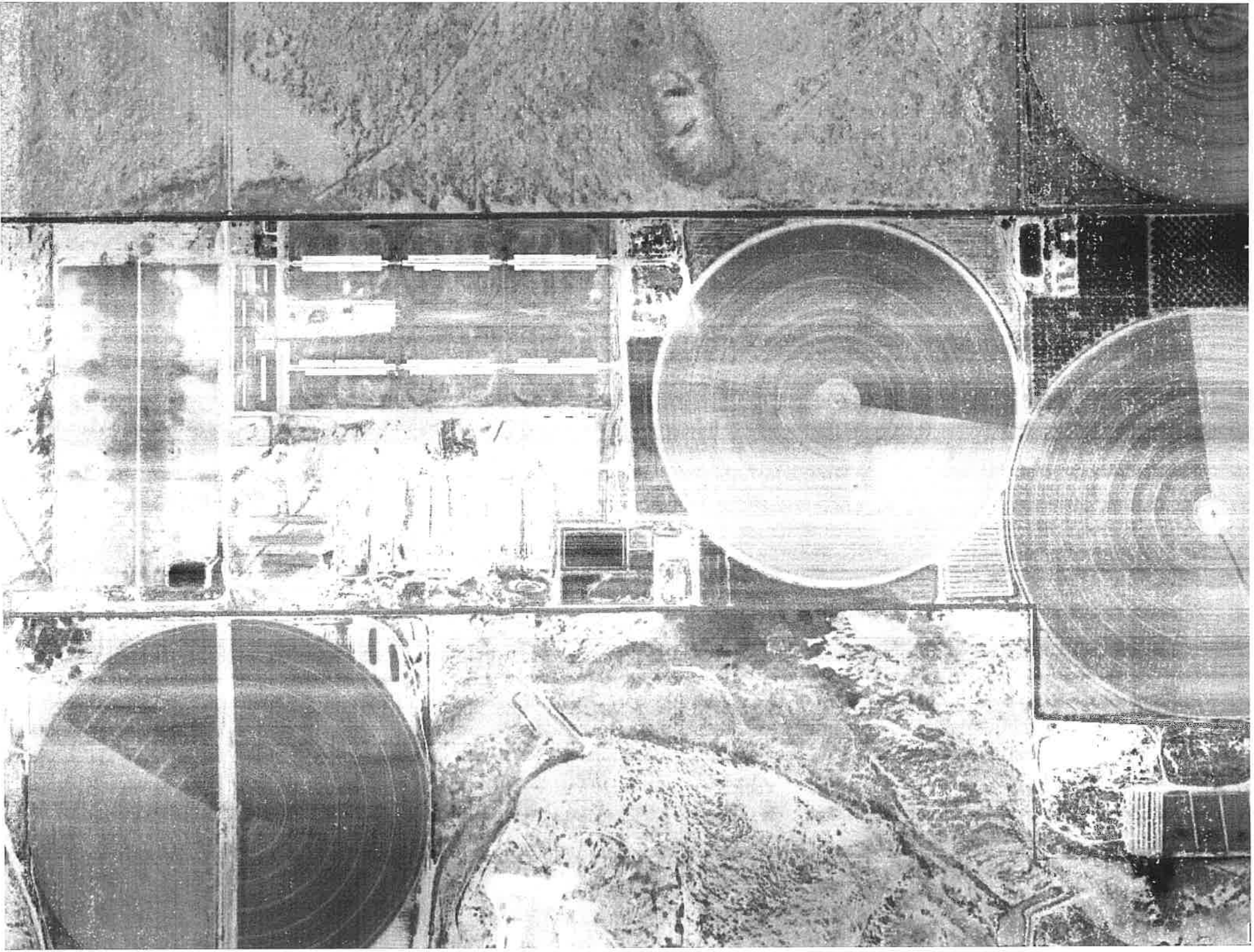
1 inch = 3,000 feet

Topographic Map
Rockhill Dairy DP-952
104 Ojibwa Road, Dexter, NM

March 2018

Atkins ENGINEERING ASSOCIATES





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ROLL # **918700-09** Lot # 7190222 **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH		Thickness	1.0mm	40mil	
	MIN:	0.961 mm	38 mil		Length	198 m	649	feet
	MAX:	1.107 mm	44 mil		Width	7.00 m	23.0	feet
	AVE:	1.05 mm	41 mil		OIT(Standard) ASTM D3895		minutes	219

Specific Gravity ASTM D792	Density		g/cc		.946
MFI ASTM D1238 COND. E GRADE:	K307	Melt Flow Index 190°C /2160 g	- g /10 min		.24
Carbon Black Content ASTM D4218	Range		%		2.22
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	22	N/mm	126 ppi	3,150 psi
	Average Strength @ Break	35	N/mm	199 ppi	4,979 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		16.59
	Average Elongation @ Break		%		708.2
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%		-0.38
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		251 N		56.395 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		296 N		66.458 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		525 N		117.95 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			certified
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ongoing

Customer: AG Services
PO: 8408
Destination Roswell, NM

Date: **5-5-09**

Signature: M. Holmes

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ROLL # **918702-09** Lot # **7190222** **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	0.997 mm	39	mil	Thickness	1.0mm	40mil
	MAX:	1.115 mm	44	mil	Length	198 m	649 feet
	AVE:	1.051 mm	41	mil	Width	7.00 m	23.0 feet

OIT(Standard) ASTM D3895 minutes **219**

Specific Gravity ASTM D792		Density	g/cc		.946
MFI ASTM D1238 COND. E GRADE:	K307	Melt Flow Index 190°C /2160 g - g /10 min			.24
Carbon Black Content ASTM D4218		Range	%		2.22
Carbon Black Dispersion ASTM D5596		Category			10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)		Average Strength @ Yield	22 N/mm	126 ppi	3,150 psi
		Average Strength @ Break	35 N/mm	199 ppi	4,979 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break		Average Elongation @ Yield	%		16.59
		Average Elongation @ Break	%		708.2
Dimensional Stability ASTM D1204 (Modified)		Average Dimensional Change	%		-0.38
Tear Resistance ASTM D1004 (Modified)		Average Tear Resistance	251 N		56.395 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)		Load	296 N		66.458 lbs
Puncture Resistance ASTM D4833 (Modified)		Load	525 N		117.95 lbs
ESCR ASTM D1693		Minimum Hrs w / o Failures	1500 hrs		certified
Notched Constant Tensile Load ASTM D5397		pass / fail @ 30%	300 hrs		ongoing

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ROLL # **918704-09** Lot # 7190222 **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH	Thickness	1.0mm	40mil		
	MIN:	0.993 mm	39 mil	Length	198 m	649	feet	
	MAX:	1.079 mm	42 mil	Width	7.00 m	23.0	feet	
	AVE:	1.049 mm	41 mil	OIT(Standard) ASTM D3895	minutes	219		

Specific Gravity ASTM D792	Density	g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g - g /10 min				.24
Carbon Black Content ASTM D4218	Range	%			2.19
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	22 N/mm	126 ppi	3,150 psi	
	Average Strength @ Break	35 N/mm	199 ppi	4,979 psi	
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo.= 2.0" Break	Average Elongation @ Yield	%			16.59
	Average Elongation @ Break	%			708.2
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			-0.38
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	251 N		56.395 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	296 N		66.458 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	525 N		117.95 lbs	
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		certified	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ongoing	

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ROLL # **918798-09** Lot # **7190222** **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH		**Thickness**	**1.0mm**	**40mil**	
	MIN:	0.984 mm	39	mil	**Length**	**198** m	**649**	feet
	MAX:	1.104 mm	43	mil	**Width**	**7.00** m	**23.0**	feet
	AVE:	1.049 mm	41	mil	**OIT(Standard) ASTM D3895**	**minutes**	**219**	

Specific Gravity ASTM D792	Density	g/cc			**.946**
MFI ASTM D1238 COND. E GRADE: **K307**	Melt Flow Index 190°C /2160 g - g /10 min				**.24**
Carbon Black Content ASTM D4218	Range	%			**2.22**
Carbon Black Dispersion ASTM D5596	Category				**10 In Cat 1**
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	**23** N/mm	**129** ppi	**3,228** psi	
	Average Strength @ Break	**38** N/mm	**215** ppi	**5,386** psi	
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Ló = 2.0" Break	Average Elongation @ Yield	%			**15.13**
	Average Elongation @ Break	%			**798.9**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			**-0.38**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	**251** N		**56.395** lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	**296** N		**66.458** lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	**525** N		**117.95** lbs	
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		**certified**	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		**ongoing**	

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ROLL # **918799-09** Lot # 7190222 **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH		Thickness	1.0mm	40mil	
	MIN:	0.992 mm	39 mil		Length	198 m	649	feet
	MAX:	1.105 mm	44 mil		Width	7.00 m	23.0	feet
	AVE:	1.057 mm	42 mil		OIT(Standard) ASTM D3895	minutes	219	

Specific Gravity ASTM D792	Density	g/cc			.946
MFI ASTM D1238 COND. E GRADE:	K307	Melt Flow Index 190°C /2160 g - g /10 min			.24
Carbon Black Content ASTM D4218	Range	%			2.22
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	23 N/mm	129 ppi	3,228 psi	
	Average Strength @ Break	38 N/mm	215 ppi	5,386 psi	
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			15.13
	Average Elongation @ Break	%			798.9
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			-0.38
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	251 N		56.395 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	296 N		66.458 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	525 N		117.95 lbs	
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		certified	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ongoing	

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ROLL # **404510-08** Lot # **MM199763** **Liner Type:SMOOTH HDPE**

		METRIC		ENGLISH	
Thickness Measurement ASTM D5199 (Modified)	MIN:	0.996	mm	39	mil
	MAX:	1.14	mm	45	mil
	AVE:	1.04	mm	41	mil

Thickness	1.0mm	40mil		
Length	198	m	649	feet
Width	6.86	m	22.5	feet
OIT(Standard) ASTM D3895		minutes	172	

Specific Gravity ASTM D792	Density		g/cc			.945
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g	-	g /10 min			.18
Carbon Black Content ASTM D4218	Range		%			2.25
Carbon Black Dispersion ASTM D5596	Category					10 in Cat. 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	19	N/mm	108	ppi	2,693 psi
	Average Strength @ Break	36	N/mm	203	ppi	5,084 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield	Average Elongation @ Yield		%			16.96
Lo = 2.0" Break	Average Elongation @ Break		%			896.8
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%			-0.48
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		165	N		37.017 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		423	N		95.088 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		469	N		105.35 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs				CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				ONGOING

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12/23/05

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ROLL # **404511-08** Lot # MM199783 **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)		METRIC		ENGLISH		Thickness	1.0mm	40mil
	MIN:	1	mm	39	mil	Length	198 m	649 feet
	MAX:	1.135	mm	45	mil	Width	6.86 m	22.5 feet
	AVE:	1.058	mm	42	mil	OIT(Standard) ASTM D3895	minutes	172

Specific Gravity ASTM D792	Density		g/cc		.945
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g		- g /10 min		.18
Carbon Black Content ASTM D4218	Range		%		2.28
Carbon Black Dispersion ASTM D5596	Category				10 in Cat. 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	18	N/mm	105 ppi	2,626 psi
	Average Strength @ Break	37	N/mm	210 ppi	5,242 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		16.58
	Average Elongation @ Break		%		920.4
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%		-0.48
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		165 N		37.017 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		423 N		95.088 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		469 N		105.35 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ONGOING

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Destination **Roswell, NM**

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ROLL # **404512-08** Lot # **MM199763** **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH
Thickness Measurement ASTM D5199 (Modified)	MIN:	1.016 mm	40 mil
	MAX:	1.095 mm	43 mil
	AVE:	1.056 mm	42 mil

Thickness	**1.0mm**		**40mil**
Length	**198**	m	**649** feet
Width	**6.86**	m	**22.5** feet

OIT(Standard) ASTM D3895 minutes **172**

Specific Gravity ASTM D792	Density	g/cc			**.945**
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190ºC /2160 g	- g /10 min			**.18**
Carbon Black Content ASTM D4218	Range	%			**2.28**
Carbon Black Dispersion ASTM D5596	Category				**10 in Cat. 1**
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	18 N/mm	**105** ppi		**2,626** psi
	Average Strength @ Break	37 N/mm	**210** ppi		**5,242** psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			**16.58**
	Average Elongation @ Break	%			**920.4**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			**-0.48**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	165 N			**37.017** lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	423 N			**95.088** lbs
Puncture Resistance ASTM D4833 (Modified)	Load	469 N			**105.35** lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			**ONGOING**

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ROLL # **404516-08** Lot # **MM199769** **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH					
Thickness Measurement ASTM D5199 (Modified)	MIN:	1.015 mm	40	mil	Thickness	1.0mm	40mil	
	MAX:	1.065 mm	42	mil	Length	198 m	649	feet
	AVE:	1.047 mm	41	mil	Width	6.86 m	22.5	feet

OIT(Standard) ASTM D3895 minutes **168**

Specific Gravity ASTM D792	Density	g/cc			**.946**	
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g - g /10 min				**.18**	
Carbon Black Content ASTM D4218	Range	%			**2.37**	
Carbon Black Dispersion ASTM D5596	Category				**10 in Cat. 1**	
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	19 N/mm		**106** ppi	**2,653**	psi
	Average Strength @ Break	37 N/mm		**212** ppi	**5,302**	psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			**17.00**	
	Average Elongation @ Break	%			**938.1**	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			**-0.14**	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		170 N		**38.314**	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		402 N		**90.378**	lbs
Puncture Resistance ASTM D4833 (Modified)	Load		454 N		**102.15**	lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			**ONGOING**	

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ROLL # **404517-08** Lot # **MM199769** **Liner Type:SMOOTH HDPE**

		METRIC		ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	1	mm	39	mil	Thickness	**1.0mm**	**40mil**
	MAX:	1.07	mm	42	mil	Length	**198** m	**649** feet
	AVE:	1.036	mm	41	mil	Width	**6.86** m	**22.5** feet

OIT(Standard) ASTM D3895 minutes **168**

Specific Gravity ASTM D792	Density		g/cc		**.946**
MFI ASTM D1238 COND. E GRADE: **7002**	Melt Flow Index 190°C /2160 g - g /10 min				**.18**
Carbon Black Content ASTM D4218	Range		%		**2.37**
Carbon Black Dispersion ASTM D5596	Category				**10 in Cat. 1**
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	**19**	N/mm	**106** ppi	**2,653** psi
	Average Strength @ Break	**37**	N/mm	**212** ppi	**5,302** psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		**17.00**
	Average Elongation @ Break		%		**938.1**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%		**-0.14**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		170 N		**38.314** lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		402 N		**90.378** lbs
Puncture Resistance ASTM D4833 (Modified)	Load		454 N		**102.15** lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			**ONGOING**

