Based on our investigations, we estimate that approximately seven percent of the mineable aggregate, approximately 133,000 cubic yards, will be lost in wash fines during gravel processing. This reduces the sellable volume from 1,900,000 cubic yards to approximately 1,767,000 cubic yards (2,740,000 tons). Approximately 50,400 cubic yards can be disposed of in the 2.8 acre pond located in the northwest corner of the site to create a new wetlands area. The remaining 82,600 cubic yards will need to be disposed of in the new reservoirs which will reduce the overall storage capacity of the project by approximately 50 acre-feet. This lost capacity has already been included in the overall storage capacity of 1650 acre-feet for the project.

## *6.0 TREATMENT ALTERNATIVES*

## *7.0 OPERATIONAL EVALUATION*

## *8.0 WATER QUALITY TESTING*

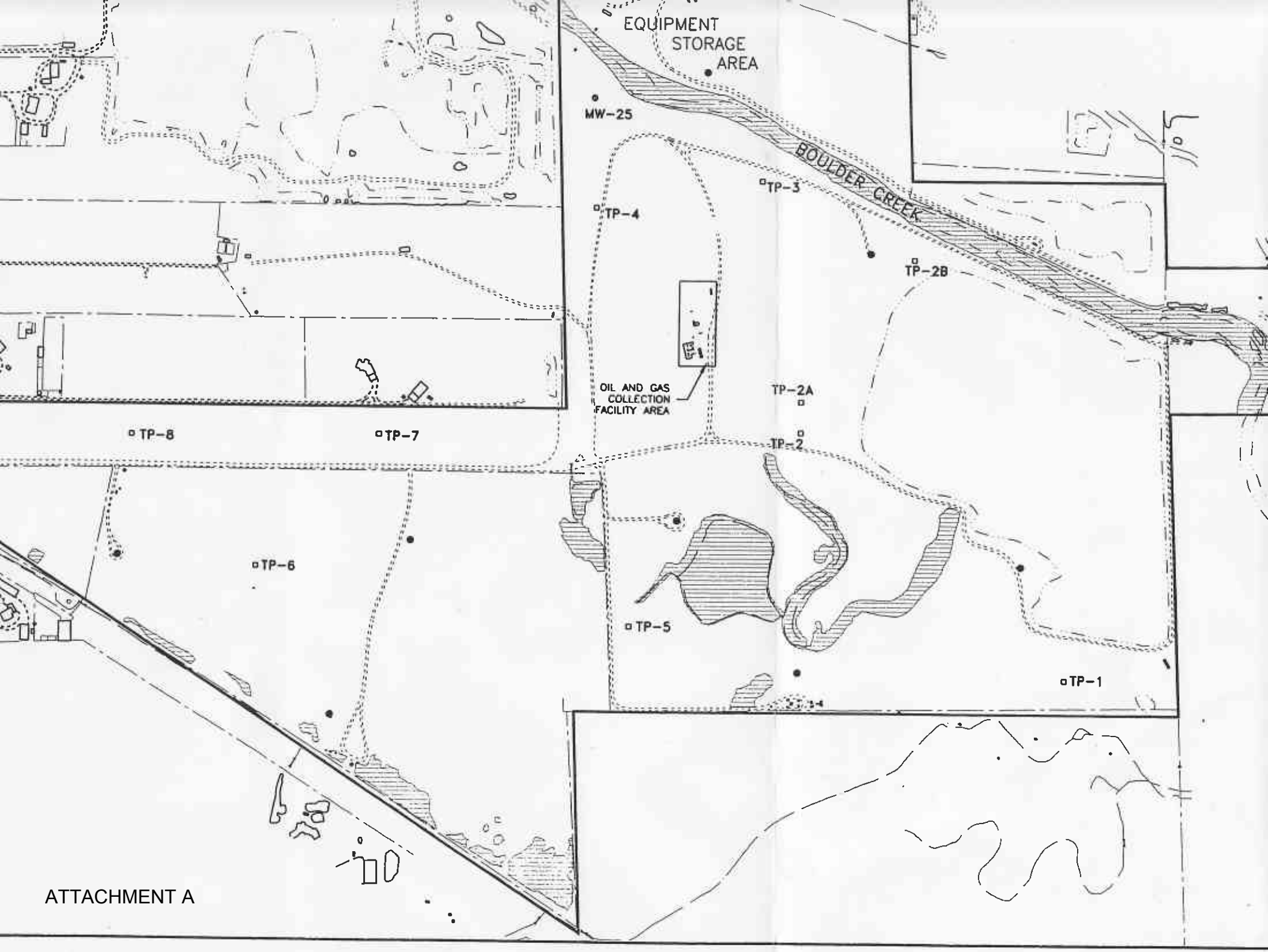
One groundwater monitoring well (MW-25) was installed during the geotechnical investigations for the purpose of collecting water quality samples. The test hole was drilled to a depth of 18.0 feet using 3.25-inch I.D. hollow stem auger which created a hole diameter of approximately six inches. To complete the well, two-inch I.D. Schedule 40 PVC pipe was set to the full depth of the test hole. The well was screened throughout the bottom ten feet of the test hole using #20 screen (0.020 inch slot size). The screened interval extended through the lower portion of the sand and gravel unit and slightly into the weathered, clayey sandstone bedrock (Figure 7). Clean silica sand was used to backfill the annulus to two feet above the top of the screened interval. Above the sand, ⅜-inch bentonite pellets were used to backfill to surface. A flush mount assembly was used to protect the top of the monitoring well at the ground surface.

