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June 3, 2019

Abandoned Mine Land Program
Mining and Minerals Division
Energy, Minerals and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505

Attention: Erin Marynak
Project Development Coordinator

Subject: Final Water Quality Monitoring Report – Task Order 5-Madrid Stormwater and Erosion Safety Project: Water Quality Testing and Analysis

Dear Ms. Marynak,

Per Task Order 5, Grouse Mountain Environmental Consultants (GMEC) has prepared a water quality monitoring report to ensure compliance with New Mexico Water Quality Standards (NMAC 20.6.4) and the New Mexico Water Quality Act (NMAC 74.6.1). Monitoring sites within the Area of Potential Impact (APE) are located on county, and private surface ownership in Madrid, New Mexico and were sampled for the approved list of water contaminants.

For any additional questions or comments, please contact Leeland Murray at (505) 930-5166 or by email: Lmurray@gmecnm.com.

Regards,

A handwritten signature in black ink, appearing to read "Leeland Murray", is written over a faint, light-colored circular stamp.

Leeland Murray
Environmental Specialist/Project Manager
Grouse Mountain Environmental Consultants

Madrid Stormwater Monitoring Report 2019

Task Order 5 - Water Quality Testing and Analysis

Prepared For:

Abandoned Mine Land Program
Mining and Minerals Division
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June 3, 2019



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Introduction

Madrid, New Mexico is the site of historic coal mining activities beginning in the 1890's. Since abandonment of the mine in the 1950's the coal waste gob piles have remained relatively unstable and poorly vegetated, resulting in the movement of large quantities of sediment downslope, especially during precipitation events. This sediment movement has had significant negative impacts on the town of Madrid, located immediately downslope and adjacent to multiple coal gob piles. Over time, sediment has accumulated within the town of Madrid, clogging drainage paths and leading to small scale flooding throughout the town. In recent years the Abandoned Mine Land (AML) Program has sought to stabilize the coal gob piles and establish stormwater conveyances that will reduce the sedimentation and flooding occurring within the town. Prior to installing stormwater conveyances, the AML Program sought to analyze existing stormwater runoff contaminants and compare testing levels to state and federal regulations. As future design plans will divert stormwater into the nearby arroyo, the AML Program wanted to confirm this runoff will not result in additional damage to the environment or pose a threat to human health.

The AML Program contracted Grouse Mountain Environmental Consultants, LLC (GMEC) to collect stormwater from five (5) locations associated with coal gob waste piles in Madrid. GMEC hydrologists were on site to select sampling sites in January 2019, and again in February 2019 to complete the final installations. These sites were selected based on AML Program staff knowledge and recommendations of where significant stormwater flows exist on the gob piles and within the town of Madrid. Stormwater samples were analyzed by Hall Environmental Laboratories in Albuquerque, NM for an approved list of contaminants. These results will be used to guide future reclamation efforts and ensure stormwater entering the unnamed ephemeral drainage through constructed conveyances will not be harmful to the environment or human health.

Methods

Monitoring Objectives

1. Monitor stormwater quality at two locations directly below the coal waste (gob) piles
2. Monitor stormwater quality at two locations near the point of discharge into the ephemeral drainage
3. Monitor a reference site where stormwater quality would have minimal effects from the gob piles and will be unaffected by proposed future actions

Monitoring Site Locations

After the January 31, 2019 preliminary visit attended by GMEC personnel and AML Program staff, a total of five (5) monitoring sites were selected for water quality testing and analysis (Table 1, Figure 1). Monitoring sites were selected based on accessibility and the ability to meet the objectives of monitoring plan. The five monitoring sites consisted of, one (1) reference site, two (2) coal waste drainage sites (one of these sites, CW2, was previously reclaimed), and two (2) discharge point sites. The name, type, geographic location and images of each monitoring site are listed below in Table 1 and depicted in the Figures section of this report.

Table 1. Madrid Water Quality Monitoring Sites

Site Name	Type	Longitude	Latitude
CW1	Coal Waste	-106.15109	35.40672
CW2	Coal Waste	-106.15179	35.40507
DP1	Discharge Point	-106.15158	35.41113
DP2	Discharge Point	-106.15214	35.40839
RF	Reference	-106.14979	35.40637

Coordinates presented in North American Datum 1983 (NAD83)

Each monitoring site was selected to represent stormwater runoff and its associated water quality. Monitoring site CW1 represents stormwater draining directly from a coal waste gob pile (Figure 1, Appendix A). CW2 represents stormwater post AML Program reclamation activities on a coal waste gob pile (Figure 1, Appendix A). Monitoring sites DP1 and DP2 are representative of cumulative stormwater runoff within the APE before discharging into the unnamed ephemeral stream (Reach Code 13020201000765) (Figure 1, Appendix A). The REF site is located on a hillside near the eastern edge of the Madrid APE and does not receive stormwater drainage from gob piles (Figure 1, Appendix A). The reference site was established to compare stormwater water quality from sites immediately below coal waste piles and cumulative sites affected by the watershed level discharge into the arroyo (CW1, CW2, DP1, and DP2).

Sampling Site Installation and Equipment

Sampling site installation occurred over the course of two (2) days on February 12 and 13, 2019. GMEC and AML Program staff constructed collection basins at each of the selected sites by using available rocks and/or digging small depressions for stormwater to accumulate. Each of the constructed collection basins were lined with plastic sheeting to create an impermeable liner. The plastic liners were anchored to the ground using available rocks found within the immediate vicinity. Each monitoring site was equipped with a Global Water WS705 composite automatic sampler with a Global Water sampler stormwater kit installed. The automatic samplers were set up in flow trigger mode, allowing the sampler to intake water when the sensor detected flow. To prevent sediment build-up at the intake, sampling tubes were installed slightly above the bottom of the collection basin. Water sampling stations were removed on May 15, 2019 and each site was rehabilitated to previous conditions by removing plastic liners, filling collection basins and redistributing rocks used to anchor the plastic liners.