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ROLL # **404518-08** Lot # MM199769 **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH	Thickness	1.0mm	40mil	
	MIN:	0.985 mm	39 mil	Length	198 m	649	feet
	MAX:	1.09 mm	43 mil	Width	6.86 m	22.5	feet
	AVE:	1.039 mm	41 mil	OIT(Standard) ASTM D3895		minutes	168
Specific Gravity ASTM D792	Density		g/cc				.946
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g		- g /10 min				.18
Carbon Black Content ASTM D4218	Range		%				2.37
Carbon Black Dispersion ASTM D5596	Category						10 in Cat. 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	19	N/mm	106	ppi	2,653	psi
	Average Strength @ Break	37	N/mm	212	ppi	5,302	psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%				17.00	
	Average Elongation @ Break	%				938.1	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%				-0.14	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	170	N			38.314	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	402	N			90.378	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	454	N			102.15	lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs				CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				ONGOING	

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ROLL # 404519-08 **Lot #** MM199769 **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH
Thickness Measurement ASTM D5199 (Modified)	MIN:	1.015 mm	40 mil
	MAX:	1.11 mm	44 mil
	AVE:	1.064 mm	42 mil

Thickness	1.0mm	40mil	
Length	198 m	649	feet
Width	6.86 m	22.5	feet

OIT(Standard) ASTM D3895 minutes **168**

Specific Gravity ASTM D792	Density	g/cc			**.946**
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g - g /10 min				**.18**
Carbon Black Content ASTM D4218	Range	%			**2.28**
Carbon Black Dispersion ASTM D5596	Category				**10 in Cat. 1**
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	19 N/mm	**106** ppi	**2,653**	psi
	Average Strength @ Break	37 N/mm	**212** ppi	**5,302**	psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			**17.00**
	Average Elongation @ Break	%			**938.1**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			**-0.14**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	170 N		**38.314**	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	402 N		**90.378**	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	454 N		**102.15**	lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		**CERTIFIED**	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		**ONGOING**	

Customer: **AG Services**
PO: **Email**
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ROLL # **404627-08** Lot # MM193769 **Liner Type:SMOOTH HDPE**

Thickness Measurement ASTM D5199 (Modified)

	METRIC	ENGLISH
MIN:	0.994 mm	39 mil
MAX:	1.094 mm	43 mil
AVE:	1.043 mm	41 mil

Thickness 1.0mm 40mil
Length 198 m 649 feet
Width 6.86 m 22.5 feet

OIT(Standard) ASTM D3895 minutes 168

Specific Gravity ASTM D792	Density	g/cc		.946
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g	g /10 min		.18
Carbon Black Content ASTM D4218	Range	%		2.43
Carbon Black Dispersion ASTM D5596	Category			10 in Cat. 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	18 N/mm	101 ppi	2,517 psi
	Average Strength @ Break	35 N/mm	199 ppi	4,984 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		16.81
	Average Elongation @ Break	%		906.6
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%		-0.14
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	170 N		38.314 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	402 N		90.378 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	454 N		102.15 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING

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ROLL # 404628-08 **Lot #** MM199769 **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH
Thickness Measurement ASTM D5199 (Modified)	MIN:	1.012 mm	40 mil
	MAX:	1.078 mm	42 mil
	AVE:	1.049 mm	41 mil

Thickness	1.0mm		40mil
Length	198	m	649 feet
Width	6.86	m	22.5 feet
OIT(Standard) ASTM D3895	minutes		168

Specific Gravity ASTM D792	Density	g/cc			.946
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g	- g /10 min			.18
Carbon Black Content ASTM D4218	Range	%			2.43
Carbon Black Dispersion ASTM D5596	Category				10 in Cat. 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	18 N/mm	101 ppi	2,517 psi	
	Average Strength @ Break	35 N/mm	199 ppi	4,984 psi	
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			16.81
	Average Elongation @ Break	%			906.6
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			-0.14
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	170 N			38.314 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	402 N			90.378 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	454 N			102.15 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ONGOING

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ROLL # **404629-08** Lot # MM199789 **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	1.001 mm	39 mil	Thickness	1.0mm	40mil	
	MAX:	1.065 mm	42 mil	Length	198 m	649	feet
	AVE:	1.036 mm	41 mil	Width	6.86 m	22.5	feet
				OIT(Standard) ASTM D3895	minutes		168
Specific Gravity ASTM D792		Density		g/cc		.946	
MFI ASTM D1238 COND. E GRADE:	7002	Melt Flow Index 190°C /2160 g		g /10 min		.48	
Carbon Black Content ASTM D4218		Range		%		2.43	
Carbon Black Dispersion ASTM D5596		Category				1 in Cat. 1	
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)		Average Strength @ Yield	18	N/mm	101 ppi	2,517	psi
		Average Strength @ Break	35	N/mm	199 ppi	4,934	psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break		Average Elongation @ Yield		%		16.81	
		Average Elongation @ Break		%		596.6	
Dimensional Stability ASTM D1204 (Modified)		Average Dimensional Change		%		-0.14	
Tear Resistance ASTM D1004 (Modified)		Average Tear Resistance		170 N		38.214	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)		Load		402 N		90.378	lbs
Puncture Resistance ASTM D4833 (Modified)		Load		454 N		102.15	lbs
ESCR ASTM D1693		Minimum Hrs w / o Failures	1500 hrs			CERTIFIED	
Notched Constant Tensile Load ASTM D5397		pass / fail @ 30%	300 hrs			ONGOING	

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ROLL # **404630-08** Lot # MM199769 **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH
Thickness Measurement ASTM D5199 (Modified)	MIN:	0.995 mm	39 mil
	MAX:	1.067 mm	42 mil
	AVE:	1.035 mm	41 mil

Thickness	1.0mm	40mil	
Length	198	m	649 feet
Width	6.86	m	22.5 feet

OIT(Standard) ASTM D3895 minutes **168**

Specific Gravity ASTM D792	Density	g/cc			**.946**
MFI ASTM D1238 COND. E GRADE: **7002**	Melt Flow Index 190°C /2160 g	- g /10 min			**.18**
Carbon Black Content ASTM D4218	Range	%			**2.43**
Carbon Black Dispersion ASTM D5596	Category				**10 in Cat. 1**
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	18 N/mm	**101** ppi		**2,517** psi
	Average Strength @ Break	35 N/mm	**199** ppi		**4,984** psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			**16.81**
	Average Elongation @ Break	%			**906.6**
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%			**-0.14**
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	170 N			**38.314** lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	402 N			**90.378** lbs
Puncture Resistance ASTM D4833 (Modified)	Load	454 N			**102.15** lbs
ESCR ASTM D1693	Minimum Hrs w/ o Failures	1500 hrs			**CERTIFIED**
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			**ONGOING**

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ROLL # **404631-08** Lot # M5199769 **Liner Type:SMOOTH HDPE**

		METRIC	ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	0.99 mm	39 mil	Thickness	1.0mm	40mil	
	MAX:	1.07 mm	42 mil	Length	198 m	649	feet
	AVE:	1.042 mm	41 mil	Width	6.86 m	22.5	feet
				OIT(Standard) ASTM D3895	minutes	168	
Specific Gravity ASTM D792	Density		g/cc			.946	
MFI ASTM D1238 COND. E GRADE:	7002	Melt Flow Index 190°C /2	160 g - g /10 min			.18	
Carbon Black Content ASTM D4218	Range		%			2.33	
Carbon Black Dispersion ASTM D5596	Category					1 for 2 of 3	
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield		19 N/mm	108 ppi		2,700	psi
	Average Strength @ Break		35 N/mm	203 ppi		5,064	psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			16.77	
	Average Elongation @ Break		%			691.1	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%			0.14	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		144 N			32.371	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		353 N			79.317	lbs
Puncture Resistance ASTM D4833 (Modified)	Load		422 N			94.843	lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs			CERTIFIED		
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ONGOING		

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ROLL # A04632-08 Lot # MM199769 Liner Type:SMOOTH HDPE

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH	Thickness	1.0mm	40mil
	MIN:	0.98 mm	39 mil	Length	198 m	649 feet
	MAX:	1.1 mm	43 mil	Width	6.86 m	22.5 feet
	AVE:	1.04 mm	41 mil	OIT(Standard) ASTM D3895	minutes	168

Specific Gravity ASTM D792	Density	g/cc		.946
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g	- g /10 min		.18
Carbon Black Content ASTM D4218	Range	%		2.33
Carbon Black Dispersion ASTM D5596	Category			10 in Cat. 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches /minute)	Average Strength @ Yield	19 N/mm	108 ppi	2,700 psi
	Average Strength @ Break	36 N/mm	203 ppi	5,064 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / 20 in/min) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		16.77
	Average Elongation @ Break	%		891.1
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%		-0.14
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	144 N		32.271 lbs
Puncture Resistance FTMS 101C Method 2065 (Modified)	Load	353 N		79.317 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	422 N		94.948 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING

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ROLL # 404633-08 Lot # MB199769 **Liner Type:** SMOOTH HDPE

		METRIC	ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	0.994 mm	39 mil	Thickness	1.0mm	40 mil	
	MAX:	1.07 mm	42 mil	Length	198 m		feet
	AVE:	1.042 mm	41 mil	Width	6.86 m		feet
				OIT(Standard) ASTM D3895	minutes	168	
Specific Gravity ASTM D792				Density	g/cc	.946	
MFI ASTM D1238 COND. E GRADE:	7002			Melt Flow Index 190°C /2160 g	- g /10 min	18	
Carbon Black Content ASTM D4218				Range	%	2.28	
Carbon Black Dispersion ASTM D5596				Category		Cat. 1	
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)				Average Strength @ Yield	19 N/mm	108 ppi	2700 psi
				Average Strength @ Break	36 N/mm	203 ppi	5084 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break				Average Elongation @ Yield	%	16.77	
				Average Elongation @ Break	%	651.1	
Dimensional Stability ASTM D1204 (Modified)				Average Dimensional Change	%	0.14	
Tear Resistance ASTM D1004 (Modified)				Average Tear Resistance	144 N	32.371	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)				Load	353 N	79.417	lbs
Puncture Resistance ASTM D4833 (Modified)				Load	422 N	94.948	lbs
ESCR ASTM D1693				Maximum Hrs w / o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397				pass / fail @ 30%	300 hrs	CERTIFIED	

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ROLL # 4634-08 Lot # NM199769 Liner Type:SMOOTH HDPE

		METRIC	ENGLISH
Thickness Measurement ASTM D5199 (Modified)	MIN:	1.016 mm	40 mil
	MAX:	1.096 mm	43 mil
	AVE:	1.067 mm	42 mil

Thickness	1.0mm	40mil	
Length	198 m	649	feet
Width	6.86 m	22.5	feet
OIT(Standard) ASTM D3895	minutes	168	

Specific Gravity ASTM D792	Density	g/cc		.946	
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g	- g/10 min		.18	
Carbon Black Content ASTM D4218	Range	%		2.28	
Carbon Black Dispersion ASTM D5596	Category			10 in Cat. 1	
Tensile Strength ASTM D638 ASTM D882 (Modified) (2 inches/minute)	Average Strength @ Yield	19 N/mm	108 ppi	2,700	psi
	Average Strength @ Break	35 N/mm	203 ppi	5,064	psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		16.77	
	Average Elongation @ Break	%		891.1	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change	%		-0.14	
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	144 N		32.271	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	583 N		79.317	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	422 N		94.948	lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING	

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ROLL # **404635-08** Lot # 8[illegible]9769 **Liner Type:** [illegible] **HDPE**

		METRIC	ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	[illegible] mm	**39** mil	Thickness	**1.0mm**	**40mil**	
	MAX:	[illegible] mm	**42** mil	Length	**198** m	[illegible]	feet
	AVE:	[illegible] mm	**41** mil	Width	**6.86** m	[illegible]	feet
				OIT(Standard) ASTM D3895		minutes	168
Specific Gravity ASTM D792	Density			g/cc			[illegible]946
MFI ASTM D1238 COND. E GRADE:	7002	Melt Flow Index 190°C /2160 g - g /10 min					[illegible]18
Carbon Black Content ASTM D4218	Range			%			[illegible]2.8
Carbon Black Dispersion ASTM D5596	Category						[illegible] 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield			19 N/mm	108 ppi		[illegible]700 **psi**
	Average Strength @ Break			36 N/mm	203 ppi		[illegible]984 **psi**
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%			[illegible]17
	Average Elongation @ Break			%			[illegible]1
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%			[illegible]
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance			144 N			[illegible]71 **lbs**
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			353 N			[illegible]347 **lbs**
Puncture Resistance ASTM D4833 (Modified)	Load			422 N			[illegible]48 **lbs**
ESCR ASTM D1693	Minimum hrs w / o Failure		1500 hrs			CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%		300 hrs			ONGOING	

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Destination **Roswell, NM**

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ROLL # 4636-08 Lot # 99769 Liner Type:SMOOTH HDPE

		METRIC	ENGLISH
Thickness Measurements ASTM D5199 (Modified)	MIN:	1.075 mm	38 mil
	MAX:	1.08 mm	43 mil
	AVE:	1.042 mm	41 mil

Thickness 1.0mm 40mil
Length 198 m 649 feet
Width 6.86 m 22.5 feet

OIT(Standard) ASTM D3895 minutes 168

Specific Gravity ASTM D792	Density	g/cc		.946
MFI ASTM D1238 COND. E GRADE: 7002	Melt Flow Index 190°C /2160 g - g/10 min			.18
Carbon Black Content ASTM D1603	Range	%		2.30
Carbon Black Dispersion ASTM D5596	Category			10 in Cat. 1
Tensile Strength ASTM D638 ASTM D638 Modified) (2 inches/min, Type IV)	Average Strength @ Yield	18 N/mm	103 ppi	2,580 psi
	Average Strength @ Break	34 N/mm	192 ppi	4,805 psi
Elongation ASTM D638 ASTM D638 Modified) (2 inches/min, Type IV) Lo = 1.3" Gage Lo = 2.0" Break	Average Elongation @ Yield	%		15.09
	Average Elongation @ Break	%		828.8
Dimensional Stability ASTM D1204 Modified)	Average Dimensional Change	%		-0.14
Tear Resistance ASTM D1004 Modified)	Average Tear Resistance	144 N		32.271 lbs
Puncture Resistance FTMS 101C Method 2065 (Modified)	Load	353 N		79.317 lbs
Puncture Resistance ASTM D4833 Modified)	Load	422 N		94.948 lbs
ESCR ASTM D1693	Minimum Hrs w / o Failures	1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 Hrs		ONGOING

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ROLL # 404637-08 Lot # [illegible] 9769 **Liner Type:** [illegible] HDPE

Thickness Measurement ASTM D5199 (Modified)		METRIC	ENGLISH	Thickness	1.0mm	40mil	
	MIN:	.016 mm	40 mil	Length	198	m	feet
	MAX:	.043 mm	42 mil	Width	6.86	m	feet
	AVE:	.039 mm	41 mil	OIT(Standard) ASTM D3895		min	168
Specific Gravity ASTM D792				Density		g/cc	.916
MFI ASTM D1238 COND. E				Melt Flow Index 190°C/2.16 kg - g /10 min			.78
GRADE:	7002						
Carbon Black Content ASTM D4218				Range		%	2.50
Carbon Black Dispersion ASTM D5596				Category			1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)				Average Strength @ Yield	18 N/mm	103 ppi	3,620 psi
				Average Strength @ Break	34 N/mm	192 ppi	4,305 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break				Average Elongation @ Yield		%	19
				Average Elongation @ Break		%	758
Dimensional Stability ASTM D1204 (Modified)				Average Dimensional Change		%	-.1
Tear Resistance ASTM D1004 (Modified)				Average Tear Resistance	134 N		30.1 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)				Load	383 N		86.317 lbs
Puncture Resistance ASTM D4833 (Modified)				Load	432 N		97.118 lbs
ESCR ASTM D1693				Minimum hrs w / o Failure	1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397				pass / fail @ 30%	300 hrs		ONGOING

