VOLUNTARY REMEDIATION WORK PLAN

FOR

TRENCH CAMP MINE PROPERTY

(January Mine, Norton Mine and Trench Camp Mine Claims, in Harshaw Mining District)

Flux Canyon Road and Harshaw Road
South of Patagonia
Santa Cruz County, Arizona

Volume 1 of 2

ADEQ VRP SITE CODE #505143-02

Prepared for:
ARIZONA MINERALS, INC
3845 N. BUSINESS CENTER DRIVE, SUITE 115
TUCSON, AZ 85705
(520) 485-1300

Prepared By:
CPE CONSULTANTS, LLC
3895 N. BUSINESS CENTER DRIVE, SUITE 115
TUCSON, ARIZONA 85705
(520) 545-7001

AND

SOVEREIGN CONSULTING, INC.
12687 W. CEDAR DRIVE, # 305
LAKEWOOD, COLORADO 80228
(702) 524-4908

October 19, 2016
CPE Job No. 346.VRPWP

ARIZONA

October 19, 2016

Mr. John Patricki
Project Manager
Voluntary Remediation Program
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: Voluntary Site Remediation Work Plan for
Trench Camp Property (January Mine, Norton Mine and Trench Camp Mine Claims)
ADEQ-VRP Site Code #505143-02

Dear Mr. Patricki:

Enclosed please find two copies of the above work plan, as well as a CD with a digital copy of the document.

We have prepared our work plan, in conformance with the guidance provided by ADEQ. We have included an annotated copy of the ADEQ VRP Work Plan Checklist, identifying the sections in our work plan that address those items that require a specific response, in accordance with the applicable Arizona statutes referenced in the checklist.

If you have any questions or need any additional information, please do not hesitate to contact me at (520) 485-1300 or jpappas@arizonamining.com regarding the revised submittal.

Sincerely,

Arizona Minerals, Inc.

Johnny Pappas
Director of Environmental and Permitting

cc: Raul F. Piña. CPE Consultants

3845 North Business Centre Drive, Suite 115 | Tucson, AZ 85705
Tel: (520) 485-1300 | Web: www.arizonamining.com

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Arizona Minerals
Voluntary Remediation Program
Application

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director

RECEIVED
MAR 22 2016
CPE CONSULTANTS, LLC

AZ1032
Log #

Via U.S. Mail

March 16, 2016
VRP 16-183

Mr. Raul Piña
CPE Consultants, LLC
3895 N. Business Center Drive, STE 115
Tucson, AZ 85705

RE: Approval of Amended VRP Application
ASARCO January Adit (Norton Mine)
Harshaw, Arizona
Site Code: 505143-02

Dear Mr. Piña:

The Arizona Department of Environmental Quality Voluntary Remediation Program (VRP) has reviewed the Amended VRP Application (the Amendment) dated February 22, 2016 and received by ADEQ on February 23, 2016. The Amendment was submitted by Arizona Minerals Inc. to include the property associated with acquisition of the ASARCO Trench Camp property.

The VRP approves the Amendment.

If you have any questions please contact me by phone at (602) 771-4397 or by e-mail at jp10@azdeq.gov.

Sincerely,

John Patricki, Project Manager
Voluntary Remediation Program

cc: Johnny Pappas, Arizona Minerals Inc

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
VOLUNTARY REMEDIATION PROGRAM APPLICATION

PART I VOLUNTARY REMEDIATION PROGRAM (VRP) INFORMATION AND APPLICATION OVERVIEW

VRP Overview

The State of Arizona enacted Senate Bill 1454, which created a new Voluntary Remediation Program (VRP), to be implemented by the Arizona Department of Environmental Quality (ADEQ). The new VRP statutes went into effect on July 18, 2000. In accordance with the new statutes, ADEQ submitted a Notice of Exempt Rulemaking with the Secretary of State on January 19, 2000. This action finalized the adoption of the VRP interim fee rules. These interim fee rules went into effect on February 9, 2001 and can be found in the Arizona Administrative Code (A.A.C), Title 18, Chapter 7, Article 5.

Fees

The interim fee rules:

- establish a $2,000 non-refundable application fee (note that upon acceptance into the VRP, the fee will be credited against total reimbursable costs);
- establish an hourly VRP oversight rate of $110 per hour;
- provide for an initial deposit of $4,000 to be submitted with the applicant's work plan or request for No Further Action (NFA) or Conditional NFA;
- request additional deposits of $4,000, if an account drops below $1,000;
- provide small businesses with the opportunity to pay the application fee in installments under an agreement with the department;
- provide for quarterly billing statements.

The above is represented as a summary of the main elements of the interim fee rule. Contact the Secretary of State at (602) 542-4086, or the VRP at (602) 771-4398, or toll free in Arizona at 800-234-5677 Ext. 4398 to obtain complete copies of the rule. Additional information can also be found on the ADEQ website, www.adeq.state.az.us.

Application Overview

The application is subdivided into five parts: **PART I**, VRP Information and Application Overview; **PART II**, VRP Eligibility; **PART III**, Applicant, Site and Remedial Action Information; **PART IV**, Voluntary Remediation Agreement; and, **PART V**, Correctness of Information and Terms and Conditions Agreement Statement.

Application Fee and Process

After completing PARTS II - V of the application, the applicant shall include with the application a **non-refundable application fee of $2,000,** pursuant to A.R.S. § 49-179 (A) and A.A.C. R18-7-502(A). The fee should be in the form of a company check, cashier's check, certified check, or money order **made payable to ADEQ.** Small businesses as defined in A.R.S. § 41-1001(19), may have their application approved upon receipt of a partial payment of the application fee, in an amount approved by ADEQ and an agreement to pay the remainder of the fee in scheduled installments.

Please return the completed application and the $2,000 non-refundable fee to the:

Arizona Department of Environmental Quality
Voluntary Remediation Program, Fourth Floor
1110 W. Washington Street, MC 4415B-2
Phoenix, AZ 85007

After receipt of the application, the VRP will promptly review the application and approve, deny, or request modifications in order to determine the applicant's eligibility to participate in the VRP. An application shall be deemed complete unless the department, within sixty days of receipt, notifies the applicant that the application is incomplete or has been denied.

PART II: VRP ELIGIBILITY

Section I: Verification of VRP Eligibility

A. VRP Eligibility

Please verify that your remedial activities are eligible for the VRP by answering "yes" or "no" to the below listed eligibility requirements specified in A.R.S. § 49-172(B). **If you circle "yes" to any of the remedial activities listed in the box below, contact the VRP for assistance at (602) 771-4398 or toll free in Arizona at (800) 234-5677 ext. 4398.**

Are remedial actions required by the terms of any of the following :		
1) a written agreement between the applicant and the Director entered into before the date of the application;	Yes	No
2) a judicial judgment or decree;	Yes	No
3) an administrative order issued before the date of the application;	Yes	No
Are remedial actions: sought to be required in the complaint in a judicial action filed and served by the state before the date of the application;	Yes	No
Are remedial activities subject to:		
1) corrective action at or closure of a facility, that has qualified for interim status or to which a permit has been issued pursuant to A.R.S. § 49-922;	Yes	No
2) listing on the WQARF Registry [see A.R.S § 49-287.01(D)] or location in a WQARF boundary area with the same contaminant(s) of concern. Specifically remedial actions at a site or portion of a site listed on the registry maintained pursuant to § 49-287.01, subsection D that address a contaminant of concern at that site, except that the department may accept an application under this article for remediation of a site or a portion of a site for which a preliminary investigation has been commenced or completed pursuant to § 49-287.01 but that has not been listed on the registry maintained pursuant to § 49-287.01, subsection D;	Yes	No
3) a corrective action pursuant to A.R.S. § 49-1005, unless the person waives any right to reimbursement from the State Assurance Fund. Answer "no" to this question if the applicant and property owner agree not to seek reimbursement from the State Assurance Fund for LUST corrective actions, or no USTs are found on site. **In all cases, if the applicant answers "no" to this question, the "Waiver of State Assurance Fund Reimbursement" must be completed.**	Yes	No

If you have answered "no" to all of the above items, your site may be eligible for participation in the VRP. If you have any questions regarding eligibility requirements or application elements, please contact the VRP prior to submittal. **(Please note that the application fee is non-refundable)**

B. Waiver of State Assurance Fund Reimbursement (signatures are <u>mandatory</u> for VRP acceptance)

The applicant and property owner (if different from the applicant) shall not seek or request reimbursement from the ADEQ/State Assurance Fund for LUST corrective actions performed or approved under the Voluntary Remediation Program.

By: _____ Name: Johnny Pappas Date: 2/19/16
(Applicant's Signature) *(Print or type)*

The property owner must sign, if different from the applicant.

By: _____ Name: Gregory F. Lucero Date: 2/19/16
(Owner's Signature) *(Print or type)*

PART III: APPLICANT RELATED, SITE AND REMEDIAL ACTION INFORMATION

Section I: Applicant Related Information

A. Applicant

Name Johnny Pappas

Company Arizona Minerals Inc. (AMI)

Address 3845 N. Business Center Drive, Suite 115

City Tucson State AZ Zip Code 85705

Phone (803) 235-5563 Fax ( ) n/a E-mail jpappas@arizonamining.com

Nature of the Relationship to the Site Owner's Representative

Type of Business: (Please circle **ALL** that apply to your business)

N - Native American Owned Entity O - Operator on Native American Property F - Federal Government
S - State Government C - County Government P - Partnership (R)- Corporation M - Municipality
Other_____

B. Applicant's Authorized Agent (if any)

Name Raul F. Piña, P.E. Relationship to Applicant Engineering Consultant

Company CPE Consultants, LLC

Address 3895 N. Business Center Drive, Suite 115 City Tucson State AZ

Zip Code 85705 Phone (520) 545-7001 Fax (520) 545-7003 E-mail raul.pina@cpeconsultants.com

Describe Agent's Authority Civil engineering firm retained to develop work plan to remediate site.

C. Property Owner

Name Gregory F. Lucero Title Vice President

Company Arizona Minerals Inc.

Address 3845 N. Business Center Drive, Suite 115 City Tucson State AZ

Zip Code 85705 Phone (520) 485-1300 Fax ( ) n/a E-mail glucero@arizonamining.com

D. Billing Information

Name _____

Company _____

Address _____ City _____ State _____

Zip Code _____ Phone ( ) _____ Fax ( ) _____ E-mail _____

Section II: Site Information

A. Description of the Location and Boundaries of the Site or Portion of the Site, that is Subject to the Remediation

Site Name January Mine, Norton Mine, and Trench Camp Mine Claims

Address Hawshaw Mining District, Santa Cruz County, Arizona

City Harshaw County Santa Cruz Zip Code _____

Approximate Center of the Property:

Latitude 31 ° 28.32 ′ N Longitude 110 ° 45.82 ′ W •••

Site Size (acres or sq. feet) 299.3 Parcel Number 105-50-001B and 105-50-001A

Township 23S Range 16E

Section 32 of the ____ ¼ of the ____ ¼ of the ____ ¼

Legal description of the Property (attach a map showing the site): January Patented Mine Claim Mineral Survey (MS) #745 in Section 32, T22S, R16E, G&SRM; Norton Patented Mine Claim Mineral Survey (MS) #929 and Trench Camp Mine Patented Mine Claim Mineral Survey (MS) #4222, in Section 5, T23S, R16E, G&SRM. All three claims are in the Harshaw Mining District, Santa Cruz County, Arizona.

B. Investigation Information

To the best of your knowledge, is the property (or any activity conducted on the property) **currently** the subject of an administrative, civil, or criminal investigation related to protection of the environment? Yes/No **[circle one]**
If yes, please describe: _____

To the best of your knowledge, has the property (or any activity conducted on the property) **ever been** the subject of an administrative, civil or criminal investigation related to protection of the environment? Yes/No **[circle one]**
If yes, please describe (including the approximate date of the investigation and any known outcome of the investigation): _____

Section III: Site Characterization

A. Description

Provide a general description of the results of the site characterization activities performed at the site or portion of the site (attach additional sheets if necessary): (see attached)

Section IV: Remedial Actions

A. Remediation

Indicate if the remediation is: X Proposed _____ In progress _____ Completed

Provide a general description of the work to be performed or already performed. (attach additional sheets if necessary): (see attached)

B. Please Check ALL Your Remedial Objectives While Participating in the VRP:

SOIL

____ Residential Soil Remediation Levels
____ Non-residential Soil Remediation Levels
____ Property specific risk-based residential levels
____ Property specific risk-based non-residential levels
____ Background levels
____ Intended cleanup level not known at this time

List contaminants_____

WATER

____ Aquifer water quality standards
____ Surface water quality standards
X Intended cleanup level not known at this time

List contaminants TMDL exceedances of camium (Cd), copper (Cu), zinc (Zn) and acidity (pH).

RISK ASSESSMENT

Please Describe (see attached)

OTHER COMMENTS

_____

_____

_____

C. Please Check ALL the Approval(s) that you will Seek While Participating in the VRP:

x Site Characterization Work Plan Approval, pursuant to A.R.S. § 49-177

x Remediation Work Plan Approval, pursuant to A.R.S. § 49-177

___ No Further Action (NFA) Determination, pursuant to A.R.S. § 49-181

x Conditional NFA Determination, pursuant to A.R.S. § 49-181(D), includes all sites closed through the use of engineering controls (DEUR sites with engineering controls, only)

Section V: Actions to be Suspended

A. Suspended Actions

If applicable, a list of actions that the applicant proposes to be suspended by the approval (examples include, but are not limited to, WQARF preliminary investigations commenced or completed on the site, or deadlines under Notices of Violation).

Suspension of ADEQ NOV #153932. dated 10 October 2014

PART IV: VOLUNTARY REMEDIATION AGREEMENT

Section I: Voluntary Remediation Agreement - Access

A. Access Agreement

The undersigned Owner(s) is/are the sole Owner(s) of the Property, and hereby grant(s) permission to ADEQ and its authorized agents and contractors to enter upon the Property at reasonable times to verify that the work is being performed in accordance with the work plan, approved pursuant to A.R.S § 49-177, or has been performed in accordance with the report submitted pursuant to A.R.S § 49-181. ADEQ's review may include field inspection and reasonable sampling. If the applicant is different from the Owner, the applicant must secure the Owner's signature on this document, granting right of entry. At ADEQ's request, the Owner, or his authorized agent, shall unlock any entry gate or door to the property and/or remove any lock on any well(s). This access agreement terminates upon receipt by ADEQ of written withdrawal notification from the applicant, issuance by ADEQ of a NFA determination, or by ADEQ notifying the Owner that they are being terminated from the program (A.R.S § 49-178).

By: _____ Name: Gregory F. Lucero

(Property Owner Signature) *(Print or type)*

Date: 2/19/14

STATE OF Arizona)
) ss.
County of Pima)

This application was subscribed and sworn to before me this 19th day of February by

Gregory F. Lucero, Owner of Property.

My commission expires: 11-1-2016

PAMELIA KAY LOPEZ
Notary Public - Arizona
Pima County
My Commission Expires
11/1/2016

_____
(Notary Public)

Section II: Voluntary Remediation Agreement - Costs/Fees, Tasks, & Meetings

A. Reimbursement of ADEQ Costs

The applicant agrees to reimburse ADEQ for all reasonable and necessary costs of actions taken by ADEQ, pursuant to A.R.S §§ 49-173 through 49-182, and 49-185. Reimbursable costs include time spent by the ADEQ employees and the costs of goods and services contracted by ADEQ to carry out the activities described in the VRP authorities listed above (A.A.C. R18-7-504). The interim hourly reimbursement rate for ADEQ staff is $110 per hour (A.A.C. R18-7-505). The applicant is responsible for costs associated with the services of any contractor retained by ADEQ. The applicant agrees to pay all costs incurred in collecting any amounts due under this agreement, including ADEQ's attorneys' fees, and other goods and services. If an application is withdrawn or terminated from the VRP, the applicant shall reimburse ADEQ for all costs incurred prior to the withdrawal or termination (A.A.C. R18-7-507).

B. Advance Deposits

The applicant agrees to provide an initial deposit of $4,000 to ADEQ [A.A.C. 18-7 503(A)], to be submitted with the applicant's work plan or request for NFA or Conditional NFA, and before the applicant's work plan (A.R.S § 49-175) or NFA/CNFA report (A.R.S § 49-181) will be reviewed by the VRP. The deposit must be in the form of a company check, cashier's check, certified check, or money order made payable to ADEQ. A site-specific deposit account will be established for the site and ADEQ will charge all incurred reimbursable costs attributable to the applicant's site against the account. If the applicant's account falls below $1,000, additional deposits of $4,000 will be requested of the applicant. All deposits are due within 30-days of the request date. If any requested deposit is not received within 60-days of request, the applicant's site may be terminated from participation in the VRP. For more information see A.A.C. R18-7-503.

C. Work Plan Schedule

The applicant agrees to carry out the tasks described in the work plan pursuant to A.R.S § 49-175 in accordance with the schedule provided in the work plan, or to submit a report pursuant to A.R.S § 49-181.

D. Meeting and Conferring with ADEQ

The applicant agrees to meet and confer with the department regarding the progress of the tasks performed in accordance with the work plan, approved pursuant to A.R.S § 49-177, if applicable.

E. Notice of Referral

Please note that upon closure, withdrawal, or termination from the VRP, any environmental issues not resolved will be referred to the appropriate ADEQ program for further investigation and/or action

PART V: CORRECTNESS OF INFORMATION AND TERMS AND CONDITIONS AGREEMENT STATEMENT

I certify under penalty of law that this application and all attachments are, to the best of my knowledge and belief, true, and complete. I also agree to the terms and conditions as specified in PART IV, Section I and II - Voluntary Remediation Agreement. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment for knowing violations.

Applicant's Signature

By: _____ Name: Johnny Pappas Date: 2/19/16

(Applicant's Signature) *(Print or type)*

Part III. APPLICANT RELATED, SITE AND REMEDIAL ACTION INFORMATION

Section III: Site Characterization

A. Description

The January and Norton Mine Claims (Parcel 105-50-001B) abut the Trench Mine Claims (Parcel 105-50-001A) and collectively were known as the Trench Mine Camp. After its closure, it was conveyed from ASARCO, LLC, formerly known as the American Smelting and Refining Company (ASARCO) to the ASARCO Multi-State Environmental Custodial Trust (Trust) pursuant to a Settlement Agreement with EPA and several States including the State of Arizona. ASARCO attempted to record a Quit Claim Deed on May 6, 2010, to correct a mistake in the designated Township and at the same time attempted to convey the January/Norton Claims to the Trust. Through a May 6, 2011, Partial Rejection of Deed, the Trust rejected this conveyance and maintained that ASARCO retained ownership of the January/Norton Claims. The "disputed parcel", Parcel 105-50-001B, contains the January Adit, which has been identified by ADEQ as a point source of surface water discharge that exceeds water quality standards.

In order to address the January Adit mining influenced water (MIW) discharge, ASARCO implemented a plan that captured it and delivered it to a wetlands treatment system. Performance of the wetlands treatment has generally been poor, resulting in a history of exceedances to the surface water quality discharge standards specified by ADEQ in a previous Arizona Pollutant Discharge Elimination System (AZPDES) permit that was issued to the wetlands. ASARCO has allowed the AZPDES permit to lapse, leaving matters unresolved.

Seepage was also found in the unnamed wash in the Trench Camp Mine property, near the base of the covered tailing piles. This new discovery prompted ADEQ to issue a Notice of Violation to the Trust. In response, the Trust committed to the development and implementation of a SWPPP and for this purpose initiated the application for an AZPDES-MSGP from ADEQ.

More recently, Arizona Minerals, Inc., (AMI) negotiated the purchase of both parcels from ASARCO and the Trust, under the following provisions:

1. AMI must enter ADEQ's VRP program and develop an acceptable work plan to remediate the MIW discharge from the January Adit and the tailing pile seepage from the Trench Camp Mine.

2. AMI must post a bond with the State of Arizona to cover long-term operational and maintenance expenses associated with the approved work plan.

Section IV. Remedial Actions

A. Remediation Proposed

Upon acquisition of both parcels, AMI agreed to implement a remedial treatment that captures both mining influenced water (MIW) discharge from the January Adit and tailing pile seepage from the Trench Camp Mine. The two streams are to be treated, such that the resulting effluent released from the treatment facility is compatible with the current surface water quality discharge standards specified by ADEQ for the site. AMI has identified a remedial treatment for the MIW and tailing pile seepage and submitted a design report and preliminary treatment facility plans for ADEQ review and concurrence. After obtaining preliminary agreement from ADEQ, AMI introduced a compliance schedule (copy attached), which was also granted ADEQ agreement. AMI now proposes to conduct a pilot test for validation of the agreed remediation treatment process, in advance of its implementation.

B. Please check ALL Your Remedial Objectives While Participating in the VRP:

WATER
Intended cleanup level not known at this time.
TMDL exceedances of camium (Cd), copper (Cu), zinc (Zn) and acidity (pH).

RISK ASSESSMENT
AMI will review all available documents in the ADEQ archives that pertain to permits and inspections of the subject mining sites. AMI will develop a plan for monitoring the quality of stormwater runoff discharging from the subject site and implement it for periodic testing, following rainstorm precipitation on site, in accordance with current ADEQ SWPP regulations. AMI will also develop a process for remedial treatment of the January Adit's MIW discharge and the Trench Camp Mine tailings pile seepage that have been found on site, and implement it following validation of a pilot test that will be placed in operation in March of 2016.

Proposed Project Schedule
January Adit (Norton Mine)
dated December 30, 2015

Passive Treatment System and Wetlands Assessment
ASARCO January Adit (Norton Mine)
Environmental & Geotechnical Studies
December 30, 2015

Task	Task Description	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017
	Notice to Proceed - January 11, '16																			
1	Project Management - Duration																			
2	Treatment Implementation Plan - 2 wks																			
3	Pilot Test Design - 3 wks																			
4	Pilot Test Construction - 1 wk																			
5	Pilot Test Monitoring - 24 wks																			
6	Pilot Test Data Analysis Report - 2 wks																			
7	Existing Wetlands Sampling - 2 wks																			
8	Geotechnical Studies - 8 wks																			
9	Final Design Plans & Permitting - 24 wks																			
10	Review and Public Comment Period - 8 wks																			
11	Construction Passive Treatment System - 180 days																			
12	Passive Treatment System Operation Adjustments - 2 wks																			
13	Passive Treatment System in Operation																			

Voluntary Remediation Program

Work Plan Checklist

Voluntary Remediation Program Work Plan Checklist

Complete Shaded Areas and Submit with Work Plan

Site Name: January, Norton and Trench Camp Mine Claims VRP Site Code: 505143-02

Volunteer/Applicant Name: Johhny Pappas, Director E&P, Arizona Minerals, Inc.

Volunteer/Applicant Email Address and Phone: jpappas@arizonamining.com / (803) 235-5563

Authorized Agent (AA)/Consulting Company: Raul FG Piña, PE, CPE Consultants, LLC

AA/Consultant Email Address and Phone: raul.pina@cpeconsultants.com / (520) 545-7001

Reference	Summary of Statutory Requirement (please review all statutes in their entirety to ensure compliance)	Page(s) Where Addressed in Work Plan (write N/A if not applicable)	VRP Use Only
§49-175A.1	Summary of existing site characterization and assessment information; information regarding any remediation previously conducted; copies of referenced reports not previously submitted;	**Sec 4, pp 3 - 10**	☐
§49-175A.2	If the site has not been characterized, a plan to conduct site characterization and a schedule for completion.	**N/A**	☐
§49-175A.3.a	If site characterization is completed, a description of how the remediation will comply with §49-175B ("Work Plans") and how the completion of remediation will be verified. A schedule for completion must be included.	**Sec6.1, pp 11 & 12**	☐
§49-175A.3.b	If site characterization is completed, the work plan may provide for the remediation to be conducted in phases or tasks. A schedule for completion must be included.	**Appendix A**	☐
§49-175A.4	Schedule for submission of progress reports.	**To be determined (TBD) in permit issued**	☐
§49-175A.5	A proposal for community involvement as prescribed by §49-176 ("Community Involvement Requirements")	Appendix F	☐
§49-175A.6	If known, a list of institutional or engineering controls necessary during remediation and after completion of the proposed remediation to control exposure to contaminants.	**N/A**	☐
§49-175A.7	A proposal for monitoring during remediation and after the remediation if necessary to verify whether the approved remediation levels or controls have been attained and will be maintained.	**TBD in permit issued**	☐
§49-175A.8	A list of any permits or legal requirements known to apply to the work or already performed by the applicant.	**N/A**	☐
§49-175A.9	If requested by the department, information regarding the financial capability of the applicant to conduct the work identified in the application. *(IF APPLICABLE)*	**N/A**	☐

Voluntary Remediation Program Work Plan Checklist

Complete Shaded Areas and Submit with Work Plan

Site Name: January, Norton and Trench Camp Mine Claims VRP Site Code: 505143-02

Reference	Summary of Statutory Requirement (please review all statutes in their entirety to ensure compliance)	Page(s) Where Addressed in Work Plan (write N/A if not applicable)	VRP Use Only
§49-175B	Remediation levels or controls for remediation conducted pursuant to this article shall be established in accordance with rules adopted pursuant to §49-282.06 unless one or more of the following applies: see §49-175B.1 through §49-175B.4, below.	**N/A**	☐
§49-175B.1	The applicant demonstrates that remediation levels, institutional controls, or engineering controls for remediation of contaminated soil comply with §49-152 and the rules adopted.	**N/A**	☐
§49-175B.2	The applicant demonstrates that remediation levels, institutional controls, or engineering controls for remediation of landfills or other facilities that contain materials that are not subject to §49-152 (i.e.: asbestos) do not exceed a cumulative excess lifetime cancer risk between $1X10^{-4}$ to $1X10^{-6}$, and a hazard index of no greater than 1.	**N/A**	☐
§49-175B.3	The applicant demonstrates that on achieving remediation levels or controls for a source or potential source of contamination to a navigable water, the source of contamination will not cause or contribute to an exceedance of surface water quality standards, or if a permit is required pursuant to 33 United States Code §1342 for any discharge from the source, that any discharges from the source will comply with the permit.	**AMI will apply for AZPDES Permit and APP**	☐
§49-175B.4	The applicant demonstrates that, on achieving remediation levels or controls for a source of contamination to an aquifer, the source will not cause or contribute to an exceedance of aquifer water quality standards (AWQS) beyond the boundary of the facility where the source is located.	**In accordance with the AZPDES Permit and APP**	☐
§49-175C	The VRP may waive any work plan requirement under this section that it determines to be unnecessary to make any of the determinations required under §49-177. *If any waivers are requested in the Work Plan or have been previously requested and approved by the VRP, cite them in the Work Plan, including a citation of the statute for which the waiver applies.*	***N/A***	☐

Voluntary Remediation Program Work Plan Checklist

Complete Shaded Areas and Submit with Work Plan

Site Name: January, Norton and Trench Camp Mine Claims VRP Site Code: 505143-02

To support the prerequisites established by A.R.S. §49-177 and §49-180, the VRP expects certain documentation to accompany a Work Plan. The following provides a list of attachments/exhibits which are recommended for submittal with a Work Plan to provide the information required by the statutes.

Work Plan Information	Title of Figure/Table/Attachment/Exhibit Where Requested Information is Cited (write N/A if not applicable)	Figure/Table/ Attachment or Report Page Number (write N/A if not applicable)	VRP Use Only
Site Location Map *(topographic or aerial)*	Location Map	**Figure 1**	☐
Site Map *(to scale)*	Trench (January/Norton) Property Overview	**Figure 4**	☐
Historical Sampling Data Table	N/A	**NIA**	☐
Historical Sample Location Map (to scale)	N/A	**N/A**	☐
Proposed Sample Location Map (to scale)	To be determined (TBD)	**TBD**	☐
Sampling and Analysis Plan (includes Field Sampling Plan & Quality Assurance Plan)	TBD in permit issued	**TBD**	☐
Proposed Remediation System Location Map	60% Plan Cover Sheet	**G 0.01 in App E**	☐
Proposed Remediation System Layout (Design Drawings)	Grading & Drainage Overview (60% Plans)	**C 3.01 in App E**	☐
Schedule for Implementation of Project Activities* (Gantt Style Chart) *Project Activities are defined in A.R.S. §§49-175A.2 through 49-175A.4, and 49-176A.2 (Community Involvement).	Project Schedule	**Appendix A**	☐
Proposed Language for Public Notification of Remediation (i.e.: example signage)	Public Notice	**Appendix I**	☐
Plan for Investigative Derived Waste (IDW)	N/A	**N/A**	☐
Evaluation of Remedial Alternatives (i.e: for Feasibility Study Work Plan)	N/A	**N/A**	☐

DOES THE WORK PLAN PROPOSE IMPLEMENTING SITE-SPECIFIC REMEDIATION LEVELS?

Yes ☑ No ☐

DOES THE WORK PLAN PROPOSE EVALUATION OF BACKGROUND LEVELS?

Yes ☐ No ☑

NOTE: When reports are submitted which document any type of sampling activity, the submittal of Electronic Data per ADEQ's *Groundwater Data Submittal Guidance (V3.4)* is strongly recommended.

Work Plan Report

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1. INTRODUCTION

1.1 January Mine Adit Location

The January Mine Adit is located approximately 5 miles south of the Town of Patagonia, Arizona. More specifically, it lies in the Harshaw Mineral District, within the Southeast Quarter of Section 32, Township 22 South and Range 16 East, Gila and Salt River Meridian, in Santa Cruz County, Arizona (see Figure 1, Location Map). According to public records, it was worked intermittently since the early 1870's; it was patented in 1894; and it was last operated by the American Smelting and Refining Company, precursor to ASARCO, LLC, (ASARCO) in the period 1925 to 1949. Arizona Minerals, Inc. (AMI), acquired it in early 2016, as part of a larger landholdings that include the January Mine, Norton Mine and Trench Camp Mine Claims. Both the January and the Norton mine claims are recognized under a single property designation by the Santa Cruz County Recorder, having been assigned parcel number 105-50-001B (see Figure 2, Santa Cruz County Assessor Map Book 105, Page 50). The Trench Camp Mine claim parcel has been assigned parcel number 105-50-001A. The US Forest Service manages the surrounding adjacent lands, as part of the Coronado National Forest.

As can be seen in the location map, all three mining claims drain into Alum Gulch, with the January Mine Claim lying furthest downstream of the three mining claims. All of the drainage generated within the legacy mined portions of the Trench Mine Property eventually discharge into the Alum Gulch. The latter is a tributary to Sonoita Creek, joining it approximately 5.5 miles downstream from the January Mine and 2.25 miles southwest from the Town of Patagonia (see Figure 1).

Historically, several mining ventures have extracted mineral ore from the upstream canyons that eventually drain into Alum Gulch, raising concerns about the presence of trace minerals in the natural drainage that eventually would reach the Sonoita Creek. In response to the State of Arizona's Clean Water Act responsibilities, the Arizona Department of Environmental Quality (ADEQ) evaluated conditions along Alum Gulch and promulgated the TMDL Implementation Plan for Alum Gulch, in March of 2007. The plan recognizes cadmium, copper, zinc and acidity as the primary agents with undesirable levels of concentration present in the Alum Gulch drainage.

Terrain within the mining claim sites and along Alum Gulch is steep and rocky, with washes carving out relatively narrow valleys through the native material. Rock outcrops and angular cobbles are readily visible in most areas, and bedrock is visible in the areas that experienced mining activity. The vegetation cover ranges from sparse grassland at the lower elevations and around the former mining worksites, and gradually increases to moderate densities at higher elevations, with trees and shrubs typical of desert mountain terrain and generically catalogued as Madrean Evergreen Woodland (see Figure 3, Aerial Photograph).

The 1885 patent survey for the January Mine indicates that the mine claim is a rectangular parcel, with its alignment such that its longest axis has a northwest to southeast orientation. The survey

also indicates that the mine at that time had three main shafts, one open cut and an adit, located near its southern corner.

1.2 Mine Influenced Water Seepage

Originally, the January and Norton Mines were operated jointly, extracting zinc, lead, silver, gold and manganese ore. In its later years, under ASARCO operation, they mostly extracted copper, lead and zinc ore. Mineral extraction and concentration activities generated mining waste material in large quantities, which was deposited at four tailings storage locations within the larger Trench Camp Mine claim, and in several smaller piles within the two other smaller mining claim sites (see Figure 3). As can be seen in the figure, three of the spent mineral ore tailings piles, identified as TP#1, TP#2 and TP#4 are located within areas that drain into the lowlands of Alum Gulch and eventually join other discharge along the main wash in Alum Gulch.

As mentioned earlier, the January Mine Adit lies at the lowest and most downstream location of the Trench Camp Mine Property watershed. In the past, discharge from the January Mine Adit has been observed to drain into Alum Gulch. Subsequent testing of these discharges indicated the presence of cadmium, copper, zinc and acidity at levels exceeding the provisions of the TMDL Implementation Plan for Alum Gulch. Therefore, ADEQ issued a discharge violation notice to ASARCO, who at that time owned the mining claim parcels.

1.3 Responsible Party

ASARCO transferred the Trench Camp Mine claim to the ASARCO Multi-State Environmental Custodial Trust (Trust) in 2009. In 2016, AMI became interested in the Trench Camp Mine Property, and acquired all three mining claims. Since the initial wetlands treatment system implemented by ASARCO has not been effective, AMI decided to implement an alternative treatment under the provisions of the ADEQ Voluntary Remediation Program (ADEQ-VRP). After selecting a suitable process and identifying its implementation period, AMI applied for and obtained ADEQ concurrence under VRP Site Code 505143-02, which requires adherence to an agreed Work Plan Schedule (see Appendix A, Project Schedule).

2. PURPOSE

The purpose of this report is to describe and explain the tasks and activities listed in the agreed Work Plan Schedule. This includes the measures that AMI proposes to implement, in order to actively remediate the seepages that have historically been observed to occur in the Trench Camp Mine Property. It also provides the basis for design of the remediation passive treatment system (RPTS) that AMI proposes to construct and operate on site under the provisions of an Arizona Pollutant Discharge Elimination System (AZPDES) permit and an Aquifer Protection Permit (APP), and for which AMI will apply to ADEQ. Finally, it presents the results from application of a pilot test that verifies that the equipment and technology proposed for the RPTS is both feasible and will generate treated effluent that will be in compliance with the applicable Surface Water Quality Standards, in accordance with the terms of the VRP agreement.

3. WORK PLAN SCHEDULE

As agreed in the VRP permit and following its acquisition of the Trench Camp Mine Property in January of 2016, AMI proceeded to accomplish the various activities identified in the Work Plan Schedule for remediation of the Trench Camp Mine seepages into Alum Gulch.

Preliminary site and materials background testing activities were completed in early 2016. In addition, a pilot test for the proposed RPTS was constructed in February, and implemented during an evaluation period of 24 weeks (see Work Plan Schedule in Appendix A). The pilot test confirmed the effectiveness of the proposed RPTS; pilot test findings are summarized in the following section.

As can be noted upon review of the Work Plan Schedule, AMI remains on schedule with the timeline agreed upon for treating the discharge through implementation of the proposed RPTS. Its design is underway, incorporating the findings from the different site evaluations performed and the pilot test system performance.

4. PROJECT SITE CHARACTERIZATION

In order to appropriately address the identified mineral seepages, it was first necessary to identify the soluble metallic and non-metallic constituents present and their concentrations, as well as the flow discharge volumes measured both at the January Mine Adit and at the TP seepage ponds upstream from the adit. Characterization of the adit and TP discharges began with a review of the historic documents made available in the ADEQ archives file and of the Alum Gulch TMDL Implementation Plan.

Field samples of the adit and TP seepages were collected by AMI personnel during a site visit in 2015, which were laboratory analyzed for presence of constituents of interest to the VRP. And, since taking ownership of the Trench Camp Mine property in January of 2016, AMI personnel have conducted field measurements and sampling of both the adit and onsite seepages, in conjunction with installation of a Pilot RPTS. The data obtained during this latter collection period was compared to the previous information of record and the initial sampling of 2015, to characterize flows and levels of constituents of concern present in the subject seepages.

4.1 Treatment Flow Estimates

Under the provisions of a Stormwater Pollution Prevention Plan (SWPPP), AMI has effectively isolated areas of concern within the Trench Camp Mine Property, protecting them from stormwater runoff. Runoff originating in undisturbed areas within the property is collected in earthen channels that intercept the runoff before it can reach areas with spent mineral ore tailings (TP's) or the January Mine Adit. This segregated natural runoff is then delivered to the wash that drains the parcel and canyon (see Figure 4, Trench (January/Norton) Property Overview). The immediate result is that the extent of Trench Camp Mine areas that originate runoff that is subject to contact with potentially polluting spent mineral piles was reduced from 266.17 acres to 26.6 acres, the latter being clearly demarcated by the diversion channels constructed along the subbasin

perimeter, as shown in the figure. In addition, a monitoring/measuring station was placed upstream from the January Mine Adit, to sample the runoff for water quality testing and to measure flow.

4.1.a Determination of January Mine Adit Seepage Flow

In order to determine the level of treatment needed for remediation of the January Mine Adit discharges, the parameters that must be identified are the volume of water contained in the adit as well as the rate of flow of the discharges observed at the adit. The initial measurements were performed in the adit drain pipe that discharges into the existing constructed wetlands immediately downstream from the adit, during the period September through November of 2015. The resulting measurements placed the flow in the range between 7 - 10 gallon-per-minute (GPM). Subsequent flow measurements using a flowmeter installed as part of the Pilot RPTS confirmed the prior flows and the sensitivity of flow to seasonal conditions.

In conjunction with the pilot plant installation, one of two monitoring wells that had earlier been installed, by ASARCO, above the adit and into the January Mine workings was equipped with a submersible pump. This well is identified as Well #1 (see Figure 5, Well Equipment Diagram). The second well, identified as Well #2, was outfitted with equipment to measure water level in the adit, as shown in Figure 5.

In May of 2016, a well recovery test was performed at the adit with a 70 GPM pump. The results from this test provided an initial estimate of 7 GPM as the recovery rate of the January Mine workings, measured at the existing January Mine wells (see Figure 6, January Mine Workings Pumping Test Results). This was taken to be representative of dry weather conditions, and correspond to the smaller flows in the 2016 adit discharge measurements. Similar adit discharge flows were reported by the previous owner/operator.

In order not to release adit seepage into the existing constructed wetlands during the Pilot RPTS evaluation, AMI requested authorization to use the January Mine water for its mineral exploration activities. ADEQ granted its authorization in July of 2016.

Detailed January Mine water pumping measurements were observed and recorded during August through October of 2016, during which time a 32 GPM pump was kept in nearly continuous operation, to evaluate the adit well production and recovery during dry and rainfall periods. The results from this test provided an estimate of 14 GPM for the well recovery rate of the adit during Monsoon Season without major storm events. A 39 GPM recovery rate was noted during Monsoon Season, due to a major storm event where 2.8-inches of rain fell within two-hours.

As explained earlier, a pilot remedial process treatment system evaluation was conducted for discharges originating at the January Adit, which also provided an opportunity to further investigate the January Mine well recovery rate and, from extrapolation of this data, the available storage in the January Mine workings. These parameters will be used for sizing of the final remedial passive treatment system. The pilot test system was installed at a location close to the January Mine Adit (see Figure 7, Remedial Treatment System Pilot Test Site Layout). Effluent generated by the pilot test treatment system was discharged to the existing constructed wetlands.

Well production, pumping rate and static water level were closely monitored during the pilot treatment period. The data gathered and the data analysis computations are provided in Appendix B to this report; the findings are summarized in an annotated graph, for ease of reference (see Figure 8, January Mine Workings Pumping Analysis Summary).

Accordingly, the following observations can be made:

a) The measured overflow discharge rate for the January Mine workings was 7 GPM, and this was taken to be representative of the adit recharge rate under dry weather conditions.

b) The computed recovery rate for the January Mine workings was 14 GPM, and this was taken to be representative of mine workings recharge under continuous pumping conditions, during the monsoon season and without significant rainfall events.

c) When a significant rainfall event was observed on site, the computed recharge rate for the January Mine workings was 39 GPM.

d) The well static water level dropped to a depth of 7.52 feet during the active pumping period when the pilot test was conducted. The available January Mine working storage at this depth is estimated at 393,120 gallons.

e) Using a recovery rate of 7 GPM, this storage volume is equivalent to 39 days of available storage before January Mine workings overflow and begin discharging from the adit.

f) Using a January Mine working recovery rate of 14 GPM, this storage volume is equivalent to 19.5 days of storage before the mine workings would overflow and a discharge would occur from the adit.

g) It is proposed that the pumping rate at its well be maintained at 20 GPM, in order to extract more water from the January Mine workings than its average recovery rate, thus creating storage for use in times of extreme rainfall or in case of temporary outages or stoppages for periodic maintenance. A mass balance worksheet is provided in Appendix B, in support of this recommendation.

4.1.b Determination of Trench Camp Mine TP Seepage Flows

In order to determine the level of treatment needed for remediation of the Trench Camp Mine seepages found near TP #1 and TP #2, the parameters that must be identified are the volume of water contained in the corresponding seepage ponds and the rate of flow of the seepages observed in the ponds. For this purpose, an examination of the pumping records for the dewatering pump installed at the TP #1 pond was conducted. Current estimates are that the seepages observed in the TP areas, which are eventually collected at the pond near TP #1 are generated at a rate of 3 GPM during the monsoon season; the pond is noted as empty during the dry season.

The seepages collected in this pond are then pumped to a sediment retention basin that was excavated in front of TP #2 (see Figure 4). The basin was excavated below TP #2, and the excavated material was used in the embankment construction, as shown in the figure. The embankment was provided with a 36" corrugated metal pipe (CMP) overflow drain, located approximately 6' above the basin bottom and 15.4' below the embankment overflow spillway. From topographic information developed for design of the proposed new remediation treatment system, the following volume capacities of the TP #2 basin can be determined:

a) The available retention volume in the basin before the CMP drain overflows is 256,956 gallons.

b) Considering a seepage rate of 3 GPM, this is equivalent to 59.5 storage days of available capacity.

c) Measurements developed during the pilot test period for the adit remedial passive treatment system indicate that an average monthly volume of 129,600 gallons is pumped from the TP #1 seepage collection pond into the TP #2 pond.

d) It is the intent of AMI to maintain the TP #2 collection pond empty and ready to receive seepage flows that might exceed the final remediation passive treatment system operating capacity. These flows would be temporarily held in the pond until the remedial passive treatment system can accommodate them.

e) Maintaining a TP #1 seepage feed flow rate of approximately 3 GPM into the final remediation passive treatment system, excess water accumulated in the TP #2 pond could be evacuated during those months when TP #1 seepage feed has lessened below 3 gpm or has been observed to remain dry.

4.1.c Process Treatment Flows

Based on these results, the January Mine Adit and TP seepage remediation passive treatment system will be designed based on a treatment flow rate of 23 GPM average flow. This includes the computed average flow for the January Mine Adit, estimated at 20 GPM, and the TP seepage flow, estimated at 3 GPM.

4.2 Seepage Water Quality Parameters

As mentioned earlier, an initial field water quality sample was taken in early 2015, and the laboratory test results from these samples provided a basis for identification, design and proposal for a remediation passive treatment system for the site. Subsequent periodic water quality sampling and testing has been performed, during the pilot test for the proposed treatment system.

4.2.a Base Design Water Quality Data

The data in Table 4.2.1, below, was obtained from a single water sample collected during the 2015 site visit. The Mine iron concentration was assumed to be 80 mg/L based on the water quality data from the Arizona Pollutants Discharge Elimination System (AZPDES) Fact Sheet.

Seep manganese concentration was assumed to be 800 mg/L based on the metals concentrations ratio from the pond that collects water from the TSF #1 seepage.

Parameter	Units	January Mine[1]	TSF #1 Seepage[1]	Mixed Water Chemistry (RPTS Influent)[2]
Flow	Gpm	45	3	0.08
pH	s.u.	5.8	4.2	-
Iron	mg/L	80	14	76
Aluminum	mg/L	0.004	346	22
Copper	mg/L	0.0004	3.8	0.24
Lead	mg/L	0.005	0.45	0.03
Zinc	mg/L	16	588	52
Cadmium	mg/L	0.01	11.7	0.74
Nickel	mg/L	0.1	6	0.46
Manganese	mg/L	65	800	111

Table 4.2.1 Pilot Influent Water Chemistry and Flow Rate

Notes: [1] Results from water samples collected during the 2015 site visit.
[2] Holding Tank water

The mixed water chemistry was calculated using the following equation:

$$\text{Mixed Water Chemistry} = \frac{C_1Q_1 \text{ X } C_2Q_2}{Q_1 + Q_2}$$

Where:
C_1 = Mine Metal concentration
C_2 = Seep Metal concentration
Q_1 = Mine monthly average flow rate (Tetra Tech, 2013)
Q_2 = Assumed Seep flow rate

4.2.b Pilot Test Influent Field Data

A pilot scale RPTS (Pilot RPTS) was constructed close to the January Mine Adit, in February, 2016. The Pilot RPTS was continuously monitored by AMI personnel for a period of 24 weeks, from March to August 2016. It included the following components, based on the findings from laboratory analysis of the initial water quality field data:

- Holding Tank,
- Iron Terrace (IT),
- Biochemical Reactor (BCR),
- Aerobic Pond (AP), and
- Manganese Removal Bed (MRB).

The holding tank for the Pilot RPTS initially contained a mixture of mostly January Mine water (1,000 gallons) with some TSF #1 seep water (80 gallons tapering off to zero as the seep water

dried up) to simulate anticipated full scale influent conditions. Seep water was only available for the first eight weeks. January Mine water was used exclusively after this time. Field parameter values in water samples were measured weekly and the results are discussed below; graphs and field data sheets are included in Appendix C (Pilot Scale Test Report, Passive Treatment System January Mine).

pH

Minor changes in pH were observed in samples collected throughout the pilot test. Change in the influent water pH was attributed to the natural variability of the water source. When the Mine and Seep water were mixed, the influent water pH ranged from 5.8 to 6.2 standard units (SU). When the influent water consisted of only Mine water, the pH ranged from 5.9 to 6.5 SU.

The pH across the IT increased due to the presence of natural bicarbonate alkalinity in the Mine water. The pH of the IT effluent ranged from 6.8 to 7.8. The BCR effluent pH ranged from 5.3 to 6.7. This slight decrease may have occurred as a result of the accumulation of organic acids from fermenting bacteria activity or from the precipitation of metal sulfides as shown in the equation below.

$$Zn^{+2} + HS^{-} \rightarrow ZnS + H^{+}$$

The pH in the AP was the highest of all the pilot units due to the increased alkalinity in the BCR effluent (which was the AP influent). In addition to the alkalinity contributions from limestone component in the BCR media, alkalinity (HCO_3^-) in the BCR effluent can also be attributed to biological activity associated with sulfate reduction as shown in the equation below.

$$SO_4^{-2} + 2\ CH_2O \rightarrow HS^{-} + 2HCO_3^{-} + H^{+}$$

Residual alkalinity in BCR effluent contributed to the pH rise in the AP effluent which ranged from 7.0 to 8.1. In a full scale system, a similar range would be expected in the effluent of an aerobic polishing wetland (APW).

The MRB effluent pH ranged from 6.8 to 8.0.

Temperature

Operating water temperature is typically of interest in the RPTS design process because it can influence the microbial kinetics of the treatment units, particularly BCRs. While the test program was unable to evaluate the effects of low winter-like temperatures, with the lowest daily observed temperature at 13 ºC, very low temperatures are not of concern for the site. The highest water temperature was 31 ºC. Metals removal occurred throughout the test and the RPTS performance overall appears to be insensitive to typical site temperature variations. No special temperature-related design considerations for the full-scale system were implicated.

Flow Rate

Flow rate was approximately 300 mL/min for 17 weeks. On week 18, the IT and the BCR were decoupled. The influent water from the Holding Tank was fed directly to the IT and to the BCR with separate pumps. The flow was increased to test the performance of these two units at a

different flow rates. The flow rate for the IT was approximately 1,400 mL/min and for the BCR was about 400 mL/min.

Oxidation-Reduction Potential (ORP)

Negative ORP values indicate anaerobic conditions that are conductive to sulfate reduction. The raw Mine water ORP ranged from -179 to 118 mv, indicating the presence of both oxidizing and reducing conditions. In contrast, samples from the TP #1 pond exhibited oxidizing ORP values ranging from 270 to 374 mv. The initial Holding Tank ORP measurements suggest that Mine and Seep mixtures typically exhibited oxidizing conditions but when the Holding Tank only received Mine water, reducing conditions prevailed. The Holding Tank water ORP ranged from -124 to 132 mv.

Although iron terraces are expected to operate under predominantly oxidizing conditions, the ORP values of the IT effluent were usually negative, which is reflective of reducing conditions. The IT effluent ORP ranged from -243 to 34 mv.

BCR effluent was consistently anaerobic, which was a primary operational goal. The BCR effluent ORP ranged from -17 to -384 mv. The AP effluent ORP ranged from -262 to 118 mv indicating that the blower was sometimes unable to aerate the tank efficiently. MRB effluent ORP ranged from -240 to 150 mv.

Conductivity

Conductivity is the ability of a substance to conduct electricity. The conductivity of water shows a direct correlation to the concentration of dissolved ions.

The Mine water exhibited the lowest pilot system conductivity which ranged from 3.5 to 5.3 mS/cm. The Seep had the highest pilot system conductivity which ranged from 8.6 to 17.2 mS/cm. The IT, BCR, AP and MRB effluents exhibited comparable conductivity values and ranged from 4.1 to 5.7, 4.1 to 5.9, 4.1 to 5.3, and 4.2 to 5.7 mS/cm, respectively.

Dissolved Oxygen (DO)

Dissolved oxygen was primarily measured in the AP and MRB. Additional DO testing in the influent waters and the other pilot system units was conducted infrequently. DO was tested in the AP to evaluate the aeration efficiency provided by the blower. The AP DO ranged from 2.0 to 8.8 mg/L. The lowest DO reading (2 mg/L) was due to a malfunctioning blower.

The MRB was measured to evaluate the DO concentration of the discharged pilot system effluent. The MRB DO ranged from 0.5 to 3.1 mg/L. The lower value of this range coincided with a malfunctioning blower situation.

Ferrous Iron (Fe^{+2})

Ferrous iron was measured in the Holding Tank water and in the IT middle and IT effluent. Ferrous iron was measured in the IT to evaluate the iron removal rate throughout the IT. Ferrous iron concertation in the Holding Tank, IT middle, and IT end samples ranged from 2 to 7 mg/L, 1 to 11 mg/L, and 1 to 8 mg/L, respectively.

5. REMEDIATION PASSIVE TREATMENT SYSTEM PILOT TEST FINDINGS

The results obtained during the Pilot RPTS period indicate a successful removal of metals from the water sources treated.

The Pilot RPTS was modified in several ways during the 24-week testing interval to improve its performance. In the IT, woodchips were removed and replaced with inert gravel. The IT and BCR were isolated for separate influent feeds at different flow rates. A stilling well was installed in the AP to reduce carry over of solids into the MRB and the MRB was rebuilt.

Iron removal in the IT was as high as 91% with treatment efficiency improving from 0.5 to 3.6 grams of Fe removed per day per square meter (gdm), after the woodchips were removed. Iron and zinc removal in the BCR was as high as 99%.

Water quality and flow rate data were found to be significantly different than the preliminary assumptions which resulted in some changes to the recommended full scale treatment system (replacing the iron terrace with an equalization basin and replacing the AP with an aerobic polishing wetland).

Detailed Pilot RPTS findings and conclusions are provided in Appendix C (Pilot Scale Test Report, Passive Treatment System January Mine) to this report.

6. FULL-SCALE REMEDIAL TREATMENT PROCESS DESCRIPTION

The RPTS originally proposed in the VRP application was designed based on the water quality and flow volume characteristics identified from archival data and field samples taken during a visit to the project site, in 2015. The Pilot RPTS has provided additional information for final design of the RPTS to be implemented.

6.1 Treatment Goals and Key Assumptions

The RPTS treatment goal will be to reduce the constituents of concern from the January Mine and the Seep to meet the discharge water quality parameters that were specified in the AZPDES permit issued to ASARCO in 2003. for the January Mine. The design uses passive treatment technology, within the space available, based on recently documented flow rates, water quality analysis, and performance data from the pilot system. Some of the key assumptions for the full scale treatment system design include:

- Water from the January Mine will be pumped to where space is available for the treatment system within the property limits.
- Pumping down the volume in the January Mine workings will also afford some storage capacity for storm flows in excess of the treatment capacity.
- Water from the TP #1 seep flows for approximately eight months per year and is otherwise dry (no flow).
- Pumping will be included to handle storm flows in excess of the treatment capacity when the water will be moved into an existing storage pond (below TP #2) to be routed to the treatment system when the treatment capacity is available.

6.2 Remediation Passive Treatment Design Parameters

The water quality used for the treatment design basis was derived from multiple samples collected over the duration of the pilot system test for both the raw January Mine and TP #1 seep water as compared to the water quality assumed from the laboratory testing results for the May of 2015 field samples.

The range of chemistries considered in the derivation of the assumed influent water quality for the full scale RPTS are provided in Tables 6.2.1 and 6.2.2 for the January Mine and the TP#1 seepage, respectively. These data were commingled mathematically and the results are tabulated in Table 6.2.3, following.

Parameter	Units	Initial Data (March-July) Gravity Flow[1]	Later Data (August) Pumped[2]	Selected Design Basis Concentration[3]
Flow	Gpm	6-14	7-40	20
pH	s.u.	6.1	6.2	6.1
Iron	mg/L	32	19	35
Aluminum	mg/L	0.2	0.17	0.2
Arsenic	mg/L	0.06	0.09	0.1
Copper	mg/L	0.004	0.004	0.004
Lead	mg/L	0.01	0.003	0.01
Zinc	mg/L	9	7.5	10
Cadmium	mg/L	0.01	0.0007	0.01
Nickel	mg/L	0.04	0.04	0.04
Manganese	mg/L	62	55	62

Table 6.2.1 January Mine Water Quality and Flow Data

Notes

[1] Average of concentrations from this period of time

[2] Average concentrations during January Mine water pumping

[3] Some metal metals concentrations were rounded up

Parameter	Units	Initial Data (March-May)[1]	Later Data (August)[2]	Selected Design Basis Concentration[3]
Flow	Gpm	-	-	3.0
pH	s.u.	3.3	3.7	3.3
Iron	mg/L	46 - 67	2.6	70
Aluminum	mg/L	120 - 220	125	220
Arsenic	mg/L	0.09	0.05	0.1
Copper	mg/L	2.6 – 3.4	2.5	3.4
Lead	mg/L	0.19	0.09	0.2
Zinc	mg/L	113 - 128	111	130
Cadmium	mg/L	1.6 – 2.1	1.4	2.1
Nickel	mg/L	1.7	1.1	1.7
Manganese	mg/L	1100	970	1100

Table 6.2.2 Seep Water Quality and Flow Data

Notes:
[1] Average of concentrations from this period of time, unless noted
[2] Average concentrations during January Mine water pumping
[3]Iron, aluminum, copper, zinc, and cadmium higher concentrations were used in the design because of the uncertainty of the Seep water chemistry

Parameter	Units	January Mine[1]	Seep	Mixed Water Chemistry (BCR Influent)
Flow	gpm	20	1.5[2]	21.5
pH	s.u.	6.1	3.3	4.0
Iron	mg/L	35	70	37
Copper	mg/L	0.004	3.4	0.24
Zinc	mg/L	10	130	18.4
Arsenic	mg/L	0.1	0.1	0.1
Nickel	mg/L	0.04	1.7	0.16
Cadmium	mg/L	0.01	2.1	0.15
Lead	mg/L	0.01	0.2	0.02
Aluminum	mg/L	0.2	220	16
Manganese	mg/L	62	1100	134
Sulfate	mg/L	2400	9800	3365
Acidity (Cal'd)	mg/L	111	1696	318
Alkalinity	mg/L	240	-	-

Table 6.2.3 Design Influent Water Chemistry

Note: [1] Results from the pilot plant testing.
[2] 1.5 gpm used to correlate with the pilot plant testing.
See Basis of Design Report for more information.

The mixed water chemistry was calculated using the following equation:

$$\text{Mixed Water Chemistry} = \frac{C_1Q_1 \text{ X } C_2Q_2}{Q_1 + Q_2}$$

Where:
C_1 = Mine Metal concentration
C_2 = TSF #1 Metal concentration
Q_1 = Mine assumed maximum flow rate
Q_2 = Assumed Seep flow rate

6.3 Remediation Passive Treatment Process Description

The proposed remediation treatment was originally proposed with ADEQ concurrence, prior to conducting the Pilot RPTS. Figure 6.3.1, below, summarizes the full-scale RPTS design concept, which includes four basic steps:

- An Equalization Basin (EB),
- A Biochemical Reactor (BCR),
- An Aerobic Polishing Wetland (APW), and
- A Manganese Removal Bed (MRB).

RPTS design parameters are summarized in the following sections; a more detailed discussion is provided in Appendix D (Basis of Design Report, Full Scale Passive Treatment System, January Mine).

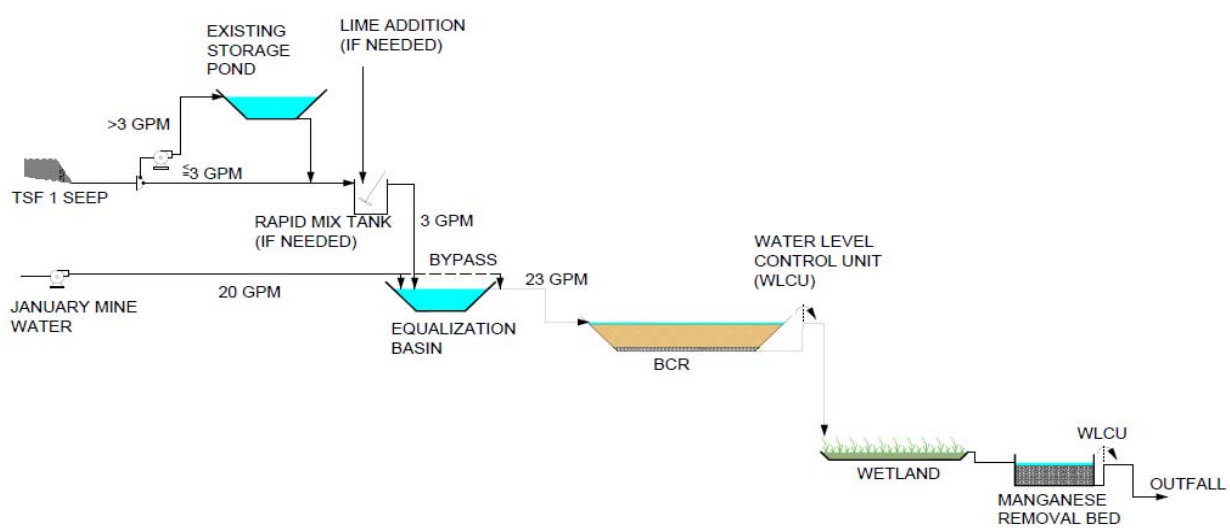


Figure 6.3.1 Remediation Treatment System Design Schematic

6.3.1 Equalization Basin (EB)

The January Mine water and the TSF #1 seep will be mixed in an Equalization Basin. Mixing waters with different pH's and concentrations will most likely result in precipitation of the higher concentrations of aluminum and iron. The EB will be designed to settle and store metal precipitates for periodic removal. This will help prevent precipitation build-up in the BCR and provide some treatment (removal) of metals in this step. The EB volume is designed for a 24 hours of retention time with an allowance for precipitation (sludge) accumulation. Table 6.3.1, following, provides the EB design details.

The ratio of Seep water to January Mine water is expected to be greater than the ratio used in the pilot testing on an intermittent basis. The design Seep flow rate varies from 0.0 (dry) to 3.0 gpm. Because the Seep is significantly more concentrated than the January Mine water, it has a greater impact on the treatment system loading. During intervals when the loading exceeds the capacity of the treatment system, temporary pretreatment of the Seep will be initiated.

The pretreatment system would consist of a small mixing tank, an alkaline reagent (TBD) feeder, and the EQ basin described above. When needed, Seep water will be diverted to the mix tank where it will be blended with a dose of alkaline reagent. The mixture will overflow into the EB where the precipitated solids will settle out. When the Seep water pH is being adjusted, the January Mine water will bypass directly into the BCR so that the full volume of the EB can be used to settle and store solids from this process.

Design Criteria	Value
Flow rate	23 gpm (Seep 3 gpm, Jan Mine 20 gpm)
Hydraulic Retention Time (HRT)	24 hours
Sludge Holding Capacity (% of total volume)	25%
EB Operating Volume (sludge, water)	42,000 gallons

Table 6.3.1 EB Design Details

6.3.2 Biochemical Reactor (BCR)

The design criteria for the BCR including volume of substrate are presented in Table 6.3.2, following. These parameters were calculated based on metal loading rates estimated from the Pilot Test.

Design Criteria	Value
Metal loading rate	0.3 moles per day per cubic meter
No. of BCR Cells	1
Flow rate	23 gpm (Seep 3 gpm, Jan Mine 20 gpm)
BCR Cell total depth with drainage layer, substrate, standing water (above substrate) and freeboard (to crest of liner)	7.0 ft.
Hydraulic Retention Time (HRT)	About 6.4 days
BCR Drainage Gravel	6 inches
Substrate Thickness	4.0 ft
Standing Water (above substrate) depth	6 inches
Freeboard (top of water to cell liner crest)	2 ft.
Bottom Footprint Dimension Ratio	L:1 = 1:1 or 2:1
Bottom Footprint Area	14,000 ft^2 (118 ft x 118 ft, if square)

Table 6.3.2 BCR Design Details

The mixture of Mine water and TSF #1 seep will enter the top of the BCR and flow vertically down through the organic substrate. With this configuration, the top of the BCR contributes more to the BCR biological kinetics initially than the lower zone that functions as a substrate "reservoir" that will be consumed in the future.

Treated water will be collected in perforated pipes placed in a gravel layer installed on the gently sloping (1% to 3%) floor of the BCR and conveyed to the APW. The collection pipes in the bottom of the BCR will have accessible cleanouts at the top of the cell.

The substrate will have a finite life, expected to be about 20 to 25 years. The BCR longevity was projected based on the Pilot Test results. At some future date, the depleted substrate will need to be replaced.

The standing water level in the BCR will be adjustable using an inline water level control unit (WLCU) on the discharge side of the BCR. This will allow the head pressure to be adjusted over time as necessary to help drive water through the system.

The BCR will be lined. BCRs can be made square or rectangular as long and they are made up of squares (length = 2 x width). Water enters the BCR near the top and above the media layer and exits from the bottom to a water level control unit. The bottom elevation at the water level control unit is typically 1' 6" below the top of the BCR media, giving a total potential head loss across the BCR of about 2'-6".

6.3.3 Aerobic Polishing Wetland (APW)

The area required for the APW was calculated based on a biological oxygen demand (BOD) removal rule-of-thumb rate of 5 square meters per gpm. It was also assumed that 15 mg/L of BOD will be removed in the APW.

The influent of the APW (BCR effluent) will enter the top of the APW and flow horizontally through the APW plants. The APW will be lined. APW dimensions and other design details are provided in Table 6.3.3, below.

Design Criteria	Value
Flow rate	23 gpm
Hydraulic Retention Time (HRT)	15 hour
Free water surface area for BOD removal	5 m^2/gpm
mg/L of BOD removal	90 mg/L
APW soil depth	1 ft.
APW water depth	6 inches
Freeboard (top of water to cell liner crest)	2 ft.
APW Cell total depth	3.5 ft.
APW bottom footprint	**1,500 ft^2**

Table 6.3.3 APW Design Details

6.3.4 Manganese Removal Bed

The MRB was designed based on a manganese removal rate of 12.5 grams per day per square meter. This factor was calculated based on the MRB Pilot testing results. The MRB influent (APW effluent) will enter the top of the MRB and flow vertically down through the MRB media. The bottom of the cell will be fitted with perforated pipes to collect the treated water. MRB dimensions and other design details are provided in Table 6.3.4, below.

Design Criteria	Value
Flow rate	23 gpm
Mn removal rate	12.5 grams/day/square meter
MRB limestone/rock depth	2 ft.
MRB water depth (above the limestone)	6 inches
Freeboard (top of water to cell liner crest)	2 ft.
MRB Cell total depth	3.5 ft.
MRB bottom footprint	**7,600 ft^2**

Table 6.3.4 MRB Design Details

As designed, the RPTS typically will require a relatively low operation and maintenance effort. Periodic inspection is recommended of the physical condition of the system units and performance monitoring of system flow rates and water chemistry.

6.3.5 RPTS Components and Construction Documents

The proposed RPTS will be constructed within the January Mine Claim, in areas immediately above the January Mine Adit and adjacent to the two wells that were earlier drilled into the January Mine workings by ASARCO. The process train basins will be excavated into the previously undisturbed hillside, and are anticipated to occupy approximately three acres. The process train will operate in a north-to-south flow direction. The treated effluent will discharge upstream from the adit and into the ephemeral reach of Alum Gulch.

As explained earlier, two wells were drilled into the January Mine workings and fitted with casing and risers in 2008. In 2016, AMI installed a submersible pump in Well #1 and in Well #2 installed water level monitoring instrumentation. A French drain system will be constructed below the TPs proximate to the TP#1 seepage pond, to capture the seepage originating from the TP's, and a pump station will deliver the collected seepage to the equalization basin at the RPTS, to be mixed with January Mine water or alkaline pretreatment prior to treatment in the RPTS. It should also be noted that collected seepage water might also be pumped to and recovered from the pond below TP#2 as seepage conditions fluctuate.

Construction of the RPTS will mostly involve excavation and grading of the terraces, basins and trenches that will accommodate the process equipment for the RPTS. It is anticipated that the RPTS project can be successfully completed within 180 days, as shown in the agreed Work Plan Project Schedule (see Appendix A).
The proposed RPTS will be integrated into the existing terrain above and adjacent to the adit, which will adequately accommodate the various basins and terraces that conform the new facility. There are many rock outcrops visible on site, which add to the expectation of stability in all existing slopes. Excavation and grading will not encroach into nor make use of any reclaimed mining waste material. It is anticipated that there is sufficient soil material on site for construction of all earthen embankments, and judicious grading can successfully integrate the available material on site. Control measures will be implemented pursuant to AMI's AZPDES Multi-Sector General Stormwater Permit, in order to control runoff from earthwork and grading activities.

To the extent possible, natural drainage patterns on site and in the project vicinity will be allowed to remain undisturbed. Stormwater runoff that originates in areas contiguous to the RPTS modules and naturally drain towards it will be diverted around the RPTS by means of earthen channels and diversion ditches.

Sixty-percent Design Documents have been developed, which illustrate the physical features and dimensions of the proposed RPTS and structures. A copy of the plans and Special Specifications is included in Appendix E (Design Documents) of this report. "For Construction" drawings and Special Design Specifications will be prepared for Aquifer Protection Permitting and AZPDES Discharge Permitting.

A set of "as-built" drawings will be prepared upon project completion and added to Appendix E.

7. ABANDONED WETLANDS

The existing wetlands constructed by ASARCO have not been effective and the RPTS proposed by AMI implements an alternative treatment that allows for abandonment of the subject wetlands. Therefore, a soil characterization sampling was performed at the existing wetlands site, to evaluate the wetland soils for levels of contaminants of concern (CoC) that may have been precipitated into the soil as a result of the wetlands behavior, and to determine the approximate zones where CoC may be located. In addition, the information was used to decide if the wetlands soil and vegetation could be used as a "seed" inoculant for the full scale RPTS, which proposes the use of a smaller wetlands within its footprint that will function as an APW.

Specific findings and recommendations from the investigation discussed in Appendix F (Wetland Sampling Report).

8. CWA SECTION 404 JURISDICTIONAL DETERMINATION

A request for Approved Jurisdictional Determination covering approximately 39 acres within the Trench Camp Mine Property, including the area where the RPTS will be built, was submitted to the Los Angeles District Office of the US Army Corps of Engineers. Following their jurisdictional review, they determined that jurisdictional waters do not occur in this area.

A copy of the Jurisdictional Determination Letter is included in Appendix G to this work plan document.

9. SPECIFIC REMEDIAL TREATMENT PARAMETERS

The proposed RPTS will enable AMI to treat the January Mine Adit water and the onsite TP seepage, to meet the provisions of the Alum Gulch TMDL Implementation Plan and the additional metal and non-metal parameter removal requirements outlined in the AZPDES and APP permits issued to AMI for construction and operation of the RPTS.

During the initial discussions about the particulars for the proposed RPTS, ADEQ directed AMI to include additional elements in the testing of the samples obtained in the field, and adjust the RPTS process to include opportunistic treatment for other constituents than those in the TMDL Implementation Plan. Therefore, the RPTS process will include removal of selected other constituents, in addition to cadmium, copper, zinc and acidity, which are the only constituents identified in the Alum Gulch TMDL Implementation Plan. A summary of expected constituents, projected effluent quality, and expected percent metals removal from the RPTS is provided in Table 9.1.

Parameter	Units	Mixed Water Chemistry (Influent)	Projected Effluent Quality	% Metals Removal	Notes
Flow	gpm	21.5	<21.5	N/A	Some flow loss is anticipated due to evaporation
pH	s.u.	4.0	6.5 – 7.5	N/A	
Aluminum (Al)	mg/L	16	7.8	50	
Cadmium (Cd)	mg/L	0.15	0.0015	99	
Copper (Cu)	mg/L	0.24	0.019	92	
Iron (Fe)	mg/L	37	0.4	99	
Lead (Pb)	mg/L	0.02	0.012	50	
Manganese (Mn)	mg/L	134	67	50	
Zinc (Zn)	mg/L	18.4	0.18	99	
Antimony (Sb)	mg/L	<0.0026	<0.0026	N/A	No significant amount expected in the influent
Arsenic (As)	mg/L	0.1	0.04	60	
Barium (Ba)	mg/L	0.0614	0.0614	0	
Beryllium (Be)	mg/L	0.004	0.002	50	
Boron (B)	mg/L	0.61	0.55	10	
Chromium (Cr^{6+})	mg/L	<0.025	<0.025	N/A	No significant amount expected in the influent
Chromium (Cr)	mg/L	0.04	0.035	10	
Cyanide (CN^-)	mg/L	<0.003	<0.003	N/A	No significant amount expected in the influent
Mercury (Hg)	mg/L	<0.000094	<0.000094	NA	No significant amount expected in the influent
Nickel (Ni)	mg/L	0.16	0.016	90	
Selenium (Se)	mg/L	0.06	0.044	30	Note 1
Silver (Ag)	mg/L	0.03	0.03	0	
Thallium (TI)	mg/L	0.01	0.006	40	
Sulfides	mg/L	0	<0.1	N/A	No significant amount expected in the influent
Hardness	mg/L	1200	1200	N/A	
Sulfate	mg/L	3365	3129	7	
Acidity (Cal'd)	mg/L	318	-	N/A	
Alkalinity	mg/L	-	500	N/A	Some alkalinity will be added

Table 9.1 RPTS Design Effluent Water Chemistry

Notes:

1 Elevated levels of Se are expected during the first 3-6 months of BCR operation due to selenium content in the straw media. This will diminish with time depending on content in the straw and flow rate. Once removed (washed out) the water quality projection for selenium is < 0.002 mg/l.

10. SAMPLING AND ANALYSIS PLAN (SAP)

Monitoring of the RPTS effluent and the associated reporting and record keeping requirements will be specified in the AZPDES permit and APP issued to AMI by ADEQ. The Sampling and Analysis Plan (SAP) specifics will be provided with the 100% plans and will be included in Appendix H to this report in a subsequent version of the report.

11. CONCLUSIONS AND RECOMMENDATIONS

Interpretation of site monitoring data that included Pilot RPTS results revealed that the preliminary RPTS proposed was oversized for the site conditions that were found during the Pilot RPTS test period. It was also found that the TP #1 seepage appears in direct response to seasonal conditions. During the non-monsoon dry months, the TP #1 seepage dries up and will not contribute acidity or metal loading to the RPTS remediation process. During the months when seepage is collected at the TP #1 pond, the geochemical characteristics of the water incorporated into the RPTS may add relatively high concentrations of dissolved iron to the remediation process. Infrequent lime dosing may be required to reduce acidity loading attributed to elevated iron concentrations.

The full scale RPTS was redesigned to address the new findings garnered during implementation of the pilot test. The water treated by the RPTS is expected to meet all applicable requirements. For some constituents, a maturation period may be needed before full treatment efficiency is realized.

12. COMMUNITY INVOLVEMENT PROPOSAL

As required by applicable Arizona Statutes, the communities and stakeholders that could be affected by the proposed remediation will be informed about the project goals and achievements. A copy of the Public Notice to be published for this project is included in Appendix I to this work plan document. Public comments and additional pertinent information will be incorporated into this appendix, as they are received.

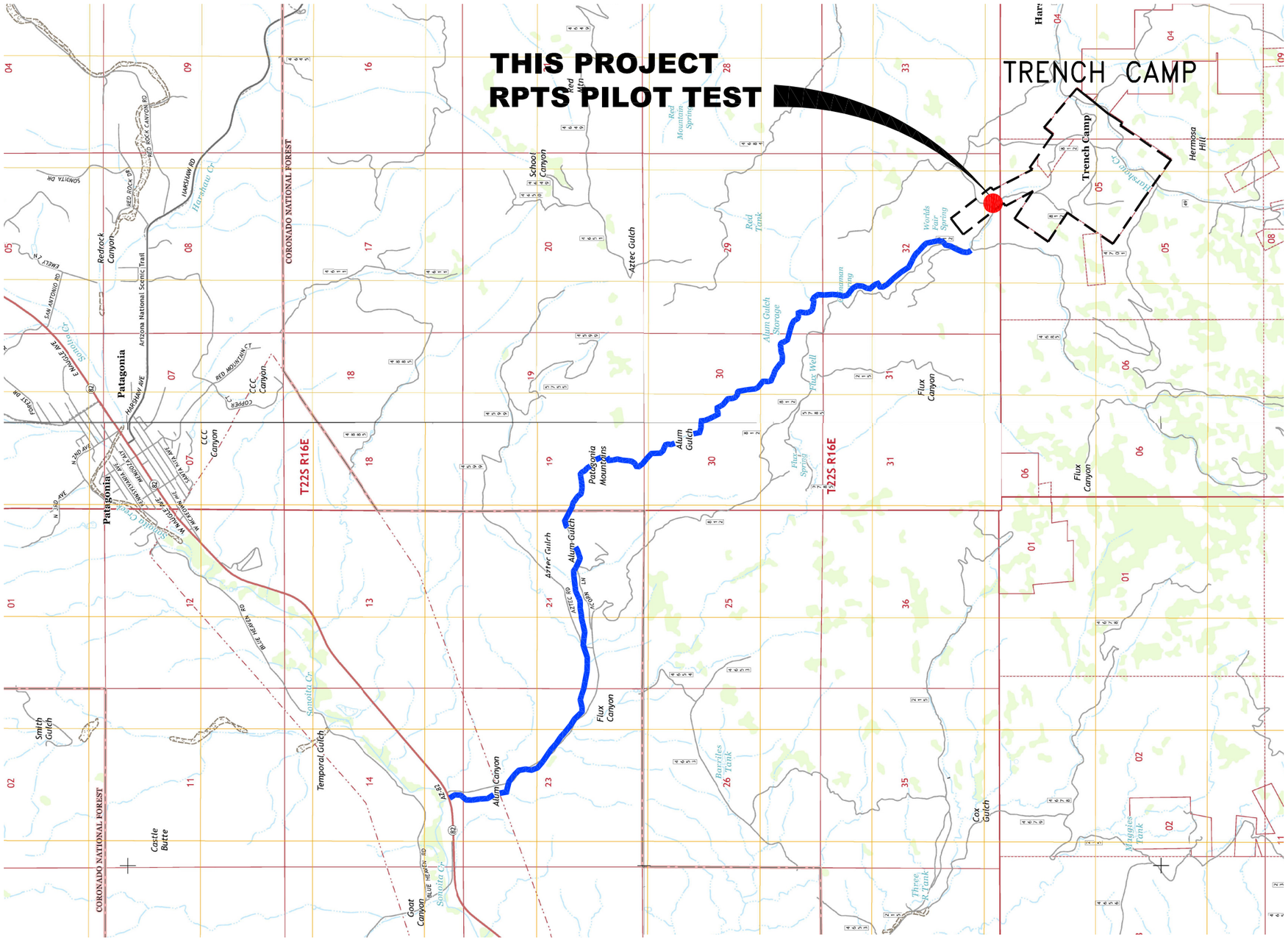
13. REFERENCES

ADEQ 2007. TMDL Implementation Plan for Cadmium, Copper, Zinc and Acidity in Alum Gulch, HUC # 15050301-561A&B. ADEQ OFR 07-03. March, 2007.