MW-25 was purged of one full well volume on December 21, 1999, which resulted in removing all water from the well. No sampling took place after this initial purge. The well was purged again and sampled on January 31, 2000 with disposable equipment. A combination of raw, filtered, preserved, and non-preserved samples were collected for laboratory analysis. All filtering was performed in the field with a disposable 0.45 micron filter and all sample bottles were supplied pre-preserved by the laboratory. The samples were packed on ice and transferred under chain-of-custody control to the laboratory within 24 hours of the sample collection time. The samples were analyzed for primary and secondary drinking water standards as well as for gross alpha and beta values and total organic carbon.

In general, most of the metals concentrations exceeded the primary and secondary drinking water standards. This is likely due to the presence of high amounts of suspended solids in the sample water. The amount of metals dissolved in the groundwater is likely much lower than the analysis indicates. The concentrations of chloride, fluoride, nitrate and sulfate were all below the primary and secondary

standards. The water is non-corrosive and possesses a moderate amount of dissolved carbon. Finally, the gross alpha level exceeds the drinking water standards while the gross beta level appears to be below the standard for man-made compounds in drinking water. The complete results of the analysis and an interpretation of these results are presented in Appendix F.

## *9.0 COST ANALYSIS*




ATTACHMENT A

# APPENDIX F

## GROUNDWATER ANALYSIS RESULTS

ACZ

# Analytical Results

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

Lab Sample ID: *L26287-01*
Client Sample ID: *MW-25*
Client Project ID: *19-0885.043.00*
ACZ Report ID: *RG114159*

Rocky Mountain Consultants, Inc.
825 Delaware Ave. Suite 500
Longmont, CO 80501
Brad Gardner

Date Sampled: *01/31/2000 4:20:00 PM*
Date Received: *02/01/2000*
Date Reported: *04/06/2000*