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Date: **1-27-08**

Signature: [signature]

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ROLL # 9330-08 Lot # 7181323 Liner Type:SMOOTH HDPE

Thickness		METRIC	ENGLISH	Thickness	1.0mm	40mil	
Measured	MIN:	mm	mil	Length	198 m	649	feet
ASTM D5199	MAX:	mm	mil	Width	7.00 m	23.0	feet
(Modified)	AVE:	mm	mil	OIT(Standard) ASTM D3895	minutes	210	

Specific	Density	g/cc		.945
MFI ASTM				
COND.	Melt Flow Index 190°C / 2160 g	- g/10 min		.22
GRADE: K307				
Carbon Black Content	Range	%		2.14
ASTM D				
Carbon Black Dispersion	Category			10 in Category 1
ASTM D				
Tensile Strength				
ASTM D	Average Strength @ Break	18 N/mm	104 ppi	2,605 psi
ASTM D638 (Modified)				
(2 inches/minute)	Average Strength @ Break	34 N/mm	194 ppi	4,852 psi
Elongation				
ASTM D	Average Elongation @ Yield	%		16.25
(2 inches/minute)				
Lo = 1.3"	Average Elongation @ Break	%		854.6
Lo = 2.0"				
Dimensional				
ASTM D1 (Modified)	Average Dimensional Change	%		-0.24
Tear Resistance				
ASTM D1004 (Modified)	Average Tear Resistance	207 N		46.639 lbs
Puncture				
FTMS 101 2065 (Modified)	Load	N		66.003 lbs
Puncture				
ASTM D4 (Modified)	Load	N		104.31 lbs
ESCR				
ASTM D1	Minimum Hrs w / o Failures	1500 hrs		CERTIFIED
Notched Constant Tensile Load				
ASTM D5	pass / fail @ 30%	300 hrs		ONGOING

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Destination: Roswell, NM

Date: 12-3-08

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ROLL # 949332-0[illegible] Lot # 7[illegible]323 **Liner Type:** S[illegible] **HDPE**

		METRIC	ENGLISH			
Thickness Measurement ASTM D5199 (Modified)	MIN:	[illegible] mm	**41** mil	Thickness	**1.0mm**	40mil
	MAX	[illegible] mm	**47** mil	Length	**198** m	feet
	AVE:	[illegible] mm	**43** mil	Width	**7.00** m	feet
				OIT(Standard) ASTM D3895 min		**210**
Specific Gravity ASTM D792	Density		g/cc			[illegible]44
MFI ASTM D1238 COND. E GRADE: K3[illegible]7	Melt flow index 190°C /2[illegible] g - g /10 min					[illegible]2
Carbon Black Content ASTM D4218	Range		%			[illegible]2-3
Carbon Black Dispersion ASTM D5596	Category				10 in Dat[illegible]	1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield		1[illegible] N/mm	105 ppi		[illegible]39 psi
	Average Strength @ Break		32 N/mm	185 ppi		[illegible]45 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			[illegible]3
	Average Elongation @ Break		%			[illegible]3
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change		%			[illegible]21
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance		[illegible]96 N			[illegible]5 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		[illegible]6 N			[illegible]7 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		470 N			[illegible]3 lbs
ESCR ASTM D1693	Minimum hrs w / o Failure	1500 hrs				[illegible]
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				[illegible]

Customer: **AG Services**
PO: **7539**
Destination **Roswell, NM**

Date: **12-3-08**

Signature: [signature]

Quality Control Depart[illegible]

[illegible]M FRM
[illegible]05

quality certificate

ROLL # 0336-08 **Lot #** 7181323 **Liner Type:SMOOTH HDPE**

Thickness		METRIC	ENGLISH	Thickness	1.0mm	40mil	
Measurem	**MIN:**	1.035 mm	41 mil	Length	198 m	649	feet
ASTM D51	**MAX:**	1.137 mm	45 mil	Width	7.00 m	23.0	feet
(Modified)	**AVE:**	1.077 mm	42 mil	OIT(Standard) ASTM D3895		minutes	210

Specific **ASTM D7**	Density	g/cc		.944
MFI AST **COND. E** **GRADE:**	**K307**	Melt Flow Index 190°C /2160 g - g/10 min		.22
Carbon **ASTM D4**	Range	%		2.13
Carbon **ASTM D5**	Category			10 in Category 1
Tensile **ASTM D6** **ASTM D6** **(2 inches**	Average Strength @ Yield	14 N/mm	105 ppi	2,629 psi
	Average Strength @ Break	32 N/mm	185 ppi	4,615 psi
Elongatio **ASTM D6** **(2 inches** **Lo = 1.3"** **Lo = 2.0"**	Average Elongation @ Yield	%		15.43
	Average Elongation @ Break	%		776.3
Dimensio **ASTM D1**	Average Dimensional Change	%		-0.24
Tear Resi **ASTM D1**	Average Tear Resistance	286 N		46.285 lbs
Puncture **FTMS 10**	Load	286 N		64.257 lbs
Puncture **ASTM D4**	Load	470 N		105.65 lbs
ESCR **ASTM D1**	Minimum Hrs w / o Failures	1500 hrs		CERTIFIED
Notched **ASTM D5**	Tensile Load	pass / fail @ 30%	300 lbs	ONGOING

Cu **GG Services**
7639
Des **Roswell, NM**

Date 12-3-08

Signature Quality Control Department

40HDSM.FRM
REV 02
12/23/05

agru america quality control dept.

quality certificate

ROLL # 949334-0[illegible] [illegible] 7[illegible]1323 **Liner Type:** S[illegible] **HDPE**

		ENGLISH				
Thickness Measurement ASTM D5199 (Modified)	MIN:	[illegible] mm	41	n	Thick[illegible]	**1.0mm** 4[illegible]
	MAX:	[illegible] mm	47	m	Length	**198** m [illegible] feet
	AVE:	[illegible] mm	43	m	Width	**7.00** m [illegible] feet
Specific Gravity ASTM D792	D[illegible]ty			g/cc		OIT(Standard) ASTM D3895 mi[illegible] 210
MFI ASTM D1238 COND. E GRADE:	K30[illegible]	Melt Flow Index 190°C /2[illegible] g /10 min				[illegible]2
Carbon Black Content ASTM D4218	Ka[illegible]			%		2[illegible]
Carbon Black Dispersion ASTM D5596	Ca[illegible]ory					10 in[illegible]
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield			[illegible] N/mm	105 pp[illegible]	psi
	Average Strength @ Break			[illegible] N/mm	185 pp[illegible]	[illegible]5 psi
Elongation ASTM D-6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		[illegible]
	Average Elongation @ Break	[illegible]		%		[illegible]
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional Change			%		[illegible]
Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance			[illegible]6 N		[illegible] lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			[illegible]6 N		[illegible] lbs
Puncture Resistance ASTM D4833 (Modified)	Load			[illegible]0 N		[illegible] lbs
ESCR ASTM D1693	Minimum Hours w / o Failure		1500 hrs		CER[illegible]	[illegible]
Notched Constant Tensile Load ASTM D5397	pass - fail @ 30%		300 hrs		OIT[illegible]	[illegible]

Customer: AG Services
PO: 7539
Destination Roswell, NM

Date: 2-3-08

Signature: [illegible]

Quality Control Departm[illegible]

[illegible]FRM

HEALTH AND SAFETY PLAN

STAGE 1 ABATEMENT PLAN
Soil Sampling Program
and
Groundwater Sampling Program

Rockhill Dairy
104 East Ojibwa Road
Dexter, New Mexico
(NMED DP-952)

Prepared
For:
Rockhill Dairy

GLORIETA GEOSCIENCE, INC.
P.O. Box 572[illegible] Santa Fe, NM 87502
(505) 983-5[illegible] Fax (505) 983-6482
E-mail: ggi@glorietageo.com
Web Address: www.glorietageo.com

December XX, 2019

HEALTH AND SAFETY PLAN

TABLE OF CONTENTS

HEALTH AND SAFETY PLAN

This plan will be kept on site during field activities and will be reviewed and updated as necessary. This plan adopts procedures contained in the work plan for the project.

1.0 PROJECT INFORMATION AND DESCRIPTION

PROJECT MANAGER: Bruce Yurdin, Glorieta Geoscience, Inc. (GGI)

OFFICE: 1723 Second Street, Santa Fe, New Mexico

HEALTH AND SAFETY MANAGER: Paul Drakos

NAME: Rockhill Dairy

LOCATION: 104 East Ojibwa Road, Dexter, NM

DATE HEALTH AND SAFETY PLAN PREPARED: December XX, 2019

DATE(S) OF SITE WORK: Intermittent starting ***TBD***

ACCESS: Site is accessible by vehicle and by foot. All on-site activities to be performed in the area of controlled access.

TOPOGRAPHY: The area is relatively flat

DESCRIPTION: The site consists of an active dairy facility with corrals, land application area, green water storage lagoon, repair shops, office, and equipment storage. Work to be performed in parking area in proximity to building.

1.1 Site Workplan

Approved work plan activities:

1. Reconnaissance of location for positioning of soil sampling.
2. Perform subsurface investigation (soil sampling) and complete survey of surface features.
3. Continued sampling of monitoring wells on a periodic cycle for Discharge Permit/Abatement Plan.

1.2 Existing Site Features

Approximate size of facility/site	~748 acres							
Approximate size of work area	<0.1 acre (four locations at dairy facility)							
Type of Area: (Check)	Industrial	X	Commercial		Residential		Unimproved	X
	Closed Site		Active Work Site	X	Fence	X	Monitored Access	X
	USTs		ASTs		Vehicular Traffic	X	Pedestrian Traffic	X
	Overhead Lines	X	Buried Lines	X	Containers/ Drums		Berms/Pits	X
Onsite Availability: (Check)	Drinking Water	X	Non-potable Water	X	Toilet or Bathroom Facilities	X	Secured Storage	

2.0 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 Project Organization

Senior Level Management: Responsible for defining project objectives, allocating resources, determining the chain-of-command, and evaluating program outcome

Field Engineer and/or
Field Scientist / Technician: Manages field operations; executes the workplan and schedule. Enforces and obeys safety procedures, enforces site control documents field activities and sample collection, serves as a liaison with others involved in project (client representation, government officials, etc).

2.2 Description of Tasks

General Field Tasks Include: soil sampling with direct-push method, preparation of soil samples; water sampling; GPS survey.

2.3 List of Subcontractor(s) and Related Task(s)

TBD – Provide drilling services.
Hall Environmental Analysis Laboratory – Perform laboratory analysis.

3.0 POTENTIAL HAZARDS

3.1 Physical Hazards

POTENTIAL HAZARD	PRECAUTION
On-site Traffic	1. Wear high visibility clothing 2. Temporary fencing and flagging for traffic control 3. Avoid high traffic areas.
Moving Vehicles	Observer remains in contact with operator and signals safe back up. Personnel to remain outside of turning radius.
Slip, Trip, Fall Hazards	Identify slippery or muddy work areas. Wear ANSI-approved work boots with toe and shank (foot bottoms) and non-skid over boots.
Back Injury	Bend knees and use leg muscles or provide mechanical lifting aids.
Trenches/Excavations	No excavations or trenching for this project.
Protruding Objects	Observe and note all work areas for protruding objects.
Electrical Shock	Subsurface and overhead hazards are identified.
Noise (> 85 dBA)	Hearing protection available to project personnel during drilling activities.
Drilling Equipment Operation	1. Observe equipment operation during excavation and removal of soils and demolition material 2. Working area defined to excluding pedestrians. 3. Review equipment operation including kill switch locations.
Subsurface Utilities	1. Location previous cleared; facility has not added any new UG utilities in the vicinity of the former tankhold. 2. NM One-Call Ticket Numbers: TBD
Inclement Weather	1. Stop outdoor work during storms. 2. Provide cover indoors or in vehicle.
CONFINED SPACES (Attach permit if required)	No confined space entry is permitted with this health plan. No entry permitted to areas identified as confined space.

3.2 Chemical Hazards

POTENTIAL HAZARD	PREVENTION
Nitrates in Soil or Groundwater	1. Wear proper PPE when handling soil material or groundwater. 2. Proper hygiene (avoid handling food or drink without washing)
Sample Preservation (Sulfuric Acid)	Wear proper PPE when handling soil material or groundwater.

3.3 Medical / Biological Hazards

HAZARD	SYMPTOMS	PREVENTION
A. HEAT STROKE	Red, hot dry skin; no perspiration, nausea; dizziness and confusion; strong, rapid pulse; coma; death.	1. Suspend physical activity and remove subject from heat (shaded, cool area). 2. Replace body fluids with 0.1% salt and water solution (i.e.: Gatorade). 3. Use cooling devices; reduce body temperature by emersion in cool water. 4. Limit contact with heat-absorbing protective clothing. Conduct work activities in early morning or evening during hot weather; reduce exposure to direct sunlight.
B. HEAT EXHAUSTION	Shallow breathing; pale; cool, moist skin; dizziness; profuse sweating.	Treat as shock; recline with feet elevated, cover body with blanket (raise body temperature); do not force fluids.
C. HYPOTHERMIA	Mild shivering; complaints of feeling chilled; absence of reflexes; barely detectable pulse and respiration; unconsciousness.	Mild: Increase insulation of dry clothing; increase physical activity; ingest high carbohydrate foods and warm fluids. Severe: find shelter and add heat; proceed with the same treatment as mild form.
D. INSECT or ANIMAL BITES /STINGS:	Swelling on skin around bite marks; nausea; fever; dizziness; general discomfort; shock.	Avoid areas that cannot be observed i. e. don't place appendages in small confined areas; inspect all areas before entering.
C. AIRBORNE PATHOGENS (HANTA VIRUS):	General fever symptoms including nausea, dizziness and confusion; strong, rapid pulse; coma; death.	Avoid unoccupied areas that contain signs of rodent occupancy; do not disturb areas that contain rodent populations.

4.0 KNOWN CHEMICALS OF CONCERN

Contaminant (CAS Number)	Location and Highest Concentration (Solid Media: mg/kg or ppm Liquid Media: mg/L)	PEL, STEL, or REL	IDLH	Symptoms and Effects of Exposure (Source: NIOSH Pocket Guide to Chemical Hazards)	IP
Nitrate (NO_3^-) Nitrite (NO_2^-)	Soil and ground water	No NIOSH PEL or STEL	MHg of 70%	Acute acquired methemoglobinemia; headache, fatigue nausea (CNS depression), cyanosis; dysrhythmias coma.	NA
Chloride	Soil and ground water	No NIOSH PEL or STEL	NA	Irritation eyes, skin, nose, respiratory system; dizziness, headache	NA
Sulfate	Soil and ground water	No NIOSH PEL or STEL	NA	Irritation eyes, skin, nose, respiratory system; dizziness; headache, fatigue, insomnia, dermatitis.	NA

IP: Ionization potential in electron volts; ppm: parts per million; mg/m^3: milligram per cubic meter; **CA:** carcinogen

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) SPECIFICATION

Task	Level	Body	Foot	Head	Eye	Hand	Respirator
Soil sampling activities	D	Not required (Cotton fabric clothing preferred)	Steel toed boots	Hard hat	Safety glasses	Nitrile for sampling	None required.
Water sampling	D	Not required (Cotton fabric clothing preferred)	Steel-toed boots	None	Safety glasses	Nitrile for sampling	None required.