CPE Consultants. 2015. "Remediation and Treatment Process Selection Report for Mine Influenced Water Seepage at the January Mine Adit in Santa Cruz County, Arizona." Prepared for Arizona Department of Environmental Quality and Arizona Mining, Inc. CPEC Project No. 346. March 11, 2015.

Tetra Tech. 2013. "Environmental Assessment and Remediation Evaluation for January and Norton Mine Claims, Santa Cruz, Arizona." Prepared for Arizona Department of Environmental Quality and ASARCO Multi-State Environmental Custodial Trust. Tetra Tech Project No. 114-320984. August 21, 2013.

Figures 1 - 8



T22S, R16E, Section 32
T23S, R16E, Sections 4 & 5
USGS Quad: Harshaw
Santa Cruz County, AZ

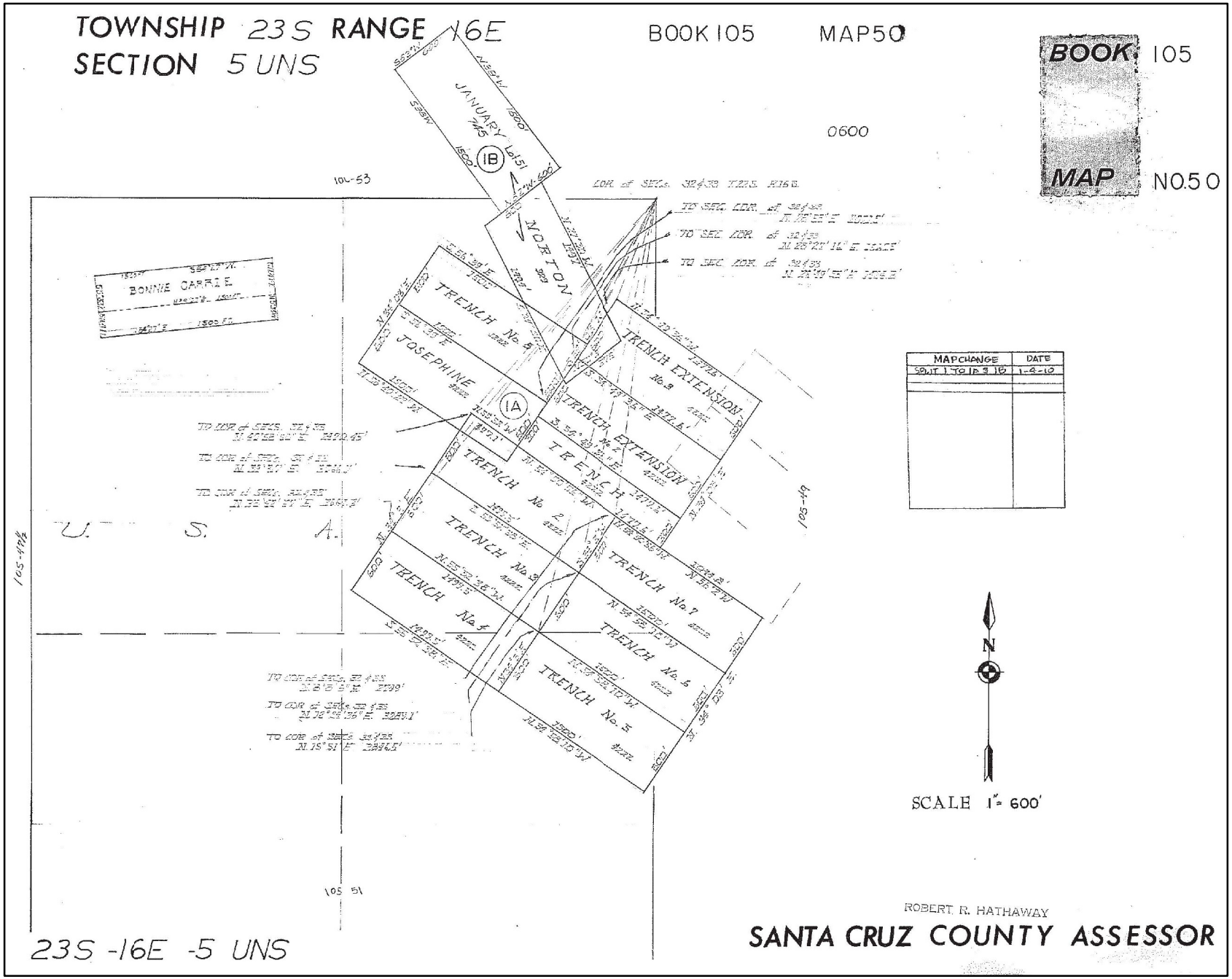
CPE
CONSULTANTS

3895 N. Business Center Dr.
Suite 115 Tucson, AZ 85705
520•545•7001

LEGEND

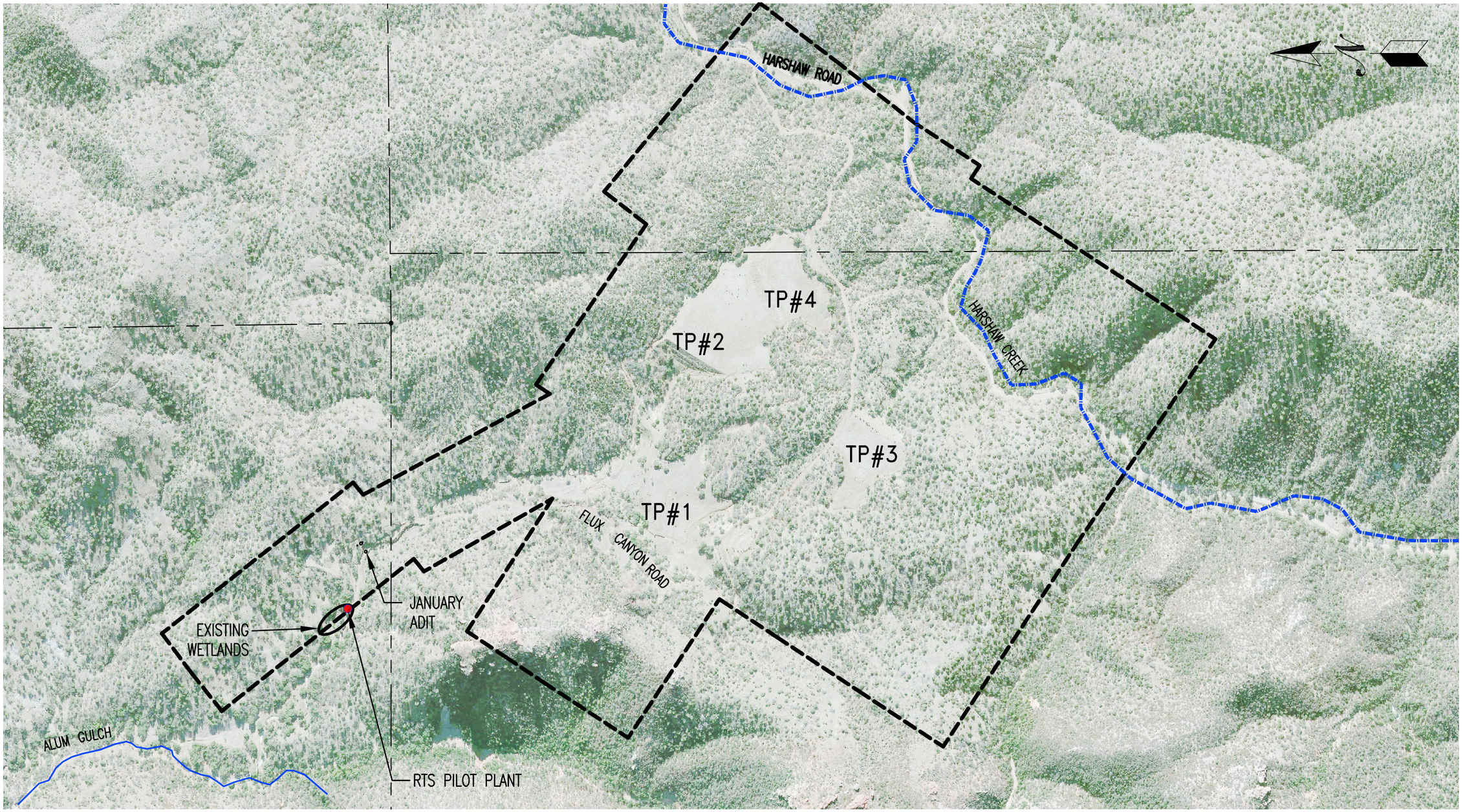
- - - - - - - - - - - ARIZONA MINERALS CLAIMS BOUNDARY
——— ALUM GULCH

FIGURE 1
LOCATION MAP
10.17.2016



10.10.2016

FIGURE 2
ASSESSOR'S MAP



1" = 600'

300 0 600 1200

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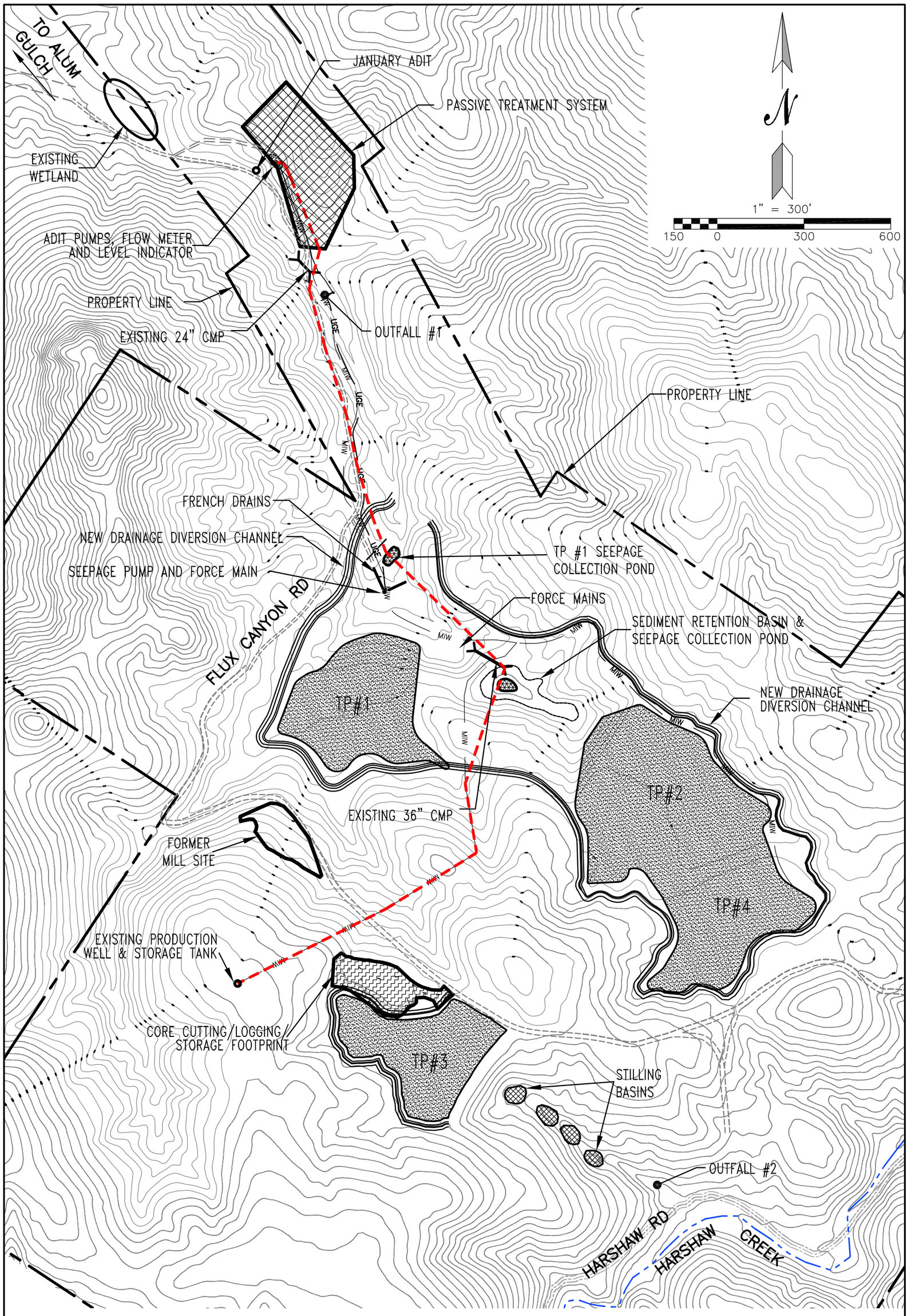
Suite 115
Tucson, AZ 85705
520·545·7001

LEGEND

- ARIZONA MINERALS CLAIMS BOUNDARY
- ALUM GULCH
- HARSHAW CREEK

AERIAL PHOTOGRAPH

FIGURE 3
10.19.2016



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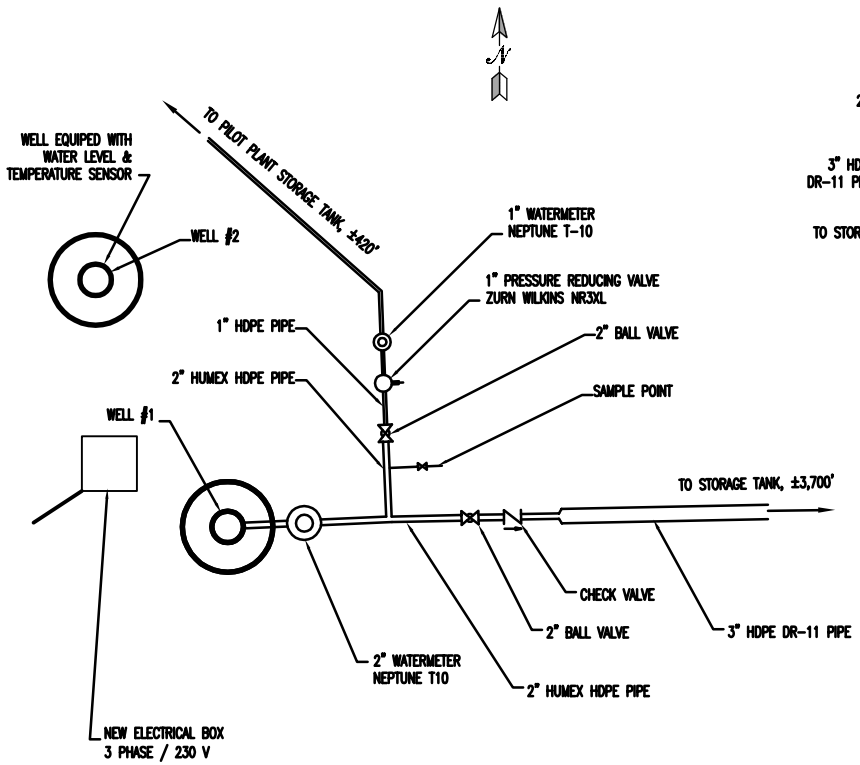
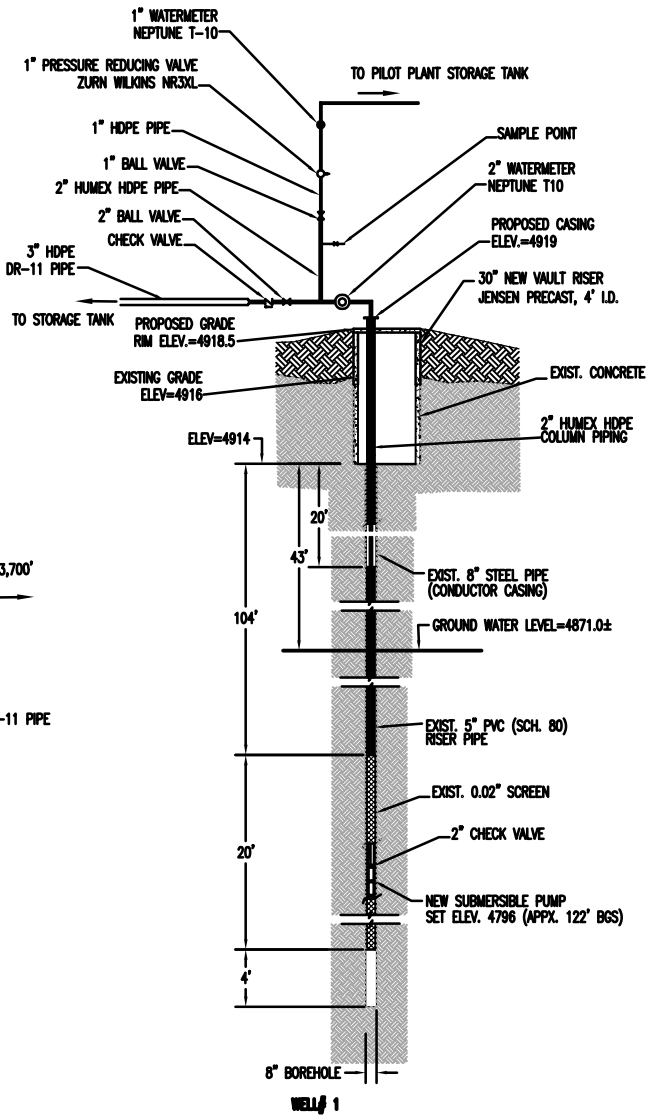
520-545-7001

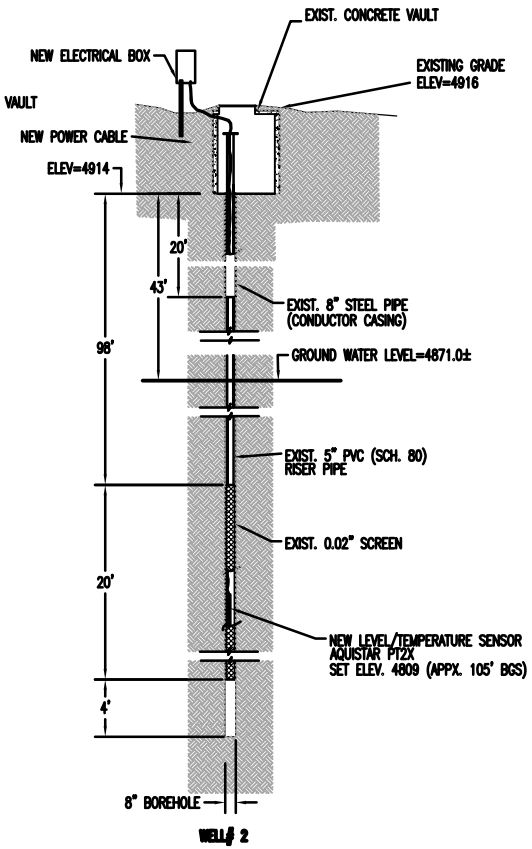
JOB # 346.1
10.18.2016

TRENCH (JANUARY/NORTON) PROPERTY OVERVIEW
VRP CODE 505143-02

FIGURE 4







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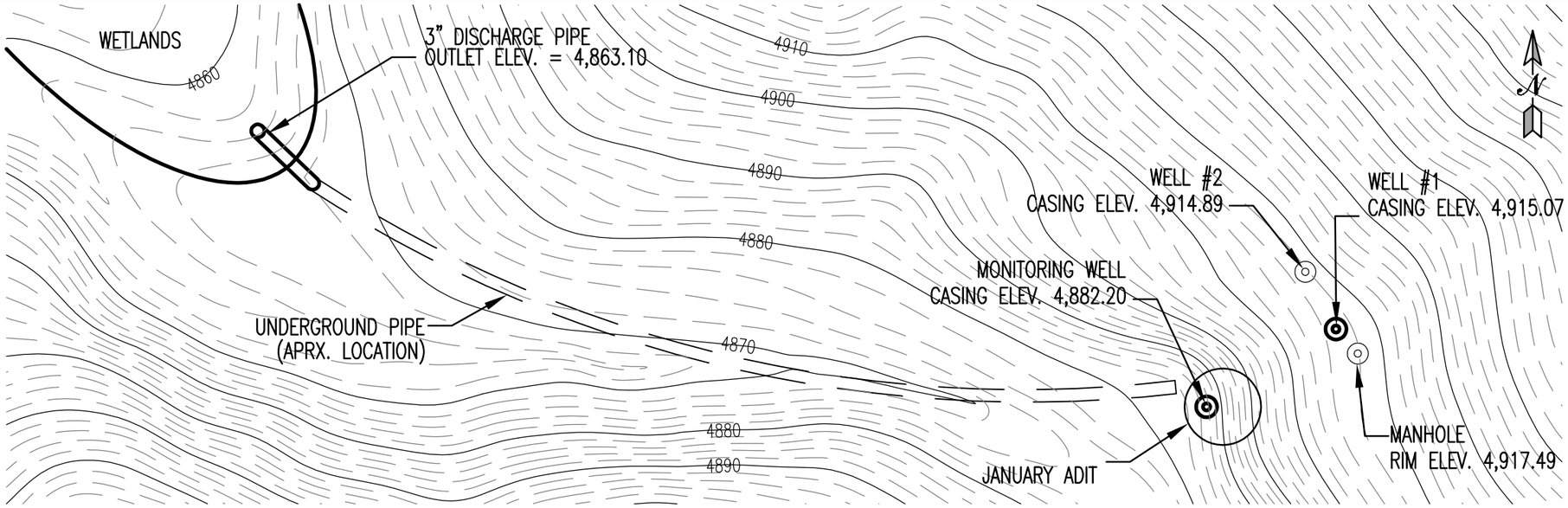
WELL EQUIPMENT DIAGRAM (FOR WELL TESTING)

FIGURE 5
10.10.2016



1" = 50'

25 0 50 100

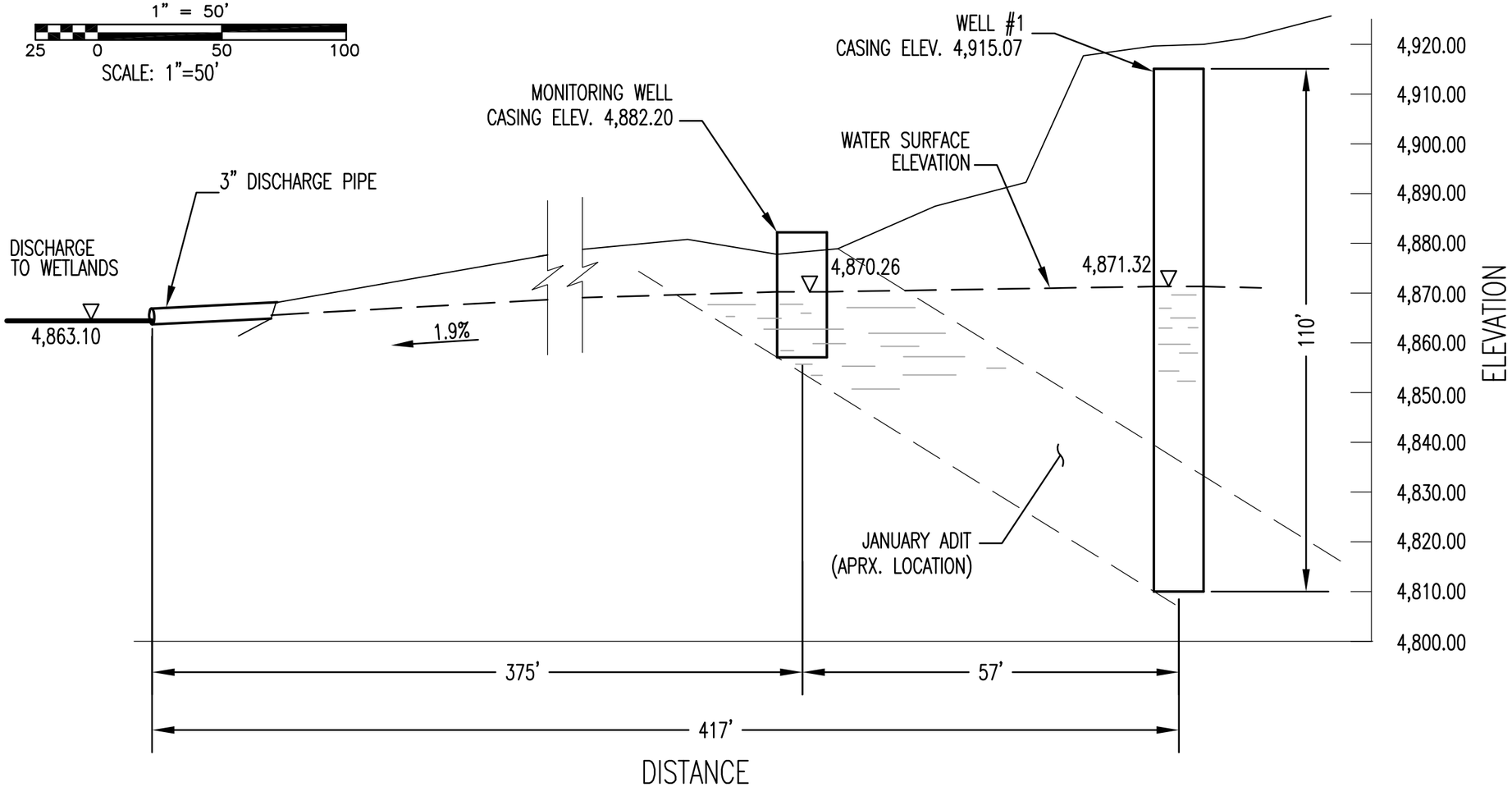
SCALE: 1"=50'

WELL #1

RIM ELEV.	4,917.06
CASING ELEV.	4,915.07
INITIAL WATER ELEV.	4,871.32
END PUMPING WATER ELEV.	4,870.95
WATER DROP DURING PUMPING, 147 MIN	0.37'
AVG. WSEL CHANGE DURING DISCHARGE	-0.0025 FT/MIN
AVG. WSEL CHANGE DURING RECOVERY	0.0011 FT/MIN

MONITORING WELL

CASING ELEV.	4,882.20
INITIAL WATER ELEV.	4,870.26
END PUMPING WATER ELEV.	4,869.87
WATER DROP DURING PUMPING, 147 MIN	0.39'
AVG. WSEL CHANGE DURING DISCHARGE	-0.003 FT/MIN
AVG. WSEL CHANGE DURING RECOVERY	0.0008 FT/MIN



TEST SUMMARY

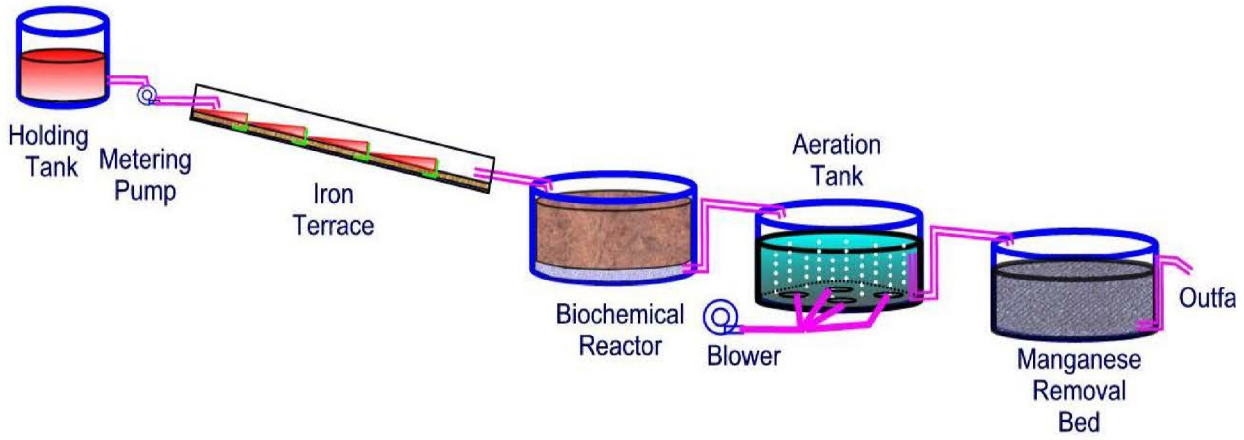
PUMP FLOW RATE	70 GPM
PUMPING TIME	147 MIN.
DISCHARGED VOLUME	8,559 GALS
RECOVERY TIME	1,230 MIN. (20.5 HRS)
RECOVERY FLOW RATE	7-8 GPM

JANUARY MINE WORKINGS PUMPING TEST RESULTS

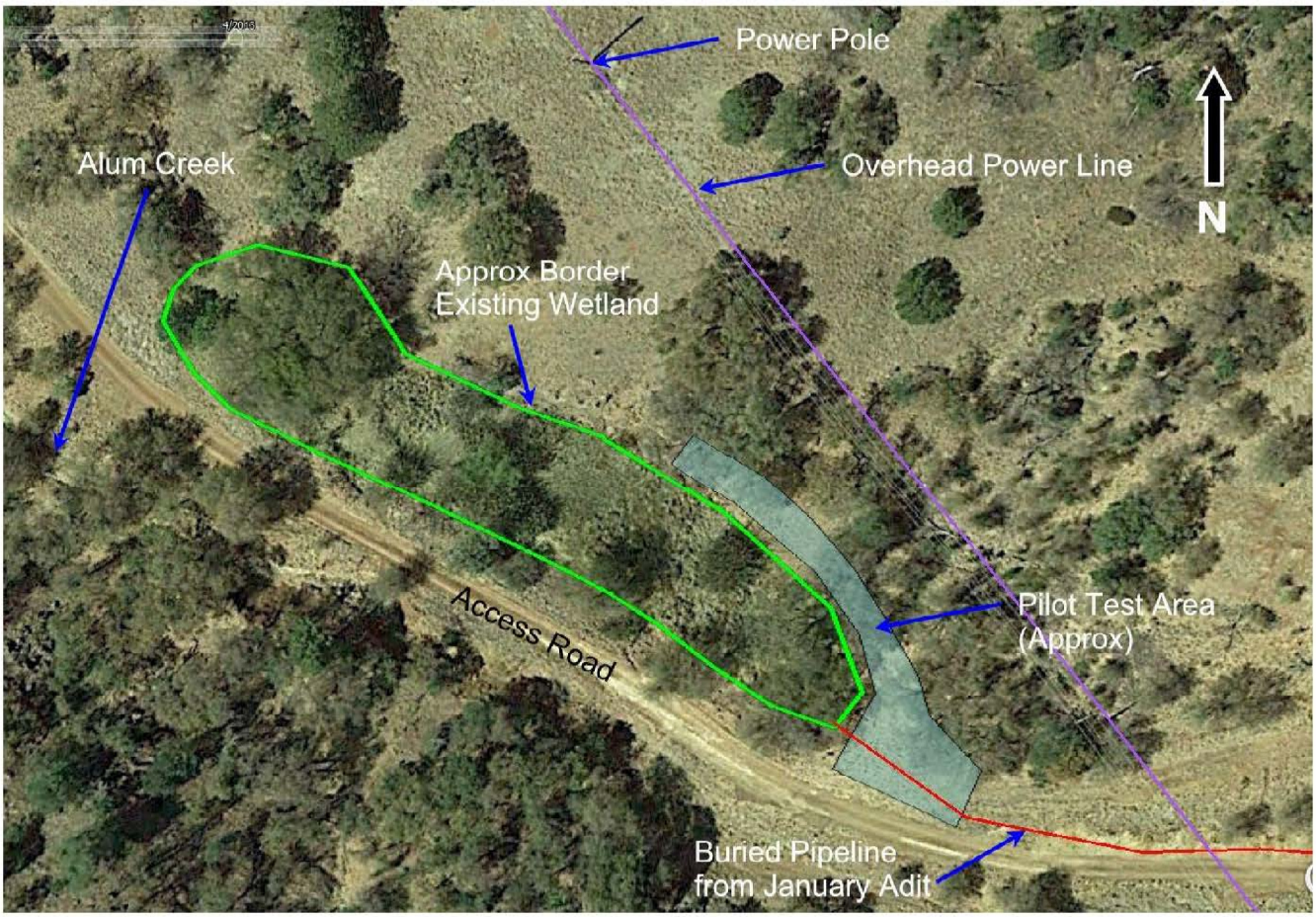
PERFORMED 05.03.2016

FIGURE 6

10.19.2016



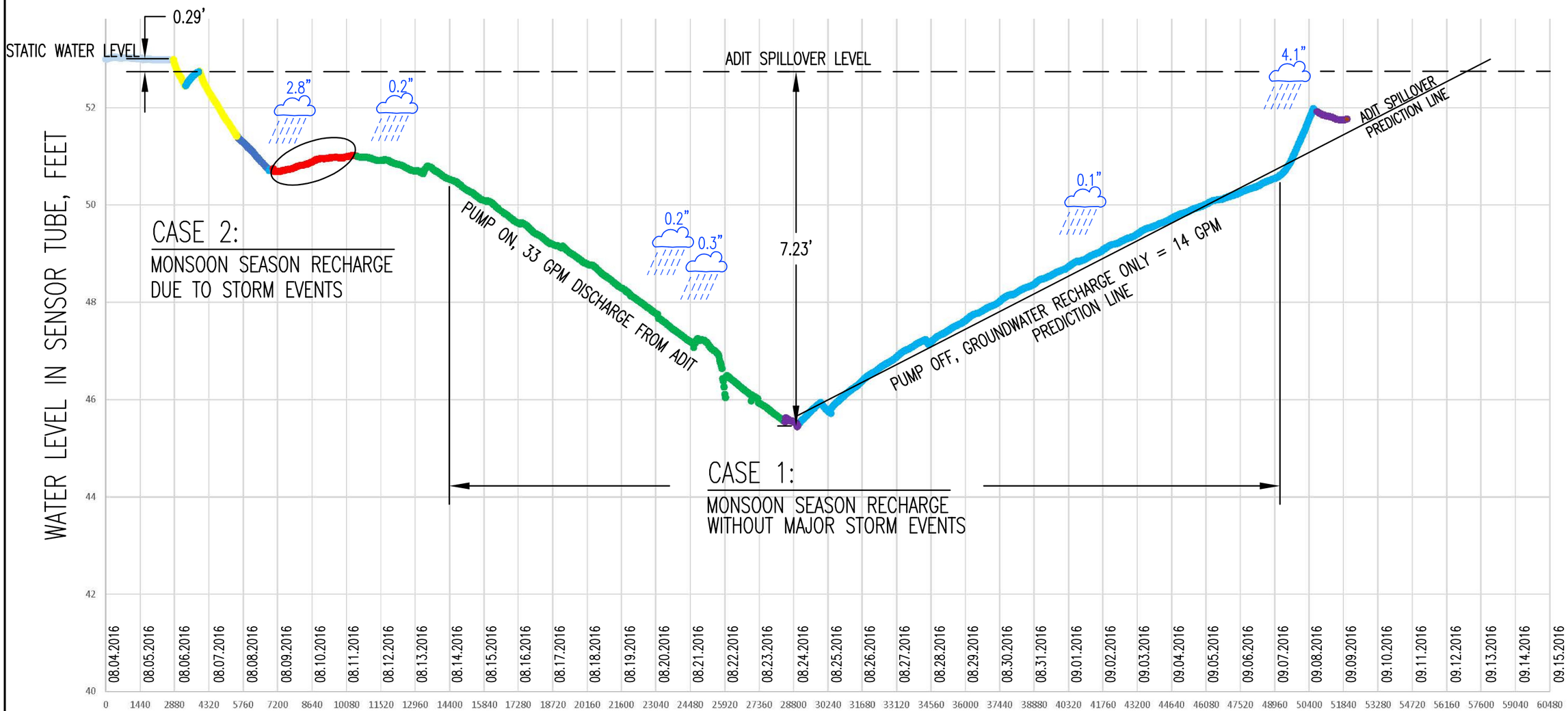
Remedial Treatment System Pilot Test Flow Diagram



Remedial Treatment System Pilot Test Site Layout

FIGURE 7
10.10.2016

JANUARY MINE WORKINGS PUMPING ANALYSIS SUMMARY FOR AUGUST – SEPTEMBER 2016



WITH WATER LEVEL 7.23' BELOW DISCHARGE POINT	
ADIT STORAGE CAPACITY	393,120 GALLONS
RECHARGE TIME TO REACH ADIT DISCHARGE POINT	19.5 DAYS

- PUMP OFF, SYSTEM NOT OPERATIONAL
- PUMP ON, 38 GPM
- PUMP ON, 34 GPM
- PUMP ON, 34 GPM, HIGH INFLOW DUE TO RAIN
- PUMP ON, 33 GPM
- PUMP ON, 32 GPM
- PUMP OFF, RECHARGE ONLY

FIGURE 8

10.19.2016

Appendix A

Project Schedule

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director

RECEIVED
MAR 22 2016
CPE CONSULTANTS, LLC

AZ1032
Log #

Via U.S. Mail

March 16, 2016
VRP 16-183

Mr. Raul Piña
CPE Consultants, LLC
3895 N. Business Center Drive, STE 115
Tucson, AZ 85705

RE: Approval of Amended VRP Application
ASARCO January Adit (Norton Mine)
Harshaw, Arizona
Site Code: 505143-02

Dear Mr. Piña:

The Arizona Department of Environmental Quality Voluntary Remediation Program (VRP) has reviewed the Amended VRP Application (the Amendment) dated February 22, 2016 and received by ADEQ on February 23, 2016. The Amendment was submitted by Arizona Minerals Inc. to include the property associated with acquisition of the ASARCO Trench Camp property.

The VRP approves the Amendment.

If you have any questions please contact me by phone at (602) 771-4397 or by e-mail at jp10@azdeq.gov.

Sincerely,

John Patricki, Project Manager
Voluntary Remediation Program

cc: Johnny Pappas, Arizona Minerals Inc

Passive Treatment System and Wetlands Assessment
ASARCO January Adit (Norton Mine)
Environmental & Geotechnical Studies
December 30, 2015

Task	Task Description	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017
	Notice to Proceed - January 11, '16																			
1	Project Management - Duration																			
2	Treatment Implementation Plan - 2 wks																			
3	Pilot Test Design - 3 wks																			
4	Pilot Test Construction - 1 wk																			
5	Pilot Test Monitoring - 24 wks																			
6	Pilot Test Data Analysis Report - 2 wks																			
7	Existing Wetlands Sampling - 2 wks																			
8	Geotechnical Studies - 8 wks																			
9	Final Design Plans & Permitting - 24 wks																			
10	Review and Public Comment Period - 8 wks																			
11	Construction Passive Treatment System - 180 days																			
12	Passive Treatment System Operation Adjustments - 2 wks																			
13	Passive Treatment System in Operation																			

Appendix B
January Mine Workings
Recharge Rate Analysis

January Mine Workings Recharge Rate Analysis

For

August and September 2016

CPE Consultants analyzed January Mine Workings Pumping Data for the period August 4th to September 9th of 2016, to determine the Mine Workings Recharge Rate. Monsoon season recharge rate without major storm event was estimated to be 14 gallons-per-minute (GPM), increasing to 39 GPM during rain events.

On August 4th, an AquiStar Model No. PT2X pressure/level sensor and water lever indicator was installed in January Mine Workings Well #2 and began recording Water Level Data.

On August 6th, a Grundfos 25S75-39DS Submersible Pump was installed in January Mine Workings Monitoring Well #1 and became operational. The pumping rate during the month of August and September varied from 38 to 32 GPM.

Water Level, Elapsed Time, and Pump Discharge Flowrate data were used to determine the Recharge Rate. A graph was created to compare the relationship between Water Level (ft) and Time (min), as recorded in Monitoring Well #2. Varying pump discharge rates were indicated on this graph with corresponding colors.

Two Cases were identified based on the data graphed for August-September 2016:

Case 1: Monsoon Season Recharge without Major Storm Events: 14 GPM
Case 2: Monsoon Season Recharge due to Major Storm: 39 GPM

<u>Case 1: Monsoon Season Recharge without Major Storm Events</u> (August 14 to September 7, 2016)
This investigation compared January Mine Workings Recharge with Pump Discharge, against Mine Workings Recharge Only (pump off), recording water level change and time data points.

This estimate was derived from observations conducted from August 14 to September 7, 2016. The Mine Workings Well Discharge Pump was operated at 33 GPM for 14,940 minutes, resulting in 5.2-ft drop in water level in the well. With the pump turned off, it took 20,070 minutes for the water levels in the mine workings to recover to its original level.

From these observations Monsoon Season Recharge Rate without Major Storm Events was determined as **14 GPM.**

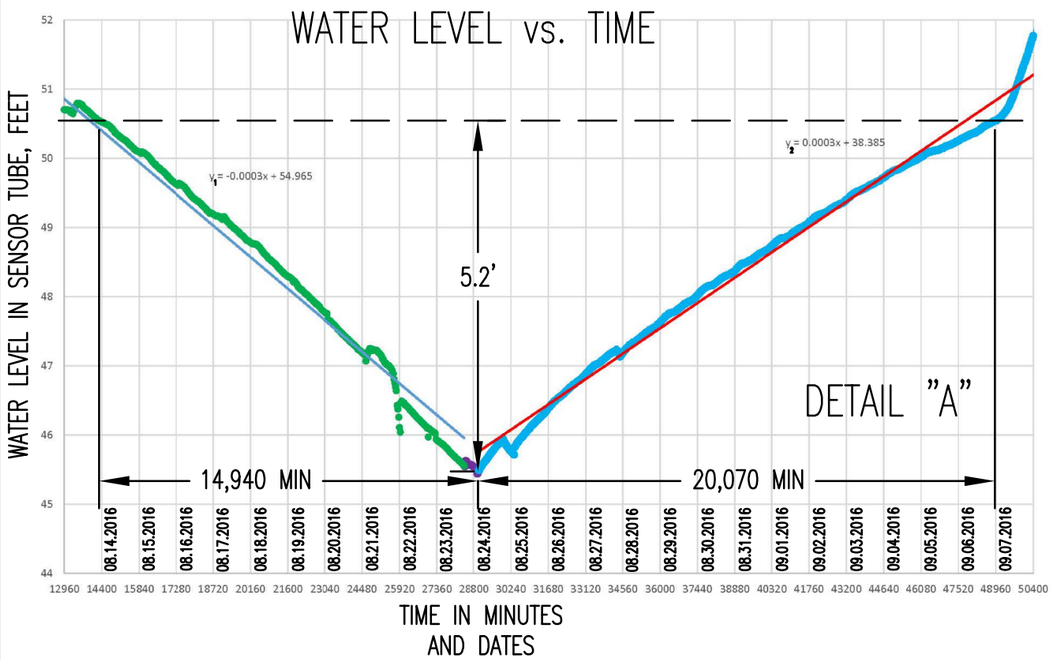
Case 2: Monsoon Season Recharge due to Major Storm (August 9 and 10, 2016)

A significant rainfall event was noted in August 9 and 10 of 2016. Rainfall depth was measured at 2.8-inches, within 2-hours, during this period. It was also observed that the January Mine Workings Recharge Rate exceeded the Pump Discharge Rate of 34 GPM, with water level rising. Comparison of Recharge & Discharge Rates in Case 1 showed the relationship of flowrates and the change in water level over a period of time, i.e., Net GPM as related to a FT/MIN water level rise and fall.

From these observations a Rain Event Recharge Rate was determined as **39 GPM.**

JANUARY MINE WORKINGS PUMPING DISCHARGE CALCULATIONS

CASE 1: AUG 14 – SEP 7, 2016
MONSOON SEASON RECHARGE WITHOUT MAJOR STORM EVENTS



PUMP ON AT 33 GPM FOR 14,940 MIN
WATER LEVEL DROP = 5.2 FT

PUMP OFF FOR 20,070 MIN
WATER LEVEL RISES = 5.2 FT

X GPM RECHARGE → VOLUME DISPLACED DURING TIME → 33 GPM DISCHARGE

VOLUME DISPLACED = (33 GPM – X GPM) * 14,940 MIN

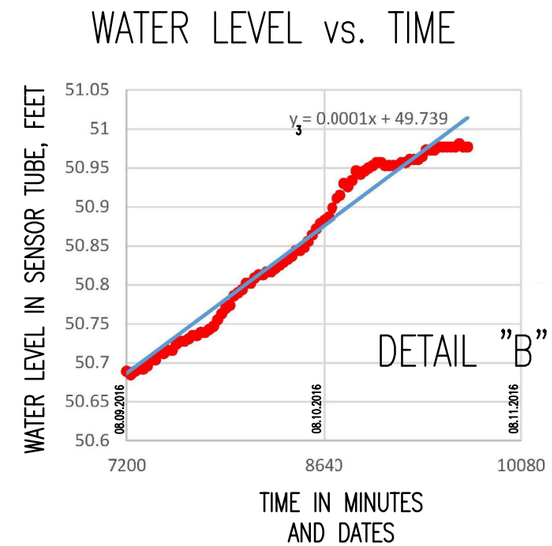
VOLUME REPLACED = X GPM * 20,070 MIN

(33 – X)*14,940 = 20,070X

X =14 GPM

MONSOON SEASON RECHARGE RATE WITHOUT MAJOR STORM EVENTS = 14 GPM

CASE 2: AUG 9–11, 2016
MONSOON SEASON RECHARGE
DUE TO MAJOR STORM, PUMP ON AT 34 GPM



RAINFALL RECHARGE =

DISCHARGE + VOLUMETRIC FLOW RATE CHANGE

WATER LEVEL RISING FUNCTION FOR AUG 9–10 AFTER RAINFALL
WITH PUMP DISCHARGE AT 34 GPM

Y_3 = 0.0001X + 49.739
WATER LEVEL RISES AT 0.0001 FT/MIN

WATER LEVEL DROPPING FUNCTION FOR AUG 7 (SEE CASE 1)
WITH PUMP DISCHARGE AT 33 GPM & 14 GPM RECHARGE

Y_2 = 0.0003X + 38.385
WATER LEVEL RISES AT 0.0003 FT/MIN WITH 14 GPM RECHARGE
WATER LEVEL RISE OF 0.0001 FT/MIN WOULD RESULT IN 5 GPM NET RECHARGE

RAINFALL RECHARGE RATE

RECHARGE – DISCHARGE = FLOWRATE CHANGE
RECHARGE = DISCHARGE + FLOWRATE CHANGE

RAINFALL RECHARGE = 34 GPM + 5 GPM

RAINFALL RECHARGE = 39 GPM

MONSOON SEASON RECHARGE RATE DUE TO STORM EVENTS = 39 GPM

APPENDIX B
10.19.2016

Appendix B

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
0	52.995	1,230	53.014	2,460	52.987	3,690	52.664	4,920	51.849
30	52.991	1,260	53.010	2,490	52.983	3,720	52.679	4,950	51.826
60	52.999	1,290	53.010	2,520	52.987	3,750	52.691	4,980	51.803
90	53.010	1,320	53.010	2,550	52.987	3,780	52.702	5,010	51.775
120	53.010	1,350	53.006	2,580	52.983	3,810	52.710	5,040	51.756
150	53.018	1,380	53.010	2,610	52.983	3,840	52.718	5,070	51.733
180	53.022	1,410	53.010	2,640	52.983	3,870	52.726	5,100	51.713
210	53.022	1,440	53.010	2,670	52.979	3,900	52.734	5,130	51.694
240	53.022	1,470	53.014	2,700	52.979	3,930	52.745	5,160	51.678
270	53.030	1,500	53.018	2,730	52.979	3,960	52.710	5,190	51.655
300	53.034	1,530	53.010	2,760	52.979	3,990	52.667	5,220	51.627
330	53.037	1,560	52.983	2,790	52.979	4,020	52.644	5,250	51.604
360	53.037	1,590	52.995	2,820	52.983	4,050	52.586	5,280	51.585
390	53.037	1,620	52.991	2,850	52.983	4,080	52.558	5,310	51.561
420	53.037	1,650	52.995	2,880	52.925	4,110	52.527	5,340	51.538
450	53.037	1,680	52.991	2,910	52.878	4,140	52.492	5,370	51.511
480	53.034	1,710	52.995	2,940	52.835	4,170	52.465	5,400	51.487
510	53.026	1,740	52.999	2,970	52.796	4,200	52.438	5,430	51.464
540	53.022	1,770	52.999	3,000	52.761	4,230	52.406	5,460	51.444
570	53.022	1,800	52.999	3,030	52.730	4,260	52.379	5,490	51.417
600	53.018	1,830	52.999	3,060	52.695	4,290	52.352	5,520	51.405
630	53.018	1,860	52.995	3,090	52.671	4,320	52.329	5,550	51.386
660	53.018	1,890	52.991	3,120	52.644	4,350	52.301	5,580	51.366
690	53.018	1,920	52.991	3,150	52.625	4,380	52.282	5,610	51.355
720	53.022	1,950	52.987	3,180	52.597	4,410	52.258	5,640	51.331
750	53.022	1,980	52.987	3,210	52.574	4,440	52.235	5,670	51.324
780	53.022	2,010	52.987	3,240	52.543	4,470	52.212	5,700	51.308
810	53.026	2,040	52.987	3,270	52.512	4,500	52.188	5,730	51.300
840	53.022	2,070	52.987	3,300	52.480	4,530	52.165	5,760	51.285
870	53.026	2,100	52.987	3,330	52.445	4,560	52.145	5,790	51.273
900	53.022	2,130	52.983	3,360	52.453	4,590	52.122	5,820	51.257
930	53.026	2,160	52.983	3,390	52.477	4,620	52.099	5,850	51.246
960	53.026	2,190	52.987	3,420	52.504	4,650	52.079	5,880	51.230
990	53.022	2,220	52.987	3,450	52.531	4,680	52.052	5,910	51.218
1,020	53.022	2,250	52.987	3,480	52.547	4,710	52.029	5,940	51.187
1,050	53.018	2,280	52.991	3,510	52.566	4,740	52.001	5,970	51.175
1,080	53.018	2,310	52.987	3,540	52.586	4,770	51.974	6,000	51.168
1,110	53.018	2,340	52.991	3,570	52.601	4,800	51.947	6,030	51.152
1,140	53.018	2,370	52.987	3,600	52.621	4,830	51.920	6,060	51.144
1,170	53.014	2,400	52.987	3,630	52.632	4,860	51.900	6,090	51.129
1,200	53.014	2,430	52.987	3,660	52.652	4,890	51.877	6,120	51.109

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
6,150	51.098	7,380	50.704	8,610	50.879	9,840	50.973	11,070	50.965
6,180	51.082	7,410	50.704	8,640	50.883	9,870	50.969	11,100	50.957
6,210	51.059	7,440	50.712	8,670	50.887	9,900	50.973	11,130	50.953
6,240	51.039	7,470	50.712	8,700	50.899	9,930	50.969	11,160	50.946
6,270	51.027	7,500	50.716	8,730	50.911	9,960	50.977	11,190	50.942
6,300	51.008	7,530	50.716	8,760	50.915	9,990	50.981	11,220	50.934
6,330	50.985	7,560	50.724	8,790	50.930	10,020	50.985	11,250	50.930
6,360	50.973	7,590	50.728	8,820	50.926	10,050	50.989	11,280	50.926
6,390	50.950	7,620	50.728	8,850	50.934	10,080	50.992	11,310	50.922
6,420	50.942	7,650	50.731	8,880	50.946	10,110	50.992	11,340	50.918
6,450	50.926	7,680	50.735	8,910	50.942	10,140	50.996	11,370	50.915
6,480	50.907	7,710	50.735	8,940	50.946	10,170	50.992	11,400	50.915
6,510	50.891	7,740	50.739	8,970	50.950	10,200	51.004	11,430	50.915
6,540	50.876	7,770	50.739	9,000	50.953	10,230	51.008	11,460	50.915
6,570	50.864	7,800	50.743	9,030	50.957	10,260	51.012	11,490	50.915
6,600	50.848	7,830	50.747	9,060	50.957	10,290	51.012	11,520	50.918
6,630	50.837	7,860	50.755	9,090	50.953	10,320	51.016	11,550	50.918
6,660	50.817	7,890	50.763	9,120	50.953	10,350	51.016	11,580	50.918
6,690	50.802	7,920	50.770	9,150	50.953	10,380	51.020	11,610	50.918
6,720	50.786	7,950	50.774	9,180	50.953	10,410	51.016	11,640	50.915
6,750	50.770	7,980	50.786	9,210	50.957	10,440	51.012	11,670	50.930
6,780	50.755	8,010	50.790	9,240	50.957	10,470	51.004	11,700	50.934
6,810	50.724	8,040	50.794	9,270	50.961	10,500	51.004	11,730	50.930
6,840	50.700	8,070	50.802	9,300	50.961	10,530	51.000	11,760	50.926
6,870	50.735	8,100	50.802	9,330	50.961	10,560	50.989	11,790	50.926
6,900	50.731	8,130	50.809	9,360	50.965	10,590	50.989	11,820	50.918
6,930	50.743	8,160	50.813	9,390	50.973	10,620	50.985	11,850	50.915
6,960	50.739	8,190	50.813	9,420	50.973	10,650	50.981	11,880	50.907
6,990	50.724	8,220	50.817	9,450	50.973	10,680	50.981	11,910	50.895
7,020	50.747	8,250	50.817	9,480	50.977	10,710	50.977	11,940	50.887
7,050	50.692	8,280	50.821	9,510	50.977	10,740	50.981	11,970	50.879
7,080	50.689	8,310	50.825	9,540	50.977	10,770	50.977	12,000	50.868
7,110	50.689	8,340	50.829	9,570	50.977	10,800	50.981	12,030	50.864
7,140	50.692	8,370	50.833	9,600	50.977	10,830	50.977	12,060	50.856
7,170	50.689	8,400	50.837	9,630	50.981	10,860	50.981	12,090	50.852
7,200	50.689	8,430	50.844	9,660	50.977	10,890	50.981	12,120	50.848
7,230	50.685	8,460	50.844	9,690	50.977	10,920	50.977	12,150	50.848
7,260	50.689	8,490	50.848	9,720	50.977	10,950	50.977	12,180	50.840
7,290	50.692	8,520	50.856	9,750	50.973	10,980	50.973	12,210	50.837
7,320	50.692	8,550	50.864	9,780	50.977	11,010	50.973	12,240	50.833
7,350	50.696	8,580	50.872	9,810	50.973	11,040	50.969	12,270	50.833

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
12,300	50.829	13,530	50.786	14,760	50.443	15,990	50.081	17,220	49.641
12,330	50.825	13,560	50.786	14,790	50.431	16,020	50.077	17,250	49.633
12,360	50.821	13,590	50.782	14,820	50.420	16,050	50.073	17,280	49.625
12,390	50.813	13,620	50.774	14,850	50.408	16,080	50.065	17,310	49.617
12,420	50.809	13,650	50.766	14,880	50.396	16,110	50.058	17,340	49.613
12,450	50.802	13,680	50.747	14,910	50.377	16,140	50.046	17,370	49.606
12,480	50.794	13,710	50.731	14,940	50.365	16,170	50.038	17,400	49.637
12,510	50.786	13,740	50.720	14,970	50.354	16,200	50.026	17,430	49.633
12,540	50.778	13,770	50.712	15,000	50.342	16,230	50.011	17,460	49.629
12,570	50.770	13,800	50.704	15,030	50.334	16,260	49.999	17,490	49.621
12,600	50.759	13,830	50.692	15,060	50.322	16,290	49.984	17,520	49.613
12,630	50.755	13,860	50.689	15,090	50.315	16,320	49.968	17,550	49.602
12,660	50.747	13,890	50.677	15,120	50.303	16,350	49.952	17,580	49.594
12,690	50.739	13,920	50.669	15,150	50.299	16,380	49.941	17,610	49.586
12,720	50.731	13,950	50.657	15,180	50.287	16,410	49.929	17,640	49.574
12,750	50.724	13,980	50.646	15,210	50.280	16,440	49.917	17,670	49.559
12,780	50.720	14,010	50.634	15,240	50.272	16,470	49.910	17,700	49.547
12,810	50.712	14,040	50.622	15,270	50.264	16,500	49.898	17,730	49.532
12,840	50.708	14,070	50.611	15,300	50.260	16,530	49.886	17,760	49.512
12,870	50.704	14,100	50.603	15,330	50.252	16,560	49.874	17,790	49.497
12,900	50.700	14,130	50.591	15,360	50.245	16,590	49.867	17,820	49.485
12,930	50.700	14,160	50.583	15,390	50.233	16,620	49.855	17,850	49.469
12,960	50.700	14,190	50.572	15,420	50.217	16,650	49.843	17,880	49.458
12,990	50.696	14,220	50.564	15,450	50.209	16,680	49.835	17,910	49.446
13,020	50.696	14,250	50.552	15,480	50.194	16,710	49.828	17,940	49.430
13,050	50.696	14,280	50.548	15,510	50.186	16,740	49.816	17,970	49.419
13,080	50.700	14,310	50.541	15,540	50.174	16,770	49.808	18,000	49.411
13,110	50.696	14,340	50.533	15,570	50.163	16,800	49.797	18,030	49.407
13,140	50.696	14,370	50.529	15,600	50.151	16,830	49.789	18,060	49.395
13,170	50.689	14,400	50.525	15,630	50.143	16,860	49.777	18,090	49.388
13,200	50.665	14,430	50.517	15,660	50.128	16,890	49.765	18,120	49.380
13,230	50.669	14,460	50.513	15,690	50.120	16,920	49.750	18,150	49.376
13,260	50.650	14,490	50.509	15,720	50.108	16,950	49.738	18,180	49.364
13,290	50.642	14,520	50.502	15,750	50.108	16,980	49.726	18,210	49.356
13,320	50.677	14,550	50.498	15,780	50.104	17,010	49.715	18,240	49.349
13,350	50.712	14,580	50.494	15,810	50.096	17,040	49.703	18,270	49.337
13,380	50.743	14,610	50.486	15,840	50.093	17,070	49.691	18,300	49.325
13,410	50.755	14,640	50.482	15,870	50.085	17,100	49.680	18,330	49.314
13,440	50.778	14,670	50.474	15,900	50.077	17,130	49.668	18,360	49.302
13,470	50.798	14,700	50.467	15,930	50.069	17,160	49.660	18,390	49.286
13,500	50.798	14,730	50.455	15,960	50.089	17,190	49.649	18,420	49.275

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
18,450	49.267	19,740	48.920	21,030	48.499	22,320	48.032	23,610	47.502
18,480	49.251	19,770	48.904	21,060	48.492	22,350	48.020	23,640	47.494
18,510	49.239	19,800	48.893	21,090	48.480	22,380	48.009	23,670	47.483
18,540	49.228	19,830	48.889	21,120	48.468	22,410	48.001	23,700	47.471
18,570	49.220	19,860	48.877	21,150	48.457	22,440	47.985	23,730	47.455
18,600	49.204	19,890	48.866	21,180	48.445	22,470	47.981	23,760	47.444
18,630	49.208	19,920	48.854	21,210	48.429	22,500	47.970	23,790	47.436
18,660	49.204	19,950	48.842	21,240	48.414	22,530	47.958	23,820	47.428
18,690	49.197	19,980	48.827	21,270	48.406	22,560	47.946	23,850	47.416
18,720	49.193	20,010	48.819	21,300	48.394	22,590	47.935	23,880	47.405
18,750	49.185	20,040	48.807	21,330	48.383	22,620	47.923	23,910	47.393
18,780	49.177	20,070	48.807	21,360	48.371	22,650	47.911	23,940	47.385
18,810	49.169	20,100	48.799	21,390	48.359	22,680	47.896	23,970	47.370
18,840	49.165	20,130	48.792	21,420	48.347	22,710	47.896	24,000	47.362
18,870	49.169	20,160	48.780	21,450	48.332	22,740	47.884	24,030	47.350
18,900	49.165	20,190	48.776	21,480	48.324	22,770	47.872	24,060	47.339
18,930	49.162	20,220	48.768	21,510	48.320	22,800	47.861	24,090	47.327
18,960	49.154	20,250	48.764	21,540	48.308	22,830	47.849	24,120	47.319
18,990	49.146	20,280	48.760	21,570	48.301	22,860	47.833	24,150	47.307
19,020	49.134	20,310	48.764	21,600	48.289	22,890	47.822	24,180	47.296
19,050	49.127	20,340	48.760	21,630	48.285	22,920	47.810	24,210	47.284
19,080	49.115	20,370	48.756	21,660	48.281	22,950	47.798	24,240	47.276
19,110	49.123	20,400	48.753	21,690	48.273	22,980	47.790	24,270	47.261
19,140	49.154	20,430	48.741	21,720	48.266	23,010	47.779	24,300	47.249
19,170	49.146	20,460	48.729	21,750	48.258	23,040	47.771	24,330	47.237
19,200	49.123	20,490	48.718	21,780	48.242	23,070	47.763	24,360	47.229
19,230	49.107	20,520	48.710	21,810	48.215	23,100	47.759	24,390	47.218
19,260	49.091	20,550	48.694	21,840	48.207	23,130	47.751	24,420	47.214
19,290	49.076	20,580	48.679	21,870	48.215	23,160	47.666	24,450	47.202
19,320	49.064	20,610	48.663	21,900	48.199	23,190	47.662	24,480	47.191
19,350	49.053	20,640	48.647	21,930	48.184	23,220	47.654	24,510	47.179
19,380	49.041	20,670	48.632	21,960	48.168	23,250	47.646	24,540	47.171
19,410	49.025	20,700	48.620	21,990	48.145	23,280	47.635	24,570	47.159
19,440	49.017	20,730	48.605	22,020	48.129	23,310	47.627	24,600	47.163
19,470	49.006	20,760	48.593	22,050	48.122	23,340	47.611	24,630	47.070
19,500	48.998	20,790	48.581	22,080	48.110	23,370	47.603	24,660	47.163
19,530	48.990	20,820	48.569	22,110	48.102	23,400	47.592	24,690	47.159
19,560	48.979	20,850	48.558	22,140	48.098	23,430	47.580	24,720	47.206
19,590	48.975	20,880	48.546	22,170	48.086	23,460	47.568	24,750	47.229
19,620	48.963	20,910	48.538	22,200	48.075	23,490	47.557	24,780	47.249
19,650	48.951	20,940	48.527	22,230	48.063	23,520	47.541	24,810	47.249
19,680	48.943	20,970	48.519	22,260	48.051	23,550	47.529	24,840	47.241
19,710	48.928	21,000	48.507	22,290	48.040	23,580	47.518	24,870	47.218

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
24,900	47.226	26,190	46.419	27,480	45.893	28,770	45.551	30,060	45.854
24,930	47.229	26,220	46.408	27,510	45.886	28,800	45.539	30,090	45.835
24,960	47.229	26,250	46.396	27,540	45.878	28,830	45.531	30,120	45.819
24,990	47.226	26,280	46.384	27,570	45.866	28,860	45.523	30,150	45.804
25,020	47.222	26,310	46.372	27,600	45.858	28,890	45.515	30,180	45.792
25,050	47.222	26,340	46.357	27,630	45.847	28,920	45.512	30,210	45.776
25,080	47.202	26,370	46.349	27,660	45.839	28,950	45.441	30,240	45.765
25,110	47.191	26,400	46.334	27,690	45.827	28,980	45.461	30,270	45.749
25,140	47.183	26,430	46.326	27,720	45.815	29,010	45.488	30,300	45.741
25,170	47.171	26,460	46.310	27,750	45.804	29,040	45.508	30,330	45.726
25,200	47.155	26,490	46.295	27,780	45.792	29,070	45.527	30,360	45.714
25,230	47.136	26,520	46.287	27,810	45.780	29,100	45.547	30,390	45.823
25,260	47.105	26,550	46.271	27,840	45.765	29,130	45.566	30,420	45.843
25,290	47.093	26,580	46.260	27,870	45.753	29,160	45.578	30,450	45.866
25,320	47.066	26,610	46.248	27,900	45.741	29,190	45.593	30,480	45.882
25,350	47.050	26,640	46.236	27,930	45.730	29,220	45.605	30,510	45.893
25,380	47.042	26,670	46.224	27,960	45.718	29,250	45.621	30,540	45.909
25,410	47.027	26,700	46.213	27,990	45.706	29,280	45.636	30,570	45.928
25,440	47.015	26,730	46.201	28,020	45.695	29,310	45.648	30,600	45.940
25,470	47.007	26,760	46.189	28,050	45.687	29,340	45.667	30,630	45.956
25,500	47.004	26,790	46.178	28,080	45.675	29,370	45.679	30,660	45.963
25,530	46.992	26,820	46.166	28,110	45.664	29,400	45.699	30,690	45.979
25,560	46.976	26,850	46.158	28,140	45.656	29,430	45.714	30,720	45.991
25,590	46.961	26,880	46.147	28,170	45.644	29,460	45.730	30,750	46.002
25,620	46.945	26,910	46.135	28,200	45.632	29,490	45.745	30,780	46.018
25,650	46.922	26,940	46.127	28,230	45.621	29,520	45.757	30,810	46.030
25,680	46.887	26,970	46.108	28,260	45.613	29,550	45.773	30,840	46.045
25,710	46.805	27,000	46.096	28,290	45.601	29,580	45.788	30,870	46.057
25,740	46.750	27,030	45.971	28,320	45.593	29,610	45.804	30,900	46.069
25,770	46.696	27,060	46.092	28,350	45.578	29,640	45.815	30,930	46.084
25,800	46.637	27,090	46.080	28,380	45.566	29,670	45.827	30,960	46.096
25,830	46.427	27,120	46.073	28,410	45.554	29,700	45.843	30,990	46.111
25,860	46.376	27,150	46.065	28,440	45.543	29,730	45.854	31,020	46.123
25,890	46.256	27,180	46.057	28,470	45.625	29,760	45.870	31,050	46.139
25,920	46.108	27,210	46.045	28,500	45.617	29,790	45.882	31,080	46.147
25,950	46.041	27,240	46.037	28,530	45.609	29,820	45.893	31,110	46.158
25,980	46.474	27,270	46.030	28,560	45.597	29,850	45.901	31,140	46.170
26,010	46.489	27,300	46.018	28,590	45.590	29,880	45.917	31,170	46.186
26,040	46.458	27,330	45.936	28,620	45.582	29,910	45.928	31,200	46.193
26,070	46.462	27,360	45.928	28,650	45.574	29,940	45.940	31,230	46.209
26,100	46.462	27,390	45.917	28,680	45.562	29,970	45.913	31,260	46.217
26,130	46.443	27,420	45.909	28,710	45.566	30,000	45.893	31,290	46.228
26,160	46.427	27,450	45.905	28,740	45.558	30,030	45.870	31,320	46.236

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
31,350	46.248	32,640	46.723	33,930	47.132	35,220	47.401	36,510	47.775
31,380	46.260	32,670	46.735	33,960	47.144	35,250	47.409	36,540	47.779
31,410	46.267	32,700	46.743	33,990	47.152	35,280	47.420	36,570	47.783
31,440	46.279	32,730	46.746	34,020	47.159	35,310	47.428	36,600	47.790
31,470	46.291	32,760	46.758	34,050	47.167	35,340	47.440	36,630	47.798
31,500	46.298	32,790	46.766	34,080	47.175	35,370	47.448	36,660	47.806
31,530	46.314	32,820	46.774	34,110	47.183	35,400	47.459	36,690	47.814
31,560	46.326	32,850	46.781	34,140	47.191	35,430	47.467	36,720	47.822
31,590	46.341	32,880	46.793	34,170	47.198	35,460	47.479	36,750	47.833
31,620	46.357	32,910	46.797	34,200	47.202	35,490	47.487	36,780	47.841
31,650	46.372	32,940	46.809	34,230	47.210	35,520	47.494	36,810	47.849
31,680	46.388	32,970	46.817	34,260	47.218	35,550	47.502	36,840	47.857
31,710	46.400	33,000	46.828	34,290	47.226	35,580	47.510	36,870	47.868
31,740	46.411	33,030	46.840	34,320	47.233	35,610	47.518	36,900	47.880
31,770	46.427	33,060	46.852	34,350	47.222	35,640	47.522	36,930	47.888
31,800	46.443	33,090	46.863	34,380	47.191	35,670	47.529	36,960	47.896
31,830	46.446	33,120	46.879	34,410	47.163	35,700	47.537	36,990	47.899
31,860	46.466	33,150	46.887	34,440	47.136	35,730	47.545	37,020	47.907
31,890	46.478	33,180	46.902	34,470	47.132	35,760	47.553	37,050	47.915
31,920	46.485	33,210	46.914	34,500	47.152	35,790	47.557	37,080	47.919
31,950	46.497	33,240	46.930	34,530	47.167	35,820	47.564	37,110	47.923
31,980	46.505	33,270	46.941	34,560	47.183	35,850	47.572	37,140	47.931
32,010	46.517	33,300	46.953	34,590	47.194	35,880	47.584	37,170	47.935
32,040	46.528	33,330	46.965	34,620	47.210	35,910	47.596	37,200	47.942
32,070	46.536	33,360	46.972	34,650	47.226	35,940	47.607	37,230	47.950
32,100	46.544	33,390	46.984	34,680	47.237	35,970	47.615	37,260	47.958
32,130	46.552	33,420	46.992	34,710	47.253	36,000	47.627	37,290	47.962
32,160	46.559	33,450	47.004	34,740	47.265	36,030	47.638	37,320	47.973
32,190	46.567	33,480	47.007	34,770	47.276	36,060	47.650	37,350	47.981
32,220	46.579	33,510	47.015	34,800	47.288	36,090	47.662	37,380	47.993
32,250	46.587	33,540	47.023	34,830	47.300	36,120	47.674	37,410	48.005
32,280	46.598	33,570	47.027	34,860	47.307	36,150	47.685	37,440	48.016
32,310	46.610	33,600	47.031	34,890	47.315	36,180	47.697	37,470	48.032
32,340	46.622	33,630	47.039	34,920	47.323	36,210	47.713	37,500	48.040
32,370	46.633	33,660	47.046	34,950	47.331	36,240	47.720	37,530	48.055
32,400	46.641	33,690	47.054	34,980	47.339	36,270	47.728	37,560	48.071
32,430	46.653	33,720	47.066	35,010	47.342	36,300	47.736	37,590	48.079
32,460	46.665	33,750	47.074	35,040	47.346	36,330	47.748	37,620	48.090
32,490	46.676	33,780	47.081	35,070	47.358	36,360	47.751	37,650	48.098
32,520	46.688	33,810	47.093	35,100	47.362	36,390	47.759	37,680	48.110
32,550	46.696	33,840	47.101	35,130	47.374	36,420	47.763	37,710	48.118
32,580	46.707	33,870	47.113	35,160	47.381	36,450	47.767	37,740	48.125
32,610	46.715	33,900	47.124	35,190	47.389	36,480	47.771	37,770	48.133

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
37,800	48.141	39,090	48.457	40,380	48.749	41,670	49.041	42,960	49.341
37,830	48.145	39,120	48.464	40,410	48.764	41,700	49.049	42,990	49.345
37,860	48.149	39,150	48.476	40,440	48.768	41,730	49.056	43,020	49.349
37,890	48.149	39,180	48.480	40,470	48.788	41,760	49.068	43,050	49.352
37,920	48.157	39,210	48.476	40,500	48.795	41,790	49.088	43,080	49.360
37,950	48.157	39,240	48.484	40,530	48.803	41,820	49.095	43,110	49.368
37,980	48.160	39,270	48.484	40,560	48.815	41,850	49.099	43,140	49.380
38,010	48.160	39,300	48.488	40,590	48.823	41,880	49.115	43,170	49.391
38,040	48.172	39,330	48.492	40,620	48.830	41,910	49.119	43,200	49.403
38,070	48.176	39,360	48.499	40,650	48.838	41,940	49.134	43,230	49.407
38,100	48.184	39,390	48.507	40,680	48.842	41,970	49.142	43,260	49.419
38,130	48.192	39,420	48.515	40,710	48.846	42,000	49.154	43,290	49.426
38,160	48.203	39,450	48.523	40,740	48.842	42,030	49.162	43,320	49.438
38,190	48.211	39,480	48.527	40,770	48.842	42,060	49.165	43,350	49.450
38,220	48.219	39,510	48.531	40,800	48.846	42,090	49.177	43,380	49.462
38,250	48.231	39,540	48.538	40,830	48.846	42,120	49.181	43,410	49.469
38,280	48.238	39,570	48.546	40,860	48.854	42,150	49.185	43,440	49.477
38,310	48.246	39,600	48.550	40,890	48.862	42,180	49.189	43,470	49.489
38,340	48.258	39,630	48.562	40,920	48.866	42,210	49.189	43,500	49.493
38,370	48.262	39,660	48.569	40,950	48.869	42,240	49.193	43,530	49.500
38,400	48.273	39,690	48.581	40,980	48.873	42,270	49.197	43,560	49.508
38,430	48.277	39,720	48.589	41,010	48.881	42,300	49.201	43,590	49.516
38,460	48.285	39,750	48.597	41,040	48.889	42,330	49.204	43,620	49.520
38,490	48.293	39,780	48.608	41,070	48.897	42,360	49.208	43,650	49.524
38,520	48.297	39,810	48.612	41,100	48.908	42,390	49.216	43,680	49.524
38,550	48.305	39,840	48.620	41,130	48.920	42,420	49.220	43,710	49.528
38,580	48.305	39,870	48.628	41,160	48.928	42,450	49.228	43,740	49.532
38,610	48.312	39,900	48.632	41,190	48.936	42,480	49.236	43,770	49.539
38,640	48.316	39,930	48.636	41,220	48.947	42,510	49.243	43,800	49.543
38,670	48.320	39,960	48.643	41,250	48.955	42,540	49.251	43,830	49.551
38,700	48.328	39,990	48.647	41,280	48.963	42,570	49.263	43,860	49.555
38,730	48.332	40,020	48.655	41,310	48.967	42,600	49.267	43,890	49.559
38,760	48.340	40,050	48.659	41,340	48.975	42,630	49.275	43,920	49.567
38,790	48.347	40,080	48.667	41,370	48.979	42,660	49.282	43,950	49.574
38,820	48.355	40,110	48.671	41,400	48.986	42,690	49.286	43,980	49.578
38,850	48.363	40,140	48.675	41,430	48.990	42,720	49.294	44,010	49.586
38,880	48.371	40,170	48.679	41,460	48.998	42,750	49.302	44,040	49.590
38,910	48.383	40,200	48.686	41,490	49.006	42,780	49.310	44,070	49.602
38,940	48.398	40,230	48.698	41,520	49.010	42,810	49.314	44,100	49.610
38,970	48.406	40,260	48.710	41,550	49.014	42,840	49.317	44,130	49.613
39,000	48.425	40,290	48.721	41,580	49.021	42,870	49.321	44,160	49.621
39,030	48.433	40,320	48.733	41,610	49.025	42,900	49.325	44,190	49.621
39,060	48.445	40,350	48.741	41,640	49.033	42,930	49.333	44,220	49.629

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft
44,250	49.633	45,540	49.913	46,830	50.132	48,120	50.361	49,410	50.716
44,280	49.637	45,570	49.921	46,860	50.139	48,150	50.369	49,440	50.735
44,310	49.645	45,600	49.925	46,890	50.143	48,180	50.369	49,470	50.759
44,340	49.652	45,630	49.929	46,920	50.143	48,210	50.381	49,500	50.782
44,370	49.660	45,660	49.933	46,950	50.151	48,240	50.385	49,530	50.809
44,400	49.664	45,690	49.941	46,980	50.159	48,270	50.393	49,560	50.833
44,430	49.668	45,720	49.945	47,010	50.167	48,300	50.396	49,590	50.856
44,460	49.676	45,750	49.948	47,040	50.170	48,330	50.404	49,620	50.883
44,490	49.680	45,780	49.952	47,070	50.174	48,360	50.412	49,650	50.915
44,520	49.687	45,810	49.960	47,100	50.182	48,390	50.424	49,680	50.946
44,550	49.699	45,840	49.968	47,130	50.182	48,420	50.435	49,710	50.977
44,580	49.707	45,870	49.972	47,160	50.186	48,450	50.443	49,740	51.012
44,610	49.715	45,900	49.972	47,190	50.190	48,480	50.451	49,770	51.043
44,640	49.719	45,930	49.980	47,220	50.198	48,510	50.459	49,800	51.074
44,670	49.730	45,960	49.987	47,250	50.202	48,540	50.463	49,830	51.109
44,700	49.734	45,990	49.995	47,280	50.206	48,570	50.470	49,860	51.148
44,730	49.750	46,020	50.003	47,310	50.213	48,600	50.478	49,890	51.179
44,760	49.758	46,050	50.007	47,340	50.217	48,630	50.482	49,920	51.211
44,790	49.765	46,080	50.015	47,370	50.221	48,660	50.490	49,950	51.250
44,820	49.773	46,110	50.022	47,400	50.229	48,690	50.498	49,980	51.281
44,850	49.781	46,140	50.030	47,430	50.237	48,720	50.502	50,010	51.312
44,880	49.785	46,170	50.034	47,460	50.241	48,750	50.505	50,040	51.347
44,910	49.793	46,200	50.042	47,490	50.245	48,780	50.509	50,070	51.378
44,940	49.800	46,230	50.058	47,520	50.252	48,810	50.517	50,100	51.409
44,970	49.808	46,260	50.065	47,550	50.260	48,840	50.521	50,130	51.440
45,000	49.816	46,290	50.069	47,580	50.268	48,870	50.533	50,160	51.472
45,030	49.820	46,320	50.077	47,610	50.276	48,900	50.537	50,190	51.503
45,060	49.824	46,350	50.085	47,640	50.280	48,930	50.541	50,220	51.542
45,090	49.828	46,380	50.089	47,670	50.287	48,960	50.544	50,250	51.581
45,120	49.828	46,410	50.093	47,700	50.291	48,990	50.544	50,280	51.620
45,150	49.832	46,440	50.093	47,730	50.295	49,020	50.556	50,310	51.655
45,180	49.839	46,470	50.100	47,760	50.299	49,050	50.568	50,340	51.694
45,210	49.839	46,500	50.100	47,790	50.307	49,080	50.572	50,370	51.729
45,240	49.847	46,530	50.104	47,820	50.315	49,110	50.583	50,400	51.768
45,270	49.851	46,560	50.104	47,850	50.319	49,140	50.591	50,430	51.799
45,300	49.859	46,590	50.108	47,880	50.326	49,170	50.603	50,460	51.842
45,330	49.867	46,620	50.108	47,910	50.326	49,200	50.611	50,490	51.877
45,360	49.871	46,650	50.112	47,940	50.338	49,230	50.626	50,520	51.916
45,390	49.878	46,680	50.112	47,970	50.342	49,260	50.638	50,550	51.955
45,420	49.890	46,710	50.116	48,000	50.342	49,290	50.654	50,580	51.978
45,450	49.898	46,740	50.116	48,030	50.350	49,320	50.665	50,610	51.955
45,480	49.902	46,770	50.120	48,060	50.354	49,350	50.681	50,640	51.943
45,510	49.909	46,800	50.128	48,090	50.357	49,380	50.700	50,670	51.931

Time, Min	Sensor Column, Ft	Time, Min	Sensor Column, Ft						
50,700	51.923	51,990	51.764						
50,730	51.916								
50,760	51.908								
50,790	51.900								
50,820	51.888								
50,850	51.881								
50,880	51.873								
50,910	51.869								
50,940	51.857								
50,970	51.853								
51,000	51.846								
51,030	51.842								
51,060	51.838								
51,090	51.834								
51,120	51.830								
51,150	51.826								
51,180	51.826								
51,210	51.822								
51,240	51.818								
51,270	51.814								
51,300	51.810								
51,330	51.807								
51,360	51.799								
51,390	51.795								
51,420	51.787								
51,450	51.779								
51,480	51.772								
51,510	51.768								
51,540	51.760								
51,570	51.760								
51,600	51.756								
51,630	51.752								
51,660	51.752								
51,690	51.752								
51,720	51.752								
51,750	51.752								
51,780	51.752								
51,810	51.752								
51,840	51.752								
51,870	51.752								
51,900	51.752								
51,930	51.756								
51,960	51.760								

January Mine Workings Recharge Rate Analysis

For

September and October 2016

CPE Consultants performed second period analysis for January Mine Workings Pumping Data during September 10th to October 6th of 2016, to determine mine workings groundwater Recharge Rate. Post-monsoon season recharge rate without major storm events was estimated to be 16 gallons-per-minute (GPM), decreasing to 12 GPM following dry periods.

