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AUG 30 2017



Ms. Michelle Hunter
Ground Water Quality Bureau (GWQB)
New Mexico Environment Department (NMED)
Harrold Runnels Building
1190 Saint Francis Drive
Santa Fe, New Mexico 87502

Dear Ms. Hunter

Attached please find the *Revised Corrective Action Report for Sewer Release of Nitrate at Manhole-13 affecting Bulk Fuels Facility Groundwater Monitoring Wells KAFB-106005, KAFB-106009, and KAFB-106012R, Bulk Fuels Facility, Solid Waste Management Unit ST-106/SS-111, Kirtland Air Force Base, New Mexico* dated August 2017. This Corrective Action Report describes activities that are being taken to address nitrate detections in groundwater monitoring wells KAFB-106005, KAFB-106009, and KAFB-106012R, and remove and replace Manhole-13. This report was prepared in response to the letter received by NMED on June 2, 2017, to provide additional work and a monitoring plan of affected groundwater in accordance to Section 20.6.2.1203.A (6) NMAC, "Notification of Discharge-Removal."

If you have any questions or concerns, please contact myself at (505) 846-9017 or at scott.clark@us.af.mil or Mrs. Holly O'Grady at (505) 853-3484 or at holly.ograde@us.af.mil.

Sincerely

SCOTT C. CLARK, GS-13, AFCEC
Remedial Project Manager

Attachments:

Revised Corrective Action Report for Sewer Release of Nitrate at Manhole-13 affecting Bulk Fuels Facility Groundwater Monitoring Wells KAFB-106005, KAFB-106009, and KAFB-106012R, August 2017

cc:

- NMED (Borrogo) letter only
- NMED-GWQB (Agnew, Pullen)
- NMED-HWR (Kieline)
- SAF-IEE (Lynnes) electronic only
- AFCEC/CZ (Renaghan, Paul, O'Grady) electronic only
- USACE-ABQ District Office (Simpler, Phaneuf, Dreeland; Sanchez; Salazar) electronic only
- Public Info Repository, AR/IR, and File



**KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO**

**CORRECTIVE ACTION REPORT FOR SEWER
RELEASE OF NITRATE AT MANHOLE-13 AFFECTING
BULK FUELS FACILITY GROUNDWATER
MONITORING WELLS KAFB-106005, KAFB-106009,
AND KAFB-106012R**

**REVISED
August 2017**



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2050 Wyoming Blvd. SE
Kirtland AFB, New Mexico 87117-5270**

**KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO**

**CORRECTIVE ACTION REPORT FOR SEWER RELEASE OF NITRATE
AT MANHOLE-13 AFFECTING BULK FUELS FACILITY
GROUNDWATER MONITORING WELLS KAFB-106005, KAFB-106009,
AND KAFB-106012R**

REVISED

August 2017

Prepared for

New Mexico Environment Department
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Prepared by

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NOTICE

This Revised Corrective Action Report (CAR) was prepared for the New Mexico Environment Department (NMED) by AFCEC Environmental Restoration Program Management (CZR) and Operations West Region (CZOW) Branches to summarize and address increases in total nitrate in three groundwater monitoring wells associated with the Kirtland Air Force Base (AFB) Bulk Fuels Facility, Solid Waste Management Unit ST-106/SS-111. This work is being performed under the requirements of the New Mexico Water Quality Control Commission Regulations (NMWQCC) and this CAR is submitted pursuant to 20.6.2.1203.A(6) New Mexico Administrative Code (NMAC), "Notification of Discharge-Removal" and addresses the activities related to the corrective actions taken.

PREFACE

This Revised CAR for the sewer release at Kirtland AFB Manhole-13 describes the corrective actions in progress to address total nitrate detections in groundwater monitoring wells KAFB-106005, KAFB-106009, and KAFB-106012R. In addition, this Revised CAR will describe how monitoring of the three affected wells will continue in the future as indicated in the attached monitoring plan. This CAR was prepared in accordance to Section 20.6.2.1203.A (6) NMAC, “Notification of Discharge-Removal”.