Note 1 Modifications of Respirator Requirement will be assessed based on results of soil sampling.

Note 2: The SCC shall specify hardhat areas.

5.1 Reasons to Upgrade or Downgrade Level of Protection

Upgrade	Downgrade
• None at this time. Any potential for upgrade exists.	• None.

6.0 CALIBRATION SPECIFICATIONS

If required, methane span gas (50% LEL) for lower explosivity limit (LEL) meter and isobutylene-in-air (100 ppm-v) span gas for photo-ionization detector (PID).

The calibration of LEL meter and PID is to be performed at the beginning of each day of work. Periodic testing of the two instruments should be performed using calibration (span) gas at a clean location.

7.0 AIR SAMPLING REQUIREMENTS

Real-time air sampling will not be performed for any tasks under this HASP. There is no indication of historical levels for gases that would provide an explosive atmosphere or IDLH situation. Monitoring with olfactory senses can provide sufficient indication to suspend work.

Available: PID: Thermo Model 580B OVM LEL/ O_2 meter: VRAE Model PGM 7800
Both instruments have been factory serviced and calibrated within the last two years.

8.0 WORK PROCEDURES

8.1 Work Practices

General Practices

1. Establish work zone to exclude unnecessary traffic.
2. No spark sources or smoking during inspections or outside of designated areas.
3. Avoid visible chemically affected areas.
4. No eating, drinking, or smoking in areas where sampling is occurring.
5. Perform work during daylight hours only. All work to be conducted after review with the facility manager or representative.

Soil Sampling Activities

1. Remove or note all surface restrictions. Establish and review work zone including traffic controls.
2. Ensure properly trained personnel are present for required tasks.
3. Ensure proper storage of all waste materials for later disposal if required.
4. Ensure area around drilling operation is secured after completion of operations during daylight hours.

Excavation and Trenching
No excavations are to be performed under this work plan.

8.2 Control Measures

1. Conduct safety briefing before starting field activities, or as tasks and conditions change at the Site.
2. Safety briefing topics: general discussion of health and safety plan; site specific hazards; location of work zones; PPE requirements; equipment; special procedures; emergencies.
3. Utilize existing boundary fence for access control during excavation activities.
4. Ensure that proper Spill Kit is available.
5. Document Project Safety Coordinator records and safety briefing attendance in logbook.
6. Have MSDSs available pertaining to on-site chemicals with exposure potential.
7. Establish off-site communications.
8. Establish procedures for disposal of material generated on site.
9. Conduct periodic inspections of work practices to determine effectiveness of this plan.
10. Note deficiencies, correct, and report to Project Manager.

Engineering Controls for Spills/Releases
No engineering controls for spills/releases (other than equipment fuel spills) have been identified for the tasks. Spill kits should be available to avoid the contamination of borings by direct-push equipment fluids.

9.0 AIR MONITORING

Photo-ionization detector (PID) and lower explosivity level / oxygen (LEL/O_2) meter will not be part of the field activities.

Continuous air monitoring is not anticipated any portion of this work plan.

10.0 FIELD PROCEDURES

10.1 Field Operations

Maintain safe work area. Work areas defined by activities at the facilities. Limit activities to areas that do not contain hazards.

PPE Level D required. Hearing protection when required.

DO NOT PROCEED WITH WORK IF SAFETY CONCERNS OR SITUATION RESULTS IN CHANGE OF WORK PLAN.

10.2 Personal Protective Equipment

Level D
Eye wear: ANZI/OSHA-approved safety glasses

Glove: Disposable nitrile gloves; outer glove: leather work gloves for situations when working with sharp metal surfaces

Foot wear: Steel-toed boot with ankle support.

Other: Earplugs (or hearing protection) in areas with high noise operations; hard hat; long-sleeved shirt and long pants; safety vest

Level C
SITUATIONS (OTHER THAN ESCAPE OR ENTERING A RECOGNIZED EXPLOSIVE ENVIRONMENT FOR AIR SAMPLING) REQUIRING LEVEL C OR HIGHER PPE ARE NOT PERMITTED UNDER THIS WORK PLAN. THIS HASP AND WORK PLAN MUST BE MODIFIED IF HIGHER LEVELS OF PPE ARE REQUIRED FOR CONTINUED ACTIVITY IN THE WORK AREA.

11.0 DECONTAMINATION PROCEDURES

DECONTAMINATION may be required for sampling equipment and direct-push equipment. Disposal of rinsate fluids on the surface is permitted. Any fluids with evidence of sheen or PSH (product on water) will be contained and disposed in an approved container.

Decontamination of PPE or personnel is not required unless there is a change in the level of PPE. Sanitation facilities at the site are available for personal hygiene.

12.0 PLAN APPROVAL

The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

PLAN WRITTEN BY: DATE:

PLAN APPROVED BY: DATE:

12.1 Plan Amendments:

DATES: CHANGES MADE BY:

CHANGES TO PLAN:

APPROVED: DATE:

DATES: CHANGES MADE BY:

CHANGES TO PLAN:

APPROVED: DATE:

13.0 ATTACHMENTS TO PLAN

Attachment 1: Employee Acknowledgement Sheet
Attachment 2: Accident/Incident (Near Miss) Report
Attachment 3: Emergency Actions
Attachment 4: Map of Route to Emergency Medical Facilities
Attachment 5: Map Showing Location of Activities
Attachment 6: Material Data Safety Sheets

A. Alconox / Liquinox
B. Sulfuric Acid (Preservation)
C. Fire Extinguisher
D. pH 7.01 Buffer Solution

Soil Samp... and Groundwa... Monitoring Program
Rockhill D...
104 East ... Road, Dexte...

ATTACHMENT 1

EMPLOYEE AND SUBCONTRACTOR ACKNOWLEDGEMENT SHEET

The emp...oyee listed be... has been provided a copy of this health and safety plan, have read and understood it, and have agreed to abide by its provisions.

EMPL...EE or SUBC...CTOR PRINTED NA...	EMPLOYEE or SUBCONTRACTOR SIGNATURE and DATE

ATTACHMENT 2

ACCIDENT/INCIDENT (NEAR MISS) REPORT

Employee's Name: D.O.B.
Address D.O.H
SS#
Job Title: Supervisor's Name
Office Location:
Location at Time of Incident:
Date/Time of Incident:

==========

Describe clearly how the accident occurred:

Was Incident: Physical Chemical
Parts of body affected Exposure: Dermal
Right Left
Inhalation
Ingestion
Witnesses: 1) 2)
Conditions/acts contributing to this incident

==========

Managers must complete this section:

Explain specifically the corrective action you have taken to prevent a recurrence:

Did injured go to doctor: Where:
When:
Did injured go to hospital: Where:
When:

==========

Signatures:

Employee Reporting: Manager Health & Safety Manager

Date: Date

This form must be completed and returned to Health and Safety manager within 5 working days

Soil Sampling and Groundwater Sampling Programs
Rockhill Facility
104 East [illegible] Dexter, NM

ATTACHMENT 3

EMERGENCY NOTIONS

EMERGENCY PROCEDURES

1. Survey the situation. Do not endanger your own life. **DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME** unless an SCBA or airline is worn, the Fire Department or HazMat team has been advised, and there is a standby for you.

2. Call 911 (if available) or the fire department IMMEDIATELY. Explain the physical injury, chemical exposure, fire, or telease.

3. **If the victim's condition appears to be non-critical, but seems to be more severe than minor cuts, have him transported to the hospital or clinic listed. If condition is obviously serious, transportation must be done by EMS.**

4. Notify supervisors - Site Assessment and Remediation and the Operations Manager. Complete the Accident/Incident/Near Miss Form found in (Attachment 2) within 24 hours.

5. Decontaminate victim without causing delay of life-saving procedures.

All field employees shall receive training regarding contingency plans for site emergencies, with emphasis on recognition, control or retreat. Training may be obtained in the 40-hour course required by OSHA, 29 CFR 1910.120.

FIRST AID

TREATING BLEEDING

1. Give Encouragement
2. Assure Airway, Breathing, and circulation
3. Use DIRECT PRESSURE over the wound with sterile dressing or your hand (use gloves). Direct pressure will control most bleeding.
4. Bleeding from an artery or several injury sites may require DIRECT PRESSURE and a PRESSURE POINT. Use pressure points for 30-60 seconds to help control severe bleeding.
5. Continue first aid care and seek medical aid as needed
6. Use non-permeable gloves.

CARDIOPULMONARY RESUSCITATION (CPR)

1. Give Medical Statement
2. Arouse - check for conscious level
3. Open airway with head-tilt
4. Look, Listen and Feel for breathing
5. If not breathing, give 2 slow full breaths.
6. Check the carotid pulse for 5 to 10 seconds.

   If there is a pulse, continue rescue breathing.

   If adult has no pulse, pump 5 seconds.

   Child has no pulse, pump 4 seconds.

   Infant has no pulse, pump 3 seconds.

7. Check pulse frequently
8. Use doctor or other trained

IF ONLY ONE RESCUER IS AVAILABLE

ADULT
Depress sternum 1½ to 2 inches
15 compressions
2 breathes

CHILD - 1-8 years old
Depress sternum 1 to 1½ inches
5 compressions
1 breath
Use heel of one hand for compressions

INFANT - 0-1 year old
Depress sternum ½ to 1 inch
5 compressions
1 breath
Use two or three fingers to compressions
Continue as long as possible or until Emergency Medical Technician arrives

Soil Sampling and Groundwater Sampling Programs
Rockhill Dairy
104 East Ojibwa Road, Dexter, NM

EMERGENCY CONTACTS

Office Phone: Glorieta Geoscience Phone No. (505) 983-5446

1. **EMS:** 911
2. **Fire:** 911

HAZMAT: NM State Police State Dispatcher;

3. **Hospital:** Attachment 4

Roswell Regional Hospital
(575) 627-7000
117 East 19th Street
Roswell, NM
(On east side of US 285/North Main Street north of New Mexico Military Institute)

4. **Police: Roswell Police** Emergency 911

5. **Poison Center:** UNM (505) 272-2222

REQUIRED PERSONNEL, LINES OF AUTHORITY, AND COMMUNICATION CHAIN

In case of emergency or change in work scope, contact the following and document instructions received.

Client Representative: Carol Irvin Manager	Phone: (575) 317-9714
State Representative: Nancy McDuffie, CPM/PE	Phone: (505) 222-9523
Project Manager: Bruce Yurdin	Phone: (505) 983-5446 ext 106
Safety Officer: Paul Drakos	Phone: (505) 983-5446 ext 108
Field Team Leader: Vanessa Ward	Phone: (505) 983-5446

ADDITIONAL EMERGENCY PHONE NUMBERS

National Response Center 800-424-8802
Chemtrec 800-262-8200

National USEPA RCRA Hotline 800-424-9346
USEPA (Region 6) 800-887-6063

OSHA Hotline 800-321-6742
USEPA Office of Ground Water and Drinking Water (SDWA) 202-564-3750

Bureau of Explosives (24 hrs) 714-855-0789
DOT Hazardous Materials Information Center 800-HMR-4922
Bureau of Alcohol, Tobacco, Firearms and Explosives 800-800-3855
National Pesticide Information Center 800-858-7378
CDC Division of Bioterrorism Preparedness and Response (Biologic Agents) 404-639-0385

Incident Documentation and Follow-up

The Project Manager is responsible for documenting the incident. Check the NIOSH/OSHA/USCG/EPA Manual, available for details on this procedure. At a minimum, include actions and decisions made and the circumstances at the time of the action and decisions.

Refer to the guidance provided in Attachment 2 for additional information that should be included in the incident documentation.

Attachment 4: Map of Route to Emergency Medical Facilities

Soil Sampling and Groundwater Sampling Program
Rockhill Dairy
104 East Calusa Road, Dexter, NM

Driving directions to 117 E 9th St, Roswell, NM 88201

A
2.7 E Calusa Rd
Dexter, NM 88230

1. Head west on E Calusa Rd/Co Rd 114 toward **Old Chisum Trail**
1.0 mi

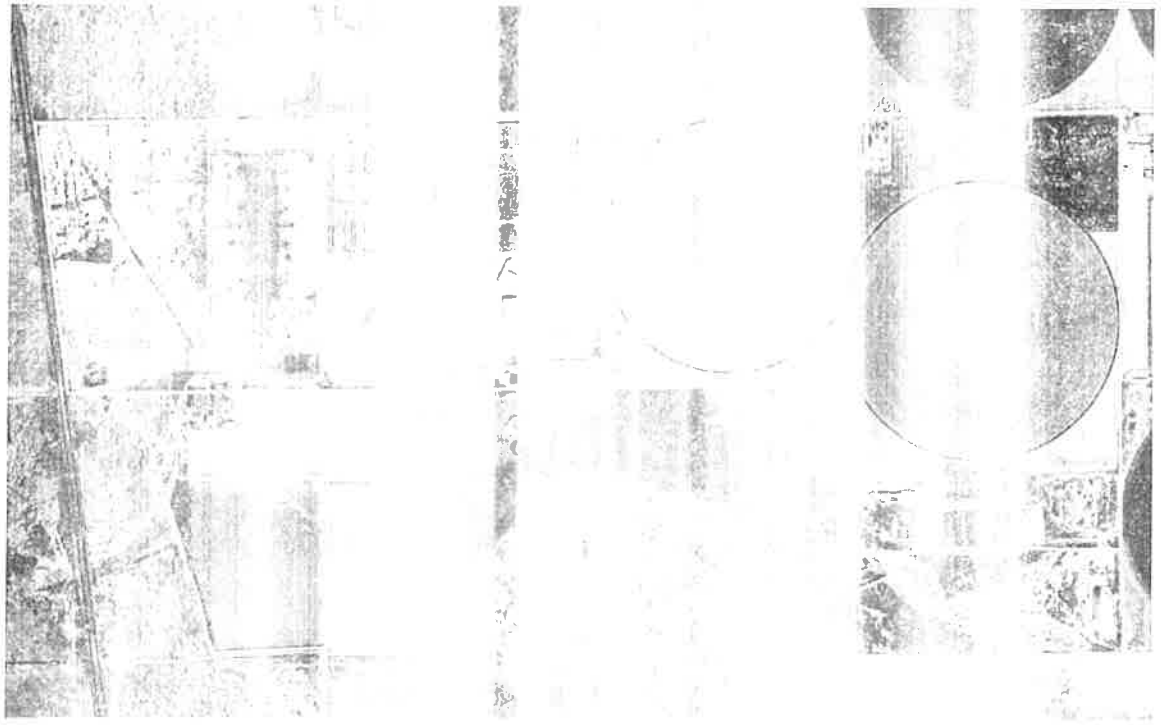
2. Turn right at **US-285 N/C a Rd 34/SE Main St**
Continue to follow US-285 N/SE Main St
5.3 mi