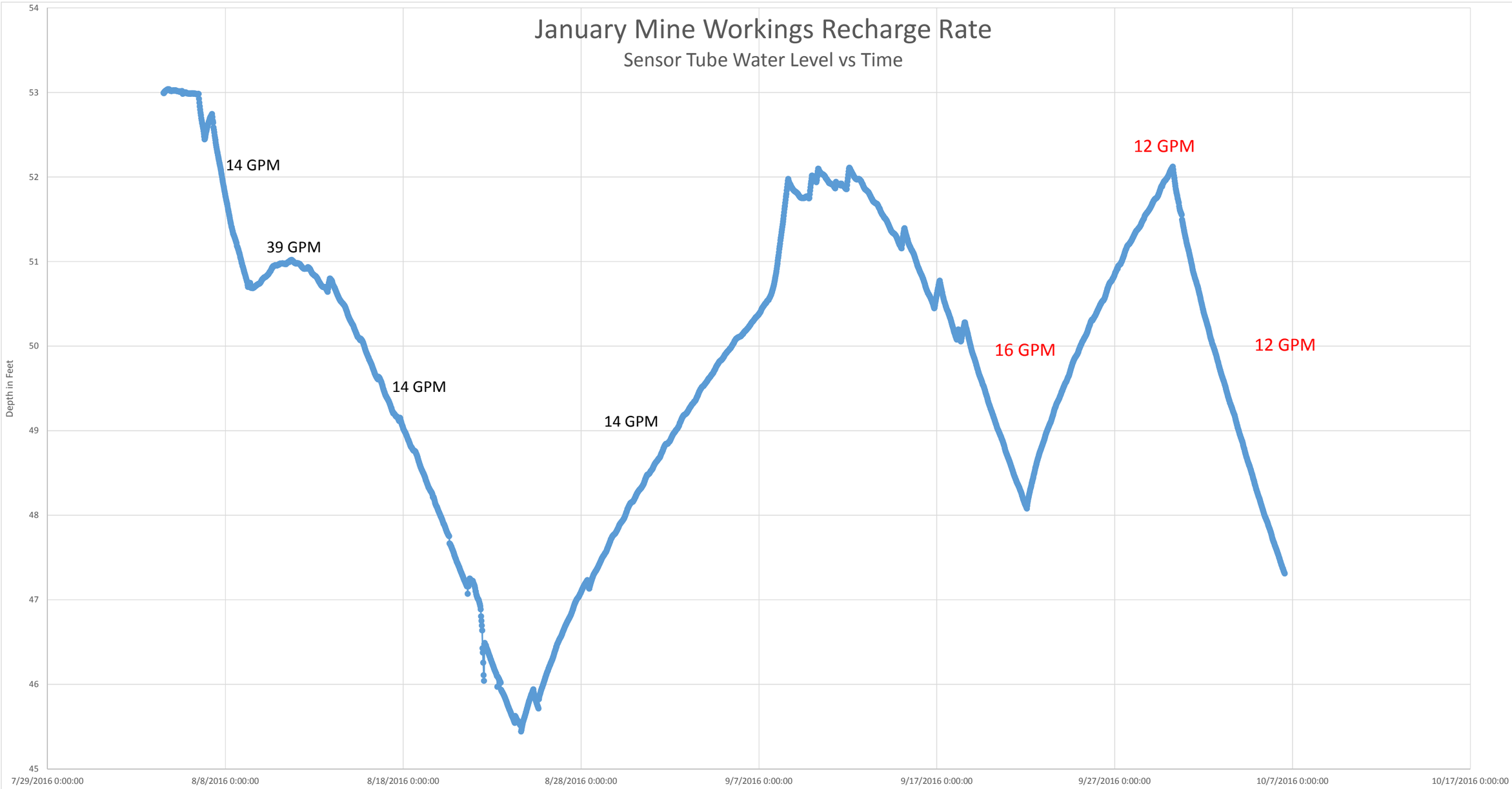
Water Level, Elapsed Time, and Pump Discharge Flowrate data were used to determine the Recharge Rate. A graph was created to compare the relationship between Water Level (ft) and Time (min), as recorded in Monitoring Well #2. Pumping rate during this period was maintained at 32 GPM.

Two time periods were identified based on the data graphed for September-October 2016:

Sep 18 – 25th Post-Monsoon Season Recharge
without Major Storm Events: 16 GPM

Sep 22nd to Oct 5th Post-Monsoon Season Recharge
without Major Storm Events: 12 GPM

These investigations compared January Mine Workings Recharge with Pump Discharge, against Mine Workings Recharge Only (pump off), recording water level change and time data points.


January Mine Workings Recharge Rate
Sensor Tube Water Level vs Time
Depth in Feet
54
53
52
51
50
49
48
47
46
45
14 GPM
39 GPM
14 GPM
14 GPM
16 GPM
12 GPM
12 GPM
7/29/2016 0:00:00
8/8/2016 0:00:00
8/18/2016 0:00:00
8/28/2016 0:00:00
9/7/2016 0:00:00
9/17/2016 0:00:00
9/27/2016 0:00:00
10/7/2016 0:00:00
10/17/2016 0:00:00

January Mine Workings

12-Months Water Mass Balance Estimation.

CPE consultants performed a mass balance analysis of the January Mine Workings to determine the rate of Inflow into the mine workings, and a sustainable rate of groundwater Outflow that can be delivered to the proposed Remediation Passive Treatment System (RPTS).

Please see accompanying chart for reference.

Three assumptions were made:

1. The RPTS will operate at a constant 23 GPM flowrate
2. There are 30-days in each 1-month period
3. There are 43,200 minutes in each 1-month period

Under those assumptions, the RPTS would treat approximately 11,923,200 gallons per year.

Groundwater recharge was observed and measured continuously during a seven-month period, and several spot measurements were taken during those months when continuous measurements were not taken. Seasonal variations were observed during the monitoring period, and recharge rates were estimated for those months where no data is yet available. The result is a one-year flow chart, from January to December, which provides a graphic record of the recharge rate for the mine workings. Tailings Pile Seepage was estimated at a constant 3 GPM flowrate, principally based on pumping records at the seepage collection basin.

Operational system criteria included constant pumping of 20 GPM to RPTS from January Mine Workings, and 3 GPM from Tailings Pile Seepage. Applying a constant pumping rate of 20 GPM to the well in the January Mine Workings, it is anticipated that an overdraft of the water in the mine workings will occur, as this operational pumping rate exceeds the observed rate of groundwater recharge in the mine workings.

A chart that illustrates and explains the computations for pumping in the mine workings well and the computed rate of recovery for the mine workings is included in this appendix. It provides a breakdown of monthly rates and volumes of pumping, ground recharge, seepage, and passive treatment.

Using a conservative assumption that 14 GPM is an annual average for the January Mine Workings groundwater recharge, and that the mine workings containment capacity is prismatic and varies only with depth, a constant 20 GPM flowrate should lower the mine workings static water level by 91 feet in one year. At this time, the mine workings well has a physical water depth of 57 feet. Under these assumptions, it is conceivable that the previously mentioned 20 GPM pumping rate in the well may cause the well to dry up.

The table and graph that accompany this discussion shows the relationship between pumping, ground recharge and treatment rates, and their corresponding volumes for the January Mine Workings, during a projected 12-month period.

JANUARY MINE WORKINGS FLOW BALANCE WORKSHEET 10.19.2016

ASSUMPTIONS

1. Water treatment flowrate at 23 GPM for 1 year = 11,923,200 gallons
2. 30 days per Month
3. 43,200 min per Month

MONTHS	PTS TREATMENT	MINE WORKINGS PUMP to PTS	MINE WORKINGS FLOW		MINE WOKINGS OVER-DRAFT	SEEPAGE PUMP to PTS	SEEPAGE FLOW	MINE WORKINGS FLOW VOLUME TREATED BY PTS	MINE WORKINGS OVERDRAFT VOLUME TREATED BY PTS	TOTAL MINE WORKINGS VOLUME TREATED BY PTS	SEEPAGE VOLUME TREATED TREATED BY PTS	TOTAL VOLUME TREATED BY PTS
UNITS	GPM	GPM	GPM		GPM	GPM	GPM	GALS	GALS	GALS	GALS	GALS
OPERATION								C * 43,200 min	D * 43,200 min	H + I	E * 43,200 min	A * 43,200 min
LABEL	A	B	C		D	E	F	H	I	J	K	G
JAN	23	20	10	Projected	10	3	3	432,000	432,000	864,000	129,600	993,600
FEB	23	20	10	Projected	10	3	3	432,000	432,000	864,000	129,600	993,600
MAR	23	20	7	Projected	13	3	3	302,400	561,600	864,000	129,600	993,600
APR	23	20	7	Projected	13	3	3	302,400	561,600	864,000	129,600	993,600
MAY	23	20	7	Measured	13	3	3	302,400	561,600	864,000	129,600	993,600
JUN	23	20	7	Measured	13	3	3	302,400	561,600	864,000	129,600	993,600
JUL	23	20	14	Measured	6	3	3	604,800	259,200	864,000	129,600	993,600
AUG	23	20	14	Measured	6	3	3	604,800	259,200	864,000	129,600	993,600
SEP	23	20	14	Measured	6	3	3	604,800	259,200	864,000	129,600	993,600
OCT	23	20	12	Measured	8	3	3	518,400	345,600	864,000	129,600	993,600
NOV	23	20	10	Measured	10	3	3	432,000	432,000	864,000	129,600	993,600
DEC	23	20	10	Projected	10	3	3	432,000	432,000	864,000	129,600	993,600
ANNUAL VOLUMES								**5,270,400**	**5,097,600**	**10,368,000**	**1,555,200**	**11,923,200**

SUMMARY

ANNUAL PTS TREATED VOLUME DUE TO ADIT FLOW	5,270,400	GALS
ANNUAL PTS TREATED VOLUME DUE TO ADIT OVERDRAFT	5,097,600	GALS
ANNUAL PTS TREATED VOLUME DUE TO SEEPAGE	1,555,200	GALS
TOTAL ANNUAL PTS TREATED VOLUME	**11,923,200**	**GALS**
ADIT DEPTH CHANGE ESTIMATION (AFTER 12 MONTHS WITH 14 GPM RECHARGE)	90.8	FT
(822,350 GALS = 7.2' DEPTH CHANGE)	(Max pumping depth is appx. 57')	
(114,215 GALS = 1' DEPTH CHANGE)		

Appendix C

Pilot Scale Test Report,

Passive Treatment System January Mine

PILOT SCALE TEST REPORT

PASSIVE TREATMENT SYSTEM

JANUARY MINE

Submitted To: CPE Consultants, LLC
3895 N. Business Center Drive, #115
Tucson, AZ 85705

Submitted By: Sovereign Consultants Inc.
12687 W. Cedar Drive, Suite 305
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October 18, 2016 **DV020.005**

Executive Summary

In conjunction with CPE Consultants (CPE) and Arizona Minerals, Inc. (AMI), Sovereign Consulting Inc. (Sovereign) conducted a pilot scale test to more accurately characterize the influent water quality & flow rates and assess the treatability of the January Mine water and TSF #1 seepage using passive technologies.

The pilot scale passive treatment system (PTS) was constructed at the January Mine Site in February, 2016 and subsequently monitored by AMI personnel for 24 weeks from March to August 2016. The Pilot included the following components based on preliminary water quality data:

- Holding Tank
- Iron Terrace (IT)
- Biochemical Reactor (BCR)
- Aerobic Pond (AP)
- Manganese Removal Bed (MRB)

The holding tank for the pilot initially contained a mixture of mostly January Mine water (1,000 gallons) with some TSF #1 seep water (80 gallons tapering off to zero as the seep water dried up) to simulate anticipated full scale influent conditions. Seep water was only available for the first eight weeks. January Mine water was used exclusively after this time.

The results indicate that the Pilot PTS successfully removed metals from the water sources. The main constituents of concern were iron and zinc because their concentrations were elevated in both the Mine and the Seep waters.

The Pilot PTS was modified in several ways during the 24-week testing interval to improve its performance. In the IT woodchips were removed and replaced with inert gravel. The IT and BCR were isolated for separate influent feeds at different flow rates. A stilling well was installed in the AP to reduce carry over of solids into the MRB and the MRB was rebuilt.

Iron removal in the IT was as high as 91% with treatment efficiency improving from 0.5 to 3.6 grams Fe removed per day per square meter (gdm) after the woodchips were removed. Iron and zinc removal in the BCR was as high as 99%.

Water quality and flow rate data were found to be significantly different than the preliminary assumptions which resulted in some changes to the recommended full scale treatment system (replacing the iron terrace with an equalization basin and replacing the AP with an aerobic polishing wetland).

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B Implementation Plan and Construction Report
C Field data and Graphs
D Laboratory Results

1.0 INTRODUCTION

In conjunction with CPE Consultants (CPE) and Arizona Minerals, Inc. (AMI), Sovereign Consulting Inc. (Sovereign) conducted a pilot scale test to assess the treatability of the January Mine water and TSF #1 seepage using passive technology. These sources of water exhibit elevated metals and sulfate concentrations and depressed pH. The findings of the test program follow.

1.1 Site Description

The January Mine Claim comprises 20.58 acres and is located approximately 5 miles south of the Town of Patagonia, Arizona. More specifically, it lies in the Harshaw Mineral District, within the Southeast Quarter of Section 32, Township 22 South, Range 16 East, Gila and Salt River Meridian, in Santa Cruz County, Arizona. According to public records, it was worked intermittently since the early 1870's, it was patented in 1894, and it was last operated by ASARCO, LLC, (ASARCO) in the period 1925 to 1949.

The 1885 patent survey for the January Mine indicates that the mine claim is a rectangular parcel, with its alignment such that its longest axis has a northwest to southeast orientation. The survey also indicates that the mine at that time had three main shafts, one open cut and an adit, located near its southern corner and next to the Alum Gulch.

The January Mine Claim lies adjacent to, northwest and downstream from two other claims, the Norton Mine and the Trench Camp Mine. Both the January and the Norton mine claims are recognized under a single property designation by the Santa Cruz County Recorder, having been assigned parcel number 105-50-001B. The Trench Camp Mine claim parcel has been assigned parcel number 105-50-001A. The US Forest Service manages the surrounding adjacent lands, as part of the Coronado National Forest.

All three mining claims drain into Alum Gulch, with the January Mine Claim lying furthest downstream. The Norton Mine Claim is another rectangular parcel aligned as the January Mine Claim, and abutting its southern boundary; it comprises 19.63 acres. The southern boundary for the Norton Mine Claim abuts and is contained within the larger Trench Camp Main Claim. The latter comprises 253.23 acres and contains the upstream areas for the watershed that empties through the January Mine claim.

Alum Gulch is a tributary to Sonoita Creek, joining it approximately 5.5 miles downstream from the January Mine and 2.25 miles southwest from the Town of Patagonia. Terrain within the mining claim sites and along Alum Gulch is steep and rocky, with washes carving out relatively narrow valleys through the native material. Rock outcrops and angular cobbles are readily visible in most areas, and bedrock is visible in the areas that experienced mining activity. The vegetation cover ranges from sparse grassland at the lower elevations and around the former mining worksites, and gradually increases to moderate densities at higher elevations, with trees and shrubs typical of desert mountain terrain and generically catalogued as Madrean Evergreen Woodland.

1.2 Pilot Scale Process Summary

Following a Sovereign design, a pilot scale passive treatment system (PTS) was constructed at the January Mine Site in February, 2016 and subsequently monitored by AMI personnel. The Pilot PTS included the following components:

- A Holding Tank,
- An Iron Terrace (IT),
- Biochemical Reactor (BCR),
- Aerobic Pond (AP), and
- Manganese Removal Bed (MRB)

The Pilot PTS was configured in the same sequence that was proposed in the full scale conceptual design for the January Mine PTS as part of a regulatory submittal.

The pilot was located adjacent to the existing wetland which receives gravity flow from the January Adit. The holding tank for the pilot contained a mixture of mostly January Mine water with some TSF #1 seep water added to simulate the full scale influent conditions. Originally it was proposed to add TSF #2 seep but TSF #2 had been dry for the duration of the pilot testing. Therefore, only Mine water and TSF #1 seep was used as the feed water to the pilot PTS.

An illustration showing the process flow diagram for the Pilot is provided in Figure 1. In subsequent process modifications, the biochemical reactor and IT both received water directly from the holding tank at different flow rates. During this time the IT effluent was diverted to the existing wetland, not the BCR.

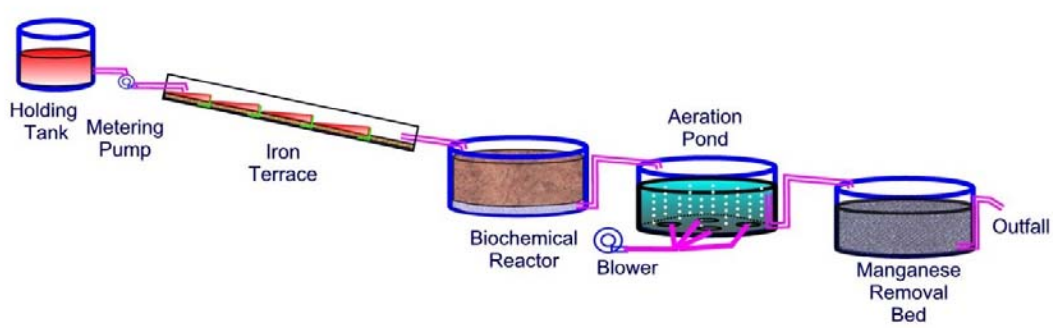

Figure 1 – Pilot Scale Passive Treatment Process Flow Diagram

1.3 Pilot PTS Goals

The Pilot PTS was designed to provide a semi-flexible test for several process units that (by conventional wisdom) would significantly improve the characteristics of the various water sources at the site. Passive treatment technology was the focus.

Individual components such as the iron terrace and biochemical reactor were fitted with intermediate sample points to generate data designed to gain a better understanding of the internal kinetics. This data would support the detailed final design effort.

Influent water chemistry and flow rate data was also collected to provide a more definitive basis for characterizing and quantifying the water that required treating. Preliminary characterization consisted of some historic records and one grab sample that was analyzed prior to the pilot testing.

2.0 PILOT OPERATION, MAINTENANCE, AND MONITORING

2.1 Operation and Maintenance

AMI staff operated the Pilot PTS for 24 weeks. This effort included field monitoring, collecting samples for laboratory analysis, system maintenance, and making a few alterations to the system. Weekly monitoring began in early March, 2016 (week zero), following the construction and commissioning phase and a one week incubation period (no forward flow). Field monitoring consisted of system observations, use of hand-held analytical instruments by onsite staff, and some field test kits. Field monitoring and analytical sample collection followed a sampling and analysis plan (SAP) prepared by Sovereign. This document included monitoring instructions, data reporting requirements, and blank field monitoring forms. One field monitoring form per week along with a set of photos were used for sharing observations, data, and for internal discussions of pilot performance with AMI and CPE staff. The photographs were taken of each pilot unit from roughly the same angle to help identify any changing appearances or conditions. Operation and maintenance activities other than monitoring and sampling included:

- Adjusting the influent pump flow rate that was feeding the iron terrace and measuring the flow rate at each pilot unit effluent.
- Inspecting the AP blower and air diffusers.
- Installing a stilling well in the AP to minimize solids carry over into the MRB.
- Replacing the AP blower that failed while in service. The blower was replaced twice.
- Removing of the AP sludge when the blower was replaced the first time.
- Refilling the MIW holding tank with Mine and Seep (as available) water. Toward the end of the test interval the January Mine water was extracted by a pump located deeper in the mine (instead of from the Adit overflow) to fill the pilot influent tank.
- Removing the woodchips from the IT and adding a layer a gravel to test if the IT would develop a better iron removal rate. The wattles were also removed.
- Removing and replacing the rock/limestone from the MRB to remove metals solids build up that carried over from the AP.
- Removing sludge deposited in the MRB effluent pipe to maintain unrestricted flow.

The timeline of major pilot test events is summarized in Table 1.

Table 1. Timeline of Major Pilot Test Events - 2016

Date	Week	Events
2/29	-2	Start Construction
3/02	-1	Incubation Period for BCR and IT
3/09	0	Commissioning – Start Steady State Flow Rate - 300 mL/min
3/22	2	First sampling event
3/30	3	MRB effluent pipe flow restricted due to clogging
5/03	8	Mine pool pumping test. Sample collected for field parameters and ICP metals (CSM)
5/10	9	No TSF#1 seepage; the collection sump was dry
6/08	13	AP air flow down AP was drained and the air stones cleaned Air pump was replaced and airflow resumed MRB down
6/15	14	AP back on line, no flow rate measurable-AP being diverted via overflow to avoid MRB
6/22	15	MRB under reconstruction Removal of organic matter from IT
6/28	16	Pilot sampling by Sovereign and AMI personnel MRB back on line
7/06	17	Composite water straight into the BCR (IT bypass). An additional pump was connected to feed only the IT. IT discharging into the wetland A single layer of inert gravel was added to the floor area of the IT
7/13	18	Air flow down. Pump was replaced and airflow resumed Flow rate to the BCR was increased to 500 mL/min Flow rate to the IT was increased to 1400 mL/min
8/06	21	Pumping of January Mine initiated – Flow from Adit stopped. Pilot influent switched to pumped water on next tank fill (Week 22)
8/24	24	End of pilot testing
8/30	-	TSF #1 seepage Composite Tank drained and filled with Seep water IT Slug test. Run one third of the Composite Tank water through the IT in the morning and the second third in the evening.
8/31	-	Run the final third of the Composite Tank water through the IT in the morning

2.2 Pilot Monitoring

The pilot system was scheduled for up to 24 weeks of monitoring. The details of the monitoring plan are presented in the document entitled: *Sampling and Analysis Plan (SAP)* (Appendix A).

2.3 Test Sampling and Analysis

Pilot Test monitoring covered the following phases.

- Baseline monitoring
- Incubation period monitoring
- Steady-State operation monitoring

Tables 2 through 6 include summaries of sampling and analyses conducted during each of the Pilot Test phases.

Table 2. Baseline Monitoring

Baseline Monitoring					
Date	**PTS Unit**	**Description**	**LOI**	**Ca, Mg, K, Na**	**Metals**
3/8/2016	BCR	Woodchips	X		
		Sawdust	X		
		Straw	X		
		Limestone		X	
	MRB	Rock			X

Note: Samples were collected before construction

LOI – Loss on Ignition

Table 3. Incubation Period Monitoring

Date	Laboratory Analysis and Field Parameters								
	Total Metals	**pH**	**Temp**	**Conductivity**	**ORP**	**Fe^{+2}**	**Flow Rate**	**Hardness**	**SO_4**
3/8/2016	C	A,T,C	A,T,C	A,T,C	A,T,C,B	C	C,IE	C	A,T,C
3/16/2016		A,T,C	A,T,C	A,T,C	A,T,C,B	C	C,IE,M		A,T,C

Notes for Tables 3, 4, 5, and 6:
Fe^{+2} – Ferrous Iron
SO_4 – Sulfate
ORP – Oxidation Reduction Potential
DO – Dissolved Oxygen
BOD – Biological Oxygen Demand
TOC – Total Organic Carbon
Cr^{+6} – Hexavalent Chromium
CN – Cyanide
Hg – Mercury
Total Metals - Al, Cd, Cu, Fe, Pb, Mn, Zn
[1]Total and Dissolved Metals - Al, Cd, Cu, Fe, Pb, Mn, Zn
[2]Total and Dissolved Metals - Sb, As, Ba, Be, B, Cr, Ni, Se, Ag, Tl
C - Composite, **A** – January Mine, **T** - Seep, IM – Iron Terrace Mid, IE – Iron Terrace End, B – BCR, AP – Aeration Pond, M – MRB

Table 4. Influent Steady-State Operation Monitoring – Laboratory Analysis

Sampling Event		Laboratory Analysis							
		Influent Sample							
Date	Week	Total Metals	Dissolved Metals	Cr^{+6}	CN	Hg	Hardness	Sulfate	Alkalinity
3/23/2016	2	C							
4/6/2016	4	C							
4/20/2016	6	C	A						
5/4/2016	8	A,T,C	A				A,T,C	A,T,C	
5/18/2016	10	C							
6/1/2016	12	A,C	A,C	C	C	C	C	C	A,C
6/15/2016	14	A,C	C						
6/29/2016	16	A,C	A,C				A,C	A,C	
7/20/2016	19	A,C	A,C	C	C	C	C	C	C
8/3/2016	21	A,C	A,C						
8/10/2016	22	C	C						
8/24/2016	24	A,T,C	A,T,C				T,C	T,C	
9/2/2016	25	T		T	T	T		T	

Table 5. Effluent Steady-State Operation Monitoring – Laboratory Analysis

Sampling Event		Laboratory Analysis										
		Effluent Sample										
Date	Week	Total Metals	Dissolved Metals	Cr^{+6}	CN	Hg	Sulfate	Sulfide	Hardness	Alkalinity	BOD	TOC
3/23/2016	**2**											
4/6/2016	4	IM.IE,B,AP,M					IM,IE,B,AP,M		IM,IE,B,AP,M		B,AP	IM,IE,B
4/20/2016	6	IM.IE,B,AP,M	M									
5/4/2016	8	IM.IE,B,AP,M	M				IM,IE,B,M		IM,IE,B,AP,M			IM,IE,B
5/18/2016	10	IM.IE,B,AP,M										
6/1/2016	12	IM.IE,B,AP,M	IM.IE,B,AP,M	M	M	M	IM,IE,B,M	B,M	IM,IE,B,AP,M		B,AP	IM,IE,B
6/15/2016	14	IM.IE,B,AP	IM.IE,B,AP									
6/29/2016	16	IM.IE,B,AP,M	IM.IE,B,AP,M				IM,IE,B,M		IM,IE,B,M			
7/20/2016	19	IM.IE,B,AP,M	IM.IE,B,AP,M	B,M	B,M	B,M	IM,IE,B,M	B,M	IM,IE,B,M	B,M	B,AP	IM,IE,B
8/3/2016	21	IM.IE,B,AP,M	IM.IE,B,AP,M									
8/10/2016	22	IM.IE,B,AP,M	IM.IE,B,AP,M									
8/24/2016	24	IM.IE,B,AP,M	IM.IE,B,AP,M				IM,IE,B,AP,M	B,AP	IM,IE,B,M		B,AP	B
9/2/2016	25	IM,IE										

Table 6. Steady State Operation and Monitoring – Field Parameters

Sampling Event		Test Cells Effluent and Influent Sample								
Date	Week	pH	Temperature	ORP	Conductivity	Odor	Water Color	Fe^{+2}	DO	Flow Rate
3/8/2016	0	X	X	X	X	X	X			X
3/16/2016	1	X	X	X	X	X	X			X
3/23/2016	2	X	X	X	X	X	X		A,T,C,IM,IE,B,M	X
3/30/2016	3	X	X	X	X	X	X		A,T,C,IM,IE,B,AP,M	X
4/6/2016	4	X	X	X	X	X	X		M	X
4/13/2016	5	X	X	X	X	X	X	A,T,C,IM,IE	B,AP,M	X
4/20/2016	6	X	X	X	X	X	X	C,IM,IE	AP,M	X
4/27/2016	7	X	X	X	X	X	X	C,IM,IE	AP,M	X
5/4/2016	8	X	X	X	X	X	X	C,IM,IE	AP,M	X
5/11/2016	9	X	X	X	X	X	X	C,IM,IE	AP,M	X
5/18/2016	10	X	X	X	X	X	X	C,IM,IE	AP,M	X
5/25/2016	11	X	X	X	X	X	X	C,IM,IE		X
6/1/2016	12	X	X	X	X	X	X	C,IM,IE		X
6/8/2016	13	X	X	X	X	X	X	C,IM,IE	AP,M	X
6/15/2016	14	X	X	X	X	X	X	C,IM,IE	AP,M	X
6/22/2016	15	X	X	X	X	X	X	C,IM,IE		X
6/29/2016	16	X	X	X	X	X	X	C,IM,IE	AP,M	X
7/6/2016	17	X	X	X	X	X	X	C,IM,IE		X
7/13/2016	18	X	X	X	X	X	X	C,IM,IE		X
7/20/2016	19	X	X	X	X	X	X	C,IM,IE	AP,M	X
7/27/2016	20	X	X	X	X	X	X	C,IM,IE	AP,M	X
8/3/2016	21	X	X	X	X	X	X	C,IM,IE	AP,M	X
8/10/2016	22	X	X	X	X	X	X	C,IM,IE	AP,M	X
8/17/2016	23	X	X	X	X	X	X	C,IM,IE	AP,M	X
8/24/2016	24	X	X	X	X	X	X	C,IM,IE	AP,M	X

2.4 Water Sampling Locations and Collection Procedures

The sample location diagram [provided in *Sampling and Analysis Plan (SAP) (*Appendix A)] illustrates the pilot system set-up and identifies the approximate locations were samples were collected for the IT, BCR, AP, and MRB. Essentially, a sample was collected at each location as follows: Influent "raw" water [mixed January Mine water and Seep (as available) water after the metering pump from the influent tank]; IT middle, IT end, BCR effluent, AP effluent, and MRB effluent. Specific sampling information includes:

- Water samples were collected for analysis from the discharge pipes/tubes exiting the BCR, AP, and MRB units to minimize any disturbance of the material. Water samples from the IT were collected in the IT middle (sampling in a manner that minimized disturbance to the iron precipitate proved to be difficult), and the IT end discharge pipe that fed into the BCR.

- Influent water samples were collected for analysis from the January Mine discharge and the TSF #1 seep. A Holding Tank was used to mix the January Mine water and the Seep water. The initial mixing ratio was 1000 gallons of January Mine with 80 gallons of Seep water. The amount of Seep water diminished to zero as the Seep dried up.

- Influent and effluent water samples were collected in a beaker and the field monitoring observations in the sample were measured with hand held probes.

- Dissolved oxygen (DO) samples were collected and measured immediately after the sample was collected. DO was measured using a HACH Pocket Colorimeter™ II Filter Photometer.

- Ferrous iron testing was performed using a HACH Iron (Ferrous) Color Disc Test Kit, Model IR-18C, 0.2-7 mg/L. Due to the low iron range of the Test kit, the sample was diluted at a ratio of 2:1. The water used for sample dilution was boiled deionized water and stored in a closed container with no head space.

- Water samples collected for analysis of total and filtered/dissolved constituents were preserved with nitric acid. The dissolved samples were passed through a 0.45 µm filter.

- Water samples collected for analysis of cyanide, hexavalent chromium, and mercury were initially sent to Turner Laboratory. A second set of samples from the next sampling event was sent to ACZ for cyanide, hexavalent chromium, and mercury analysis due to ACZ's lower detection limits for these constituents.

3.0 PILOT DESIGN BASIS CRITERIA

3.1 Design Basis Water Quality

The pilot scale system was treating the water from the Holding Tank that contained a mixture of water from the January Mine and the Seep (initially mixed at 1000 January Mine to 80 gallons seep water). The pilot scale system was design based on the chemistry shown in Table 7. The data in Table 7 was obtained from a single water sample collected during the recent site visit. The January Mine water iron concentration was assumed to be 80 mg/L based on the water quality data from the Arizona Pollutants Discharge Elimination System (AZPDES) Fact Sheet. Seep manganese concentration was assumed to be 800 mg/L based on the metals concentrations ratio from the pond that collects water from the TSF #1 seepage.

Table 7. Pilot Influent Water Chemistry

Parameter	Units	January Mine Water[1]	TSF #1 Seepage[1]	Mixed Water Chemistry (PTS Influent)[2]
Flow	gpm	45	3	0.08
pH	s.u.	5.8	4.2	-
Iron	mg/L	80	14	76
Aluminum	mg/L	0.004	346	22
Copper	mg/L	0.0004	3.8	0.24
Lead	mg/L	0.005	0.45	0.03
Zinc	mg/L	16	588	52
Cadmium	mg/L	0.01	11.7	0.74
Nickel	mg/L	0.1	6	0.46
Manganese	mg/L	65	800	111

Notes:
[1] Results from water samples collected during the Site visit on February 10, 2015.
[2] Holding Tank water

The mixed water chemistry was calculated using the following equation:

$$\text{Mixed Water Chemistry} = \frac{C_1Q_1 \text{ X } C_2Q_2}{Q_1 + Q_2}$$

Where:
C_1 = January Mine Metal concentration
C_2 = Seep Metal water concentration
Q_1 = January Mine water monthly average flow rate (Tetra Tech, 2013)
Q_2 = Assumed Seep flow rate

3.2 Flow Rate

The Holding Tank was filled with the January Mine water and Seep water (as available). The pilot flow design rate was 300 ml/min (0.08 gpm). On week 9 there was no seepage from TSF #1, therefore, only January Mine water was used.

The pilot configuration and flow rate was maintained for 17 weeks. At this point an additional pump was added to provide influent directly to both the IT and the BCR. The flow was increased to 1,400 mL/min to the IT and about 400 mL/min to the BCR.

Due to monsoon storm events in week 24, TSF #1 seepage was again detected in the collection sump. Consequently, an additional one time “slug” test was done after the pilot was finished (week 25) to evaluate just the Seep water through the IT. One thousand gallons of Seep water was added to the Holding Tank and delivered to the IT at a rate of about 2,500 mL/min over a period of 24 hrs. Because the iron concentration of the Seep water was relatively dilute (about 2 mg/L) the test was not conclusive about iron removal over the IT. This did indicate a seasonal change in the water chemistry from the Seep that was taken into consideration in the implications for full scale treatment.

3.3 Pilot PTS Components Sizing Criteria and Construction

The Pilot PTS components and sizing criteria are described in detail in the *Pilot Test Implementation Plan in* Appendix B. This appendix also includes the Pilot PTS construction as-built report.

4.0 PILOT SCALE TEST RESULTS

4.1 Field Parameters

Field parameter values in water samples were measured weekly and the results are discussed below; graphs and field data sheets are included in Appendix C.

pH

Minor changes in pH were observed in samples collected throughout the pilot test. Change in the influent water pH was attributed to the natural variability of the water source. When the January Mine water and Seep water were mixed (approximately 25:2 ratio or 7% Seep water), the influent water pH ranged from 5.8 to 6.2. When the influent water consisted of only January Mine water, the pH ranged from 5.9 to 6.5.

The pH across the IT increased due to the presence of natural bicarbonate alkalinity in the January Mine water. The pH of the IT effluent ranged from 6.8 to 7.8. The BCR effluent pH ranged from 5.3 to 6.7. This slight decrease may have occurred as a result of the accumulation of organic acids from fermenting bacteria activity or from the precipitation of metal sulfides as shown in the equation below.

$$Zn^{+2} + HS^{-} \rightarrow ZnS + H^{+}$$

The pH in the AP was the highest of all the pilot units due to the increased alkalinity in the BCR effluent (which was the AP influent). In addition to the alkalinity contributions from limestone component in the BCR media, alkalinity (HCO_3^-) in the BCR effluent can also be attributed to biological activity associated with sulfate reduction as shown in the equation below.

$$SO_4^{-2} + 2\ CH_2O \rightarrow HS^{-} + \mathbf{2HCO_3^{-}} + H^{+}$$

Residual alkalinity in BCR effluent contributed to the pH rise in the AP effluent which ranged from 7.0 to 8.1. In a full scale system, a similar range would be expected in the effluent of an aerobic polishing wetland (APW).

The MRB effluent pH ranged from 6.8 to 8.0.

Temperature

Operating water temperature is typically of interest in the PTS design process because it can influence the microbial kinetics of the treatment units, particularly BCRs. While the test program was unable to evaluate the effects of low winter-like temperatures, with the lowest daily observed temperature at 13 ºC on week 3 (March 30, 2016), very low temperatures are not of concern for the Site. The highest water temperature was 31 ºC on week 17 (July 5, 2016). Metals removal occurred throughout the test and the PTS performance overall appears to be insensitive to typical site

temperature variations. No special temperature-related design considerations for the full-scale system were implicated.

Flow Rate

Flow rate was approximately 300 mL/min for 17 weeks. The flow rate varied slightly through the pilot units due to suspected evaporation in the IT. On week 18, the IT and the BCR were decoupled. The influent water from the Holding Tank was fed directly to the IT and to the BCR with separate pumps. The flow was increased to test the performance of these two units at a different flow rates. The flow rate for the IT was approximately 1,400 mL/min and for the BCR was about 400 mL/min.

Oxidation-Reduction Potential (ORP)

Negative ORP values indicate anaerobic conditions that are conductive to sulfate reduction. The raw January Mine water ORP ranged from -179 to 118 mv, indicating the presence of both oxidizing and reducing conditions. In contrast, samples from the TSF #1 sump exhibited oxidizing ORP values ranging from 270 to 374 mv. The initial Holding Tank ORP measurements suggest that January Mine water and Seep mixtures typically exhibited oxidizing conditions but when the Holding Tank only received January Mine water, reducing conditions prevailed. Apparently, January Mine water ORP was relatively sensitive to the addition of a small proportion of Seep water. The Holding Tank water ORP ranged from -124 to 132 mv.

Although iron terraces are expected to operate under predominantly oxidizing conditions, the ORP values of the IT effluent were usually negative which is reflective of reducing conditions. The presence of organic matter in the IT (at least initially) could have contributed to this condition. The IT effluent ORP ranged from -243 to 34 mv.

BCR effluent was consistently anaerobic, which was a primary operational goal. The BCR effluent ORP ranged from -17 to -384 mv. The AP effluent ORP ranged from -262 to 118 mv indicating that the blower was sometimes unable to aerate the tank efficiently. Due to carryover from the AP, the MRB effluent ORP mirrored the AP ORP values; the MRB effluent ORP ranged from -240 to 150 mv.

Conductivity

Conductivity is the ability of a substance to conduct electricity. The conductivity of water shows a direct correlation to the concentration of dissolved ions.

The January Mine water exhibited the lowest pilot system conductivity which ranged from 3.5 to 5.3 mS/cm. The Seep had the highest pilot system conductivity which ranged from 8.6 to 17.2 mS/cm. The IT, BCR, AP and MRB effluents exhibited comparable conductivity values and ranged from 4.1 to 5.7, 4.1 to 5.9, 4.1 to 5.3, and 4.2 to 5.7 mS/cm, respectively.

Dissolved Oxygen (DO)

Dissolved oxygen was primarily measured in the AP and MRB. Additional DO testing in the influent waters and the other pilot system units was conducted infrequently; the results are inconsequential to the design process and are not discussed here. The DO was tested in the AP to evaluate the aeration efficiency provided by the blower. The AP DO ranged from 2.0 to 8.8 mg/L. The lowest DO reading (2 mg/L) was due to a malfunctioning blower. The blower was subsequently replaced and the DO increased. This situation recurred once more and the reported DO was 3 mg/L. The blower was replaced twice during the test interval.

The MRB was measured to evaluate the DO concentration of the discharged pilot system effluent. The MRB DO ranged from 0.5 to 3.1 mg/L. The lower value of this range coincided with a malfunctioning blower situation.

Ferrous Iron (Fe^{+2})

Ferrous iron was measured in the Holding Tank water and in the IT middle and IT effluent. Ferrous iron was measured in the IT to evaluate the iron removal rate throughout the IT. Ferrous iron concertation in the Holding Tank, IT middle, and IT end samples ranged from 2 to 7 mg/L, 1 to 11 mg/L, and 1 to 8 mg/L, respectively.

4.2 Laboratory Analysis

Alkalinity

The January Mine water had a natural alkalinity of approximately 200 mg/L. The BCR and MRB effluent alkalinity concentrations were 440 and 290 mg/L (alkalinity was tested only once). Elevated effluent alkalinity concentrations indicate desirable biological processes were occurring in the BCR, and/or that the limestone present in the BCR was dissolving.

Hardness

ADEQ has issued water quality standards based on hardness and samples were tested for this parameter to assess PTS effluent quality. The typical water hardness for the pilot PTS effluents was around 1,300 mg/L. Seep water hardness was approximately 900 mg/L.

Total Organic Carbon (TOC)

TOC was measured only in the IT and the BCR. Originally, the IT media was comprised of woodchips (organic matter) and this design feature prompted TOC measurements. On week 15, the woodchips were removed; therefore, the IT TOC was only measured during three sampling events. The TOC in the IT effluent ranged from 3.6 to 6.3 mg/L. The TOC in the BCR effluent gradually decreased over the course of the testing. The BCR TOC ranged from 150 to 19 mg/L.

The presence of TOC in the BCR effluent is interpreted as a measure of BCR inefficiency. The lower the TOC value, the better, as the presence of carbon in the BCR effluent suggests that it was not being utilized by the sulfate reducing microbial community. Elevated TOC values at startup infer that the microbial community had yet to mature fully.

Biological Oxygen Demand (BOD)

BOD was measured in the BCR due to the reducing conditions and biological activity. The AP was designed to remove the BOD, therefore it was measured also in the AP. The BCR BOD ranged from 80 to 330 mg/L (out of three samples). The AP BOD ranged from 33 to 65 mg/L.

Sulfate

January Mine water sulfate concentrations were approximately 2,400 mg/L and Seep water was around 9,500 mg/L. The Holding Tank sulfate concentrations ranged from 2,400 to 2,800 mg/L. The IT sulfate effluent concentration ranged from 2,400 to 3,000 mg/L. The BCR sulfate effluent concentrations ranged from 2,100 to 2,900 mg/L indicating some sulfate reduction was occurring in the BCR. The MRB sulfate concertation ranged from 2,100 to 3,000 mg/L. In one sample the MRB reported a sulfate concentration of 5,600 mg/L. This was considered an outlier because nothing in the MRB should have produced sulfate.

Sulfide

Sulfide was produced in the BCR due to sulfate reduction, therefore it was measured in the BCR effluent and in the MRB. Sulfide concentrations in the BCR ranged from 5.7 to 6.9 mg/L. Sulfide in the MRB ranged from non-detected to 5.5 mg/L.

Multi-Element Scans (ICP/AES)

The ICP results mainly from week 19 were used to discuss the Pilot PTS performance due to changes to the influent water chemistry. The source for the January Mine water was changed during the last three weeks of the Pilot test from the over flow point in the January Adit to pumped water from wells located deeper in the mine. This was done to accommodate utilization of the January Mine water for other activities at the site and also serve as a water quality test for “pumped” water from the mine. This was important because for the full scale treatment system water will need to be pumped form the mine to deliver it to the treatment system location. The Pilot test results of week 19 are presented in Table 8. The total metals concentrations in Table 8 are presented for comparison. The total and dissolved metals concentrations were used to make engineering decisions for the full scale design.

As mentioned in Section 3.2, the flow from the holding Tank was split to directly feed to the BCR and IT in week 17. The flow rate to the IT and BCR was also increased to 1400 ml/min and 400 ml/min,

respectively. Therefore, the results presented in Table 8 show the performance of the isolated IT and the BCR disconnected from the IT.

The results shown in Table 8 are from CSM lab. As mentioned in Section 2.4 three water samples were sent to ACZ for cyanide, hexavalent chromium, and mercury testing due to ACZ lower detection limits for these constituents. In addition, the selenium results from Turner were used for metal discussion because a possible interference problem that CSM has with spectrometer lines associated with sulfur.

Pilot PTS Influent Water – On week 19, the Pilot PTS received January Mine water only as an its influent source. Therefore, the January Mine water and Holding Tank results were assumed to be the same. However, the results in Table 8 indicate that some metals concentrations vary. This could easily be caused by chemical reactions occurring in the Holding Tank.

Iron Terrace (IT) – Based on the results from Table 8, the iron removal in the IT middle was 84%. The iron removal from the IT middle to the IT end was 45%. The overall iron removal was 91%. The grams of iron removed per day per square meter (gdm) were calculated for the IT mid, the IT end and for the whole length of the IT. The gdm was 6.7 (IT mid), 0.6 (IT end), and 3.6 (whole IT).

Biochemical Reactor (BCR):

Metal percent removal in the Pilot are presented in Table 9.

- **Trace Metals (Not-detected)** – Dissolved concentrations of antimony, hexavalent chromium, mercury, cyanide were not detected in influent water samples. These analytes were also not present above detection limits in BCR effluent samples.

- **Trace Metals (Above detection limit)** - Cadmium chromium, thallium, copper, lead, arsenic, boron, nickel, beryllium, and selenium were removed in the BCR. Barium and silver concentrations in the BCR effluent were virtually unchanged when compared to the BCR influent values.

- **Trace Metals (Above the influent water metals concentrations) –** Barium and cyanide concentrations in the BCR effluent were slightly above these metals concentrations in the Holding Tank.

- **Iron and Zinc Removal –** Iron and zinc removal in the BCR was 99%. Figure 2 and 3 show the iron and zinc results from week 12 to 24. It can be noted in Figure 2 that the iron concentration in week 22 and 24 changed considerably and the zinc concentrations were the same.

Manganese Removal Bed (MRB) – Manganese was not removed in neither the IT nor the BCR. Manganese removal in the MRB effluent was about 50%.

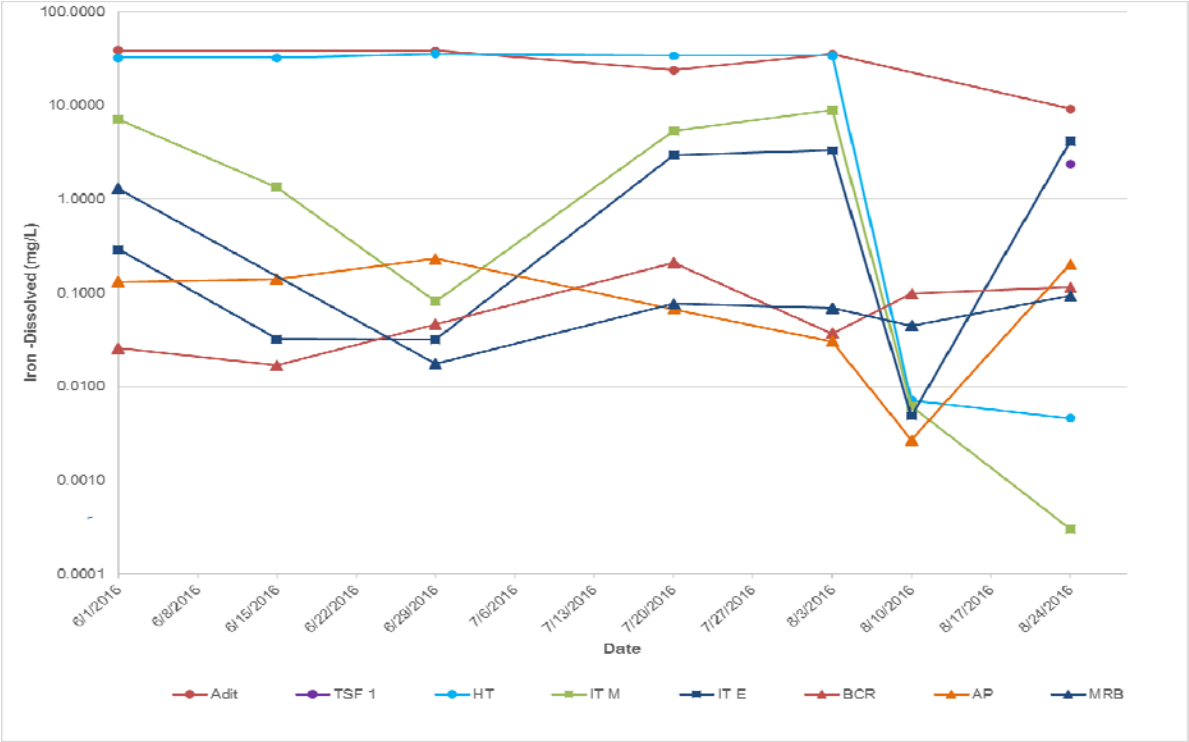

Figure 2 - Dissolved Iron Concentration in the Pilot PTS (CSM Results)

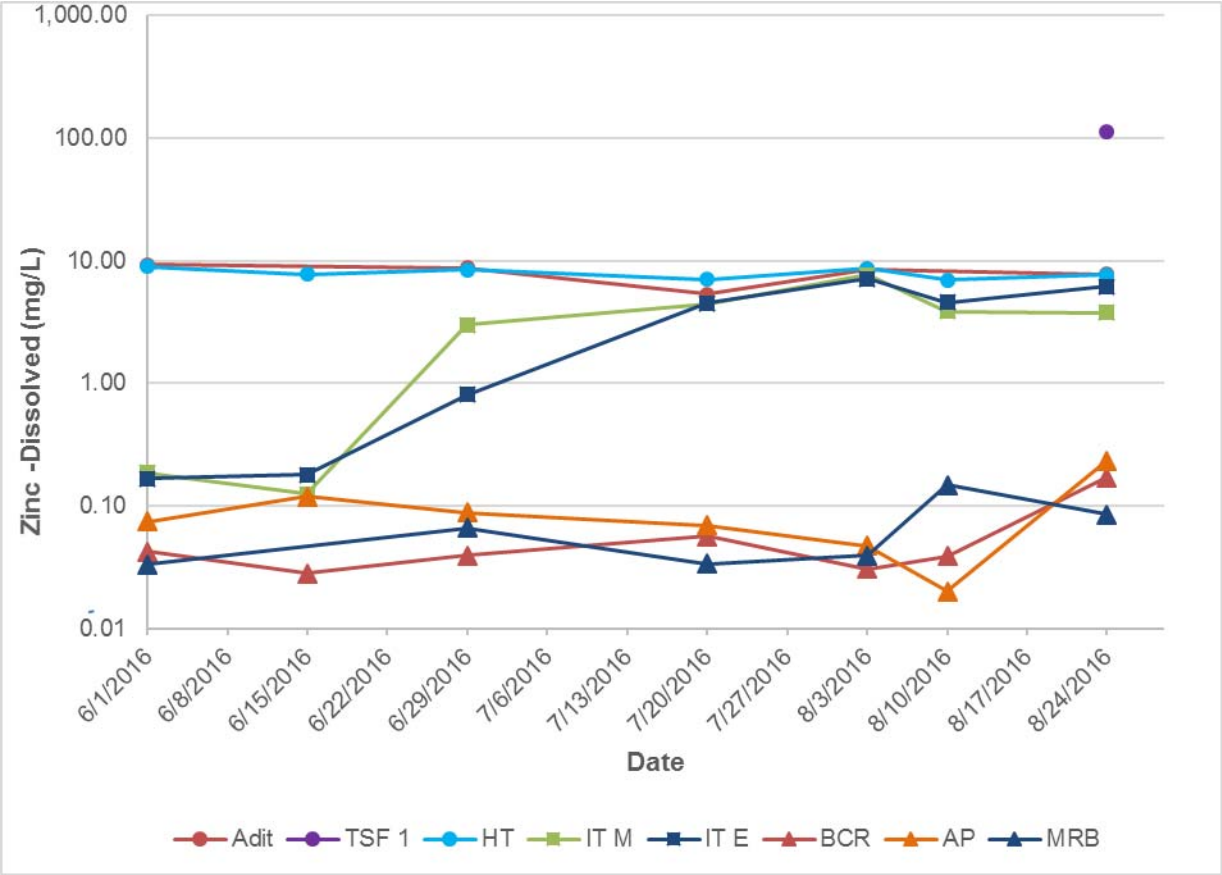

Figure 3. Dissolved Zinc Concentration in the Pilot PTS (CSM Results)

Table 8 – Pilot PTS Analytical Results - Total and Dissolved Metal Concentrations (Week 19)

Date	Parameter	January Mine Water	TSF1	HT	IT Mid	IT End	BCR	AP	MRB	Lab	Lab DL
7/20/16 Week 19 (Dissolved)	**Al**	0.029		0.15	0.03	0.03	0.14	0.12	0.03	CSM	0.0205
	Cd	0.0018		0.0032	0.0007	0.0007	ND	ND	ND		0.0001
	Cu	ND		ND	ND	0.0012	ND	0.0018	ND		0.0011
	Fe	24.0		34.1	5.4	3.0	0.2	0.1	0.1		0.0003
	Pb	ND		ND	ND	ND	ND	ND	0.005		0.002
	Mn	36		50	49	47	56	45	25		0.00004
	Zn	5.4		7.1	4.5	4.5	0.06	0.07	0.03		0.0003
	Sb	ND		ND	ND	ND	ND	ND	ND		0.0026
	As	0.05		0.07	ND	ND	0.02	0.04	0.01		0.03
	Ba	0.010		0.016	0.02	0.015	0.06	0.06	0.08		0.0002
	Be	0.0013		0.0008	0.0008	0.0004	0.0008	0.0037	ND		0.0001
	B	0.12		0.26	0.12	ND	0.13	0.11	ND		0.14
	Cr	ND		ND	ND	ND	ND	0.0011	ND		0.0002
	Cr VI	ND		ND	-	**-**	**ND**	-	ND	ACZ	0.005/***0.03***
	Ni	0.030		0.039	0.034	0.034	0.002	0.011	0.002	CSM	0.001
	Se			0.00061	-	-	0.00033	-	ND	Turner	0.00016
	Tl	ND		ND	ND	ND	ND	ND	ND	CSM	0.0055
7/20/16 Week 19 (Total)	**Al**	0.03		0.15	4.4	0.162	0.029	0.144	0.026	CSM	0.0205
	Cd	0.0014		0.003	0.085	0.0006	ND	ND	ND		0.0001
	Cu	ND		ND	ND	ND	ND	0.002	ND		0.0011
	Fe	21		34	-	5	0.04	0.40	0.22		0.00032
	Pb	0.012		0.004	0.43	0.004	ND	ND	0.004		0.002
	Mn	29		49	82	53	36	45	37		0.00004
	Zn	4.8		6.9	69.1	5.9	0.01	0.09	0.1		0.0003

Date	Parameter	January Mine Water	TSF1	HT	IT Mid	IT End	BCR	AP	MRB	Lab	Lab DL
	Sb	ND		ND	ND	ND	ND	ND	ND		0.0051
	As	0.1		0.1	0.3	0.04	ND	0.04	0.02		0.0047
	Ba	0.003		0.006	0.2	0.01	0.02	0.05	0.1		0.00011
	Be	0.001		0.001	0.02	0.01	0.001	0.002	ND		0.00023
	B	0.2		0.3	5.6	0.1	0.12	0.11	0.1		0.046
	Cr	0.0002		0.0002	0.0002	0.001	0.0002	0.0002	0.0002		0.0003
	CN	ND		-	-	-	0.008	-	ND	ACZ	0.003
	Hg	0.0000116		-	-	-	ND	-	0.000026		0.000004
	Ni	0.03		0.04	0.11	0.05	ND	0.01	0.0	CSM	0.0005
	Se	0.01		0.01	0.007	0.14	0.011	0.17	0.06		0.01
	Tl	ND		ND	ND	ND	ND	ND	ND		0.0018

Notes:
Units: mg/L
Sample Locations: **Mine** - January Mine portal discharge pipe by existing wetland; **TSF1** - Toe Seep from Tailing Facility #1; **HT** - Influent to Pilot from Mix Tank (TSF1 mixed by proportion w/ Mine when available); **IT Mid** - Iron Terrace mid-point; **IT End** - Iron Terrace effluent; **BCR** - Biochemical Reactor effluent; **AP** - Aeration Pond Tank effluent; **MRB** - Manganese Removal Bed effluent.
Detection Limits - ND = Result was below the laboratory detection limit.
Limits for Chromium VI varies based on lab internal standards. The bold "DL" symbol or result aligns with the bold limit given.

Table 9. Metal Percent Removal in the Pilot

Parameter	Units	% Metals Removal	Notes
Aluminum (Al)	mg/L	50	
Cadmium (Cd)	mg/L	99	
Copper (Cu)	mg/L	92	
Iron (Fe)	mg/L	99	
Lead (Pb)	mg/L	50	
Manganese (Mn)	mg/L	50	Remove in the MRB
Zinc (Zn)	mg/L	99	
Antimony (Sb)	mg/L	N/A	No significant amount expected in the influent
Arsenic (As)	mg/L	60	
Barium (Ba)	mg/L	0	Unchanged
Beryllium (Be)	mg/L	50	
Boron (B)	mg/L	10	
Chromium (Cr^{6+})	mg/L	N/A	No significant amount expected in the influent
Chromium (Cr)	mg/L	10	
Cyanide (CN^-)	mg/L	N/A	No significant amount expected in the influent
Mercury (Hg)	mg/L	NA	No significant amount expected in the influent
Nickel (Ni)	mg/L	90	
Selenium (Se)	mg/L	30	Note 1
Silver (Ag)	mg/L	0	Unchanged
Thallium (Tl)	mg/L	40	

4.3 Substrate Longevity

Organic substrate longevity was calculated based on the amount of carbon required to support the sulfate reduction occurring in the BCR. The initial organic carbon content of the BCR substrate/media was determined using the straw and woodchips values reported from the loss on ignition (LOI) analysis. As previously discussed, total organic carbon (TOC) analysis results in the BCR effluent are a measure of BCR inefficiency; the carbon present in the effluent is assumed to be unavailable for microbial use in sulfate reduction.

The pilot scale test results indicate that the rate of carbon consumption and loss (unused carbon in the effluent as TOC) are the primary governing factors in the calculation of the longevity of the substrate. Note that two moles of carbon are required to reduce one mole of sulfate to one mole of

sulfide. As indicated in Table 10, the pilot BCR substrate initially contained about 127 kg of carbon, of which it was assumed that 90% was biologically available; about ten percent was assumed to be biologically unavailable lignin. The average carbon consumption rate in the BCR was 30 grams/day.

Note that these values apply to the substrate volume in the pilot BCR which was only about 24 inches thick. Substrate thickness is directly proportional to BCR longevity. For example, the longevity of a substrate layer 36 inches thick comprised of the BCR mixture (wood, straw, and limestone) would be 15 years:

36/24 x 10 = 15 years.

This value is consistent with the longevity estimates at other mining sites.

Table 10 – BCR Cell Substrate Longevity

Pilot Unit	Carbon kg	Average Carbon Consumption (g/day)	Longevity years
BCR	127	30	10

4.4 Baseline Sample Results

A water sample from the Mine, Seep, and the Holding Tank (composite samples) was collected during the BCR and IT incubation period. The results are presented in Table 11.

Table 11. Baseline Water Sample Results

Parameter	DL	Mine	Seep	Composite
Al	0.0005	0.33	185	7.0
As	0.0045	0.09	DL	0.08
B	0.0042	0.29	0.70	0.31
Ba	0.0070	DL	0.13	0.008
Be	0.0001	0.001	0.04	0.002
Ca	0.0001	449	365	432
Cd	0.0047	0.008	1.6	0.08
Cr	0.0003	DL	DL	DL
Cu	0.0003	0.01	2.8	0.11
Fe	0.0004	36	66	34
Mn	0.0013	54	NV	82
Ni	0.0065	0.06	1.5	0.12
Pb	0.0083	0.02	0.34	0.03
Se	0.0058	DL	0.53	DL
Tl	0.0001	DL	DL	DL
Zn	0.0002	11	113	32
Sb	0.0011	DL	DL	DL

Notes:
Units are in mg/L
Metal concentrations are for the total form
DL – Lab detection limit
NV – No Value

4.5 Solid Samples

BCR Substrate

Samples of straw and woodchips were collected for loss on ignition (LOI) testing. The LOI is used to determine the carbon content of the substrate and it was used to calculate the longevity of the substrate. The straw and the woodchips LOI values were 97% and 90%, respectively.

Limestone and Rock

A whole rock analysis was conducted on the limestone used in the BCR and on the limestone and "inert" rock used in the MRB. This data constitutes a "fingerprint" of the elements contained in the samples that may be used to identify metals of potential environmental concern that may be absent in

the January Mine water but present in the materials (Table 12). The whole rock analysis of the limestone also assessed calcium, magnesium, and potassium. These three elements could potentially contribute to the hardness increases observed in the BCR and the MRB effluents.

The calcium content in the limestone was 30%; magnesium was 0.33%; and potassium was 0.30%. The limestone and rock results indicate that concentrations of metals were low and/or not detected so the likelihood of mobilizing undesirable analytes from these materials is remote.

Table 12. Rock and Limestone Whole Rock Analysis Results

Parameter	Limestone	Rock
Al	0.641	6.29
As	<0.005	0.008
Ba	<0.005	0.043
Be	<0.0005	<0.0005
Ca	29.9	0.281
Cd	<0.0005	<0.0005
Cr	<0.0025	0.011
Cu	<0.0025	<0.0025
Fe	0.249	1.02
K	0.292	4.4
Mg	0.325	0.132
Mn	0.0088	0.0413
Na	0.064	1.79
Ni	<0.0025	<0.0025
Pb	<0.005	<0.005
Sb	<0.005	<0.005
Zn	<0.001	0.006

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

A QA/QC procedure was developed to assess laboratory data quality. The QA/QC procedures are provided in the SAP (Appendix A) and summarized with results in this section.

5.1 Inter-Laboratory Data Verification

Water samples were collected every two weeks and shipped to the Colorado School of Mines (CSM). Every four weeks water samples were sent to CSM and Turner (an Arizona, certified laboratory) for ICP metals analysis. Inter-laboratory quality assurance testing was performed on these six samples and assessed with respect to a relative percent difference (RPD) target of 30%.

The sample results comparison was only performed on the dissolved metal concentrations derived from filtered samples. Total metal concentrations are more prone to sampling bias, especially in the difficult sampling situation presented in the iron terrace. Therefore, variations observed in the reported total metal concentrations were not assessed with respect to RPD criteria.

The dissolved metal samples were filtered and preserved in the field and shipped to both labs. The inter-laboratory results comparison was performed in those dissolved constituents that exceeded 10 times the detection limit. Based on this criterion, twenty five results were compared with respect to the RPD. Fifteen samples were below 10% RPD, four samples were below 20% RPD, and one sample was below 30%. Five samples reported a RPD greater than 30%. Overall, the Inter-laboratory ICP results reported good reproducibility.

Two metals concentrations (manganese and zinc) reported by Turner were considered outliers and were not included in the inter-laboratory comparison. As the goal of the Pilot PTS testing was oriented toward overall process validation, this action was inconsequential with respect to process design.

5.2 Duplicates and Blanks Samples

Duplicates samples were collected and submitted to Turner for quality control of lab results. Five duplicates samples were collected and the results indicate that 81% of the results compared well.

Blanks were collected (deionized water) and accompanied the sample container from the field to Turner and CSM. Two blank samples that accompanied the sample containers sent to Turner were analyzed for total and dissolve metals concentrations. All the metals results were below the lab detection limit, except for manganese that reported a concentration of 0.013 mg/L in one blank sample. The blank sample that accompanied the samples sent to CSM reported metal concentrations below the lab detection limits for most of the metals except for aluminum (0.031 mg/L), copper (0.0013 mg/L), iron (0.0013 mg/L), manganese (0.0018 mg/L), and zinc (0.0053 mg/L).

Again, as the goal of the Pilot PTS testing was oriented toward overall process validation, the findings with respect to duplicate and blank samples were inconsequential with respect to process design and were deemed acceptable for making informed project decisions.

6.0 RESULTS SUMMARY

The startup and operation of the Pilot PTS was successful, metals removal ranged from 50% to 99% as indicated in Table 9. Metals concentrations in the BCR influent water that were below the lab detection limit remained below the lab detection limit in the BCR effluent, which means that the BCR was not releasing these metals. Mercury was tested as total metal only and the BCR removed 66% of the mercury present.

Iron and zinc were the main constituents of concern in this Pilot study. The January Mine water (influent water to the BCR and water that was stored in the Holding Tank) iron and zinc average dissolved concentrations during the Pilot Test were 34 and 8.0 mg/L, respectively. The BCR removed 99% of the iron and zinc.

Barium and cyanide concentrations in the BCR effluent were slightly above the influent BCR water. However, the concentrations of these analytes were very low that could be just noise (analytical inconsistency around the detection limit). Cyanide BCR effluent concentration was less than ten times the lab detection limit and the difference cannot really be assessed until the concentration exceeds ten times the lab detection limit.

Manganese is not removed in the BCR and the manganese removal in the MRB was 50%.

The grams of iron removed per day per square meter (gdm) were calculated for the IT mid, the IT end and for the whole length of the IT. The gdm was 6.7 (IT mid), 0.6 (IT end), and 3.6 (whole IT) gdm. It is interesting to note that most of the iron removal occurred in the first half of the IT.

Iron removal in the IT was 91% overall, which means that the BCR was more efficient at iron removal.

The estimated longevity of the BCR was 10 years. Note that these values apply to the substrate volume in the pilot BCR which were only about 24 inches thick. IF the full scale substrate thickness was 36 inches the longevity of the substrate would be about 15 years.

Modifications to the Pilot PTS such as: woodchips removal and adding gravel to the IT, splitting the flow to the IT and the BCR, and flow increased were implemented to improve the performance of the Pilot PTS. The overall iron removal rate (gdm) in the IT increased from 0.5 to 3.6 gdm in response to the changes.

The BCR alone still removed 99% of iron and zinc loading at a flow rate higher than the design value, suggesting that the BCR could accommodate *temporary* overloading (of about 30%) without suffering a significant loss in performance.

7.0 IMPLICATIONS FOR FULL SCALE

7.1 January Mine Flow Rate

January Mine flow rate was measured from May 18, 2016 to August 3, 2016. The flow from the January Adit overflow point was measured from 6 to 14 gpm while it was flowing during the testing period. In the last month, when the January Mine water was drawn down from pumping, the flow rate was measured by recharge rate in the mine because there was no overflow from the adit. Sovereign was provided with a data point of 40 gpm measured by recharge rate that occurred only temporarily during a storm event. This makes the observed Mine flow rate range from 6 to 40 gpm. The latter flow rate was observed on August 3, 2016 and is suspected to be elevated in response to a localized monsoon storm event on top of a rainy period.

7.2 Preliminary PTS Design Summary

The preliminary full scale design included:

- An Iron Terrace, (IT)
- Biochemical Reactor (BCR),
- Aerobic Pond (AP), and
- Manganese Removal Bed (MRB)

In addition, a flow rate of 50 gpm and higher metals concentrations were used to size the units of the preliminary full scale PTS.

The full scale design was restricted by the land available to construct it. Therefore, the IT was designed to lower the concentration of iron and consequently the size of the BCR. A wetland was considered to polish the BCR effluent but there was insufficient space to construct it. Instead, an AP was designed to polish the effluent of the BCR. A mechanical blower was used in the AP design to minimize its size. An MRB was designed to remove manganese as conservative step to sequester metals that may remain in solution if the PTS was inadvertently or intentionally overloaded. The metals would adsorb to manganese oxide coatings that formed in the MRB.

7.3 Modifications to Preliminary PTS Design

Interpretation of site monitoring data that included Pilot PTS results revealed that the preliminary full scale PTS was oversized for the site conditions especially with respect to the assumed January Mine flow rate and water chemistry. In addition, the TSF #1 seepage sump appears to respond to seasonal conditions. During the non-monsoon dry months, the TSF #1 seep dries up and does not contribute the acidity and metal loading to the PTS. During the months when TSF #1 is draining, the

geochemical characteristics of the water appear to vary between relatively low and high concentrations of dissolved iron.

These and other general observations suggested the following modifications to the full scale PTS process:

- As the BCR removed iron more efficiently than an iron terrace and iron concentrations in the mixed January Mine water and Seep sources were less than originally expected, **the iron terrace process was eliminated from the process flow diagram**.

- The bicarbonate alkalinity concentration in the January Mine water is elevated enough to counteract the acidity concentration in Seep water, so whenever Seep water is fed to the PTS, it should be mixed with January Mine water. Settlable iron and/or aluminum precipitates would most likely form when the waters commingle. Thus an Equalization Basin is important as the first step in the treatment process to reduce the overall loading to the BCR and remove solids that could potentially blind off the surface of the BCR. Consequently, **an equalization basin (EB) upstream of the BCR was added to the process flow diagram.** The EB should be designed to allow for the periodic removal of accumulated metal precipitates.

- **Additional available land surface is available that would allow the substitution of a natural aerobic polishing wetland (APW) for the aerobic pond (AP)**. The APW would be less energy intensive and easier to maintain than an AP. As such, it would be a more sustainable water treatment process. It also provides additional treatment that an AP would not.

- The TSF #1 seepage exhibits elevated manganese concentrations, sometimes exceeding 1,000 mg/L. Even when mixed with January Mine water, manganese concentrations are still unacceptably elevated. While the MRB was included in the original design as a conservative design measure, **the MRB in the new process flow sheet should be appropriately sized for additional manganese removal** during periods when the Seep water is being fed to the PTS.

The above considerations should be incorporated into the Basis of Design Report which is being prepared as a separate document.

ATTACHMENT A
SAMPLING AND ANALYSIS PLAN

SOVEREIGN CONSULTING INC.

JANUARY ADIT, SANTA CRUZ COUNTY, ARIZONA

PILOT TESTING

SAMPLING AND ANALYSIS PLAN (SAP

MARCH 7, 2016

SUBMITTED TO:

CPE Consultants
3895 N. Business Center Dr. #115
Tucson, AZ 85705

DV020.005

12687 West Cedar Drive, #305 • Lakewood, CO 80228 • Tel: 720-524-4908

1.0 OVERALL GOALS AND OBJECTIVES

The sampling and analysis plan serve to identify the methods of sample collection and analysis during the assessment of the pilot scale treatment system and to document how quality assurance and quality control activities will be implemented during the life cycle of the project to ensure that data are of sufficient quality to support decision making regarding acid mine drainage treatment.

2.0 SAMPLING LOCATION AND DESCRIPTION

2.1 Sample Location

Water and solid samples will be collected at the locations indicated in Figure 1.

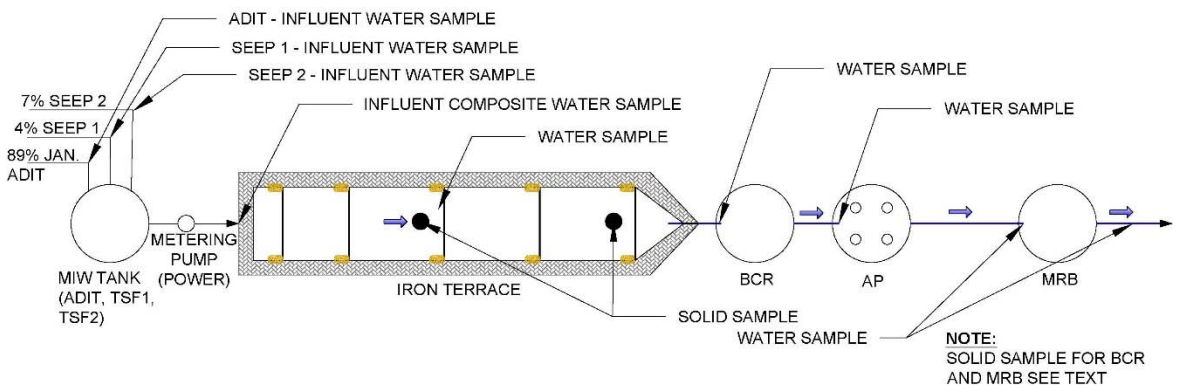

Figure 1. Sampling Location

2.2 Water Samples

Influent water that is being used for testing will be characterized and samples taken at the effluent of each passive treatment system (PTS) unit will be analyzed by ICP to evaluate the removal/change of concentration of the constituent of concern (COC), including, sulfate, sulfide, total organic carbon (TOC),and biochemical oxygen demand (BOD).

2.3 Solid Samples

2.3.1 Iron Terrace

The iron terrace substrate will consist of woodchips, the same kind of the BCR. Only one sample of woodchips needs to be collected before it is installed.

At the end of the pilot testing two solid samples will be collected from two locations of the iron terrace. The samples will be subjected to loss on ignition (LOI) to determine carbon content. In addition the samples will be analyzed by ICP Aqua Regia Digestion to evaluate the removal /change of the COC.

2.3.2 Biochemical Reactor (BCR) Substrate

Samples from the BCR substrate (woodchips and straw) will be collected and subjected to LOI to determine moisture and carbon content. A limestone sample will be analyzed by ICP Aqua Regia Digestion to establish calcium, magnesium, potassium, and sodium content.

2.3.3 Manganese Removal Bed (MRB)

A sample from the MRB media (limestone/rock) will be collected (before installation) and analyze by ICP Aqua Regia Digestion to determine metals content. This will provide a baseline data for comparison with the sample data collected at the end of the pilot testing to evaluate the removal /change of the COC.

3.0 SAMPLING, FREQUENCY AND ANALYSIS

The number of samples, frequency, and analytical testing are summarized in Table 1. The samples will be sent to an Arizona certified laboratory located in Tucson, and to the Colorado School of Mines (CSM) Chemistry Department.