Water Sample Collections

At each site, sampling of stormwater was conducted for a maximum of four (4) precipitation events with enough runoff to initiate overland flow. A total of seventeen (17) water samples were collected for analysis. The number of samples collected and the collection date at each site can be found in Table 2. All water samples were collected by on-call GMEC staff within three (3) hours of a precipitation event to prevent sample degradation. GMEC used containers and preservatives supplied by Hall Environmental Analysis Laboratory to store samples prior to transfer to the laboratory. Samples were stored in a cooler, maintained at a temperature between 2° - 6°C by crushed ice, and hand delivered to the laboratory.

Table 2. Number of Samples and Collection Dates by Site

Site	# of Samples	Sample Dates
CW1	4	02/22/2019 03/04/2019 03/11/2019 03/12/2019
CW2	4	03/04/2019 03/11/2019 03/12/2019 03/21/2019
DP1	3	03/12/2019 03/21/2019 04/23/2019
DP2	4	03/11/2019 03/12/2019 03/21/2019 04/22/2019
REF	2	03/11/2019 03/12/2019

Water Quality Constituents

Monitoring constituents were selected by the AML Program in consultation with the New Mexico Environment Department (NMED) from the list of contaminants referenced in NMAC 20.6.139 and 20.6.4.900. The listed constituents in Table 3 were analyzed by Hall Environmental Analysis Laboratory in Albuquerque, NM, a NMED approved laboratory. The laboratory followed methods and analytical techniques described in New Mexico Administrative Code (NMAC) 20.6.4.14 *Sampling and Analysis*. The following constituents are included for the analysis of water quality.

Table 3. Selected Sampling Constituents

Constituents	
Water Properties	Test Type
pH	Meter
Total Hardness	Total
Water Quality	Test Type
Conductivity	Meter
Acidity/Alkalinity	Meter
Total Suspended Solids (TSS)	Total
Total Dissolved solids (TDS)	Total
Total Organic Carbon (TOC)	Total
Water Pollutants	Test Type
Aluminum (Al)	Total/Dissolved
Arsenic (As)	Dissolved
Boron (B)	Dissolved
Cadmium (Cd)	Dissolved
Chlorine residual	Total
Chromium (Cr)	Dissolved
Chromium (Cr) VI	Dissolved
Cobalt (Co)	Dissolved
Copper (Cu)	Dissolved
Cyanide	Total
Lead (Pb)	Dissolved
Manganese (Mn)	Dissolved

Constituents	
Mercury (Hg)	Total/Dissolved
Molybdenum (Mo)	Total
Nitrite + Nitrate	Dissolved
Selenium (Se)	Total/Dissolved
Vanadium (V)	Dissolved
Nickel (Ni)	Dissolved
Silver (Ag)	Dissolved
Zinc (Zn)	Dissolved

Results

Analytical results of water sampling activities are presented in Appendix B, tables A-F for supplemental information. Tables A-F present the analytical results and water quality measurements for water samples collected at each of the five (5) monitoring sites. Due to a lack of four (4) overland flow events at three (3) of the five (5) monitoring sites, only three (3) samples were collected at site DP1 and only two (2) samples were collected at site REF. Four (4) samples were collected at sites: CW1, CW2, and DP2.

Water samples were submitted to the Hall Environmental Analysis Laboratory for chemical analysis. Samples submitted to the Hall Lab were analyzed in accordance with the applicable Environmental Protection Agency (EPA) analytical methods. Analytical results were compared with EPA maximum contaminant levels (MCLs) for drinking water supplies (U.S. Environmental Protection Agency, 2009) or NMED maximum allowable concentrations (MACs) (NMWQCC, 2018) for human health, domestic water supply and irrigation use standards (Subsections A, B, and C in Section of 20.6.2.3109 NMAC).

Table A summarizes the analytical results for monitoring site **CW1**. Most of the analytes at this site were either at a non-detection (ND) reporting limit or below the established EPA MCLs/NMED MACs standards. The analyte concentrations collected at CW1 that exceeded the EPA MCL/NMED MAC standards are:

- Total dissolved solids (TDS), 760 mg/L in the water sample collected on 3/12/2019 exceeded EPA MCLs standard of 500 mg/L, but was below NMED MACs standard of 1000 mg/L
- Dissolved Aluminum (Al), 44 mg/L in the water sample collected on 3/12/2019 exceeded both EPA MCLs standard of 0.05-0.2 mg/L and NMED MACs standard of 5 mg/L

Table B summarizes the analytical results for monitoring site **CW2**. Results from this site indicated only dissolved Aluminum (Al), **0.07 mg/L** in the water sample collected on 3/12/2019 exceeded EPA MCLs standard of **0.05-0.2 mg/L**, but was below NMED MACs standard. All other analytes were either at ND limit or below the established EPA MCLs/NMED MACs standards.