3. Turn right
Destination will be on the left
0.3 mi

B
117 E 9th St
Roswell, NM 88201

Soil Sampling and Groundwater Sampling Programs
Rockhill Dairy
104 East Ojibwa Road, Dexter, NM

Attachment 5: Map Showing Location of Activities



Attachment 6: Material Safety Data Sheets

A. Alconox / Liquinox
B. Sulfuric Acid (Preservation)
C. Fire Extinguisher
D. pH 7.01 Buffer Solution

Rockhill Dairy
DP-952

Analyticals

Summary of Groundwater Quality Data

Date	Dairy ID	Well ID	Chlorides (mg/L)	Nitrates (mg/L)	Sulfate (mg/L)	TDS (mg/L)	TKN (mg/L)
05/15/12	Rockhill	Lagoon	250	1.1	--	3,360	320
08/13/12	Rockhill	Lagoon	260	<1.0	--	2,800	340.00
12/06/12	Rockhill	Lagoon	210	2.4	--	4,060	330
02/26/13	Rockhill	Lagoon	230	3.3	--	3,320	450
06/18/13	Rockhill	Lagoon	240	<1.0	--	3,180	430
09/17/13	Rockhill	Lagoon	330	<0.5	--	2,520	280
12/18/13	Rockhill	Lagoon	250	<1.0	--	2,970	1,400
03/26/14	Rockhill	Lagoon	180	<1.0	--	2,390	290
07/02/14	Rockhill	Lagoon	240	<1.0	--	2,150	230
10/01/14	Rockhill	Lagoon	330	<1.0	--	2,610	78
12/18/14	Rockhill	Lagoon	170	<1.0	--	2,380	280
03/18/15	Rockhill	Lagoon	160	<1.0	200	2,260	190
06/16/15	Rockhill	Lagoon	210	<1.0	160	2,250	200
09/16/15	Rockhill	Lagoon	190	<1.0	140	1,960	200
12/21/15	Rockhill	Lagoon	250	<1.0	61	2,590	1,100
03/17/16	Rockhill	Lagoon	220	<1.0	--	2,520	450
06/14/16	Rockhill	Lagoon	190	<1.0	--	1,920	180
09/01/16	Rockhill	Lagoon	150	<1.0	420	1,620	98
12/20/16	Rockhill	Lagoon	190	<1.0	59	2,330	280
03/21/17	Rockhill	Lagoon	310	<1.0	97	3,710	1,100
06/13/17	Rockhill	Lagoon	350	<1.0	58	2,470	380
09/07/17	Rockhill	Lagoon	250	<1.0	96	2,240	550
12/07/17	Rockhill	Lagoon	190	<1.0	76	2,360	220
02/27/18	Rockhill	Lagoon	140	<1.0	450	1,820	140
05/29/18	Rockhill	Lagoon	180	<1.0	350	2,190	340
09/17/18	Rockhill	Lagoon	270	<1.0	140	2,320	490
12/12/18	Rockhill	Lagoon	240	<1.0	44	10,700	720
06/07/19	Rockhill	Lagoon	350	<1.0	310	--	--
09/11/19	Rockhill	Lagoon	140	14	540	1850	73
05/15/12	Rockhill	MW-1 (Domestic)	48	13	--	1,460	<2.0
08/13/12	Rockhill	MW-1 (Domestic)	48	13	--	1,450	<2.0
12/06/12	Rockhill	MW-1 (Domestic)	19	1.1	--	669	<1.0
02/26/13	Rockhill	MW-1 (Domestic)	18	0.98	--	688	<1.0

Date	Dairy ID	Well ID	Chlorides (mg/L)	Nitrates (mg/L)	Sulfate (mg/L)	TDS (mg/L)	TKN (mg/L)
06/18/13	Rockhill	MW-1 (Domestic)	17	0.93	--	686	<1.0
09/17/13	Rockhill	MW-1 (Domestic)	18	1.1	--	659	<1.0
12/18/13	Rockhill	MW-1 (Domestic)	43	12	--	1,370	<2.0
03/26/14	Rockhill	MW-1 (Domestic)	44	12	--	1,340	<2.0
07/02/14	Rockhill	MW-1 (Domestic)	43	11	--	1,360	<2.0
10/01/14	Rockhill	MW-1 (Domestic)	16	1.1	--	684	<1.0
12/18/14	Rockhill	MW-1 (Domestic)	17	1.5	--	677	<1.0
03/18/15	Rockhill	MW-1 (Domestic)	50	12	620	1,390	<2.0
06/16/15	Rockhill	MW-1 (Domestic)	46	12	610	1,370	<2.0
09/16/15	Rockhill	MW-1 (Domestic)	17	1.0	310	685	<1.0
12/21/15	Rockhill	MW-1 (Domestic)	45	12	600	1,370	<2.0
03/17/16	Rockhill	MW-1 (Domestic)	18	1.1	--	676	<1.0
06/14/16	Rockhill	MW-1 (Domestic)	46	13	--	1,380	<2.0
09/01/16	Rockhill	MW-1 (Domestic)	15	<1.0	290	716	<1.0
12/20/16	Rockhill	MW-1 (Domestic)	51	14	610	1,400	<2.0
03/21/17	Rockhill	MW-1 (Domestic)	16	1.0	310	678	<1.0
06/13/17	Rockhill	MW-1 (Domestic)	56	16	710	1,470	<2.0
09/07/17	Rockhill	MW-1 (Domestic)	16	1.1	300	695	<1.0
12/07/17	Rockhill	MW-1 (Domestic)	17	1.1	310	710	<1.0
02/27/18	Rockhill	MW-1 (Domestic)	51	16	550	1,470	<2.0
05/29/18	Rockhill	MW-1 (Domestic)	16	1.0	290	698	<1.0
09/17/18	Rockhill	**MW-1 (Domestic)**	**56**	**18.0**	**610**	**1,470**	**<2.0**
12/12/18	Rockhill	MW-1 (Domestic)	60	18.0	650	1500	<2.0
06/07/19	Rockhill	MW-1 (Domestic)	56	18.0	670	--	<5.0
09/11/19	Rockhill	MW-1 (Domestic)	--	--	--	--	--
05/15/12	Rockhill	MW-2	290	31	--	2,810	<5.0
08/13/12	Rockhill	MW-2	370	51	--	2,960	<5.0
12/06/12	Rockhill	MW-2	380	53	--	2,910	<5.0
02/26/13	Rockhill	MW-2	370	50	--	3,150	<5.0
06/18/13	Rockhill	MW-2	380	65	--	3,210	<5.0
09/17/13	Rockhill	MW-2	410	78	--	3,490	<5.0
12/18/13	Rockhill	MW-2	410	70	--	3,110	<5.0
03/26/14	Rockhill	MW-2	310	67	--	2,910	<5.0

Rockhill Dairy
DP-952

Analyticals

Summary of Groundwater Quality Data

Date	Dairy ID	Well ID	Chlorides (mg/L)	Nitrates (mg/L)	Sulfate (mg/L)	TDS (mg/L)	TKN (mg/L)
07/02/14	Rockhill	MW-2	380	79	--	3,100	<5.0
10/01/14	Rockhill	MW-2	380	79	--	3,270	<5.0
12/18/14	Rockhill	MW-2	400	86	--	3,140	<5.0
03/18/15	Rockhill	MW-2	380	85	1,400	2,840	<5.0
06/16/15	Rockhill	MW-2	350	75	1,300	2,940	<5.0
09/16/15	Rockhill	MW-2	400	90	1,400	3,550	<5.0
12/21/15	Rockhill	MW-2	370	84	1,400	3,100	<5.0
03/17/16	Rockhill	MW-2	380	78	--	3,090	<5.0
06/14/16	Rockhill	MW-2	370	83	--	3,370	<5.0
09/01/16	Rockhill	MW-2	350	81	1,400	3,450	<5.0
12/20/16	Rockhill	MW-2	400	82	1,400	3,270	<5.0
03/21/17	Rockhill	MW-2	380	82	1,300	3,280	<5.0
06/13/17	Rockhill	MW-2	380	67	1,400	3,440	<5.0
09/07/17	Rockhill	MW-2	310	67	1,100	3,010	<5.0
12/07/17	Rockhill	MW-2	380	68	1,300	2,760	<5.0
02/27/18	Rockhill	MW-2	310	57	1,000	2,980	<5.0
05/29/18	Rockhill	MW-2	--	--	--	--	--
09/17/18	Rockhill	MW-2	--	--	--	--	--
12/12/18	Rockhill	MW-2	--	--	--	--	--
06/07/19	Rockhill	MW-2	--	--	--	--	--
09/11/19	Rockhill	MW-2	--	--	--	--	--
05/15/12	Rockhill	MW-3	200	26	--	2,140	<5.0
08/13/12	Rockhill	MW-3	210	31	--	2,360	<5.0
12/06/12	Rockhill	MW-3	160	20	--	2,000	<5.0
02/26/13	Rockhill	MW-3	210	28	--	2,200	<5.0
06/18/13	Rockhill	MW-3	130	16	--	1,920	<2.0
09/17/13	Rockhill	MW-3	110	13	--	1,830	<2.0
12/18/13	Rockhill	MW-3	100	11	--	1,740	<2.0
03/26/14	Rockhill	MW-3	140	17	--	1,800	<2.0
07/02/14	Rockhill	MW-3	93	11	--	1,690	2.8
10/01/14	Rockhill	MW-3	85	9	--	1,670	<1.0
12/18/14	Rockhill	MW-3	94	10	--	1,610	<2.0
03/18/15	Rockhill	MW-3	100	11	740	1,420	<2.0

Rockhill Dairy
DP-952

Analyticals

Summary of Groundwater Quality Data

Date	Dairy ID	Well ID	Chlorides (mg/L)	Nitrates (mg/L)	Sulfate (mg/L)	TDS (mg/L)	TKN (mg/L)
06/16/15	Rockhill	MW-3	94	10	710	1,480	<2.0
09/16/15	Rockhill	MW-3	92	9.0	700	1,430	<2.0
12/21/15	Rockhill	MW-3	83	9.1	690	1,570	<5.0
03/17/16	Rockhill	MW-3	95	11.0	--	1,670	<2.0
06/14/16	Rockhill	MW-3	90	9.9	--	1,630	<5.0
09/01/16	Rockhill	MW-3	83	9.2	630	1,720	<5.0
12/20/16	Rockhill	MW-3	81	8.4	690	1,610	<5.0
03/21/17	Rockhill	MW-3	84	8.7	690	1,680	<5.0
06/15/17	Rockhill	MW-3	83	8.7	720	1,800	<5.0
09/07/17	Rockhill	MW-3	--	--	--	--	--
12/07/17	Rockhill	MW-3	81	8.6	750	1,750	<5.0
02/27/18	Rockhill	MW-3	70	7.5	580	1,390	<5.0
05/29/18	Rockhill	MW-3	--	--	--	--	--
09/17/18	Rockhill	MW-3	--	--	--	--	--
12/12/18	Rockhill	MW-3	--	--	--	--	--
06/07/19	Rockhill	MW-3	--	--	--	--	--
09/11/19	Rockhill	MW-3	150	24	--	1,690	<5.0
05/15/12	Rockhill	MW-4	140	22	--	1,540	<5.0
09/19/12	Rockhill	MW-4	170	27	--	2,440	<5.0
12/06/12	Rockhill	MW-4	140	22	--	1,580	<5.0
02/26/13	Rockhill	MW-4	140	23	--	1,600	<5.0
06/18/13	Rockhill	MW-4	150	25	--	1,650	<5.0
09/17/13	Rockhill	MW-4	150	23	--	1,620	<5.0
12/18/13	Rockhill	MW-4	140	23	--	1,540	4.5
03/26/14	Rockhill	MW-4	150	25	--	1,730	<5.0
07/02/14	Rockhill	MW-4	180	31	--	1,730	<5.0
10/01/14	Rockhill	MW-4	170	37	--	1,830	<5.0
12/18/14	Rockhill	MW-4	190	36	750	1,790	<5.0
03/18/15	Rockhill	MW-4	190	36	770	1,820	<5.0
06/16/15	Rockhill	MW-4	180	31	730	1,830	<5.0
09/16/15	Rockhill	MW-4	170	33	690	1,810	<5.0
12/21/15	Rockhill	MW-4	180	32	--	1,780	<5.0
03/17/16	Rockhill	MW-4					

Rockhill Dairy
DP-952

Analyticals

Summary of Groundwater Quality Data

Date	Dairy ID	Well ID	Chlorides (mg/L)	Nitrates (mg/L)	Sulfate (mg/L)	TDS (mg/L)	TKN (mg/L)
06/14/16	Rockhill	MW-4	190	37	--	1,950	<5.0
09/01/16	Rockhill	MW-4	150	28	640	1,690	<5.0
12/20/16	Rockhill	MW-4	200	38	780	1,900	<5.0
03/21/17	Rockhill	MW-4	170	30	710	1,770	<5.0
06/13/17	Rockhill	MW-4	190	36	810	1,980	<5.0
09/07/17	Rockhill	MW-4	180	36	720	1,920	<5.0
12/07/17	Rockhill	MW-4	190	44	900	2,070	<5.0
02/27/18	Rockhill	MW-4	170	42	790	2,010	<5.0
5/29/2018	Rockhill	MW-4	180	36	760	1,870	<5.0
[illegible]	[illegible]	[illegible]	180	37	[illegible]	[illegible]	[illegible]
12/12/18	Rockhill	MW-4	200	42	880	1,900	<5.0
06/07/19	Rockhill	MW-4	**170**	34	840	1,900	<5.0
09/11/19	Rockhill	MW-4	160	31	800	1,860	<5.0

Table 2. Rockhill Dairy Proposed Abatement Actions Summarized		
1.	Examine Rockhill Dairy monitoring wells along with Dexter/Starry Night Dairy wells as a separate monitoring network for examination of localized ground water flow direction and gradient.	Prepare localized potentiometric surface maps for quarterly reports due in late 2019 and through 2020.
2.	Examine Rockhill Dairy monitoring wells along with Dexter/Starry Night Dairy monitoring wells as an extensive monitoring network for examination of regional ground water flow direction and gradient.	Prepare regional potentiometric surface maps for quarterly reports due in late 2019 and through 2020.
3.	Schedule the design of site upgrades and grade revisions via NRCS. Establish a time line for actions and submit it to NMED within a Status Update letter report.	Apply for NRCS EQUIP funds for 2020 award year. Establish schedule within 60 days of AP proposal approval.
4	Construct and evaluate four quarters of nitrate isocontours focused on Rockhill Dairy.	Prepare maps for 2019 and first three quarters of 2020 data
5	Conduct soil sampling within land application areas.	Prior to end of 2019. Data will be submitted to NMED within Stage 1 AP Report.
6.	Construct at least three hydrogeologic cross-sections using well logs for Rockhill and Dexter/Starry Night Dairies.	Submit within 150 days of approved AP proposal.
7	Submit an addendum to the pending Discharge Permit application to describe proposed changes to production area (i.e. grading and stormwater impoundment modifications, proper closure of former lagoons).	Submit within 240 days of approved AP.
8.	Install monitoring wells as required by new Discharge Permit.	Within timeline of approved DP.
9	Propose any necessary new AP monitoring wells.	Following with installation of required DP monitoring wells and evaluation of area hydrology with additional data points.
10.	Sample all wells according to the DP, including the new wells.	Revise NMP accordingly.
11.	Review and assess chemical fertilizer use history and soil sample results for TKN and S.	Revise NMP accordingly.
12.	Monitor water use by measurements at the sump.	Reduce water use and disposal needs by reductions in and controls on floor flush system and water line controls.