Table 1. Sampling and Analysis Plan

					Analysis											
						Certified Lab										
							Trace Substance Action Levels									
		Sampling Points	Frequency	Field Testing[1]	ICP (CSM)[2]	COC[2]	Metals Total[2]	Cr (VI)	Cyanide	Sulfide	LOI	COC from digestion	Hardness ($CaCO_3$)	Sulfate	TOC	BOD
WATER	Influent	January Adit	every 4 weeks	7	7	3	-	-	-	-	-	-	3	7	-	-
		TSF #1 Seepage		7	7	3	-	-	-	-	-	-	3	7	-	-
		TSF #2 Seepage		7	7	3	-	-	-	-	-	-	3	7	-	-
		Composite		13	13	4	3	3	3	-	-	-	4	7	-	-
	Effluent	IT (mid)	every 2 Weeks	12	12	6	-	-	-	-	-	-	6	6	6	-
		IT (end)		12	12	6	-	-	-	-	-	-	6	6	6	-
		BCR		12	12	6	-	-	-	-	-	-	6	6	6	6
		Aeration Tank		12	12	6	-	-	-	-	-	-	6	-	-	6
		MRB		12	12	6	3	3	3	3	-	-	6	6	-	-
SOLIDS	Precip.	IT (mid & end)	Once	-	-	-	-	-	-	-	2	2	-	-	-	-
	BCR Substrate	Woodchips	Once	-	-	-	-	-	-	-	1	-	-	-	-	-
		Sawdust		-	-	-	-	-	-	-	1	-	-	-	-	-
		Hay		-	-	-	-	-	-	-	1	-	-	-	-	-
		Limestone		-	-	-	-	-	-	-	-	1 [3]	-	-	-	-

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	Rock	MRB	Once	-	-	-	-	-	-	-		2	-	-	-	-
		Duplicates	1 for every 20 samples	-	-	2	-	-	-	-	-	-	-	2	1	1
		Blanks	-	-	3	3	-	-	-	-	-	-	-	-	-	-
		Total No. of Samples	-	94	97	48	6	6	6	3	5	5	43	54	19	13

Notes: The pilot test planned for 24 weeks after forward flow is initiated after the incubation period of about one week)

Additional test samples may be collected and analyzed based on pilot test performance

[3]BCR Limestone will be run for major metals only (Ca, Mg, K, Na)

[1] Field Testing Parameters

Specific Conductivity

pH

Oxidation Reduction Potential

Temperature

Color/odor

Dissolved Oxygen

Fe^{+2}

Photos

Algae Growth/Precipitate/Crust

[2]ICP Metals
(Total unless noted)

COC - Cd, Cu, Pb, Mn, Zn, Al, Fe

Trace Substance Action Levels -
Ag,As,B,Ba,Be,Hg,Ni,Sb,Se,Tl,CN,Cr, Cr (VI -Total)

CSM - Al, As, B,Ba,Be,Ca,Cd,Co,Cr,Cu,Fe,K,
Li,Mg,Mn,Na,Ni,P,Pb,S,Se,Si,Sr,Tl,V,Zn,Sn,Mo,Sb.Ti

Legend

IT - Iron Terrace

BCR - Biochemical Reactor

MRB - Manganese Removal Bed

ICP - Inductively Coupled Plasma

CSM - Colorado School of Mines Chemistry Department

LOI - Loss on Ignition

TOC - Total Organic Carbon

BOD - Biochemical Oxygen Demand

4.0 SAMPLING PROTOCOL

4.1 Field Parameters

Water samples will be collected in a beaker from each location indicated in Figure 1. The backer should be rinsed with distilled water before collecting a sample.

Field data sheets are included in Attachment 1. The person that is collecting samples will fill a field data sheet every sampling event. Attachment 1 is subdivided in the following attachment according to the sampling event for that week:

- Attachment 1A – Week 0 samples
- Attachment 1B – Weeks 2, 6, 10, 14, 18, 22 samples
- Attachment 1C – Weeks 4, 12, 20 samples
- Attachment 1D – Weeks 8, 16, 24 samples

The field testing parameters required for the influent and effluent are provided in Table 2 and in the field data sheets. Field parameters will be measured with a hand held pH/conductivity meter, ORP meter, dissolved oxygen meter, and Hach Test Kit for Fe^{+2}. Temperature will be measured with the ORP meter.

Table 2. Field Testing Parameters

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	X	X	X	X	X	X	X	X	X
Water Temp (°C)	X	X	X	X	X	X	X	X	X
DO (ppm)	X	X	X	X	X	X	X	X	X
Conductivity (µS/cm)	X	X	X	X	X	X	X	X	X
ORP (mv)	X	X	X	X	X	X	X	X	X
Fe^{+2}					X	X			
Color/Odor	X	X	X	X	X	X	X	X	X
Algae Growth/Precipitate/Crust					X	X	X	X	X
Photos					X	X	X	X	X

Note: Measure ORP of the BCR effluent LAST to avoid carry-over.

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4.2 Laboratory Samples

4.2.1 Solid Samples

Solid samples from the BCR substrate and MRB limestone/rock will be collected in a water-tight one quarter gallon plastic bag and placed in one container. Soil samples will not need to be preserved. These sample will be sent to a certified laboratory in Denver, CO.

4.2.2 Water Samples

Water samples will be collected in plastic bottles provided by the labs at the locations indicated in Figure 1.

ICP Metals Samples

Water samples will be collected in plastic bottles provided by the labs at the locations indicated in Figure 1 and as indicated in Table 1. The bottles from the certified lab should have the preservative needed (nitric acid [HNO_3]). The bottles provided by CSM will not have HNO_3. Nitric acid shall be added to the CSM bottles until a pH of less than 2 is reached.

Sulfate, Sulfide, TOC, and BOD

The certified lab will send the bottles (with the preservative, if required) to collect the samples.

4.3 Blank Samples

Three blank water samples will be collected as indicated in Table 1 and Attachment 2D. The sample will be sent to the certified lab and CSM and subjected to ICP analysis.

5.0 SAMPLE LABELING AND HANDLING

The samples will be labeled with the project name, date, and sample location. For example a samples collected from the iron terrace effluent on March 3, 2016 will be label as: Jan030316IT_E. Chain-of-Custody forms identifying all the sample containers, analysis to be done, and other field data required by the laboratory will be completed and accompany each sample cooler to the off-site laboratories.

To prevent cross contamination, solid samples will be placed in one container. Water samples should be placed in another container. All containers should contain enough ice to maintain 4°C ± 2°C during transport to the laboratory

6.0 QUALITY ASSURANCE/QUALITY CONTROL

The following Quality/Assurance/Quality Control (QA/QC) measures for the lab and field will be observed.

6.1 Laboratory QA/QC

- The laboratory to be used must be an Arizona Department of Health Services (ADHS) certified laboratory.
- The laboratory must report using the Arizona Data Qualifiers.
- At a minimum, the laboratory must provide a Level II data package.
- Duplicate samples will be collected for quality control of lab results.

7.0 FIELD QA/QC

- Chain of Custody form will accompany each sample cooler to the off-site laboratory

- A new pair of Latex gloves will be used each sample a soil sample is collected.
- A new filter will be used each time a filtered sample is collected.
- The backer use to collect the water sample will be rinsed twice with distilled water before a sample is collected.
- The same person (primary monitor) should be collecting data/sampling each visit for consistency. If this is not possible the second person should be trained and have one site visit of on the job training from the primary monitor.

Attachments: 1. Field data sheets

ATTACHMENT B

IMPLEMENTATION PLAN AND CONSTRUCTION REPORT

SOVEREIGN CONSULTING INC.

JANUARY ADIT, SANTA CRUZ COUNTY, ARIZONA

PILOT TESTING

IMPLEMENTATION PLAN (IP)

REV 1

FEBRUARY 17, 2016

SUBMITTED TO:

CPE Consultants
3895 N. Business Center Dr. #115
Tucson, AZ 85705

DV020.005

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1.0 GENERAL OVERVIEW

1.1 Goals and Objectives

The plan covers a pilot test consisting of an iron terrace, biochemical reactor (BCR), aerobic pond, and manganese removal bed (MRB) that is configured in the same sequence that was proposed in the conceptual design for the January Adit passive water treatment system. The pilot is not only designed to evaluate and verify treatment performance of the system under on-site conditions but also provide insight into specific design elements for each individual process unit. Field measurements, analytical testing, and qualitative observations will be used to establish baseline conditions, determine "treatment" capacity (removal rates in the system), and evaluate specific characteristics of each component (maturation, accumulation, longevity, stresses, etc.). The test is scheduled to run up to 24 weeks with the main focus on achieving the primary goals (providing the core design basis for the full scale system). Secondary goals will be evaluated as much as practical during the test period.

1.1.1 Overall/General

Primary - Quantitatively evaluate the performance of the proposed process units with respect to metals removal and pH improvement to support the core design basis of a full scale system.

Secondary

- Evaluate the development/maturation of the pilot process units so that a "full treatment effect" timeline can be estimated for each full-scale unit.
- Extract from the procurement, set-up, and operation of the test system the "lessons learned" that can be applied to the full scale design.
- Estimate the process unit response to stresses - overloading and under-loading (as time and performance allows).

1.1.2 Iron Terrace

Primary - Determine removal rates for Al and Fe (grams/day/m^2)

Secondary

- Evaluate the consistency of removal rates through the system to determine if there is a "ramp-up" zone and a "diminishing returns" zone as the metal concentrations decrease in a given process unit.
- Evaluate the precipitates that form (visually) to gain insight to its consistency, preferred growth areas, thickness, layers, etc. that may help develop the full scale terrace layout.
    - How does the precipitate proliferate (e.g. near edges, eddies, in bunches, sporadically, etc.)?
    - What is the stability of the precipitate (e.g. does it grow and shrink, wash away easily, form a crust, change with weather/temperature, etc.)?
- Estimate the in-place density of the iron/aluminum solids in several locations to estimate appropriate retrofitting schedule and solids characteristics.
- Evaluate the diurnal impact (daylight/night) on the effectiveness of metals removal rates.

1.1.3 Biochemical Reactor (BCR)

Primary - Confirm volumetric metal and sulfate removal rates through the unit

Secondary

- Determine volumetric metal and sulfate removal rates as a function of distance from the surface of the BCR substrate/media.
- Estimate the longevity of the media components to estimate an appropriate retrofitting schedule.

1.1.4 Aeration Pond

Primary - Determine the extent of BOD removal in relation to residence time with air entrainment.

Secondary

- Estimate the rate at which biosolids accumulate and settling/consolidation characteristics
- Evaluate air requirements for yielding needed results

1.1.5 Manganese Removal Bed (MRB)

Primary -Determine volumetric and specific area manganese removal rates

Secondary

- Evaluate removal rates as a function of distance from the surface of the MRB media.
- Evaluate the removal of other metals in this unit
- Assess whether the chemical composition of the media (limestone versus silicate rock) appears to affect manganese removal rate

1.2 Pilot Components

The Pilot system will consist of:

- Iron Terrace
- Biochemical Reactor (BCR)
- Aeration Pond
- Manganese Removal Bed (MRB)

An illustration showing the process flow diagram for the Pilot is provided in Figure 1. The main process features, listed above, are in the same sequence that was proposed for the full scale system. The holding tank for the Pilot will contain a mixture of mostly January Adit water with some TSF 1 and TSF 2 seep water added to simulate the full scale influent conditions.

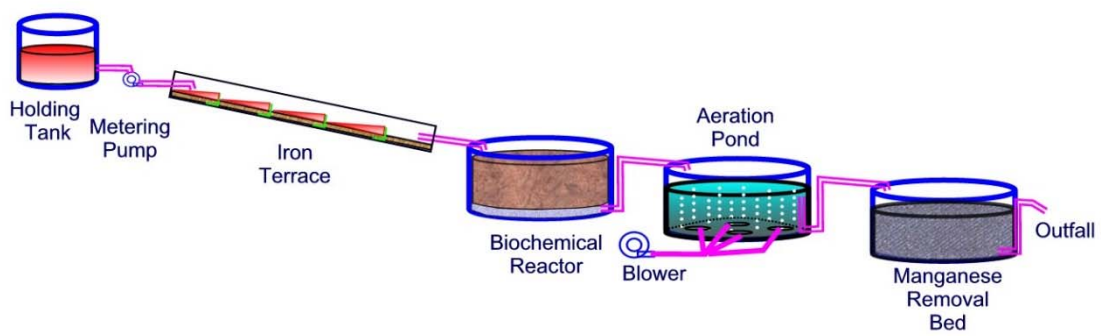


Figure 1 - Pilot Process Flow Diagram (PFD)

2.0 PILOT LOCATION

The Pilot will be located adjacent to the existing wetland which receives gravity flow from the January Adit as shown in Figure 2. The process components will be arranged in series with the Holding (Pilot influent)

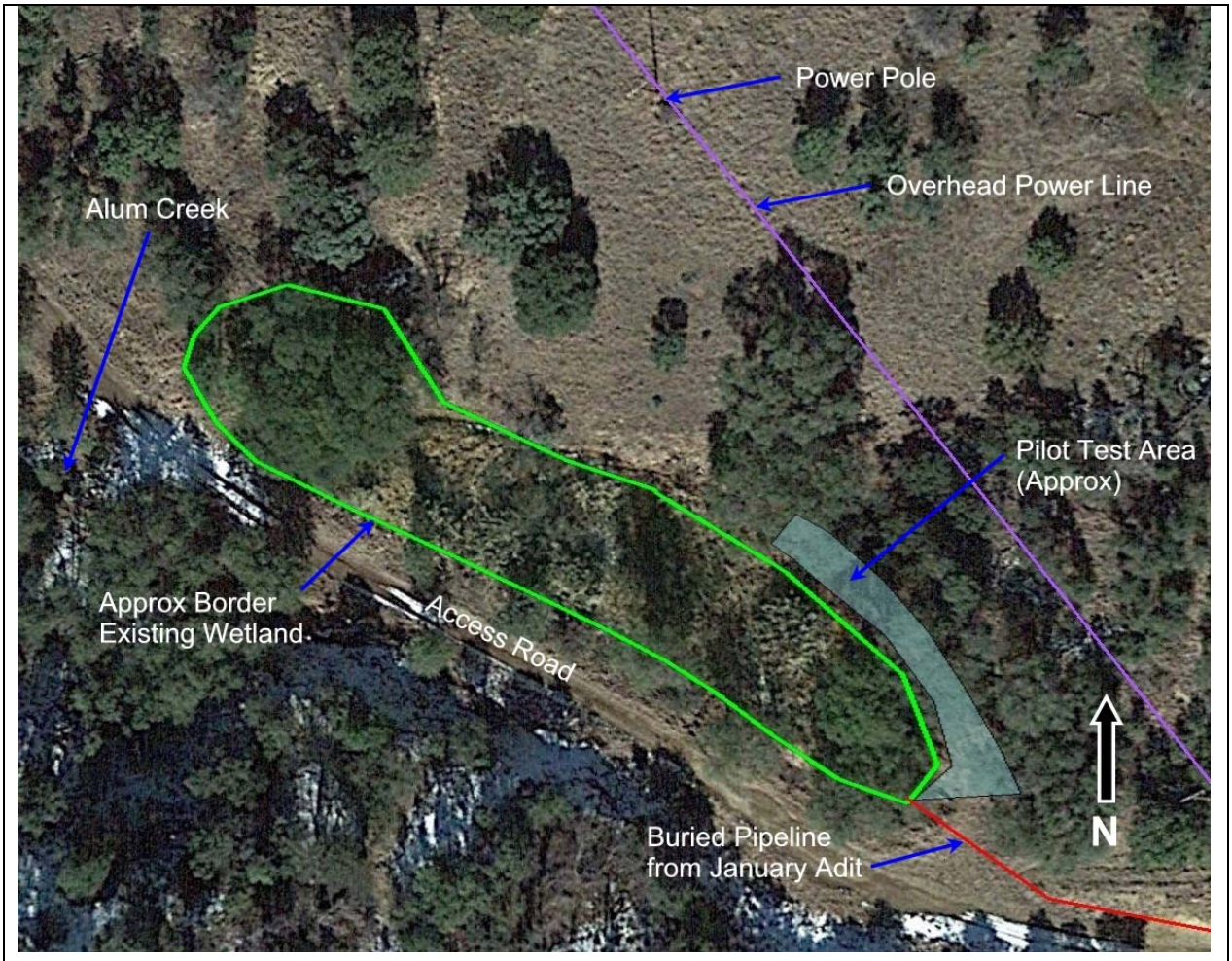


Figure 2- Pilot Approximate Location

Tank installed where the existing 4" HDPE gravity pipeline that delivers flow to the wetland becomes exposed above ground. The end of this pipe will be fitted with a flow meter and valving/plumbing that will allow MIW from the January Adit to be quantified and diverted to the Holding Tank.

This location is favored because of the proximity of power, access to the adit flow (by gravity), and the ability to discharge into the existing wetland. The site has an old roadway that provides a good sloped area for the pilot layout, a previously disturbed area for construction, and some cover from view from the main access road. The pilot will be located all on private (company) property.

The effluent from the Pilot (about 100 gallons per day) will be discharged into the existing wetland. This is a relatively small percentage of the total MIW flow the wetland receives, so improvements in the wetland chemistry are not expected and not a part of the Pilot objectives.

For security, the test area will be fenced and some berms or partial burial may be used to lower the visual presence of the components and protect against target practice, gunfire.

3.0 PILOT COMPONENTS

The following items embody the treatment or major components of the Pilot. Some more detailed installation/assembly drawings are available in Attachment 1.

3.1 Mining Influenced Water (MIW) Holding Tank/Deliver System

The MIW delivery rate will be about 280 milliliters per min (mL/min) or about 0.08 gpm. This amounts to a supply requirement of about 106 gallons/day (or 740 gallons/week).

- 660 gallons/week January Adit water (89%)
- 30 gallons/week TSF 1 Seep (4%)
- 50 gallons/week TSF 2 Seep (7%)
- 740 gallons/week Total

The Holding Tank (1,000 gallons) was initially sized to provide a seven-day supply but the as-installed tank may be smaller depending on the availability of tanks. Site personnel will be responsible for insuring that the tank is filled with MIW that approximates the relative contributions from the January Adit, the TSF 1 Seep, and the TSF 2 Seep.

The tank material will be inert plastic (e.g. HDPE or equivalent). To mitigate against potential vandalism, the Holding Tank may be partially or completely buried with native soil.

Water from the January Adit will be transferred to the tank using the existing 4” HDPE pipeline connecting the Adit to the existing wetland. Flow will be diverted from the existing pipe into the tank by gravity flow using the available head (pressure) in the line through a temporary connection made into the line for the Pilot.

A flow meter is planned to be installed in the existing January Adit pipeline to help measure volume into the tank and to measure the normal flow from the adit over time.

Contribution from the TSF 1 Seep and the TSF 2 Seep will be made by collecting water from the respective seep locations in transportable tanks/buckets and transferring the appropriate amount into the influent tank each time it is filled (initially planned to be weekly).

The combined MIW in the holding/influent tank will be delivered to the iron terrace using a metering pump about 500 mL/min (max). A 120V ac power line will need to be installed prior to commissioning. This metering system is intended to provide a measurable/reliable flow rate to base calculations and provide some adjustability. A low and accurate flow rate is needed to measure the residence time in the test system to evaluate full (or close to full) removal potential and rates.

3.2 Iron Terrace

The iron terrace test unit will consist of a geomembrane lined area that is level from side to side and sloped downward to the end (about five feet wide and 26 feet long = 130 ft^2). The size is based on the planned flow rate and a baseline removal rate of five grams of iron per day per square meter (gdm). This is a more conservative rate compared to the conceptual design which assumed seven gdm for iron removal to provide more surface area for measuring variances and accumulating some anticipated aluminum for removal evaluation.

The floor of the pilot iron terrace will be gently-sloped (5% to 10%) and the floor covered with a two-inch thick layer of wood chips derived from a local scrub oak tree source. The wood chips will be covered with jute mat typically used for erosion control. To minimize channeling, the iron terrace floor will be fitted with several corrosion resistant four-inch-high “wattles” fabricated from HDPE materials. Finally, locally harvested iron sludge from the existing wetland or from existing pipelines will be applied to the surface of the wood chips/jute mat/wattles to encourage rapid maturation of the biogeochemical processes expected

in this process unit. About five to ten gallons of sludge will be needed that will be applied by scattering (casting by handful) randomly spread over the iron terrace surface.

Effluent from the iron terrace will flow by gravity to the biochemical reactor. Sampling points will include the terrace influent, mid-way down the terrace, and at the terrace outfall (feed to the BCR). If iron and aluminum gdm values in the first half of the pilot iron terrace differ significantly from the second half, sample locations may be changed to the one-third points.

3.3 Biochemical Reactor

The BCR will be comprised of a plastic tank about five feet in diameter and three feet high. The floor of this top-feed unit will be fitted with a grid of perforated PVC pipes surrounded by inert gravel. A two-foot thick layer of organic media will be installed above the gravel drainage layer. This is about 1.6 cubic yards of media. The media will composed of the following materials on an *as-received weight percent* basis:

- Oak wood chips (60%)
- Limestone sand (29.5%)
- Straw or hay (10%)
- Composted cow manure (0.5%) – mixed into the upper six inches of installed media

To gain a better understanding of the bio-kinetic rates of sulfate reduction and accompanying metal sequestration, the BCR media layer will be fitted with several intermediate sampling points at various levels from the surface of the media.

The installed BCR may be covered, but the cover will not fit tightly.

Effluent from the BCR will contain excess BOD that could interfere with reactions in the manganese removal bed. Consequently, the BCR effluent will flow by gravity to the Aeration Pond.

The BCR effluent sample will serve as the Aeration Tank influent sample.

3.4 Aeration Pond

The Aeration Pond will be made from an approximate five foot diameter tank (holding about 250 gallons of water) sized for a 24-hour hydraulic retention time (HRT) at the planned flow rate. The tank will be filled to a depth of about 1.5 feet. The outlet pipe will be submerged several inches below the surface to avoid clogging with debris that might be floating on the surface.

The floor of the tank will be fitted with four circular “air stones” that will be connected to a common blower powered by electricity. The air stones, ballasted with common bricks, will be spread evenly into the four quadrants of the tank floor. The installed tank may be covered, but the cover will not fit tightly.

The aeration pond effluent sample will serve as the Manganese Removal Bed influent sample.

3.5 Manganese Removal Bed (MRB)

The MRB placed in an approximately five foot diameter tank (holding about 1.2 yards / 34 ft^3 of rock media) was sized for a manganese removal rate of about 20 gdm at the planned flow rate. The “area” in this case is specific area of the media in the tank, not the plan view of the tank itself. The media will be comprised of one-inch diameter washed gravel. Half the gravel will be derived from a limestone rock source; the other half will be derived from a silicate rock source. The planned media depth is about 1.5 feet with a water depth about 4” above the media.

The floor of the MRB will be fitted with a grid of perforated pipes for collection of treated MIW.

The gravel/limestone media will be "conditioned" with a solution of potassium permanganate ($KMnO_4$) prior to the MRB's receiving effluent from the Aeration Pond. The surface of the tank will also be inoculated with "pond scum" or algae harvested from local sources as this has been shown to facilitate MRB functionality.

Similar to the BCR, the MRB media layer will be fitted with several intermediate sampling points at various depths from the surface of the media. The installed tank may be covered, but the cover will not fit tightly.

The MRB effluent sample will serve as the effluent sample of the whole Pilot system. The MRB effluent will discharge into the existing wetland at a point to-be-determined.

3.6 General Considerations

Effluent Flow Check - A way to conduct a flow test (timed bucket fill) will be built into the influent line and effluent end of the Iron Terrace and MRB so that a flow rate can be measured periodically. This test will help to verify the flow rate from the pump(s) and provide a basis for determining losses due to evapotranspiration and leaks if there are any.

Contamination for External Sources – Project materials, tanks, pipes, valves, tubing, liners, etc. will be selected from relatively inert plastic materials, i.e., PVC, HDPE, poly, or other substances that have good chemical compatibility and minimal to no leaching characteristics. Support, drainage, ballast media and materials (non-plastic) that come in contact with the process water will also be selected for their inert qualities. Process media will be analytically evaluated for metals content. All materials will be inspected for extraneous debris or dirt and cleaned/washed as needed.

4.0 ASSEMBLY/COMMISSIONING/MONITORING

4.1 Assembly

The Pilot construction is expected to take about a week to complete. However, some site grading, procurement, location preparation will occur earlier. Preparation activities include:

- TSF Seep Collection – Collecting the weekly allotment of water from each seep will be investigated for practicality. Locations will be identified and "sumps" may be installed to collect enough seep water for the batch required.
- Power - Two process units will require electricity; the metering pump for feeding MIW from the Holding Tank to the Iron Terrace and the blower unit(s) for the Aeration Pond.
- Influent Tie In – The tie into the existing 4" HDPE pipe for the January Adit water sample.
- Site Grading – The pilot site will be graded for the iron terrace and tank placement prior to equipment placement
- Procurement – All of the long lead items have been or will be procured to align with the project schedule.
- Preliminary Equipment Staging – Some of the larger equipment and bulk materials will be staged at the Pilot location

A Sovereign representative will be on-site for the main assembly period when the media is mixed/loaded and most connections are made. The system will be commissioned as soon as the Pilot is assembled.

4.2 Commissioning

Commissioning will consist of operational checks, the start of the maturation/incubation period, and operator training. Flow through the system will be initiated (at a higher flow rate to "fill" the system) and the system checked for integrity (leaks, level, and appropriate alignment/support) and capacity. Once the system has been checked for operational readiness, the system will be considered ready to commence the maturing interval.

Sample locations will be identified and labeled clearly for reference.

4.2.1 Maturation/Incubation

The maturation/inoculation period is projected to take place for one week.

- Iron Terrace – MIW will be pumped into the iron terrace at the maximum feasible rate to start the precipitation of iron in the terrace. The effluent from the terrace will be diverted to the pilot outlet (to the wetland) and not to the BCR or other process units.
- Biochemical Reactor – The BCR will be filled with MIW and left static for the inoculation period.
- Aerobic Pond - Will be left empty as no maturation step is needed for this process.
- Manganese Removal Bed – The MRB will be filled with "clean" water and dosed with potassium permanganate conditioning agent. The water will remain static during the maturation process.

After the maturation/incubation period is over [typically verified by a negative oxidation-reduction potential (ORP) reading from the BCR], the flow rate will be adjusted to the design flow and the system will be checked again for "physical" performance (leaks, flow problems, etc.). The monitoring period for the test will then begin.

4.2.2 Training

During the commissioning process, operators will be trained on sample location, sampling methods, operations, and maintenance events for the system. Operators will assist with the commissioning and start-up activities. The operators will be locally-based.

4.2.3 Monitoring

The pilot system is scheduled for up to 24 weeks of monitoring. The details of the monitoring plan are provided in the preliminary sampling and analysis table in Attachment 2. Field data and observation along with analytical data will be used to evaluate the system.

5.0 QUALITY CONTROL

The primary quality control measures for this project are:

1) Good communication between the designer, installer, and monitor. This is one reason that all three parties will meet on-site at the end of the installation phase to review the testing apparatus, function, monitoring, sampling, and maintenance steps. The system is designed to be installed so that some minor adjustments to flow balance, level, and hydraulic retention time (HRT) can be made periodically as needed during the test.
2) Proper operation and maintenance of the testing apparatus components. Field logs will be completed to document site activities and note any deviations, issues, or optimizations observed or performed. A list of lessons learned will also be maintained for the project so that any issues can be resolved prior to roll out of the final design.
3) Proper sampling methods and procedures, which will be covered in the Sampling and Analysis Plan (SAP) (under preparation).

6.0 PILOT REPORT

After the Pilot Scale Test is completed, the team will prepare a brief report that summarizes the actions taken, the test results, recommendations, and conclusions about the design basis for the full scale system. The Report will provide the metal removal rates observed during the test, and the process unit dimensions for the full-scale system. Following AZ DEQ review of the Draft Report and incorporation of their comments, the team will provide a Final Pilot Scale Test Report to AZ DEQ.

Upon request, AZ DEQ representatives can be escorted on a guided tour of the Pilot to provide them with a better understanding of the processes and the overall system performance.

Attachments:
1. Pilot Construction Guidance Drawing Set (3 pages)
2. Sampling and Analysis Summary Table (2 pages)

SOVEREIGN CONSULTING INC.
AN ENVIRONMENTAL SERVICES FIRM

JANUARY ADIT
PILOT PASSIVE TREATMENT TEST

March 2016

JANUARY ADIT

- **Pilot Media Installation and Commissioning -** Feb 29th to March 2nd
  - Influent Tank
  - Iron Terrace (IT)
  - Biochemical Reactor (BCR)
  - Aerobic Pond (AP)
  - Manganese Removal Bed (MRB)
- **Inoculation started:** March 2nd, 2016
- **Steady-State Flow Started**: March 9th, 2016

PILOT INSTALLATION

JANUARY ADIT

- **Iron Terrace Installation/Commissioning**

WATTLE INSTALLED - BEHIND

WATTLES INSTALLED

WOOD CHIPS INSTALLED

IRON "SEED" PRECIPITATE ADDED – FLOW STARTED @5 GPM & THROTTLED BACK TO ABOUT 0.07 GPM FOR STEADY-STATE OPERATION

JUTE MAT (OVER WOOD CHIPS) INSTALLED

JANUARY ADIT

- **Biochemical Reactor (BCR) Installation/Commissioning**

MIXING BCR MEDIA

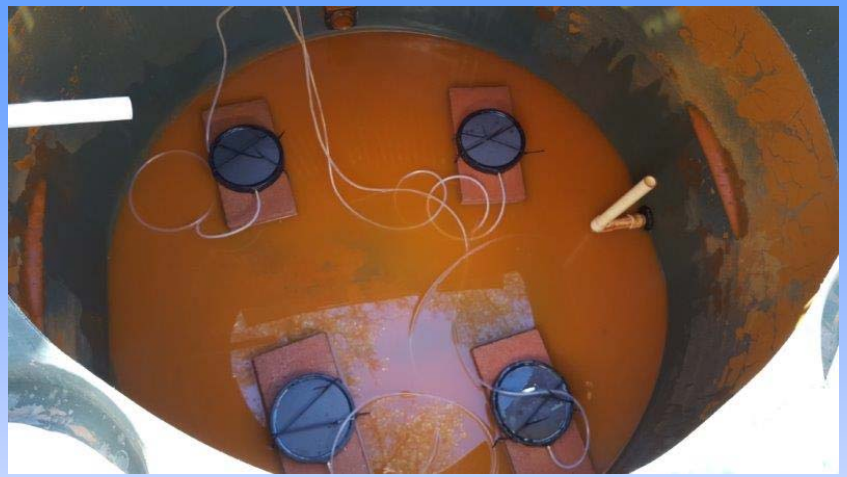
2ND LAYER OF BCR MEDIA 6" DEEP

BCR INITIAL FILLING WITH ADIT WATER

BRICKS ADDED FOR BALLAST TO KEEP BCR MEDIA FROM FLOATING

JANUARY ADIT

- **Aeration Pond (AP) and Manganese Removal Bed (MRB) Installation/Commissioning**



AP AIR STONES SECURED TO BRICKS

AP AIR FLOW TEST

MRB AFTER POTASSIUM PERMANGANATE ADDITION (For Media Conditioning)

Note: solution was recirculated until water was clear (MnO_2 coating on media completed)

JANUARY ADIT

- **System Overview and Training**

INFLUENT WATER TO PASSIVE TREATMENT SYSTEM – 1000 GAL TANK

GENERATOR, AIR METERING PUMP & INFLUENT SAMPLE PORT

PILOT OVERVIEW

TRAINING – INFLUENT TANK FILLING

TRAINING – SAMPLING MONITORING

- **January Adit – Passive Treatment Pilot System: Installation Data**

Media Bulk Density Table - Field Measured

	Measured		Calculated		Typical
	Volume (gal)	Mass (lb)	Density (Kg/L)	Density pcf	Density's (Kg/L)
Wood Chips					0.1-0.4
Limestone					1.1-2.0
Straw					0.1-0.2
Animal Manure					0.15-0.9

Proportions by Mass - Actual Placed into BCR Test Cell

	lbs	%
Wood Chips	620	58.8%
Limestone	316	30.0%
Straw	109	10.3%
Animal Manure	10	1.0%
Totals	1056	100%

Substrate (Mixed Media) Data for BCR

Void Volume (ft^3)	**19.8**
Void Ratio	69%
Shrinkage Factor	
lbs of substrate	1056
Vol. substrate (ft^3)	39
Substrate Density (lbs/ft^3)	27

Initial Flow Rates for Innoculation

	gpm
MRB recycle rate after 28 oz of potassium permanganate addition	4.2
BCR Fill Rate before isolation (0.0 flow)	5.1
Iron Terrace initial flow rate (1st week)	5.0

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ATTACHMENT C
FIELD DATA AND GRAPHS

FIELD DATA SHEET FOR WEEK 0

ATTACHMENT 1A

Sampler Name: Chuck Blair
Sampler Initials: C. Blair

Start Time: 03:15:00 PM
Finish Time: 04:02:00 PM

Date: 3/8/2016
Week: **0**

Field Parameters	Influent (MIW)				PTS Effluents					
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB	
pH (s.u.)	6.18	3.68		6.23						
Water Temp (°C)	16	12.3		15.0						
DO (ppm)										[4]
Conductivity (mS/cm)	3.63	8.82		3.80						
ORP (mv)	128	374		127			-469			[2]
Fe^{+2} (mg/l)				10.5						[1]
Flow Rate (ml/min)				300		260			0	
Color/Odor	Clear/ No Odor	Murky Tan/No Odor		Cloudy/No Odor						
Algae Growth /Precipitate/Crust										
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB					

[3]

Lab Sample Check List

ICP Metals-CSM[1] [P]	X	X	X	X					
ICP Metals-Lab[2] [P]				X					
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Sulfide [P]									
Sulfate [ch]	X	N/A	X	X					
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

[P] = Preserved [ch] = chilled

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] Fe^{+2} sampled from composite was 1 part composite x 2 parts D-oxy water

[2] ORP for BCR was from readings on 3/7/16 an average of -470, -469, -466, -470

[3] Influent tank filled on 2/8/16 approx. 12:00p (1000gal Adit + 80 gal TSF2) No TSF1 water availbale

[4] DO kit not delivered to project yet.

FIELD DATA SHEET FOR WEEK 1

ATTACHMENT 1A

Sampler Name: Bowdon/Riker
Sampler Initials: MR

Start Time: 02:30:00 PM
Finish Time: 03:35:00 PM

Date: 3/15/2016
Week: **1**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.17	3.57		5.94					
Water Temp (°C)	25.4	22.4		24.80					
DO (ppm)	N/A	N/A		N/A					
Conductivity (mS/cm)	3.71	8.6		4.16					
ORP (mv)	86	367		132.00					
Fe^{+2}				4.65					
Flow Rate (ml/min)				300		250			300
Color/Odor	Clear/ No Odor	Slightly Cloudy/ No Odor		Foggy/No Odor					
Algae Growth /Precipitate/Crust									
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				

Lab Sample Check List

ICP Metals-CSM[1] [P]									
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Sulfide [P]									
Sulfate [ch]		N/A							
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] Fe^{+2} sampled from composite was 1 part composite x 2 parts D-oxy water

FIELD DATA SHEET FOR WEEK 2, 6, 10, 14, 18, 22

ATTACHMENT 1B

Sampler Name: Chuck Blair
Sampler Initials: CB

Start Time: 1540
Finish Time: 1745

Date: 3/22/2016
Week: 2

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.16	4.25		6.18	7.11	6.96	6.10	7.54	7.96
Water Temp (°C)	21.3	21.6		23.10	15.10	19.00	16.30	16.30	15.90
DO (ppm)	3.1	7.1		2.90	2.70	11.00	5.00	0.00	2.00
Conductivity (mS/cm)	3.5	8.59		3.80	4.36	4.34	4.43	4.42	4.28
ORP (mv)	107	276		123.00	15	38	-17	0	234
Fe^{+2}				6.0	10.5	3.9			
Flow Rate (ml/min)				280.00		200			200
Color/Odor	Clear/ No Odor	Murky and Tan/ No Odor		Slightly Cloudy. No Odor	Cloudy and Tan/ Metallic-salty smell	Mostly Clear/ Slight Metallic Odor	Light Purple-Clear/ Peaty Smell	Brown/ Slight Smell of Wood Chips	Brown/ Smells Like Wet Wood Chips
Algae Growth /Precipitate/Crust					White and Red Crusts/ precipitates	Red Precipitate/ Flaky Film on water	Film on Water Surface	None	None
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]				X	X	X	X	X	X
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

[P] = Preserved [ch] = chilled

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] Samples and Blanks Were Mixed 1 Part Per 2 Parts D-oxy Water…. Reported Results Were Not Adjusted

FIELD DATA SHEET FOR WEEK 3

ATTACHMENT 1B

Sampler Name: Chuck Blair
Sampler Initials: CB

Start Time: 1530
Finish Time: 1700
Date: 3/30/2016
Week: 3

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.33	3.79	NA	5.94	7.01	7.38	6.14	7.84	7.98
Water Temp (°C)	20	16.6	NA	21.20	14.70	13.20	17.40	15.10	14.20
DO (ppm)	1.7	9.6	NA	3.30	2.30	5.60	5.30	4.30	1.20
Conductivity (mS/cm)	3.75	8.97	NA	3.96	3.87	4.06	4.48	4.10	4.36
ORP (mv)	118	271	NA	126	5	13	-97	-52	-18
Fe^{+2}				4.80	11	8			
Flow Rate (ml/min)				300		260			NA
Color/Odor	Clear/ No Odor	Foggy/very light tan/ metallic salt smell	NA	Slight fog/ No Odor	Mostly Clear/ Alkaline Smell	Mostly Clear/ Alkalie Smell	Smoky Purple/ Rotten Egg Smell	Smoky Brown/ Peaty Smell	Clearer brown/ Wood Chip Smell
Algae Growth /Precipitate/Crust					Red precipitates in water/ White Crust on surfaces in IT	Red precipitates in water/ White Crust on surfaces in IT	Film on water in BCR	None	Film on water in MRB
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]									
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]] Fe+2 Samples and Blanks Were Mixed 1 Part Per 2 Parts D-oxy Water…. Reported Results Were Not Adjusted

[2] Unable to record flow rate for MRB effluent, technical difficulties, explained in email.

FIELD DATA SHEET FOR WEEK 4,12, 20

ATTACHMENT 1C

Sampler Name: Brent Bowdon
Sampler Initials: B.B.

Start Time: 11:10:00 AM
Finish Time:

Date: 4/6/2016
Week: 4

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.39	3.69	N/A	5.90	6.53	6.82	6.27	7.55	7.60
Water Temp (°C)	26	24.3	N/A	24.70	25.10	23.50	20.90	24.40	23.40
DO (ppm)							0.00	0.00	2.30
Conductivity (mS/cm)	3.66	8.94	N/A	4.01	4.10	4.12	4.29	4.29	4.24
ORP (mv)	45	315	N/A	86.00	46	19	206	18	5
Fe^{+2}				1.80	2	2			
Flow Rate (ml/min)				275.00		200	200	150	150
Color/Odor	Clear/ No Odor	Clear/ No Odor	N/A	Slight Yellow/ No Odor	Cloudy Orange/ No Odor	Slight Yellow/ No Odor	Purple Blue Opaque/ Rotten Egg	Purple Cloudy/ No Odor	Slight Purple/ Slight Rotten Egg Smell
Algae Growth /Precipitate/Crust					Slight precip/Crust	Moderate Precip/ Crust	Mod Precip/ Crust Orange Foam	No Crust No Alga	No Crust/ No Algae
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]	X	X	X	X	X	X	X	X	X
ICP Metals-Lab² [P]					X	X	X	X	X
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [p]									
Sulfide [P]									
Sulfate [ch]				X	X	X	X		X
Biological Oxygen Demand (BOD) [ch]							X	X	
Total Organic Carbon (TOC) [P]					X	X	X		

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reach [P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

³ Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 5

ATTACHMENT 1B

Sampler Name: Blair/McNeil
Sampler Initials: C.B./G.M.

Start Time: 1030
Finish Time: 1445

Date: 4/13/2016
Week: 5

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6	3.43		5.60	6.40	7.00	6.00	7.70	7.30
Water Temp (°C)	22.9	13.9		23.20	27.50	29.50	20.00	19.20	19.20
DO (ppm)							1.80	5.60	2.30
Conductivity (mS/cm) (1)	4.1	17.22		4.40	4.40	4.60	4.70	10.70	11.00
ORP (mv)	10	350		68.00	-58	-44	-190	49	-27
Fe^{+2}	1.5	1.5		1.50	2	1			
Flow Rate (ml/min)				450.00		300		100	150
Color/Odor	Clear/ No Odor	Slightly Cloudy Tan/ No Odor		Light Yellow/ No Odor	Cloudy/Musty	Clear/ No Odor	Light Yellow/ Sulfur Smell	Light Purple/ Metallic Salty	Smokey/Light Grey/ Slight Yellow/ Metallic Salty
Algae Growth /Precipitate/Crust					No Algae/Orange	No Algae/Orange	No Algae/ Orange Precipitate	No Algae/ Black Foaming	No/ Black Precip
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

(1) Conductivity Reading Modulating Between Units

FIELD DATA SHEET FOR WEEK 6

ATTACHMENT 1B

Sampler Name: Chuck Blair
Sampler Initials: CB

Start Time: 1030
Finish Time: 1445

Date: 4/19/2016
Week: **6**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.13	3.38	N/A	5.80	6.50	6.96	6.01	7.92	7.42
Water Temp (°C)	21.6	19.5	N/A	22.1	22.5	20.3	16.3	17.2	17.6
DO (ppm)								6.30	2.10
Conductivity (mS/cm)	4.22	10.06	N/A	4.8	4.9	4.8	4.1	4.3	4.6
ORP (mv)	35	352	N/A	7	-48	-75	-224	118	-86
Fe^{+2}				3.5	1	1			
Flow Rate (ml/min)				250		125	175	175	200
Color/Odor	Clear/ No Odor	Clear/ No Odor	N/A	Hazy Light Yellow?No Odor	Cloudy/Flshy odor	Clear/ No Odor	Light Yellow/ Sulphury odor	Light grey/ Metallic Salty	Smokey Grey/ Metallic salty
Algae Growth /Precipitate/Crust					None/ Orange Precip	None/ Orange Precip	None/ Light film on water	None	None
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P] - TOTAL				X	X	X	X	X	X
ICP Metals-CSM¹ [P] - Qfilter					X			X	X
ICP Metals-CSM¹ [P] - dissolved								X	X
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached [P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] sample to be run through a "qualitative" filter (course filter like a coffee filter - medium and fast filters provided by Lee during last trip)

[2] sample should be pulled or pushed through a 0.45 micron filter before being placed into the 15 ml sample vial and then preserved like normal

FIELD DATA SHEET FOR WEEK 7

ATTACHMENT 1E

Sampler Name: C. Blair/McNeil
Sampler Initials: CB

Start Time: 1330
Finish Time: 1500

Date: 4/27/2016
Week: Week 7

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.07	3.3	N/A	5.80	6.70	7.00	5.90	7.80	7.40
Water Temp (°C)	20	20.3	N/A	20.30	25.20	20.40	15.70	16.50	19.40
DO (ppm)								5.80	3.10
Conductivity (mS/cm)	4.5	10.2	N/A	4.90	5.10	5.40	4.30	4.60	4.80
ORP (mv)	-34	338	N/A	-9.00	-91	-105	-258	81	59
Fe^{+2}				7.00	7	1			
Flow Rate (ml/min)				250 (1)		275	300	250	225
Color/Odor	Clear/No Odor	Clear/ Slightly salty	N/A	Clear/ Very light yellow/No Odor	Clear/ Light metallic	Clear/No odor	ear yellow/ Rotten Eg	Smoky pink/ salty smell	Smoky grey/ metallic, salty, organic smell
Algae Growth /Precipitate/Crust					Flaky film on water/Red Precip	Red crust precipitates/ White Crust	Very thick film on surface of water	foamy film on water surface in less aerated area	
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] Comp flow rate @ pump maximums = 1300 ml/min, pump reset to 40st/62sp

FIELD DATA SHEET FOR WEEK 8

ATTACHMENT 1C

Sampler Name: C. Blair/ McNeil
Sampler Initials: C.B.

Start Time: 12:30
Finish Time: 14:00

Date: 5/4/2016
Week: **8**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.1	3.33	N/A	5.90	6.88	7.10	5.95	8.01	7.45
Water Temp (°C)	22	21.6	N/A	26.00	29.10	26.20	19.30	19.30	22.00
DO (ppm)								5.00	0.80
Conductivity (mS/cm)	4.44	9.2	N/A	4.54	5.12	5.00	5.08	4.76	5.20
ORP (mv)	-25	270	N/A	-19.00	-110	-123	-273	90	20
Fe^{+2}				7.00	7	2			
Flow Rate (ml/min)				250.00		250	250	175	150
Color/Odor	Clear/No Odor	Clear/ No Odor	N/A	Clear No Odor	Clear/ No Odor	Light yellow/ no odor	Light yellow/ sulfur	Smokey gray/ metallic	Grey-brown/ metallic
Algae Growth /Precipitate/Crust					No Algae/ Orange Precip	No algae/ light film on water	No algae/light film on water	No algae/light foam	No algae
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]	X	X	X	X	X	X	X	X	X
ICP Metals-Lab[2] [P]	X	X	X	X	X	X	X	X	X
ICP Metals -Trace Substance Action Levels [P]									
Cr VI									
Blanks [p]	Blank sample (Deionized water) Sample name (Jan050416B)								
Sulfide [P]									
Sulfate [ch]	X	X	X	X	X	X	X		X
Biological Oxygen Demand (BOD) [ch]							X	X	
Total Organic Carbon (TOC) [P]					X	X	X		

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

[3] Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 9

ATTACHMENT 1E

Sampler Name: Glenn McNeil/Newman
Sampler Initials: GM

Start Time: 13:46
Finish Time: 14:45

Date: 5/11/2016
Week: Week 9

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6	N/A	N/A	6.00	6.80	7.00	5.30	7.90	7.16
Water Temp (°C)	22	N/A	N/A	23.4	26.7	22.6	18.1	18.7	21.8
DO (ppm)								4.90	2.50
Conductivity (mS/cm)	4.42	N/A	N/A	4.70	5.05	5.04	5.40	4.80	5.70
ORP (mv)	-37	N/A	N/A	-23	-107	-116	-27	60	-46
Fe^{+2}				6	7	6			
Flow Rate (ml/min)				220		225		150	150
Color/Odor	Clear/ No Odor	N/A	N/A	Light Yellow/ No Odor	Light Yellow/ No odor	Light Red/ No odor	Light yellow/ Sulfur	cloudy grey/metallic	Smokey grey/ metallic
Algae Growth /Precipitate/Crust					No algae/ Red precip	No algae/ Red precip	No algae/light film on water	No algae/ Foamy black	No algae
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 10

ATTACHMENT 1B

Sampler Name: Blair/Purvis
Sampler Initials: CB/JP

Start Time: 10:00
Finish Time: 12:00

Date: 5/18/2016
Week: **10**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.2	NA	NA	6.20	6.90	7.20	6.10	7.60	7.30
Water Temp (°C)	20.8	NA	NA	22.60	22.90	18.80	18.40	19.60	20.40
DO (ppm)								3.30	1.00
Conductivity (mS/cm)	4.5	NA	NA	4.60	5.00	5.30	5.70	4.60	5.00
ORP (mv)	-34	NA	NA	-47.00	-115	-125	-288	79	-111
Fe^{+2}				3.00	2	3			
Flow Rate (ml/min)	6.8gpm			260.00		75	100	50	50
Color/Odor	clear/odorless	NA	NA	light brwn/odorless	mod. brwn/salty	very light brwn/salty	clear yellow/sulphur	clear brwn&red/salty	clear brwn/salty&metal
Algae Growth /Precipitate/Crust					red precip	light red film and precip	film/red precip	light red film	light film
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]									
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 11

ATTACHMENT 1E

Sampler Name: Blair/Gibson
Sampler Initials: CB/AJG

Start Time: 1230
Finish Time: 200

Date: 5/25/2016
Week: Week 11

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.1	NA	NA	6.10	7.10	7.24	6.09	7.70	7.30
Water Temp (°C)	20.4	NA	NA	24.70	24.70	23.90	19.70	22.40	26.20
DO (ppm)								2.00	0.50
Conductivity (mS/cm)	4.6	NA	NA	4.50	5.00	5.00	5.20	4.60	5.00
ORP (mv)	-42	NA	NA	-71.00	-163	-195	-30	88	55
Fe^{+2}				4.50	3	2			
Flow Rate (ml/min)	6.7gpm			200.00		150	125	100	100
Color/Odor	clear/odorless	NA	NA	clear/odorless	clear light orange/murky with solids	clear w/ solids/salty	clear light yellow/sulphur	clear light amber/salty	clear light brwn/salty
Algae Growth /Precipitate/Crust					film w/ red precip and white crust	light white crust; ref precip/ light film	moderate film; red precip	light film	none
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]									
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 12

ATTACHMENT 1D

Sampler Name: Glen/Chuck/AJ
Sampler Initials: CB/AJG/GM

Start Time: 11:00AM
Finish Time: 2:00PM

Date: 6/1/2016
Week: **12**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.07	NA	NA	6.11	7.03	7.29	6.45	7.67	6.90
Water Temp (°C)	21.7	NA	NA	27.90	27.40	21.20	19.30	21.10	21.50
DO (ppm)									
Conductivity (mS/cm)	4.49	NA	NA	4.71	4.85	5.10	5.20	4.73	4.82
ORP (mv)	-15	NA	NA	-40.00	-102	-100	-284	-22	-132
Fe^{+2}				2.50	2	1			
Flow Rate (ml/min)	7.1gpm			200.00		125			125
Color/Odor	clear/odorless			clear/odorless	smokey'fishy	clear/odorless	clear;lght yellow/sulphur	clear;light brwn/salty	clear; light brwn/salty
Algae Growth /Precipitate/Crust					iron precip.	oily film	oily film	foamy	oily film
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-CSM¹ [P] Filtered									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr VI [ch] No head space									
Cyanide [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									
Alkalinity - No preservative									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 13

ATTACHMENT 1B

Sampler Name: McNeil/Blair
Sampler Initials: GM/CB

Start Time: 13:50
Finish Time: 14:50

Date: 6/8/2016
Week: 13

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.2	NA	NA	6.04	7.09	7.51	6.34	NA	NA
Water Temp (°C)	23.6	NA	NA	29.40	304.00	27.90	23.50	NA	NA
DO (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (mS/cm)	4.61	NA	NA	4.33	4.93	5.08	5.25	NA	NA
ORP (mv)	-43	NA	NA	-19.00	-145	-161	-290	NA	NA
Fe^{+2}	4	NA	NA	6.00	4	0	0	NA	NA
Flow Rate (ml/min)	6.7 GPM	NA	NA	250.00		175	200	NA	NA
Color/Odor	Clear/ No odor	NA	NA	Clear/ No odor	Clear/ No odor	Clear/ No odor	Light yellow/Sulphur	NA	NA
Algae Growth /Precipitate/Crust		NA	NA		No Algae/ Red Precip	No Algae/Red Precip/ White crust	Black film on top	NA	NA
Photos		NA	NA		Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

AP Air flow down: Pump was replaced and airflow resumed. Ap was also drained and the air stones cleaned.

Plant flow rate: IT and BCR rates may have been measured low -the plant generator was down for service prior to sampling.

FIELD DATA SHEET FOR WEEK 14

ATTACHMENT 1B

Sampler Name: Gibson/Lucero
Sampler Initials: AJ/NL

Start Time: 1045
Finish Time: 1245

Date: 6/15/2016
Week: **14**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank 2	MRB
pH (s.u.)	6.4	N/A	N/A	6.3	7.3	7.8	6.6	7.9	N/A
Water Temp (°C)	25.9	N/A	N/A	26.6	22.6	24.9	24.6	22.6	N/A
DO (ppm)		N/A	N/A					6.1	N/A
Conductivity (mS/cm)	4.6	N/A	N/A	4.45	4.72	4.6	5	4.9	N/A
ORP (mv)	-179	N/A	N/A	-126	-150	-157	-270	-113	N/A
Fe^{+2}		N/A	N/A	3.5	1.5	3			N/A
Flow Rate (ml/min)	6.3 GPM	N/A	N/A	250		150	175	N/A	N/A
Color/Odor	Clear/odorless	N/A	N/A	Light pink/odorless	brown/musty	Clear/odorless	Yellow/Rotten Eggs	Brown/ salty	N/A
Algae Growth /Precipitate/Crust		N/A	N/A		No algae/ organics present/iron precip	Iron precip	No algae/ Red precip/ Film on water	No algae/ many small black solids/ no crust	N/A
Photos		N/A	N/A		Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]	X			X	X	X	X	X	X
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached
[2] **Lab** bottles should already have the required preservative
* Flow rate from the IT influent

[P] = Preserved [ch] = chilled

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] A/B =Old/New ORP Menu

[2] Conductivity Readings are in mS/cm

[3] AP back on line, no flow rate measurable-AP being diverted via overflow to avoid MRB

FIELD DATA SHEET FOR WEEK 15

ATTACHMENT 1E

Sampler Name: Nick-AJ-Chuck
Sampler Initials: NGL-AJG-CB

Start Time: 1041
Finish Time: 1205

Date: 6/22/2016
Week: **15**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.1	N/A	N/A	6.10	7.40	7.70	6.40	7.40	N/A
Water Temp (°C)	24.1	N/A	N/A	26.00	30	26.60	24.60	27.60	N/A
DO (ppm)									
Conductivity (mS/cm)	4.5	N/A	N/A	4.50	4.90	4.70	5.00	4.80	N/A
ORP (mv)	-55	N/A	N/A	-107	-164	-234	-290	82	N/A
Fe^{+2}				4.50	1	0			
Flow Rate (ml/min)	6.9gpm			400		250	300	300	N/A
Color/Odor	clear/odorless	N/A	N/A	light-tan/odorless	clear tan/odorless	clear/odorless	light yellow/sulfur	medium clear brown/salty	N/A
Algae Growth /Precipitate/Crust					iron precip. on bottom	iron precip. on bottom	organic film	none/clean looking	N/A
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]									
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] IT end test 0 for Fe2; was tested three consective times; same outcome 3rd test was collected directly from sample port.

MRB under recompletion.

FIELD DATA SHEET FOR WEEK 8,16, 24

ATTACHMENT 1D

Sampler Name: AJ/Nick
Sampler Initials: AJG/NGL

Start Time: 930
Finish Time: 1330

Date: 6/28/2016
Week: **16**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.1	NA	NA	5.90	7.40	7.68	6.50	7.70	7.20
Water Temp (°C)	21	NA	NA	22.4	22.3	24.4	25.1	24.2	24.8
DO (ppm)								3.00	10.30
Conductivity (mS/cm)	2.6	NA	NA	2.50	5.10	5.22	5.25	4.90	5.35
ORP (mv)	-19/2	NA	NA	-1	-5	-11	-275	-30	-94
Fe^{+2}				2.50	5	0			
Flow Rate (ml/min)	7.3gpm			250.00		200	250	350	350
Color/Odor	clear/odorless		NA	red-tan/odorless	clear-tan/odorless	clear/odorless	light yellow/sulfer	tan/salty	light tan/odorless
Algae Growth /Precipitate/Crust					red precip.	red precip.	none	bubbles	cloudy
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P] Total									
ICP Metals-CSM¹ [P] Dis									
ICP Metals-Lab² [P] Total									
ICP Metals-Lab² [P] Dis									
ICP Metals -Trace Substance Action Levels [P] Total									
ICP Metals -Trace Substance Action Levels [P] Dis									
Cr VI									
Cyanide Total [P]									
Blanks [P]	Week 8, 16, 24 - Include a blank sample								
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

³ Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 17

ATTACHMENT 1E

Sampler Name: Charles Blair
Sampler Initials: CB/NL

Start Time: 1300
Finish Time: 1400

Date: 7/6/2016
Week: Week 17

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.1	N/A	N/A	6.00	7.70	7.67	6.70	6.90	7.50
Water Temp (°C)	25.4	N/A	N/A	31.2	37.5	31.4	26.0	N/A	N/A
DO (ppm)								N/A	N/A
Conductivity (mS/cm)	4.8	N/A	N/A	4.40	5.50	5.60	4.20	N/A	N/A
ORP (mv)	-83	N/A	N/A	-124	-148	-243	-353	-262	-240
Fe^{+2}				4.00	0	0			
Flow Rate (ml/min)	7.2 GPM			250.00		125	125		
Color/Odor	Clear / Salty	N/A	N/A	Clear / Salty	Clear	Clear / Salty	Yellow Clear / sulpher	N/A	N/A
Algae Growth /Precipitate/Crust					None / Tan solids / Red crust	None /Some red precip / red	None / Not visable / film on water & water is milky	N/A	N/A
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] All conductivity measurements reported in millisiemens /cm

[2]

FIELD DATA SHEET FOR WEEK 18

ATTACHMENT 1E

Sampler Name: AJ/Chuck
Sampler Initials: AJG/CB

Start Time: 1034AM
Finish Time: 1215PM

Date: 7/13/2016
Week: Week 18

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.14	NA	NA	6.32	[2]	7.26	6.52	[1]	[1]
Water Temp (°C)	22.8	NA	NA	24.10	[2]	28.30	25.90	[1]	[1]
DO (ppm)		NA	NA					[1]	[1]
Conductivity (mS/cm)	5.14	NA	NA	5.07	[2]	5.04	4.72	[1]	[1]
ORP (mv)	-60	NA	NA	-88	[2]	-187	-384	[1]	[1]
Fe^{+2}		NA	NA	2.00	[2]	1			
Flow Rate (ml/min)	6.3gpm	NA	NA	1320.00		1000	n/a	[1]	[1]
Color/Odor	clear/odorless	NA	NA	clear/odorless	[2]	clear/odorless	sulfer/clear-lightyellow	[1]	[1]
Algae Growth /Precipitate/Crust		NA	NA		iron precip.	iron precip.	brown organic film	[1]	[1]
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P]									
ICP Metals-Lab[2] [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] Retrofit in progress on AP & MRB tanks.

[2] No IT-Mid sample could be taken due to no standing water at mid-point of IT.

FIELD DATA SHEET FOR WEEK 19

ATTACHMENT 1D

Sampler Name: AJ and Liz
Sampler Initials: AJG-EP

Start Time: 820
Finish Time: 1045

Date: 7/20/2016
Week: **19**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	COMPOSITE	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.1			6.10	6.90	7.10	6.30	7.80	7.44
Water Temp (°C)	22.3			22.60	27.40	24.40	21.10	21.10	21.20
DO (ppm)								11.00	10.30
Conductivity (mS/cm)	5.04			5.20	5.16	5.23	5.00	4.30	4.80
ORP (mv) A	-4			-20.00	-43	-78	-285	3	-164
Fe^{+2}				6.00	7	3			
Flow Rate (ml/min)	6.4gpm		500	1050.00		1050			500
Color/Odor	clear-rustysmell			clear-odorless	rusty-odorless	clear-odorless	clear light brown-sulfer	light brown-light salty	clear light brown-light salty
Algae Growth /Precipitate/Crust					oily iron precip.	iron precip.	iron film	bubbles	mosquitoes
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P] Total									
ICP Metals-CSM[1] [P] Dis									
ICP Metals-Lab[2] [P] Total									
ICP Metals-Lab[2] [P] Dis									
ICP Metals -Trace Substance Action Levels [P] Total									
ICP Metals -Trace Substance Action Levels [P] Dis									
Alkalinity									
Hg - ICP Metals									
Cr VI [ch]									
Cyanide Total									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

[3] Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 20

ATTACHMENT 1E

Sampler Name: AJ/Liz
Sampler Initials: AJG/EP

Start Time: 800
Finish Time: 915

Date: 7/27/2016
Week: Week 20

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	TSF #2	COMPOSITE	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.13	NA	NA	6.15	6.97	7.19	6.40	8.12	6.97
Water Temp (°C)	21.4	NA	NA	21.80	23.10	22.80	22.90	22.90	23.90
DO (ppm)								7.40	2.60
Conductivity (mS/cm)	4.94	NA	NA	5.12	4.96	5.12	4.85	4.89	4.88
ORP (mv)	-49	NA	NA	-45	-89	-150	-291	-48	-171
Fe^{+2}				4.00	2	1			
Flow Rate (ml/min)	5.9gpm			700.00		650	200	200	200
Color/Odor	clear-odorless	NA	NA	clear-odorless	opaque orange-rusty	clear-odorless	clear light tan-sulfur	tan- light sulfur	light tan-light sulfur
Algae Growth /Precipitate/Crust					iron precip at bottom - oil sheen	iron precip at bottom - oil sheen	iron crust	bubbles	mosquitoes
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P]									
ICP Metals-Lab² [P]									
ICP Metals -Trace Substance Action Levels [P]									
Cr IV [ch]									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

FIELD DATA SHEET FOR WEEK 21

ATTACHMENT 1D

Sampler Name: AJ/Liz
Sampler Initials: AJG/EP

Start Time: 920AM
Finish Time: 1153AM

Date: 8/3/2016
Week: **21**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	COMPOSITE BCR	COMPOSITE IT	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.29			6.09	7.03	6.96	6.42	7.75	7.42
Water Temp (°C)	21.1			22.70	22.00	22.50	21.50	22.10	22.10
DO (ppm)								8.80	2.10
Conductivity (mS/cm)	5.33			5.20	5.55	5.13	6.58	4.01	4.16
ORP (mv)	-33			-8.00	-72	-87	-268	-8	-122
Fe^{+2}				6.50	3	5.5			
Flow Rate (ml/min)	12.9gpm		600	1400.00		1100	700		700
Color/Odor	clear - odorless			clear - odorless	orange- rusty	clear - odorless	light clear yellow - sulfer	cloudy-salty	clear tan - salty
Algae Growth /Precipitate/Crust					oily iron precip.	oily iron precip.	patches of iron crust	soapy	mosquitoes
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P] Total									
ICP Metals-CSM¹ [P] Dis									
ICP Metals-Lab² [P] Total									
ICP Metals-Lab² [P] Dis									
ICP Metals -Trace Substance Action Levels [P] Total									
ICP Metals -Trace Substance Action Levels [P] Dis									
Alkalinity									
Hg - ICP Metals									
Cr VI [ch]									
Cyanide Total									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

³ Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 22

ATTACHMENT 1D

Sampler Name: C. Blair/ S. Cubillas
Sampler Initials: CB/SC

Start Time: 1500
Finish Time: 1700

Date: 8/9/2016
Week: **22**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	COMPOSITE BCR	COMPOSITE IT	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.15			6.02	7.25	7.22	6.41	7.77	6.80
Water Temp (°C)	20.8			26.40	27.50	28.50	24.40	23.70	23.00
DO (ppm)								5.30	0.00
Conductivity (mS/cm)	4.53			5.10	5.25	5.37	4.86	5.25	4.70
ORP (mv)	54			49.00	62	38	217	5	150
Fe^{+2}				7.00	4	4			
Flow Rate (ml/min)	0 [1]		310	1200.00		1100	350	300	310
Color/Odor	Clear/ No odor			Clear-orange/ no odor	Red/ Metallic	Clear-light yellow/ no odor	Light-opaque yellow/ Sulphur	Murky-tan/Sulphur	Light yellow-murky/ Salty, light sulphur smell
Algae Growth /Precipitate/Crust					No algae/ red crust	None	No algae/ Red and orange precipitates	No algae/ sparse solids	No algae/ sparse solids
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM¹ [P] Total				X	X	X	X	X	X
ICP Metals-CSM¹ [P] Dis				X	X	X	X	X	X
ICP Metals-Lab² [P] Total									
ICP Metals-Lab² [P] Dis									
ICP Metals -Trace Substance Action Levels [P] Total									
ICP Metals -Trace Substance Action Levels [P] Dis									
Alkalinity									
Hg - ICP Metals									
Cr VI [ch]									
Cyanide Total									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

¹ **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

² **Lab** bottles should already have the required preservative

³ Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1] No flow due to adit water pumping for drilling

FIELD DATA SHEET FOR WEEK 23

ATTACHMENT 1D

Sampler Name: AJ/liz
Sampler Initials: ajg/ep

Start Time: 1039am
Finish Time: 1113am

Date: 8/17/2016
Week: **23**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	COMPOSITE BCR	COMPOSITE IT	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)				6.17	7.41	7.47	6.40	7.85	7.05
Water Temp (°C)				25	29	29.3	22.2	21.7	22
DO (ppm)								6.30	2.60
Conductivity (mS/cm)				5.52	5.62	5.46	5.83	4.86	4.72
ORP (mv)				-74.00	-123	-197	-295	-58	-186
Fe^{+2}				6.50	7	3			
Flow Rate (ml/min)			350	1200.00		1200	350	300	300
Color/Odor				tanish-odorless	red-rusty	clear-odorless	clesr yellow-sulfer	cloudy light tan-light sulfer	light tan-light sulfer
Algae Growth /Precipitate/Crust					red precip.	red precip.	red precip. on bottom	bubble film	some misquitoes
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P] Total									
ICP Metals-CSM[1] [P] Dis									
ICP Metals-Lab[2] [P] Total									
ICP Metals-Lab[2] [P] Dis									
ICP Metals -Trace Substance Action Levels [P] Total									
ICP Metals -Trace Substance Action Levels [P] Dis									
Alkalinity									
Hg - ICP Metals									
Cr VI [ch]									
Cyanide Total									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]									
Biological Oxygen Demand (BOD) [ch]									
Total Organic Carbon (TOC) [P]									

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

[3] Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

FIELD DATA SHEET FOR WEEK 24

ATTACHMENT 1D

Sampler Name: AJ/Liz
Sampler Initials: AJG/EP

Start Time: 815AM
Finish Time: 1150AM

Date: 8/24/2016
Week: **24**

Field Parameters	Influent (MIW)				PTS Effluents				
	ADIT	TSF #1	COMPOSITE BCR	COMPOSITE IT	IT (MID)	IT (END)	BCR	Aeration Tank	MRB
pH (s.u.)	6.18	3.71		6.45	7.52	7.70	6.55	7.94	7.34
Water Temp (°C)	28.8	25.4		23.60	27.90	22.80	20.20	19.60	18.90
DO (ppm)								5.70	1.50
Conductivity (mS/cm)	5.07	8		5.40	5.52	5.65	5.85	4.66	4.79
ORP (mv)	59	250		-11.00	-59	-86	-301	-43	-224
Fe^{+2}				6.50	7	4			
Flow Rate (ml/min)			350	1400.00		1200	350	350	350
Color/Odor	light orange-odorless	clear-odorless		light orange-odorless	cloude red orange-iron smell	light tan-iron smell	clear-sulfur	cloudy tan-light sulfur	cloudy tan-light sulfur
Algae Growth /Precipitate/Crust		**none**			iron ppt	iron ppt	iron ppt	bubby	cloudy mosquitoes
Photos					Take photos - IT [whole, each section(4)] , top of BCR, AP, MRB				
Lab Sample Check List									
ICP Metals-CSM[1] [P] Total									
ICP Metals-CSM[1] [P] Dis									
ICP Metals-Lab[2] [P] Total									
ICP Metals-Lab[2] [P] Dis							D[3]		
ICP Metals -Trace Substance Action Levels [P] Total									
ICP Metals -Trace Substance Action Levels [P] Dis									
Alkalinity									
Hg - ICP Metals									
Cr VI [ch]									
Cyanide Total									
Blanks [P]									
Sulfide [P]									
Sulfate [ch]							D[3]		
Biological Oxygen Demand (BOD) [ch]							D[3]		
Total Organic Carbon (TOC) [P]							D[3]		

[1] **CSM** plastic bottles do not have preservative already added. Need to add nitric acid until a pH less than 2 is reached

[P] = Preserved [ch] = chilled

[2] **Lab** bottles should already have the required preservative

[3] Duplicate sample on week 16

* Flow rate from the IT influent

Additional Comments [# comments (here) and place the same # in the box above that the comment pertains to]

[1]

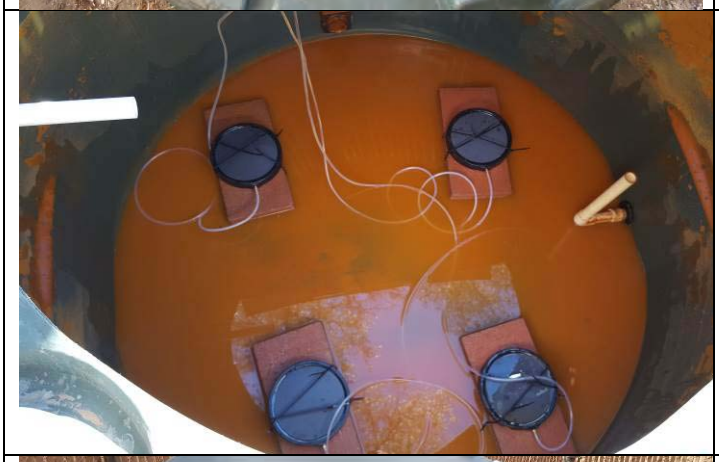
ATTACHMENT C2
PHOTOS

Pilot System
Week by Week Progress
Photos

Photo Placement Legend

Iron Terrace (whole length w/ BCR, AP, MRB in back)	Iron Terrace (1st section) Flow left to right)
Biochemical Reactor (BCR)	Iron Terrace (2nd section) Flow left to right)
Aerobic Pond (AP)	Iron Terrace (3rd section) Flow left to right)
Manganese Removal Bed (MRB)	Iron Terrace (4th section) Flow left to right)

WEEK (-01) Inoculation, 01MAR16 - January Adit Pilot Photos –

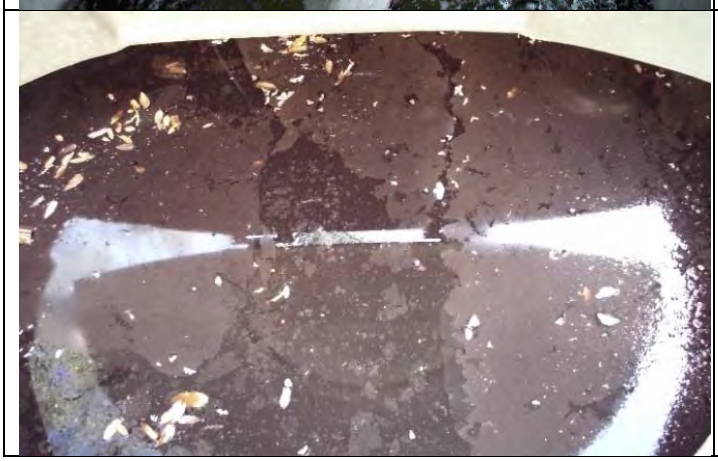


WEEK 00, 08Mar16 - January Adit Pilot Photos –

WEEK 01, 15Mar16 - January Adit Pilot Photos –

WEEK 02, 22Mar16 - January Adit Pilot Photos –

WEEK 03, 30Mar16 - January Adit Pilot Photos –



WEEK 04, 05APR16 - January Adit Pilot Photos –

WEEK 05, 13APR16 - January Adit Pilot Photos –

WEEK 06, 20APR16 - January Adit Pilot Photos –

WEEK 07, 27APR16 - January Adit Pilot Photos –

WEEK 08, 04MAY16 - January Adit Pilot Photos –

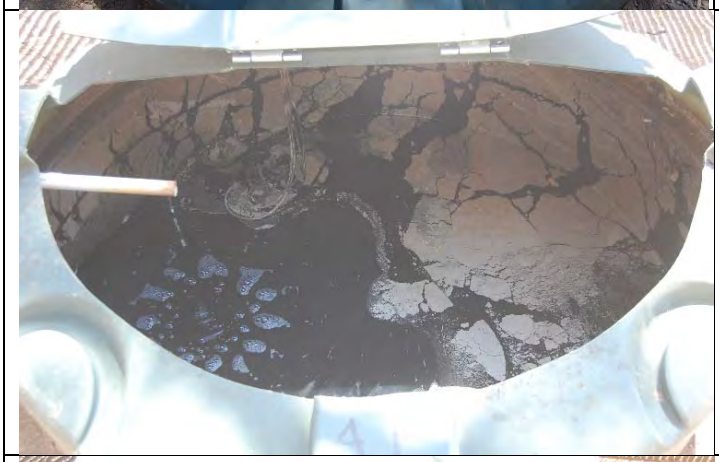
WEEK 09, 11May16 - January Adit Pilot Photos –

WEEK 10, 18MAY16 - January Adit Pilot Photos –

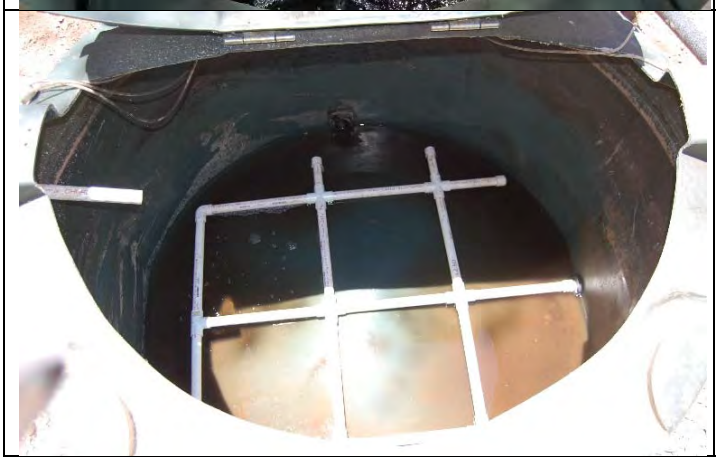
WEEK 11, 25MAY16 - January Adit Pilot Photos –

WEEK 12, 01JUN16 - January Adit Pilot Photos –

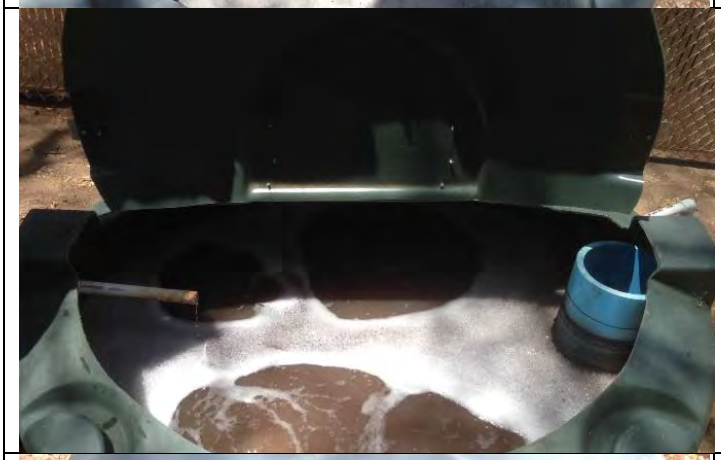
WEEK 13, 08JUN16 - January Adit Pilot Photos –

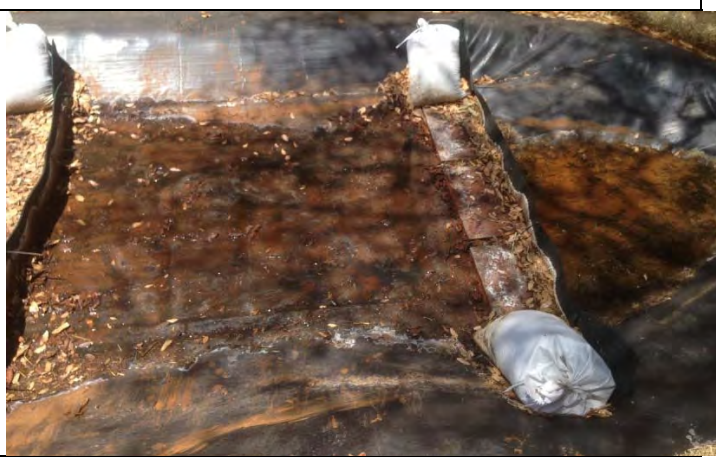


WEEK 14, 15JUN16 - January Adit Pilot Photos –



WEEK 15, 22JUN16 - January Adit Pilot Photos –





WEEK 16, 27 & 28JUN16 - January Adit Pilot Photos

Back to Back days – same area photos shown side by side over next two pages

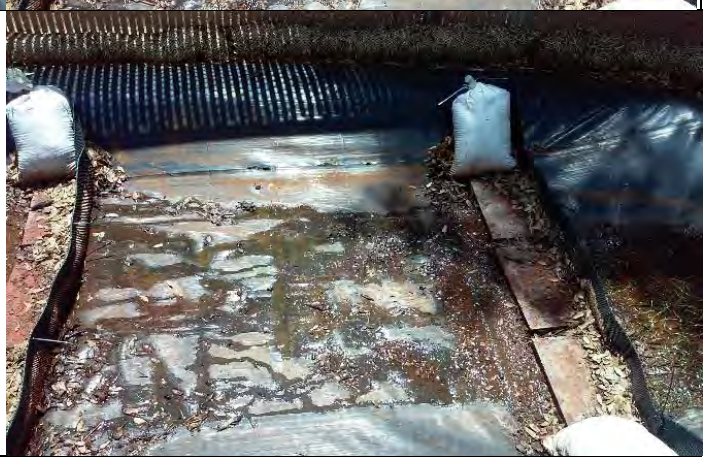
(27JUN16 – Heavy Rain) (28JUN16 – Next Day – No Rain)