Table C summarizes the analytical results for monitoring site **DP1**. Most of the analytes were either at non-detection (ND) reporting limit or below the established EPA MCLs/NMED MACs standards. The analyte concentrations collected at DP1 that exceeded the EPA MCLs/NMED MACs standards are:

- Total dissolved solids (TDS), **1100 mg/L** and **1110 mg/L** in the water samples collected on 3/12/2019 and 3/21/2019 respectively, exceeded EPA MCLs standard of **500 mg/L** and NMED MACs standard of **1000 mg/L**

- Dissolved Aluminum (Al), **4.5 mg/L** and **3.9 mg/L** in the water sample collected on 3/12/2019 and 3/21/2019 respectively, exceeded EPA MCLs standard of **0.05-0.2 mg/L**, whereas dissolved Aluminum of **8.6 mg/L** in water sample collected on 4/23/2019 exceeded both EPA MCLs standard of **0.05-0.2 mg/L** and NMED MACs standard of **5 mg/L**
- Dissolved Manganese (Mn), **0.25mg/L** and **0.13 mg/L** in water samples collected on 3/12/2019 and 4/23/2019 respectively, exceeded both EPA MCLs standard of **0.05 mg/L** and NMED MACs standard of **0.2 mg/L**, whereas dissolved Manganese (Mn), **0.062 mg/L** in water sample collected on 3/21/2019 exceeded only EPA MCLs standards
- Dissolved Lead (Pb), **0.062 mg/L** in water sample collected on 3/12/2019 exceeded both EPA MCLs and NMED MACs standards of **0.05 mg/L**

Table D summarizes the analytical results for monitoring site **DP2**. Most of the analytes were either at non-detection (ND) reporting limits or below the established EPA MCLs/NMED MACs standards. The analyte concentrations in the water samples collected at DP2 exceeding the EPA MCLs/NMED MACs standards are:

- Total dissolved solids (TDS), **650 mg/L**, **960 mg/L**, and **1040 mg/L** in the water samples collected on 3/11/2019, 3/12/2019, and 3/21/2019 respectively, exceeded both EPA MCLs standard of **500 mg/L** and NMED MACs standard of **1000 mg/L**
- Dissolved Aluminum (Al), **17 mg/L** in the water sample collected on 3/12/2019 exceeded both EPA MCLs standard of **0.05-0.2 mg/L** and NMED MACs standard of **5 mg/L**, whereas dissolved Aluminum (Al) **1.6mg/L**, **0.78 mg/L**, and **0.31 mg/L** collected on 3/11/2019, 3/21/2019, and 4/22/2019 respectively, exceeded EPA MCLs, but were below NMED MACs standard
- Dissolved Manganese (Mn), **0.13 mg/L** and **0.17 mg/L** in water samples collected on 3/11/2019 and 4/12/2019 respectively, exceeded EPA MCLs standard of **0.05 mg/L**, but were below NMED MACs standard of **0.2 mg/L**

Table E summarizes the analytical results for monitoring site **REF**. At this site, all the analytes were either at ND levels or below the established EPA MCLs/NMED MACs standards, except for the following analyte:

- Dissolved Aluminum (AL), **0.064 gm/L** and **0.13 mg/L** collected on 3/11/2019 and 3/21/2019 respectively, exceeded EPA MCLs standard of **0.05-0.2 mg/L**, but were below NMED MACs standards.

Table F summarizes the average values of analytical results for all five (5) monitoring sites. Based on the average values, all the analytes in water samples collected at monitoring sites CW2 and REF were either at ND levels or below the established EPA MCLs and NMED MACs standards. At site CW1, only dissolved Aluminum **11.19 mg/L** exceeded both EPA MCLs and NMED MACs standards. At monitoring sites DP1 and DP2, TDS levels of **986.67 mg/L** and **775 mg/L** respectively, and dissolved Manganese (Mn) of **0.15 mg/L** and **0.09 mg/L** respectively exceeded EPA MCLs standards while remaining below NMED MCAs standards.

Summary and Conclusions

Storm water sampling was conducted in Madrid, New Mexico between 2/14/2019 and 5/15/2019 for four (4) different rainfall events in support of Madrid Stormwater and Erosion Safety Project. Water sampling was conducted at five (5) monitoring sites located within the APE. The average analytical results for water samples collected from the monitoring sites indicated:

- Most of the analytes in water samples from all monitoring sites were either at the non-detection (ND) reporting limit or below the established EPA MCLs or NMED MACs standards
- All the analytes in water samples from sites **CW2** and **REF** were either at the non-detection (ND) reporting limit or below the established EPA MCLs or NMED MACs standards
- TDS level was above established MCLs or MACs standards at monitoring sites **DP1** and **DP2**
- Dissolved Manganese was detected above established MCLs, but below MACs standards at monitoring sites **DP1** and **DP2**
- Dissolved Aluminum was above established MCLs or MACs standards at monitoring sites **CW1** and **DP1**, and above MCLs, but below MACs at **DP2**

Given the instability of the coal waste gob piles and the amount of sediment that is actively eroding from these piles it was expected that some pollutants would exceed MCLs or MACs standards. However, only TDS, dissolved aluminum, and dissolved manganese exceeded these standards at specific sites. These specific sites include **DP1** and **DP2**, which represent cumulative water quality within the APE prior to discharge into Waters of the US (WOUS) and **CW1**, located below an unreclaimed gob waste pile. While the exceedance of dissolved aluminum and manganese may be cause for concern, it is evident that previous reclamation efforts conducted by the AML Program have made a positive impact on the water quality of the stormwater collected at site **CW2**. Prior to the collection basin at site **CW2** stormwater flows through a series of Zuni bowls from nearby gob piles previously reinforced with wattles and vegetation matting to slow surface runoff and improve infiltration.