Sample Matrix: *Ground Water*

## Metals Analysis

| Parameter | EPA Method | Result | Qual | Units | MDL | PQL | Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| Aluminum, total | M200.7 ICP | 759 | | mg/L | 0.3 | 2 | 2/4/2000 | kr |
| Antimony, total | M200.8 ICP-MS | 0.02 | B | mg/L | 0.01 | 0.05 | 4/3/2000 | lcj |
| Arsenic, total | M200.8 ICP-MS | 0.19 | | mg/L | 0.01 | 0.05 | 3/29/2000 | lcj |
| Barium, total | M200.7 ICP | 7.54 | | mg/L | 0.03 | 0.1 | 2/4/2000 | kr |
| Beryllium, total | M200.8 ICP-MS | 0.07 | | mg/L | 0.01 | 0.05 | 4/3/2000 | lcj |
| Cadmium, total | M200.7 ICP | | U | mg/L | 0.03 | 0.2 | 2/4/2000 | kr |
| Calcium, total | M200.7 ICP | 1170 | | mg/L | 2 | 10 | 2/4/2000 | kr |
| Chromium, total | M200.7 ICP | 1.2 | | mg/L | 0.1 | 0.5 | 2/4/2000 | kr |
| Copper, total | M200.7 ICP | 1.2 | | mg/L | 0.1 | 0.5 | 2/4/2000 | kr |
| Iron, total | M200.7 ICP | 1190 | | mg/L | 0.1 | 0.5 | 2/4/2000 | kr |
| Lead, total | M200.8 ICP-MS | 1.100 | | mg/L | 0.002 | 0.01 | 3/29/2000 | lcj |
| Manganese, total | M200.7 ICP | 43.10 | | mg/L | 0.05 | 0.3 | 2/4/2000 | kr |
| Mercury, total | M245.1 CVAA | 0.0005 | B | mg/L | 0.0002 | 0.001 | 2/3/2000 | sjs |
| Nickel, total | M200.7 ICP | 0.9 | | mg/L | 0.1 | 0.5 | 2/4/2000 | kr |
| Selenium, total | M270.2 GFAA | | U | mg/L | 0.002 | 0.01 | 2/10/2000 | jl |
| Silver, total | M200.7 ICP | | U | mg/L | 0.05 | 0.3 | 2/4/2000 | kr |
| Thallium, total | M200.8 ICP-MS | 0.015 | | mg/L | 0.001 | 0.005 | 3/29/2000 | lcj |
| Zinc, total | M200.7 ICP | 3.6 | | mg/L | 0.1 | 0.5 | 2/4/2000 | kr |

## Metals Prep

| Parameter | EPA Method | Result | Qual | Units | MDL | PQL | Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| Total Digestion | M200.2 GFAA | | | | | | 2/8/2000 | hl |
| Total Digestion | M200.2 ICPMS | | | | | | 2/17/2000 | laa |
| Total Hot Plate Digestion | M200.2 ICP | | | | | | 2/3/2000 | hl |

## Wet Chemistry

| Parameter | EPA Method | Result | Qual | Units | MDL | PQL | Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3 | M2320B | | | | | | | |
| Bicarbonate as CaCO3 | | 313 | | mg/L | 2 | 10 | 2/2/2000 | mh |
| Carbonate as CaCO3 | | | U | mg/L | 2 | 10 | 2/2/2000 | mh |
| Hydroxide as CaCO3 | | | U | mg/L | 2 | 10 | 2/2/2000 | mh |
| Total Alkalinity | | 313 | | mg/L | 2 | 10 | 2/2/2000 | mh |
| Carbon, dissolved organic (DOC) | M415.1 - Combustion | 10 | | mg/L | 1 | 5 | 2/3/2000 | mh |
| Chloride | M325.2 - Colorimetric (RFA) | 60 | | mg/L | 1 | 5 | 2/8/2000 | lms |
| Coliforms, total | SM9222B - Membrane Filter | See note | | | | | | N/A |
| Color | M110.1 - Colorimetric | >100 | | Co/Pt | 5 | 5 | 2/1/2000 | jas |
| Corrosivity (calc.) | SM 2330 - CaCO3 SI | 2.2 | | SI unit | 0.01 | | 3/27/2000 | calc |
| Fluoride | M340.2 - ISE | 1.4 | | mg/L | 0.1 | 0.5 | 2/3/2000 | jas |

**Inorganic Qualifiers (based on EPA CLP 3/90)**

U = Analyte was analyzed for but not detected at the indicated MDL

B = Analyte concentration detected at a value between MDL and PQL

PQL = Practical Quantitation Limit

Vice President of Operations: Ralph Poulsen

ATTACHMENT A

ACZ

**Analytical Results**

*ACZ Laboratories, Inc.*
*2773 Downhill Drive*
*Steamboat Springs, CO 80487*
*(800) 334-5493*