WEEK 16, 27 & 28JUN16 - January Adit Pilot Photos

Back to Back days – same area photos shown side by side – all IT this page

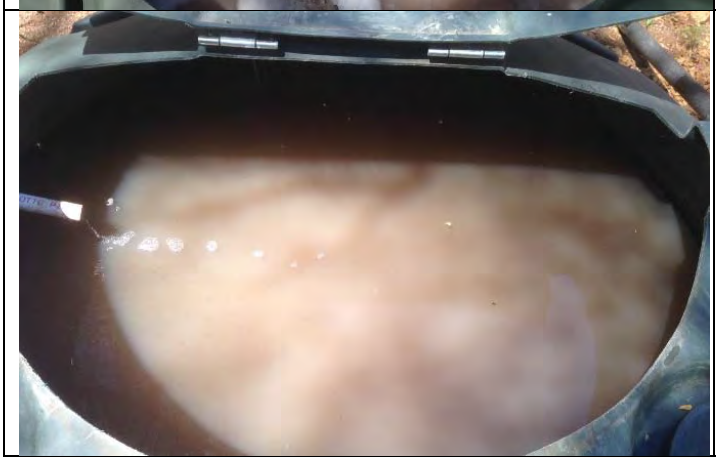
(27JUN16 – Heavy Rain) (28JUN16 – Next Day – No Rain)

WEEK 17, 06JUL16 - January Adit Pilot Photos –

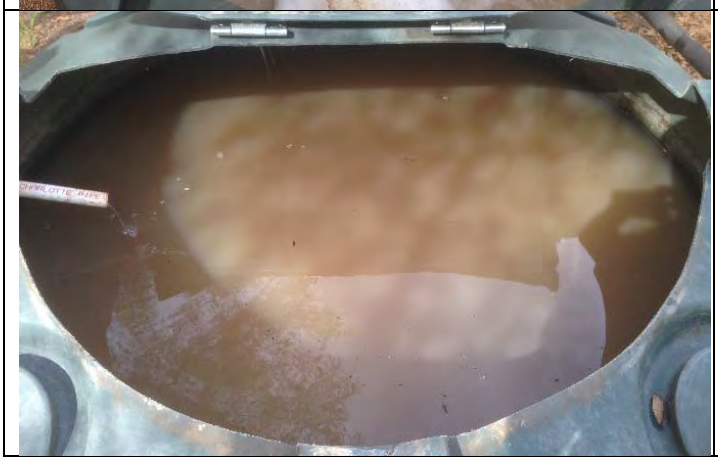


WEEK 18, 13JUL16 - January Adit Pilot Photos –

WEEK 19, 20JUL16 - January Adit Pilot Photos –



WEEK 20, 18MAY16 - January Adit Pilot Photos –

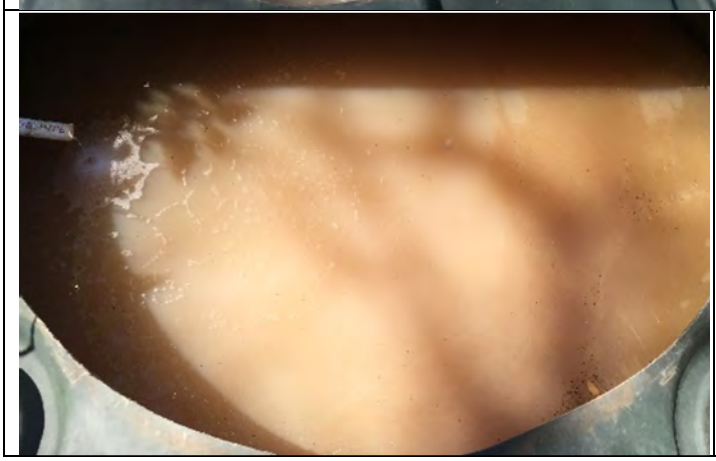


WEEK 21, 02AUG16 - January Adit Pilot Photos –

WEEK 22, 18MAY16 - January Adit Pilot Photos –

WEEK 23, 17AUG16 - January Adit Pilot Photos –

WEEK 24, 24AUG16 - January Adit Pilot Photos –



TSF #1 SLUG TEST, 02SEP16 - January Adit Pilot Photos –

ATTACHMENT D1
CSM RESULTS

Date	**4/3/2016**		start cell	elements		
Method	**Water-Mira 032713U**		82	34		
Client	**Jim Gusek, Elli Heil**		0	1	5	4
			82	116	252	218
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	JAN030216TSF1	JAN030216Adit
0	Sc 357.634-A	% Concentration	100	103	96	102
1	Ar 420.069-A	% Concentration	103	104	92	103
2	Sc 361.383-R	% Concentration	101	103	100	104
3	Al 308.215-A	0.0005	20.0657	0.0110	180.2042	0.1478
4	As 188.979-A*	0.0045	18.4567	BDL	BDL	0.0887
5	B 249.772-R	0.0042	19.8109	0.1775	0.3217	0.2587
6	Ba 233.527-A*	0.0070	8.6299	BDL	0.0169	BDL
7	Be 313.107-R	0.0001	9.5193	0.0003	0.0352	0.0010
8	Ca 315.887-R*	0.0001	18.4874	BDL	356.6080	445.7655
9	Cd 214.440-A	0.0047	9.4074	BDL	1.5861	0.0062
10	Co 228.616-A	0.0003	9.4151	BDL	1.4199	0.0313
11	Cr 205.560-A	0.0003	4.7274	0.0004	BDL	BDL
12	Cu 324.752-A	0.0003	18.4209	0.0018	2.5774	BDL
13	Fe 238.204-A	0.0004	18.4576	0.0006	46.4443	35.4023
14	K 766.490-R	0.0003	69.2921	BDL	3.1848	11.3959
15	Li 670.784-R	0.0404	19.3576	BDL	0.5153	0.0984
16	Mg 279.553-R	0.0007	18.6134	BDL	314.4471	173.0757
17	Mg 285.213-R	0.0001	18.2542	BDL	567.1321	215.2949
18	Mn 257.610-A*	0.0013	9.2847	BDL		52.3358
19	Na 589.592-R	0.0003	BDL	81.4993	46.4233	59.8004
20	Ni 231.604-A	0.0065	18.5929	BDL	1.5007	0.0537
21	P 177.434-A	0.0004	46.2043	BDL	BDL	0.0437
22	Pb 220.353-A	0.0083	18.5538	BDL	0.1017	0.0100
23	S 180.669-A	0.0018	0.4884	48.3250	1714.9877	704.9690
24	Se 196.026-A	0.0058	18.9863	BDL	0.5697	BDL
25	Si 251.611-A*	0.0061	0.2534	48.7546	47.7354	18.8784
26	Sr 407.771-R*	0.0114	18.3590	BDL	0.3649	0.4853
27	Tl 190.801-A	0.0001	18.5078	BDL	BDL	BDL
28	V 292.402-A*	0.0027	9.1390	BDL	BDL	BDL
29	Zn 213.857-A	0.0002	9.3915	BDL	112.3699	11.1017
30	Sn 189.927	0.0004	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0005	18.5476	0.0036	BDL	BDL
32	Sb 217.582	0.0011	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0006	BDL	0.0028	BDL	BDL
34	Sc 357.634-A	0.0022	102.7957	96.6777	97.6060	96.4159
35	Ar 420.069-A	0.0001	103.5841	103.2425	90.9776	92.4253

Date	**4/3/2016**		start cell	elements			
Method	**Water-Mira 032713U**		82	34			
Client	**Jim Gusek, Elli Heil**		0	1	3	6	2
			82	116	184	286	150
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Adit metals	TSF1 Metals	Composite metals
0	Sc 357.634-A	% Concentration	100	103	105	98	97
1	Ar 420.069-A	% Concentration	103	104	102	91	103
2	Sc 361.383-R	% Concentration	101	103	103	102	99
3	Al 308.215-A	0.0005	20.0657	0.0110	0.3260	185.3773	6.9926
4	As 188.979-A*	0.0045	18.4567	BDL	0.0946	BDL	0.0801
5	B 249.772-R	0.0042	19.8109	0.1775	0.2885	0.6975	0.3090
6	Ba 233.527-A*	0.0070	8.6299	BDL	BDL	0.1290	0.0078
7	Be 313.107-R	0.0001	9.5193	0.0003	0.0010	0.0352	0.0023
8	Ca 315.887-R*	0.0001	18.4874	BDL	449.1284	365.0491	432.0659
9	Cd 214.440-A	0.0047	9.4074	BDL	0.0077	1.6222	0.0761
10	Co 228.616-A	0.0003	9.4151	BDL	0.0323	1.4657	0.0906
11	Cr 205.560-A	0.0003	4.7274	0.0004	BDL	BDL	BDL
12	Cu 324.752-A	0.0003	18.4209	0.0018	0.0084	2.8426	0.1117
13	Fe 238.204-A	0.0004	18.4576	0.0006	35.9736	65.5494	34.1857
14	K 766.490-R	0.0003	69.2921	BDL	16.1392	21.0187	13.9975
15	Li 670.784-R	0.0404	19.3576	BDL	0.1007	0.5295	0.1170
16	Mg 279.553-R	0.0007	18.6134	BDL	174.3078	310.5396	182.8836
17	Mg 285.213-R	0.0001	18.2542	BDL	219.4114	574.6122	232.9400
18	Mn 257.610-A*	0.0013	9.2847	BDL	54.1039		81.7767
19	Na 589.592-R	0.0003	BDL	81.4993	60.3746	52.1686	59.2426
20	Ni 231.604-A	0.0065	18.5929	BDL	0.0562	1.5274	0.1158
21	P 177.434-A	0.0004	46.2043	BDL	0.0892	BDL	0.0309
22	Pb 220.353-A	0.0083	18.5538	BDL	0.0200	0.3417	0.0282
23	S 180.669-A	0.0018	0.4884	48.3250	737.5423	1744.8660	734.6227
24	Se 196.026-A	0.0058	18.9863	BDL	BDL	0.5343	BDL
25	Si 251.611-A*	0.0061	0.2534	48.7546	19.5601	50.8567	19.1763
26	Sr 407.771-R*	0.0114	18.3590	BDL	0.4930	0.3857	0.4889
27	Tl 190.801-A	0.0001	18.5078	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0027	9.1390	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0002	9.3915	BDL	11.3992	112.7618	31.6920
30	Sn 189.927	0.0004	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0005	18.5476	0.0036	BDL	BDL	BDL
32	Sb 217.582	0.0011	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0006	BDL	0.0028	BDL	0.0309	BDL
34	Sc 357.634-A	0.0022	102.7957	96.6777	102.0207	106.5232	104.6952
35	Ar 420.069-A	0.0001	103.5841	103.2425	103.2014	105.1358	102.4980

Date	**4/3/2016**		start cell	elements						
Method	**Water-Mira 032713U**		82	34						
Client	**Jim Gusek, Elli Heil**		0	1	7	8	9	10	11	14
			82	116	320	354	388	422	456	558
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Composite	IT MID	IT END	BCR EFF	AP EFF	MRB EFF plant out
0	Sc 357.634-A	% Concentration	100	103	107	105	104	109	105	106
1	Ar 420.069-A	% Concentration	103	104	105	104	104	105	101	102
2	Sc 361.383-R	% Concentration	101	103	106	111	106	110	109	112
3	Al 308.215-A	0.0005	20.0657	0.0110	5.6875	1.9391	0.5694	0.2121	1.4157	1.3561
4	As 188.979-A*	0.0045	18.4567	BDL	0.0632	0.1435	0.0046	BDL	0.0130	0.0060
5	B 249.772-R	0.0042	19.8109	0.1775	0.3949	0.7156	0.3997	0.3141	0.2822	0.3149
6	Ba 233.527-A*	0.0070	8.6299	BDL	0.0840	0.1103	0.0665	0.1684	0.3397	0.1789
7	Be 313.107-R	0.0001	9.5193	0.0003	0.0019	0.0013	0.0009	0.0008	0.0009	0.0007
8	Ca 315.887-R*	0.0001	18.4874	BDL	465.3225	484.3043	525.9755	625.4834	603.9289	533.6087
9	Cd 214.440-A	0.0047	9.4074	BDL	0.0943	0.0102	0.0053	BDL	BDL	BDL
10	Co 228.616-A	0.0003	9.4151	BDL	0.1130	0.1198	0.1364	0.0446	0.0266	0.0037
11	Cr 205.560-A	0.0003	4.7274	0.0004	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0003	18.4209	0.0018	0.1085	0.0249	0.0148	0.0049	0.0186	0.0269
13	Fe 238.204-A	0.0004	18.4576	0.0006	34.5546	92.6063	23.3345	8.6054	2.8061	0.6313
14	K 766.490-R	0.0003	69.2921	BDL	17.3801	18.7488	46.4165	53.0687	137.8518	242.1407
15	Li 670.784-R	0.0404	19.3576	BDL	0.1187	0.1502	0.1683	0.1536	0.1467	0.1299
16	Mg 279.553-R	0.0007	18.6134	BDL	186.6122	199.1750	215.7940	209.3644	210.4002	194.2845
17	Mg 285.213-R	0.0001	18.2542	BDL	242.5393	269.6611	300.9582	292.6007	289.9523	261.3467
18	Mn 257.610-A*	0.0013	9.2847	BDL	93.1887	114.6321		104.6542	75.6521	49.6036
19	Na 589.592-R	0.0003	BDL	81.4993	65.4791	69.3100	80.0218	76.3436	82.4495	81.5805
20	Ni 231.604-A	0.0065	18.5929	BDL	0.1398	0.1128	0.1271	0.0284	0.0229	0.0196
21	P 177.434-A	0.0004	46.2043	BDL	0.0424	0.2319	BDL	1.1417	1.5615	0.1066
22	Pb 220.353-A	0.0083	18.5538	BDL	0.0366	0.0435	0.0158	0.0125	BDL	BDL
23	S 180.669-A	0.0018	0.4884	48.3250	843.3142	936.6556	979.7230	990.1497	908.2052	883.9632
24	Se 196.026-A	0.0058	18.9863	BDL	BDL	BDL	0.0366	0.0488	0.0311	0.0242
25	Si 251.611-A*	0.0061	0.2534	48.7546	21.4166	18.5210	10.3030	21.2416	18.2514	14.6547
26	Sr 407.771-R*	0.0114	18.3590	BDL	0.5505	0.6584	0.7318	1.0701	1.3306	1.4554
27	Tl 190.801-A	0.0001	18.5078	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0027	9.1390	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0002	9.3915	BDL	37.5733	22.8128	12.8179	0.9221	0.9046	0.6699
30	Sn 189.927	0.0004	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0005	18.5476	0.0036	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0011	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0006	BDL	0.0028	BDL	BDL	BDL	BDL	BDL	BDL
34	Sc 357.634-A	0.0022	102.7957	96.6777	105.4660	103.5466	108.6525	105.1243	111.1310	113.0900
35	Ar 420.069-A	0.0001	103.5841	103.2425	103.7963	103.6459	105.3047	101.1206	110.0132	112.0933

Date	**4/15/2016**							
Method	**Water-Mira 032713U**							
Client	**Gusek**		2	3	7	12	11	8
			150	184	320	490	456	354
ID	Analyte Name	DL (mg/l)	Jan040616 Comp	Jan040616 IT_M	Jan 040616 IT_E	JAN 040616 BCR_E Filter	JAN 040616 AP_E Filter	JAN 040616 MRB_E Filter
0	Sc 357.634-A	% Concentration	105	108	112	118	111	111
1	Ar 420.069-A	% Concentration	99	104	104	103	103	104
2	Sc 361.383-R	% Concentration	107	110	117	121	116	117
3	Al 308.215-A	0.0005	1.39	0.36	0.15	0.24	0.22	0.89
4	As 188.979-A*	0.0045	0.027	0.054	0.009	0.020	0.016	0.020
5	B 249.772-R	0.0042	0.14	0.09	0.02	0.24	0.27	0.10
6	Ba 233.527-A*	0.0070	0.0102	0.0256	0.0245	0.1549	0.1738	0.2662
7	Be 313.107-R	0.0001	0.0019	0.0010	0.0006	0.0008	0.0008	0.0007
8	Ca 315.887-R*	0.0001	420	456	449	511	508	495
9	Cd 214.440-A	0.0047	0.13	BDL	BDL	BDL	BDL	BDL
10	Co 228.616-A	0.0003	0.14	0.11	0.11	0.015	0.019	0.021
11	Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0003	0.10	0.004	0.0004	0.0036	0.0033	0.014
13	Fe 238.204-A	0.0004	29.7	20.9	12.5	8.5	7.1	3.7
14	K 766.490-R	0.0003	10	14	15	23	27	62
15	Li 670.784-R	0.0404	0.11	0.11	0.12	0.12	0.12	0.11
16	Mg 279.553-R	0.0007	177	188	185	181	189	187
17	Mg 285.213-R	0.0001	243	261	262	261	265	264
18	Mn 257.610-A*	0.0013	105	103	107	108	103	87
19	Na 589.592-R	0.0003	55	62	63	65	69	66
20	Ni 231.604-A	0.0065	0.17	0.13	0.13	0.02	0.02	0.03
21	P 177.434-A	0.0004	BDL	0.0058	BDL	0.9759	0.6429	0.1974
22	Pb 220.353-A	0.0083	0.015	0.017	0.012	0.010	0.010	0.011
23	S 180.669-A	0.0018	800	875	916	924	899	904
24	Se 196.026-A	0.0058	0.026	0.038	0.049	0.065	0.053	0.045
25	Si 251.611-A*	0.0061	19	13	10	24	19	18
26	Sr 407.771-R*	0.0114	0.43	0.52	0.52	0.65	0.67	0.87
27	Tl 190.801-A	0.0001	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0027	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0002	44.97	24.66	17.27	0.78	0.75	0.55
30	Sn 189.927	0.0004	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0005	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0011	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0006	BDL	BDL	BDL	BDL	BDL	BDL
34	Sc 357.634-A	0.0022	108	118	111	117	118	117
35	Ar 420.069-A	0.0001	104	109	104	108	103	109

Date	**5/11/2016**		start cell	elements								
Method	**Water-Mira 100814U**		82	34								
Client	**ɔk, Guadelupe, Kate Spangler**		0	1	2	3	4	5	6	7	11	14
			82	116	150	184	218	252	286	320	456	558
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Jan042016COMP_1	Jan042016IT_M	Jan042016IT_E	Jan042016BCR_E	Jan042016AP_E	Jan042016MRB_E	Jan042016AP_E_Dis	Jan042016MRB_E_Dis
0	Sc 357.634-A	% Concentration	100	102	100	104	106	107	108	107	108	110
1	Ar 420.069-A	% Concentration	102	103	103	105	108	108	109	108	110	109
2	Sc 361.383-R	% Concentration	100	102	101	105	107	107	111	108	109	112
3	Al 308.215-A	0.0045	20.8075	0.0090	1.6906	6.9165	0.2936	0.2851	0.3175	0.2559	0.2917	0.2597
4	As 188.979-A*	0.0042	19.2805	0.0048	0.0190	0.0739	0.0056	0.0069	0.0173	0.0284	0.0123	0.0215
5	B 249.772-R	0.0070	20.1568	0.2115	0.2571	0.2099	0.1554	0.0745	0.0671	0.0769	0.1164	0.2134
6	Ba 233.527-A*	0.0001	9.1304	0.0007	0.0083	0.0573	0.0304	0.0743	0.0935	0.1234	0.0938	0.2170
7	Be 313.107-R	0.0001	9.7596	0.0007	0.0015	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
8	Ca 315.887-R*	0.0047	19.2894	BDL	463.5599	502.5993	522.0810	504.8362	508.9046	542.0495	511.9538	539.8862
9	Cd 214.440-A	0.0003	9.8355	BDL	0.1488	0.0031	BDL	BDL	BDL	BDL	BDL	BDL
10	Co 228.616-A	0.0003	10.1404	BDL	0.1588	0.1520	0.1537	0.0037	0.0046	0.0105	0.0015	0.0081
11	Cr 205.560-A	0.0003	5.0919	0.0007	BDL	0.0014	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0004	19.5629	0.0010	0.1179	0.0228	BDL	BDL	0.0042	0.0051	0.0033	0.0120
13	Fe 238.204-A	0.0003	19.4597	0.0033	27.7835	15.7791	1.8366	0.6064	1.0829	3.5897	0.1222	0.8602
14	K 766.490-R	0.0404	47.7387	BDL	7.3521	11.3583	11.6886	12.8826	13.3455	31.9594	14.1056	32.7118
15	Li 670.784-R	0.0007	18.3701	0.0027	0.1034	0.1107	0.1174	0.1051	0.1004	0.0990	0.1023	0.0990
16	Mg 279.553-R	0.0001	18.9365	0.0004	190.6115	195.1555	205.7074	197.0718	192.8758	199.4725	196.9258	196.6828
17	Mg 285.213-R	0.0013	19.3377	BDL	272.1265	287.7347	304.9299	288.9321	278.8998	290.4215	280.7105	286.4934
18	Mn 257.610-A*	0.0003	9.8110	0.0005	111.9878	114.3174	121.9077	116.2034	115.6907	90.5787	116.7287	92.7028
19	Na 589.592-R	0.0065	0.0541	80.0916	53.1754	58.2728	63.6524	55.9510	53.5603	57.6275	61.3567	69.0586
20	Ni 231.604-A	0.0004	19.5583	BDL	0.1719	0.1666	0.1658	0.0042	0.0068	0.0127	0.0052	0.0114
21	P 177.434-A	0.0083	46.5765	BDL	BDL	0.2974	0.0156	0.6268	0.4075	0.3270	0.2686	0.1196
22	Pb 220.353-A	0.0018	19.3092	0.0028	0.0161	0.0286	0.0101	0.0103	0.0101	0.0079	0.0114	0.0095
23	S 180.669-A	0.0058	0.3716	50.1203	863.8714	922.3748	1005.4286	993.6875	913.8213	940.6858	927.6644	983.5332
24	Se 196.026-A	0.0061	19.2554	BDL	0.0518	0.0619	0.0738	0.5431	0.2287	0.1635	0.1322	0.0929
25	Si 251.611-A*	0.0114	0.2451	47.9762	19.0061	33.0161	14.0594	30.3931	24.7801	18.3337	24.8782	18.7247
26	Sr 407.771-R*	0.0001	18.2429	0.0010	0.4905	0.6179	0.6569	0.6412	0.6392	0.9754	0.6405	0.9587
27	Tl 190.801-A	0.0027	18.9275	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0027	9.6769	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0004	9.8013	BDL	48.5495	31.1973	25.8791	1.2053	1.2999	0.4495	0.3592	0.5292
30	Sn 189.927	0.0005	BDL	0.0030	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0011	19.9133	0.0046	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0022	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0001	0.0015	0.0031	BDL	0.1491	BDL	BDL	BDL	BDL	BDL	BDL

Date	**5/18/2016**		start cell	elements						
Method	**Water-Mira 032713U**		82	34	I	J	K	L	M	
Client	**Gusek**		0	1	16	4	15	5	7	9
			82	116	626	218	592	252	320	388
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetal	Jan050416 TSF	Jan050416Comp_I	Jan050416 IT_M	Jan050416IT_E	Jan050416BCR_E	Jan050416 AP_E
0	Sc 357.634-A	% Concentration	100	101	104	110	111	111	104	110
1	Ar 420.069-A	% Concentration	101	102	103	112	120	114	110	114
2	Sc 361.383-R	% Concentration	100	104	108	112	112	112	108	111
3	Al 308.215-A	0.0295	19.6636	BDL	208.9567	1.5708	0.3375	0.2309	0.2545	1.1951
4	As 188.979-A*	0.0057	18.2343	BDL	BDL	0.0469	0.0114	BDL	0.0183	0.0326
5	B 249.772-R	0.1365	19.1091	0.1786	0.4942	0.2003	0.4109	BDL	BDL	0.2100
6	Ba 233.527-A*	0.0002	8.6036	0.0008	0.0800	0.0075	0.0617	0.0250	0.0947	0.1793
7	Be 313.107-R	0.0001	9.2564	0.0005	0.0423	0.0014	0.0006	0.0005	0.0005	0.0005
8	Ca 315.887-R*	0.0123	18.4044	BDL	387.7681	466.6302	536.7073	498.1549	492.2675	502.8334
9	Cd 214.440-A	0.0002	9.2078	BDL	2.0767	0.1194	0.0022	BDL	BDL	BDL
10	Co 228.616-A	0.0004	9.4377	BDL	1.7647	0.1295	0.0881	0.0865	0.0006	0.0011
11	Cr 205.560-A	0.0002	4.7192	0.0006	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	18.3964	0.0012	3.1038	0.0951	BDL	BDL	BDL	0.0117
13	Fe 238.204-A	0.0003	18.2782	0.0033	67.2337	41.8719	42.7910	5.4973	0.1583	0.7755
14	K 766.490-R	0.0488	45.6034	BDL	2.5109	6.5918	10.2200	11.3983	14.4945	14.8788
15	Li 670.784-R	0.0013	17.6876	0.0015	0.3807	0.0852	0.0933	0.0958	0.1023	0.1037
16	Mg 279.553-R	0.0001	17.9321	0.0003	296.6779	177.9714	191.9361	193.9877	198.3026	197.3159
17	Mg 285.213-R	0.0021	18.4139	BDL	623.2080	251.0768	277.4285	282.5951	291.2332	294.1837
18	Mn 257.610-A*	0.0001	9.2300	0.0006	1010.0000	103.9749	98.1993	95.1097	106.9045	113.9084
19	Na 589.592-R	0.0237	0.0696	76.3461	45.3166	50.7261	62.0117	62.4126	59.4979	62.5914
20	Ni 231.604-A	0.0010	18.3016	BDL	1.7203	0.1421	0.1041	0.1079	0.0039	0.0043
21	P 177.434-A	0.0160	43.8545	BDL	0.3001	0.0175	0.0191	BDL	1.2994	0.8317
22	Pb 220.353-A	0.0023	18.2577	BDL	0.1275	0.0090	0.0075	0.0066	0.0072	0.0102
23	S 180.669-A	0.0201	0.3605	48.3734	1991.1777	903.6674	995.7260	964.4480	1179.0162	935.9990
24	Se 196.026-A	0.0067	18.3738	BDL	0.9187	0.0425	0.1534	0.0584	0.5636	0.2745
25	Si 251.611-A*	0.0964	0.2398	47.1078	53.1517	20.7777	19.6641	12.5057	39.7967	37.2729
26	Sr 407.771-R*	0.0002	17.6352	0.0008	0.3508	0.4632	0.6008	0.5600	0.6575	0.6549
27	Tl 190.801-A	0.0055	17.9440	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0006	9.0262	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0001	9.2398	0.0002	128.3450	42.4083	17.3762	12.9014	0.2209	0.6519
30	Sn 189.927	0.0019	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0016	18.5228	0.0040	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0026	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0001	0.0015	0.0032	BDL	BDL	BDL	BDL	BDL	BDL
34	Sc 357.634-A	0.0022	101.4038	108.6225	112.5686	111.2228	104.4352	111.1984	108.0421	113.7518
35	Ar 420.069-A	0.0001	102.0162	106.6520	120.7630	113.5597	102.7917	119.4622	114.8680	119.9428

5/18/2016

Water-Mira 032713U N

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Analyte Name	DL (mg/l)	Jan050416 MRB_E	Jan050416AP_E_Dis	Jan050416 MRB_E_Dis	Jan050416B
Sc 357.634-A	% Concentration	112	108	108	111
Ar 420.069-A	% Concentration	117	108	115	119
Sc 361.383-R	% Concentration	115	112	108	110
Al 308.215-A	0.0295	0.3991	0.2730	0.3927	0.0307
As 188.979-A*	0.0057	0.0366	0.0241	0.0322	BDL
B 249.772-R	0.1365	0.3105	BDL	0.3969	BDL
Ba 233.527-A*	0.0002	0.2239	0.0958	0.1788	BDL
Be 313.107-R	0.0001	0.0005	0.0005	0.0004	BDL
Ca 315.887-R*	0.0123	516.2627	494.6754	507.0932	BDL
Cd 214.440-A	0.0002	BDL	BDL	BDL	BDL
Co 228.616-A	0.0004	0.0094	0.0010	0.0045	BDL
Cr 205.560-A	0.0002	BDL	BDL	BDL	BDL
Cu 324.752-A	0.0011	0.0114	0.0044	0.0018	0.0013
Fe 238.204-A	0.0003	1.7197	0.1455	0.8191	0.0013
K 766.490-R	0.0488	23.8289	14.2701	23.7657	BDL
Li 670.784-R	0.0013	0.0988	0.1029	0.1025	BDL
Mg 279.553-R	0.0001	197.2412	194.9160	200.2373	0.0053
Mg 285.213-R	0.0021	292.2904	294.5869	294.9097	0.0056
Mn 257.610-A*	0.0001	108.3007	110.3189	103.5097	0.0018
Na 589.592-R	0.0237	73.5508	63.5346	72.8301	BDL
Ni 231.604-A	0.0010	0.0147	0.0027	0.0071	BDL
P 177.434-A	0.0160	0.6520	0.6891	0.4911	BDL
Pb 220.353-A	0.0023	0.0099	0.0083	0.0072	BDL
S 180.669-A	0.0201	973.7128	904.8857	936.6465	0.7182
Se 196.026-A	0.0067	0.1847	0.0752	0.3061	BDL
Si 251.611-A*	0.0964	33.8644	36.3326	32.5110	BDL
Sr 407.771-R*	0.0002	0.7623	0.6543	0.7572	BDL
Tl 190.801-A	0.0055	BDL	BDL	BDL	BDL
V 292.402-A*	0.0006	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0001	0.7319	0.1582	0.8026	0.0053
Sn 189.927	0.0019	BDL	BDL	BDL	BDL
Mo 202.031	0.0016	BDL	BDL	BDL	BDL
Sb 217.582	0.0026	BDL	BDL	BDL	BDL
Ti 334.940	0.0001	BDL	BDL	BDL	BDL
Sc 357.634-A	0.0022	110.7440	110.0235	110.0836	104.2788
Ar 420.069-A	0.0001	120.2675	112.4094	114.4609	110.0284

Date	**6/3/2016**		start cell	elements						
Method	**Water-Mira 100814U**		634	34						
Client	**ıa (8), Ellie (47), Jim Gusek (6)**		0	1	87	88	89	90	91	92
			634	668	3592	3626	3660	3694	3728	3762
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetal	Jan051816COMP_1	Jan051816IT_M	Jan051816IT_E	Jan051816BCR_E	Jan051816AP_E	Jan051816MRB_E
0	Sc 357.634-A	% Concentration	99	101	99	101	99	107	103	103
1	Ar 420.069-A	% Concentration	101	101	159	166	191	131	138	137
2	Sc 361.383-R	% Concentration	100	99	90	88	84	106	101	101
3	Al 308.215-A	0.0045	17.8119	0.0128	0.3215	0.2507	0.1785	0.2634	0.2743	0.2736
4	As 188.979-A*	0.0042	16.6966	BDL	0.0594	0.0112	0.0067	0.0434	0.0538	0.0445
5	B 249.772-R	0.0070	17.4227	0.1071	0.1567	0.0567	0.0436	0.0203	0.0139	0.0144
6	Ba 233.527-A*	0.0001	7.9679	0.0006	0.0079	0.0339	0.0219	0.1391	0.1209	0.1842
7	Be 313.107-R	0.0001	8.7310	0.0010	BDL	BDL	BDL	BDL	BDL	BDL
8	Ca 315.887-R*	0.0047	17.0419	0.0060	545.9656	594.0901	592.8423	576.1955	589.4250	591.1422
9	Cd 214.440-A	0.0003	8.4378	BDL	0.0170	0.0018	BDL	BDL	BDL	BDL
10	Co 228.616-A	0.0003	8.6243	BDL	0.0444	0.0322	0.0354	BDL	BDL	0.0067
11	Cr 205.560-A	0.0003	4.3064	0.0004	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0004	16.6849	0.0006	0.0058	0.0333	BDL	BDL	0.0035	0.0037
13	Fe 238.204-A	0.0003	16.7137	0.0038	29.8295	6.1812	4.8884	0.1211	0.5476	2.1922
14	K 766.490-R	0.0404	41.4703	0.0472	8.6736	13.0781	12.4474	17.5384	17.0962	23.4724
15	Li 670.784-R	0.0007	16.6114	0.0018	0.0768	0.1032	0.1057	0.1111	0.1106	0.1092
16	Mg 279.553-R	0.0001	16.9610	0.0015	191.9296	236.5675	249.7925	211.8273	220.2222	220.8900
17	Mg 285.213-R	0.0013	17.1803	0.0024	260.6235	337.2917	352.2316	319.7376	333.7135	333.8133
18	Mn 257.610-A*	0.0003	8.4410	0.0004	66.2742	91.0692	90.7916	109.2837	114.1286	107.7447
19	Na 589.592-R	0.0065	0.0626	75.1041	57.7664	74.9576	75.4737	68.0712	69.4430	68.7810
20	Ni 231.604-A	0.0004	16.7526	BDL	0.0655	0.0462	0.0516	0.0077	0.0057	0.0133
21	P 177.434-A	0.0083	40.6832	BDL	0.0493	BDL	BDL	1.8703	1.1162	0.6608
22	Pb 220.353-A	0.0018	16.8736	0.0024	0.0100	0.0072	0.0092	0.0069	0.0089	0.0098
23	S 180.669-A	0.0058	0.3373	46.4481	918.5669	1113.4690	1159.9109	1215.8658	1050.1157	1065.2836
24	Se 196.026-A	0.0061	17.0573	BDL	0.0669	0.1004	0.1178	0.4015	0.2367	0.1989
25	Si 251.611-A*	0.0114	0.2290	43.8197	20.6073	16.3098	13.2947	63.3728	50.5531	41.5369
26	Sr 407.771-R*	0.0001	16.4551	0.0011	0.4865	0.5559	0.5521	0.7232	0.7045	0.7805
27	Tl 190.801-A	0.0027	16.4498	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0027	8.3018	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0004	8.4815	0.0008	14.3728	3.6942	1.2473	0.1502	0.1379	0.1546
30	Sn 189.927	0.0005	BDL	0.0015	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0011	16.9032	0.0034	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0022	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0001	0.0021	0.0032	BDL	BDL	BDL	BDL	BDL	BDL

Date	**6/15/2016**		start cell	elements						
Method	**Water-Mira 100814U**		548	34						
Client	**/idso (11), Jim Gusek (14)**		0	1	15	16	17	18	19	20
			548	582	1058	1092	1126	1160	1194	1228
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Jan061116Adit	Jan060116COMP_1	Jan060116IT_M	Jan060116IT_E	Jan060116BCR_E	Jan060116AP_E
0	Sc 357.634-A	% Concentration	96	99	127	130	133	133	122	125
1	Ar 420.069-A	% Concentration	101	102	95	98	101	102	97	99
2	Sc 361.383-R	% Concentration	101	102	116	126	133	138	128	131
3	Al 308.215-A	0.0205	19.9765	BDL	0.2046	0.1801	0.1790	0.1194	0.1941	0.1949
4	As 188.979-A*	0.0047	19.0858	0.0101	0.1037	0.0577	0.0145	0.0170	0.0347	0.0445
5	B 249.772-R	0.0459	20.0160	0.2735	0.6190	0.6934	0.6063	0.5469	0.4481	0.3627
6	Ba 233.527-A*	0.0001	9.0437	0.0006	0.0070	0.0070	0.0167	0.0174	0.0913	0.0954
7	Be 313.107-R	0.0002	9.9332	0.0009	0.0007	0.0007	0.0006	0.0005	0.0005	0.0005
8	Ca 315.887-R*	0.0064	20.0541	BDL	444.9826	437.4274	436.4758	412.7325	420.1484	430.3863
9	Cd 214.440-A	0.0001	9.7092	BDL	0.0041	0.0047	BDL	0.0004	BDL	BDL
10	Co 228.616-A	0.0002	9.8891	BDL	0.0301	0.0303	0.0022	0.0094	0.0008	0.0005
11	Cr 205.560-A	0.0003	4.9586	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	19.2502	0.0014	BDL	BDL	BDL	BDL	BDL	BDL
13	Fe 238.204-A	0.0003	19.1881	0.0016	37.0959	33.8180	8.4771	20.9367	0.0868	0.4075
14	K 766.490-R	0.0323	48.3743	BDL	7.0819	7.0427	8.4841	8.5689	12.3706	12.8346
15	Li 670.784-R	0.0014	18.6486	BDL	0.0720	0.0662	0.0733	0.0722	0.0848	0.0884
16	Mg 279.553-R	0.0001	19.2032	BDL	151.3506	143.7525	149.0837	149.3923	161.5236	162.1040
17	Mg 285.213-R	0.0014	19.8812	BDL	220.7629	212.5466	224.4232	225.9062	250.9128	255.7787
18	Mn 257.610-A*	0.0000	9.6918	0.0006	53.3805	53.7917	49.2878	46.7668	75.0421	84.1391
19	Na 589.592-R	0.1345	BDL	80.3124	50.1409	48.1299	53.5382	52.9635	57.4897	56.6664
20	Ni 231.604-A	0.0005	19.2585	BDL	0.0444	0.0449	0.0023	0.0198	0.0036	0.0026
21	P 177.434-A	0.0106	46.3727	BDL	0.0779	0.0290	0.0599	0.1125	1.0227	1.1078
22	Pb 220.353-A	0.0020	19.1397	BDL	0.0081	0.0081	BDL	BDL	0.0025	0.0038
23	S 180.669-A	0.0276	0.2923	41.1696	623.3912	626.3793	670.5616	678.6891	955.4368	664.2164
24	Se 196.026-A	0.0100	19.2605	BDL	0.0142	0.0167	0.0214	BDL	0.4479	0.2753
25	Si 251.611-A*	0.0114	0.2383	47.6231	34.0095	30.3072	25.3277	22.1795	54.7535	52.0413
26	Sr 407.771-R*	0.0001	15.9329	0.0013	0.4067	0.3926	0.4126	0.3886	0.4925	0.5071
27	Tl 190.801-A	0.0018	18.6224	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.5543	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0003	9.7440	BDL	8.5945	8.6103	0.1898	0.3372	0.0965	0.0663
30	Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	19.3609	0.0095	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0012	0.0029	BDL	BDL	BDL	BDL	BDL	BDL
		0.0022								
		0.0001								

6/15/2016

Water-Mira 100814U

ridso (11), Jim Gusek (14)

		21	22	23	26	27	28	29
		1262	1296	1330	1432	1466	1500	1534
Analyte Name	DL (mg/l)	Jan060116MRB_E	Jan06116Adit_Dis	Jan060116COMP_1_Dis	Jan060116IT_M_Dis	Jan060116IT_E_Dis	Jan060116BCR_E_Dis	Jan060116AP_E_Dis
Sc 357.634-A	% Concentration	131	130	132	145	148	153	146
Ar 420.069-A	% Concentration	99	122	116	130	135	125	116
Sc 361.383-R	% Concentration	127	123	134	142	133	146	148
Al 308.215-A	0.0205	0.2258	0.1688	0.1517	0.1598	0.1339	0.2299	0.2604
As 188.979-A*	0.0047	0.0387	0.0806	0.0429	0.0137	0.0193	0.0328	0.0565
B 249.772-R	0.0459	0.3273	0.4190	0.3351	0.3273	0.1953	0.1912	0.1432
Ba 233.527-A*	0.0001	0.1853	0.0264	0.0253	0.0302	0.0612	0.1135	0.1151
Be 313.107-R	0.0002	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006
Ca 315.887-R*	0.0064	432.2771	414.5560	414.0923	428.3669	429.1834	407.7359	412.0668
Cd 214.440-A	0.0001	BDL	0.0052	0.0052	BDL	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0063	0.0325	0.0327	0.0022	0.0103	0.0003	0.0011
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cu 324.752-A	0.0011	BDL	BDL	BDL	BDL	0.0012	BDL	0.0018
Fe 238.204-A	0.0003	1.5716	38.8594	32.4011	7.0668	0.2919	0.0258	0.1315
K 766.490-R	0.0323	19.0812	6.3519	6.3922	7.8405	8.4061	10.7925	11.6988
Li 670.784-R	0.0014	0.0891	0.0611	0.0583	0.0655	0.0669	0.0700	0.0776
Mg 279.553-R	0.0001	164.7315	142.6157	138.3339	146.0432	156.8908	152.0027	151.9036
Mg 285.213-R	0.0014	259.2429	199.0964	194.3749	210.6459	223.4114	224.7246	230.1955
Mn 257.610-A*	0.0000	84.5363	56.5602	56.1753	57.3738	51.3699	89.0148	97.3847
Na 589.592-R	0.1345	54.9613	45.5485	44.3889	49.9172	50.8362	51.2364	49.9245
Ni 231.604-A	0.0005	0.0082	0.0478	0.0487	0.0030	0.0218	0.0022	0.0007
P 177.434-A	0.0106	0.6257	BDL	BDL	BDL	BDL	1.1374	1.1616
Pb 220.353-A	0.0020	0.0073	BDL	BDL	BDL	BDL	0.0049	0.0056
S 180.669-A	0.0276	719.6949	658.3339	653.6796	751.9802	778.0751	1068.9189	756.9895
Se 196.026-A	0.0100	0.1981	0.1491	0.1390	0.1217	0.1096	0.2763	0.1643
Si 251.611-A*	0.0114	44.2558	23.1246	22.3689	22.1955	17.8546	60.7017	57.4994
Sr 407.771-R*	0.0001	0.5828	0.3577	0.3515	0.3768	0.3668	0.4316	0.4497
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	0.0721	9.2826	8.9567	0.1853	0.1664	0.0426	0.0749
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	0.0022							
	0.0001							

6/15/2016

Water-Mira 100814U

ridso (11), Jim Gusek (14) 30

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Analyte Name	DL (mg/l)	Jan060116MRB_E_Dis
Sc 357.634-A	% Concentration	145
Ar 420.069-A	% Concentration	114
Sc 361.383-R	% Concentration	144
Al 308.215-A	0.0205	0.2450
As 188.979-A*	0.0047	0.0370
B 249.772-R	0.0459	0.1340
Ba 233.527-A*	0.0001	0.1994
Be 313.107-R	0.0002	0.0007
Ca 315.887-R*	0.0064	427.5667
Cd 214.440-A	0.0001	BDL
Co 228.616-A	0.0002	0.0028
Cr 205.560-A	0.0003	BDL
Cu 324.752-A	0.0011	BDL
Fe 238.204-A	0.0003	1.2977
K 766.490-R	0.0323	17.6107
Li 670.784-R	0.0014	0.0788
Mg 279.553-R	0.0001	157.1475
Mg 285.213-R	0.0014	239.5595
Mn 257.610-A*	0.0000	91.8526
Na 589.592-R	0.1345	49.6402
Ni 231.604-A	0.0005	0.0034
P 177.434-A	0.0106	0.5684
Pb 220.353-A	0.0020	0.0056
S 180.669-A	0.0276	766.7305
Se 196.026-A	0.0100	0.1300
Si 251.611-A*	0.0114	45.1091
Sr 407.771-R*	0.0001	0.5344
Tl 190.801-A	0.0018	BDL
V 292.402-A*	0.0008	BDL
Zn 213.857-A	0.0003	0.0331
Sn 189.927	0.0017	BDL
Mo 202.031	0.0010	BDL
Sb 217.582	0.0051	BDL
Ti 334.940	0.0002	BDL
	0.0022	
	0.0001	

Date	**6/23/2016**		start cell	elements						
Method	**Water-Mira 100814U**		82	34						
Client	**usek, Nathan Switzner**		0	1	2	3	4	5	6
			82	116	150	184	218	252	286
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Jan061516Adit	Jan061516COMP_I	Jan061516IT_M	Jan061516IT_E	Jan061516BCR_E
0	Sc 357.634-A	% Concentration	98	100	94	97	96	100	96
1	Ar 420.069-A	% Concentration	100	100	96	102	114	105	101
2	Sc 361.383-R	% Concentration	101	103	97	98	101	104	104
3	Al 308.215-A	0.0205	19.3421	BDL	0.1393	0.1600	1.2542	0.1043	0.1251
4	As 188.979-A*	0.0047	18.9844	0.0054	0.0855	0.0762	0.0421	0.0107	0.0149
5	B 249.772-R	0.0459	18.8766	0.1160	0.2427	0.2260	0.1301	0.0735	0.0556
6	Ba 233.527-A*	0.0001	8.6063	0.0005	0.0056	0.0062	0.0274	0.0127	0.0730
7	Be 313.107-R	0.0002	9.8075	0.0003	0.0010	0.0009	0.0008	0.0006	0.0006
8	Ca 315.887-R*	0.0064	19.0371	BDL	482.9312	485.6818	519.2749	524.8204	479.7924
9	Cd 214.440-A	0.0001	9.5727	BDL	0.0032	0.0038	0.0022	BDL	BDL
10	Co 228.616-A	0.0002	9.8483	BDL	0.0255	0.0275	0.0028	0.0043	0.0006
11	Cr 205.560-A	0.0003	4.9272	0.0005	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	19.0347	BDL	BDL	BDL	0.0060	BDL	BDL
13	Fe 238.204-A	0.0003	18.9867	BDL	31.8964	34.5373	14.2706	1.3205	0.1080
14	K 766.490-R	0.0323	46.0723	BDL	7.8070	7.8813	10.0164	10.0790	15.5962
15	Li 670.784-R	0.0014	18.5674	BDL	0.0822	0.0821	0.0937	0.0946	0.0974
16	Mg 279.553-R	0.0001	19.0822	0.0007	180.7057	180.5229	195.6300	197.0879	208.9145
17	Mg 285.213-R	0.0014	19.0194	BDL	245.9648	246.5392	279.0547	285.3458	308.1499
18	Mn 257.610-A*	0.0000	9.4956	BDL	48.0230	50.6084	51.5645	46.8160	47.2924
19	Na 589.592-R	0.1345	BDL	76.2440	55.4370	55.3737	63.8181	66.2303	68.4206
20	Ni 231.604-A	0.0005	19.0310	BDL	0.0384	0.0416	0.0072	0.0100	0.0048
21	P 177.434-A	0.0106	47.8509	BDL	0.0647	0.0780	0.2518	BDL	0.3539
22	Pb 220.353-A	0.0020	19.1210	BDL	0.0052	0.0064	0.0126	BDL	BDL
23	S 180.669-A	0.0276	0.3726	46.9122	648.3957	687.7794	755.9481	783.2467	1105.0739
24	Se 196.026-A	0.0100	19.1184	BDL	0.0110	0.0176	0.0214	0.0217	0.3733
25	Si 251.611-A*	0.0114	0.2296	44.9364	17.2731	18.0925	19.7248	14.0260	44.3633
26	Sr 407.771-R*	0.0001	17.6648	0.0005	0.5074	0.5097	0.5500	0.5531	0.6006
27	Tl 190.801-A	0.0018	18.7493	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.3820	0.0009	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0003	9.6069	0.0004	7.1420	7.5253	2.3961	0.1059	0.0733
30	Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	19.2389	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0027	0.0031	BDL	BDL	BDL	BDL	BDL

6/23/2016

Water-Mira 100814U

usek, Nathan Switzner

		7	8	9	10	11	14
		320	354	388	422	456	558
Analyte Name	DL (mg/l)	Jan061516AP_E	Jan061516COMP_I_Dis	Jan061516IT_M_Dis	Jan061516IT_E_Dis	Jan061516BCR_E_Dis	Jan061516AP_E_Dis
Sc 357.634-A	% Concentration	95	98	102	97	98	95
Ar 420.069-A	% Concentration	108	110	120	110	108	108
Sc 361.383-R	% Concentration	101	100	96	100	99	100
Al 308.215-A	0.0205	0.1264	0.1208	0.1399	0.0951	0.1095	0.1096
As 188.979-A*	0.0047	0.0716	0.0530	0.0242	0.0225	0.0184	0.0730
B 249.772-R	0.0459	0.0489	0.2136	0.0644	0.0879	0.0811	0.1373
Ba 233.527-A*	0.0001	0.0858	0.0215	0.0304	0.0225	0.0775	0.0880
Be 313.107-R	0.0002	0.0006	0.0009	0.0007	0.0005	0.0006	0.0006
Ca 315.887-R*	0.0064	518.0603	493.5571	533.9253	522.4449	488.0793	519.1419
Cd 214.440-A	0.0001	BDL	0.0037	BDL	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0007	0.0281	0.0014	0.0037	0.0003	BDL
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL
Cu 324.752-A	0.0011	BDL	BDL	BDL	BDL	BDL	0.0019
Fe 238.204-A	0.0003	0.8410	32.1548	1.3387	0.0323	0.0168	0.1408
K 766.490-R	0.0323	17.0022	0.0000	10.1143	9.8843	15.7631	16.4199
Li 670.784-R	0.0014	0.1107	0.0803	0.0897	0.0940	0.0994	0.1106
Mg 279.553-R	0.0001	222.1226	180.7229	203.4742	202.8646	216.0882	224.5743
Mg 285.213-R	0.0014	335.1090	245.5461	281.6175	285.1375	310.2739	335.0351
Mn 257.610-A*	0.0000	55.5412	51.3107	52.9795	46.3657	48.0472	54.5718
Na 589.592-R	0.1345	83.0813	57.0947	64.6260	67.3147	70.2739	84.2667
Ni 231.604-A	0.0005	0.0047	0.0421	0.0054	0.0096	0.0030	0.0033
P 177.434-A	0.0106	0.6241	BDL	BDL	BDL	0.3334	0.5375
Pb 220.353-A	0.0020	0.0024	BDL	BDL	BDL	BDL	BDL
S 180.669-A	0.0276	783.4298	717.2802	829.3329	784.4482	1152.6934	785.8391
Se 196.026-A	0.0100	0.1585	0.1273	0.1336	0.1142	0.2409	0.0997
Si 251.611-A*	0.0114	46.7796	18.0984	16.9718	13.4869	45.4915	46.5382
Sr 407.771-R*	0.0001	0.6563	0.5049	0.5388	0.5452	0.5986	0.6569
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	0.0873	7.7642	0.1245	0.1806	0.0282	0.1192
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	BDL	BDL
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL

Date	**7/12/2016**		start cell	elements							
Method	**Water-Mira 100814U**		82	34							
Client	**(14), myjung(3), Kate Spangler**		0	1	2	3	4	5	6	7	8
			82	116	150	184	218	252	286	320	354
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetal	Jan062916Adit	Jan061516COMP_I	Jan062916IT_M	Jan062916IT_E	Jan062916BCR_E	Jan062916AP_E	Jan062916MRB_E
0	Sc 357.634-A	% Concentration	98	99	94	101	102	110	100	102	101
1	Ar 420.069-A	% Concentration	102	102	97	100	115	147	146	135	151
2	Sc 361.383-R	% Concentration	99	99	96	101	103	96	91	102	94
3	Al 308.215-A	0.0205	18.8708	BDL	0.1807	0.2447	0.4479	0.1128	0.1046	0.1121	0.0830
4	As 188.979-A*	0.0047	18.1877	0.0064	0.0848	0.2013	0.1612	0.0147	0.1721	0.2608	0.2213
5	B 249.772-R	0.0459	18.4586	0.1464	0.2590	0.2529	0.2133	0.1026	0.0763	0.0764	0.0603
6	Ba 233.527-A*	0.0001	8.7920	0.0011	0.0066	0.0064	0.0127	0.0199	0.0642	0.0799	0.0204
7	Be 313.107-R	0.0002	9.3013	0.0010	0.0006	0.0006	0.0009	0.0005	0.0006	0.0007	0.0007
8	Ca 315.887-R*	0.0064	18.4768	BDL	453.9448	467.2099	506.4805	559.7834	497.7434	525.9158	548.7940
9	Cd 214.440-A	0.0001	9.1979	BDL	0.0035	0.0052	0.0296	BDL	BDL	BDL	BDL
10	Co 228.616-A	0.0002	9.3396	0.0009	0.0236	0.0275	0.0291	0.0201	0.0008	0.0007	0.0008
11	Cr 205.560-A	0.0003	4.6684	0.0006	BDL	BDL	BDL	BDL	BDL	BDL	0.0011
12	Cu 324.752-A	0.0011	18.2735	0.0017	0.0089	BDL	0.0056	BDL	BDL	BDL	0.0156
13	Fe 238.204-A	0.0003	18.2331	0.0077	29.9694	43.9276	36.0167	0.2534	0.0836	0.0617	0.0709
14	K 766.490-R	0.0323	46.3847	BDL	8.0510	7.4756	8.6567	9.9231	12.9400	12.7362	0.0000
15	Li 670.784-R	0.0014	17.6300	0.0036	0.0771	0.0772	0.0786	0.0777	0.0733	0.0819	0.0765
16	Mg 279.553-R	0.0001	18.0376	0.0003	164.4960	165.5626	172.2302	180.6007	182.5926	194.0097	194.4278
17	Mg 285.213-R	0.0014	18.3659	BDL	231.2386	234.4937	241.2004	248.8439	252.7987	274.2889	270.3368
18	Mn 257.610-A*	0.0000	9.2016	0.0009	44.9070	49.1987	52.0599	54.6116	47.3076	49.7521	18.0018
19	Na 589.592-R	0.1345	BDL	75.3417	51.7960	52.2212	54.0561	55.4989	54.3600	64.2695	95.6520
20	Ni 231.604-A	0.0005	18.2505	0.0009	0.0352	0.0394	0.0436	0.0323	0.0030	0.0022	0.0049
21	P 177.434-A	0.0106	43.6315	BDL	0.0901	0.2607	0.3112	BDL	0.1153	0.3542	0.0967
22	Pb 220.353-A	0.0020	18.2095	BDL	0.0217	0.0168	0.0313	BDL	BDL	BDL	BDL
23	S 180.669-A	0.0276	0.5231	49.3060	658.3268	737.8938	803.3480	968.4825	1240.8045	831.5941	929.9824
24	Se 196.026-A	0.0100	18.4863	BDL	0.0123	BDL	BDL	0.0303	0.5684	0.1757	0.1294
25	Si 251.611-A*	0.0114	0.2071	40.7676	16.5085	18.8128	22.3574	19.1144	40.0094	46.5752	42.0975
26	Sr 407.771-R*	0.0001	17.0592	0.0043	0.4832	0.4899	0.5281	0.5569	0.5202	0.5655	1.1229
27	Tl 190.801-A	0.0018	17.7867	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.0270	0.0014	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0003	9.2483	0.0006	6.6522	7.4922	9.8454	0.7691	0.0891	0.0866	0.0688
30	Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	18.2964	0.0104	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0075	0.0031	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		0.0022									
		0.0001									

7/12/2016

Water-Mira 100814U

(14), myjung(3), Kate Spangler

		9	10	11	14	15	16	17
		388	422	456	558	592	626	660
Analyte Name	DL (mg/l)	Jan062916Adit_Dis	Jan062916COMP_I_Dis	Jan062916IT_M_Dis	Jan062916IT_E_Dis	Jan062916BCR_E_Dis	Jan062916AP_E_Dis	Jan062916MRB_E_Dis
Sc 357.634-A	% Concentration	105	102	105	108	97	101	101
Ar 420.069-A	% Concentration	157	151	187	194	183	191	199
Sc 361.383-R	% Concentration	90	93	88	87	81	87	85
Al 308.215-A	0.0205	0.1800	0.1556	0.1292	0.1337	0.1258	0.1393	0.0912
As 188.979-A*	0.0047	0.2594	0.2030	0.1751	0.1564	0.2778	0.3329	0.2810
B 249.772-R	0.0459	0.2007	0.1897	0.0590	0.1565	0.1154	0.0886	0.0860
Ba 233.527-A*	0.0001	0.0233	0.0173	0.0198	0.0275	0.0708	0.0863	0.0248
Be 313.107-R	0.0002	0.0008	0.0008	0.0007	0.0006	0.0005	0.0004	0.0007
Ca 315.887-R*	0.0064	521.6964	518.7997	564.0106	591.3823	531.4700	561.9097	594.5020
Cd 214.440-A	0.0001	0.0042	0.0044	BDL	BDL	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0315	0.0308	0.0301	0.0215	0.0006	0.0006	0.0010
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL	0.0005
Cu 324.752-A	0.0011	BDL	BDL	BDL	BDL	BDL	0.0018	0.0073
Fe 238.204-A	0.0003	38.6681	35.6553	0.0816	0.0318	0.0466	0.2319	0.0176
K 766.490-R	0.0323	7.5868	7.3918	8.7977	9.9441	13.1471	12.8915	90.2079
Li 670.784-R	0.0014	0.0692	0.0701	0.0720	0.0753	0.0713	0.0787	0.0733
Mg 279.553-R	0.0001	186.4758	180.5322	192.6806	193.9243	204.3962	214.2149	212.3296
Mg 285.213-R	0.0014	242.7614	241.5172	252.3161	254.8452	260.2328	284.7108	278.2397
Mn 257.610-A*	0.0000	57.1241	56.0085	60.4716	58.1464	49.6690	55.0991	18.8375
Na 589.592-R	0.1345	50.6420	51.0628	53.2358	54.7202	53.5991	64.0915	95.9683
Ni 231.604-A	0.0005	0.0466	0.0453	0.0464	0.0348	0.0027	0.0036	0.0047
P 177.434-A	0.0106	BDL	BDL	BDL	BDL	0.0865	0.5148	0.0496
Pb 220.353-A	0.0020	BDL	BDL	BDL	BDL	BDL	0.0022	BDL
S 180.669-A	0.0276	883.4385	848.4710	983.3335	1069.0127	1314.3470	947.4390	1034.8670
Se 196.026-A	0.0100	0.1259	0.1291	0.1575	0.1345	0.4328	0.1620	0.1116
Si 251.611-A*	0.0114	20.0020	19.2446	18.5751	20.1924	40.9862	49.3756	44.2024
Sr 407.771-R*	0.0001	0.4640	0.4706	0.5032	0.5427	0.5077	0.5584	1.1087
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	8.7354	8.4299	3.0019	0.8065	0.0395	0.0887	0.0664
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	BDL	BDL	0.0020
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	0.0022							
	0.0001							

Date	**8/2/2016**		start cell	elements							
Method	**Water-Mira 100814U**		82	34							
Client	**Guadalupe (14)**		0	1	10	2	14	8	4	6	16
			82	116	422	150	558	354	218	286	626
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Jan072016Adit	Jan072016COMP_I	Jan072016IT_M	Jan072016IT_E	Jan072016BCR_E	Jan072016AP_E	Jan072016MRB_E
0	Sc 357.634-A	% Concentration	98	100	56	95	101	95	137	98	81
1	Ar 420.069-A	% Concentration	106	107	126	107	91	166	120	126	113
2	Sc 361.383-R	% Concentration	103	103	63	101	122	90	99	99	85
3	Al 308.215-A	0.0205	18.8247	0.0748	BDL	0.1503	4.3784	0.1619	BDL	0.1443	0.0263
4	As 188.979-A*	0.0047	18.6921	0.0584	0.0612	0.0808	0.2896	0.0411	BDL	0.0444	0.0184
5	B 249.772-R	0.0459	18.7132	0.1862	0.1692	0.2797	5.5827	0.0863	0.1162	0.1067	BDL
6	Ba 233.527-A*	0.0001	9.0326	0.0266	0.0033	0.0058	0.1702	0.0139	0.0178	0.0545	0.1326
7	Be 313.107-R	0.0002	9.6310	0.0277	0.0010	0.0009	0.0218	0.0074	0.0006	0.0015	BDL
8	Ca 315.887-R*	0.0064	18.9798	0.0940	389.8424	478.0341	544.3021	518.3458	508.3670	486.8744	445.1969
9	Cd 214.440-A	0.0001	9.7237	0.0275	0.0014	0.0031	0.0853	0.0006	BDL	BDL	BDL
10	Co 228.616-A	0.0002	9.8492	0.0287	0.0155	0.0257	0.0761	0.0315	BDL	0.0008	0.0016
11	Cr 205.560-A	0.0003	4.9066	0.0136	BDL	BDL	BDL	0.0009	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	18.9361	0.0551	BDL	BDL	BDL	BDL	BDL	0.0020	BDL
13	Fe 238.204-A	0.0003	19.1178	0.0687	20.8217	33.9490	871.9963	4.7598	0.0441	0.4039	0.2242
14	K 766.490-R	0.0323	47.2539	0.0908	5.6378	7.6691	10.8481	0.0000	7.8899	8.2296	12.3211
15	Li 670.784-R	0.0014	17.8940	0.0533	0.1544	0.0791	0.0422	0.0725	0.0753	0.0741	0.0910
16	Mg 279.553-R	0.0001	18.5582	0.0558	198.1396	184.5862	228.6274	199.2953	190.5729	189.8639	237.0110
17	Mg 285.213-R	0.0014	18.9501	0.0547	217.0980	242.6538	261.9162	248.9673	248.8045	244.4401	255.4402
18	Mn 257.610-A*	0.0000	9.6252	0.0273	28.9894	49.2947	82.0834	53.4057	35.9938	45.2370	37.1475
19	Na 589.592-R	0.1345	BDL	75.0404	33.7748	50.8146	57.6110	50.3875	50.3368	49.9832	51.7009
20	Ni 231.604-A	0.0005	19.2138	0.0567	0.0272	0.0391	0.1072	0.0501	BDL	0.0124	0.0035
21	P 177.434-A	0.0106	45.0906	0.1221	0.0257	0.0717	2.8501	BDL	BDL	0.0870	0.0774
22	Pb 220.353-A	0.0020	18.8411	0.0529	0.0116	0.0038	0.4337	0.0038	BDL	BDL	0.0042
23	S 180.669-A	0.0276	0.4070	49.4067	609.2387	690.0640	610.3472	834.9946	389.4112	690.5877	625.7680
24	Se 196.026-A	0.0100	18.6881	0.0611	BDL	0.0128	BDL	0.1408	0.0106	0.1690	0.0621
25	Si 251.611-A*	0.0114	0.3700	34.6906	11.7955	16.9879	156.4260	15.8357	13.3800	28.1686	24.3317
26	Sr 407.771-R*	0.0001	17.7681	0.0514	0.4452	0.5021	0.7173	0.4973	0.5317	0.5261	0.6701
27	Tl 190.801-A	0.0018	18.3614	0.0567	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.3837	0.0278	BDL	BDL	BDL	0.0019	BDL	BDL	BDL
29	Zn 213.857-A	0.0003	9.6162	0.0353	4.8037	6.8776	69.1356	5.9385	0.0075	0.0911	0.0619
30	Sn 189.927	0.0017	BDL	0.0042	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	19.2546	0.0669	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0094	0.0033	BDL	BDL	BDL	BDL	BDL	BDL	BDL

8/2/2016

Water-Mira 100814U

Guadalupe (14)		11	3	15	9	5	7	17
		456	184	592	388	252	320	660
Analyte Name	DL (mg/l)	Jan072016Adit_Dis	Jan072016Comp_I_Dis	Jan072016IT_M_Dis	Jan072016IT_E_Dis	Jan072016BCR_E_Dis	Jan072016AP_E_Dis	Jan072016MRB_E_Dis
Sc 357.634-A	% Concentration	65	96	89	88	98	98	55
Ar 420.069-A	% Concentration	127	111	107	106	118	136	125
Sc 361.383-R	% Concentration	75	99	102	105	99	95	66
Al 308.215-A	0.0205	BDL	0.1501	0.0314	BDL	0.1413	0.1247	BDL
As 188.979-A*	0.0047	0.0545	0.0709	BDL	BDL	0.0159	0.0428	0.0102
B 249.772-R	0.0459	0.1173	0.2605	0.1248	BDL	0.1317	0.1111	BDL
Ba 233.527-A*	0.0001	0.0099	0.0156	0.0186	0.0149	0.0570	0.0576	0.0830
Be 313.107-R	0.0002	0.0013	0.0008	0.0008	0.0004	0.0008	0.0037	BDL
Ca 315.887-R*	0.0064	425.9078	486.7103	482.8089	468.8893	503.7604	491.8155	397.2516
Cd 214.440-A	0.0001	0.0018	0.0032	0.0007	0.0007	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0194	0.0261	0.0228	0.0224	0.0006	0.0042	0.0013
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	0.0011	BDL
Cu 324.752-A	0.0011	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fe 238.204-A	0.0003	23.9501	34.0669	5.3562	2.9717	0.2106	0.0669	0.0769
K 766.490-R	0.0323	5.9755	7.5756	8.0196	8.4139	7.7223	8.3539	11.3600
Li 670.784-R	0.0014	0.1119	0.0792	0.0525	0.0843	0.0752	0.0756	0.1423
Mg 279.553-R	0.0001	212.6156	189.2590	247.2917	222.0156	190.2341	195.7463	220.4170
Mg 285.213-R	0.0014	228.0023	244.3891	260.1764	251.4132	245.3828	246.6219	237.9027
Mn 257.610-A*	0.0000	36.2193	50.4960	48.9774	47.3501	55.7640	45.0338	24.6696
Na 589.592-R	0.1345	35.9233	51.2166	56.2935	51.4319	50.1915	50.4557	43.9165
Ni 231.604-A	0.0005	0.0301	0.0391	0.0338	0.0337	0.0023	0.0107	0.0018
P 177.434-A	0.0106	BDL	BDL	BDL	BDL	0.0141	0.0629	0.0281
Pb 220.353-A	0.0020	0.0080	0.0021	0.0020	BDL	BDL	BDL	0.0049
S 180.669-A	0.0276	666.2628	713.5316	711.8701	696.6083	932.0165	716.0093	567.2431
Se 196.026-A	0.0100	BDL	0.0121	0.0135	0.0184	0.6088	0.1489	0.0877
Si 251.611-A*	0.0114	13.1870	17.3368	14.0994	13.3150	24.1899	28.7868	19.7175
Sr 407.771-R*	0.0001	0.4607	0.5042	0.5452	0.4978	0.5311	0.5234	0.6214
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	5.3732	7.0625	4.4742	4.5247	0.0568	0.0692	0.0337
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Date	**8/19/2016**		start cell	elements						
Method	**Water-Mira 032713U**		82	34						
Client	**Jim Gusek(30)**		0	1	4	3	2	11	10	9
			82	116	218	184	150	456	422	388
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Jan 080316 Adit filt	Jan 080316 comp-I filt	Jan 080316 IT-M filt	Jan 080316 IT-E filt	Jan 080316 BCR-E filt	Jan 080316 AP-E filt
0	Sc 357.634-A	% Concentration	99	102	95	95	93	98	97	98
1	Ar 420.069-A	% Concentration	102	103	99	98	99	99	98	99
2	Sc 361.383-R	% Concentration	102	103	97	97	97	101	100	101
3	Al 308.215-A	0.0205	19.9060	0.0627	0.1663	0.1558	0.2557	0.1244	0.1092	0.0745
4	As 188.979-A*	0.0047	19.0971	0.0549	0.1179	0.0929	0.1499	0.0190	0.0200	0.0233
5	B 249.772-R	0.0459	19.3008	0.1868	0.1943	0.2090	0.3110	0.0631	0.0742	0.0796
6	Ba 233.527-A*	0.0001	8.4976	0.0236	0.0061	0.0063	0.0107	0.0072	0.0459	0.0396
7	Be 313.107-R	0.0002	9.9569	0.0261	0.0008	0.0006	0.0010	0.0008	0.0007	0.0008
8	Ca 315.887-R*	0.0064	19.4954	0.0943	496.5311	492.7133	492.2891	498.4041	512.3145	455.6539
9	Cd 214.440-A	0.0001	9.8255	0.0219	0.0070	0.0068	0.0115	0.0021	BDL	BDL
10	Co 228.616-A	0.0002	9.9261	0.0257	0.0277	0.0269	0.0281	0.0279	0.0006	0.0006
11	Cr 205.560-A	0.0003	4.9748	0.0130	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	19.3286	0.0506	BDL	BDL	BDL	BDL	BDL	BDL
13	Fe 238.204-A	0.0003	19.1474	0.0584	32.2341	31.1887	60.1108	3.6840	0.2555	0.0774
14	K 766.490-R	0.0323	45.7517	0.0933	7.4126	7.3499	7.5328	7.5319	7.4609	9.4097
15	Li 670.784-R	0.0014	18.5231	0.0475	0.0829	0.0830	0.0827	0.0825	0.0773	0.0768
16	Mg 279.553-R	0.0001	19.0652	0.0525	174.7585	175.9159	173.9542	175.4012	175.8765	172.5306
17	Mg 285.213-R	0.0014	19.4003	0.0507	250.4427	251.6722	252.2136	252.1122	249.6226	245.6720
18	Mn 257.610-A*	0.0000	9.6943	0.0264	45.6142	45.3087	45.2418	47.1772	48.8520	30.7011
19	Na 589.592-R	0.1345	0.2053	77.6880	54.5635	54.0338	55.1131	53.8193	52.7461	52.6489
20	Ni 231.604-A	0.0005	19.4000	0.0505	0.0409	0.0400	0.0417	0.0410	0.0020	0.0014
21	P 177.434-A	0.0106	48.4945	0.1080	0.2342	0.1572	0.1730	BDL	0.0503	0.1005
22	Pb 220.353-A	0.0020	18.9607	0.0524	0.0378	0.0281	0.0178	0.0024	BDL	BDL
23	S 180.669-A	0.0276	0.3917	48.2615	665.5593	661.4999	652.0600	712.5467	1004.2215	565.9727
24	Se 196.026-A	0.0100	18.9095	0.0553	BDL	BDL	BDL	0.2696	1.3363	BDL
25	Si 251.611-A*	0.0114	1.1323	41.0364	15.1991	15.3193	18.5888	13.3358	20.6826	25.9221
26	Sr 407.771-R*	0.0001	17.3202	0.0458	0.5053	0.4990	0.5090	0.5012	0.5279	0.4988
27	Tl 190.801-A	0.0018	18.6235	0.0528	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.4809	0.0252	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0003	9.9225	0.0344	7.6445	7.6205	8.8769	6.7900	0.0295	0.0459
30	Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	19.4543	0.0893	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0014	0.0032	BDL	BDL	BDL	BDL	BDL	BDL
34	Sc 357.634-A	0.0022	102.0962	93.2836	97.6271	94.8486	94.5812	104.0018	98.4088	97.3617
35	Ar 420.069-A	0.0001	102.7365	98.7227	97.9546	99.0525	98.0933	103.5195	98.9609	97.8944

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Jim Gusek(30)

		8	29	30	31	32	33	27	28
		354	1068	1102	1136	1170	1204	1000	1034
Analyte Name	DL (mg/l)	Jan080316 MRB-E Filt	Jan 080316 Aditi Dis	Jan 080316 COMP-I-Dis	Jan 080316 IT-M-Dis	Jan080316 IT-E-Dis	Jan080316 BCR-E-Dis	Jan080316 AP-E Dis	Jan 080316 MRB-E-Dis
Sc 357.634-A	% Concentration	98	107	108	107	106	106	106	106
Ar 420.069-A	% Concentration	99	94	94	94	95	92	95	95
Sc 361.383-R	% Concentration	101	114	113	114	110	111	112	112
Al 308.215-A	0.0205	0.0607	0.1994	0.1971	0.1355	0.1265	0.1406	0.0998	0.0920
As 188.979-A*	0.0047	0.0357	0.1007	0.0609	0.0281	0.0251	0.0156	0.0393	0.0452
B 249.772-R	0.0459	0.0857	0.1549	0.1467	0.0830	0.0625	0.0695	0.1140	0.0980
Ba 233.527-A*	0.0001	0.0851	0.0162	0.0158	0.0167	0.0152	0.0549	0.0438	0.0906
Be 313.107-R	0.0002	0.0005	0.0009	0.0008	0.0003	0.0004	0.0004	0.0003	0.0003
Ca 315.887-R*	0.0064	420.3415	491.9172	496.5434	494.4176	497.0640	510.3038	451.9990	419.6778
Cd 214.440-A	0.0001	BDL	0.0076	0.0078	0.0030	0.0018	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0012	0.0309	0.0312	0.0306	0.0297	0.0010	0.0010	0.0007
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cu 324.752-A	0.0011	BDL	BDL	BDL	BDL	BDL	BDL	0.0018	BDL
Fe 238.204-A	0.0003	0.1409	35.2578	33.9380	8.8915	3.3373	0.0370	0.0304	0.0690
K 766.490-R	0.0323	13.5278	7.0604	7.1794	7.3518	7.3635	7.2476	9.1875	13.2190
Li 670.784-R	0.0014	0.0732	0.0785	0.0792	0.0807	0.0810	0.0764	0.0755	0.0718
Mg 279.553-R	0.0001	169.1501	167.0792	168.7805	168.3535	171.2076	169.5968	167.2231	165.4790
Mg 285.213-R	0.0014	240.5881	245.6349	247.0626	247.4940	249.3626	245.0424	243.5591	237.2425
Mn 257.610-A*	0.0000	23.9285	50.2804	50.7912	51.0277	50.0971	52.4240	31.8995	25.6100
Na 589.592-R	0.1345	52.6736	49.9366	49.9931	49.9463	50.2380	48.7523	49.6019	48.9909
Ni 231.604-A	0.0005	0.0024	0.0455	0.0459	0.0461	0.0441	0.0010	0.0014	0.0011
P 177.434-A	0.0106	0.0675	0.0408	BDL	BDL	BDL	BDL	0.0492	0.0690
Pb 220.353-A	0.0020	BDL	0.0056	0.0027	BDL	0.0021	BDL	BDL	BDL
S 180.669-A	0.0276	575.3424	742.0325	746.3256	750.5178	741.7215	1273.5223	614.4992	605.9624
Se 196.026-A	0.0100	BDL	0.0945	0.0889	0.0956	0.0964	0.6812	0.1249	0.0979
Si 251.611-A*	0.0114	26.6713	16.4693	16.5623	15.0179	13.9899	22.3226	27.8687	28.5458
Sr 407.771-R*	0.0001	0.5311	0.4784	0.4795	0.4799	0.4833	0.5097	0.4813	0.5069
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	0.0454	8.5345	8.6069	7.6760	7.1589	0.0307	0.0473	0.0392
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sc 357.634-A	0.0022	97.8781	107.5046	107.2761	105.5540	105.8919	105.8606	105.8456	106.9464
Ar 420.069-A	0.0001	98.9980	94.2822	94.3961	94.9944	92.2259	94.9247	94.8306	94.2618

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Jim Gusek(30)

Analyte Name	DL (mg/l)
Sc 357.634-A	% Concentration
Ar 420.069-A	% Concentration
Sc 361.383-R	% Concentration
Al 308.215-A	0.0205
As 188.979-A*	0.0047
B 249.772-R	0.0459
Ba 233.527-A*	0.0001
Be 313.107-R	0.0002
Ca 315.887-R*	0.0064
Cd 214.440-A	0.0001
Co 228.616-A	0.0002
Cr 205.560-A	0.0003
Cu 324.752-A	0.0011
Fe 238.204-A	0.0003
K 766.490-R	0.0323
Li 670.784-R	0.0014
Mg 279.553-R	0.0001
Mg 285.213-R	0.0014
Mn 257.610-A*	0.0000
Na 589.592-R	0.1345
Ni 231.604-A	0.0005
P 177.434-A	0.0106
Pb 220.353-A	0.0020
S 180.669-A	0.0276
Se 196.026-A	0.0100
Si 251.611-A*	0.0114
Sr 407.771-R*	0.0001
Tl 190.801-A	0.0018
V 292.402-A*	0.0008
Zn 213.857-A	0.0003
Sn 189.927	0.0017
Mo 202.031	0.0010
Sb 217.582	0.0051
Ti 334.940	0.0002
Sc 357.634-A	0.0022
Ar 420.069-A	0.0001