References

New Mexico Water Quality Control Commission (NMWQCC) (2018, August). Ground and Surface Water Protection. (Section 20.6.2 of the New Mexico Administrative Code). Retrieved from <https://www.env.nm.gov/gwqb/gw-regulations/>

U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance. (2009, May). National Primary Drinking Water Regulations. (EPA 816-F-09-004). Retrieved from https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf

FIGURES

Figure 1. Madrid, NM Water Sampling Field Locations Map 2019

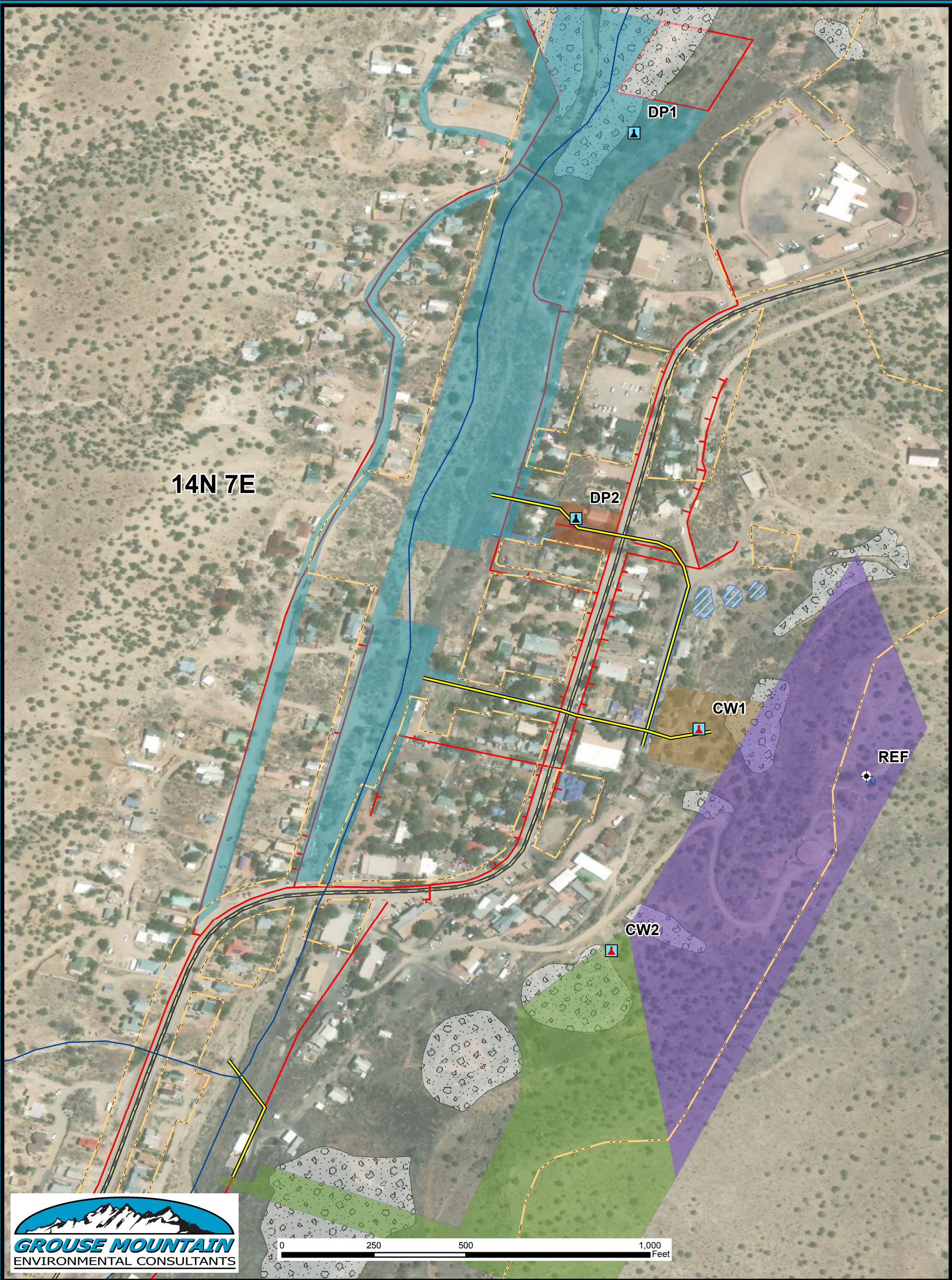

















Figure 1. Madrid, New Mexico Water Sampling Field Locations Map 2019

Sample Type		Land Ownership			
	Coal Waste		Brian Bodel		Madrid Gob Piles
	Discharge		Cathasha Cabrielle		Water Conveyance Routes
	Reference		Santa Fe County		Madrid Water System
	Ephemeral streams		Clifford and Edith Kitzrow		Collection Basin
	Madrid APE		You and Me LLC		Stormwater Channels

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Scale: 1:3,000
Date: 5/29/2019
Created by: Imurray
File Name: NMAML005_FinalWQ sitesMadrid_Map

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APPENDICES

Appendix A. Monitoring Site Location Photographs



Water Quality Monitoring Site **CW1**, located below an unreclaimed gob waste pile



Water Quality Monitoring Site **CW2**, located below reclaimed gob pile



Water Quality Monitoring Site **DP1**, first discharge point representing cumulative storm runoff within APE before discharging into the unnamed ephemeral stream



Water Quality Monitoring Site **DP2**, second discharge point representing cumulative stormwater runoff within APE before discharging into the unnamed ephemeral stream



Water Quality Monitoring Site **REF** located on a hillside near the eastern edge of the Madrid APE