The Environmental Restoration Section Chief is Mr. Scott Clark of Kirtland AFB. This report was prepared by Scott Clark, Holly O’Grady, AFCEC/CZOW; and Dr. Adria Bodour, AFCEC/CZRZ.

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
BFF	Bulk Fuels Facility
CAR	Corrective Action Report
CZRX	Environmental Restoration Program Management West Region Branch
CZOW	Environmental Operations West Region Branch
DoD	Department of Defense
ELLE	Eurofins Lancaster Laboratories Environmental, LLC
ft	feet
GWM	groundwater monitoring
MH-13	Manhole-13
MCL	maximum contaminant level
mg/L	milligrams per liter
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission Regulations
Rd	Road
SWMU	Solid Waste Management Unit

EXECUTIVE SUMMARY

This Corrective Action Report describes activities in progress to address increased nitrate concentrations associated with three Bulk Fuels Facility (BFF) groundwater monitoring (GWM) wells at Solid Waste Management Unit (SWMU) ST-106/SS-111, Kirtland Air Force Base (AFB), New Mexico. Nitrate concentrations in groundwater have increased during historical sampling events at the following wells: KAFB-106005, KAFB-106009, and KAFB-106012R. Only one well, KAFB-106009, has groundwater samples with nitrate concentrations that exceed the New Mexico Water Quality Control Commission Regulations (NMWQCC) numeric standard of 10 milligrams per liter (mg/L) which is equivalent to the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL).

Upon investigation, the Manhole-13 (MH-13) structural integrity was confirmed compromised due to tree root invasion into the bottom of the manhole structure which caused leakage of sewer water. To address the sewer leak, MH-13 and approximately 10-20 feet (ft) of connective piping will be replaced in fall 2017. Sampling of affected BFF GWM wells KAFB-106005, KAFB-106009, and KAFB-106012R will continue on a quarterly basis until concentrations demonstrate reduction of total nitrate below the NMWQCC standard of 10 mg/L.

1. INTRODUCTION

BFF Quarterly Monitoring Reports present a trend of increasing concentrations of total nitrate in groundwater monitoring wells, which prompted investigation of sewer lines near impacted wells (Figure 1).

1.1 Description of the Release

Groundwater monitoring wells KAFB-106005, KAFB-106009, and KAFB-106012R have shown total nitrate concentrations that continue to increase with time. As a result, the base maintenance contractor performed a camera inspection of the main pipeline parallel to Randolph Road (Rd) (approximately 700 ft of line) and was unable to find any issues with this line. Additional investigation was performed to find the source of nitrate increases in the affected BFF wells by inspecting manholes along Randolph Rd. In March 2017, MH-13 was observed in a state of disrepair due to tree root penetration compromising the bottom of the manhole structure (Appendix A). Additionally, the pipelines associated with MH-13 were inspected and determined not impacted (Appendix A).

1.2 Increasing Concentrations Trends in Groundwater Monitoring Wells

An evaluation was performed to determine the sources of elevated nitrate, chloride, sulfate, sodium, and potassium concentrations in samples from BFF GWM wells KAFB-106005, KAFB-106009, and KAFB-106012R. Concentrations of these five analytes have displayed increasing concentrations in quarterly samples obtained from 2014-2016. The total nitrate concentrations have been increasing in all three groundwater-monitoring locations with KAFB-106009, exceeding the NMAC 20.6.2.3103A numeric standard of 10 mg/L (equivalent to the EPA MCL) (Figure 2). The groundwater gradient from MH-13 flows towards KAFB-106009.