Date	**8/19/2016**		start cell	elements						
Method	**Water-Mira 032713U**		82	34						
Client	**Jim Gusek(30)**		0	1	18	17	16	14	15	7
			82	116	694	660	626	558	592	320
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Comp I 10Aug2016	ITM 10Aug2016 filt	IT E 10Aug2016 Filt	AP-E 10Aug2016 filt	BCr-E 10Aug2016 filt	MRBE 10Aug2016 filt
0	Sc 357.634-A	% Concentration	99	102	102	102	102	100	101	98
1	Ar 420.069-A	% Concentration	102	103	96	96	97	99	95	99
2	Sc 361.383-R	% Concentration	102	103	106	106	105	101	106	100
3	Al 308.215-A	0.0205	19.9060	0.0627	0.1616	0.3967	0.1213	0.1135	0.1097	0.0891
4	As 188.979-A*	0.0047	19.0971	0.0549	0.0724	0.2017	0.0251	0.0283	BDL	0.0250
5	B 249.772-R	0.0459	19.3008	0.1868	0.0897	0.2912	0.0930	0.1499	0.1050	0.0988
6	Ba 233.527-A*	0.0001	8.4976	0.0236	0.0048	0.0106	0.0061	0.0439	0.0454	0.0853
7	Be 313.107-R	0.0002	9.9569	0.0261	0.0005	0.0013	0.0004	0.0003	0.0003	0.0005
8	Ca 315.887-R*	0.0064	19.4954	0.0943	505.8805	506.3354	512.5920	475.9566	476.9012	441.7246
9	Cd 214.440-A	0.0001	9.8255	0.0219	0.0007	0.0151	BDL	BDL	BDL	BDL
10	Co 228.616-A	0.0002	9.9261	0.0257	0.0266	0.0279	0.0256	0.0005	BDL	0.0012
11	Cr 205.560-A	0.0003	4.9748	0.0130	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	19.3286	0.0506	0.0018	BDL	BDL	0.0035	BDL	0.0011
13	Fe 238.204-A	0.0003	19.1474	0.0584	8.5661	83.5634	1.9178	0.0777	0.0118	0.1230
14	K 766.490-R	0.0323	45.7517	0.0933	8.5958	11.7822	9.0038	9.7644	31.6548	9.3794
15	Li 670.784-R	0.0014	18.5231	0.0475	0.0801	0.0796	0.0806	0.0776	0.0746	0.0728
16	Mg 279.553-R	0.0001	19.0652	0.0525	173.6377	174.2597	176.4070	166.6969	161.4479	163.2814
17	Mg 285.213-R	0.0014	19.4003	0.0507	252.8213	253.9381	257.7004	232.9910	225.7328	226.6646
18	Mn 257.610-A*	0.0000	9.6943	0.0264	50.2494	50.2525	50.2145	42.6670	46.4205	37.4673
19	Na 589.592-R	0.1345	0.2053	77.6880	53.0353	52.9557	54.6849	50.1004	47.8956	49.3736
20	Ni 231.604-A	0.0005	19.4000	0.0505	0.0384	0.0406	0.0372	0.0016	0.0016	0.0021
21	P 177.434-A	0.0106	48.4945	0.1080	0.0469	0.3672	BDL	0.0769	BDL	0.1090
22	Pb 220.353-A	0.0020	18.9607	0.0524	0.0021	0.0344	BDL	0.0046	BDL	BDL
23	S 180.669-A	0.0276	0.3917	48.2615	739.6138	738.2225	750.6337	607.3999	574.6290	571.5262
24	Se 196.026-A	0.0100	18.9095	0.0553	0.1152	0.0782	0.1502	0.1869	0.2001	0.0102
25	Si 251.611-A*	0.0114	1.1323	41.0364	14.5404	20.8047	13.9114	22.6101	19.9186	23.1227
26	Sr 407.771-R*	0.0001	17.3202	0.0458	0.4853	0.4888	0.4945	0.5046	0.4990	0.5199
27	Tl 190.801-A	0.0018	18.6235	0.0528	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.4809	0.0252	BDL	BDL	BDL	BDL	BDL	BDL
29	Zn 213.857-A	0.0003	9.9225	0.0344	6.8604	9.3981	4.9170	0.1204	0.0235	0.0473
30	Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	19.4543	0.0893	BDL	BDL	BDL	0.0062	0.0100	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0014	0.0032	BDL	BDL	BDL	BDL	BDL	BDL
34	Sc 357.634-A	0.0022	102.0962	93.2836	102.9256	101.8510	101.5447	100.6908	101.5780	97.6783
35	Ar 420.069-A	0.0001	102.7365	98.7227	96.8851	96.2805	96.3533	94.8381	97.0739	99.0515

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Water-Mira 032713U

Jim Gusek(30)

		20	21	22	23	26	19
		762	796	830	864	966	728
Analyte Name	DL (mg/l)	Comp IT Dis 10Aug2016	ITM Dis 10Aug2016	IT End Dis 10Aug2016	BCr-E Dis 10Aug2016	AP-E Dis 10Aug2016	MrB-E 10Aug2016 Dis
Sc 357.634-A	% Concentration	104	103	104	104	106	103
Ar 420.069-A	% Concentration	94	96	96	95	93	97
Sc 361.383-R	% Concentration	108	109	110	109	111	108
Al 308.215-A	0.0205	0.1301	0.1236	0.1253	0.1193	0.0966	0.1094
As 188.979-A*	0.0047	0.0233	0.0184	0.0223	0.0145	BDL	0.0288
B 249.772-R	0.0459	0.1592	0.1361	0.1395	0.0463	0.2313	0.1726
Ba 233.527-A*	0.0001	0.0138	0.0174	0.0185	0.0473	0.0440	0.0859
Be 313.107-R	0.0002	0.0006	0.0004	0.0004	0.0005	0.0003	0.0004
Ca 315.887-R*	0.0064	504.6143	506.9245	511.3483	474.2999	463.0168	444.1876
Cd 214.440-A	0.0001	BDL	BDL	BDL	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0267	0.0255	0.0262	0.0007	BDL	0.0008
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL
Cu 324.752-A	0.0011	0.0015	BDL	BDL	BDL	BDL	BDL
Fe 238.204-A	0.0003	0.0071	0.0061	0.0048	0.0980	0.0027	0.0449
K 766.490-R	0.0323	8.3965	11.5694	8.6425	31.8391	9.0200	8.9382
Li 670.784-R	0.0014	0.0788	0.0790	0.0791	0.0741	0.0751	0.0715
Mg 279.553-R	0.0001	171.4806	173.2704	172.0457	161.7783	163.1795	159.7840
Mg 285.213-R	0.0014	249.7989	254.2725	256.8986	226.8804	228.9438	224.2896
Mn 257.610-A*	0.0000	50.9148	50.4472	51.2515	47.3028	34.7252	38.8504
Na 589.592-R	0.1345	55.2925	54.6179	55.0839	47.1227	47.8427	48.1470
Ni 231.604-A	0.0005	0.0388	0.0380	0.0379	0.0018	0.0011	BDL
P 177.434-A	0.0106	BDL	BDL	BDL	BDL	0.0294	0.0811
Pb 220.353-A	0.0020	BDL	BDL	BDL	BDL	BDL	BDL
S 180.669-A	0.0276	750.0458	762.5911	771.5242	1001.7665	624.0524	611.5823
Se 196.026-A	0.0100	0.1279	0.1202	0.0976	0.7680	0.1651	0.1196
Si 251.611-A*	0.0114	14.3056	13.4584	13.9638	20.3348	24.0671	24.1156
Sr 407.771-R*	0.0001	0.4930	0.4865	0.4884	0.4928	0.4831	0.5055
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	6.9865	3.8616	4.6002	0.0389	0.0200	0.1477
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	0.0116	BDL
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL
Sc 357.634-A	0.0022	103.0866	104.3138	103.5370	107.7466	105.5256	103.9082
Ar 420.069-A	0.0001	96.3899	95.8557	94.7862	103.0842	95.0295	94.0089

Date	**8/31/2016**		start cell	elements							
Method	**Water-Mira 032713U**		82	34							
Client	**Sovereign**		0	1	34	35	38	39	40	41	42
			82	116	1238	1272	1374	1408	1442	1476	1510
ID	Analyte Name	DL (mg/l)	CCV Metals	CCV Nonmetals	Jan082416 Adit	Jan082416TSF1-I	Jan082416TSF1-I 2	Jan082416Comp-I	Jan082416Comp-M	Jan082416IT-E	Jan082416BCR-E
0	Sc 357.634-A	% Concentrat	97	97	105	101	103	106	99	105	104
1	Ar 420.069-A	% Concentrat	96	97	102	92	98	102	99	105	102
2	Sc 361.383-R	% Concentrat	103	102	109	109	110	110	108	109	110
3	Al 308.215-A	0.0205	19.6934	BDL	0.1660	125.4953	126.3192	0.1741	2.2075	0.1553	0.1961
4	As 188.979-A*	0.0047	18.7079	0.0067	0.0573	BDL	BDL	0.0648	2.1153	0.0240	0.0073
5	B 249.772-R	0.0459	18.9836	0.1342	0.1105	0.1092	0.1763	0.1340	2.0273	0.0961	0.0757
6	Ba 233.527-A*	0.0001	8.7194	0.0020	0.0064	0.0080	0.0080	0.0063	0.0629	0.0070	0.0485
7	Be 313.107-R	0.0002	9.6725	0.0015	0.0007	0.0348	0.0355	0.0008	0.0102	0.0004	0.0005
8	Ca 315.887-R*	0.0064	19.0763	0.0095	514.9213	312.2252	325.7741	513.6678	536.9138	523.4711	520.6826
9	Cd 214.440-A	0.0001	9.4487	BDL	0.0010	1.4326	1.4972	0.0005	0.0982	BDL	BDL
10	Co 228.616-A	0.0002	9.6223	0.0016	0.0274	1.1194	1.1699	0.0281	0.0492	0.0278	0.0015
11	Cr 205.560-A	0.0003	4.8137	0.0012	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12	Cu 324.752-A	0.0011	19.0660	0.0031	BDL	2.4535	2.4610	BDL	BDL	BDL	0.0023
13	Fe 238.204-A	0.0003	18.6079	0.0050	19.0900	2.6068	2.6767	12.4303	416.9681	4.0076	0.1096
14	K 766.490-R	0.0323	48.0094	BDL	7.4621	4.9938	4.9616	7.8070	8.2638	8.7942	8.8689
15	Li 670.784-R	0.0014	18.6311	0.0028	0.0750	0.4171	0.4048	0.0746	0.0762	0.0763	0.0729
16	Mg 279.553-R	0.0001	18.7637	0.0044	179.0028	262.0875	274.8066	179.2883	181.5213	182.7167	178.9966
17	Mg 285.213-R	0.0014	19.0885	0.0042	248.5470	469.8038	471.9277	246.3587	248.5760	251.0442	243.4204
18	Mn 257.610-A*	0.0000	9.4579	0.0019	54.5523	192.8018	201.6035	54.6006	61.2799	54.7280	53.8922
19	Na 589.592-R	0.1345	BDL	77.8474	48.4606	27.0040	26.5699	47.8162	48.8839	49.1179	47.6551
20	Ni 231.604-A	0.0005	18.8310	0.0015	0.0385	1.1365	1.1774	0.0380	0.0664	0.0375	0.0013
21	P 177.434-A	0.0106	44.4183	BDL	0.0923	0.1193	0.1137	0.0396	3.8560	BDL	BDL
22	Pb 220.353-A	0.0020	18.9383	0.0037	0.0026	0.0920	0.0960	0.0042	0.4137	BDL	BDL
23	S 180.669-A	0.0276	0.3197	47.9796	774.0400	1454.7730	1491.2060	775.5783	729.9850	796.9828	1636.2195
24	Se 196.026-A	0.0100	18.6079	BDL	0.0159	0.4840	0.5048	BDL	BDL	0.0238	1.0717
25	Si 251.611-A*	0.0114	0.4618	43.3572	17.2293	55.0309	56.2932	16.8641	83.0338	16.6039	24.2216
26	Sr 407.771-R*	0.0001	17.9082	0.0030	0.4817	0.2390	0.2385	0.4765	0.5492	0.4896	0.5040
27	Tl 190.801-A	0.0018	18.2988	0.0084	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	V 292.402-A*	0.0008	9.1789	0.0016	BDL	BDL	BDL	BDL	0.0911	BDL	BDL
29	Zn 213.857-A	0.0003	9.5242	0.0041	7.5256	110.4606	114.3276	7.5375	38.0918	5.8875	0.2066
30	Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	Mo 202.031	0.0010	18.8667	0.0171	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
33	Ti 334.940	0.0002	0.0016	0.0042	BDL	BDL	BDL	BDL	BDL	BDL	BDL
34	Sc 357.634-A	0.0022	97.2796	91.0811	101.1340	109.8002	105.5229	99.2573	105.1374	104.4192	106.0003
35	Ar 420.069-A	0.0001	97.1620	92.7749	92.4103	105.8689	102.2468	99.2352	105.4910	101.9567	103.9814

8/31/2016

Water-Mira 032713U

Sovereign		43	44	45	46	50	51	52	53
		1544	1578	1612	1646	1782	1816	1850	1884
Analyte Name	DL (mg/l)	Jan082416 AP-E Filt	Jan082416MRB-E	Jan082416Adit-Dis	Jan082416TSF1-I-Dis	Jan082416Comp-I-Dis	Jan082416IT-M-Dis	Jan082416IT-E-Dis	Jan082416BCR-E-Dis
Sc 357.634-A	% Concentrat	106	108	107	103	108	109	109	107
Ar 420.069-A	% Concentrat	104	102	105	96	107	104	108	103
Sc 361.383-R	% Concentrat	113	114	114	111	111	114	113	113
Al 308.215-A	0.0205	0.1701	0.1685	0.1665	126.9712	0.1640	0.1592	0.1727	0.2018
As 188.979-A*	0.0047	0.0196	0.0277	0.0423	BDL	0.0185	0.0175	0.0295	0.0051
B 249.772-R	0.0459	0.0700	0.0616	0.1066	0.1489	0.1403	0.1129	0.1077	0.0848
Ba 233.527-A*	0.0001	0.0503	0.1034	0.0245	0.0255	0.0177	0.0265	0.0075	0.0501
Be 313.107-R	0.0002	0.0005	0.0004	0.0006	0.0355	0.0005	0.0004	0.0004	0.0005
Ca 315.887-R*	0.0064	514.1435	509.3413	520.3317	317.2711	519.7383	518.3854	528.8827	528.3985
Cd 214.440-A	0.0001	BDL	BDL	0.0002	1.5037	BDL	BDL	BDL	BDL
Co 228.616-A	0.0002	0.0007	0.0017	0.0296	1.1815	0.0292	0.0265	0.0285	0.0013
Cr 205.560-A	0.0003	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cu 324.752-A	0.0011	0.0036	0.0055	BDL	2.5060	0.0019	0.0018	0.0013	0.0024
Fe 238.204-A	0.0003	0.0913	0.0955	9.2619	2.3589	0.0046	BDL	4.1507	0.1145
K 766.490-R	0.0323	8.2723	9.0264	7.2824	1.6271	7.8899	8.0304	8.6363	8.9552
Li 670.784-R	0.0014	0.0729	0.0720	0.0731	0.4036	0.0740	0.0741	0.0734	0.0728
Mg 279.553-R	0.0001	177.0599	176.5253	177.7876	264.2764	181.9334	177.8442	181.5898	180.6184
Mg 285.213-R	0.0014	243.2483	241.6439	246.4169	467.4635	245.6682	246.7981	249.5717	243.7779
Mn 257.610-A*	0.0000	51.4195	49.2099	56.3202	200.4934	56.5402	55.2926	57.2315	55.6490
Na 589.592-R	0.1345	48.0522	53.9263	48.1286	26.5735	47.2220	47.7848	48.0119	46.5447
Ni 231.604-A	0.0005	0.0012	0.0022	0.0389	1.1873	0.0391	0.0368	0.0390	0.0013
P 177.434-A	0.0106	0.0234	0.0889	BDL	0.1322	BDL	BDL	0.0120	BDL
Pb 220.353-A	0.0020	BDL	BDL	BDL	0.0852	BDL	BDL	0.0048	BDL
S 180.669-A	0.0276	722.7979	751.3070	795.6388	1488.8211	798.8292	818.9295	828.4543	1600.1004
Se 196.026-A	0.0100	0.3271	0.2647	0.2138	0.6848	0.1592	0.1382	0.1204	0.5847
Si 251.611-A*	0.0114	24.0842	26.2975	17.2030	56.3225	16.6251	16.4509	17.2820	24.8916
Sr 407.771-R*	0.0001	0.5012	0.5199	0.4770	0.2348	0.4693	0.4778	0.4807	0.4969
Tl 190.801-A	0.0018	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zn 213.857-A	0.0003	0.1111	0.0827	7.7853	113.8282	7.7068	3.7647	6.1466	0.1706
Sn 189.927	0.0017	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mo 202.031	0.0010	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sb 217.582	0.0051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ti 334.940	0.0002	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sc 357.634-A	0.0022	108.3403	106.9931	103.4098	103.2690	108.9059	108.8961	107.4688	109.0933
Ar 420.069-A	0.0001	102.4194	104.7772	96.4246	97.6623	103.8171	108.2984	103.1344	105.3154

8/31/2016

Water-Mira 032713U

Sovereign		54	55
		1918	1952
Analyte Name	DL (mg/l)	Jan082416 AP-E-Dis filt	Jan082416MRB-E-Dis
Sc 357.634-A	% Concentrat	109	109
Ar 420.069-A	% Concentrat	105	107
Sc 361.383-R	% Concentrat	114	115
Al 308.215-A	0.0205	0.2137	0.1779
As 188.979-A*	0.0047	0.0355	0.0272
B 249.772-R	0.0459	0.0747	0.0746
Ba 233.527-A*	0.0001	0.0521	0.1075
Be 313.107-R	0.0002	0.0005	0.0005
Ca 315.887-R*	0.0064	518.1515	515.1405
Cd 214.440-A	0.0001	BDL	BDL
Co 228.616-A	0.0002	0.0017	0.0019
Cr 205.560-A	0.0003	BDL	BDL
Cu 324.752-A	0.0011	0.0051	0.0053
Fe 238.204-A	0.0003	0.2022	0.0933
K 766.490-R	0.0323	8.3218	8.8548
Li 670.784-R	0.0014	0.0726	0.0693
Mg 279.553-R	0.0001	177.5484	178.3767
Mg 285.213-R	0.0014	242.2627	240.0839
Mn 257.610-A*	0.0000	52.6321	50.3943
Na 589.592-R	0.1345	46.6873	52.8163
Ni 231.604-A	0.0005	0.0016	0.0026
P 177.434-A	0.0106	0.0270	0.0868
Pb 220.353-A	0.0020	0.0033	BDL
S 180.669-A	0.0276	743.5320	763.2381
Se 196.026-A	0.0100	0.2134	0.1782
Si 251.611-A*	0.0114	24.9588	26.5680
Sr 407.771-R*	0.0001	0.4896	0.5136
Tl 190.801-A	0.0018	BDL	BDL
V 292.402-A*	0.0008	BDL	BDL
Zn 213.857-A	0.0003	0.2328	0.0850
Sn 189.927	0.0017	BDL	BDL
Mo 202.031	0.0010	BDL	BDL
Sb 217.582	0.0051	BDL	BDL
Ti 334.940	0.0002	BDL	BDL
Sc 357.634-A	0.0022	109.1623	114.3294
Ar 420.069-A	0.0001	107.4753	110.5868

ATTACHMENT D2
TURNER RESULTS

TURNER
LABORATORIES INC.

April 06, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16C0425
Order Name: Pilot Plant

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 4 sample(s) on 03/09/2016 for the analyses presented in the following report.

The attached report has been revised. Please refer to the Case Narrative page for an explanation of the changes. We apologize for any inconvenience this may have caused you.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,
Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Technical Director

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Date Received: 03/09/2016

Order: Pilot Plant

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16C0425-01	Week 0 Adit	Wastewater	03/08/2016 1602
16C0425-02	Week 0 TSF 2	Wastewater	03/08/2016 1602
16C0425-03	Week 0 Composite	Wastewater	03/08/2016 1602
16C0425-04	Week O Composite	Wastewater	03/09/2016 1602

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Date Received: 03/09/2016

Case Narrative

This report was originally generated on 3/25/2016. It is being revised on 4/6/2016 to include analytes reported to the MDL, which was not on the original report.

E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
M4	The analysis of the spiked sample required a dilution such that the calculation does not provide useful information. The associated LCS/LCSD recovery was acceptable.
M7	Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Lab Sample ID: 16C0425-01

Client Sample ID: Week 0 Adit
Collection Date/Time: 03/08/2016 1602
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	03/14/2016 0920	03/16/2016 1444	RAD
ICP Total Metals-E200.7									
Calcium	460		4.0		mg/L	1	03/14/2016 0920	03/16/2016 1444	RAD
Anions by Ion Chromatography-E300									
Sulfate	2400		500		mg/L	100	03/17/2016 1300	03/17/2016 1318	MR

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Lab Sample ID: 16C0425-02

Client Sample ID: Week 0 TSF 2
Collection Date/Time: 03/08/2016 1602
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	880				mg/L	1	03/14/2016 0920	03/16/2016 1448	RAD
ICP Total Metals-E200.7									
Calcium	350		4.0		mg/L	1	03/14/2016 0920	03/16/2016 1448	RAD
Anions by Ion Chromatography-E300									
Sulfate	9100		2500		mg/L	500	03/17/2016 1300	03/17/2016 1337	MR

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Lab Sample ID: 16C0425-03

Client Sample ID: Week 0 Composite
Collection Date/Time: 03/08/2016 1602
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1100				mg/L	1	03/14/2016 0920	03/16/2016 1452	RAD
ICP Total Metals-E200.7									
Calcium	460		4.0		mg/L	1	03/14/2016 0920	03/16/2016 1452	RAD
Anions by Ion Chromatography-E300									
Sulfate	2600		500		mg/L	100	03/17/2016 1300	03/17/2016 1355	MR

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Lab Sample ID: 16C0425-04

Client Sample ID: Week O Composite
Collection Date/Time: 03/09/2016 1602
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	8.1		2.0		mg/L	1	03/14/2016 0920	03/16/2016 1319	RAD
Cadmium	0.072		0.0020		mg/L	1	03/14/2016 0920	03/16/2016 1319	RAD
Copper	0.13		0.020		mg/L	1	03/14/2016 0920	03/16/2016 1319	RAD
Iron	39		0.30		mg/L	1	03/14/2016 0920	03/16/2016 1318	RAD
Lead	0.031	0.0016	0.040	E4	mg/L	1	03/14/2016 0920	03/16/2016 1319	RAD
Manganese	110		0.40		mg/L	20	03/14/2016 0920	03/17/2016 1558	RAD
Zinc	41		0.80		mg/L	20	03/14/2016 0920	03/17/2016 1558	RAD

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Date Received: 03/09/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1603145 - E 200.2 ICP										
Blank (1603145-BLK1)				Prepared: 03/14/2016 Analyzed: 03/16/2016						
Aluminum	ND	2.0	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1603145-BS1)				Prepared: 03/14/2016 Analyzed: 03/16/2016						
Aluminum	1.9	2.0	mg/L	2.000		94	85-115			
Cadmium	0.047	0.0020	mg/L	0.05000		93	85-115			
Calcium	9.8	4.0	mg/L	10.00		98	85-115			
Copper	0.24	0.020	mg/L	0.2500		94	85-115			
Iron	0.96	0.30	mg/L	1.000		96	85-115			
Lead	0.47	0.040	mg/L	0.5000		93	85-115			
Manganese	0.48	0.020	mg/L	0.5000		96	85-115			
Zinc	0.47	0.040	mg/L	0.5000		93	85-115			
LCS Dup (1603145-BSD1)				Prepared: 03/14/2016 Analyzed: 03/16/2016						
Aluminum	1.9	2.0	mg/L	2.000		95	85-115	1	20	
Cadmium	0.047	0.0020	mg/L	0.05000		93	85-115	0.2	20	
Calcium	10	4.0	mg/L	10.00		100	85-115	1	20	
Copper	0.24	0.020	mg/L	0.2500		95	85-115	0.7	20	
Iron	0.97	0.30	mg/L	1.000		97	85-115	0.5	20	
Lead	0.47	0.040	mg/L	0.5000		93	85-115	0.3	20	
Manganese	0.48	0.020	mg/L	0.5000		96	85-115	0.3	20	
Zinc	0.47	0.040	mg/L	0.5000		93	85-115	0.3	20	
Matrix Spike (1603145-MS1)		**Source: 16C0138-02**		Prepared: 03/14/2016 Analyzed: 03/16/2016						
Aluminum	2.4	2.0	mg/L	2.000	0.19	110	70-130			
Cadmium	0.043	0.0020	mg/L	0.05000	ND	85	70-130			
Calcium	160	4.0	mg/L	10.00	150	89	70-130			
Copper	0.36	0.020	mg/L	0.2500	0.11	100	70-130			
Iron	1.6	0.30	mg/L	1.000	0.68	93	70-130			
Lead	0.44	0.040	mg/L	0.5000	ND	89	70-130			
Manganese	0.53	0.020	mg/L	0.5000	0.058	94	70-130			
Zinc	0.65	0.040	mg/L	0.5000	0.19	93	70-130			
Matrix Spike (1603145-MS2)		**Source: 16C0425-04**		Prepared: 03/14/2016 Analyzed: 03/16/2016						
Aluminum	9.8	2.0	mg/L	2.000	8.1	90	70-130			
Cadmium	0.11	0.0020	mg/L	0.05000	0.072	78	70-130			
Calcium	460	4.0	mg/L	10.00	480	NR	70-130			M3
Copper	0.39	0.020	mg/L	0.2500	0.13	104	70-130			
Iron	38	0.30	mg/L	1.000	39	NR	70-130			M3
Lead	0.38	0.040	mg/L	0.5000	0.031	70	70-130			M7
Manganese	110	0.40	mg/L	0.5000	62	NR	70-130			M4
Zinc	41	0.80	mg/L	0.5000	24	NR	70-130			M4

Turner Laboratories, Inc.

Date: 04/06/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16C0425
Date Received: 03/09/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1603092 - IC PREP										
Blank (1603092-BLK1)				Prepared & Analyzed: 03/09/2016						
Sulfate	ND	5.0	mg/L							
LCS (1603092-BS1)				Prepared & Analyzed: 03/09/2016						
Sulfate	13	5.0	mg/L	12.50		105	90-110			
LCS Dup (1603092-BSD1)				Prepared & Analyzed: 03/09/2016						
Sulfate	13	5.0	mg/L	12.50		105	90-110	0.9	10	
Matrix Spike (1603092-MS1)		**Source: 16C0420-01**		Prepared & Analyzed: 03/09/2016						
Sulfate	27	5.0	mg/L	12.50	16	91	80-120			
Matrix Spike Dup (1603092-MSD1)		**Source: 16C0420-01**		Prepared & Analyzed: 03/09/2016						
Sulfate	27	5.0	mg/L	12.50	16	90	80-120	0.4	10	

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 1600425 DATE 3/8/2016 PAGE 1 OF 1

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	Hardness as CaCO3
Week 0 Adit	3/8/2016	1602		WW	1		X	X
Week 0 TSF 2	3/8/2016	1602		WW	1		X	X
Week 0 Composite	3/8/2016	1602		WW	1		X	X
Week 0 Composite	3/8/2016	1602		WW	1	X		

1. RELINQUISHED BY: Signature; Printed Name Dwic Bowden; Firm AMI; Date/Time 3/9/1234

2. RECEIVED BY: Signature; Printed Name; Firm; Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)
Add 10% to invoice

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 4
Temperature 2.3
☒ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY: Signature; Printed Name; Firm; Date/Time

4. RECEIVED BY: Signature; Printed Name; Firm TURNER LABORATORIES, INC.; Date/Time 3/9/16 1234

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis: ☐ Yes ☐ No	Custody Seals ☐	Preservation Confirmation ☒
ADEQ Forms: ☐ Yes ☐ No	Container Intact ☒	Appropriate Head Space ☒
Mail ADEQ Forms: ☐ Yes ☐ No	COC/Labels Agree ☒	Received Within Hold Time ☒

TURNER
LABORATORIES INC.

April 26, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16D0308
Order Name: Pilot Plant

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 6 sample(s) on 04/06/2016 for the analyses presented in the following report.

The attached report has been revised. Please refer to the Case Narrative page for an explanation of the changes. We apologize for any inconvenience this may have caused you.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,
Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Technical Director

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

Order: Pilot Plant

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16D0308-01	Jan040616IT_M	Wastewater	04/06/2016 1340
16D0308-02	Jan040616IT_E	Wastewater	04/06/2016 1340
16D0308-03	Jan040616BCR_E	Wastewater	04/06/2016 1340
16D0308-04	Jan040616BCR_D	Wastewater	04/06/2016 1340
16D0308-05	Jan040616AP_E	Wastewater	04/06/2016 1340
16D0308-06	Jan040616MRB_E	Wastewater	04/06/2016 1340

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

Case Narrative

This report was originally generated on 4/25/2016. It is being revised on 4/26/2016 to include all metals by ICP to be reported to the MDL.

E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Lab Sample ID: 16D0308-01

Client Sample ID: Jan040616IT_M
Collection Date/Time: 04/06/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	04/07/2016 1005	04/11/2016 1223	RAD
ICP Total Metals-E200.7									
Aluminum	0.32	0.016	2.0	E4	mg/L	1	04/07/2016 1005	04/11/2016 1224	RAD
Cadmium	0.00088	0.00028	0.0020	E4	mg/L	1	04/07/2016 1005	04/11/2016 1225	RAD
Calcium	500		4.0		mg/L	1	04/07/2016 1005	04/11/2016 1223	RAD
Copper	0.0040	0.0011	0.020	E4	mg/L	1	04/07/2016 1005	04/11/2016 1225	RAD
Iron	13		0.30		mg/L	1	04/07/2016 1005	04/11/2016 1223	RAD
Lead	0.015	0.0016	0.040	E4	mg/L	1	04/07/2016 1005	04/11/2016 1225	RAD
Manganese	140		0.20		mg/L	10	04/07/2016 1005	04/11/2016 1325	RAD
Zinc	25		0.20		mg/L	5	04/07/2016 1005	04/11/2016 1316	RAD
Anions by Ion Chromatography-E300									
Sulfate	3000		500		mg/L	100	04/07/2016 1445	04/07/2016 1525	MR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	14		0.50		mg/L	1	04/07/2016 0907	04/07/2016 2051	MR

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Lab Sample ID: 16D0308-02

Client Sample ID: Jan040616IT_E
Collection Date/Time: 04/06/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	04/07/2016 1005	04/11/2016 1228	RAD
ICP Total Metals-E200.7									
Aluminum	0.14	0.016	2.0	E4	mg/L	1	04/07/2016 1005	04/11/2016 1229	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	04/07/2016 1005	04/11/2016 1229	RAD
Calcium	480		4.0		mg/L	1	04/07/2016 1005	04/11/2016 1228	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	04/07/2016 1005	04/11/2016 1229	RAD
Iron	11		0.30		mg/L	1	04/07/2016 1005	04/11/2016 1228	RAD
Lead	0.014	0.0016	0.040	E4	mg/L	1	04/07/2016 1005	04/11/2016 1229	RAD
Manganese	140		0.20		mg/L	10	04/07/2016 1005	04/11/2016 1320	RAD
Zinc	18		0.40		mg/L	10	04/07/2016 1005	04/11/2016 1320	RAD
Anions by Ion Chromatography-E300									
Sulfate	3000		500		mg/L	100	04/07/2016 1445	04/07/2016 1543	MR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	3.6		0.50		mg/L	1	04/13/2016 0916	04/13/2016 1641	MR

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Lab Sample ID: 16D0308-03

Client Sample ID: Jan040616BCR_E
Collection Date/Time: 04/06/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1500				mg/L	1	04/07/2016 1005	04/11/2016 1232	RAD
ICP Total Metals-E200.7									
Aluminum	0.16	0.016	2.0	E4	mg/L	1	04/07/2016 1005	04/11/2016 1233	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	04/07/2016 1005	04/11/2016 1233	RAD
Calcium	580		4.0		mg/L	1	04/07/2016 1005	04/11/2016 1232	RAD
Copper	0.0036	0.0011	0.020	E4	mg/L	1	04/07/2016 1005	04/11/2016 1233	RAD
Iron	7.8		0.30		mg/L	1	04/07/2016 1005	04/11/2016 1232	RAD
Lead	0.011	0.0016	0.040	E4	mg/L	1	04/07/2016 1005	04/11/2016 1233	RAD
Manganese	140		0.20		mg/L	10	04/07/2016 1005	04/11/2016 1338	RAD
Zinc	0.21		0.040		mg/L	1	04/07/2016 1005	04/11/2016 1233	RAD
Anions by Ion Chromatography-E300									
Sulfate	2900		500		mg/L	100	04/07/2016 1445	04/07/2016 1657	MR
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	290		2.0		mg/L	1	04/06/2016 1630	04/11/2016 1330	CC
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	150		5.0		mg/L	10	04/13/2016 0916	04/15/2016 1145	MR

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Lab Sample ID: 16D0308-04

Client Sample ID: Jan040616BCR_D
Collection Date/Time: 04/06/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	04/07/2016 1005	04/11/2016 1237	RAD
ICP Total Metals-E200.7									
Aluminum	0.19	0.016	2.0	E4	mg/L	1	04/07/2016 1005	04/11/2016 1238	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	04/07/2016 1005	04/11/2016 1238	RAD
Calcium	510		4.0		mg/L	1	04/07/2016 1005	04/11/2016 1237	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	04/07/2016 1005	04/11/2016 1238	RAD
Iron	6.6		0.30		mg/L	1	04/07/2016 1005	04/11/2016 1237	RAD
Lead	0.012	0.0016	0.040	E4	mg/L	1	04/07/2016 1005	04/11/2016 1238	RAD
Manganese	130		0.20		mg/L	10	04/07/2016 1005	04/11/2016 1334	RAD
Zinc	0.25		0.040		mg/L	1	04/07/2016 1005	04/11/2016 1238	RAD
Anions by Ion Chromatography-E300									
Sulfate	2900		500		mg/L	100	04/07/2016 1445	04/07/2016 1715	MR

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Lab Sample ID: 16D0308-05

Client Sample ID: Jan040616AP_E
Collection Date/Time: 04/06/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1400				mg/L	1	04/07/2016 1005	04/11/2016 1241	RAD
ICP Total Metals-E200.7									
Aluminum	0.13	0.016	2.0	E4	mg/L	1	04/07/2016 1005	04/11/2016 1242	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	04/07/2016 1005	04/11/2016 1242	RAD
Calcium	550		4.0		mg/L	1	04/07/2016 1005	04/11/2016 1241	RAD
Copper	0.0030	0.0011	0.020	E4	mg/L	1	04/07/2016 1005	04/11/2016 1242	RAD
Iron	7.1		0.30		mg/L	1	04/07/2016 1005	04/11/2016 1241	RAD
Lead	0.011	0.0016	0.040	E4	mg/L	1	04/07/2016 1005	04/11/2016 1242	RAD
Manganese	130		0.20		mg/L	10	04/07/2016 1005	04/11/2016 1400	RAD
Zinc	0.21		0.040		mg/L	1	04/07/2016 1005	04/11/2016 1242	RAD
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	62		2.0		mg/L	1	04/06/2016 1630	04/11/2016 1330	CC

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Lab Sample ID: 16D0308-06

Client Sample ID: Jan040616MRB_E
Collection Date/Time: 04/06/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1400				mg/L	1	04/11/2016 1000	04/12/2016 1317	RAD
ICP Total Metals-E200.7									
Aluminum	0.19	0.016	2.0	E4	mg/L	1	04/11/2016 1000	04/12/2016 1318	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	04/11/2016 1000	04/12/2016 1318	RAD
Calcium	560		4.0		mg/L	1	04/11/2016 1000	04/12/2016 1317	RAD
Copper	0.0086	0.0011	0.020	E4	mg/L	1	04/11/2016 1000	04/12/2016 1318	RAD
Iron	3.6		0.30		mg/L	1	04/11/2016 1000	04/12/2016 1317	RAD
Lead	0.014	0.0016	0.040	E4	mg/L	1	04/11/2016 1000	04/12/2016 1318	RAD
Manganese	100		0.20		mg/L	10	04/11/2016 1000	04/12/2016 1313	RAD
Zinc	0.22		0.040		mg/L	1	04/11/2016 1000	04/12/2016 1318	RAD
Anions by Ion Chromatography-E300									
Sulfate	3000		500		mg/L	100	04/07/2016 1445	04/07/2016 1734	MR

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1604075 - E 200.2 ICP										
Blank (1604075-BLK1)				Prepared: 04/07/2016 Analyzed: 04/11/2016						
Aluminum	ND	2.0	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1604075-BS1)				Prepared: 04/07/2016 Analyzed: 04/11/2016						
Aluminum	1.9	2.0	mg/L	2.000		94	85-115			
Cadmium	0.046	0.0020	mg/L	0.05000		93	85-115			
Calcium	9.2	4.0	mg/L	10.00		92	85-115			
Copper	0.23	0.020	mg/L	0.2500		93	85-115			
Iron	0.95	0.30	mg/L	1.000		95	85-115			
Lead	0.48	0.040	mg/L	0.5000		95	85-115			
Manganese	0.48	0.020	mg/L	0.5000		96	85-115			
Zinc	0.46	0.040	mg/L	0.5000		92	85-115			
LCS Dup (1604075-BSD1)				Prepared: 04/07/2016 Analyzed: 04/11/2016						
Aluminum	1.9	2.0	mg/L	2.000		93	85-115	1	20	
Cadmium	0.045	0.0020	mg/L	0.05000		90	85-115	3	20	
Calcium	8.9	4.0	mg/L	10.00		89	85-115	3	20	
Copper	0.23	0.020	mg/L	0.2500		92	85-115	0.9	20	
Iron	0.92	0.30	mg/L	1.000		92	85-115	3	20	
Lead	0.46	0.040	mg/L	0.5000		93	85-115	3	20	
Manganese	0.47	0.020	mg/L	0.5000		94	85-115	2	20	
Zinc	0.45	0.040	mg/L	0.5000		90	85-115	2	20	
Matrix Spike (1604075-MS1)		**Source: 16D0008-02**		Prepared: 04/07/2016 Analyzed: 04/11/2016						
Aluminum	2.2	2.0	mg/L	2.000	0.14	103	70-130			
Cadmium	0.040	0.0020	mg/L	0.05000	ND	80	70-130			
Calcium	150	4.0	mg/L	10.00	140	56	70-130			M3
Copper	0.32	0.020	mg/L	0.2500	0.077	99	70-130			
Iron	1.3	0.30	mg/L	1.000	0.43	87	70-130			
Lead	0.42	0.040	mg/L	0.5000	ND	84	70-130			
Manganese	0.50	0.020	mg/L	0.5000	0.061	89	70-130			
Zinc	0.59	0.040	mg/L	0.5000	0.14	90	70-130			
Matrix Spike (1604075-MS2)		**Source: 16D0028-01**		Prepared: 04/07/2016 Analyzed: 04/11/2016						
Aluminum	2.0	2.0	mg/L	2.000	0.041	97	70-130			
Cadmium	0.042	0.0020	mg/L	0.05000	ND	83	70-130			
Calcium	59	4.0	mg/L	10.00	51	81	70-130			
Copper	0.25	0.020	mg/L	0.2500	0.011	95	70-130			
Iron	1.6	0.30	mg/L	1.000	0.70	93	70-130			
Lead	0.43	0.040	mg/L	0.5000	ND	86	70-130			
Manganese	0.54	0.020	mg/L	0.5000	0.090	90	70-130			
Zinc	0.48	0.040	mg/L	0.5000	0.036	88	70-130			

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1604106 - E 200.2 ICP										
Blank (1604106-BLK1)				Prepared: 04/11/2016 Analyzed: 04/12/2016						
Aluminum	0.035	2.0	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Copper	0.0018	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1604106-BS1)				Prepared: 04/11/2016 Analyzed: 04/12/2016						
Aluminum	2.0	2.0	mg/L	2.000		101	85-115			
Cadmium	0.049	0.0020	mg/L	0.05000		97	85-115			
Calcium	9.4	4.0	mg/L	10.00		94	85-115			
Copper	0.25	0.020	mg/L	0.2500		99	85-115			
Iron	0.95	0.30	mg/L	1.000		95	85-115			
Lead	0.50	0.040	mg/L	0.5000		101	85-115			
Manganese	0.50	0.020	mg/L	0.5000		100	85-115			
Zinc	0.48	0.040	mg/L	0.5000		97	85-115			
LCS Dup (1604106-BSD1)				Prepared: 04/11/2016 Analyzed: 04/12/2016						
Aluminum	2.0	2.0	mg/L	2.000		98	85-115	2	20	
Cadmium	0.048	0.0020	mg/L	0.05000		96	85-115	1	20	
Calcium	9.3	4.0	mg/L	10.00		93	85-115	0.7	20	
Copper	0.24	0.020	mg/L	0.2500		97	85-115	2	20	
Iron	0.95	0.30	mg/L	1.000		95	85-115	0.5	20	
Lead	0.50	0.040	mg/L	0.5000		100	85-115	0.7	20	
Manganese	0.50	0.020	mg/L	0.5000		99	85-115	1	20	
Zinc	0.48	0.040	mg/L	0.5000		96	85-115	1	20	
Matrix Spike (1604106-MS1)		**Source: 16D0017-01**		Prepared: 04/11/2016 Analyzed: 04/12/2016						
Aluminum	2.1	2.0	mg/L	2.000	0.067	100	70-130			
Cadmium	0.045	0.0020	mg/L	0.05000	ND	90	70-130			
Calcium	9.5	4.0	mg/L	10.00	ND	95	70-130			
Copper	0.26	0.020	mg/L	0.2500	0.0087	100	70-130			
Iron	0.93	0.30	mg/L	1.000	ND	93	70-130			
Lead	0.47	0.040	mg/L	0.5000	ND	94	70-130			
Manganese	0.48	0.020	mg/L	0.5000	ND	95	70-130			
Zinc	0.48	0.040	mg/L	0.5000	ND	96	70-130			
Matrix Spike (1604106-MS2)		**Source: 16D0351-01**		Prepared: 04/11/2016 Analyzed: 04/12/2016						
Aluminum	3.5	2.0	mg/L	2.000	1.2	118	70-130			
Cadmium	0.042	0.0020	mg/L	0.05000	ND	85	70-130			
Calcium	180	4.0	mg/L	10.00	180	26	70-130			M3
Copper	0.27	0.020	mg/L	0.2500	0.0078	104	70-130			
Iron	2.4	0.30	mg/L	1.000	1.5	88	70-130			
Lead	0.45	0.040	mg/L	0.5000	ND	89	70-130			
Manganese	1.2	0.020	mg/L	0.5000	0.77	84	70-130			
Zinc	0.50	0.040	mg/L	0.5000	0.025	95	70-130			

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1604059 - GEN CHEM										
Blank (1604059-BLK1)				Prepared & Analyzed: 04/07/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1604059-BS1)				Prepared & Analyzed: 04/07/2016						
Organic Carbon, Total	11	0.50	mg/L	10.00		107	90-110			
LCS Dup (1604059-BSD1)				Prepared & Analyzed: 04/07/2016						
Organic Carbon, Total	11	0.50	mg/L	10.00		109	90-110	1	10	
Matrix Spike (1604059-MS1)		**Source: 16D0008-01**		Prepared & Analyzed: 04/07/2016						
Organic Carbon, Total	13		mg/L	10.00	2.2	104	80-120			
Matrix Spike Dup (1604059-MSD1)		**Source: 16D0008-01**		Prepared & Analyzed: 04/07/2016						
Organic Carbon, Total	13		mg/L	10.00	2.2	104	80-120	0.2	15	
Batch 1604076 - GEN CHEM										
Blank (1604076-BLK1)				Prepared: 04/07/2016 Analyzed: 04/11/2016						
Biochemical Oxygen Demand	ND	2.0	mg/L							
LCS (1604076-BS1)				Prepared: 04/07/2016 Analyzed: 04/11/2016						
Biochemical Oxygen Demand	170		mg/L	198.0		85	85-115			
Batch 1604130 - GEN CHEM										
Blank (1604130-BLK1)				Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1604130-BS1)				Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		105	90-110			
LCS Dup (1604130-BSD1)				Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		105	90-110	0.3	10	
Matrix Spike (1604130-MS1)		**Source: 16D0367-01**		Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	13		mg/L	10.00	2.7	104	80-120			
Matrix Spike (1604130-MS2)		**Source: 16D0367-04**		Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	13		mg/L	10.00	2.7	104	80-120			
Matrix Spike Dup (1604130-MSD1)		**Source: 16D0367-01**		Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	13		mg/L	10.00	2.7	104	80-120	0.2	15	
Matrix Spike Dup (1604130-MSD2)		**Source: 16D0367-04**		Prepared & Analyzed: 04/13/2016						
Organic Carbon, Total	13		mg/L	10.00	2.7	105	80-120	0.8	15	
Batch 1604164 - GEN CHEM										
Blank (1604164-BLK1)				Prepared & Analyzed: 04/15/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1604164-BS1)				Prepared & Analyzed: 04/15/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		102	90-110			

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1604164 - GEN CHEM										
LCS Dup (1604164-BSD1)				Prepared & Analyzed: 04/15/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		103	90-110	0.9	10	
Matrix Spike (1604164-MS1)	**Source: 16D0478-01**			Prepared & Analyzed: 04/15/2016						
Organic Carbon, Total	11	0.50	mg/L	10.00	0.45	103	85-115			
Matrix Spike Dup (1604164-MSD1)	**Source: 16D0478-01**			Prepared & Analyzed: 04/15/2016						
Organic Carbon, Total	11	0.50	mg/L	10.00	0.45	101	85-115	1	15	

Turner Laboratories, Inc.

Date: 04/26/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16D0308
Date Received: 04/06/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1604061 - IC PREP										
Blank (1604061-BLK1)				Prepared & Analyzed: 04/07/2016						
Sulfate	ND	5.0	mg/L							
LCS (1604061-BS1)				Prepared & Analyzed: 04/07/2016						
Sulfate	12	5.0	mg/L	12.50		99	90-110			
LCS Dup (1604061-BSD1)				Prepared & Analyzed: 04/07/2016						
Sulfate	12	5.0	mg/L	12.50		99	90-110	0.1	10	
Matrix Spike (1604061-MS2)		**Source: 16D0347-01RE1**		Prepared: 04/08/2016 Analyzed: 04/09/2016						
Sulfate	30		mg/L	12.50	19	89	80-120			
Matrix Spike Dup (1604061-MSD2)		**Source: 16D0347-01RE1**		Prepared: 04/08/2016 Analyzed: 04/09/2016						
Sulfate	30		mg/L	12.50	19	90	80-120	0.5	10	

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 1604308 DATE 4/6/16 PAGE 1 OF 1

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	BOD	Organic Carbon, Total	Hardness as CaCO3
Jan040616IT_M	4/6/16	1340		WW		X	X		X	X
Jan040616IT_E		1340				X	X		X	X
Jan040616BCR_E		1340				X	X	X	X	X
Jan040616BCR_D		1340				X	X			X
Jan040616AP_E		1340				X		X		X
Jan040616MRB_E		1340				X	X			X

1. RELINQUISHED BY:
Signature
Brent
Printed Name
Bonds
Firm
AMI 4/6/16
Date/Time

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)
Add 10% to invoice

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 16
Temperature 11.1
Wet Ice Blue Ice

3. RELINQUISHED BY: 1625
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature
Printed Name
TURNER LABORATORIES, INC.
Firm
4/6/16 1625
Date/Time

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis:	Yes	No	Custody Seals		Preservation Confirmation		
ADEQ Forms:	Yes	No	Container Intact		Appropriate Head Space		
Mail ADEQ Forms:	Yes	No	COC/Labels Agree		Received Within Hold Time		

May 19, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16E0275
Order Name: Pilot Plant

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 12 sample(s) on 05/04/2016 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Technical Director

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Date Received: 05/04/2016

Order: Pilot Plant

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16E0275-01	Jan050416ADIT	Wastewater	05/04/2016 1344
16E0275-02	Jan050416TSF1_I	Wastewater	05/04/2016 1400
16E0275-03	Jan050416COMP_I	Wastewater	05/04/2016 1340
16E0275-04	Jan050416IT_M	Wastewater	05/04/2016 1331
16E0275-05	Jan050416IT_E	Wastewater	05/04/2016 1325
16E0275-06	Jan050416IT_ED	Wastewater	05/04/2016 1323
16E0275-07	Jan050416BCR_E	Wastewater	05/04/2016 1306
16E0275-09	Jan050416AP_E	Wastewater	05/04/2016 1236
16E0275-10	Jan050416MRB_E	Wastewater	05/04/2016 1222
16E0275-11	Jan050416MRB_D	Wastewater	05/04/2016 1220
16E0275-12	Jan050416B	Wastewater	05/04/2016 1258

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Date Received: 05/04/2016

Case Narrative

BOD analysis was not reported due incubation temperature out of range.

E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
M4	The analysis of the spiked sample required a dilution such that the calculation does not provide useful information. The associated LCS/LCSD recovery was acceptable.
M7	Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-01

Client Sample ID: Jan050416ADIT
Collection Date/Time: 05/04/2016 1344
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
ICP Total Metals-E200.7									
Aluminum	0.19	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
Cadmium	0.0013	0.00028	0.0020	E4	mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
Calcium	460		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
Copper	0.0038	0.0011	0.020	E4	mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
Iron	35		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
Lead	0.0079	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1338	RAD
Manganese	62		0.20		mg/L	10	05/06/2016 0935	05/12/2016 1505	RAD
Zinc	9.9		0.40		mg/L	10	05/06/2016 0935	05/12/2016 1505	RAD
Anions by Ion Chromatography-E300									
Sulfate	2400		1000		mg/L	200	05/05/2016 1330	05/05/2016 1504	MR

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-02

Client Sample ID: Jan050416TSF1_I
Collection Date/Time: 05/04/2016 1400
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	960				mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
ICP Total Metals-E200.7									
Aluminum	220		2.0		mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
Cadmium	1.5		0.0020		mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
Calcium	380		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
Copper	3.4		0.020		mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
Iron	89		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
Lead	0.11		0.040		mg/L	1	05/06/2016 0935	05/09/2016 1456	RAD
Manganese	1400		2.0		mg/L	100	05/06/2016 0935	05/09/2016 1520	RAD
Zinc	740		4.0		mg/L	100	05/06/2016 0935	05/09/2016 1520	RAD
Anions by Ion Chromatography-E300									
Sulfate	9800		2000		mg/L	400	05/06/2016 1015	05/06/2016 1151	MR

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-03

Client Sample ID: Jan050416COMP_I
Collection Date/Time: 05/04/2016 1340
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
ICP Total Metals-E200.7									
Aluminum	1.5	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
Cadmium	0.090		0.0020		mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
Calcium	470		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
Copper	0.10		0.020		mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
Iron	38		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
Lead	0.0065	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1500	RAD
Manganese	130		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1512	RAD
Zinc	50		0.40		mg/L	10	05/06/2016 0935	05/09/2016 1512	RAD
Anions by Ion Chromatography-E300									
Sulfate	2800		1000		mg/L	200	05/05/2016 1200	05/05/2016 1808	MR

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-04

Client Sample ID: Jan050416IT_M
Collection Date/Time: 05/04/2016 1331
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
ICP Total Metals-E200.7									
Aluminum	0.68	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
Cadmium	0.00063	0.00028	0.0020	E4	mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
Calcium	530		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
Copper	0.010	0.0011	0.020	E4	mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
Iron	84		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
Lead	0.021	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1504	RAD
Manganese	110		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1516	RAD
Zinc	22		0.40		mg/L	10	05/06/2016 0935	05/09/2016 1516	RAD
Anions by Ion Chromatography-E300									
Sulfate	2900		1000		mg/L	200	05/05/2016 1200	05/05/2016 1827	MR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	3.9		0.50		mg/L	1	05/06/2016 0900	05/16/2016 1544	MR

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-05

Client Sample ID: Jan050416IT_E
Collection Date/Time: 05/04/2016 1325
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	05/06/2016 0935	05/09/2016 1523	RAD
ICP Total Metals-E200.7									
Aluminum	0.17	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1524	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1524	RAD
Calcium	510		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1523	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1524	RAD
Iron	13		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1523	RAD
Lead	0.0074	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1524	RAD
Manganese	120		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1528	RAD
Zinc	13		0.40		mg/L	10	05/06/2016 0935	05/09/2016 1528	RAD
Anions by Ion Chromatography-E300									
Sulfate	2900		1000		mg/L	200	05/05/2016 1200	05/05/2016 1845	MR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	6.3		0.50		mg/L	1	05/06/2016 0900	05/06/2016 2015	RAD

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-06

Client Sample ID: Jan050416IT_ED
Collection Date/Time: 05/04/2016 1323
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	2.7		0.50		mg/L	1	05/06/2016 0900	05/06/2016 1851	RAD

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-07

Client Sample ID: Jan050416BCR_E
Collection Date/Time: 05/04/2016 1306
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
ICP Total Metals-E200.7									
Aluminum	0.18	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Calcium	510		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Iron	0.14	0.0025	0.30	E4	mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Lead	0.0052	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Manganese	140		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1600	RAD
Zinc	0.19		0.040		mg/L	1	05/06/2016 0935	05/09/2016 1532	RAD
Anions by Ion Chromatography-E300									
Sulfate	2500		1000		mg/L	200	05/05/2016 1200	05/05/2016 1904	MR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	88		10		mg/L	20	05/06/2016 0900	05/06/2016 2035	RAD

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-09

Client Sample ID: Jan050416AP_E
Collection Date/Time: 05/04/2016 1236
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.17	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1556	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1556	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1556	RAD
Iron	0.68		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1555	RAD
Lead	0.0065	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1556	RAD
Manganese	130		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1604	RAD
Zinc	0.20		0.040		mg/L	1	05/06/2016 0935	05/09/2016 1556	RAD

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-10

Client Sample ID: Jan050416MRB_E
Collection Date/Time: 05/04/2016 1222
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
ICP Total Metals-E200.7									
Aluminum	0.18	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Calcium	510		4.0		mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Iron	1.5		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Lead	0.0075	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Manganese	110		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1612	RAD
Zinc	0.14		0.040		mg/L	1	05/06/2016 0935	05/09/2016 1608	RAD
Anions by Ion Chromatography-E300									
Sulfate	5600		1000		mg/L	200	05/05/2016 1200	05/05/2016 2245	MR

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-11

Client Sample ID: Jan050416MRB_D
Collection Date/Time: 05/04/2016 1220
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.18	0.016	2.0	E4	mg/L	1	05/06/2016 0935	05/09/2016 1616	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1616	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1616	RAD
Iron	1.5		0.30		mg/L	1	05/06/2016 0935	05/09/2016 1616	RAD
Lead	0.0094	0.0016	0.040	E4	mg/L	1	05/06/2016 0935	05/09/2016 1616	RAD
Manganese	120		0.20		mg/L	10	05/06/2016 0935	05/09/2016 1624	RAD
Zinc	0.14		0.040		mg/L	1	05/06/2016 0935	05/09/2016 1616	RAD
Anions by Ion Chromatography-E300									
Sulfate	2700		1000		mg/L	200	05/05/2016 1200	05/05/2016 2303	MR

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Lab Sample ID: 16E0275-12

Client Sample ID: Jan050416B
Collection Date/Time: 05/04/2016 1258
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	ND	0.016	2.0	E8	mg/L	1	05/06/2016 0935	05/09/2016 1620	RAD
Cadmium	ND	0.00028	0.0020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1620	RAD
Copper	ND	0.0011	0.020	E8	mg/L	1	05/06/2016 0935	05/09/2016 1620	RAD
Iron	ND	0.0025	0.30	E8	mg/L	1	05/06/2016 0935	05/09/2016 1620	RAD
Lead	ND	0.0016	0.040	E8	mg/L	1	05/06/2016 0935	05/09/2016 1620	RAD
Manganese	ND	0.00022	0.020	E8	mg/L	1	05/06/2016 0935	05/12/2016 1501	RAD
Zinc	ND	0.0015	0.040	E8	mg/L	1	05/06/2016 0935	05/09/2016 1620	RAD

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Date Received: 05/04/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1605088 - E200.7										
Blank (1605088-BLK1)				Prepared: 05/06/2016 Analyzed: 05/09/2016						
Aluminum	ND	2.0	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Copper	0.0014	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1605088-BS1)				Prepared: 05/06/2016 Analyzed: 05/09/2016						
Aluminum	1.9	2.0	mg/L	2.000		96	85-115			
Cadmium	0.046	0.0020	mg/L	0.05000		92	85-115			
Calcium	9.4	4.0	mg/L	10.00		94	85-115			
Copper	0.23	0.020	mg/L	0.2500		90	85-115			
Iron	0.93	0.30	mg/L	1.000		93	85-115			
Lead	0.45	0.040	mg/L	0.5000		91	85-115			
Manganese	0.47	0.020	mg/L	0.5000		94	85-115			
Zinc	0.46	0.040	mg/L	0.5000		92	85-115			
LCS Dup (1605088-BSD1)				Prepared: 05/06/2016 Analyzed: 05/09/2016						
Aluminum	1.9	2.0	mg/L	2.000		97	85-115	1	20	
Cadmium	0.046	0.0020	mg/L	0.05000		92	85-115	0.7	20	
Calcium	9.5	4.0	mg/L	10.00		95	85-115	1	20	
Copper	0.23	0.020	mg/L	0.2500		92	85-115	2	20	
Iron	0.95	0.30	mg/L	1.000		95	85-115	2	20	
Lead	0.45	0.040	mg/L	0.5000		91	85-115	0.5	20	
Manganese	0.48	0.020	mg/L	0.5000		96	85-115	2	20	
Zinc	0.46	0.040	mg/L	0.5000		93	85-115	1	20	
Matrix Spike (1605088-MS1)		**Source: 16E0275-01**		Prepared: 05/06/2016 Analyzed: 05/09/2016						
Aluminum	2.4	2.0	mg/L	2.000	0.19	111	70-130			
Cadmium	0.042	0.0020	mg/L	0.05000	0.0013	82	70-130			
Calcium	470	4.0	mg/L	10.00	460	30	70-130			M3
Copper	0.27	0.020	mg/L	0.2500	0.0038	105	70-130			
Iron	35	0.30	mg/L	1.000	35	37	70-130			M3
Lead	0.33	0.040	mg/L	0.5000	0.0079	64	70-130			M7
Manganese	60	0.20	mg/L	0.5000	62	NR	70-130			M4
Zinc	9.9	0.40	mg/L	0.5000	9.9	9	70-130			M4
Matrix Spike (1605088-MS2)		**Source: 16E0289-01**		Prepared: 05/06/2016 Analyzed: 05/09/2016						
Aluminum	2.4	2.0	mg/L	2.000	0.16	110	70-130			
Cadmium	0.043	0.0020	mg/L	0.05000	ND	86	70-130			
Calcium	78	4.0	mg/L	10.00	69	85	70-130			
Copper	0.25	0.020	mg/L	0.2500	0.0019	98	70-130			
Iron	1.8	0.30	mg/L	1.000	1.1	70	70-130			
Lead	0.43	0.040	mg/L	0.5000	ND	86	70-130			
Manganese	0.48	0.020	mg/L	0.5000	0.030	90	70-130			
Zinc	0.79	0.040	mg/L	0.5000	0.35	89	70-130			

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Date Received: 05/04/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1605080 - SM5310 C										
Blank (1605080-BLK1)				Prepared & Analyzed: 05/06/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1605080-BS1)				Prepared & Analyzed: 05/06/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		103	90-110			
LCS Dup (1605080-BSD1)				Prepared & Analyzed: 05/06/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		103	90-110	0.4	10	
Matrix Spike (1605080-MS1)		**Source: 16E0013-01**		Prepared & Analyzed: 05/06/2016						
Organic Carbon, Total	13		mg/L	10.00	2.7	102	80-120			
Matrix Spike Dup (1605080-MSD1)		**Source: 16E0013-01**		Prepared & Analyzed: 05/06/2016						
Organic Carbon, Total	13		mg/L	10.00	2.7	103	80-120	0.8	15	
Batch 1605161 - SM5310 C										
Blank (1605161-BLK1)				Prepared & Analyzed: 05/16/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1605161-BS1)				Prepared & Analyzed: 05/16/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		104	90-110			
LCS Dup (1605161-BSD1)				Prepared & Analyzed: 05/16/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		104	90-110	0.5	10	
Matrix Spike (1605161-MS1)		**Source: 16E0421-01**		Prepared & Analyzed: 05/16/2016						
Organic Carbon, Total	15		mg/L	10.00	4.5	102	80-120			
Matrix Spike Dup (1605161-MSD1)		**Source: 16E0421-01**		Prepared & Analyzed: 05/16/2016						
Organic Carbon, Total	15		mg/L	10.00	4.5	102	80-120	0.3	15	

Turner Laboratories, Inc.

Date: 05/19/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16E0275
Date Received: 05/04/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1605052 - E300										
Blank (1605052-BLK1)				Prepared & Analyzed: 05/05/2016						
Sulfate	ND	5.0	mg/L							
LCS (1605052-BS1)				Prepared & Analyzed: 05/05/2016						
Sulfate	13	5.0	mg/L	12.50		101	90-110			
LCS Dup (1605052-BSD1)				Prepared & Analyzed: 05/05/2016						
Sulfate	13	5.0	mg/L	12.50		101	90-110	0.06	10	
Matrix Spike (1605052-MS2)		**Source: 16E0327-01RE1**		Prepared & Analyzed: 05/05/2016						
Sulfate	21		mg/L	12.50	9.3	93	80-120			
Matrix Spike (1605052-MS3)		**Source: 16E0323-01**		Prepared & Analyzed: 05/05/2016						
Sulfate	45	5.0	mg/L	12.50	34	91	80-120			
Matrix Spike Dup (1605052-MSD2)		**Source: 16E0327-01RE1**		Prepared & Analyzed: 05/05/2016						
Sulfate	21		mg/L	12.50	9.3	93	80-120	0.4	10	
Matrix Spike Dup (1605052-MSD3)		**Source: 16E0323-01**		Prepared & Analyzed: 05/05/2016						
Sulfate	45	5.0	mg/L	12.50	34	91	80-120	0.1	10	

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 16E0275 DATE 5/4/16 PAGE 1 OF 1

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE Charles Blair

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	Hardnes as CaCO3	BOD	Organic Carbon, Total
Jan050416ADIT	5/4/2016	1344		WW	2	X	X	X		
Jan050416TSF1_I		1400			2	X	X	X		
Jan050416COMP_I		1340			2	X	X	X		
Jan050416IT_M		1331			3	X	X	X		X
Jan050416IT_E		1305			3	X	X	X		X
Jan050416IT_ED		1323			1					X
Jan050416BCR_E		1306			4	X	X	X	X	X
Jan050416BCR_D		1300			1				X	
Jan050416AP_E		1236			2	X			X	
Jan050416MRB_E		1222			2	X	X	X		
Jan050416MRB_D		1220			2	X	X			
Jan050416B		1258			1	X				

1. RELINQUISHED BY: Charles Blair
Signature
Printed Name
Firm Arizona Minerals
Date/Time 04MAY2016 / 1635

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
__X__ Standard (approx.10 days)*
____ Next day ____ 2 Day ____ 5 Day*
____ Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
____ I. Routine Report
__X__ II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
____ III. Date Validation Report (Includes All Raw Data)
Add 10% to invoice

INVOICE INFORMATION:
Account ____ Y ____ N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 25
Temperature 12.2
[X] Wet Ice [ ] Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature
Printed Name
Firm TURNER LABORATORIES, INC.
5/4/16 1635

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis:	[ ] Yes [ ] No	Custody Seals	[ ]	Preservation Confirmation	[X]
ADEQ Forms:	[ ] Yes [ ] No	Container Intact	[X]	Appropriate Head Space	[X]
Mail ADEQ Forms:	[ ] Yes [ ] No	COC/Labels Agree	[X]	Received Within Hold Time	[X]

TURNER
LABORATORIES INC.

June 22, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16F0072
Order Name: Pilot Plant

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 7 sample(s) on 06/01/2016 for the analyses presented in the following report.

The attached report has been revised. Please refer to the Case Narrative page for an explanation of the changes. We apologize for any inconvenience this may have caused you.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,
Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Technical Director

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

Order: Pilot Plant

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16F0072-01	Jan060116ADIT	Wastewater	06/01/2016 1310
16F0072-02	Jan060116COMP_I	Wastewater	06/01/2016 1302
16F0072-03	Jan060116IT_M	Wastewater	06/01/2016 1300
16F0072-04	Jan060116IT_E	Wastewater	06/01/2016 1248
16F0072-05	Jan060116BCR_E	Wastewater	06/01/2016 1137
16F0072-06	Jan060116AP_E	Wastewater	06/01/2016 1135
16F0072-07	Jan060116MRB_E	Wastewater	06/01/2016 1130

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

Case Narrative

Alkalinity analysis was not reported on samples -05 or -07 due to matrix interference.

This report was originally generated on 6/15/2016. It is being revised on 6/22/2016 to include some analyses reported to the MDL, which was not on the original report.

E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
K5	The dilution water D.O depletion was >0.2 mg/L.
K6	Glucose/glutamic acid BOD/CBOD was below the method acceptance criteria.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
M7	Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.
Q9	Insufficient sample received to meet method QC requirements.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-01

Client Sample ID: Jan060116ADIT
Collection Date/Time: 06/01/2016 1310
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	240		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH
Alkalinity, Total (As CaCO3)	240		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-02

Client Sample ID: Jan060116COMP_I
Collection Date/Time: 06/01/2016 1302
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	06/03/2016 0925	06/06/2016 1040	MR
ICP Total Metals-E200.7									
Aluminum	0.12	0.015	2.0	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Antimony	0.0025	0.0015	0.20	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Arsenic	0.077		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Barium	0.0047	0.0014	0.050	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Boron	0.096	0.0028	0.10	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Cadmium	0.0019	0.0014	0.0020	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Calcium	470		4.0		mg/L	1	06/03/2016 0925	06/06/2016 1040	MR
Chromium	0.013	0.0015	0.030	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Iron	33		0.30		mg/L	1	06/03/2016 0925	06/06/2016 1040	MR
Lead	0.0051	0.0024	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Manganese	61		0.20		mg/L	10	06/03/2016 0925	06/06/2016 1052	MR
Nickel	0.023	0.00081	0.050	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Selenium	0.015	0.0082	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Silver	0.014		0.010		mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Thallium	0.0076	0.0020	0.050	E4	mg/L	1	06/03/2016 0925	06/06/2016 1041	MR
Zinc	8.2		0.40		mg/L	10	06/03/2016 0925	06/06/2016 1052	MR
CVAA Total Mercury-E245.1									
Mercury	ND	0.000094	0.0010	E8	mg/L	1	06/09/2016 1130	06/10/2016 1023	MR
Anions by Ion Chromatography-E300									
Sulfate	2400		500		mg/L	100	06/03/2016 1740	06/04/2016 0136	KM
Hexavalent Chromium, Low-Level, Dissolved-H 8023									
Chromium, Hexavalent	ND	10	10	E8	ug/L	1	06/02/2016 1030	06/02/2016 1045	SM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	200		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-02

Client Sample ID: Jan060116COMP_I
Collection Date/Time: 06/01/2016 1302
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH
Alkalinity, Total (As CaCO3)	200		2.0		mg/L	1	06/02/2016 0810	06/02/2016 0930	LH
Cyanide-SM4500-CN BE									
Cyanide	ND	0.025	0.10	E8	mg/L	1	06/02/2016 0830	06/02/2016 1500	KM

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-03

Client Sample ID: Jan060116IT_M
Collection Date/Time: 06/01/2016 1300
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	06/03/2016 0925	06/06/2016 1157	MR
ICP Total Metals-E200.7									
Aluminum	0.11	0.015	2.0	E4	mg/L	1	06/03/2016 0925	06/06/2016 1158	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1158	MR
Calcium	500		4.0		mg/L	1	06/03/2016 0925	06/06/2016 1157	MR
Copper	0.0038	0.0033	0.020	E4	mg/L	1	06/03/2016 0925	06/06/2016 1158	MR
Iron	6.4		0.30		mg/L	1	06/03/2016 0925	06/06/2016 1157	MR
Lead	0.0039	0.0024	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1158	MR
Manganese	54		0.20		mg/L	10	06/03/2016 0925	06/06/2016 1235	MR
Zinc	0.23		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1158	MR
Anions by Ion Chromatography-E300									
Sulfate	2600		500		mg/L	100	06/03/2016 1740	06/04/2016 0154	KM
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	4.9		0.50		mg/L	1	06/07/2016 0830	06/07/2016 1357	MR

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-04

Client Sample ID: Jan060116IT_E
Collection Date/Time: 06/01/2016 1248
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	06/03/2016 0925	06/06/2016 1201	MR
ICP Total Metals-E200.7									
Aluminum	0.075	0.015	2.0	E4	mg/L	1	06/03/2016 0925	06/06/2016 1202	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1202	MR
Calcium	500		4.0		mg/L	1	06/03/2016 0925	06/06/2016 1201	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1202	MR
Iron	37		0.30		mg/L	1	06/03/2016 0925	06/06/2016 1201	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	06/03/2016 0925	06/06/2016 1202	MR
Manganese	52		0.20		mg/L	10	06/03/2016 0925	06/06/2016 1239	MR
Zinc	0.45		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1202	MR
Anions by Ion Chromatography-E300									
Sulfate	2700		500		mg/L	100	06/03/2016 1740	06/04/2016 0213	KM
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	3.6		0.50		mg/L	1	06/07/2016 0830	06/07/2016 1515	MR

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-05

Client Sample ID: Jan060116BCR_E
Collection Date/Time: 06/01/2016 1137
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	06/03/2016 0925	06/06/2016 1206	MR
ICP Total Metals-E200.7									
Aluminum	0.10	0.015	2.0	E4	mg/L	1	06/03/2016 0925	06/06/2016 1207	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1207	MR
Calcium	480		4.0		mg/L	1	06/03/2016 0925	06/06/2016 1206	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1207	MR
Iron	0.091	0.0044	0.30	E4	mg/L	1	06/03/2016 0925	06/06/2016 1206	MR
Lead	0.0040	0.0024	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1207	MR
Manganese	88		0.20		mg/L	10	06/03/2016 0925	06/06/2016 1243	MR
Zinc	0.077		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1207	MR
Anions by Ion Chromatography-E300									
Sulfate	2300		500		mg/L	100	06/03/2016 1740	06/04/2016 0326	KM
Sulfide-SM4500-S2-F									
Sulfide	5.8		0.50	Q9	mg/L	1	06/06/2016 1500	06/06/2016 1540	KM
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	330		2.0		mg/L	1	06/02/2016 1040	06/07/2016 1220	CC
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	79		2.5		mg/L	5	06/07/2016 0830	06/07/2016 1535	MR

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-06

Client Sample ID: Jan060116AP_E
Collection Date/Time: 06/01/2016 1135
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.11	0.015	2.0	E4	mg/L	1	06/03/2016 0925	06/06/2016 1210	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1210	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1210	MR
Iron	0.45		0.30		mg/L	1	06/03/2016 0925	06/06/2016 1210	MR
Lead	0.0074	0.0024	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1210	MR
Manganese	110		0.40		mg/L	20	06/03/2016 0925	06/06/2016 1247	MR
Zinc	0.069		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1210	MR
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	33		2.0		mg/L	1	06/02/2016 1040	06/07/2016 1220	CC

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-07

Client Sample ID: Jan060116MRB_E
Collection Date/Time: 06/01/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
ICP Total Metals-E200.7									
Aluminum	0.12	0.015	2.0	E4	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Antimony	ND	0.0015	0.20	E8	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Arsenic	0.046		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Barium	0.18		0.050		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Boron	0.11		0.10		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Calcium	530		4.0		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Chromium	0.023	0.0015	0.030	E4	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Iron	1.6		0.30		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Lead	0.0054	0.0024	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Manganese	110		0.40		mg/L	20	06/03/2016 0925	06/06/2016 1251	MR
Nickel	ND	0.00081	0.050	E8	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Selenium	0.027	0.0082	0.040	E4	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Silver	0.025		0.010		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Thallium	0.019	0.0020	0.050	E4	mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
Zinc	0.069		0.040		mg/L	1	06/03/2016 0925	06/06/2016 1214	MR
CVAA Total Mercury-E245.1									
Mercury	ND	0.000094	0.0010	E8	mg/L	1	06/09/2016 1130	06/10/2016 1031	MR
Anions by Ion Chromatography-E300									
Sulfate	2800		500		mg/L	100	06/02/2016 1600	06/03/2016 0205	KM
Hexavalent Chromium, Low-Level, Dissolved-H 8023									
Chromium, Hexavalent	ND	10	10	E8	ug/L	1	06/02/2016 1030	06/02/2016 1045	SM
Cyanide-SM4500-CN BE									
Cyanide	ND	0.025	0.10	E8	mg/L	1	06/02/2016 0830	06/02/2016 1500	KM
Sulfide-SM4500-S2-F									

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Lab Sample ID: 16F0072-07

Client Sample ID: Jan060116MRB_E
Collection Date/Time: 06/01/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Sulfide	ND		0.50	Q9	mg/L	1	06/06/2016 1500	06/06/2016 1540	KM

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1606035 - E 200.2 ICP										
Blank (1606035-BLK1)				Prepared: 06/03/2016 Analyzed: 06/06/2016						
Aluminum	ND	2.0	mg/L							
Antimony	ND	0.20	mg/L							
Arsenic	ND	0.040	mg/L							
Barium	ND	0.050	mg/L							
Beryllium	ND	0.0020	mg/L							
Boron	0.028	0.10	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Chromium	ND	0.030	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Nickel	ND	0.050	mg/L							
Selenium	ND	0.040	mg/L							
Silver	ND	0.010	mg/L							
Thallium	ND	0.050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1606035-BS1)				Prepared: 06/03/2016 Analyzed: 06/06/2016						
Aluminum	2.0	2.0	mg/L	2.000		98	85-115			
Antimony	0.51	0.20	mg/L	0.5000		102	85-115			
Arsenic	1.98	0.040	mg/L	2.000		99	85-115			
Barium	1.9	0.050	mg/L	2.000		95	85-115			
Beryllium	0.048	0.0020	mg/L	0.05000		95	85-115			
Boron	0.93	0.10	mg/L	1.000		93	85-115			
Cadmium	0.048	0.0020	mg/L	0.05000		96	85-115			
Calcium	9.7	4.0	mg/L	10.00		97	85-115			
Chromium	0.20	0.030	mg/L	0.2000		99	85-115			
Copper	0.23	0.020	mg/L	0.2500		92	85-115			
Iron	0.97	0.30	mg/L	1.000		97	85-115			
Lead	0.48	0.040	mg/L	0.5000		95	85-115			
Manganese	0.48	0.020	mg/L	0.5000		96	85-115			
Nickel	0.46	0.050	mg/L	0.5000		93	85-115			
Selenium	1.9	0.040	mg/L	2.000		96	85-115			
Silver	0.049	0.010	mg/L	0.05000		98	85-115			
Thallium	1.9	0.050	mg/L	2.000		96	85-115			
Zinc	0.47	0.040	mg/L	0.5000		94	85-115			

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1606035 - E 200.2 ICP										
LCS Dup (1606035-BSD1)				Prepared: 06/03/2016 Analyzed: 06/06/2016						
Aluminum	2.0	2.0	mg/L	2.000		99	85-115	1	20	
Antimony	0.51	0.20	mg/L	0.5000		102	85-115	0.4	20	
Arsenic	2.00	0.040	mg/L	2.000		100	85-115	0.9	20	
Barium	1.9	0.050	mg/L	2.000		96	85-115	1	20	
Beryllium	0.048	0.0020	mg/L	0.05000		96	85-115	0.9	20	
Boron	0.95	0.10	mg/L	1.000		95	85-115	1	20	
Cadmium	0.048	0.0020	mg/L	0.05000		97	85-115	0.5	20	
Calcium	9.8	4.0	mg/L	10.00		98	85-115	1	20	
Chromium	0.20	0.030	mg/L	0.2000		100	85-115	1	20	
Copper	0.23	0.020	mg/L	0.2500		93	85-115	1	20	
Iron	0.97	0.30	mg/L	1.000		97	85-115	0.4	20	
Lead	0.48	0.040	mg/L	0.5000		97	85-115	1	20	
Manganese	0.49	0.020	mg/L	0.5000		97	85-115	1	20	
Nickel	0.47	0.050	mg/L	0.5000		94	85-115	1	20	
Selenium	1.9	0.040	mg/L	2.000		97	85-115	1	20	
Silver	0.050	0.010	mg/L	0.05000		99	85-115	1	20	
Thallium	1.9	0.050	mg/L	2.000		97	85-115	1	20	
Zinc	0.48	0.040	mg/L	0.5000		95	85-115	0.9	20	
Matrix Spike (1606035-MS1)		**Source: 16E0732-02**		Prepared: 06/03/2016 Analyzed: 06/06/2016						
Aluminum	2.3	2.0	mg/L	2.000	0.16	106	70-130			
Antimony	0.49	0.20	mg/L	0.5000	ND	97	70-130			
Arsenic	1.98	0.040	mg/L	2.000	0.0212	98	70-130			
Barium	1.8	0.050	mg/L	2.000	0.13	84	70-130			
Beryllium	0.045	0.0020	mg/L	0.05000	ND	90	70-130			
Boron	1.2	0.10	mg/L	1.000	0.27	91	70-130			
Cadmium	0.042	0.0020	mg/L	0.05000	ND	84	70-130			
Calcium	170	4.0	mg/L	10.00	160	50	70-130			M3
Chromium	0.19	0.030	mg/L	0.2000	0.0024	92	70-130			
Copper	0.31	0.020	mg/L	0.2500	0.079	93	70-130			
Iron	1.4	0.30	mg/L	1.000	0.60	83	70-130			
Lead	0.43	0.040	mg/L	0.5000	ND	86	70-130			
Manganese	0.53	0.020	mg/L	0.5000	0.076	91	70-130			
Nickel	0.46	0.050	mg/L	0.5000	0.0040	90	70-130			
Selenium	1.8	0.040	mg/L	2.000	ND	90	70-130			
Silver	0.048	0.010	mg/L	0.05000	0.0013	93	70-130			
Thallium	1.7	0.050	mg/L	2.000	ND	84	70-130			
Zinc	0.76	0.040	mg/L	0.5000	0.18	115	70-130			

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1606035 - E 200.2 ICP										
Matrix Spike (1606035-MS2)		**Source: 16F0072-02**		Prepared: 06/03/2016 Analyzed: 06/06/2016						
Aluminum	2.4	2.0	mg/L	2.000	0.12	112	70-130			
Antimony	0.53	0.20	mg/L	0.5000	0.0025	105	70-130			
Arsenic	2.20	0.040	mg/L	2.000	0.0767	106	70-130			
Barium	0.62	0.050	mg/L	2.000	0.0047	31	70-130			M7
Beryllium	0.045	0.0020	mg/L	0.05000	ND	89	70-130			
Boron	1.1	0.10	mg/L	1.000	0.096	96	70-130			
Cadmium	0.046	0.0020	mg/L	0.05000	0.0019	87	70-130			
Calcium	470	4.0	mg/L	10.00	470	NR	70-130			M3
Chromium	0.20	0.030	mg/L	0.2000	0.013	94	70-130			
Copper	0.26	0.020	mg/L	0.2500	ND	102	70-130			
Iron	33	0.30	mg/L	1.000	33	NR	70-130			M3
Lead	0.27	0.040	mg/L	0.5000	0.0051	54	70-130			M7
Manganese	64	0.20	mg/L	0.5000	61	652	70-130			M3
Nickel	0.50	0.050	mg/L	0.5000	0.023	95	70-130			
Selenium	2.1	0.040	mg/L	2.000	0.015	102	70-130			
Silver	0.064	0.010	mg/L	0.05000	0.014	100	70-130			
Thallium	1.6	0.050	mg/L	2.000	0.0076	79	70-130			
Zinc	9.2	0.40	mg/L	0.5000	8.2	185	70-130			M3
Batch 1606092 - E 245.1										
Blank (1606092-BLK1)				Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	ND	0.0010	mg/L							
LCS (1606092-BS1)				Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	0.0050	0.0010	mg/L	0.005000		101	85-115			
LCS Dup (1606092-BSD1)				Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	0.0052	0.0010	mg/L	0.005000		104	85-115	3	20	
Matrix Spike (1606092-MS1)		**Source: 16F0013-01**		Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	0.0052	0.0010	mg/L	0.005000	ND	104	85-115			
Matrix Spike (1606092-MS2)		**Source: 16F0112-01**		Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	0.0050	0.0010	mg/L	0.005000	ND	101	85-115			
Matrix Spike Dup (1606092-MSD1)		**Source: 16F0013-01**		Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	0.0053	0.0010	mg/L	0.005000	ND	106	85-115	2	20	
Matrix Spike Dup (1606092-MSD2)		**Source: 16F0112-01**		Prepared: 06/09/2016 Analyzed: 06/10/2016						
Mercury	0.0049	0.0010	mg/L	0.005000	ND	98	85-115	3	20	

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1606019 - GEN CHEM										
LCS (1606019-BS1)				Prepared & Analyzed: 06/02/2016						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		96	90-110			
LCS Dup (1606019-BSD1)				Prepared & Analyzed: 06/02/2016						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		94	90-110	2	10	
Matrix Spike (1606019-MS1)		**Source: 16E0798-01**		Prepared & Analyzed: 06/02/2016						
Alkalinity, Total (As CaCO3)	360	2.0	mg/L	250.0	130	93	85-115			
Matrix Spike Dup (1606019-MSD1)		**Source: 16E0798-01**		Prepared & Analyzed: 06/02/2016						
Alkalinity, Total (As CaCO3)	360	2.0	mg/L	250.0	130	92	85-115	0.6	10	
Batch 1606025 - SPECTRO PREP										
Blank (1606025-BLK1)				Prepared & Analyzed: 06/02/2016						
Chromium, Hexavalent	ND	10	ug/L							
LCS (1606025-BS1)				Prepared & Analyzed: 06/02/2016						
Chromium, Hexavalent	210	10	ug/L	200.0		105	90-110			
LCS Dup (1606025-BSD1)				Prepared & Analyzed: 06/02/2016						
Chromium, Hexavalent	200	10	ug/L	200.0		100	90-110	5	10	
Matrix Spike (1606025-MS1)		**Source: 16F0072-02**		Prepared & Analyzed: 06/02/2016						
Chromium, Hexavalent	ND	10	ug/L	200.0	ND		70-130			M7
Matrix Spike Dup (1606025-MSD1)		**Source: 16F0072-02**		Prepared & Analyzed: 06/02/2016						
Chromium, Hexavalent	ND	10	ug/L	200.0	ND		70-130		15	M7
Batch 1606028 - SPECTRO PREP										
Blank (1606028-BLK1)				Prepared & Analyzed: 06/02/2016						
Cyanide	ND	0.10	mg/L							
LCS (1606028-BS1)				Prepared & Analyzed: 06/02/2016						
Cyanide	2.0	0.10	mg/L	2.000		101	90-110			
LCS Dup (1606028-BSD1)				Prepared & Analyzed: 06/02/2016						
Cyanide	2.0	0.10	mg/L	2.000		98	90-110	3	20	
Matrix Spike (1606028-MS1)		**Source: 16E0621-02**		Prepared & Analyzed: 06/02/2016						
Cyanide	2.0	0.10	mg/L	2.000	0.045	99	70-130			
Matrix Spike Dup (1606028-MSD1)		**Source: 16E0621-02**		Prepared & Analyzed: 06/02/2016						
Cyanide	1.9	0.10	mg/L	2.000	0.045	94	70-130	6	20	
Batch 1606050 - GEN CHEM										
Blank (1606050-BLK1)				Prepared & Analyzed: 06/07/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1606050-BS1)				Prepared & Analyzed: 06/07/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		102	90-110			

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1606050 - GEN CHEM										
LCS Dup (1606050-BSD1)				Prepared & Analyzed: 06/07/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		103	90-110	1	10	
Matrix Spike (1606050-MS1)		**Source: 16F0072-03**		Prepared & Analyzed: 06/07/2016						
Organic Carbon, Total	14	0.50	mg/L	10.00	4.9	91	80-120			
Matrix Spike Dup (1606050-MSD1)		**Source: 16F0072-03**		Prepared & Analyzed: 06/07/2016						
Organic Carbon, Total	14	0.50	mg/L	10.00	4.9	92	80-120	0.9	15	
Batch 1606057 - GEN CHEM										
Blank (1606057-BLK1)				Prepared & Analyzed: 06/06/2016						
Sulfide	ND	0.50	mg/L							
LCS (1606057-BS1)				Prepared & Analyzed: 06/06/2016						
Sulfide	3.2		mg/L	3.333		96	70-130			
LCS Dup (1606057-BSD1)				Prepared & Analyzed: 06/06/2016						
Sulfide	3.2		mg/L	3.333		96	70-130	0	20	
Batch 1606059 - GEN CHEM										
Blank (1606059-BLK1)				Prepared: 06/02/2016 Analyzed: 06/07/2016						
Biochemical Oxygen Demand	ND	2.0	mg/L							K5
LCS (1606059-BS1)				Prepared: 06/02/2016 Analyzed: 06/07/2016						
Biochemical Oxygen Demand	150		mg/L	198.0		73	85-115			K6

Turner Laboratories, Inc.