TABLE 3. SUMMARY OF SAMPLE ANALYTICAL AND QUALITY CONTROL REQUIREMENTS, ROCKHILL DAIRY

Target Analytes	Matrix	Analytical Method	WQCC Standard (mg/L)	PQL[1]	Sample Container	Preservative	Holding Time[2]
Nitrate as N	Water	EPA Method 300.0	10	0.1 mg/L	250 mL HDPE bottle	H_2SO_4 to pH <2, stored at <6°C	48 hours
Nitrate as N	Soil	EPA Method 300.0	NA	0.3 mg/Kg	Four ounce glass jar with Teflon-lined cap	Stored at <6°C	As soon as possible
TKN	Water	SM 4500-N_{org} C	No Standard	1.0 mg/L	500 mL HDPE bottle	H_2SO_4 to pH <2; stored at <6°C	28 days
TKN	Soil	SM 4500-N_{org} C	NA	25 mg/Kg	Four ounce glass jar with Teflon-lined cap	Stored at <6°C	As soon as possible
Chloride	Water	EPA Method 300.0	250	0.1 mg/L	250 mL HDPE bottle	Stored at <6°C	28 days
Chloride	Soil	EPA Method 300.0	NA	0.3 mg/Kg	Four ounce glass jar with Teflon-lined cap	Stored at <6°C	As soon as possible
TDS	Water	SM 2540 C	1,000	10 mg/L	250 mL HDPE bottle	Stored at <6°C	7 days
Physical Parameters	Soil	See Table 3 - Note A	NA	NA	One gallon plastic bag	None required	None specified
Agronomic Values	Soil	See Table 3 - Note B	NA	NA	One liter plastic-lined sample bag	Stored at <6°C	As soon as possible

PQL[1]: Practical Quantification Limit (based on normalization of sample).
Holding Time[2]: Nitrate holding time is for unpreserved containers. If holding time is exceeded for nitrate, then a combined nitrate/nitrite value is obtained within the 28-day holding time.
mg/Kg: milligram per kilogram; **mg/L:** milligram per liter; **mL:** milliliter; **HDPE:** high-density polyethylene; **NA:** not applicable

TABLE 3. SUMMARY OF SAMPLE ANALYTICAL AND QUALITY CONTROL REQUIREMENTS, ROCKHILL DATA (Continued)

Table 3 Analytical Methods References:

Standard Methods (SM) are from *Standard Methods for the Examination of Water and Wastewater*, 21st Edition, 2005: American Public Health Association, *et.al.*

SM 2540 C: Total Dissolved Solids Dried at 180° C

SM 4500-N_{org} C: Semi-Micro-Kjeldahl Method

EPA Method is from United States Environmental Protection Agency *Methods for Chemical Analysis of Water and Wastes*, Revised; 600/4-79-020

Method 300.0: Determination of Inorganic Anions by Ion Chromatography, Revision 2.1, 1993

Table 3 -Note A: Soil Analytical Procedures For Physical Parameters:

The following American Standard for Testing and Materials (ASTM) methods are available for describing grain-size distribution for application in ground water modeling for soil samples obtained

ASTM Method D422 - 63 (2007) *Standard Test Method for Particle-Size Analysis of Soils*

ASTM Method D6836 - 02 (2008)e2 *Standard Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using a Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, and/or Centrifuge*

Table 3 - Note B: Soil Analytical Procedures For Agronomic Values:

The following soil components are analyzed using agronomy procedures for calculating the agronomic uptake for specific crops in land application areas. All of these methods are recognized by the National Resource Conservation Service, United States Department of Agriculture.

Soil NO_3-N: analyzed with a two-molar KCl extraction, as described in *Methods of Soil Analysis: Chemical Methods*, Part 3, Soil Science Society of America.

Soil TKN: analyzed by the Kjeldahl method as described in *Methods of Soil Analysis: Chemical Methods,* Part 3, Soil Science Society of America.

Soil Cl: analyzed by the mercury (II) thiocyanate method, as described in *Soil Testing: Sampling, Correlation, Calibration, and Interpretation,* SSSA Special Publication 21, Soil Science Society of America.

Table 4. Data Quality Objectives, Rockhill Dairy

Step 1: State the Problem
• Ground water samples collected from monitoring wells installed at the facility reported to contain concentrations of nitrate and/or TDS in excess of WQCC Standards (20 NMAC 6.2.3103). • Nature and extent of ground water and soil impacts must be established.
Step 2: Identify the Goals of the Stage 1 Abatement Plan
• What are the sources of contamination in the monitoring wells at the Dairy? • What are the hydrologic characteristics of the facility and what is their relation to the transport of contaminants? • What are the impacts, if any, to ground water wells and domestic well users in the vicinity of the facility related to current levels of contamination?
Step 3: Identify Inputs to the Decisions
• Inputs to the decision include identification of contaminant sources and management practices that have contributed to the potential contaminant sources. • Inputs to the decision are analysis of current and valid historical ground water sample results for nitrate, chloride, TDS, sulfate and TKN concentrations. • Inputs to the decision are soil analytical results and assessment of nitrate levels within soil profiles. • Inputs to the decision are the determination of ground water flow direction and aquifer hydrologic properties. • Inputs to the decision are stratigraphic and hydrologic information compiled into cross section(s) across the site. • Inputs to the decision are expanding current system of ground water monitoring to include additional on-site wells. • Inputs to the decision are determining background nitrate, TDS, chloride, sulfate and TKN levels and determining where Rockhill Dairy concentrations range compared to background.
Step 4: Define Study Boundaries
• The horizontal study boundary is defined by the Dairy property boundaries, dairy supply wells and wells of current land application areas not owned by the Dairy, where practicable. Rockhill Dairy has an extensive monitoring well network and data from that network will be evaluated with respect to Rockhill Dairy. • The vertical extent of the study area extends from ground surface to the upper three feet of soil and into ground water (up to 120 feet bgs at present). • The temporal boundary extends through the period of performance for this project.
Step 5: Develop Decision Rules
• Evaluate potential receptors to determine if Stage 2 Abatement Plan is required. • Analyze trends of constituents of concern to determine if Stage 2 Abatement Plan is required. • Evaluate data for completeness to design an effective Stage 2 Abatement Plan, if required. If necessary, data gaps will be defined and further investigation will be required to complete the data gaps. • Utilize hydrogeologic data to evaluate potential threat to off-site receptors.

• Determine "background" concentrations for chemicals of concern within shallow aquifer up-gradient and down-gradient of Rockhill Dairy.
Step 6: Specify Tolerable Limits on Decision Errors
• No statistical analyses are planned to be performed on the results of sample analyses. Data will be evaluated as outlined in the SAP.
Step 7: Optimize the Sampling Design
• Establish direction of ground water flow after four quarters of Rockhill Dairy focused mapping are completed and evaluate ground water monitoring points for proper placement. • Additional monitoring points may be added if data gaps show them to be necessary.

ROCKHILL DAIRY

Table 5. Summary of NMED List of Potential Source Areas and Assessment Status

NMED Potential Source	Status	History	Research Conducted	Comments on Potential Source	Additional Research/Investigation of Source Proposed
Synthetically Lined Grass Scale Lagoon System WW-2 and WW-3	Three Cells, Synthetically Lined	Three-cell System online in 2008/2009	Liner Installation logs/ As-Built, Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	MW-3 is possibly up-gradient of this potential source, and was greater than 10 mg/L in 2012, although the recent trend shows <10 mg/L. MW-3 is currently dry. MW-1 may act as monitoring well for lagoon system. MW-1 is >10 mg/L.	Localized groundwater flow direction and gradient needs to be confirmed, additional monitoring well may be needed. Replace MW-3.
Closed Clay Water Lagoons	Clay Lined closed in 2008/2009 however, runoff still collects within old lagoon.	Used from 1992 to 2008/2009	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	MW-1 may monitor this potential source. MW-2 is nearest this site and is reporting dry conditions. Lagoon will be properly closed and re-graded as part of Stage 1 Activities.	Localized groundwater flow direction and gradient needs to be confirmed, additional monitoring well may be needed. Replace MW-2.
Stormwater Impoundment	Synthetically lined, in use.	Used from 2008/2009 to present	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	This pond is located due south of lined lagoon system, and southeast of corrals. Nearest well is MW-3 which is report dry conditions.	Facility re-grade will improve runoff collection and management within this pond. Replace MW-3.

Table 5. Summary of NMED List of Potential Source Areas and Assessment Status

NMED Potential Source	Status	History	Research Conducted	Comments on Potential Source	Additional Research/Investigation of Source Proposed
LAA Field 1 (9-acre flood field)	Accepts green water from lagoon system, flood field irrigation system	Installed in approx. 1998	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP Report.
LAA Field 2 (9-acre flood field)	Accepts green water from lagoon system, flood field irrigation system	Installed in approx. 1998.	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP Report.
LAA Field 3 (120 acre pivot)	Accepts green water from lagoon system, center pivot sprinkler irrigation/ application	Installed in approx. 1998.	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP Report.
LAA Field 4 (9-acre flood field)	Accepts green water from lagoon system, flood field	Installed in approx. 1998.	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP

Table 5. Summary of NMED List of Potential Source Areas and Assessment Status

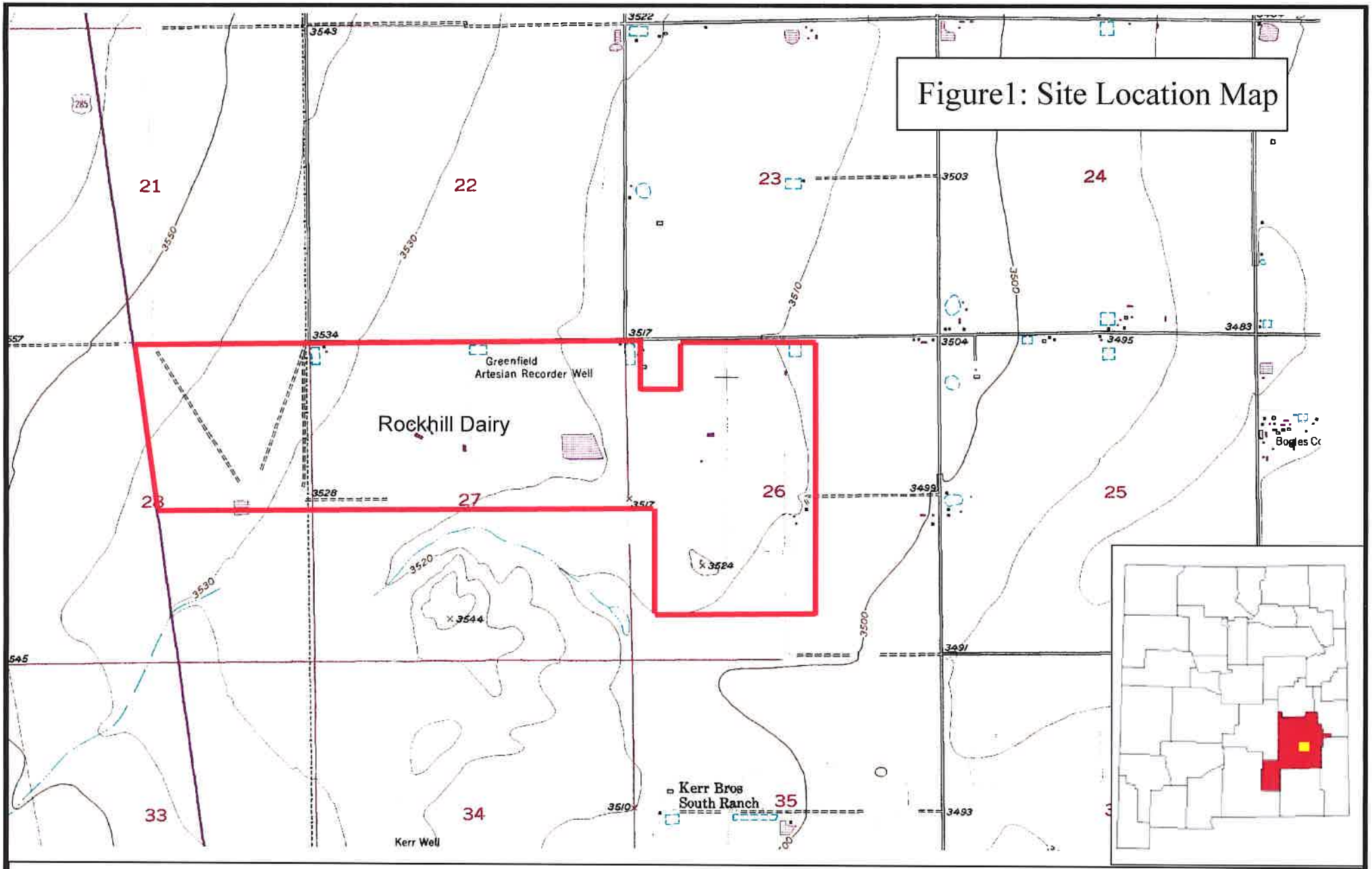
NMED Potential Source	Status	History	Research Conducted	Comments on Potential Source	Additional Research/Investigation of Source Proposed
	irrigation system		files		Report.
	irrigation system		files		Report.
LAA Field 6 (25-acre flood field)	Accepts green water from lagoon system, flood field irrigation system	Installed in approx. 1998.	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP Report.
LAA Field 7 (25-acre flood field)	Accepts green water from lagoon system, flood field irrigation system	Installed in approx. 1998.	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED files	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP Report.
LAA Field 8 (150-acre pivot)	Accepts green water from lagoon system, center pivot	Installed in approx. 1998	Dairy Personnel Interviews, Aerial Photos, Historical Maps and NMED	Monitoring well will be installed as part of new DP.	Soil sampling planned for 2019. Locate past soil sampling results and provide to NMED within Stage 1 AP

Table 5. Summary of NMED List of Potential Source Areas and Assessment Status

NMED Potential Source	Status	History	Research Conducted	Comments on Potential Source	Additional Research/Investigation Source Proposed
	sprinkler irrigation/ application		tiles		Report.
Chemical application	Currently [illegible]	Applied at all fields	Dairy Personnel Interviews, NMED files	[illegible]	NMED to review application data as part of review with farmer/contractor who applies fertilizer.
Manure Storage	Short-term storage only (two-weeks to one-month maximum).	Has contract with manure hauler and long-term storage has not been practiced	Dairy Personnel Interviews, Aerial Photos	Not considered a likely source, except possibly at separator/lagoon interface.	Regulations of dairy MWP in new DP will monitor lagoon/separator as potential sources.
[illegible] application to LAA	[illegible]	[illegible]	Dairy Personnel Interviews	[illegible]	[illegible]
Green Silage Storage	Storage on southern side of dairy.	Has been stored on-site since what appears to be dairy's beginning.	Dairy Personnel Interviews, Aerial Photos	Not considered a potential source	None needed at this time
Milking Barn	Operational	Has always been in current location, any	Dairy Personnel Interviews, Aerial Photos	Not considered a potential source	None needed at this time

Table 5. Summary of NMED List of Potential Source Areas and Assessment Status

NMED Potential Source	Status	History	Research Conducted	Comments on Potential Source	Additional Research/Investigation of Source Proposed
		leaks in sprinklers or hoses are immediately fixed.			
		of original dairy.		Not considered a potential source, pens are cleaned on a daily basis, low spots and high spots are eliminated	
Water Troughs	Operational, not leaking	Operational, no significant leaks	Dairy Personnel Interviews, Aerial Photos	Not considered a potential source, leaks are fixed immediately	None needed at this time
	Identified, in down gradient direction, no [illegible] extent of Dairy	Not yet determined	conducted.	No septic system data to area of Dairy, all area homes expected to have	Review NMED files for cesspools in area of dairy, review aerial photos for [illegible] source of Nitrate.