In Figure 2, nitrate in groundwater at KAFB-106009 exceeded the 10 mg/L for total nitrate in third quarter (Q3) 2014 and continued to rise reaching maximum total nitrate concentration of 25.3 mg/L in second quarter (Q2) 2016. Additionally, KAFB-106005 and KAFB-106012R have seen increasing total nitrate concentrations (Figure 2) but have not exceeded the 10 mg/L numeric standard. KAFB-106005 and KAFB-106012R maximum total nitrate were 2.3 mg/L in Q2 2016 and 6.4 mg/L in Q3 2016, respectively. It is important to note that monitoring well KAFB-106012 was abandoned in 2014 and replaced by KAFB-106012R as a result of damage to the original well and quarterly samples were not collected from first quarter (Q1) 2013 through Q1 2014.

The observed increases in nitrate, chloride, sulfate, sodium, and potassium concentrations at these wells are consistent with an impact from a leaking sewage line. A positive correlation is observed between nitrate and chloride at KAFB-106005 and KAFB-106009, suggesting that both analytes have a common source. The BFF spill has influenced groundwater chemistry, but those influences include decreasing nitrate and sulfate concentrations, and generally do not affect chloride, sodium, or potassium. This trend indicates that the increasing concentrations of these five analytes are not related to the BFF fuel spill.

2. CORRECTIVE ACTIONS

The increase in total nitrate appears to have come from MH-13, which is in close proximity to KAFB-106009 (approximately 140 ft). The Kirtland AFB Civil Engineering base maintenance contractor started an investigation of the sewer line closest to the nitrate impacted BFF groundwater monitoring wells. A video camera survey of the main sewer line paralleling Randolph Rd was performed to try and identify a potential sewer leak. The investigation found no leak in this main sewer line along Randolph Rd.

Due to the continued observation of increasing total nitrate in BFF GWM wells, AFCEC expanded the sewer line investigations with the assistance from the U.S. Army Corps of Engineers. This led to an investigation of manholes near the nitrate-impacted BFF GWM wells. During this investigation, MH-13 was found full of water and debris (Appendix A). After removal of the debris for MH-13, tree roots were observed growing into the bottom of the cinder block in MH-13 (Appendix A). In addition, there are three sewer lines (two 8 inch and one 4 inch), approximately 12 years old, that feed into MH-13 from two unoccupied buildings. The camera investigations showed that there were no other leaks from the sewer lines (i.e., two 8 inch and one 4 inch), and that the suspected sewer leak is coming from MH-13 and the probable source of increasing total nitrate in the three BFF GWM wells (Appendix A). The MH-13 is approximately 80 ft from KAFB-106005, 140 ft from KAFB-106009, and 570 ft from KAFB-106012R (Figure 1).

The Kirtland AFB Civil Engineering base maintenance contractor will remove and replace MH-13 and about 10-20 ft of connecting pipe in all three directions. This construction will inhibit further tree root invasions into the manhole structure.

Groundwater sampling of monitoring wells KAFB-106005, KAFB-106009, and KAFB-106012R associated with this CAR will be conducted in conjunction with quarterly BFF GWM program sampling until the total nitrate concentration in groundwater is below the NMWQCC numeric standard of 10 mg/L. Groundwater samples will be collected via low-flow sampling techniques or with passive sampling in accordance with the most current NMED approved methods for the wells under the BFF GWM program. These supplemental samples will be analyzed for total nitrate, sulfate, chloride, and fluoride. Sampling protocols will follow the Monitoring Plan included in Appendix B.

2.1 Summary and Recommendation

Based on the sewer line inspections, and the location of MH-13 in proximity to the three affected BFF groundwater wells, MH-13 appears to be the discharge source causing total nitrate in groundwater to exceed the NMWQCC numeric standard. No other potential nitrate sources were identified during the sewer line and manhole inspections.

During the time of investigation, the top half of MH-13 had been reconstructed, and the bottom half of the manhole was still the original structure. It is unknown why the top half was reconstructed. Thus, in order to ensure that tree roots do not invade the manhole structure or sewer lines in the future, the entire manhole structure is being removed and replaced, along with 10-20 ft of connecting pipe.

The contract to repair and replace MH-13 was awarded in August 2017. The estimated completion date for remove and replace MH-13 is October 2017. Quarterly monitoring of analytes will continue until the total nitrate in the affected wells is below the NMWQCC numeric standard of 10 mg/L.