Appendix B. Analytical Results for Water Samples

Table A. Analytical Results for Water Samples Collected at CW1

Method	Constituents	EPA MCLs/ NMED MACs	Units	Results				
				Sample Collection Dates				
Water Properties				2/22/2019	3/4/2019	3/11/2019	3/12/2019	Average
SM4500-H+B / 9040C	pH	6-9	s.u.	7.11	7.48	7.94	8.24	7.69
SM2510B	Specific Conductance	--	µmhos/c	120	67	120	90	99.25
SM2340B	Hardness (as CaCO3)	--	mg/L	50	31	83	480	161.00
SM2540C MOD	Total Dissolved Solids (TDS)	500/1000	mg/L	98	66	208	760	283.00
SM 2540D	Total Suspended Solids (TSS)	--	mg/L	9	26	160	940	283.75
SM 5310B	Total Organic Carbon (TOC)	--	mg/L	--	3.4	14	3.8	7.07
Alkalinity								
SM2320B	Bicarbonate (as CaCO3)	--	mg/L	36.92	23.92	48.72	181	72.64
SM2320B	Carbonate (as CaCO3)	--	mg/L	ND	ND	ND	ND	ND
SM2320B	Total Alkalinity (as CaCO3)	--	mg/L	36.92	23.92	48.72	181	72.64
Anions								
EPA METHOD 300.0	Nitrogen, Nitrite (as N)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 300.0	Nitrogen, Nitrate (as N)	10	mg/L	2.1	ND	1.2	ND	1.65
Chlorine								
HACH 8167	Total Chlorine	--	mg/L	ND	ND	ND	ND	ND
Metals, Dissolved								
EPA METHOD 200.7	Aluminum (Al)	0.05-0.2/5	mg/L	0.1	0.3	0.37	44	11.19
EPA 200.8	Arsenic (As)	0.01/0.1	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Boron (B)	0.75	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Cadmium (Cd)	0.05/0.01	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Chromium (Cr)	0.1/0.05	mg/L	ND	ND	ND	ND	ND
SM 3500 Cr C-2011	Chromium (Cr) VI	--	mg/L	--	ND	ND	ND	ND
EPA METHOD 200.7	Cobalt (Co)	0.05	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Copper (Cu)	1	mg/L	0.0027	0.0024	0.0062	0.011	0.006
EPA 200.8	Lead (Pb)	0.05	mg/L	ND	ND	0.00056	0.0084	0.0045
EPA METHOD 200.7	Manganese (Mn)	0.05/0.20	mg/L	0.013	0.0059	0.017	0.053	0.022
EPA METHOD 245.1	Mercury (Hg)	--	mg/L	ND	0.0002	ND	0.0002	0.0002
EPA 200.8	Selenium (Se)	0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Vanadium (V)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.8	Nickel (Ni)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.9	Silver (Ag)	0.1/0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.10	Zinc (Zn)	5/10	mg/L	0.034	0.033	0.041	ND	0.036
Metals, Total								
EPA METHOD 200.7	Aluminum (Al)	--	mg/L	0.86	3.6	6.5	52	15.74
EPA METHOD 335.4	Cyanide (CN)	0.2	mg/L	--	ND	ND	ND	ND
EPA METHOD 245.1	Mercury (Hg)	0.002	mg/L	ND	0.0002	ND	ND	0.0002
EPA METHOD 200.7	Molybdenum (Mo)	--	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Selenium (Se)	--	mg/L	--	0.001	0.001	0.006	0.00266667

Notes:

EPA MCL/NMED MAC= US EPA Maximum Contaminant Level or NMED Maximum Allowable Concentration

Bold=Concentration exceeds EPA (MCL) or NMED MAC

ND= Concentration below detection reporting limit

Average calculation included concentration at or above detection reporting limit

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Table B. Analytical Results for Water Samples Collected at CW2

Method	Constituents	EPA MCLs/ NMED MACs	Units	Results				
				Sample Collection Dates				
Water Properties				3/4/2019	3/11/2019	3/12/2019	3/21/2019	Average
SM4500-H+B / 9040C	pH	6-9	s.u.	7.47	7.23	7.64	7.08	7.4
SM2510B	Specific Conductance	--	µmhos/c	73	80	57	50	65.0
SM2340B	Hardness (as CaCO3)	--	mg/L	31	34	34	22	30.3
SM2540C MOD	Total Dissolved Solids (TDS)	500/1000	mg/L	86	54	74	30	61.0
SM 2540D	Total Suspended Solids (TSS)	--	mg/L	ND	14	90	18	40.7
SM 5310B	Total Organic Carbon (TOC)	--	mg/L	3.1	6.2	2.9	4.1	4.1
Alkalinity								
SM2320B	Bicarbonate (as CaCO3)	--	mg/L	23.84	25.16	ND	ND	24.5
SM2320B	Carbonate (as CaCO3)	--	mg/L	ND	ND	ND	ND	ND
SM2320B	Total Alkalinity (as CaCO3)	--	mg/L	23.84	25.16	ND	ND	24.5
Anions								
EPA METHOD 300.0	Nitrogen, Nitrite (as N)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 300.0	Nitrogen, Nitrate (as N)	10	mg/L	ND	0.64	ND	0.44	0.5
Chlorine								
HACH 8167	Total Chlorine	--	mg/L	ND	ND	ND	ND	ND
Metals, Dissolved								
EPA METHOD 200.7	Aluminum (Al)	0.05-0.2/5	mg/L	0.0017	0.023	0.07	ND	0.032
EPA 200.8	Arsenic (As)	0.01/0.1	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Boron (B)	0.75	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Cadmium (Cd)	0.05/0.01	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Chromium (Cr)	0.1/0.05	mg/L	ND	ND	ND	ND	ND
SM 3500 Cr C-2011	Chromium (Cr) VI	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Cobalt (Co)	0.05	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Copper (Cu)	1	mg/L	0.017	0.018	0.12	0.012	0.042
EPA 200.8	Lead (Pb)	0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Manganese (Mn)	0.05/0.20	mg/L	ND	0.0089	0.011	0.0072	0.009
EPA METHOD 245.1	Mercury (Hg)	--	mg/L	0.00021	ND	ND	ND	0.00021
EPA 200.8	Selenium (Se)	0.05	mg/L	0.0017	0.0028	0.012	0.0011	0.004
EPA METHOD 200.7	Vanadium (V)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.8	Nickel (Ni)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.9	Silver (Ag)	0.1/0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.10	Zinc (Zn)	5/10	mg/L	0.023	0.031	0.018	0.025	0.024
Metals, Total								
EPA METHOD 200.7	Aluminum (Al)	--	mg/L	0.36	1.4	3	0.64	1.350
EPA METHOD 335.4	Cyanide (CN)	0.2	mg/L	ND	ND	ND	ND	ND
EPA METHOD 245.1	Mercury (Hg)	0.002	mg/L	0.00021	ND	ND	ND	0.00021
EPA METHOD 200.7	Molybdenum (Mo)	--	mg/L	0.015	0.026	0.015	0.012	0.0170
EPA 200.8	Selenium (Se)	--	mg/L	0.0018	0.0026	0.0014	0.0019	0.0019