Date: 06/22/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0072
Date Received: 06/01/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1606016 - IC PREP										
Blank (1606016-BLK1)				Prepared & Analyzed: 06/02/2016						
Sulfate	ND	5.0	mg/L							
LCS (1606016-BS1)				Prepared & Analyzed: 06/02/2016						
Sulfate	13	5.0	mg/L	12.50		103	90-110			
LCS Dup (1606016-BSD1)				Prepared & Analyzed: 06/02/2016						
Sulfate	13	5.0	mg/L	12.50		102	90-110	0.5	10	
Matrix Spike (1606016-MS5)		**Source: 16F0111-01RE2**		Prepared: 06/03/2016 Analyzed: 06/04/2016						
Sulfate	23		mg/L	12.50	11	94	80-120			
Matrix Spike Dup (1606016-MSD5)		**Source: 16F0111-01RE2**		Prepared: 06/03/2016 Analyzed: 06/04/2016						
Sulfate	22		mg/L	12.50	11	92	80-120	1	10	

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
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www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 16F0072 DATE 6/1/16 PAGE 1 OF 1

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	ICP-E200.7 Total Ag,As,B,Ba,Be,Hg,N	Hardness as CaCO3	Cyanide	Chromium, Hexavalent (dissolved)	BOD	Organic Carbon, Total	Sulfide	Alkalinity
Jan060116ADIT	6/1/2016	1210		WW											X
Jan060116COMP_I		1302				X	X	X	X	X	X				X
Jan060116IT_M		1300				X	X		X				X		
Jan060116IT_E		1248				X	X		X				X		
Jan060116BCR_E		1137				X	X		X			X	X	X	X
Jan060116AP_E		1135				X						X			
Jan060116MRB_E		1130				X	X	X	X	X	X			X	X

1. RELINQUISHED BY:
Signature A.J. Gibson
Printed Name Arizona Minerals/Sovereign
Firm
01JUN2016 1645
Date/Time

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)
Add 10% to invoice

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 28
Temperature 21.2
☒ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature
Printed Name
TURNER LABORATORIES, INC.
Firm
6/1/16 1645
Date/Time

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis: ☐ Yes ☐ No	Custody Seals ☐	Preservation Confirmation ☒
ADEQ Forms: ☐ Yes ☐ No	Container Intact ☒	Appropriate Head Space ☒
Mail ADEQ Forms: ☐ Yes ☐ No	COC/Labels Agree ☒	Received Within Hold Time ☒

Contacted client BOD bottle for Jan060116AP_E on COC was only marked as Jan060116 on bottle confirmed with client to analyze per request.

KKM

July 12, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16F0832
Order Name: Pilot Plant

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 13 sample(s) on 06/29/2016 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Technical Director

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Date Received: 06/29/2016

Order: Pilot Plant

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16F0832-01	Jan062916ADIT_I	Wastewater	06/29/2016 0000
16F0832-02	Jan062916COMP_I	Wastewater	06/29/2016 0000
16F0832-03	Jan062916BCR_E	Wastewater	06/29/2016 0000
16F0832-04	Jan062916MRB_E	Wastewater	06/29/2016 0000
16F0832-05	Jan062916ADIT_I_DIS	Wastewater	06/29/2016 0000
16F0832-06	Jan062916COMP_I_DIS	Wastewater	06/29/2016 0000
16F0832-07	Jan062916IT_M_DIS	Wastewater	06/29/2016 0000
16F0832-08	Jan062916IT_E_DIS	Wastewater	06/29/2016 0000
16F0832-09	Jan062916BCR_E_DIS	Wastewater	06/29/2016 0000
16F0832-10	Jan062916AP_E_DIS	Wastewater	06/29/2016 0000
16F0832-11	Jan062916MRB_E_DIS	Wastewater	06/29/2016 0000
16F0832-12	Jan062916MRB_ED_DIS	Wastewater	06/29/2016 0000
16F0832-13	Jan062916B	Wastewater	06/29/2016 0000

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Date Received: 06/29/2016

Case Narrative

E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-01

Client Sample ID: Jan062916ADIT_I
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
ICP Total Metals-E200.7									
Aluminum	0.17	0.015	2.0	E4	mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
Cadmium	0.0018	0.0014	0.0020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
Calcium	510		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
Iron	35		0.30		mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
Lead	0.0030	0.0024	0.040	E4	mg/L	1	07/05/2016 0920	07/06/2016 1045	MR
Manganese	62		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1112	MR
Zinc	7.8		0.40		mg/L	10	07/05/2016 0920	07/06/2016 1112	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-02

Client Sample ID: Jan062916COMP_I
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
ICP Total Metals-E200.7									
Aluminum	0.31	0.015	2.0	E4	mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
Cadmium	0.0017	0.0014	0.0020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
Calcium	520		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
Copper	0.0090	0.0033	0.020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
Iron	52		0.30		mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
Lead	0.016	0.0024	0.040	E4	mg/L	1	07/05/2016 0920	07/06/2016 1445	MR
Manganese	69		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1618	MR
Zinc	9.3		0.40		mg/L	10	07/05/2016 0920	07/06/2016 1618	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-03

Client Sample ID: Jan062916BCR_E
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	07/05/2016 0920	07/06/2016 1508	MR
ICP Total Metals-E200.7									
Aluminum	0.10	0.015	2.0	E4	mg/L	1	07/05/2016 0920	07/06/2016 1509	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1509	MR
Calcium	520		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1508	MR
Copper	0.0053	0.0033	0.020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1509	MR
Iron	0.069	0.0044	0.30	E4	mg/L	1	07/05/2016 0920	07/06/2016 1508	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1509	MR
Manganese	63		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1622	MR
Zinc	0.13		0.040		mg/L	1	07/05/2016 0920	07/06/2016 1509	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-04

Client Sample ID: Jan062916MRB_E
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1400				mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
ICP Total Metals-E200.7									
Aluminum	0.074	0.015	2.0	E4	mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Calcium	560		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Copper	0.015	0.0033	0.020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Iron	0.056	0.0044	0.30	E4	mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Manganese	17		0.020		mg/L	1	07/05/2016 0920	07/06/2016 1513	MR
Zinc	0.086		0.040		mg/L	1	07/05/2016 0920	07/06/2016 1513	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-05

Client Sample ID: Jan062916ADIT_I_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	2	07/05/2016 0920	07/06/2016 1134	MR
ICP Total Metals-E200.7									
Aluminum	0.17	0.030	4.0	E4	mg/L	2	07/05/2016 0920	07/06/2016 1134	MR
Cadmium	ND	0.0028	0.0040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1135	MR
Calcium	520		8.0		mg/L	2	07/05/2016 0920	07/06/2016 1134	MR
Copper	ND	0.0066	0.040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1135	MR
Iron	36		0.60		mg/L	2	07/05/2016 0920	07/06/2016 1134	MR
Lead	ND	0.0048	0.080	E8	mg/L	2	07/05/2016 0920	07/06/2016 1135	MR
Manganese	72		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1314	MR
Zinc	7.3		0.080		mg/L	2	07/05/2016 0920	07/06/2016 1134	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-06

Client Sample ID: Jan062916COMP_I_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1500				mg/L	1	07/05/2016 0920	07/06/2016 1520	MR
ICP Total Metals-E200.7									
Aluminum	0.12	0.015	2.0	E4	mg/L	1	07/05/2016 0920	07/06/2016 1521	MR
Cadmium	0.0035		0.0020		mg/L	1	07/05/2016 0920	07/06/2016 1521	MR
Calcium	610		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1520	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1521	MR
Iron	37		0.30		mg/L	1	07/05/2016 0920	07/06/2016 1520	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1521	MR
Manganese	64		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1626	MR
Zinc	8.1		0.40		mg/L	10	07/05/2016 0920	07/06/2016 1626	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-07

Client Sample ID: Jan062916IT_M_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1500				mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
ICP Total Metals-E200.7									
Aluminum	0.10	0.030	4.0	E4	mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
Cadmium	ND	0.0028	0.0040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
Calcium	600		8.0		mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
Copper	ND	0.0066	0.040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
Iron	0.060	0.0088	0.60	E4	mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
Lead	ND	0.0048	0.080	E8	mg/L	2	07/05/2016 0920	07/06/2016 1630	MR
Manganese	66		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1634	MR
Zinc	2.2		0.080		mg/L	2	07/05/2016 0920	07/06/2016 1630	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-08

Client Sample ID: Jan062916IT_E_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1600				mg/L	2	07/05/2016 0920	07/06/2016 1638	MR
ICP Total Metals-E200.7									
Aluminum	ND	0.030	4.0	E8	mg/L	2	07/05/2016 0920	07/06/2016 1639	MR
Cadmium	ND	0.0028	0.0040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1639	MR
Calcium	630		8.0		mg/L	2	07/05/2016 0920	07/06/2016 1638	MR
Copper	ND	0.0066	0.040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1639	MR
Iron	0.047	0.0088	0.60	E4	mg/L	2	07/05/2016 0920	07/06/2016 1638	MR
Lead	ND	0.0048	0.080	E8	mg/L	2	07/05/2016 0920	07/06/2016 1639	MR
Manganese	57		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1643	MR
Zinc	0.74		0.080		mg/L	2	07/05/2016 0920	07/06/2016 1639	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-09

Client Sample ID: Jan062916BCR_E_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	2	07/05/2016 0920	07/06/2016 1646	MR
ICP Total Metals-E200.7									
Aluminum	ND	0.030	4.0	E8	mg/L	2	07/05/2016 0920	07/06/2016 1647	MR
Cadmium	ND	0.0028	0.0040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1647	MR
Calcium	520		8.0		mg/L	2	07/05/2016 0920	07/06/2016 1646	MR
Copper	ND	0.0066	0.040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1647	MR
Iron	0.018	0.0088	0.60	E4	mg/L	2	07/05/2016 0920	07/06/2016 1646	MR
Lead	ND	0.0048	0.080	E8	mg/L	2	07/05/2016 0920	07/06/2016 1647	MR
Manganese	54		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1719	MR
Zinc	0.095		0.080		mg/L	2	07/05/2016 0920	07/06/2016 1647	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-10

Client Sample ID: Jan062916AP_E_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
ICP Total Metals-E200.7									
Aluminum	0.10	0.015	2.0	E4	mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
Calcium	530		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
Iron	0.081	0.0044	0.30	E4	mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1539	MR
Manganese	57		0.20		mg/L	10	07/05/2016 0920	07/06/2016 1723	MR
Zinc	0.081		0.040		mg/L	1	07/05/2016 0920	07/06/2016 1539	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-11

Client Sample ID: Jan062916MRB_E_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1500				mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
ICP Total Metals-E200.7									
Aluminum	ND	0.015	2.0	E8	mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
Calcium	580		4.0		mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
Copper	0.0058	0.0033	0.020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
Iron	ND	0.0044	0.30	E8	mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1543	MR
Manganese	18		0.10		mg/L	5	07/05/2016 0920	07/06/2016 1727	MR
Zinc	0.084		0.040		mg/L	1	07/05/2016 0920	07/06/2016 1543	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-12

Client Sample ID: Jan062916MRB_ED_DIS
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.087	0.030	4.0	E4	mg/L	2	07/05/2016 0920	07/06/2016 1610	MR
Cadmium	ND	0.0028	0.0040	E8	mg/L	2	07/05/2016 0920	07/06/2016 1610	MR
Copper	0.0092	0.0066	0.040	E4	mg/L	2	07/05/2016 0920	07/06/2016 1610	MR
Iron	ND	0.0088	0.60	E8	mg/L	2	07/05/2016 0920	07/06/2016 1610	MR
Lead	ND	0.0048	0.080	E8	mg/L	2	07/05/2016 0920	07/06/2016 1610	MR
Manganese	17		0.040		mg/L	2	07/05/2016 0920	07/06/2016 1610	MR
Zinc	0.10		0.080		mg/L	2	07/05/2016 0920	07/06/2016 1610	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Lab Sample ID: 16F0832-13

Client Sample ID: Jan062916B
Collection Date/Time: 06/29/2016 0000
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	ND	0.015	2.0	E8	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR
Cadmium	ND	0.0014	0.0020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR
Iron	ND	0.0044	0.30	E8	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR
Lead	ND	0.0024	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR
Manganese	0.013	0.0014	0.020	E4	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR
Zinc	ND	0.0065	0.040	E8	mg/L	1	07/05/2016 0920	07/06/2016 1614	MR

Turner Laboratories, Inc.

Date: 07/12/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16F0832
Date Received: 06/29/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1607021 - E200.7										
Blank (1607021-BLK1)				Prepared: 07/05/2016 Analyzed: 07/06/2016						
Aluminum	0.016	2.0	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1607021-BS1)				Prepared: 07/05/2016 Analyzed: 07/06/2016						
Aluminum	2.0	2.0	mg/L	2.000		102	85-115			
Cadmium	0.050	0.0020	mg/L	0.05000		100	85-115			
Calcium	9.9	4.0	mg/L	10.00		99	85-115			
Copper	0.24	0.020	mg/L	0.2500		95	85-115			
Iron	0.98	0.30	mg/L	1.000		98	85-115			
Lead	0.49	0.040	mg/L	0.5000		98	85-115			
Manganese	0.50	0.020	mg/L	0.5000		100	85-115			
Zinc	0.49	0.040	mg/L	0.5000		97	85-115			
LCS Dup (1607021-BSD1)				Prepared: 07/05/2016 Analyzed: 07/06/2016						
Aluminum	2.0	2.0	mg/L	2.000		102	85-115	0.4	20	
Cadmium	0.050	0.0020	mg/L	0.05000		100	85-115	0.5	20	
Calcium	9.9	4.0	mg/L	10.00		99	85-115	0.3	20	
Copper	0.24	0.020	mg/L	0.2500		95	85-115	0.5	20	
Iron	0.99	0.30	mg/L	1.000		99	85-115	0.9	20	
Lead	0.50	0.040	mg/L	0.5000		99	85-115	0.7	20	
Manganese	0.50	0.020	mg/L	0.5000		101	85-115	0.8	20	
Zinc	0.49	0.040	mg/L	0.5000		97	85-115	0.3	20	
Matrix Spike (1607021-MS1)		**Source: 16F0832-01**		Prepared: 07/05/2016 Analyzed: 07/06/2016						
Aluminum	2.6	2.0	mg/L	2.000	0.17	122	70-130			
Cadmium	0.057	0.0020	mg/L	0.05000	0.0018	110	70-130			
Calcium	620	4.0	mg/L	10.00	510	NR	70-130			M3
Copper	0.25	0.020	mg/L	0.2500	ND	101	70-130			
Iron	42	0.30	mg/L	1.000	35	666	70-130			M3
Lead	0.59	0.040	mg/L	0.5000	0.0030	118	70-130			
Manganese	62	0.20	mg/L	0.5000	62	21	70-130			M3
Zinc	8.3	0.40	mg/L	0.5000	7.8	97	70-130			
Matrix Spike (1607021-MS2)		**Source: 16F0832-05**		Prepared: 07/05/2016 Analyzed: 07/06/2016						
Aluminum	2.4	10	mg/L	2.000	0.17	114	70-130			
Cadmium	0.055	0.010	mg/L	0.05000	ND	111	70-130			
Calcium	540	20	mg/L	10.00	520	195	70-130			M3
Copper	0.28	0.10	mg/L	0.2500	ND	113	70-130			
Iron	38	1.5	mg/L	1.000	36	219	70-130			M3
Lead	0.46	0.20	mg/L	0.5000	ND	93	70-130			
Manganese	63	0.20	mg/L	0.5000	72	NR	70-130			M3
Zinc	8.4	0.20	mg/L	0.5000	7.3	219	70-130			M3

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 16F0832 DATE 6/29/16 PAGE 1 OF 1

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Hardness as CaCO3
Jan062916ADIT_I	6/29/2016			WW			
Jan062916COMP_I							
Jan062916BCR_E						X	X
Jan062916MRB_E						X	X
Jan062916ADIT_I_DIS						X	X
Jan062916COMP_I_DIS						X	X
Jan062916IT_M_DIS						X	X
Jan062916IT_E_DIS						X	X
Jan062916BCR_E_DIS						X	X
Jan062916AP_E_DIS						X	X
Jan062916MRB_E_DIS						X	X
Jan062916MRB_ED_DIS						X	
Jan062916B						X	

1. RELINQUISHED BY:
Signature A Jibson
Printed Name
Firm
Date/Time 6/28/16 930

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)
Add 10% to invoice

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 11
Temperature 10.4
☒ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature Guadalupe Fattore
Printed Name
Firm Sovereign Consulting
Date/Time 6/29/16 13:10

4. RECEIVED BY:
Signature
Printed Name
Firm TURNER LABORATORIES, INC.
Date/Time 6/29/16 1310

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis: ☐ Yes ☐ No	Custody Seals ☐	Preservation Confirmation ☒
ADEQ Forms: ☐ Yes ☐ No	Container Intact ☒	Appropriate Head Space ☒
Mail ADEQ Forms: ☐ Yes ☐ No	COC/Labels Agree ☒	Received Within Hold Time ☒

On first two samples analysis was not checked. Contacted client would like 200.7 metals and hardness.
KMM 6/30/16

TURNER
LABORATORIES INC.

August 23, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16G0676
Order Name: Pilot Plant

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 10 sample(s) on 07/20/2016 for the analyses presented in the following report.

The attached report has been revised. Please refer to the Case Narrative page for an explanation of the changes. We apologize for any inconvenience this may have caused you.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,
Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Technical Director

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

Order: Pilot Plant

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16G0676-01	Jan072016COMP_I	Wastewater	07/20/2016 1130
16G0676-02	Jan0720166IT_M	Wastewater	07/20/2016 1130
16G0676-03	Jan072016IT_E	Wastewater	07/20/2016 1130
16G0676-04	Jan072016BCR_E	Wastewater	07/20/2016 1130
16G0676-05	Jan072016AP_E	Wastewater	07/20/2016 1130
16G0676-06	Jan072016MRB_E	Wastewater	07/20/2016 1130
16G0676-07	Jan062916COMP_I_DIS	Wastewater	07/20/2016 1130
16G0676-08	Jan062916BCR_E_DIS	Wastewater	07/20/2016 1130
16G0676-09	Jan062916AP_E_DIS	Wastewater	07/20/2016 1130
16G0676-10	Jan062916MRB_E_DIS	Wastewater	07/20/2016 1130

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

Case Narrative

This report was originally generated on 8/3/2016. It is being revised on 8/23/2016 to include additional metal analyses by ICP/MS, which were not on the original report.

D5	Minimum Reporting Limit (MRL) is adjusted due to sample dilution; analyte was non-detect in the sample.
E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
K6	Glucose/glutamic acid BOD/CBOD was below the method acceptance criteria.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
M7	Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-01

Client Sample ID: Jan072016COMP_I
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1400				mg/L	5	07/22/2016 1010	07/26/2016 1603	MR
ICP Total Metals-E200.7									
Aluminum	ND	0.075	10	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Antimony	ND	0.0075	1.0	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Arsenic	0.21		0.20		mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Barium	0.019	0.0070	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Beryllium	ND	0.0065	0.010	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Boron	0.17	0.014	0.50	E4	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Cadmium	ND	0.0070	0.010	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Calcium	560		20		mg/L	5	07/22/2016 1010	07/26/2016 1603	MR
Chromium	0.027	0.0075	0.15	E4	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Copper	ND	0.017	0.10	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Iron	42		1.5		mg/L	5	07/22/2016 1010	07/26/2016 1603	MR
Lead	ND	0.012	0.20	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Manganese	68		0.10		mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Nickel	0.069	0.0041	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Selenium	ND	0.041	0.20	E8	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Silver	0.015	0.0036	0.050	E4	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Thallium	0.022	0.010	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
Zinc	9.1		0.20		mg/L	5	07/22/2016 1010	07/26/2016 1604	MR
ICP/MS Total Metals-E200.8									
Cadmium	0.0021		0.00025		mg/L	1	08/16/2016 1030	08/19/2016 1221	MH
Selenium	ND		0.0025		mg/L	1	08/16/2016 1030	08/19/2016 1221	MH
Anions by Ion Chromatography-E300									
Sulfate	2400		500		mg/L	100	07/22/2016 1640	07/22/2016 1952	KM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	150		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Total (As CaCO3)	150		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-02

Client Sample ID: Jan0720166IT_M
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Anions by Ion Chromatography-E300									
Sulfate	2500		500		mg/L	100	07/22/2016 1640	07/22/2016 2010	KM

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-03

Client Sample ID: Jan072016IT_E
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Anions by Ion Chromatography-E300									
Sulfate	2400		500		mg/L	100	07/22/2016 1640	07/22/2016 2029	KM

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-04

Client Sample ID: Jan072016BCR_E
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1400				mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
ICP Total Metals-E200.7									
Aluminum	ND	0.075	10	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Antimony	ND	0.0075	1.0	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Arsenic	0.051	0.024	0.20	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Barium	0.077	0.0070	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Beryllium	ND	0.0065	0.010	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Boron	0.094	0.014	0.50	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Cadmium	ND	0.0070	0.010	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Calcium	560		20		mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Chromium	0.026	0.0075	0.15	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Copper	ND	0.017	0.10	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Iron	0.27	0.022	1.5	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Lead	ND	0.012	0.20	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Manganese	69		0.10		mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Nickel	0.032	0.0041	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Selenium	ND	0.041	0.20	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Silver	0.018	0.0036	0.050	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Thallium	ND	0.010	0.25	E8	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
Zinc	0.038	0.033	0.20	E4	mg/L	5	07/22/2016 1010	07/26/2016 1659	MR
ICP/MS Total Metals-E200.8									
Cadmium	ND		0.00025		mg/L	1	08/16/2016 1030	08/19/2016 1232	MH
Selenium	ND		0.0025		mg/L	1	08/16/2016 1030	08/19/2016 1232	MH
Anions by Ion Chromatography-E300									
Sulfate	2100		500		mg/L	100	07/22/2016 1640	07/22/2016 2047	KM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	440		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Total (As CaCO3)	440		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-04

Client Sample ID: Jan072016BCR_E
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Sulfide-SM4500-S2-F									
Sulfide	6.9		0.50		mg/L	1	07/27/2016 1430	07/27/2016 1630	KM
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	80		2.0		mg/L	1	07/21/2016 0930	07/26/2016 1200	CC
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	19		2.5		mg/L	5	07/21/2016 0836	07/25/2016 1321	MR

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-05

Client Sample ID: Jan072016AP_E
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.099	0.015	2.0	E4	mg/L	1	07/22/2016 1010	07/28/2016 1651	MR
Cadmium	ND	0.014	0.020	E8	mg/L	10	07/22/2016 1010	07/28/2016 1554	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/22/2016 1010	07/28/2016 1651	MR
Iron	0.34		0.30		mg/L	1	07/22/2016 1010	07/28/2016 1650	MR
Lead	0.0025	0.0024	0.040	E4	mg/L	1	07/22/2016 1010	07/28/2016 1651	MR
Manganese	54		0.20		mg/L	10	07/22/2016 1010	07/28/2016 1554	MR
Zinc	ND	0.065	0.40	E8	mg/L	10	07/22/2016 1010	07/28/2016 1554	MR
ICP/MS Total Metals-E200.8									
Cadmium	ND		0.00050	D5	mg/L	2	08/16/2016 1030	08/19/2016 1319	MH
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	43		2.0		mg/L	1	07/21/2016 0930	07/26/2016 1200	CC

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-06

Client Sample ID: Jan072016MRB_E
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1100				mg/L	1	07/22/2016 1010	07/28/2016 1654	MR
ICP Total Metals-E200.7									
Aluminum	0.065	0.015	2.0	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Antimony	0.0027	0.0015	0.20	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Arsenic	0.046		0.040		mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Barium	0.25		0.050		mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Boron	0.14		0.10		mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Cadmium	ND	0.0070	0.010	E8	mg/L	5	07/22/2016 1010	07/28/2016 1550	MR
Calcium	440		4.0		mg/L	1	07/22/2016 1010	07/28/2016 1654	MR
Chromium	0.025	0.0015	0.030	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Iron	0.14	0.0044	0.30	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Lead	0.0055	0.0024	0.040	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Manganese	52		0.10		mg/L	5	07/22/2016 1010	07/28/2016 1550	MR
Nickel	ND	0.00081	0.050	E8	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Selenium	0.019	0.0082	0.040	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Silver	0.019		0.010		mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Thallium	0.017	0.0020	0.050	E4	mg/L	1	07/22/2016 1010	07/28/2016 1655	MR
Zinc	0.051	0.033	0.20	E4	mg/L	5	07/22/2016 1010	07/28/2016 1550	MR
ICP/MS Total Metals-E200.8									
Cadmium	ND		0.00025		mg/L	1	08/16/2016 1030	08/19/2016 1255	MH
Selenium	ND		0.0025		mg/L	1	08/16/2016 1030	08/19/2016 1255	MH
Anions by Ion Chromatography-E300									
Sulfate	2100		500		mg/L	100	07/22/2016 1640	07/22/2016 2105	KM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	290		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH
Alkalinity, Total (As CaCO3)	290		2.0		mg/L	1	07/28/2016 0830	07/28/2016 1020	LH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-06

Client Sample ID: Jan072016MRB_E
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Sulfide-SM4500-S2-F									
Sulfide	1.7		0.50		mg/L	1	07/27/2016 1430	07/27/2016 1630	KM

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-07

Client Sample ID: Jan062916COMP_I_DIS
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1400				mg/L	5	07/22/2016 1010	07/26/2016 1624	MR
ICP Total Metals-E200.7									
Aluminum	0.16	0.075	10	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Antimony	ND	0.0075	1.0	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Arsenic	0.12	0.024	0.20	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Barium	0.016	0.0070	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Beryllium	ND	0.0065	0.010	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Boron	0.070	0.014	0.50	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Cadmium	ND	0.0070	0.010	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Calcium	550		20		mg/L	5	07/22/2016 1010	07/26/2016 1624	MR
Chromium	0.021	0.0075	0.15	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Copper	ND	0.017	0.10	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Iron	40		1.5		mg/L	5	07/22/2016 1010	07/26/2016 1624	MR
Lead	ND	0.012	0.20	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Manganese	59		0.10		mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Nickel	0.068	0.0041	0.25	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Selenium	ND	0.041	0.20	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Silver	0.015	0.0036	0.050	E4	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Thallium	ND	0.010	0.25	E8	mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
Zinc	7.6		0.20		mg/L	5	07/22/2016 1010	07/26/2016 1625	MR
ICP/MS Total Metals-E200.8									
Cadmium	0.0018		0.00025		mg/L	1	08/16/2016 1030	08/19/2016 1332	MH
Selenium	ND		0.0025		mg/L	1	08/16/2016 1030	08/19/2016 1332	MH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-08

Client Sample ID: Jan062916BCR_E_DIS
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1600				mg/L	5	07/22/2016 1010	07/28/2016 1557	MR
ICP Total Metals-E200.7									
Aluminum	ND	0.075	10	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Antimony	ND	0.0075	1.0	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Arsenic	0.044	0.024	0.20	E4	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Barium	0.080	0.0070	0.25	E4	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Beryllium	ND	0.0065	0.010	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Boron	0.081	0.014	0.50	E4	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Cadmium	ND	0.0070	0.010	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Calcium	630		20		mg/L	5	07/22/2016 1010	07/28/2016 1557	MR
Chromium	0.029	0.0075	0.15	E4	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Copper	ND	0.017	0.10	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Iron	0.13	0.022	1.5	E4	mg/L	5	07/22/2016 1010	07/28/2016 1557	MR
Lead	ND	0.012	0.20	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Manganese	71		0.10		mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Nickel	ND	0.0041	0.25	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Selenium	ND	0.041	0.20	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Silver	0.017	0.0036	0.050	E4	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Thallium	ND	0.010	0.25	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
Zinc	ND	0.033	0.20	E8	mg/L	5	07/22/2016 1010	07/28/2016 1558	MR
ICP/MS Total Metals-E200.8									
Cadmium	ND		0.00050		mg/L	2	08/16/2016 1030	08/19/2016 1345	MH
Selenium	ND		0.0050		mg/L	2	08/16/2016 1030	08/19/2016 1345	MH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-09

Client Sample ID: Jan062916AP_E_DIS
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.041	0.015	2.0	E4	mg/L	1	07/22/2016 1010	07/28/2016 1703	MR
Cadmium	ND	0.0070	0.010	E8	mg/L	5	07/22/2016 1010	07/28/2016 1602	MR
Copper	ND	0.0033	0.020	E8	mg/L	1	07/22/2016 1010	07/28/2016 1703	MR
Iron	0.033	0.0044	0.30	E4	mg/L	1	07/22/2016 1010	07/28/2016 1702	MR
Lead	0.0042	0.0024	0.040	E4	mg/L	1	07/22/2016 1010	07/28/2016 1703	MR
Manganese	57		0.10		mg/L	5	07/22/2016 1010	07/28/2016 1602	MR
Zinc	0.047	0.033	0.20	E4	mg/L	5	07/22/2016 1010	07/28/2016 1602	MR
ICP/MS Total Metals-E200.8									
Cadmium	ND		0.00025		mg/L	1	08/16/2016 1030	08/19/2016 1350	MH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Lab Sample ID: 16G0676-10

Client Sample ID: Jan062916MRB_E_DIS
Collection Date/Time: 07/20/2016 1130
Matrix: Wastewater
Order Name: Pilot Plant

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	10	07/22/2016 1010	07/28/2016 1646	MR
ICP Total Metals-E200.7									
Aluminum	0.19	0.15	20	E4	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Antimony	ND	0.015	2.0	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Arsenic	0.062	0.047	0.40	E4	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Barium	0.18	0.014	0.50	E4	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Beryllium	ND	0.013	0.020	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Boron	0.13	0.028	1.0	E4	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Cadmium	ND	0.014	0.020	E8	mg/L	10	07/22/2016 1010	08/01/2016 1220	MR
Calcium	470		40		mg/L	10	07/22/2016 1010	07/28/2016 1646	MR
Chromium	0.021	0.015	0.30	E4	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Copper	ND	0.033	0.20	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Iron	ND	0.044	3.0	E8	mg/L	10	07/22/2016 1010	07/28/2016 1646	MR
Lead	ND	0.024	0.40	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Manganese	47		0.20		mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Nickel	ND	0.0081	0.50	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Selenium	ND	0.082	0.40	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Silver	0.015	0.0072	0.10	E4	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Thallium	ND	0.020	0.50	E8	mg/L	10	07/22/2016 1010	07/28/2016 1647	MR
Zinc	ND	0.065	0.40	E8	mg/L	10	07/22/2016 1010	08/01/2016 1220	MR
ICP/MS Total Metals-E200.8									
Cadmium	ND		0.00025		mg/L	1	08/16/2016 1030	08/19/2016 1356	MH
Selenium	ND		0.0025		mg/L	1	08/16/2016 1030	08/19/2016 1356	MH

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1607231 - E 200.2 ICP										
Blank (1607231-BLK1)				Prepared: 07/22/2016 Analyzed: 07/26/2016						
Aluminum	0.043	2.0	mg/L							
Antimony	ND	0.20	mg/L							
Arsenic	ND	0.040	mg/L							
Barium	ND	0.050	mg/L							
Beryllium	ND	0.0020	mg/L							
Boron	0.028	0.10	mg/L							
Cadmium	ND	0.0020	mg/L							
Calcium	ND	4.0	mg/L							
Chromium	ND	0.030	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Manganese	ND	0.020	mg/L							
Nickel	ND	0.050	mg/L							
Selenium	ND	0.040	mg/L							
Silver	ND	0.010	mg/L							
Thallium	ND	0.050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1607231-BS1)				Prepared: 07/22/2016 Analyzed: 07/26/2016						
Aluminum	2.1	2.0	mg/L	2.000		106	85-115			
Antimony	0.54	0.20	mg/L	0.5000		108	85-115			
Arsenic	2.05	0.040	mg/L	2.000		103	85-115			
Barium	2.0	0.050	mg/L	2.000		98	85-115			
Beryllium	0.049	0.0020	mg/L	0.05000		99	85-115			
Boron	1.0	0.10	mg/L	1.000		102	85-115			
Cadmium	0.048	0.0020	mg/L	0.05000		95	85-115			
Calcium	10	4.0	mg/L	10.00		100	85-115			
Chromium	0.20	0.030	mg/L	0.2000		102	85-115			
Copper	0.25	0.020	mg/L	0.2500		99	85-115			
Iron	1.0	0.30	mg/L	1.000		103	85-115			
Lead	0.50	0.040	mg/L	0.5000		99	85-115			
Manganese	0.50	0.020	mg/L	0.5000		100	85-115			
Nickel	0.48	0.050	mg/L	0.5000		97	85-115			
Selenium	2.0	0.040	mg/L	2.000		99	85-115			
Silver	0.050	0.010	mg/L	0.05000		100	85-115			
Thallium	2.0	0.050	mg/L	2.000		99	85-115			
Zinc	0.48	0.040	mg/L	0.5000		96	85-115			

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1607231 - E 200.2 ICP										
LCS Dup (1607231-BSD1)				Prepared: 07/22/2016 Analyzed: 07/26/2016						
Aluminum	2.1	2.0	mg/L	2.000		104	85-115	2	20	
Antimony	0.53	0.20	mg/L	0.5000		106	85-115	2	20	
Arsenic	2.04	0.040	mg/L	2.000		102	85-115	0.7	20	
Barium	2.0	0.050	mg/L	2.000		98	85-115	0.5	20	
Beryllium	0.049	0.0020	mg/L	0.05000		98	85-115	0.5	20	
Boron	1.0	0.10	mg/L	1.000		100	85-115	2	20	
Cadmium	0.047	0.0020	mg/L	0.05000		95	85-115	0.6	20	
Calcium	10	4.0	mg/L	10.00		100	85-115	0.1	20	
Chromium	0.20	0.030	mg/L	0.2000		101	85-115	0.3	20	
Copper	0.25	0.020	mg/L	0.2500		98	85-115	1	20	
Iron	1.0	0.30	mg/L	1.000		102	85-115	0.7	20	
Lead	0.49	0.040	mg/L	0.5000		99	85-115	0.6	20	
Manganese	0.50	0.020	mg/L	0.5000		99	85-115	0.7	20	
Nickel	0.48	0.050	mg/L	0.5000		96	85-115	0.5	20	
Selenium	2.0	0.040	mg/L	2.000		99	85-115	0.1	20	
Silver	0.050	0.010	mg/L	0.05000		99	85-115	0.4	20	
Thallium	2.0	0.050	mg/L	2.000		99	85-115	0.5	20	
Zinc	0.48	0.040	mg/L	0.5000		95	85-115	0.8	20	
Matrix Spike (1607231-MS1)	**Source: 16G0676-01**			Prepared: 07/22/2016 Analyzed: 07/26/2016						
Aluminum	2.4	10	mg/L	2.000	ND	119	70-130			
Antimony	0.57	1.0	mg/L	0.5000	ND	114	70-130			
Arsenic	2.49	0.20	mg/L	2.000	0.208	114	70-130			
Barium	1.4	0.25	mg/L	2.000	0.019	70	70-130			
Beryllium	0.051	0.010	mg/L	0.05000	ND	103	70-130			
Boron	1.2	0.50	mg/L	1.000	0.17	103	70-130			
Cadmium	0.054	0.010	mg/L	0.05000	ND	108	70-130			
Calcium	540	20	mg/L	10.00	560	NR	70-130			M3
Chromium	0.24	0.15	mg/L	0.2000	0.027	106	70-130			
Copper	0.28	0.10	mg/L	0.2500	ND	111	70-130			
Iron	43	1.5	mg/L	1.000	42	128	70-130			
Lead	0.40	0.20	mg/L	0.5000	ND	81	70-130			
Manganese	58	0.10	mg/L	0.5000	68	NR	70-130			M3
Nickel	0.59	0.25	mg/L	0.5000	0.069	105	70-130			
Selenium	2.2	0.20	mg/L	2.000	ND	109	70-130			
Silver	0.065	0.050	mg/L	0.05000	0.015	101	70-130			
Thallium	2.0	0.25	mg/L	2.000	0.022	98	70-130			
Zinc	8.1	0.20	mg/L	0.5000	9.1	NR	70-130			M3

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1607231 - E 200.2 ICP										
Matrix Spike (1607231-MS2)		**Source: 16G0676-07**		Prepared: 07/22/2016 Analyzed: 07/26/2016						
Aluminum	2.2	10	mg/L	2.000	0.16	104	70-130			
Antimony	0.57	1.0	mg/L	0.5000	ND	114	70-130			
Arsenic	2.46	0.20	mg/L	2.000	0.117	117	70-130			
Barium	1.0	0.25	mg/L	2.000	0.016	51	70-130			M7
Beryllium	0.054	0.010	mg/L	0.05000	ND	108	70-130			
Boron	1.2	0.50	mg/L	1.000	0.070	115	70-130			
Cadmium	0.056	0.010	mg/L	0.05000	ND	112	70-130			
Calcium	590	20	mg/L	10.00	550	359	70-130			M3
Chromium	0.24	0.15	mg/L	0.2000	0.021	110	70-130			
Copper	0.27	0.10	mg/L	0.2500	ND	107	70-130			
Iron	43	1.5	mg/L	1.000	40	276	70-130			M3
Lead	0.37	0.20	mg/L	0.5000	ND	74	70-130			
Manganese	59	0.10	mg/L	0.5000	59	158	70-130			M3
Nickel	0.59	0.25	mg/L	0.5000	0.068	104	70-130			
Selenium	2.2	0.20	mg/L	2.000	ND	109	70-130			
Silver	0.067	0.050	mg/L	0.05000	0.015	103	70-130			
Thallium	2.0	0.25	mg/L	2.000	ND	100	70-130			
Zinc	8.3	0.20	mg/L	0.5000	7.6	133	70-130			M3
Batch 1608180 - E 200.8 ICP/MS										
Blank (1608180-BLK1)				Prepared: 08/16/2016 Analyzed: 08/17/2016						
Cadmium	ND	0.00025	mg/L							
Selenium	ND	0.0025	mg/L							
LCS (1608180-BS1)				Prepared: 08/16/2016 Analyzed: 08/17/2016						
Cadmium	0.049	0.00025	mg/L	0.05000		98	85-115			
Selenium	0.24	0.0025	mg/L	0.2500		97	85-115			
LCS Dup (1608180-BSD1)				Prepared: 08/16/2016 Analyzed: 08/17/2016						
Cadmium	0.049	0.00025	mg/L	0.05000		98	85-115	0.7	20	
Selenium	0.24	0.0025	mg/L	0.2500		97	85-115	0.5	20	
Matrix Spike (1608180-MS1)		**Source: 16H0471-03**		Prepared: 08/16/2016 Analyzed: 08/17/2016						
Cadmium	0.043	0.00025	mg/L	0.05000	ND	86	70-130			
Selenium	0.20	0.0025	mg/L	0.2500	0.0014	81	70-130			
Matrix Spike (1608180-MS2)		**Source: 16H0471-04**		Prepared: 08/16/2016 Analyzed: 08/17/2016						
Cadmium	0.043	0.00025	mg/L	0.05000	ND	85	70-130			
Selenium	0.20	0.0025	mg/L	0.2500	0.0013	79	70-130			

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1607196 - GEN CHEM										
Blank (1607196-BLK1)				Prepared & Analyzed: 07/25/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1607196-BS1)				Prepared & Analyzed: 07/25/2016						
Organic Carbon, Total	9.4	0.50	mg/L	10.00		94	90-110			
LCS Dup (1607196-BSD1)				Prepared & Analyzed: 07/25/2016						
Organic Carbon, Total	9.8	0.50	mg/L	10.00		98	90-110	5	10	
Matrix Spike (1607196-MS1)		**Source: 16G0547-03**		Prepared & Analyzed: 07/25/2016						
Organic Carbon, Total	11	0.50	mg/L	10.00	1.1	97	85-115			
Matrix Spike Dup (1607196-MSD1)		**Source: 16G0547-03**		Prepared & Analyzed: 07/25/2016						
Organic Carbon, Total	11	0.50	mg/L	10.00	1.1	97	85-115	0.3	15	
Batch 1607245 - GEN CHEM										
Blank (1607245-BLK1)				Prepared: 07/21/2016 Analyzed: 07/26/2016						
Biochemical Oxygen Demand	ND	2.0	mg/L							
LCS (1607245-BS1)				Prepared: 07/21/2016 Analyzed: 07/26/2016						
Biochemical Oxygen Demand	150		mg/L	198.0		74	85-115			K6
Batch 1607288 - GEN CHEM										
Blank (1607288-BLK1)				Prepared & Analyzed: 07/27/2016						
Sulfide	ND	0.50	mg/L							
LCS (1607288-BS1)				Prepared & Analyzed: 07/27/2016						
Sulfide	3.3		mg/L	3.200		104	70-130			
LCS Dup (1607288-BSD1)				Prepared & Analyzed: 07/27/2016						
Sulfide	3.3		mg/L	3.200		104	70-130	0	20	
Matrix Spike (1607288-MS1)		**Source: 16G0085-02**		Prepared & Analyzed: 07/27/2016						
Sulfide	3.1		mg/L	3.200	0.036	96	70-130			
Matrix Spike Dup (1607288-MSD1)		**Source: 16G0085-02**		Prepared & Analyzed: 07/27/2016						
Sulfide	3.4		mg/L	3.200	0.036	104	70-130	8	20	
Batch 1607300 - GEN CHEM										
LCS (1607300-BS1)				Prepared & Analyzed: 07/28/2016						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		94	90-110			
LCS Dup (1607300-BSD1)				Prepared & Analyzed: 07/28/2016						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		96	90-110	2	10	
Matrix Spike (1607300-MS1)		**Source: 16G0824-01**		Prepared & Analyzed: 07/28/2016						
Alkalinity, Total (As CaCO3)	350	2.0	mg/L	250.0	120	94	85-115			
Matrix Spike Dup (1607300-MSD1)		**Source: 16G0824-01**		Prepared & Analyzed: 07/28/2016						
Alkalinity, Total (As CaCO3)	360	2.0	mg/L	250.0	120	96	85-115	1	10	

Turner Laboratories, Inc.

Date: 08/23/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16G0676
Date Received: 07/20/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1607203 - IC PREP										
Blank (1607203-BLK1)				Prepared & Analyzed: 07/21/2016						
Sulfate	ND	5.0	mg/L							
LCS (1607203-BS1)				Prepared & Analyzed: 07/21/2016						
Sulfate	12	5.0	mg/L	12.50		99	90-110			
LCS Dup (1607203-BSD1)				Prepared & Analyzed: 07/21/2016						
Sulfate	12	5.0	mg/L	12.50		98	90-110	2	10	
Matrix Spike (1607203-MS1)		**Source: 16G0658-01**		Prepared & Analyzed: 07/21/2016						
Sulfate	14	5.0	mg/L	12.50	2.4	91	80-120			
Matrix Spike (1607203-MS2)		**Source: 16G0710-01**		Prepared & Analyzed: 07/21/2016						
Sulfate	24	5.0	mg/L	12.50	13	90	80-120			
Matrix Spike Dup (1607203-MSD1)		**Source: 16G0658-01**		Prepared & Analyzed: 07/21/2016						
Sulfate	14	5.0	mg/L	12.50	2.4	92	80-120	0.5	10	
Matrix Spike Dup (1607203-MSD2)		**Source: 16G0710-01**		Prepared: 07/21/2016 Analyzed: 07/22/2016						
Sulfate	24	5.0	mg/L	12.50	13	90	80-120	0.3	10	

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 1660676 DATE 7/20/16 PAGE ____ OF

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	ICP-E200.7 Total Ag,As,B,Ba,Be,Ni,Sb,Se,Tl,Cr	Hardnes as CaCO3	BOD	Organic Carbon, Total	Sulfide	Alkalinity
Jan072016COMP_I	7/20/2016	820		WW		X	X	X	X				X
Jan0720166IT_M							X						
Jan072016IT_E							X						
Jan072016BCR_E						X	X	X	X	X	X	X	X
Jan072016AP_E						X				X			
Jan072016MRB_E						X	X	X	X			X	X
Jan062916COMP_I_DIS						X		X	X				
Jan062916BCR_E_DIS						X		X	X				
Jan062916AP_E_DIS						X							
Jan062916MRB_E_DIS		1130				X		X	X				

1. RELINQUISHED BY:
Signature: AJibson
Printed Name: AMF
Firm:
Date/Time: 7/20/16 14:36

2. RECEIVED BY:
Signature:
Printed Name:
Firm:
Date/Time:

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 25
Temperature 7.4
X Wet Ice Blue Ice

3. RELINQUISHED BY:
Signature:
Printed Name:
Firm:
Date/Time:

4. RECEIVED BY:
Signature:
Printed Name: hz
Firm: TURNER LABORATORIES, INC.
Date/Time: 7/20/16 1436

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis: Yes No	Custody Seals	Preservation Confirmation	Y
ADEQ Forms: Yes No	Container Intact	Appropriate Head Space	Y
Mail ADEQ Form: Yes No	COC/Labels Agree	Received Within Hold Time	Y

TURNER
LABORATORIES INC.

September 13, 2016

Guadalupe Fattore
Sovereign Consulting, Inc.
12687 West Cedar Drive, #305
Lakewood, CO 80228

TEL (720) 524-4908
FAX

Work Order No.: 16H0810
Order Name: January Adit

RE: Pilot Plant

Dear Guadalupe Fattore,

Turner Laboratories, Inc. received 13 sample(s) on 08/24/2016 for the analyses presented in the following report.

The attached report has been revised. Please refer to the Case Narrative page for an explanation of the changes. We apologize for any inconvenience this may have caused you.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,
Turner Laboratories, Inc.
ADHS License AZ0066

Dawn Weyer

Dawn Weyer
Project Manager

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

Order: January Adit

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
16H0810-01	Jan082416TSF1_1	Wastewater	08/24/2016 1145
16H0810-02	Jan082416COMP_I	Wastewater	08/24/2016 1145
16H0810-03	Jan082416IT_M	Wastewater	08/24/2016 1145
16H0810-04	Jan082416IT_E	Wastewater	08/24/2016 1145
16H0810-05	Jan082416BCR_E	Wastewater	08/24/2016 1145
16H0810-06	Jan082416AP_E	Wastewater	08/24/2016 1145
16H0810-07	Jan082416MRB_E	Wastewater	08/24/2016 1145
16H0810-08	Jan082416TSF1_1_DIS	Wastewater	08/24/2016 1145
16H0810-09	Jan082416COMP_I_DIS	Wastewater	08/24/2016 1145
16H0810-10	Jan082416BCR_E_DIS	Wastewater	08/24/2016 1145
16H0810-11	Jan082416BCR_E_DIS_D	Wastewater	08/24/2016 1145
16H0810-12	Jan082416AP_E_DIS	Wastewater	08/24/2016 1145
16H0810-13	Jan082416MRB_E_DIS	Wastewater	08/24/2016 1145

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

Case Narrative

Cyanide amenable to chlorination analysis was not performed due to the absence of total cyanide.

This report was originally generated on 9/12/2016. It is being revised on 9/13/2016 to include Hardness, Calcium, which was not on the original report.

E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
K5	The dilution water D.O depletion was >0.2 mg/L.
K6	Glucose/glutamic acid BOD/CBOD was below the method acceptance criteria.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
M6	Matrix spike recovery was high. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-01

Client Sample ID: Jan082416TSF1_1
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	770				mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Hardness, Calcium/Magnesium (As CaCO3)	2900				mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
ICP Total Metals-E200.7									
Aluminum	130	0.015	2.0		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Antimony	ND	0.0015	0.20	E8	mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Arsenic	0.051	0.0047	0.040		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Barium	0.015	0.0014	0.050	E4	mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Beryllium	0.031	0.0013	0.0020		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Boron	0.15	0.0028	0.10		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Calcium	310	0.10	4.0		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Chromium	0.20	0.0015	0.030		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Copper	2.6	0.0033	0.020		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Iron	2.6	0.0044	0.30		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Lead	0.086	0.0024	0.040		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Magnesium	530	0.13	3.0		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Manganese	970	0.14	2.0		mg/L	100	08/25/2016 1400	08/31/2016 1350	MH
Nickel	1.0	0.00081	0.050		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Silver	0.21	0.036	0.50	E4	mg/L	1	09/01/2016 1125	09/09/2016 1512	MH
Thallium	0.12	0.0020	0.050		mg/L	1	08/25/2016 1400	08/29/2016 1646	MH
Zinc	270	1.3	8.0		mg/L	200	08/25/2016 1400	08/31/2016 1354	MH
ICP/MS Total Metals-E200.8									
Cadmium	1.4	0.000090	0.0013		mg/L	5	08/26/2016 1100	09/01/2016 1550	MH
Selenium	0.019	0.00080	0.013		mg/L	5	08/26/2016 1100	09/01/2016 1550	MH
Anions by Ion Chromatography-E300									
Sulfate	6200	20	1000		mg/L	200	08/26/2016 1530	08/29/2016 1727	KM
Cyanide-SM4500-CN BE									
Cyanide	ND	0.025	0.10		mg/L	1	08/25/2016 0900	08/25/2016 1720	KM

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-02

Client Sample ID: Jan082416COMP_I
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Hardness, Calcium/Magnesium (As CaCO3)	2400				mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
ICP Total Metals-E200.7									
Aluminum	0.15	0.015	2.0	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Antimony	ND	0.0015	0.20	E8	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Arsenic	0.066	0.0047	0.040		mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Barium	0.012	0.0014	0.050	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Boron	0.10	0.0028	0.10	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Calcium	520	0.10	4.0		mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Chromium	0.014	0.0015	0.030	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Copper	ND	0.0033	0.020	E8	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Iron	12	0.0044	0.30		mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Lead	0.0057	0.0024	0.040	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Magnesium	270	0.13	3.0		mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Manganese	59	0.014	0.20		mg/L	10	08/25/2016 1400	08/31/2016 1345	MH
Nickel	0.024	0.00081	0.050	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Silver	0.015	0.00072	0.010		mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Thallium	0.0093	0.0020	0.050	E4	mg/L	1	08/25/2016 1400	08/29/2016 1650	MH
Zinc	7.0	0.065	0.40		mg/L	10	08/25/2016 1400	08/31/2016 1345	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.00066	0.000018	0.00025		mg/L	1	08/26/2016 1100	09/01/2016 1701	MH
Selenium	0.0018	0.00016	0.0025	E4	mg/L	1	08/26/2016 1100	09/01/2016 1701	MH
Anions by Ion Chromatography-E300									
Sulfate	2400	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2121	KM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	150		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Total (As CaCO3)	150		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH

Turner Laboratories, Inc.

Date: 09/13/2016

Client:	Sovereign Consulting, Inc.	**Client Sample ID:**	Jan082416COMP_I
Project:	Pilot Plant	**Collection Date/Time:**	08/24/2016 1145
Work Order:	16H0810	**Matrix:**	Wastewater
Lab Sample ID:	16H0810-02	**Order Name:**	January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-03

Client Sample ID: Jan082416IT_M
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Anions by Ion Chromatography-E300									
Sulfate	2400	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2139	KM

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-04

Client Sample ID: Jan082416IT_E
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Anions by Ion Chromatography-E300									
Sulfate	2400	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2158	KM

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-05

Client Sample ID: Jan082416BCR_E
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1300				mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Hardness, Calcium/Magnesium (As CaCO3)	2300				mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
ICP Total Metals-E200.7									
Aluminum	0.088	0.015	2.0	E4	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Antimony	ND	0.0015	0.20	E8	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Arsenic	0.020	0.0047	0.040	E4	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Barium	0.058	0.0014	0.050		mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Boron	0.11	0.0028	0.10		mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Calcium	510	0.10	4.0		mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Chromium	0.017	0.0015	0.030	E4	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Copper	ND	0.0033	0.020	E8	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Iron	0.033	0.0044	0.30	E4	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Lead	ND	0.0024	0.040	E8	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Magnesium	250	0.13	3.0		mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Manganese	57	0.014	0.20		mg/L	10	08/25/2016 1400	08/31/2016 1411	MH
Nickel	15	0.00081	0.050		mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Silver	0.017	0.00072	0.010		mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Thallium	0.0080	0.0020	0.050	E4	mg/L	1	08/25/2016 1400	08/29/2016 1654	MH
Zinc	0.084	0.0065	0.040		mg/L	1	08/25/2016 1400	08/31/2016 1416	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.000045	0.000018	0.00025	E4	mg/L	1	08/26/2016 1100	09/01/2016 1707	MH
Selenium	0.00077	0.00016	0.0025	E4	mg/L	1	08/26/2016 1100	09/01/2016 1707	MH
Anions by Ion Chromatography-E300									
Sulfate	2000	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2216	KM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	590		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Total (As CaCO3)	590		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-05

Client Sample ID: Jan082416BCR_E
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Sulfide-SM4500-S2-F									
Sulfide	5.7	0.16	0.50		mg/L	1	08/30/2016 1430	08/30/2016 1600	KM
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	260		2.0		mg/L	1	08/25/2016 1115	08/30/2016 1410	CC
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	14	1.2	2.5		mg/L	5	08/25/2016 0828	08/25/2016 1251	MH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-06

Client Sample ID: Jan082416AP_E
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1500				mg/L	5	08/25/2016 1400	08/29/2016 1706	MH
Hardness, Calcium/Magnesium (As CaCO3)	2700				mg/L	5	08/25/2016 1400	08/29/2016 1706	MH
ICP Total Metals-E200.7									
Aluminum	0.35	0.075	10	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Antimony	ND	0.0075	1.0	E8	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Arsenic	0.057	0.024	0.20	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Barium	0.055	0.0070	0.25	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Beryllium	ND	0.0065	0.010	E8	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Boron	0.27	0.014	0.50	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Calcium	590	0.50	20		mg/L	5	08/25/2016 1400	08/29/2016 1706	MH
Chromium	0.020	0.0075	0.15	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Copper	ND	0.017	0.10	E8	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Iron	0.043	0.022	1.5	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Lead	ND	0.012	0.20	E8	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Magnesium	310	0.65	15		mg/L	5	08/25/2016 1400	08/29/2016 1706	MH
Manganese	52	0.0070	0.10		mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Nickel	ND	0.0041	0.25	E8	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Silver	0.011	0.0036	0.050	E4	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Thallium	ND	0.010	0.25	E8	mg/L	5	08/25/2016 1400	08/29/2016 1707	MH
Zinc	0.027	0.0065	0.040	E4	mg/L	1	08/25/2016 1400	08/31/2016 1420	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.000092	0.000018	0.00025	E4	mg/L	1	08/26/2016 1100	09/01/2016 1719	MH
Selenium	0.00097	0.00016	0.0025	E4	mg/L	1	08/26/2016 1100	09/01/2016 1719	MH
Anions by Ion Chromatography-E300									
Sulfate	2100	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2234	KM
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	410		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH
Alkalinity, Total (As CaCO3)	410		2.0		mg/L	1	08/30/2016 1100	08/30/2016 1700	LH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-06

Client Sample ID: Jan082416AP_E
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Sulfide-SM4500-S2-F									
Sulfide	5.5	0.16	0.50		mg/L	1	08/30/2016 1430	08/30/2016 1600	KM
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	84		2.0		mg/L	1	08/25/2016 1115	08/30/2016 1410	CC

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-07

Client Sample ID: Jan082416MRB_E
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	08/25/2016 1400	08/29/2016 1702	MH
Hardness, Calcium/Magnesium (As CaCO3)	2200				mg/L	1	08/25/2016 1400	08/29/2016 1702	MH
ICP Total Metals-E200.7									
Aluminum	0.073	0.015	2.0	E4	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Antimony	ND	0.0015	0.20	E8	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Arsenic	0.027	0.0047	0.040	E4	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Barium	0.12	0.0014	0.050		mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Boron	0.11	0.0028	0.10		mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Calcium	470	0.10	4.0		mg/L	1	08/25/2016 1400	08/29/2016 1702	MH
Chromium	0.016	0.0015	0.030	E4	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Copper	ND	0.0033	0.020	E8	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Iron	0.079	0.0044	0.30	E4	mg/L	1	08/25/2016 1400	08/29/2016 1702	MH
Lead	ND	0.0024	0.040	E8	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Magnesium	250	0.13	3.0		mg/L	1	08/25/2016 1400	08/29/2016 1702	MH
Manganese	50	0.014	0.20		mg/L	10	08/25/2016 1400	08/31/2016 1424	MH
Nickel	ND	0.00081	0.050	E8	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Silver	0.016	0.00072	0.010		mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Thallium	0.0082	0.0020	0.050	E4	mg/L	1	08/25/2016 1400	08/29/2016 1703	MH
Zinc	0.024	0.0065	0.040	E4	mg/L	1	08/25/2016 1400	08/31/2016 1428	MH
ICP/MS Total Metals-E200.8									
Cadmium	ND	0.000018	0.00025	E8	mg/L	1	08/26/2016 1100	09/01/2016 1727	MH
Selenium	0.0010	0.00016	0.0025	E4	mg/L	1	08/26/2016 1100	09/01/2016 1727	MH
Anions by Ion Chromatography-E300									
Sulfate	2200	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2253	KM

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-08

Client Sample ID: Jan082416TSF1_1_DIS
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	700				mg/L	1	08/29/2016 1105	09/08/2016 1804	MH
Hardness, Calcium/Magnesium (As CaCO3)	2700				mg/L	1	08/29/2016 1105	09/08/2016 1804	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND	0.000094	0.0010	E8	mg/L	1	09/02/2016 1445	09/06/2016 1242	MH
ICP Total Metals-E200.7									
Aluminum	130	0.015	2.0		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Antimony	ND	0.0015	0.20	E8	mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Arsenic	0.042	0.0047	0.040		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Barium	0.013	0.0014	0.050	E4	mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Beryllium	0.030	0.0013	0.0020		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Boron	0.15	0.0028	0.10		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Calcium	280	0.10	4.0		mg/L	1	08/29/2016 1105	09/08/2016 1804	MH
Chromium	0.22	0.0015	0.030		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Copper	2.4	0.0033	0.020		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Iron	2.1	0.0044	0.30		mg/L	1	08/29/2016 1105	09/08/2016 1804	MH
Lead	0.086	0.0024	0.040		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Magnesium	490	0.13	3.0		mg/L	1	08/29/2016 1105	09/08/2016 1804	MH
Manganese	960	0.14	2.0		mg/L	100	08/29/2016 1105	09/08/2016 1754	MH
Nickel	0.95	0.00081	0.050		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Silver	0.19	0.036	0.50	E4	mg/L	1	09/09/2016 1120	09/12/2016 1351	MH
Thallium	0.056	0.0020	0.050		mg/L	1	08/29/2016 1105	09/08/2016 1805	MH
Zinc	540	1.3	8.0		mg/L	200	08/29/2016 1105	09/08/2016 1758	MH
ICP/MS Total Metals-E200.8									
Cadmium	1.5	0.000090	0.0013		mg/L	5	09/06/2016 1055	09/07/2016 1417	MH
Selenium	0.022	0.00080	0.013		mg/L	5	09/06/2016 1055	09/07/2016 1417	MH
Anions by Ion Chromatography-E300									
Sulfate	6300	20	1000		mg/L	200	08/26/2016 1530	08/29/2016 1745	KM
Hexavalent Chromium Dissolved-H 8023									
Chromium, Hexavalent	ND	0.0	0.10		mg/L	1	08/25/2016 0950	08/25/2016 1000	KM

Turner Laboratories, Inc.