FIGURES

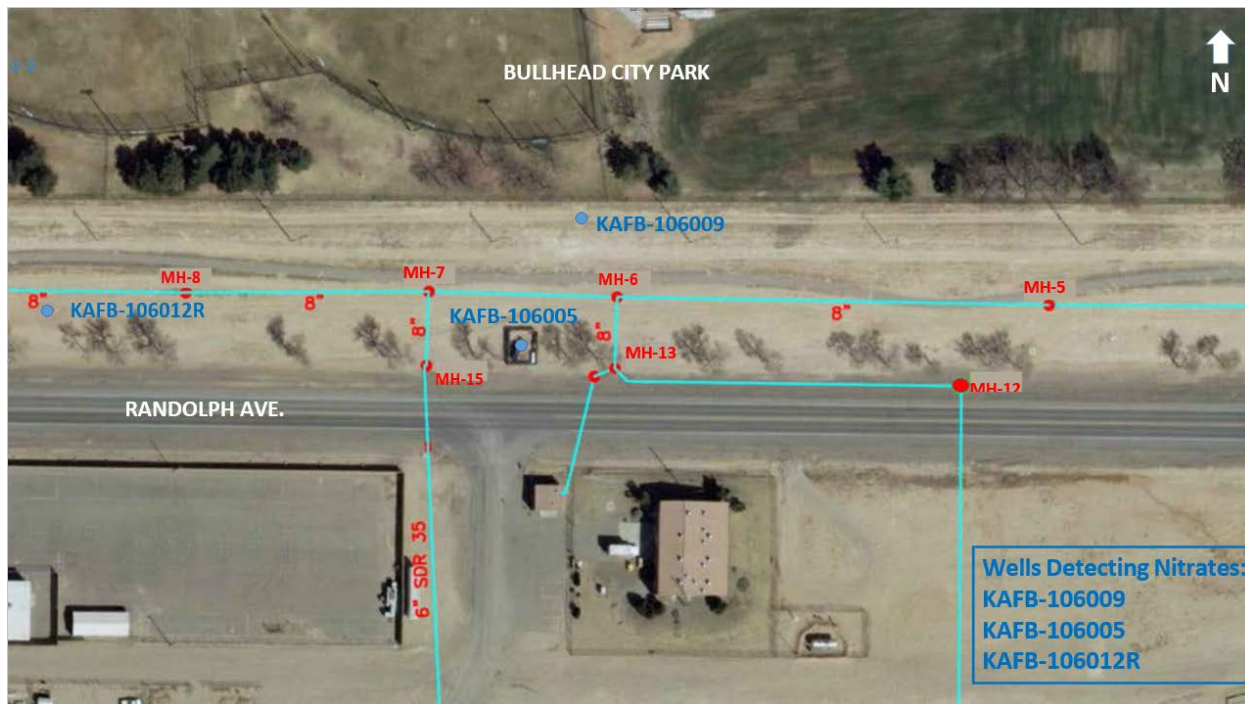


Figure 1: Location of Sewer Lines, Manholes, and Groundwater Monitoring Wells

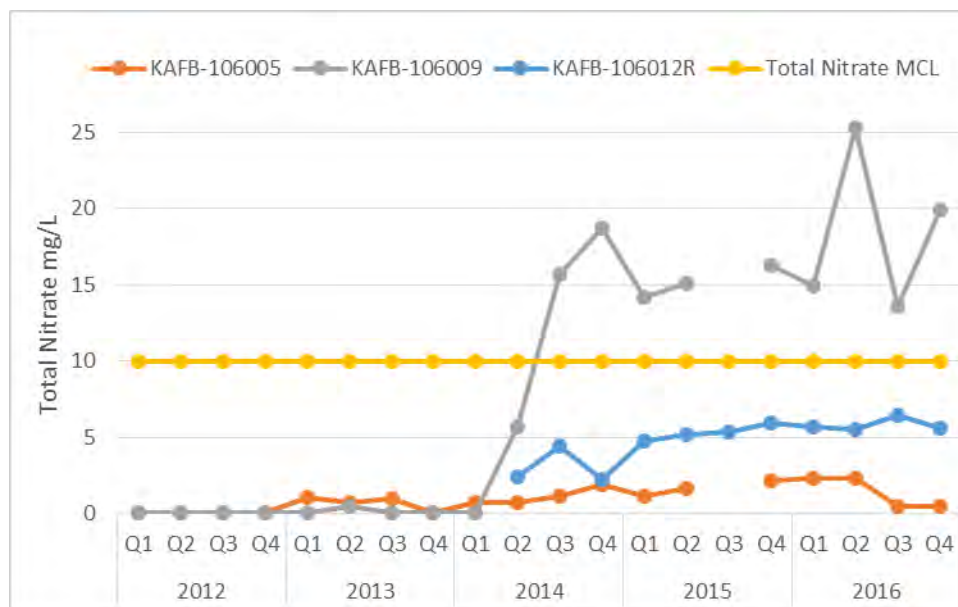


Figure 2: Total Nitrate Concentrations in BFF Groundwater Monitoring Wells KAFB-106005, KAFB-106009, and KAFB-106102R

APPENDIX A
PHOTOGRAPHS

Manhole 13

First Look Inside



Manhole 13

Material removed from manhole.



Manhole 13

View of roots growing into the manhole from the outside of the manhole (about 6' bgs).



Inside 4" Line

Image is from video inspection looking upstream (south) 1.1' from the manhole.

High Water Mark

Water Flowing

USMH: UNKNOWN
DSMH: 6

1.1 ft.

0





APPENDIX B
Monitoring Plan

Monitoring Plan

This monitoring plan describes additional sampling activities for three wells within the Bulk Fuels Facility (BFF) groundwater monitoring (GWM) well network at Kirtland Air Force Base (AFB), New Mexico. Groundwater near these wells has been impacted by a localized sanitary sewer line release. Groundwater from these wells will be sampled in conjunction with the routine quarterly BFF GWM sampling events performed in accordance with the *Work Plan for the Bulk Fuels Facility Expansion of the Dissolved-Phase Plume Groundwater Treatment System Design Revision 2, Solid Waste Management Unit ST-106/SS-111*.

B.1 Sample Locations and Sampling Frequency