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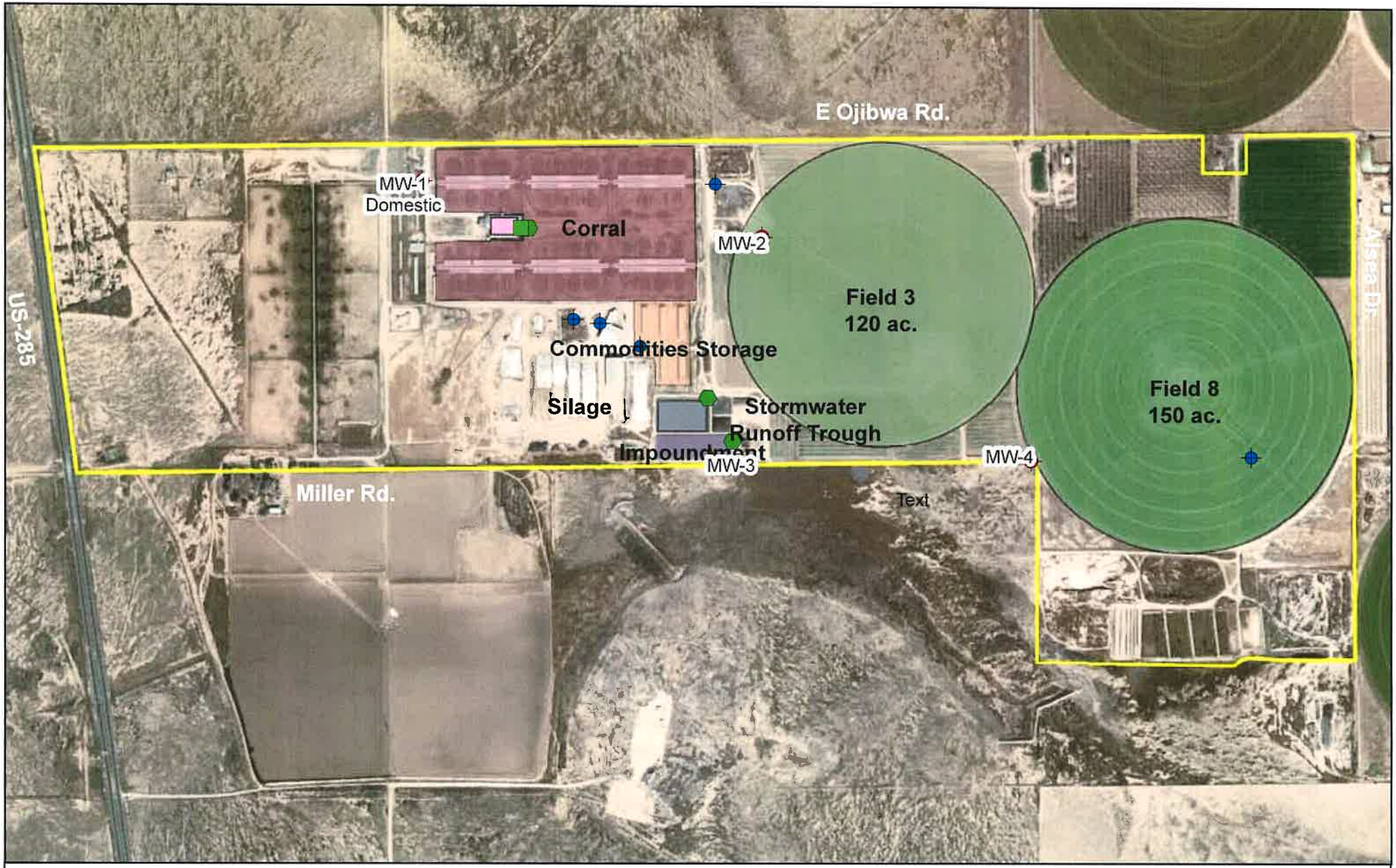

Legend

- Irrigation Well
- Sump
- Greenwater Meter
- Monitoring Well
- Corral
- Lagoon
- Impoundment
- Septic System
- Commodity Storage
- Land Application Area
- Property Boundary

Rockhill Dairy Site Map

*MW locations from GGI site visit; irrigation .wells plotted from Atkins

N

0 0.075 0.15 0.3 0.45 0.6 Miles

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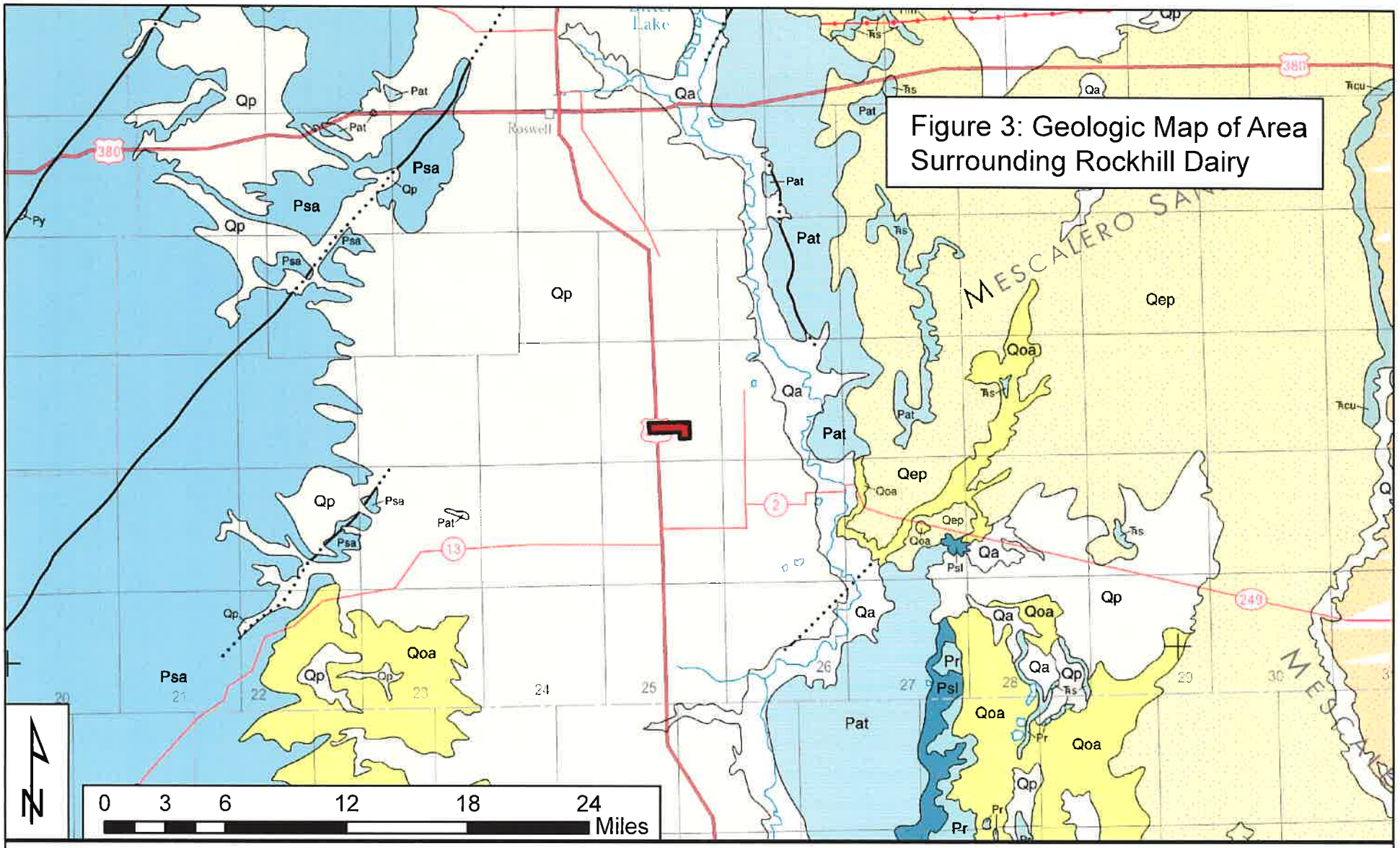
Figure 3: Geologic Map of Area Surrounding Rockhill Dairy
Roswell
Lake
MESCALERO SAN
MESCALERO
Qp
Qa
Qep
Qoa
Pat
Psa
Psl
Pr
Py
Trs
Tcu
380
2
13
249
20
21
22
23
24
25
26
27
28
29
30
N
0 3 6 12 18 24
Miles
Explanation
Property Boundary
Qep Eolian and Piedmont Deposits
Tcu Upper Chinle Group
Pat Artesia Group
Qa Alluvium
Qoa Older Alluvial Deposits
Pr Rustler Fm.
Psa San Andreas Fm.
Qp Piedmont Alluvial Deposits
Trs Santa Rose Fm.
Psl Salado Fm.
Py Yeso Fm.
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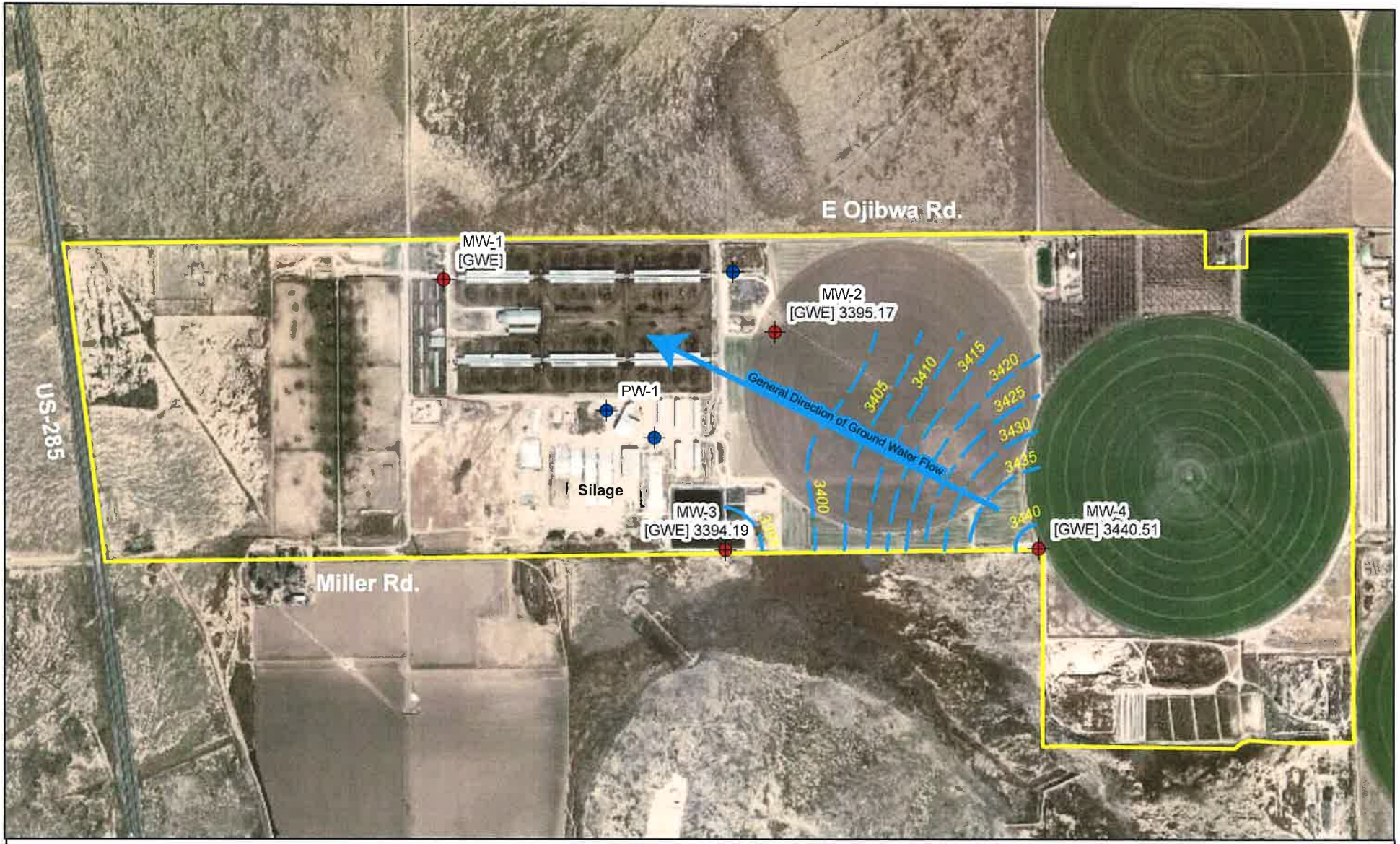

Figure 4. Rockhill Dairy: Groundwater Elevation Map

*Data taken from February 2018 sampling conducted by Atkins Engineering; subsequent sampling data unavailable due to dry wells (MW-1, MW-2 and MW-3)

Top-of-casing measurement taken from Atkins Engineering
GGI does not verify this data