Notes:

EPA MCL/NMED MAC= US EPA Maximum Contaminant Level or NMED Maximum Allowable Concentration

Bold= Concentration exceeds EPA (MCL) or NMED MAC

ND= Concentration below detection reporting limit

Average calculation included concentration at or above detection reporting limit

* Groundwater Quality standard

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Table C. Analytical Results for Water Samples Collected at DP1

Method	Constituents	EPA MCLs/ NMED MACs	Units	Results			
				Sample Collection Dates			
Water Properties				3/12/2019	3/21/2019	4/23/2019	Average
SM4500-H+B / 9040C	pH	6-9	s.u.	7.76	7.82	7.8	7.79
SM2510B	Specific Conductance	--	µmhos/c	350	670	540	520.00
SM2340B	Hardness (as CaCO3)	--	mg/L	494	430	260	394.67
SM2540C MOD	Total Dissolved Solids (TDS)	500/1000	mg/L	1100	1110	750	986.67
SM 2540D	Total Suspended Solids (TSS)	--	mg/L	2900	4100	580	2526.67
SM 5310B	Total Organic Carbon (TOC)	--	mg/L	12	11	20	14.33
Alkalinity							
SM2320B	Bicarbonate (as CaCO3)	--	mg/L	69.32	52.4	103	74.91
SM2320B	Carbonate (as CaCO3)	--	mg/L	ND	ND	ND	ND
SM2320B	Total Alkalinity (as CaCO3)	--	mg/L	69.32	52.4	103	74.91
Anions							
EPA METHOD 300.0	Nitrogen, Nitrite (as N)	--	mg/L	ND	ND	ND	ND
EPA METHOD 300.0	Nitrogen, Nitrate (as N)	10	mg/L	1.7	2.3	2.2	2.07
Chlorine							
HACH 8167	Total Chlorine	--	mg/L	ND	ND	ND	ND
Metals, Dissolved							
EPA METHOD 200.7	Aluminum (Al)	0.05-0.2/5	mg/L	4.5	3.9	8.6	5.67
EPA 200.8	Arsenic (As)	0.01/0.1	mg/L	ND	0.002	0.0034	0.0027
EPA METHOD 200.7	Boron (B)	0.75	mg/L	0.076	0.062	ND	0.07
EPA METHOD 200.7	Cadmium (Cd)	0.05/0.01	mg/L	ND	ND	ND	ND
EPA METHOD 200.7	Chromium (Cr)	0.1/0.05	mg/L	ND	ND	ND	ND
SM 3500 Cr C-2011	Chromium (Cr) VI	--	mg/L	0.000996	0.000867	--	0.0009
EPA METHOD 200.7	Cobalt (Co)	0.05	mg/L	ND	ND	ND	ND
EPA 200.8	Copper (Cu)	1	mg/L	0.058	0.013	0.025	0.03
EPA 200.8	Lead (Pb)	0.05	mg/L	0.062	0.0085	0.018	0.03
EPA METHOD 200.7	Manganese (Mn)	0.05/0.20	mg/L	0.25	0.062	0.13	0.15
EPA METHOD 245.1	Mercury (Hg)	--	mg/L	ND	ND	ND	ND
EPA 200.8	Selenium (Se)	0.05	mg/L	ND	ND	ND	ND
EPA METHOD 200.7	Vanadium (V)	--	mg/L	ND	ND	ND	ND
EPA METHOD 200.8	Nickel (Ni)	--	mg/L	ND	ND	ND	ND
EPA METHOD 200.9	Silver (Ag)	0.1/0.05	mg/L	ND	ND	ND	ND
EPA METHOD 200.10	Zinc (Zn)	5/10	mg/L	0.17	0.04	0.067	0.09
Metals, Total							
EPA METHOD 200.7	Aluminum (Al)	--	mg/L	83	110	32	75.00
EPA METHOD 335.4	Cyanide (CN)	0.2	mg/L	ND	ND	--	ND
EPA METHOD 245.1	Mercury (Hg)	0.002	mg/L	ND	ND	ND	ND
EPA METHOD 200.7	Molybdenum (Mo)	--	mg/L	ND	ND	ND	ND
EPA 200.8	Selenium (Se)	--	mg/L	0.0084	0.0089	0.003	0.01

Notes:

EPA MCL/NMED MAC= US EPA Maximum Contaminant Level or NMED Maximum Allowable Concentration