Three monitoring wells located near Manhole-13 (MH-13) have been affected by the increasing nitrates caused by the leakage of sewer water. For this monitoring plan, samples will be collected quarterly (Table 1) from monitoring wells KAFB-106005, KAFB-106009, and KAFB-106012R in conjunction with Kirtland BFF quarterly sampling events (Figure 1). Sampling of affected BFF GWM wells KAFB-106005, KAFB-106009, and KAFB-106012R will continue on a quarterly basis until concentrations demonstrate reduction of total nitrate below the NMED WQCC standard of 10 mg/L (NMAC 20.6.2.3101A).

B.2 Sampling Procedure

Groundwater samples will be collected in accordance NMED approved methods in the *Work Plan for the Bulk Fuels Facility Expansion of the Dissolved-Phase Plume Groundwater Treatment System Design Revision 2, Solid Waste Management Unit ST-106/SS-111* (or most current version). Low-flow sampling will performed in conformance with Section 3.2.16.4 “Collection of Groundwater Samples from Monitoring Wells Not Equipped with Dedicated Pumps Using Active, Low-Flow Sampling Techniques”. For passive sampling, the samples will be collected in conformance with Section 3.2.16.5 “Collection of Groundwater Samples from Monitoring Wells Not Equipped with Dedicated Pumps Using Passive Sampling Techniques”. If low-flow sampling is performed, collection of field parameters will be performed as part of the BFF GWM program. Table 2 summarize the field instrument quality control required for this monitoring plan.