Lab Sample ID: *L26287-01*
Client Sample ID: *MW-25*
Client Project ID: *19-0885.043.00*
ACZ Report ID: *RG114159*

Rocky Mountain Consultants, Inc.
825 Delaware Ave. Suite 500
Longmont, CO 80501
Brad Gardner

Date Sampled: *01/31/2000 4:20:00 PM*
Date Received: *02/01/2000*
Date Reported: *04/06/2000*

Sample Matrix: *Ground Water*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Nitrate as N, dissolved | Calculation: NO3NO2 minus NO2 | 0.07 | B | mg/L | 0.02 | 0.1 | 4/6/2000 | calc |
| Nitrate/Nitrite as N, dissolved | M353.2 - Automated Cadmium Reduction | 0.07 | B | mg/L | 0.02 | 0.1 | 2/1/2000 | ejs |
| Nitrite as N, dissolved | M353.2 - Automated Cadmium Reduction | | U | mg/L | 0.01 | 0.05 | 2/1/2000 | ejs |
| Odor | M140.1 - Threshold Odor | 4 | | TON | 1 | 1 | 2/1/2000 | jas |
| pH (lab) | M150.1 - Electrometric | 8.1 | | units | 0.1 | 0.1 | 2/2/2000 | mh |
| Residue, Filterable (TDS) @180C | M160.1 - Gravimetric | 690 | | mg/L | 10 | 20 | 2/1/2000 | jas |
| Sulfate | M375.3 - Gravimetric | 240 | | mg/L | 10 | 20 | 2/1/2000 | js/kc |
| Surfactants as MBAS | M425.1 - Colorimetric | 1060 | | mg/L | 3 | 20 | 2/2/2000 | mh |
| Turbidity | M180.1 - Nephelometric | 62000 | | NTU | 200 | 1000 | 2/1/2000 | jas |

**Note: The Corrosivity value was calculated using 20 degrees C. The Total Antimony value is estimated due to low recovery (79%) of lab control sample. There was too much sediment in the sample to make an accurate coliform reading.**

**Inorganic Qualifiers (based on EPA CLP 3/90)**

U = Analyte was analyzed for but not detected at the indicated MDL

B = Analyte concentration detected at a value between MDL and PQL

PQL = Practical Quantitation Limit

RWP

Vice President of Operations: Ralph Poulsen

ATTACHMENT A

# Radiochemistry Results

ACZ

*ACZ Laboratories, Inc.*
*2773 Downhill Drive*
*Steamboat Springs, CO 80487*
*(800) 334-5493*

ACZ Project ID: *L26287*
Client Project ID: *19-0885.043.00*
ACZ Report ID: *RG112672*

Rocky Mountain Consultants, Inc.
825 Delaware Ave. Suite 500
Longmont, CO 80501
Brad Gardner

Date Sampled: *1/31/00*
Date Received: *2/1/00*
Date Reported: *2/23/00*

| | | | | | | | | Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACZ ID | Client ID | Matrix | Parameter | Result | Error(+/-) | MDA | Units | Method | Date | Analyst | Method | Date | Analyst |
| L26287-01 | MW-25 | Ground Water | Gross Alpha | 23 | 12 | 8.5 | pCi/L | Method | 2/17/00 | hl | M900.0 | 2/18/00 | cbr |
| | | | Gross Beta | 35 | 10 | 12 | pCi/L | Method | 2/17/00 | hl | M900.0 | 2/18/00 | cbr |

## Radiochemistry Notes

MDA: Calculated sample specific Minimum Detectable Activity

Error(+/-): Calculated sample specific uncertainty

Solid matrices reported on a dry weight basis

Preparation Method: "Method" indicates preparation defined in analytical method

Method Prefix Reference:

M = EPA SM = Standard Methods D = ASTM RP = DOE ESM = DOE/ESM

Radiochemistry Supervisor: Craig B. Russell