Bold= Concentration exceeds EPA (MCL) or NMED MAC

ND= Concentration below detection reporting limit

Average calculation included concentration at or above detection reporting limit

Table D. Analytical Results for Water Samples Collected at DP2

Method	Constituents	EPA MCLs/ NMED MACs	Units	Results				
				Sample Collection Dates				
				3/11/2019	3/12/2019	3/21/2019	4/22/2019	Average
Water Properties								
SM4500-H+B / 9040C	pH	6-9	s.u.	7.61	7.85	7.84	7.44	7.7
SM2510B	Specific Conductance	--	µmhos/c	1300	610	720	530	790.0
SM2340B	Hardness (as CaCO3)	--	mg/L	240	440	240	73	248.3
SM2540C MOD	Total Dissolved Solids (TDS)	500/1000	mg/L	650	960	1040	450	775.0
SM 2540D	Total Suspended Solids (TSS)	--	mg/L	300	2000	1000	120	855.0
SM 5310B	Total Organic Carbon (TOC)	--	mg/L	32	13	13	27	21.3
Alkalinity								
SM2320B	Bicarbonate (as CaCO3)	--	mg/L	84.52	89.36	57.44	80.64	78.0
SM2320B	Carbonate (as CaCO3)	--	mg/L	ND	ND	ND	ND	ND
SM2320B	Total Alkalinity (as CaCO3)	--	mg/L	84.52	89.36	57.44	80.64	78.0
Anions								
EPA METHOD 300.0	Nitrogen, Nitrite (as N)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 300.0	Nitrogen, Nitrate (as N)	10	mg/L	3.9	1.7	2.8	2.2	2.7
Chlorine								
HACH 8167	Total Chlorine	--	mg/L	ND	ND	ND	ND	ND
Metals, Dissolved								
EPA METHOD 200.7	Aluminum (Al)	0.05-0.2/5	mg/L	1.6	17	0.78	0.31	4.923
EPA 200.8	Arsenic (As)	0.01/0.1	mg/L	ND	ND	0.0018	0.002	0.002
EPA METHOD 200.7	Boron (B)	0.75	mg/L	0.12	ND	0.069	0.079	0.089
EPA METHOD 200.7	Cadmium (Cd)	0.05/0.01	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Chromium (Cr)	0.1/0.05	mg/L	0.013	ND	ND	ND	0.013
SM 3500 Cr C-2011	Chromium (Cr) VI	--	mg/L	0.0108	0.00309	0.00157	0.00138	0.004
EPA METHOD 200.7	Cobalt (Co)	0.05	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Copper (Cu)	1	mg/L	0.04	0.04	0.02	0.014	0.029
EPA 200.8	Lead (Pb)	0.05	mg/L	0.019	0.023	0.0046	0.0021	0.012
EPA METHOD 200.7	Manganese (Mn)	0.05/0.20	mg/L	0.13	0.17	0.041	0.031	0.093
EPA METHOD 245.1	Mercury (Hg)	--	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Selenium (Se)	0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Vanadium (V)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.8	Nickel (Ni)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.9	Silver (Ag)	0.1/0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.10	Zinc (Zn)	5/10	mg/L	0.072	0.12	0.029	0.033	0.064
Metals, Total								
EPA METHOD 200.7	Aluminum (Al)	--	mg/L	25	66	30	6.1	31.775
EPA METHOD 335.4	Cyanide (CN)	0.2	mg/L	ND	ND	ND	ND	ND
EPA METHOD 245.1	Mercury (Hg)	0.002	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Molybdenum (Mo)	--	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Selenium (Se)	--	mg/L	0.0012	0.007	0.0059	ND	0.005

Notes:

EPA MCL/NMED MAC= US EPA Maximum Contaminant Level or NMED Maximum Allowable Concentration

Bold= Concentration exceeds EPA (MCL) or NMED MAC

ND= Concentration below detection reporting limit

Average calculation included concentration at or above detection reporting limit

Table E. Analytical Results for Water Samples Collected at REF

Method	Constituents	EPA MCLs/ NMED MACs	Units	Results		
				Sample Collection Dates		
Water Properties				3/11/2019	3/12/2019	Average
SM4500-H+B / 9040C	pH	6-9	s.u.	7.31	7.62	7.465
SM2510B	Specific Conductance	--	µmhos/c	65	79	72
SM2340B	Hardness (as CaCO3)	--	mg/L	27	47	37
SM2540C MOD	Total Dissolved Solids (TDS)	500/1000	mg/L	56	124	90
SM 2540D	Total Suspended Solids (TSS)	--	mg/L	36	110	73
SM 5310B	Total Organic Carbon (TOC)	--	mg/L	8.3	4.5	6.4
Alkalinity						
SM2320B	Bicarbonate (as CaCO3)	--	mg/L	20.6	28.2	24.4
SM2320B	Carbonate (as CaCO3)	--	mg/L	ND	ND	ND
SM2320B	Total Alkalinity (as CaCO3)	--	mg/L	20.6	28.2	24.4
Anions						
EPA METHOD 300.0	Nitrogen, Nitrite (as N)	--	mg/L	ND	ND	ND
EPA METHOD 300.0	Nitrogen, Nitrate (as N)	10	mg/L	0.85	1.1	0.975
Chlorine						
HACH 8167	Total Chlorine	--	mg/L	ND	ND	
Metals, Dissolved						
EPA METHOD 200.7	Aluminum (Al)	0.05-0.2/5	mg/L	0.064	0.13	0.097
EPA 200.8	Arsenic (As)	0.01/0.1	mg/L	ND	ND	ND
EPA METHOD 200.7	Boron (B)	0.75	mg/L	ND	ND	ND
EPA METHOD 200.7	Cadmium (Cd)	0.05/0.01	mg/L	ND	ND	ND
EPA METHOD 200.7	Chromium (Cr)	0.1/0.05	mg/L	ND	ND	ND
SM 3500 Cr C-2011	Chromium (Cr) VI	--	mg/L	ND	ND	ND
EPA METHOD 200.7	Cobalt (Co)	0.05	mg/L	ND	ND	ND
EPA 200.8	Copper (Cu)	1	mg/L	0.0035	0.002	0.00275
EPA 200.8	Lead (Pb)	0.05	mg/L	ND	ND	ND
EPA METHOD 200.7	Manganese (Mn)	0.05/0.20	mg/L	0.016	0.017	0.0165
EPA METHOD 245.1	Mercury (Hg)	--	mg/L	ND	ND	ND
EPA 200.8	Selenium (Se)	0.05	mg/L	ND	ND	ND
EPA METHOD 200.7	Vanadium (V)	--	mg/L	ND	ND	ND
EPA METHOD 200.8	Nickel (Ni)	--	mg/L	ND	ND	ND
EPA METHOD 200.9	Silver (Ag)	0.1/0.05	mg/L	ND	ND	ND
EPA METHOD 200.10	Zinc (Zn)	5/10	mg/L	0.04	0.021	0.0305
Metals, Total						
EPA METHOD 200.7	Aluminum (Al)	--	mg/L	2	6.9	4.45
EPA METHOD 335.4	Cyanide (CN)	0.2	mg/L	ND	ND	ND
EPA METHOD 245.1	Mercury (Hg)	0.002	mg/L	ND	ND	ND
EPA METHOD 200.7	Molybdenum (Mb)	--	mg/L	ND	ND	ND
EPA 200.8	Selenium (Se)	--	mg/L	ND	ND	ND