B.3 Field Quality Control (QC) Samples

Field QC samples will be collected in association with the sampling to ensure field sample collection and analytical precision and representativeness. One duplicate sample will be collected from KAFB-106009.

B.4 Sample Bottles, Preservation, and Shipping

Water samples collected from the three monitoring wells affected by the sewer release will be collected and analyzed in accordance with the EPA guidelines for analytical methods and parameters, sample containers, sample preservation, and sample preparation and analysis holding times are summarized on Table 3.

B.5 Laboratory Analyses and Methods

Analytical methods for total nitrogen, fluoride, sulfate, and chloride in addition to reporting limits and project screening levels are summarized on Table 4. Eurofins Lancaster Laboratories Environmental, LLC (ELLE), Lancaster, Pennsylvania will provide analytical testing services in support of this contract. ELLE maintains current Department of Defense (DoD) Environmental Laboratory Accreditation Program certification and has the analytical expertise to perform the analyses required for this contract in accordance with DoD Quality Systems Manual Version 5.0 and EPA or other industry standard analytical methodologies. ELLE reporting limits will achieve the NMWQCC numeric standards and the EPA MCLs.

B.6 Data Validation

Analytical data generated in support of this monitoring plan will undergo data validation by the project chemist and an independent third party validation subcontractor to ensure compliance with data quality and project objectives. All project data will undergo data verification by the project chemist or designee. The Project Chemist or designated third party subcontractor will use established data validation procedures to perform 10 percent EPA Stage 3 data review for groundwater analytical data. Groundwater samples from these three wells will undergo 100 percent Stage 3 validation. Data qualifiers (Table 5) will be uploaded to the project database prior to finalizing data for use in project reports. Results of the data verification and validation efforts will be documented in the Semiannual Monitoring Reports and all data will be uploaded to the Environmental Resources Program Information Management System.

B.7 Reporting

Groundwater sampling of the three affected monitoring wells will occur on a quarterly basis in conjunction with the BFF GWM program, and Kirtland AFB will submit a semiannual report documenting the results of that sampling. The first of these reports (Dec 2017) will also include a completion report documenting the replacement of MH-13. These semiannual letter reports will be submitted to NMED and describe past and current sampling results and figures that show trends in nitrate, fluoride, chloride, and sulfate concentrations at the affected wells.

Table B-1
Monitoring Requirements

Analysis	Frequency	Sample Location
Chloride, sulfate, fluoride – Method E300.0A	Semiannual	KAFB-106005; KAFB-106009; KAFB-106012R
Nitrogen (nitrate-nitrite) – Method E353.2	Semiannual	KAFB-106005; KAFB-106009; KAFB-106012R

E = EPA Methods for Chemical Analysis of Water and Wastes, 1983 and Updates.

**Table B-2
Field Instrument Quality Control for Low-Flow Sampling**

Field Equipment	Calibration Verification Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Standard Operating Procedure Reference
YSI (or equivalent) water quality meter with flow cell	Check calibration against two of the following three traceable standards with nominal pH of 4.0, 7.0, and 10.0 Check calibration of outside of range -10–60 °C (14–140 °F)	Calibrate probe once per week and then verify once per day before first use	± 0.2 pH units	Recalibrate	Field personnel	Manufacturer's Operation Manual
	Check calibration against specific conductance standard Check calibration of outside of range -10–60 °C (14–140 °F)	Calibrate probe once per week and then verify once per day before first use	± 0.5% of standard value or 0.0001 millisiemens per centimeter, whichever is greater	Recalibrate	Field personnel	Manufacturer's Operation Manual
Turbidity Meter	Calibrate with primary standard of 10 nephelometric turbidity units	Calibrate every 3 months; verify once a week reading is within acceptable value	±10%	Recalibrate	Field personnel	Manufacturer's Operation Manual

°C = Degree Celsius

°F= Degree Fahrenheit

**Table B-3
Analytical Parameter, Method, Sample Container, Preservation, and Holding Time Requirements**

Parameter	Preparation/ Analysis Method	Bottle Type	Preservative	Preparation Holding Time	Analytical Holding Time
Anions (chloride, sulfate, fluoride)	E300.0A	2 x 40-ml VOA vials	Cool $\leq 6^{\circ}\text{C}$	NA	28 days
Nitrate-nitrite nitrogen	E353.2	1 x 250-ml HDPE	H ₂ SO ₄ to pH<2; Cool to 6°C	NA	28 days

$^{\circ}\text{C}$ = Degrees Celsius.