Monitoring Wells

Production Wells

Nitrate Contour

Property Boundary

0 0.075 0.15 0.3 0.45 0.6 Miles

N

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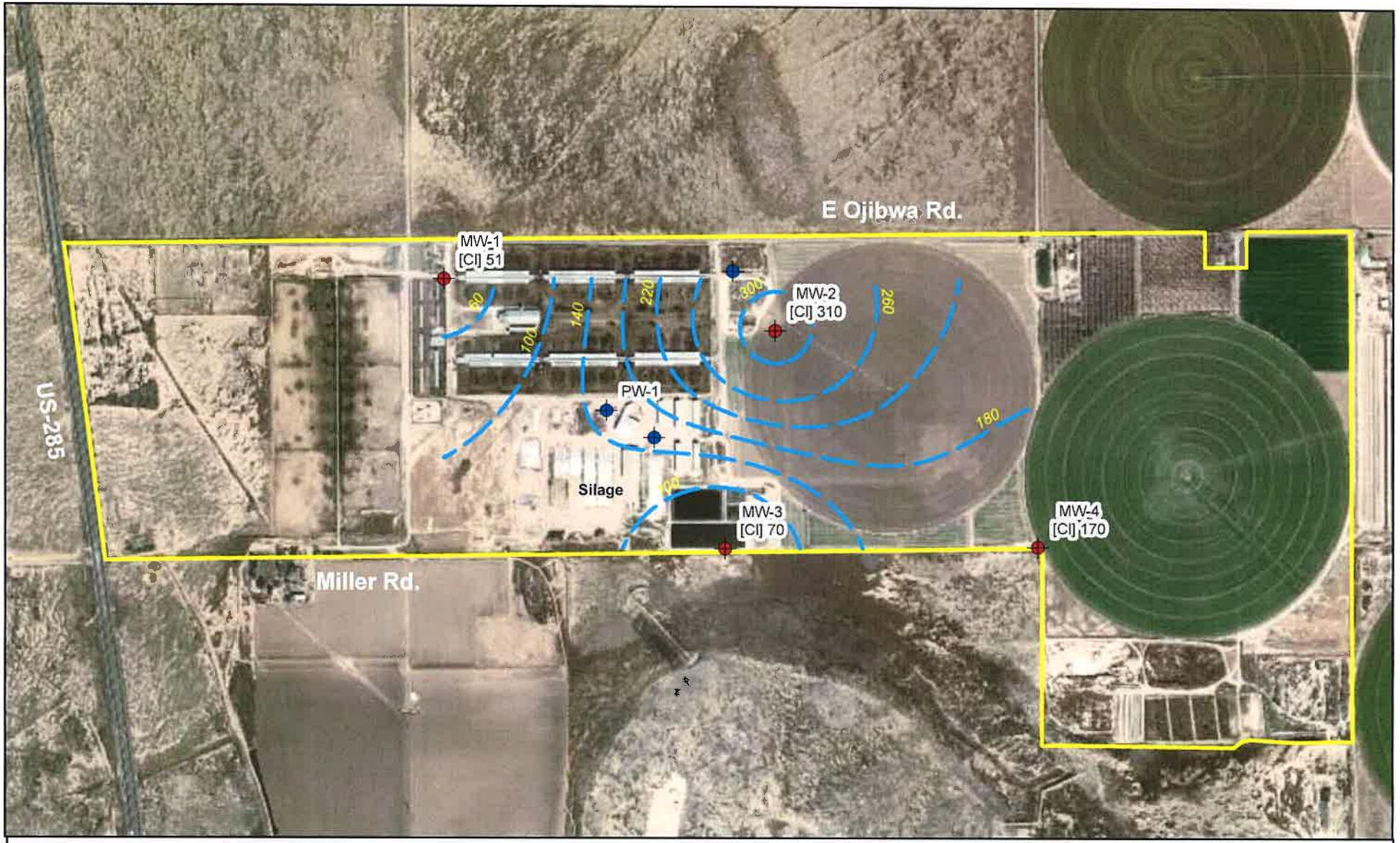

Figure 6. Rockhill Dairy: Chloride Isocontour Map

**Data taken from February 2018 sampling conducted by Atkins Engineering; subsequent sampling data unavailable due to dry wells (MW-1, MW-2 and MW-3)*

Monitoring Wells

Production Wells

Chloride Contour

Property Boundary

0 0.075 0.15 0.3 0.45 0.6 Miles

N

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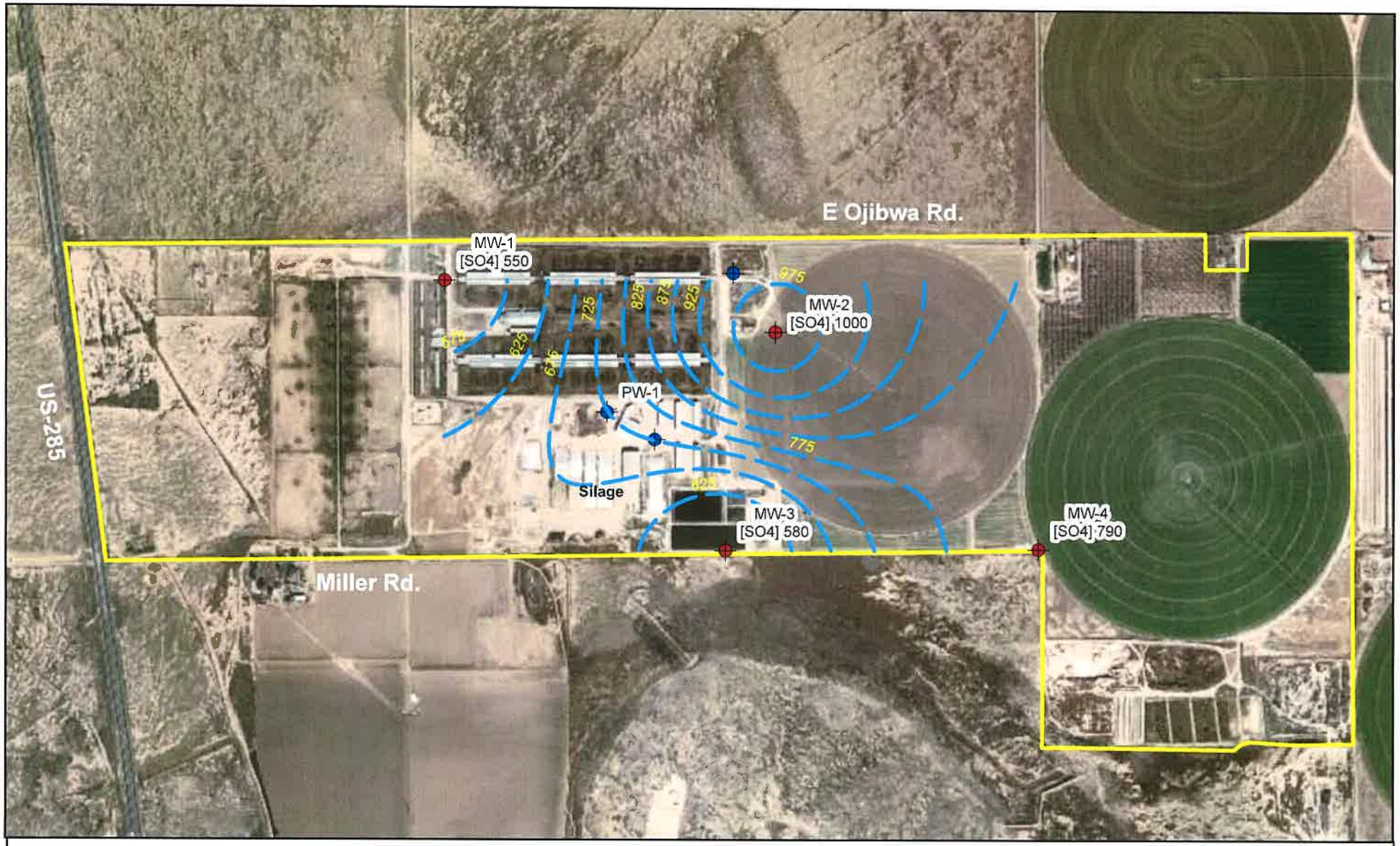


Figure 7. Rockhill Dairy: Sulfate Isocontour Map

**Data taken from February 2018 sampling conducted by Atkins Engineering; subsequent sampling data unavailable due to dry wells (MW-1, MW-2 and MW-3)*

Monitoring Wells

Production Wells

Sulfate Contour

Property Boundary

0 0.075 0.15 0.3 0.45 0.6 Miles

N

GLORIETA GEOSCIENCE INC.

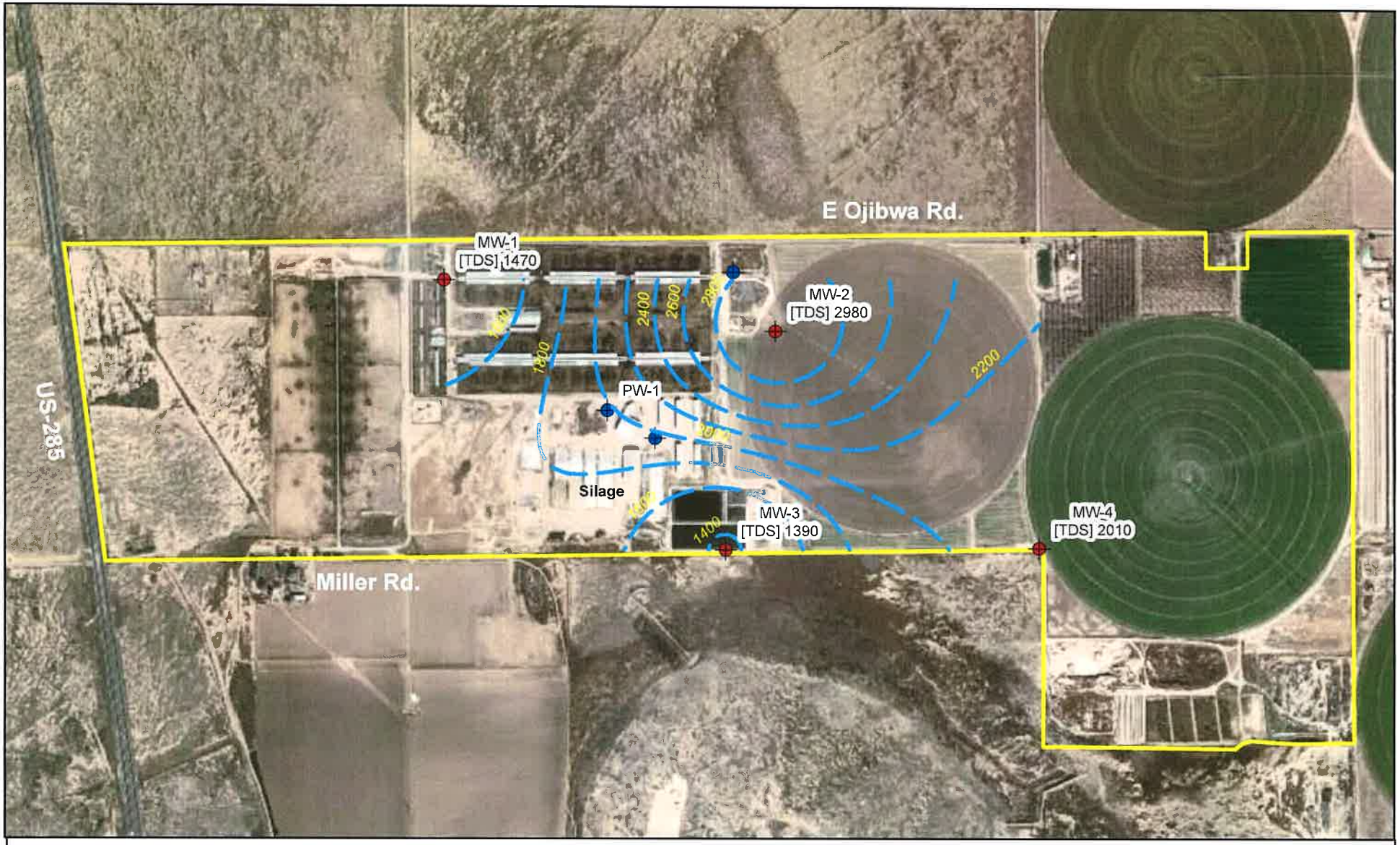


Figure 8. Rockhill Dairy: Total Dissolved Solids Isocontour Map

**Data taken from February 2018 sampling conducted by Atkins Engineering; subsequent sampling data unavailable due to dry wells (MW-1, MW-2 and MW-3)*

Monitoring Wells

Production Wells

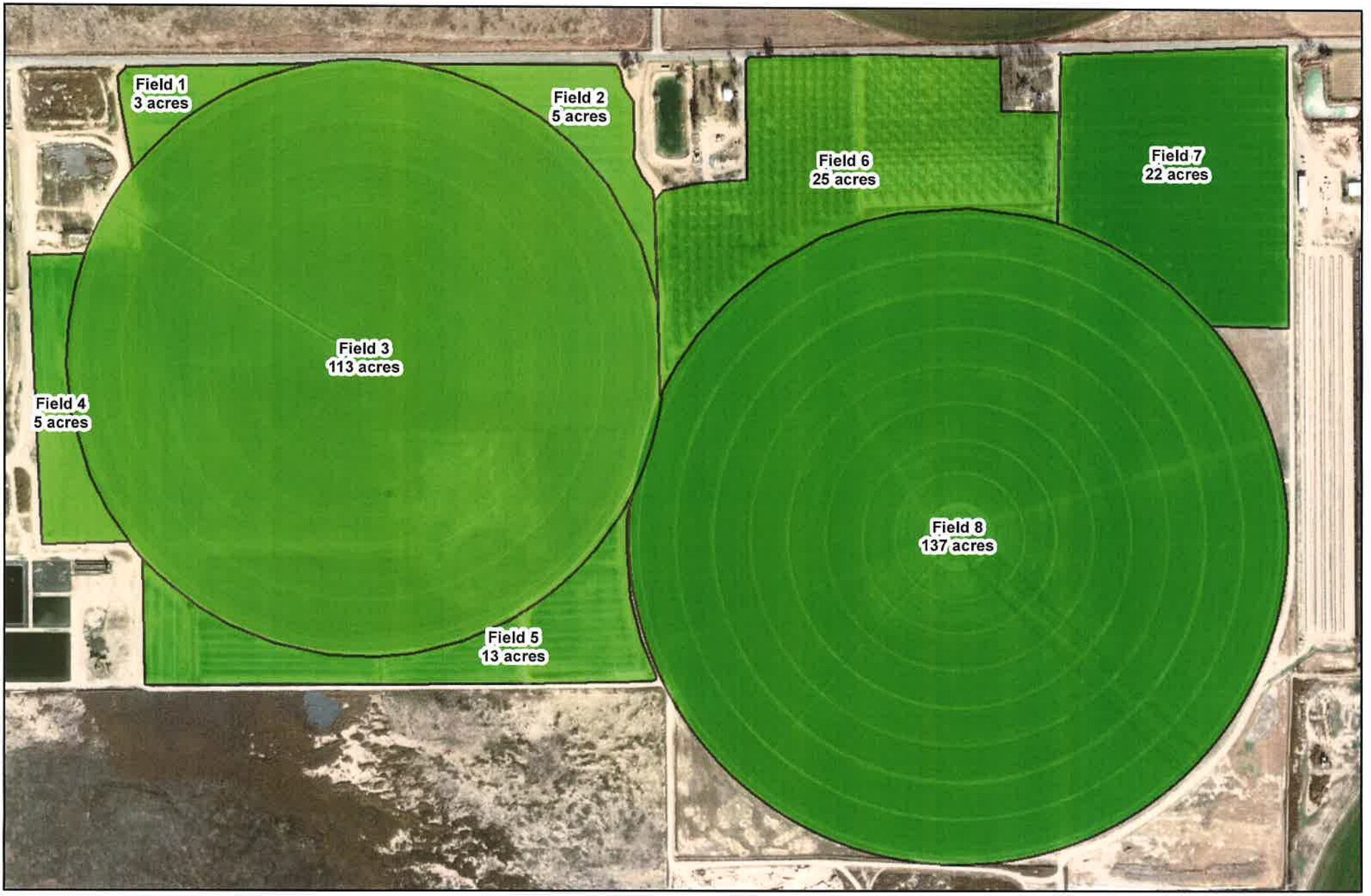
TDS Contour

Property Boundary

0 0.075 0.15 0.3 0.45 0.6 Miles

N

GLORIETA GEOSCIENCE, INC.



Rockhill Dairy
Georeferenced Soil Sampling Map

land_application_area

0 0.05 0.1 0.2
Miles

N

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