Notes:

EPA MCL/NMED MAC= US EPA Maximum Contaminant Level or NMED Maximum Allowable Concentration

Bold= Concentration exceeds EPA (MCL) or NMED MAC

ND= Concentration below detection reporting limit

Average calculation included concentration at or above detection reporting limit

Table F. Summary of Analytical Results for Water Samples Collected at Various Water Quality Monitoring Sites

Method	Constituents	EPA MCLs/ NMED MACs	Units	Sites				
Water Properties				CW1	CW2	DP1	DP2	REF
SM4500-H+B / 9040C	pH	6-9	s.u.	7.69	7.36	7.79	7.69	7.47
SM2510B	Specific Conductance	--	µmhos/c	99.25	65.00	520.00	790.00	72.00
SM2340B	Hardness (as CaCO ₃)	--	mg/L	161.00	30.25	394.67	248.25	37.00
SM2540C MOD	Total Dissolved Solids (TDS)	500/1000	mg/L	283.00	61.00	986.67	775.00	90.00
SM 2540D	Total Suspended Solids (TSS)	--	mg/L	283.75	40.67	2526.67	855.00	73.00
SM 5310B	Total Organic Carbon (TOC)	--	mg/L	7.07	4.08	14.33	21.25	6.40
Alkalinity								
SM2320B	Bicarbonate (as CaCO ₃)	--	mg/L	72.64	24.50	74.91	77.99	24.40
SM2320B	Carbonate (as CaCO ₃)	--	mg/L	ND	ND	ND	ND	ND
SM2320B	Total Alkalinity (as CaCO ₃)	--	mg/L	72.64	24.50	74.91	77.99	24.40
Anions								
EPA METHOD 300.0	Nitrogen, Nitrite (as N)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 300.0	Nitrogen, Nitrate (as N)	10	mg/L	1.65	0.54	2.07	2.65	0.98
Chlorine								
HACH 8167	Total Chlorine	--	mg/L	ND	ND	ND	ND	ND
Metals, Dissolved								
EPA METHOD 200.7	Aluminum (Al)	0.05-0.2/5	mg/L	11.19	0.032	5.67	4.92	0.10
EPA 200.8	Arsenic (As)	0.01/0.1	mg/L	ND	ND	0.003	0.002	ND
EPA METHOD 200.7	Boron (B)	0.75	mg/L	ND	ND	0.07	0.09	ND
EPA METHOD 200.7	Cadmium (Cd)	0.05/0.01	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.7	Chromium (Cr)	0.1/0.05	mg/L	ND	ND	ND	0.013	ND
SM 3500 Cr C-2011	Chromium (Cr) VI	--	mg/L	ND	ND	0.001	0.004	ND
EPA METHOD 200.7	Cobalt (Co)	0.05	mg/L	ND	ND	ND	ND	ND
EPA 200.8	Copper (Cu)	1	mg/L	0.006	0.042	0.032	0.029	0.003
EPA 200.8	Lead (Pb)	0.05	mg/L	0.004	ND	0.030	0.012	ND
EPA METHOD 200.7	Manganese (Mn)	0.05/0.20	mg/L	0.02	0.00903	0.15	0.09	0.02
EPA METHOD 245.1	Mercury (Hg)	--	mg/L	0.00	0.00021	ND	ND	ND
EPA 200.8	Selenium (Se)	0.05	mg/L	ND	0.004	ND	ND	ND
EPA METHOD 200.7	Vanadium (V)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.8	Nickel (Ni)	--	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.9	Silver (Ag)	0.1/0.05	mg/L	ND	ND	ND	ND	ND
EPA METHOD 200.10	Zinc (Zn)	5/10	mg/L	0.04	0.024	0.09	0.06	0.03
Metals, Total								
EPA METHOD 200.7	Aluminum (Al)	--	mg/L	15.74	1.35	75.00	31.78	4.45
EPA METHOD 335.4	Cyanide (CN)	0.2	mg/L	ND	ND	ND	ND	ND
EPA METHOD 245.1	Mercury (Hg)	0.002	mg/L	0.0002	0.0002	ND	ND	ND
EPA METHOD 200.7	Molybdenum (Mb)	--	mg/L	ND	0.02	ND	ND	ND
EPA 200.8	Selenium (Se)	--	mg/L	0.003	0.002	0.007	0.005	ND

Notes:

EPA MCL/NMED MAC= US EPA Maximum Contaminant Level or NMED Maximum Allowable Concentration

Bold= Concentration exceeds EPA (MCL) or NMED MAC

ND= Concentration below detection reporting limit

Average calculation included concentration at or above detection reporting limit