E = EPA Methods for Chemical Analysis of Water and Wastes, 1983 and Updates

H₂SO₄ = Sulfuric acid.

HDPE = High density polyethylene.

HNO₃ = Nitric acid.

ml = Milliliter.

NA = Not applicable.

VOA = Volatile organics analysis.

**TABLE B-4
Analytical Parameter, Analyte Reporting Limits, And Screening Criteria for Water**

Analyte	Analytical Method	CASRN	Units	NMWQCC ¹	EPA MCL ²	Project Screening Level ³	Achievable Laboratory Limits ⁴		
							LOQ	LOD	DL
Chloride	E300.0A	16887-00-6	mg/L	250	NS	250	2.0	2.0	1.0
Fluoride	E300.0A	16984-48-8	mg/L	1.6	NS	1.6	0.5	0.5	0.25
Nitrate-nitrite nitrogen ⁵	E353.2	84145-82-4	mg/L	10	10	10	1.0	0.1	0.04
Sulfate	E300.0A	18785-72-3	mg/L	600	250	250	5.0	5.0	1.5

¹ NMWQCC standards per the New Mexico Administrative Code Title 20.6.2.3101A, Standards for Ground Water of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC 2004). For metals, the NMWQCC standard applies to dissolved metals and total mercury.

² EPA National Primary Drinking Water Regulations, Maximum Contaminant Levels and Secondary Maximum Contaminant Levels, Title 40CFR Part 141, 143 (May 2009).

³ The project screening level was selected to satisfy the requirements of the Kirtland Air Force Base Hazardous Waste Permit No. NM9570024423 as the lowest of 1) NMWQCC standard or 2) EPA MCL. If no MCL or NMWQCC standard exists for any analyte, then the project screening level will be the EPA Tapwater RSL. Project screening levels below the LOD are highlighted and the screening level is set at the LOQ.

⁴ Achievable laboratory limits are for Eurofins Lancaster Laboratories Environmental, LLC, Lancaster Pennsylvania.

⁵ MCL for nitrate is 10 mg/L.

mg/L = Milligram(s) per liter.

CASRN = Chemical Abstracts Service Registry Number.

DL = Detection limit.

E = EPA Methods for Chemical Analysis of Water and Wastes, 1983 and Updates.

EPA = U.S. Environmental Protection Agency.

LOD = Limit of detection.

LOQ = Limit of quantitation.

MCL = Maximum Contaminant Level.

NMWQCC = New Mexico Water Quality Control Commission.

NS = Not specified.

**Table B-5
Data Qualification Flags and Reason Codes**

Qualifier	Definition
	No Qualifier indicates that the data are acceptable both qualitatively and quantitatively.
U	The analyte was analyzed for but was not detected above the reported limit of quantitation.
J	The analyte was analyzed for and was positively identified, but the reported numerical value may not be consistent with the amount actually present in the environmental sample. Results are estimated, although the data are considered usable and may be used as appropriate to meet project objectives. Results are qualitatively acceptable and quantitatively uncertain.
J-	The analyte was positively identified; the associated numerical value is its approximate concentration with a low bias in the sample.
J+	The analyte was positively identified; the associated numerical value is its approximate concentration with a high bias in the sample.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
R	The analyte was analyzed for, but the presence <u>or</u> absence of the analyte has not been verified. Re-sampling and re-analysis may be necessary to confirm or deny the presence of the analyte. Results are rejected, and data are <u>unusable</u> for any purposes.