Date: 09/13/2016

Client:	Sovereign Consulting, Inc.	**Client Sample ID:**	Jan082416TSF1_1_DIS
Project:	Pilot Plant	**Collection Date/Time:**	08/24/2016 1145
Work Order:	16H0810	**Matrix:**	Wastewater
Lab Sample ID:	16H0810-08	**Order Name:**	January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-09

Client Sample ID: Jan082416COMP_I_DIS
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	08/29/2016 1105	09/08/2016 1717	MH
Hardness, Calcium/Magnesium (As CaCO3)	2300				mg/L	1	08/29/2016 1105	09/08/2016 1717	MH
ICP Total Metals-E200.7									
Aluminum	0.11	0.015	2.0	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Antimony	0.0017	0.0015	0.20	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Arsenic	0.011	0.0047	0.040	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Barium	0.019	0.0014	0.050	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Boron	0.10	0.0028	0.10		mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Calcium	480	0.10	4.0		mg/L	1	08/29/2016 1105	09/08/2016 1717	MH
Chromium	0.016	0.0015	0.030	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Copper	0.012	0.0033	0.020	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Iron	0.021	0.0044	0.30	E4	mg/L	1	08/29/2016 1105	09/08/2016 1717	MH
Lead	0.0031	0.0024	0.040	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Magnesium	260	0.13	3.0		mg/L	1	08/29/2016 1105	09/08/2016 1717	MH
Manganese	58	0.014	0.20		mg/L	10	08/29/2016 1105	09/08/2016 1715	MH
Nickel	0.021	0.00081	0.050	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Silver	0.017	0.00072	0.010		mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Thallium	0.0059	0.0020	0.050	E4	mg/L	1	08/29/2016 1105	09/08/2016 1718	MH
Zinc	6.8	0.065	0.40		mg/L	10	08/29/2016 1105	09/08/2016 1715	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.00073	0.000018	0.00025		mg/L	1	09/06/2016 1055	09/07/2016 1311	MH
Selenium	0.0016	0.00016	0.0025	E4	mg/L	1	09/06/2016 1055	09/07/2016 1311	MH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-10

Client Sample ID: Jan082416BCR_E_DIS
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.13	0.015	2.0	E4	mg/L	1	08/29/2016 1105	09/08/2016 1723	MH
Antimony	ND	0.0015	0.20	E8	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Arsenic	0.012	0.0047	0.040	E4	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Barium	0.054	0.0014	0.050		mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/29/2016 1105	09/08/2016 1723	MH
Boron	0.093	0.0028	0.10	E4	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Chromium	0.015	0.0015	0.030	E4	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Copper	0.020	0.0033	0.020		mg/L	1	08/29/2016 1105	09/08/2016 1723	MH
Iron	0.065	0.0044	0.30	E4	mg/L	1	08/29/2016 1105	09/08/2016 1723	MH
Lead	0.0026	0.0024	0.040	E4	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Manganese	57	0.014	0.20		mg/L	10	08/29/2016 1105	09/08/2016 1721	MH
Nickel	ND	0.00081	0.050	E8	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Silver	0.017	0.00072	0.010		mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Thallium	0.0034	0.0020	0.050	E4	mg/L	1	08/29/2016 1105	09/08/2016 1724	MH
Zinc	0.20	0.0065	0.040		mg/L	1	08/29/2016 1105	09/08/2016 1723	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.00059	0.000018	0.00025		mg/L	1	09/06/2016 1055	09/07/2016 1316	MH
Selenium	0.00054	0.00016	0.0025	E4	mg/L	1	09/06/2016 1055	09/07/2016 1316	MH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-11

Client Sample ID: Jan082416BCR_E_DIS_D
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7									
Aluminum	0.078	0.015	2.0	E4	mg/L	1	08/29/2016 1105	09/08/2016 1802	MH
Copper	0.035	0.0033	0.020		mg/L	1	08/29/2016 1105	09/08/2016 1802	MH
Iron	0.053	0.0044	0.30	E4	mg/L	1	08/29/2016 1105	09/08/2016 1801	MH
Lead	ND	0.0024	0.040	E8	mg/L	1	08/29/2016 1105	09/08/2016 1802	MH
Manganese	57	0.014	0.20		mg/L	10	08/29/2016 1105	09/08/2016 1726	MH
Zinc	0.023	0.0065	0.040	E4	mg/L	1	08/29/2016 1105	09/08/2016 1802	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.00083	0.000018	0.00025		mg/L	1	09/06/2016 1055	09/07/2016 1332	MH
Anions by Ion Chromatography-E300									
Sulfate	2000	10	500		mg/L	100	08/26/2016 1420	08/26/2016 2330	KM
BOD, 5 day-SM5210 B									
Biochemical Oxygen Demand	210		2.0		mg/L	1	08/25/2016 1115	08/30/2016 1410	CC
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	18	1.2	2.5		mg/L	5	08/25/2016 0828	08/25/2016 1311	MH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-12

Client Sample ID: Jan082416AP_E_DIS
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	08/29/2016 1105	09/09/2016 0947	MH
Hardness, Calcium/Magnesium (As CaCO3)	2300				mg/L	1	08/29/2016 1105	09/09/2016 0947	MH
ICP Total Metals-E200.7									
Aluminum	0.11	0.015	2.0	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Antimony	0.0032	0.0015	0.20	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Arsenic	0.014	0.0047	0.040	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Barium	0.055	0.0014	0.050		mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Boron	0.11	0.0028	0.10		mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Calcium	480	0.10	4.0		mg/L	1	08/29/2016 1105	09/09/2016 0947	MH
Chromium	0.012	0.0015	0.030	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Copper	0.014	0.0033	0.020	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Iron	0.044	0.0044	0.30	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Lead	ND	0.0024	0.040	E8	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Magnesium	260	0.13	3.0		mg/L	1	08/29/2016 1105	09/09/2016 0947	MH
Manganese	52	0.014	0.20		mg/L	10	08/29/2016 1105	09/09/2016 1249	MH
Nickel	ND	0.00081	0.050	E8	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Silver	0.016	0.00072	0.010		mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Thallium	0.0028	0.0020	0.050	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
Zinc	0.033	0.0065	0.040	E4	mg/L	1	08/29/2016 1105	09/09/2016 0948	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.000028	0.000018	0.00025	E4	mg/L	1	09/06/2016 1055	09/07/2016 1338	MH
Selenium	0.00096	0.00016	0.0025	E4	mg/L	1	09/06/2016 1055	09/07/2016 1338	MH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Lab Sample ID: 16H0810-13

Client Sample ID: Jan082416MRB_E_DIS
Collection Date/Time: 08/24/2016 1145
Matrix: Wastewater
Order Name: January Adit

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Ca-Calculation									
Hardness, Calcium (As CaCO3)	1200				mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Hardness, Calcium/Magnesium (As CaCO3)	2200				mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
ICP Total Metals-E200.7									
Aluminum	0.066	0.015	2.0	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Antimony	0.0015	0.0015	0.20	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Arsenic	0.026	0.0047	0.040	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Barium	0.11	0.0014	0.050		mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Beryllium	ND	0.0013	0.0020	E8	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Boron	0.099	0.0028	0.10	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Calcium	470	0.10	4.0		mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Chromium	0.013	0.0015	0.030	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Copper	0.014	0.0033	0.020	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Iron	0.062	0.0044	0.30	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Lead	ND	0.0024	0.040	E8	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Magnesium	250	0.13	3.0		mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Manganese	49	0.014	0.20		mg/L	10	08/29/2016 1105	09/09/2016 1253	MH
Nickel	ND	0.00081	0.050	E8	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Silver	0.015	0.00072	0.010		mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Thallium	ND	0.0020	0.050	E8	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
Zinc	0.025	0.0065	0.040	E4	mg/L	1	08/29/2016 1105	09/09/2016 0956	MH
ICP/MS Total Metals-E200.8									
Cadmium	0.000042	0.000018	0.00025	E4	mg/L	1	09/06/2016 1055	09/07/2016 1343	MH
Selenium	0.0013	0.00016	0.0025	E4	mg/L	1	09/06/2016 1055	09/07/2016 1343	MH

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608344 - E 200.2 ICP										
Blank (1608344-BLK1)				Prepared & Analyzed: 08/29/2016						
Aluminum	0.052	2.0	mg/L							
Antimony	ND	0.20	mg/L							
Arsenic	ND	0.040	mg/L							
Barium	ND	0.050	mg/L							
Beryllium	ND	0.0020	mg/L							
Boron	0.020	0.10	mg/L							
Calcium	0.58	4.0	mg/L							
Chromium	ND	0.030	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Magnesium	0.67	3.0	mg/L							
Manganese	ND	0.020	mg/L							
Nickel	ND	0.050	mg/L							
Silver	ND	0.010	mg/L							
Thallium	ND	0.050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1608344-BS1)				Prepared & Analyzed: 08/29/2016						
Aluminum	2.1	2.0	mg/L	2.000		103	85-115			
Antimony	0.53	0.20	mg/L	0.5000		106	85-115			
Arsenic	2.02	0.040	mg/L	2.000		101	85-115			
Barium	1.9	0.050	mg/L	2.000		96	85-115			
Beryllium	0.049	0.0020	mg/L	0.05000		97	85-115			
Boron	1.0	0.10	mg/L	1.000		100	85-115			
Calcium	10	4.0	mg/L	10.00		101	85-115			
Chromium	0.20	0.030	mg/L	0.2000		100	85-115			
Copper	0.23	0.020	mg/L	0.2500		93	85-115			
Iron	1.0	0.30	mg/L	1.000		100	85-115			
Lead	0.48	0.040	mg/L	0.5000		96	85-115			
Magnesium	10	3.0	mg/L	10.00		103	85-115			
Manganese	0.49	0.020	mg/L	0.5000		97	85-115			
Nickel	0.46	0.050	mg/L	0.5000		93	85-115			
Silver	0.048	0.010	mg/L	0.05000		97	85-115			
Thallium	2.0	0.050	mg/L	2.000		99	85-115			
Zinc	0.47	0.040	mg/L	0.5000		94	85-115			

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608344 - E 200.2 ICP										
LCS Dup (1608344-BSD1)				Prepared & Analyzed: 08/29/2016						
Aluminum	2.0	2.0	mg/L	2.000		101	85-115	1	20	
Antimony	0.53	0.20	mg/L	0.5000		106	85-115	0.2	20	
Arsenic	2.01	0.040	mg/L	2.000		101	85-115	0.2	20	
Barium	1.9	0.050	mg/L	2.000		96	85-115	0.1	20	
Beryllium	0.049	0.0020	mg/L	0.05000		97	85-115	0.0003	20	
Boron	1.0	0.10	mg/L	1.000		100	85-115	0.5	20	
Calcium	10	4.0	mg/L	10.00		100	85-115	0.8	20	
Chromium	0.20	0.030	mg/L	0.2000		100	85-115	0.1	20	
Copper	0.23	0.020	mg/L	0.2500		92	85-115	0.5	20	
Iron	1.0	0.30	mg/L	1.000		100	85-115	0.08	20	
Lead	0.48	0.040	mg/L	0.5000		96	85-115	0.3	20	
Magnesium	10	3.0	mg/L	10.00		103	85-115	0.09	20	
Manganese	0.48	0.020	mg/L	0.5000		97	85-115	0.4	20	
Nickel	0.46	0.050	mg/L	0.5000		93	85-115	0.2	20	
Silver	0.048	0.010	mg/L	0.05000		96	85-115	1	20	
Thallium	2.0	0.050	mg/L	2.000		99	85-115	0.2	20	
Zinc	0.47	0.040	mg/L	0.5000		94	85-115	0.1	20	
Matrix Spike (1608344-MS1)		**Source: 16H0705-02**		Prepared & Analyzed: 08/29/2016						
Aluminum	2.7	2.0	mg/L	2.000	0.26	120	70-130			
Antimony	0.53	0.20	mg/L	0.5000	ND	105	70-130			
Arsenic	2.16	0.040	mg/L	2.000	0.0200	107	70-130			
Barium	1.9	0.050	mg/L	2.000	0.14	90	70-130			
Beryllium	0.049	0.0020	mg/L	0.05000	ND	97	70-130			
Boron	1.4	0.10	mg/L	1.000	0.29	109	70-130			
Calcium	200	4.0	mg/L	10.00	190	95	70-130			
Chromium	0.20	0.030	mg/L	0.2000	0.0032	100	70-130			
Copper	0.34	0.020	mg/L	0.2500	0.073	105	70-130			
Iron	1.4	0.30	mg/L	1.000	0.42	98	70-130			
Lead	0.48	0.040	mg/L	0.5000	ND	95	70-130			
Magnesium	51	3.0	mg/L	10.00	40	105	70-130			
Manganese	0.54	0.020	mg/L	0.5000	0.060	95	70-130			
Nickel	0.50	0.050	mg/L	0.5000	ND	101	70-130			
Silver	0.052	0.010	mg/L	0.05000	ND	104	70-130			
Thallium	1.9	0.050	mg/L	2.000	ND	96	70-130			
Zinc	0.76	0.040	mg/L	0.5000	0.16	120	70-130			

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608344 - E 200.2 ICP										
Matrix Spike (1608344-MS2)		**Source: 16H0815-01**		Prepared & Analyzed: 08/29/2016						
Aluminum	2.3	2.0	mg/L	2.000	0.13	108	70-130			
Antimony	0.53	0.20	mg/L	0.5000	ND	107	70-130			
Arsenic	2.10	0.040	mg/L	2.000	0.0118	105	70-130			
Barium	2.0	0.050	mg/L	2.000	0.078	94	70-130			
Beryllium	0.048	0.0020	mg/L	0.05000	ND	96	70-130			
Boron	1.1	0.10	mg/L	1.000	0.086	104	70-130			
Calcium	78	4.0	mg/L	10.00	69	96	70-130			
Chromium	0.22	0.030	mg/L	0.2000	0.017	100	70-130			
Copper	0.32	0.020	mg/L	0.2500	0.087	94	70-130			
Iron	1.2	0.30	mg/L	1.000	0.19	101	70-130			
Lead	0.48	0.040	mg/L	0.5000	ND	97	70-130			
Magnesium	19	3.0	mg/L	10.00	9.5	98	70-130			
Manganese	0.48	0.020	mg/L	0.5000	0.0061	95	70-130			
Nickel	0.49	0.050	mg/L	0.5000	0.0077	96	70-130			
Silver	0.051	0.010	mg/L	0.05000	ND	101	70-130			
Thallium	1.9	0.050	mg/L	2.000	ND	97	70-130			
Zinc	0.53	0.040	mg/L	0.5000	0.040	98	70-130			
Batch 1608357 - E 200.8 ICP/MS										
Blank (1608357-BLK1)				Prepared: 08/26/2016 Analyzed: 08/31/2016						
Cadmium	ND	0.00025	mg/L							
Selenium	0.00022	0.0025	mg/L							
LCS (1608357-BS1)				Prepared: 08/26/2016 Analyzed: 08/31/2016						
Cadmium	0.048	0.00025	mg/L	0.05000		96	85-115			
Selenium	0.25	0.0025	mg/L	0.2500		98	85-115			
LCS Dup (1608357-BSD1)				Prepared: 08/26/2016 Analyzed: 08/31/2016						
Cadmium	0.047	0.00025	mg/L	0.05000		95	85-115	1	20	
Selenium	0.25	0.0025	mg/L	0.2500		98	85-115	0.07	20	
Matrix Spike (1608357-MS1)		**Source: 16H0748-05**		Prepared: 08/26/2016 Analyzed: 08/31/2016						
Cadmium	0.043	0.00025	mg/L	0.05000	ND	87	70-130			
Selenium	0.22	0.0025	mg/L	0.2500	0.0026	86	70-130			
Matrix Spike (1608357-MS2)		**Source: 16H0748-06**		Prepared: 08/26/2016 Analyzed: 09/01/2016						
Cadmium	0.045	0.00025	mg/L	0.05000	ND	89	70-130			
Selenium	0.20	0.0025	mg/L	0.2500	0.00058	81	70-130			
Batch 1608365 - E 200.2 ICP										

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608365 - E 200.2 ICP										
Blank (1608365-BLK1)				Prepared: 08/29/2016 Analyzed: 09/08/2016						
Aluminum	ND	2.0	mg/L							
Antimony	ND	0.20	mg/L							
Arsenic	ND	0.040	mg/L							
Barium	ND	0.050	mg/L							
Beryllium	ND	0.0020	mg/L							
Boron	0.020	0.10	mg/L							
Calcium	0.46	4.0	mg/L							
Chromium	ND	0.030	mg/L							
Copper	ND	0.020	mg/L							
Iron	ND	0.30	mg/L							
Lead	ND	0.040	mg/L							
Magnesium	0.42	3.0	mg/L							
Manganese	ND	0.020	mg/L							
Nickel	ND	0.050	mg/L							
Silver	ND	0.010	mg/L							
Thallium	ND	0.050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1608365-BS1)				Prepared: 08/29/2016 Analyzed: 09/08/2016						
Aluminum	1.9	2.0	mg/L	2.000		95	85-115			
Antimony	0.51	0.20	mg/L	0.5000		102	85-115			
Arsenic	1.96	0.040	mg/L	2.000		98	85-115			
Barium	2.0	0.050	mg/L	2.000		98	85-115			
Beryllium	0.049	0.0020	mg/L	0.05000		97	85-115			
Boron	0.96	0.10	mg/L	1.000		96	85-115			
Calcium	9.8	4.0	mg/L	10.00		98	85-115			
Chromium	0.20	0.030	mg/L	0.2000		102	85-115			
Copper	0.23	0.020	mg/L	0.2500		91	85-115			
Iron	0.98	0.30	mg/L	1.000		98	85-115			
Lead	0.48	0.040	mg/L	0.5000		96	85-115			
Magnesium	9.7	3.0	mg/L	10.00		97	85-115			
Manganese	0.49	0.020	mg/L	0.5000		99	85-115			
Nickel	0.46	0.050	mg/L	0.5000		93	85-115			
Silver	0.048	0.010	mg/L	0.05000		96	85-115			
Thallium	1.9	0.050	mg/L	2.000		96	85-115			
Zinc	0.47	0.040	mg/L	0.5000		95	85-115			

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608365 - E 200.2 ICP										
LCS Dup (1608365-BSD1)				Prepared: 08/29/2016 Analyzed: 09/08/2016						
Aluminum	1.9	2.0	mg/L	2.000		94	85-115	1	20	
Antimony	0.51	0.20	mg/L	0.5000		103	85-115	1	20	
Arsenic	1.97	0.040	mg/L	2.000		99	85-115	0.4	20	
Barium	2.0	0.050	mg/L	2.000		98	85-115	0.3	20	
Beryllium	0.048	0.0020	mg/L	0.05000		97	85-115	0.4	20	
Boron	0.96	0.10	mg/L	1.000		96	85-115	0.05	20	
Calcium	9.7	4.0	mg/L	10.00		97	85-115	0.8	20	
Chromium	0.20	0.030	mg/L	0.2000		101	85-115	0.8	20	
Copper	0.22	0.020	mg/L	0.2500		90	85-115	1	20	
Iron	0.97	0.30	mg/L	1.000		97	85-115	0.7	20	
Lead	0.48	0.040	mg/L	0.5000		95	85-115	0.8	20	
Magnesium	9.5	3.0	mg/L	10.00		95	85-115	2	20	
Manganese	0.49	0.020	mg/L	0.5000		98	85-115	0.5	20	
Nickel	0.46	0.050	mg/L	0.5000		92	85-115	0.8	20	
Silver	0.048	0.010	mg/L	0.05000		96	85-115	0.8	20	
Thallium	1.9	0.050	mg/L	2.000		95	85-115	0.9	20	
Zinc	0.47	0.040	mg/L	0.5000		95	85-115	0.4	20	
Matrix Spike (1608365-MS1)		**Source: 16H0710-01**		Prepared: 08/29/2016 Analyzed: 09/08/2016						
Aluminum	2.1	2.0	mg/L	2.000	0.054	102	70-130			
Antimony	0.51	0.20	mg/L	0.5000	0.0028	100	70-130			
Arsenic	2.03	0.040	mg/L	2.000	0.0201	100	70-130			
Barium	1.9	0.050	mg/L	2.000	0.030	93	70-130			
Beryllium	0.047	0.0020	mg/L	0.05000	ND	93	70-130			
Boron	1.1	0.10	mg/L	1.000	0.11	99	70-130			
Calcium	43	4.0	mg/L	10.00	34	93	70-130			
Chromium	0.19	0.030	mg/L	0.2000	0.0023	96	70-130			
Copper	0.27	0.020	mg/L	0.2500	0.022	101	70-130			
Iron	2.6	0.30	mg/L	1.000	0.79	179	70-130			M6
Lead	0.47	0.040	mg/L	0.5000	ND	94	70-130			
Magnesium	14	3.0	mg/L	10.00	4.1	94	70-130			
Manganese	0.53	0.020	mg/L	0.5000	0.10	85	70-130			
Nickel	0.47	0.050	mg/L	0.5000	ND	95	70-130			
Silver	0.046	0.010	mg/L	0.05000	ND	93	70-130			
Thallium	1.8	0.050	mg/L	2.000	ND	91	70-130			
Zinc	0.50	0.040	mg/L	0.5000	0.032	94	70-130			

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608365 - E 200.2 ICP										
Matrix Spike (1608365-MS2)		**Source: 16H0882-01**		Prepared: 08/29/2016 Analyzed: 09/08/2016						
Aluminum	2.0	2.0	mg/L	2.000	0.082	98	70-130			
Antimony	0.52	0.20	mg/L	0.5000	0.0028	103	70-130			
Arsenic	2.02	0.040	mg/L	2.000	0.0105	100	70-130			
Barium	1.9	0.050	mg/L	2.000	0.071	93	70-130			
Beryllium	0.047	0.0020	mg/L	0.05000	ND	94	70-130			
Boron	1.1	0.10	mg/L	1.000	0.083	99	70-130			
Calcium	53	4.0	mg/L	10.00	46	69	70-130			M3
Chromium	0.23	0.030	mg/L	0.2000	0.032	97	70-130			
Copper	0.38	0.020	mg/L	0.2500	0.15	88	70-130			
Iron	1.1	0.30	mg/L	1.000	0.17	94	70-130			
Lead	0.46	0.040	mg/L	0.5000	ND	93	70-130			
Magnesium	17	3.0	mg/L	10.00	8.1	88	70-130			
Manganese	0.48	0.020	mg/L	0.5000	0.030	90	70-130			
Nickel	0.48	0.050	mg/L	0.5000	0.014	92	70-130			
Silver	0.046	0.010	mg/L	0.05000	ND	92	70-130			
Thallium	1.8	0.050	mg/L	2.000	ND	92	70-130			
Zinc	0.51	0.040	mg/L	0.5000	0.052	91	70-130			
Batch 1609032 - E 245.1_DISS										
Blank (1609032-BLK1)				Prepared: 09/02/2016 Analyzed: 09/06/2016						
Mercury	ND	0.0010	mg/L							
LCS (1609032-BS1)				Prepared: 09/02/2016 Analyzed: 09/06/2016						
Mercury	0.0054	0.0010	mg/L	0.005000		109	85-115			
LCS Dup (1609032-BSD1)				Prepared: 09/02/2016 Analyzed: 09/06/2016						
Mercury	0.0053	0.0010	mg/L	0.005000		107	85-115	2	20	
Matrix Spike (1609032-MS1)		**Source: 16H0902-01**		Prepared: 09/02/2016 Analyzed: 09/06/2016						
Mercury	0.0053	0.0010	mg/L	0.005000	ND	107	85-115			
Matrix Spike Dup (1609032-MSD1)		**Source: 16H0902-01**		Prepared: 09/02/2016 Analyzed: 09/06/2016						
Mercury	0.0053	0.0010	mg/L	0.005000	ND	106	85-115	0.2	20	
Batch 1609050 - E 200.2 ICP										
Blank (1609050-BLK1)				Prepared: 09/01/2016 Analyzed: 09/09/2016						
Silver	ND	0.010	mg/L							
LCS (1609050-BS1)				Prepared: 09/01/2016 Analyzed: 09/09/2016						
Silver	0.050	0.010	mg/L	0.05000		101	85-115			
LCS Dup (1609050-BSD1)				Prepared: 09/01/2016 Analyzed: 09/09/2016						
Silver	0.050	0.010	mg/L	0.05000		101	85-115	0.1	20	
Matrix Spike (1609050-MS1)		**Source: 16H0858-02**		Prepared: 09/01/2016 Analyzed: 09/09/2016						
Silver	0.049	0.010	mg/L	0.05000	0.0018	94	70-130			
Matrix Spike (1609050-MS2)		**Source: 16H0950-01**		Prepared: 09/01/2016 Analyzed: 09/09/2016						
Silver	0.044	0.010	mg/L	0.05000	ND	88	70-130			

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1609053 - E 200.8 ICP/MS										
Blank (1609053-BLK1)				Prepared: 09/06/2016 Analyzed: 09/07/2016						
Cadmium	0.00012	0.00025	mg/L							
Selenium	ND	0.0025	mg/L							
LCS (1609053-BS1)				Prepared: 09/06/2016 Analyzed: 09/07/2016						
Cadmium	0.051	0.00025	mg/L	0.05000		103	85-115			
Selenium	0.25	0.0025	mg/L	0.2500		102	85-115			
LCS Dup (1609053-BSD1)				Prepared: 09/06/2016 Analyzed: 09/07/2016						
Cadmium	0.051	0.00025	mg/L	0.05000		102	85-115	0.5	20	
Selenium	0.25	0.0025	mg/L	0.2500		101	85-115	0.3	20	
Matrix Spike (1609053-MS1)		**Source: 16H0902-01**		Prepared: 09/06/2016 Analyzed: 09/07/2016						
Cadmium	0.051	0.00025	mg/L	0.05000	0.00098	99	70-130			
Selenium	0.23	0.0025	mg/L	0.2500	0.00086	90	70-130			
Matrix Spike (1609053-MS2)		**Source: 16H0935-04**		Prepared: 09/06/2016 Analyzed: 09/07/2016						
Cadmium	0.051	0.00025	mg/L	0.05000	0.000083	101	70-130			
Selenium	0.23	0.0025	mg/L	0.2500	0.00022	92	70-130			
Batch 1609098 - E 200.2 ICP										
Blank (1609098-BLK1)				Prepared: 09/09/2016 Analyzed: 09/12/2016						
Silver	ND	0.010	mg/L							
LCS (1609098-BS1)				Prepared: 09/09/2016 Analyzed: 09/12/2016						
Silver	0.050	0.010	mg/L	0.05000		101	85-115			
LCS Dup (1609098-BSD1)				Prepared: 09/09/2016 Analyzed: 09/12/2016						
Silver	0.051	0.010	mg/L	0.05000		102	85-115	0.8	20	
Matrix Spike (1609098-MS1)		**Source: 16I0288-01**		Prepared: 09/09/2016 Analyzed: 09/12/2016						
Silver	0.050	0.010	mg/L	0.05000	ND	100	70-130			
Matrix Spike (1609098-MS2)		**Source: 16I0302-02**		Prepared: 09/09/2016 Analyzed: 09/12/2016						
Silver	0.050	0.010	mg/L	0.05000	ND	99	70-130			

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608306 - GEN CHEM										
Blank (1608306-BLK1)				Prepared & Analyzed: 08/25/2016						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1608306-BS1)				Prepared & Analyzed: 08/25/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		101	90-110			
LCS Dup (1608306-BSD1)				Prepared & Analyzed: 08/25/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00		101	90-110	0.4	10	
Matrix Spike (1608306-MS1)		**Source: 16H0839-01**		Prepared & Analyzed: 08/25/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00	0.35	100	85-115			
Matrix Spike Dup (1608306-MSD1)		**Source: 16H0839-01**		Prepared & Analyzed: 08/25/2016						
Organic Carbon, Total	10	0.50	mg/L	10.00	0.35	100	85-115	0.09	15	
Batch 1608318 - SPECTRO PREP										
Blank (1608318-BLK1)				Prepared & Analyzed: 08/25/2016						
Cyanide	ND	0.10	mg/L							
LCS (1608318-BS1)				Prepared & Analyzed: 08/25/2016						
Cyanide	1.9	0.10	mg/L	2.000		94	90-110			
LCS Dup (1608318-BSD1)				Prepared & Analyzed: 08/25/2016						
Cyanide	1.9	0.10	mg/L	2.000		95	90-110	2	20	
Matrix Spike (1608318-MS1)		**Source: 16H0545-02**		Prepared & Analyzed: 08/25/2016						
Cyanide	1.9	0.10	mg/L	2.000	ND	93	90-110			
Matrix Spike Dup (1608318-MSD1)		**Source: 16H0545-02**		Prepared & Analyzed: 08/25/2016						
Cyanide	1.9	0.10	mg/L	2.000	ND	96	90-110	4	20	
Batch 1608327 - SPECTRO PREP										
Blank (1608327-BLK1)				Prepared & Analyzed: 08/25/2016						
Chromium, Hexavalent	ND	0.10	mg/L							
LCS (1608327-BS1)				Prepared & Analyzed: 08/25/2016						
Chromium, Hexavalent	0.21	0.10	mg/L	0.2000		105	90-110			
LCS Dup (1608327-BSD1)				Prepared & Analyzed: 08/25/2016						
Chromium, Hexavalent	0.20	0.10	mg/L	0.2000		100	90-110	5	10	
Matrix Spike (1608327-MS1)		**Source: 16H0810-08**		Prepared & Analyzed: 08/25/2016						
Chromium, Hexavalent	0.15	0.10	mg/L	0.2000	ND	75	70-130			
Matrix Spike Dup (1608327-MSD1)		**Source: 16H0810-08**		Prepared & Analyzed: 08/25/2016						
Chromium, Hexavalent	0.15	0.10	mg/L	0.2000	ND	75	70-130	0	15	
Batch 1608368 - GEN CHEM										
Blank (1608368-BLK1)				Prepared: 08/25/2016 Analyzed: 08/30/2016						
Biochemical Oxygen Demand	0.33	2.0	mg/L							K5

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608368 - GEN CHEM										
LCS (1608368-BS1)				Prepared: 08/25/2016 Analyzed: 08/30/2016						
Biochemical Oxygen Demand	170		mg/L	198.0		84	85-115			K6
Batch 1608370 - GEN CHEM										
Blank (1608370-BLK1)				Prepared & Analyzed: 08/30/2016						
Sulfide	ND	0.50	mg/L							
LCS (1608370-BS1)				Prepared & Analyzed: 08/30/2016						
Sulfide	3.3		mg/L	3.333		100	70-130			
LCS Dup (1608370-BSD1)				Prepared & Analyzed: 08/30/2016						
Sulfide	3.3		mg/L	3.333		100	70-130	0	20	
Matrix Spike (1608370-MS1)		**Source: 16H0810-06**		Prepared & Analyzed: 08/30/2016						
Sulfide	8.1		mg/L	3.333	5.5	79	70-130			
Matrix Spike Dup (1608370-MSD1)		**Source: 16H0810-06**		Prepared & Analyzed: 08/30/2016						
Sulfide	7.8		mg/L	3.333	5.5	71	70-130	4	20	
Batch 1608383 - GEN CHEM										
LCS (1608383-BS1)				Prepared & Analyzed: 08/30/2016						
Alkalinity, Total (As CaCO3)	230	2.0	mg/L	250.0		93	90-110			
LCS Dup (1608383-BSD1)				Prepared & Analyzed: 08/30/2016						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		94	90-110	2	10	
Matrix Spike (1608383-MS1)		**Source: 16H0904-03**		Prepared & Analyzed: 08/30/2016						
Alkalinity, Total (As CaCO3)	560	2.0	mg/L	250.0	320	96	85-115			
Matrix Spike Dup (1608383-MSD1)		**Source: 16H0904-03**		Prepared & Analyzed: 08/30/2016						
Alkalinity, Total (As CaCO3)	560	2.0	mg/L	250.0	320	94	85-115	0.7	10	

Turner Laboratories, Inc.

Date: 09/13/2016

Client: Sovereign Consulting, Inc.
Project: Pilot Plant
Work Order: 16H0810
Date Received: 08/24/2016

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1608325 - IC PREP										
Blank (1608325-BLK1)				Prepared & Analyzed: 08/26/2016						
Sulfate	ND	5.0	mg/L							
LCS (1608325-BS1)				Prepared & Analyzed: 08/26/2016						
Sulfate	12	5.0	mg/L	12.50		98	90-110			
LCS Dup (1608325-BSD1)				Prepared & Analyzed: 08/26/2016						
Sulfate	12	5.0	mg/L	12.50		97	90-110	0.6	10	
Matrix Spike (1608325-MS2)		**Source: 16H0868-01**		Prepared & Analyzed: 08/26/2016						
Sulfate	24	5.0	mg/L	12.50	13	91	80-120			
Matrix Spike (1608325-MS4)		**Source: 16H0875-01RE1**		Prepared & Analyzed: 08/29/2016						
Sulfate	28		mg/L	12.50	17	90	80-120			
Matrix Spike Dup (1608325-MSD2)		**Source: 16H0868-01**		Prepared & Analyzed: 08/26/2016						
Sulfate	25	5.0	mg/L	12.50	13	97	80-120	3	10	
Matrix Spike Dup (1608325-MSD4)		**Source: 16H0875-01RE1**		Prepared & Analyzed: 08/29/2016						
Sulfate	28		mg/L	12.50	17	89	80-120	0.3	10	

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 16H0810 DATE 8/24/16 PAGE ____ OF ____

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	ICP-E200.7 Total Ag,As,B,Ba,Be,Ni,Sb,Se,Tl,Cr	Hardnes as CaCO3	BOD	Organic Carbon, Total	Sulfide	Alkalinity	Cyanide, Amenable to Chlorination	Chromium, Hexavalent (dissolved)	Mercury, Dissolved	* Analyze Co, Se 200.8					
Jan082416TSF1_1	8/24/2016	815AM		WW	3	X	X	X	X					X								
Jan082416COMP_I					2	X	X	X	X				X									
Jan082416IT_M					1		X															
Jan082416IT_E					1		X					3										
Jan082416BCR_E					7	X	X	X	X	X	X	X	X									
Jan082416AP_E					7	X	X	X	X	X		X	X									
Jan082416MRB_E					2	X	X	X	X													
Jan082416TSF1_1_DIS					3	X	X	X	X						X	X						
Jan082416COMP_I_DIS					1	X		X	X													
Jan082416BCR_E_DIS					1	X		X	X													
Jan082416BCR_E_DIS_D					4	X	X			X	X											
Jan082416AP_E_DIS					1	X		X	X													
Jan082416MRB_E_DIS		1145AM			1	X		X	X													

1. RELINQUISHED BY:
Signature A Gibson
Printed Name
Firm AZM
Date/Time 8/24/16 15:52

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 32
Temperature 0.6
☒ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm

4. RECEIVED BY:
Signature
Printed Name
TURNER LABORATORIES, INC.
Firm 8/24/16 1552

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis	☐ Yes ☐ No	Custody Seals	☐	Preservation Confirmation	☒
ADEQ Forms	☐ Yes ☐ No	Container Intact	☒	Appropriate Head Space	☒
Mail ADEQ Form	☐ Yes ☐ No	COC/Labels Agree	☒	Received Within Hold Time	☒

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
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CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 16H0810 DATE 8/24/16 PAGE ____ OF

PROJECT NAME January Adit # DV020
CONTACT NAME Guadalupe Fattore
COMPANY NAME Sovereign Consulting Inc
ADDRESS 12687 W Cedar Dr. Ste 305
CITY Lakewood STATE CO ZIP CODE 80228
PHONE 720-524-4908 FAX
SAMPLER'S SIGNATURE

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	ICP-E200.7 Cd,Cu,Pb,Mn,Zn,Al,Fe	Sulfate by Ion Chromatography	ICP-E200.7 Total Ag,As,B,Ba,Be,Ni,Sb,Se,Tl,Cr	Hardnes as CaCO3	BOD	Organic Carbon, Total	Sulfide	Alkalinity	Cyanide, Amenable to Chlorination	Chromium, Hexavalent (dissolved)	Mercury, Dissolved	* Analyze Cd, Se 200.8					
Jan082416TSF1_1	8/24/2016	8:15AM		WW	3	X	X	X	X					X								
Jan082416COMP_I					2	X	X	X	X				X									
Jan082416IT_M					1		X															
Jan082416IT_E					1		X															
Jan082416BCR_E					7	X	X	X	X	X	X	X	X									
Jan082416AP_E					4	X	X	X	X	X		X	X									
Jan082416MRB_E					2	X	X	X	X													
Jan082416TSF1_1_DIS					3	X	X	X	X						X	X						
Jan082416COMP_I_DIS					1	X		X	X													
Jan082416BCR_E_DIS					1	X		X	X													
Jan082416BCR_E_DIS_D					4	X	X			X	X											
Jan082416AP_E_DIS					1	X		X	X													
Jan082416MRB_E_DIS		11:45AM			1	X		X	X													

1. RELINQUISHED BY: Signature AJ Gibson Printed Name Firm AZM Date/Time 8/24/16 15:52

2. RECEIVED BY: Signature Printed Name Firm Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx.10 days)*
Next day 2 Day 5 Day*
Email Preliminary Results To:
* Working Days

REPORT REQUIREMENTS:
I. Routine Report
X II. Report (includes DUP,MS,MSD, as required, may be charged as samples)
III. Date Validation Report (Includes All Raw Data)

INVOICE INFORMATION:
Account Y N
P.O. # DV020
Bill to: Sovereign Consulting

SAMPLE RECEIPT:
Total Containers 31
Temperature 0.6
☒ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY: Signature Printed Name Firm

4. RECEIVED BY: Signature Printed Name TURNER LABORATORIES, INC. Firm 8/24/16 1552

*LEGEND
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL

SPECIAL INSTRUCTIONS/COMMENTS:

Compliance Analysis ☐ Yes ☐ No	Custody Seals ☐	Preservation Confirmation ☒
ADEQ Forms ☐ Yes ☐ No	Container Intact ☒	Appropriate Head Space ☒
Mail ADEQ Form ☐ Yes ☐ No	COC/Labels Agree ☒	Received Within Hold Time ☒

ATTACHMENT D3
ACZ RESULTS

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

Analytical Report

August 24, 2016

Report to:
Guadalupe Fattore
Sovereign Consulting Inc.
12687 W. Cedar Dr.
Ste 305
Lakewood, CO 80228

cc: Jim Gusek

Bill to:
Lee Josselyn
Sovereign Consulting Inc
12687 W. Cedar Dr
Ste 305
Lakewood, CO 80228

Project ID: DV020
ACZ Project ID: L32156

Guadalupe Fattore:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on August 05, 2016. This project has been assigned to ACZ's project number, L32156. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L32156. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after September 23, 2016. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek has reviewed and approved this report.

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

Inorganic Analytical Results

Sovereign Consulting Inc.
Project ID: DV020
Sample ID: JAN080316COMP-I

ACZ Sample ID: ***L32156-01***
Date Sampled: *08/03/16 09:20*
Date Received: *08/05/16*
Sample Matrix: *Waste Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation				*				08/11/16 10:03	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Mercury, total	M1631, Atomic Fluorescence	1	11.6		*	ng/L	0.2	0.5	08/17/16 12:43	mfm

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	08/11/16 23:04	pjb
Dissolved Chromium, Hexavalent	SM3500Cr-B	1		UH	*	mg/L	0.005	0.02	08/05/16 14:01	sck

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

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

Inorganic Analytical Results

Sovereign Consulting Inc.
Project ID: DV020
Sample ID: JAN080316BCR-E

ACZ Sample ID: ***L32156-02***
Date Sampled: *08/03/16 09:20*
Date Received: *08/05/16*
Sample Matrix: *Waste Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation				*				08/11/16 10:20	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Mercury, total	M1631, Atomic Fluorescence	20		U	*	ng/L	4	10	08/24/16 13:49	mfm

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5	0.008	B	*	mg/L	0.003	0.01	08/11/16 23:06	pjb
Dissolved Chromium, Hexavalent	SM3500Cr-B	5		UH	*	mg/L	0.03	0.1	08/05/16 14:04	sck

Arizona license number: AZ0102

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Sovereign Consulting Inc.
Project ID: DV020
Sample ID: JAN080316MRB-E

ACZ Sample ID: ***L32156-03***
Date Sampled: *08/03/16 09:20*
Date Received: *08/05/16*
Sample Matrix: *Waste Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation				*				08/11/16 10:37	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Mercury, total	M1631, Atomic Fluorescence	5	26		*	ng/L	1	3	08/17/16 12:48	mfm

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	08/11/16 23:08	pjb
Dissolved Chromium, Hexavalent	SM3500Cr-B	1		UH	*	mg/L	0.005	0.02	08/05/16 14:06	sck

Arizona license number: AZ0102

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

Inorganic Analytical Results

Sovereign Consulting Inc.
Project ID: DV020
Sample ID: TRIP BLANK

ACZ Sample ID: ***L32156-04***
Date Sampled: *08/03/16 12:00*
Date Received: *08/05/16*
Sample Matrix: *Waste Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Mercury, total	M1631, Atomic Fluorescence	1		U	*	ng/L	0.2	0.5	08/17/16 12:53	mfm

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Sovereign Consulting Inc.

ACZ Project ID: ***L32156***

Cyanide, total M335.4 - Colorimetric w/ distillation

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG408037													
WG408037ICV	ICV	08/11/16 22:59	WI160801-8	.3003		.2873	mg/L	96	90	110			
WG408037ICB	ICB	08/11/16 23:00				U	mg/L		-0.003	0.003			
WG407962LRB	LRB	08/11/16 23:01				U	mg/L		-0.003	0.003			
WG407962LFB	LFB	08/11/16 23:02	WI160801-4	.2		.2028	mg/L	101	90	110			
L32156-01DUP	DUP	08/11/16 23:05			U	U	mg/L				0	20	RA
L32156-02LFM	LFM	08/11/16 23:07	WI160801-4	.2	.008	.1661	mg/L	79	90	110			M2

Dissolved Chromium, Hexavalent SM3500Cr-B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG407736													
WG407736ICV	ICV	08/05/16 13:50	WC160609-4	.05		.0546	mg/L	109	90	110			
WG407736ICB	ICB	08/05/16 13:52				U	mg/L		-0.005	0.005			
WG407736LFB	LFB	08/05/16 13:55	WC160608-3	.05		.0545	mg/L	109	90	110			
L32156-03AS	AS	08/05/16 14:09	WC160608-3	.05	U	.0461	mg/L	92	90	110			
L32156-03DUP	DUP	08/05/16 14:12			U	U	mg/L				0	20	RA

Sovereign Consulting Inc.

ACZ Project ID: ***L32156***

Mercury, total M1631, Atomic Fluorescence

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG406554													
WG406554ICV	ICV	07/27/16 12:51	HG160525-4	10		9.37	ng/L	94	79	121			
WG406554ICB	ICB	07/27/16 12:56				U	ng/L		-0.5	0.5			
WG408295													
WG408295CCV2	CCV	08/17/16 12:24	HG160525-4	10		9.05	ng/L	91	76.5	123.4			
WG408295CCB1	CCB	08/17/16 12:29				.26	ng/L		-0.5	0.5			
WG408295PQV	PQV	08/17/16 12:33	HG160525-5	.5		.37	ng/L	74	70	130			
WG408295LFB	LFB	08/17/16 12:38	HG160525-6	2		1.66	ng/L	83	71	125			
WG408295CCV3	CCV	08/17/16 13:22	HG160525-4	10		8.73	ng/L	87	76.5	123.4			
WG408295CCB2	CCB	08/17/16 13:27				.25	ng/L		-0.5	0.5			
WG408295CCV4	CCV	08/17/16 14:21	HG160525-4	10		9.11	ng/L	91	76.5	123.4			
WG408295CCB3	CCB	08/17/16 14:26				.31	ng/L		-0.5	0.5			
L32156-02MS	MS	08/17/16 14:46	HG5XPREP	50	U	U	ng/L	0	71	125			M2
L32156-02MSD	MSD	08/17/16 14:50	HG5XPREP	50	U	U	ng/L	0	71	125		24	M2
WG408295CCV5	CCV	08/17/16 14:55	HG160525-4	10		7.9	ng/L	79	76.5	123.4			
WG408295CCB4	CCB	08/17/16 15:00				U	ng/L		-0.5	0.5			
WG408680													
WG408680CCV1	CCV	08/24/16 11:12	HG160824-4	10		10.2	ng/L	102	76.5	123.4			
WG408680CCB1	CCB	08/24/16 11:17				U	ng/L		-0.5	0.5			
WG408680PQV	PQV	08/24/16 11:22	HG160824-5	.5		.52	ng/L	104	70	130			
WG408680LFB	LFB	08/24/16 11:27	HG160824-6	2		2.23	ng/L	112	71	125			
L32354-02MS	MS	08/24/16 11:47	HG160824-6	2	136	139	ng/L	150	71	125			M3
L32354-02MSD	MSD	08/24/16 11:52	HG160824-6	2	136	141	ng/L	250	71	125	1	24	M3
WG408680CCV2	CCV	08/24/16 12:11	HG160824-4	10		9.33	ng/L	93	76.5	123.4			
WG408680CCB2	CCB	08/24/16 12:16				U	ng/L		-0.5	0.5			
WG408680CCV3	CCV	08/24/16 13:10	HG160824-4	10		8.47	ng/L	85	76.5	123.4			
WG408680CCB3	CCB	08/24/16 13:15				U	ng/L		-0.5	0.5			
WG408680CCV4	CCV	08/24/16 13:39	HG160824-4	10		8.78	ng/L	88	76.5	123.4			
WG408680CCB4	CCB	08/24/16 13:44				U	ng/L		-0.5	0.5			
WG408680CCV5	CCV	08/24/16 13:54	HG160824-4	10		8.8	ng/L	88	76.5	123.4			
WG408680CCB5	CCB	08/24/16 13:59				U	ng/L		-0.5	0.5			

Sovereign Consulting Inc. ACZ Project ID: ***L32156***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L32156-01	WG407962	Cyanide, total	M335.4 - Manual Distillation	Q3	Sample received with improper or inadequate chemical preservation.
	WG408295	Mercury, total	M1631, Atomic Fluorescence	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG408037	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG407736	Dissolved Chromium, Hexavalent	SM3500Cr-B	H3	Sample was received and analyzed past holding time.
			SM3500Cr-B	Q6	Sample was received above recommended temperature.
			SM3500Cr-B	QD	Reported value is the background-corrected concentration, as described by the method.
			SM3500Cr-B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L32156-02	WG407962	Cyanide, total	M335.4 - Manual Distillation	EE	CN value may be biased low because the sample tested positive for sulfide more than 24 hours after collection.
			M335.4 - Manual Distillation	Q3	Sample received with improper or inadequate chemical preservation.
	WG408680	Mercury, total	M1631, Atomic Fluorescence	D1	Sample required dilution due to matrix.
			M1631, Atomic Fluorescence	DD	Sample required dilution due to matrix color or odor.
			M1631, Atomic Fluorescence	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG408037	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG407736	Dissolved Chromium, Hexavalent	SM3500Cr-B	D1	Sample required dilution due to matrix.
			SM3500Cr-B	H3	Sample was received and analyzed past holding time.
			SM3500Cr-B	Q6	Sample was received above recommended temperature.
			SM3500Cr-B	QD	Reported value is the background-corrected concentration, as described by the method.
			SM3500Cr-B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L32156-03	WG407962	Cyanide, total	M335.4 - Manual Distillation	Q3	Sample received with improper or inadequate chemical preservation.
	WG408295	Mercury, total	M1631, Atomic Fluorescence	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG408037	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG407736	Dissolved Chromium, Hexavalent	SM3500Cr-B	H3	Sample was received and analyzed past holding time.
			SM3500Cr-B	Q6	Sample was received above recommended temperature.
			SM3500Cr-B	QD	Reported value is the background-corrected concentration, as described by the method.
			SM3500Cr-B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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

Inorganic Extended Qualifier Report

Sovereign Consulting Inc.

ACZ Project ID: ***L32156***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L32156-04	WG408295	Mercury, total	M1631, Atomic Fluorescence	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

Wet Chemistry

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Dissolved Chromium, Hexavalent	SM3500Cr-B

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

Sample Receipt

Sovereign Consulting Inc.
DV020

ACZ Project ID:	L32156
Date Received:	08/05/2016 10:02
Received By:	kmo
Date Printed:	8/5/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?		X	
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	X		

A change was made in the # of Containers Line 1 and Relinquished Date:Time section prior to ACZ custody.

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?	X		
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
4837	20.5	<=6.0	17	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

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

Sample Receipt

Sovereign Consulting Inc.
DV020

ACZ Project ID:	L32156
Date Received:	08/05/2016 10:02
Received By:	kmo
Date Printed:	8/5/2016

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L32156

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Guadalupe Fattore
Company: Sovereign Consulting
E-mail: gfattore@sovcon.com
Address: 12687 W Cedar Dr, Ste 305
80228
Telephone: 720-524-4908

Copy of Report to:

Name:
Company:
E-mail:
Telephone:

Invoice to:

Name:
Company:
E-mail:
Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: AJ / Liz **Sampler's Site Information** **State** AZ **Zip code**_____ **Time Zone**_____

***Sampler's Signature:** _____

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: CN-CR6-Hg1631
PO#: DV020
Reporting state for compliance testing:
Check box if samples include NRC licensed material? ☐

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	CN	CR6	Hg1631	Blank				
Jan080316COMP-I	0200AM		3	X	X	X					
Jan080316BCR-E	↓		3	X	X	X					
Jan080316MRB-E	↓		3	X	X	X					
Trip Blank	1200pm		1				X				

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

L32156 Chain of Custody

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
AJ	1200pm 8/3/16	[illegible]	8/3/16 002

Appendix D

Basis of Design Report

Full Scale Passive Treatment System

January Mine

BASIS OF DESIGN REPORT

FULL SCALE PASSIVE TREATMENT SYSTEM
JANUARY MINE

Submitted To: CPE Consultants, LLC
3895 N. Business Center Drive, #115
Tucson, AZ 85705

Submitted By: Sovereign Consultants Inc.
12687 W. Cedar Drive, Suite 305
Lakewood, CO 80228

October 18, 2016 **DV017.005**

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Figure 1 Full Scale Passive Treatment Process Flow Diagram
Figure 2 Full Scale - Process Flow Diagram

1.0 INTRODUCTION

At the request of CPE Consultants (CPE) and Arizona Minerals, Inc. (AMI), Sovereign Consulting Inc. (Sovereign) prepared this Basis of Design for the Full Scale Passive Treatment System (PTS) for the January Mine water and Tailings Storage Facility (TSF) #1 seepage.

1.1 Background

The Basis of Design is provided to cover the key process assumptions and criteria used in development of the full scale passive water treatment system for the Voluntary Remediation Work Plan for Trench Camp Mine Property (January Mine, Norton Mine and Trench Camp Mine Claims, in Harshaw Mining District), ADEQ VRP Site Code #505143-02, as described in this document. The treatment system was developed under the work plan titled, "Remediation and Treatment Process Selection Report for Mine Influenced Water Seepage at the January Mine Adit in Santa Cruz County, Arizona", March 2015. The recommendations in this report included constructing a pilot treatment system to test several potential passive treatment technologies and collecting more data that could be used to characterized influent water quality and flow rates. The work plan established, "The primary goal of the PTS would be to meet the discharge water quality parameters that were specified in the Arizona Pollutant Discharge Elimination System (AZPDES) permit issued to ASARCO in 2003, for the January Mine and the constructed wetlands located immediately downstream from it. The PTS would also address intermittent Mine Influenced Water seepage from TSF #1 and TSF #2 as a secondary goal."

The pilot treatment system operated for 24 weeks from February to August, 2016 on the combined January Mine water (about 93% of the flow contribution) and TSF #1 seep (about 7% of the flow contribution as available). Source water from the January Mine was delivered by a gravity pipeline from the adit for the first 21 weeks and then from a pump installed in an existing well into the January Mine in the final three weeks. Seep water was collected from a sump placed at the base of TSF #1 for the first eight weeks of the pilot before the seep went dry. A collection trench installed to capture the TSF #2 seep never produced any water and was abandoned. Each component of the pilot system [iron terrace (IT), biochemical reactor (BCR), aerobic pond (AP), and a manganese removal bed (MRB)] were evaluated using field and analytical data for performance characteristics.

The full scale PTS design is based on the process, influent, and flow data collected during the pilot testing period.

1.2 Implications From the Pilot Scale Testing

The full scale PTS Basis of Design is based on Sovereign's interpretation of site monitoring data that included Pilot PTS results. This data revealed that a preliminary full scale PTS design that was issued in May 2015 and was conservatively based on very limited data was oversized for the site conditions observed in the last six months. This is especially true with respect to the assumed

January Mine flow rate and water chemistry. In addition, the TSF #1 seepage sump appears to respond to seasonal conditions. During the non-monsoon dry months, the TSF #1 seep (Seep) dries up and the acidity and metal loading to the PTS from this source decreases to zero. During the months when the Seep is actually draining, the geochemical characteristics of the water appear to vary between relatively low and high concentrations of dissolved iron. The physical-geochemical reasons for these variations are unknown but dilution is not suspected because other water quality parameters do not seem to be diluted.

These and other general observations suggested the following modifications to the full scale PTS process design as originally conceived:

- As the Pilot biochemical reactor (BCR) removed iron more efficiently than the Pilot iron terrace, and iron concentrations in the mixed January Mine and Seep sources were less than originally expected, **the iron terrace process was eliminated from the proposed full scale design**.
- The bicarbonate alkalinity concentration in the January Mine water is elevated enough to counteract the acidity concentration in Seep water, so whenever Seep water is fed to the PTS, it should be mixed with January Mine water. Settleable iron and/or aluminum precipitates would most likely form when the waters commingle. Thus, an Equalization Basin is important as the first step in the treatment process to reduce the overall loading to the BCR and remove solids that could potentially blind off and plug the surface of the BCR. Consequently, **an equalization basin (EB) upstream of the BCR was added to the process flow diagram.** The EB should be designed to allow for the periodic removal of accumulated metal precipitates.
- **Additional available land surface is available that would allow the substitution of a natural aerobic polishing wetland (APW) for the aerobic pond (AP)**. The APW would be less energy intensive and easier to maintain than an AP. As such, it would be a more sustainable water treatment process. It also provides additional treatment that an AP would not.
- The TSF #1 seepage exhibits elevated manganese concentrations, sometimes exceeding 1,000 mg/L. Even when mixed with January Mine water, manganese concentrations are still elevated. While the MRB was included in the original design as a conservative design measure, **the MRB in the proposed full scale design should be appropriately sized for additional manganese removal** during periods when the Seep water is being fed to the PTS.

The above considerations have been incorporated into the Basis of Design report that follows.

2.0 DESIGN BASIS CRITERIA AND TREATMENT GOALS

2.1 Treatment Goals and Key Assumptions

The PTS treatment goal will be to reduce the constituents of concern from the January Mine and the Seep to meet the discharge water quality parameters that were specified in the AZPDES permit issued to ASARCO in 2003. for the January Mine. The design uses passive treatment technology, within the space available, based on recently documented flow rates, water quality analysis, and performance data from the pilot system. Some of the key assumptions for the full scale treatment system design include:

- Water from the January Mine will be pumped to where space is available for the treatment system within the property limits.
- Pumping down the volume in the January Mine workings will also afford some storage capacity for storm flows in excess of the treatment capacity.
- Water from the TSF #1 seep flows for approximately eight months per year and is otherwise dry (no flow).
- Pumping will be included to handle storm flows in excess of the treatment capacity when the water will be moved into an existing storage pond (below TSF #2) to be routed to the treatment system when the treatment capacity is available.
- The treatment system design is based on recent data for both the January Mine and TSF #1 seep with the following conservative (safety) factors applied:
    - Design influent concentrations for the main constituents of concern are greater than average
    - The selected design flow rates are greater than the average flow observed
    - Some additional treatment space is available for expanding the system if treatment capacity is later determined to be inadequate.

2.2 Flow Rate

The January Mine flow rate was measured from May 18, 2016 to August 3, 2016 while the pilot test was on-going. The flow from the January Adit overflow point was measured from 6 to 14 gpm while it was flowing during the testing period. In the last month, when the January Mine water was drawn down from pumping, the flow rate was measured by recharge rate in the January Mine because there was no outflow from the adit. Sovereign was provided with a data point of 40 gpm measured by recharge rate that occurred only temporarily during a storm event. This makes the observed January Mine flow rate range from 6 to 40 gpm. The latter flow rate was observed on August 3, 2016 and is suspected to be elevated in response to a localized monsoon storm event on top of a rainy period.

The flow rate of the TSF #1 seep (0 to 3 gpm) was measured by timing the refill rate of an installed sump (55 gallon drum placed below grade in the seep collection area) and estimated from pumping frequency from the existing seep capture pond. The peak flow rate (~10gpm) was observed immediately after the largest storm event of the Pilot test period. According to anecdotal information from the site, it declined from this peak to about 3 gpm over the space of several days. The minimum observed flow rate was 0 gpm (dry) over about a three-month interval.

The steady-state design flow rate for the full scale PTS was selected to be 23 gpm; this flow is derived from the two sources as follows:

- 20 gpm from the January Mine – Establishing storage capacity in the January Mine (from draw down) to handle storm flows in excess of the flow capacity.
- 3 gpm from TSF #1 Seep – Flows in excess can be stored in the existing pond and diverted to treatment as capacity exists including over the dry months when the seep was not observed to have flow.

2.3 Influent Water Quality

The water quality used for the full scale treatment design basis was derived from multiple samples collected over the duration of the pilot system test period for both the January Mine and the Seep water. One of the objectives of the pilot test was to characterize the influent water (multiple samples over a period of time). The pilot system design basis used only one grab sample, and was used only to design the pilot test. Tables 1 and 2 show the data gathered during the pilot testing under different operational conditions (initial and final) and the "selected" Design Basis concentration is derived from this data. Table 1 is for the January Mine and Table 2 is for the Seep. Table 3 then combines the two design basis influents (January Mine and Seep) into one comingled influent water quality value that was applied to the PTS design.

In Tables 1 and 2, the Initial Data (March-July) was the average measured concentration of the water gravity draining from the January Mine adit (before pumping from the January Mine was initiated). The Later Data (August) was the average measured concentration of the water quality after pumping from the January Mine began. They are both compared here to illustrate the differences in the water quality between the two operational scenarios, gravity draining and pumping. The later data is considered more characteristic of the Full Scale PTS where the water will be pumped to deliver it to the treatment system. The "selected" Design Basis concentration is a worst case derived from data observed during the two operating periods. Iron and Zinc were rounded up for the "selected" Design Basis concentration to provide some conservatism in the design as they are both key concentrations in determining the size of the process units.

In Table 3, the combined influent water quality is based on blending 20 gpm of the January Mine water and 1.5 gpm (instead of the design flow of 3.0 gpm) of the Seep water. This was done to correlate directly with the mixing ratio used in the pilot testing from which removal rates for each parameter were specifically derived. The Seep is significantly more concentrated than the water from January Mine and when it is mixed at 3.0 gpm, the calculated effluent concentration falls slightly short of the desired treatment (effluent) goals established for the system for several parameters. A fully mature PTS may easily handle this loading but to ensure that the goals are met, a pre-treatment process was included in the system (pH adjustment of the seep water). The pre-treatment step would only be used on a temporary basis when and if the seep flow acidity load exceeds the treatment capacity of the system. This condition may only occur briefly during a given season when the seep is actually flowing.

Table 1. January Mine Water Quality and Flow Data

Parameter	Units	Initial Data (March-July) Gravity Flow[1]	Later Data (August) Pumped[2]	Selected Design Basis Concentration[3]
Flow	gpm	6-14	7-40	20
pH	s.u.	6.1	6.2	6.1
Iron	mg/L	32	19	35
Aluminum	mg/L	0.2	0.17	0.2
Arsenic	mg/L	0.06	0.09	0.1
Copper	mg/L	0.004	0.004	0.004
Lead	mg/L	0.01	0.003	0.01
Zinc	mg/L	9	7.5	10
Cadmium	mg/L	0.01	0.0007	0.01
Nickel	mg/L	0.04	0.04	0.04
Manganese	mg/L	62	55	62

Notes
[1] Average of concentrations from this period of time
[2] Average concentrations during January Mine water pumping
[3]Some metal metals concentrations were rounded up

Table 2. Seep Water Quality and Flow Data

Parameter	Units	Initial Data (March-May)[1]	Later Data (August)[2]	Selected Design Basis Concentration[3]
Flow	gpm	-	-	3.0
pH	s.u.	3.3	3.7	3.3
Iron	mg/L	46 - 67	2.6	70
Aluminum	mg/L	120 - 220	125	220
Arsenic	mg/L	0.09	0.05	0.1
Copper	mg/L	2.6 – 3.4	2.5	3.4
Lead	mg/L	0.19	0.09	0.2
Zinc	mg/L	113 - 128	111	130
Cadmium	mg/L	1.6 – 2.1	1.4	2.1
Nickel	mg/L	1.7	1.1	1.7
Manganese	mg/L	1100	970	1100

Notes:
[1] Average of concentrations from this period of time, unless noted
[2] Average concentrations during January Mine water pumping
[3]Iron, aluminum, copper, zinc, and cadmium higher concentrations were used in the design because of the uncertainty of the Seep water chemistry

Table 3. Design Influent Water Chemistry

Parameter	Units	January Mine[1]	Seep	Mixed Water Chemistry (BCR Influent)
Flow	gpm	20	1.5	21.5
pH	s.u.	6.1	3.3	4.0
Iron	mg/L	35	70	37
Copper	mg/L	0.004	3.4	0.24
Zinc	mg/L	10	130	18.4
Arsenic	mg/L	0.1	0.1	0.1
Nickel	mg/L	0.04	1.7	0.16
Cadmium	mg/L	0.01	2.1	0.15
Lead	mg/L	0.01	0.2	0.02
Aluminum	mg/L	0.2	220	16
Manganese	mg/L	62	1100	134
Sulfate	mg/L	2400	9800	3365
Acidity (Cal'd)	mg/L	111	1696	318
Alkalinity	mg/L	240	-	-

The mixed water chemistry was calculated using the following equation:

$$\text{Mixed Water Chemistry} = \frac{C_1Q_1 \text{ X } C_2Q_2}{Q_1 + Q_2}$$

Where:
C_1 = January Mine Metal concentration
C_2 = TSF #1 Metal concentration
Q_1 = January Mine assumed maximum flow rate
Q_2 = Assumed SEEP flow rate

Although the flow rate from TSF #1 seep is comparatively low, its high metals concentration results in contributing 60% of total metals loading to the PTS.

2.4 Data Variability

Iron concentrations from the January Mine and the Seep varied significantly during the Pilot Test in the month of August. It should be noted that the January Mine water was being pumped from a well located above the January Mine instead of from overflow draining from the adit. Water quality data from the January Mine indicated that the reduced iron concentration was not fully attributable to dilution from infiltration as concentrations of other constituents did not decrease as significantly. One explanation for this may be that the lowering of the January Mine water level would have caused more of the mine water to be exposed to oxygen and this caused precipitation of iron within the January Mine working. The concentration of iron also dropped in the Seep water. This may be due in part to dilution from the storm events.

The iron concentration trends show this variability in Figure 1 below. Because the January Mine iron concentration was fairly constant from March to July, the design of the BCR was based on the iron data before the pumping and monsoon as a conservative measure.

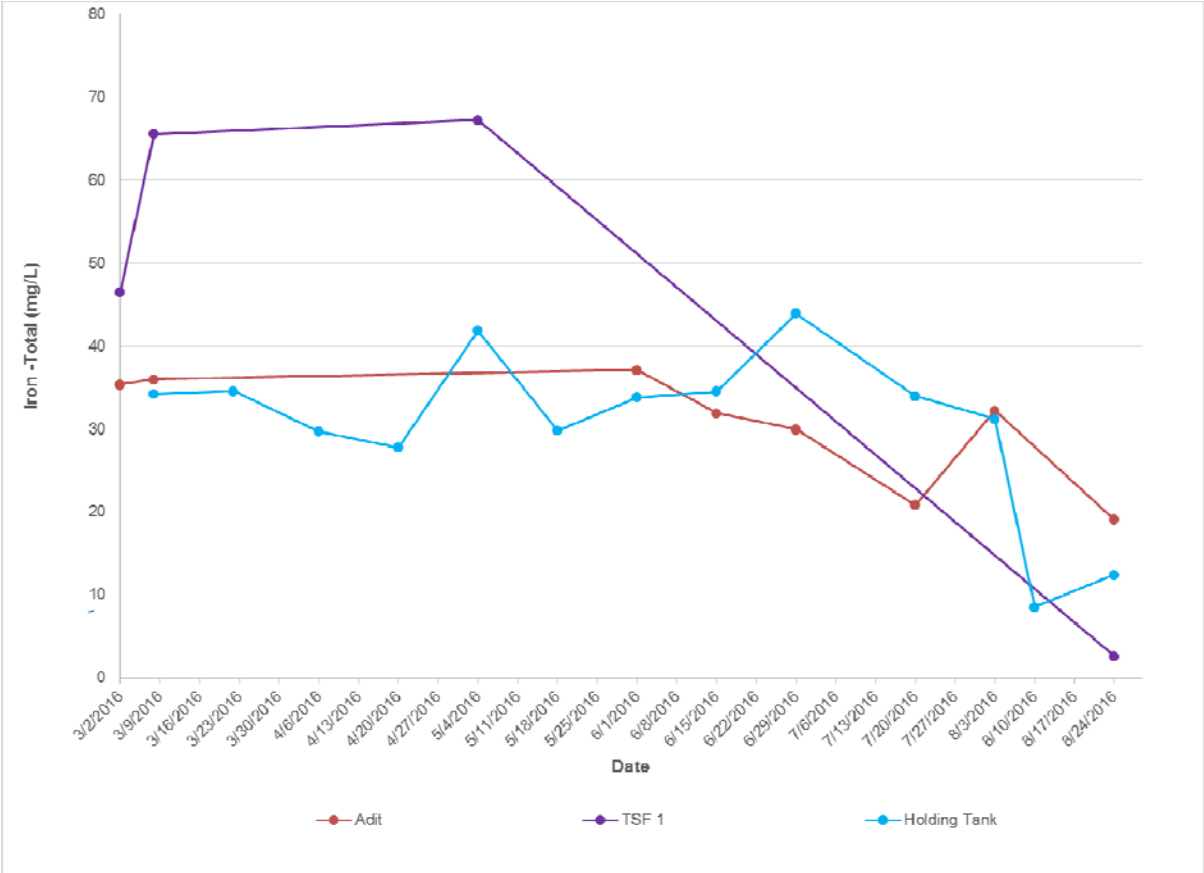

Figure 1. Total Influent Iron Concentration

2.5 Effluent Water Quality Projections

Table 4 below shows the effluent water quality projections (assumptions) made from the pilot results. The pilot system was effective at demonstrating the performance of individual and combined process units as well as collecting more complete influent data for characterization. Based on the data from the pilot, some changes were made to the full scale system design. These changes included the removal of the iron terrace and aerobic pond and adding an equalization basin and aerobic wetland. There were also some adjustments made to assumed treatment rates and how fast this particular biologically-driven treatment system will mature to its full potential. The full scale system will also differ from the pilot in:

- Scale – Full scale systems typically handle TSS better and perform more consistently.
- Duration - The full scale system will be able to fully mature over the first several years.
- Concentration – The more concentrated Seep is mixed into the influent at a higher ratio in the full scale system (about 13% vs. 7% from the pilot). Because of this intermittent higher

loading from the Seep, a temporary pre-treatment system (pH adjustment as needed and equalization basin) is included in the design.

The effluent water quality projections consider all of these factors.

Table 4. Design Effluent Water Chemistry

Parameter	Units	Mixed Water Chemistry (Influent)	Projected Effluent Quality	% Metals Removal	Notes
Flow	gpm	21.5	<21.5	N/A	Some flow loss is anticipated due to evaporation
pH	s.u.	4.0	6.5 – 7.5	N/A	
Aluminum (Al)	mg/L	16	7.8	50	
Cadmium (Cd)	mg/L	0.15	0.0015	99	
Copper (Cu)	mg/L	0.24	0.019	92	
Iron (Fe)	mg/L	37	0.4	99	
Lead (Pb)	mg/L	0.02	0.012	50	
Manganese (Mn)	mg/L	134	67	50	
Zinc (Zn)	mg/L	18.4	0.18	99	
Antimony (Sb)	mg/L	<0.0026	<0.0026	N/A	No significant amount expected in the influent
Arsenic (As)	mg/L	0.1	0.04	60	
Barium (Ba)	mg/L	0.0614	0.0614	0	
Beryllium (Be)	mg/L	0.004	0.002	50	
Boron (B)	mg/L	0.61	0.55	10	
Chromium (Cr^{6+})	mg/L	<0.025	<0.025	N/A	No significant amount expected in the influent
Chromium (Cr)	mg/L	0.04	0.035	10	
Cyanide (CN^-)	mg/L	<0.003	<0.003	N/A	No significant amount expected in the influent
Mercury (Hg)	mg/L	<0.000094	<0.000094	NA	No significant amount expected in the influent
Nickel (Ni)	mg/L	0.16	0.016	90	
Selenium (Se)	mg/L	0.06	0.044	30	Note 1
Silver (Ag)	mg/L	0.03	0.03	0	
Thallium (TI)	mg/L	0.01	0.006	40	
Sulfides	mg/L	0	<0.1	N/A	No significant amount expected in the influent
Hardness	mg/L	1200	1200	N/A	
Sulfate	mg/L	3365	3129	7	
Acidity (Cal'd)	mg/L	318	-	N/A	
Alkalinity	mg/L	-	500	N/A	Some alkalinity will be added

Notes:

1 Elevated levels of Se are expected during the first 3-6 months of BCR operation due to selenium content in the straw media. This will diminish with time depending on content in the straw and flow rate. Once removed (washed out) the water quality projection for selenium is < 0.002 mg/l.

3.0 TREATMENT PROCESS DESCRIPTION

Figure 2 summarizes the January Mine full scale PTS design concept. The PTS will involve four basic steps:

- An Equalization Basin (EB)
- A Biochemical Reactor (BCR),
- An Aerobic Polishing Wetland (APW)
- A Manganese Removal Bed (MRB)

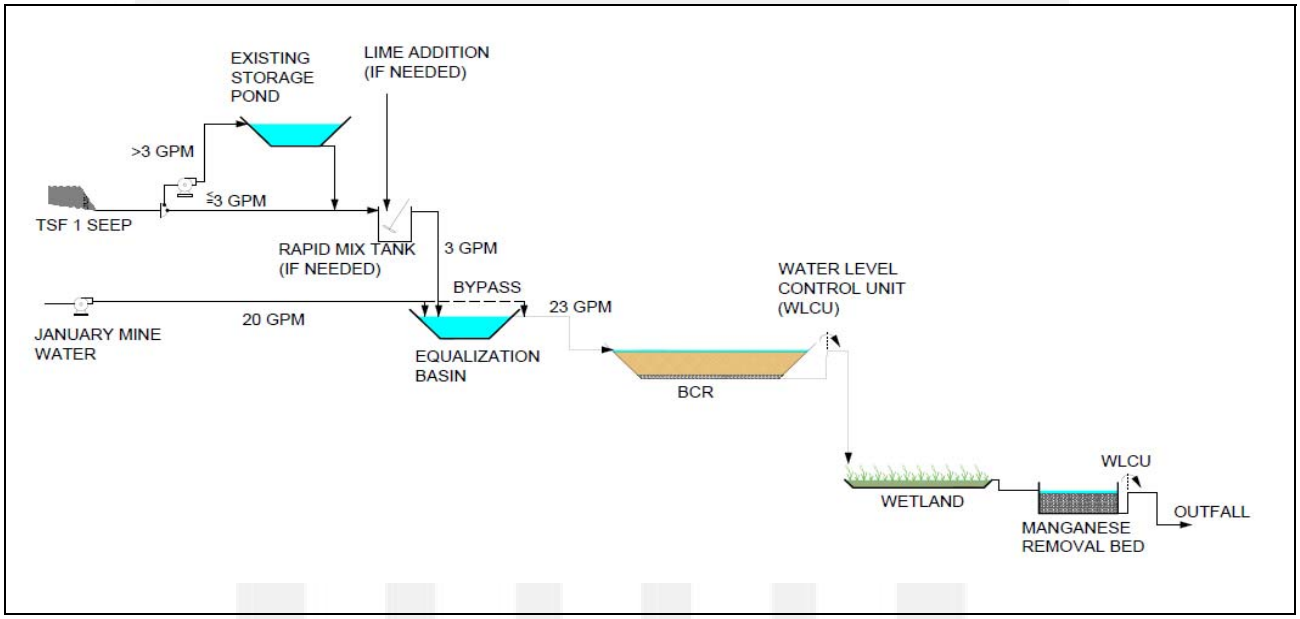

Figure 2. Full Scale - Process Flow Diagram

3.1 Equalization Basin (EB)

The January Mine water and the TSF #1 seep water will be mixed in an Equalization Basin. Mixing waters with different pH's and concentrations will most likely result in precipitation of the high concentrations of aluminum and iron. The EB will be designed to settle and store metal precipitates for periodic removal. This will help prevent precipitation build-up in the BCR and provide some treatment (removal) of metals in this step. The EB volume is designed for a 24 hours of retention time with an allowance for precipitation (sludge) accumulation. Table 4 provides the EB design details.

Table 4. EB Design Details

Design Criteria	Value
Flow rate	23 gpm (Seep 3 gpm, Jan Mine 20 gpm)
Hydraulic Retention Time (HRT)	24 hours
Sludge Holding Capacity (% of total volume)	25%
EP Operating Volume (sludge, water)	42,000 gallons

3.2 Seep Pretreatment (if needed)

The ratio of Seep water to January Mine water is expected to be greater than the ratio used in the pilot testing on an intermittent basis. The design Seep flow rate varies from 0.0 (dry) to 3.0 gpm. Because the Seep is significantly more concentrated than the January Mine water, it has a greater impact on the treatment system loading. During intervals when the loading exceeds the capacity of the treatment system, temporary pretreatment of the Seep will be initiated.

The pretreatment system would consist of a small mixing tank, an alkaline reagent (TBD) feeder, and the EQ basin described above. When needed, Seep water will be diverted to the mix tank where it will be blended with a dose of alkaline reagent. The mixture will overflow into the EB where the precipitated solids will settle out. When the Seep water pH is being adjusted, the January Mine water will bypass directly into the BCR so that the full volume of the EB can be used to settle and store solids from this process. Table 4T (temporary) indicates the EB design details.

Table 4T. Seep Pretreatment (Lime Addition) Design Details

Design Criteria	Value
Flow rate	3 gpm
Mixing Tank, Operating Volume	400 gallons
Hydrated Lime Use (at 3 gpm)	1 ton per month of Seep pH adjustment
EB Hydraulic Retention Time (HRT at 3 gpm)	5 days
EB Seep/Lime Sludge Holding Capacity (% of total vol)	50%
EB Operating Volume (sludge, water)	42,000 gallons

3.3 Biochemical Reactor (BCR)

The design criteria for the BCR including volume of substrate (see Table 5) was calculated based on metal loading rates measured from the Pilot Test.

The mixture of January Mine water and TSF #1 seep water will enter the top of the BCR and flow vertically down through the organic substrate. With this configuration, the top of the BCR contributes

more to the BCR biological kinetics initially than the lower zone that functions as a substrate "reservoir" that will be consumed in the future.

Treated water will be collected in perforated pipes placed in a gravel layer installed on the gently sloping (1% to 3%) floor of the BCR and conveyed to the APW. The collection pipes in the bottom of the BCR will have accessible cleanouts at the top of the cell.

The substrate will have a finite life, expected to be about 20 to 25 years. The BCR longevity was projected based on the Pilot Test results. At some future date, the depleted substrate will need to be replaced.

Table 5. BCR Design Details

Design Criteria	Value
Metal loading rate	0.3 moles per day per cubic meter
No. of BCR Cells	1
Flow rate	23 gpm (Seep 3 gpm, Jan Mine 20 gpm)
BCR Cell total depth with drainage layer, substrate, standing water (above substrate) and freeboard (to crest of liner)	7.0 ft.
Hydraulic Retention Time (HRT)	About 6.4 days
BCR Drainage Gravel	6 inches
Substrate Thickness	4.0 ft
Standing Water (above substrate) depth	6 inches
Freeboard (top of water to cell liner crest)	2 ft.
Bottom Footprint Dimension Ratio	L:1 = 1:1 or 2:1
Bottom Footprint Area	14,000 ft^2 (168 ft x 84 ft)

The standing water level in the BCR will be adjustable using an inline water level control unit (WLCU) on the discharge side of the BCR. This will allow the head pressure to be adjusted over time as necessary to help drive water through the system.

The BCR will be lined. BCRs can be made square or rectangular as long and they are made up of squares (length = 2 x width). Water enters the BCR near the top (ponded water depth is adjustable from about 3" to 12" above the media layer) and exits from the bottom to the WLCU. The bottom discharge elevation of the WLCU is typically 1' 6" below the top of the BCR media giving a total available head loss across the BCR (if needed) of about 2'-6".

3.4 Aerobic Polishing Wetland (APW)

The area required for the APW was calculated based on a rule of thumb sizing criteria of 5 square meters per gpm of flow for biological oxygen demand (BOD) removal. The sizing criteria was scaled from a full scale wetland designed by Sovereign staff and it consistent with other published results for

APW sizing. It was assumed that 15 mg/L of BOD will be removed in the APW. The influent of the APW (BCR effluent) will enter the top of the APW and flow horizontally through the APW aquatic plant community. The APW will be lined. APW dimensions and other design details are provided in Table 6.

Table 6. APW Design Details

Design Criteria	Value
Flow rate	23 gpm
Hydraulic Retention Time (HRT)	4 hours
Area Sizing Criteria for BOD removal	5 m^2/gpm
mg/L of BOD removal	15 mg/L
APW soil depth	1 ft.
APW water depth	6 inches
Freeboard (top of water to cell liner crest)	2 ft.
APW Cell total depth	3.5 ft.
APW bottom footprint with intermediate berms	**1,500 ft^2**

3.5 Manganese Removal Bed

The MRB was designed based on a manganese removal rate of 12.5 grams per day per square meter. This factor was calculated based on the MRB Pilot testing results. The MRB influent (APW effluent) will enter the top of the MRB and flow vertically down through the MRB media. The bottom of the cell will be fitted with perforated pipes to collect the treated water. MRB dimensions and other design details are provided in Table 7.

Table 7. MRB Design Details

Design Criteria	Value
Flow rate	23 gpm
Mn removal rate	12.5 grams/day/square meter
MRB limestone/rock depth	2 ft.
MRB water depth (above the limestone)	6 inches
Freeboard (top of water to cell liner crest)	2 ft.
MRB Cell total depth	4.5 ft.
MRB bottom footprint	**7,600 ft²**

4.0 INFRASTRUCTURE CONSIDERATIONS

4.1 Storm Water Management

Storm water runoff will be diverted around the PTS by means of surface water channels and diversion ditches. The system conveyance features (inlets/outlets, overflows, piping channels, etc.) will be designed to handle additional flow from storm water that falls inside the bermed areas of the treatment cells.

4.2 Lined System

The design will include membrane liners under all of the treatment cells.

- Existing Storage Pond (Seep surge storage)
- Equalization Basin
- BCR
- APW
- MRB

5.0 COMMISSIONING CONSIDERATIONS

A passive treatment system is a biological process that will need time to mature (grow, acclimate, develop) before its full treatment capability will be realized. While a BCR may only take several months to achieve full treatment capacity, a MRB should keep developing and improving over its lifetime. Inoculation is also used in some of the process cells to speed up the maturation process. The system as a whole is expected to be performing at all design levels in three years. Table 8 describes the expected maturation intervals for each process unit

Table 8. Maturation for Process Cells

EQ Basin	No inoculation needed. Mixing of the Seep and January Mine water will start precipitation right away. Settling will improve as a "bed" and contact/transition zone of solids is produced. The transition zone provides more opportunity for particle contact that improves settling. Establishing a good "bed" may take several months but can more readily be established in subsequent years by leaving some solids in the basin after cleaning.
BCR	The BCR is inoculated with manure. The BCR will initially be filled with process water and left to stand (no or minimal forward flow) for about two weeks to a month to cultivate the desired bacteria. Observing negative value oxidation reduction potential (ORP) readings in the BCR substrate mass will be indicative of the proper condition to initiate flow. The flow rate will then be increased over a one to two month period to full flow capacity. It is typical for the BCR to initially have elevated levels for constituents found in the organic media such as selenium in the straw. The elevated levels diminish over time (usually in the first 3 to 6 months) depending on concentration in the media and flow rate.
APW	After initial planting, the wetland will need to be watered until the plants are submerged with BCR effluent. The APW commissioning could be accelerated with the addition of fresh water (not January Mine water) to maintain saturated soil conditions. Once process flow is initiated, "treatment" should start right away. However, the full effectiveness of the wetland will not be realized until the plants have a chance to reproduce and spread to fill the available area. This process may take from two to three years.
MRB	The MRB cell can be inoculated with potassium permanganate to help establish a black manganese oxide coating on the limestone and gravel media. Addition of a small amount (five gallon bucket) of algae harvested from Alum Creek could accelerate the process. The inoculation process should only take a few days with water standing or recirculated water. The system can be brought on-line at full flow with manganese removal occurring right away. The removal rate will improve as more and more manganese is deposited (in a self-perpetuating manner). Improvement should continue for many years, however significant manganese removal should occur in the first year and full design effectiveness in the second year depending on manganese concentrations. The ability of the MRB to remove other metals (adsorb to the Mn surface) is more likely to occur noticeably in the third year and beyond.

6.0 OPERATION AND MAINTENANCE CONSIDERATIONS

A full O&M Manual and Sampling and Analysis Plan (SAP) will be developed with the completion of the full scale system design. The following section just highlights some of the key O&M features for each of the process units. A PTS typically exhibits a relatively low operation and maintenance (O&M) requirement. However, a certain level of operations, monitoring, and maintenance is recommended to maintain good performance over a long period of time:

- Monitoring the physical condition of the system units, and
- Performance monitoring of system flow rates and water chemistry

The above general requirements suggest periodic inspections that would include sampling events. O&M protocols associated with specific PTS components follow.

6.1 Delivery Pipe

Over time, scale may form throughout the influent delivery system, and piping may need to be periodically cleaned. It is recommended that inflow pipeline inspections be conducted at least once a year.

If a major scale removal effort is required, it is recommended that a “pressure jet” method be used to protect the smooth inner surfaces of the delivery pipelines. Of course, this is dependent on actual in-field conditions. Detailed instructions for pipeline de-scaling would be included in the O&M manual.

6.2 Equalization Basin

The sludge generated by the mixing of January Mine water and TSF #1 seep water will occur only when the seep water is available, which is estimated to be about five months per year. It was assumed that the sludge will be removed once a year. The sludge could be disposed on either of the two TSFs

6.3 Seep Pretreatment System

A pretreatment system is recommended to be used if the metal concentrations in the Seep become too high for the PTS to treat effectively. The system will consist of a mix tank and a small alkalinity reagent bulk feeder using hydrated lime or another alkalinity reagent. The system would only be used temporarily if needed. The tank should be cleaned out (flushed) after use.

6.4 Biochemical Reactors

Any scaling (due to BOD) or flow blockage within the BCR cell (most likely to occur in the WLCU) might first manifest itself as a steady rise in the pool elevation above the substrate (and eventually reach the overflow pipeline) that is not related to increases in feed flow rate. This situation can be remedied by using a brush to clean out the WLCU and loosen the accumulation. This material would be flushed to the APW where it would settle out.

If BOD-related scaling is suspected in the effluent collection piping, the scale may be eliminated by utilizing the BCR cleanouts. Circulating septic system maintenance products (e.g., Rid-X) through the cleanout pipes may be considered for removal of BOD scaling.

The BCR substrate has a finite life, expected to be about 20 to 25 years. At some future date, the depleted substrate will need to be replaced.

During retrofitting events (timed to occur during low flow), all water flow would be diverted to the APW while the substrate in the BCR is removed and replaced. It should be noted that when this occurs, only the January Mine water will be treated, which it is relatively good water. The PTS feed flow rate may be adjusted during a retrofitting event.

6.5 Aerobic Polishing Wetland

Biosolids from BOD removal from the water and plant detritus will accumulate over time. There is a tendency for the biosolid mass to be thicker near the influent end of the Wetland which can cause some “deltas” to form reducing the overall HRT of the system. If maintenance for biosolid mounding is necessary for system performance then there are several remedies from just fixing localized problems with a shovel and hoe, using a medium pressure hose to “sluice” the solids to a temporary sump, or raising berms to redistribute the water flow more evenly. We assume that some form of maintenance would be performed every five years or so.

6.6 Manganese Removal Bed

As the MRBs mature, a layer of hard pan of limestone cemented together with manganese dioxide will form on the surface of the MRB. The only maintenance required will be the mechanical loosening/ breaking of this hard pan. The pond will need to be inspected annually for solids accumulation and may require periodic maintenance about every three to five years.