ARIZONA MINERALS

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April 27, 2017

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

Re: Voluntary Site Remediation Work Plan for
Trench Camp Property (January Mine, Norton Mine and Trench Camp Mine Claims)
ADEQ-VRP Site Code #5051430-02

Dear Mr. Patricki:

Enclosed please find 2 copies of the above-referenced work plan, as well as a digital copy of the document on CD.

This work plan was prepared in conformance with the guidance provided by ADEQ. We have included an annotated copy of the ADEQ VRP Work Plan Checklist identifying the sections 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 additional information, please do not hesitate to contact me at (520) 485-1300 or jpappas@arizonamining.com.

Sincerely,

Arizona Minerals, Inc.

Johnny Pappas
Director of Environmental and Permitting

Encl.

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:	Johnny Pappas, Director E&P, Arizona Minerals, Inc.
Volunteer/Applicant Email Address and Phone:	jpappas@arizonamining.com / 803-235-5563
Authorized Agent (AA)/Consulting Company:	
AA/Consultant Email Address and Phone:	

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;	Section 5	☐
§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.	N/A per 49-175.B3 (AZPDES permit)	☐
§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.	Attachment E	☐
§49-175A.4	Schedule for submission of progress reports.	N/A	☐
§49-175A.5	A proposal for community involvement as prescribed by §49-176 ("Community Involvement Requirements")	Section 10 and Attachment 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.	Section 7	☐
§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 APZDES 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 (main text of work plan)	Figure 1	☐
Site Map *(to scale)*	Site Plan (main text)	Figure 3	☐
Historical Sampling Data Table	Figures 1, 2, 3 (main text)	Figures 1,2,3	☐
Historical Sample Location Map (to scale)	Figure 12: Water Monitoring Locations (main text)	Figure 12	☐
Proposed Sample Location Map (to scale)	TBD	TBD	☐
Sampling and Analysis Plan (includes Field Sampling Plan & Quality Assurance Plan)	TBD in permit issued	TBD	☐
Proposed Remediation System Location Map	Attachment B Figures Cover Page	Attachment B	☐
Proposed Remediation System Layout (Design Drawings)	Figure A010 (Attachment B)	Attachment B	☐
Schedule for Implementation of Project Activities* (Gantt Style Chart)	Attachment E	Attachment E	☐
Proposed Language for Public Notification of Remediation (i.e.: example signage)	Attachment F	Attachment F	☐
Plan for Investigative Derived Waste (IDW)		NA	☐
Evaluation of Remedial Alternatives (i.e: for Feasibility Study Work Plan)		NA	☐

*Project Activities are defined in A.R.S. §§49-175A.2 through 49-175A.4, and 49-176A.2 (Community Involvement).

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.

ASARCO January Adit (Norton Mine)
Voluntary Remediation Program (VRP) Site
Remedial Action Work Plan

Santa Cruz County, Arizona
VRP Site Code 505143-02

Volume 1 of 2

Prepared for:

Arizona Minerals, Inc.
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Bozeman, MT 59718

April 27, 2017

TABLE OF CONTENTS

TABLES

REGISTERED GEOLOGIST
CERTIFICATE NO.
44511
ALISON H.
JONES
Date Signed 4-25-17
ARIZONA, U.S.A.
Expires 06/30/ 2018

FIGURES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AL	Alert Level
AMI	Arizona Minerals Inc.
APP	Aquifer Protection Permit
AQL	Aquifer Quality Limit
ARS	Arizona Revised Statutes
AWQS	Aquifer Water Quality Standard
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technology
bls	below land surface
CFR	Code of Federal Regulations
Clear Creek	Clear Creek Associates, PLC
COC	Constituent of Concern
CRD	Carbonate Replacement Deposit
CWA	Clean Water Act
DIA	Discharge Impact Area
FEMA	Federal Emergency Management Agency
ft	feet
ft/day	feet per day
gpm/ft	gallons per day per foot
gpm	gallons per minute
GWSI	Groundwater Site Inventory
m	meter
MIW	mine influenced water
mg/L	milligrams per liter
PAG	Potentially Acid Generating
RPTS	Remediation Passive Treatment System
TMDL	total maximum daily load
TSF	tailing storage facility
USEPA	United States Environmental Protection Agency
USGS	United Stated Geological Survey
VRP	Voluntary Remediation Program

Wells 55	ADWR Well Registry Database
WTP	Water Treatment Plant
µg/l	microgram per liter

1. INTRODUCTION

1.1 Purpose

Arizona Minerals, Inc. (AMI) is the applicant to the Arizona Department of Environmental Quality's (ADEQ) Voluntary Remediation Program (VRP) for the January Adit (Norton Mine) Project at the Trench Camp Mine property in Santa Cruz County, Arizona. This revised work plan was prepared by AMI in accordance with A.R.S. §49-175 to eliminate discharges of mine impacted water to Alum Gulch from the January Adit and tailings pile seepage.

Key elements of this Work Plan include materials characterization by Schafer Limited Attachment A), design of the proposed lined tailing storage facility and underdrain pond (Attachment B) by NewFields, and the water treatment plant design by Water Engineering Technologies (Attachment C).

1.2 VRP Status

AMI submitted a VRP application for the January Mine, Norton Mine and Trench Camp Mine claims (Project) in the historic Harshaw Mineral District on February 19, 2016, shortly after AMI acquired the claims. The project was designated as VRP Site No. 505143-02.

A pilot scale Remediation Passive Treatment System (RPTS) was constructed near the January Mine Adit, in February 2016 to treat discharges from the January Mine Adit and seepage from Tailing Storage Piles #1, #2, and #4. The Pilot RPTS was continuously monitored by AMI personnel for a period of 24 weeks, from March to August 2016.

While the pilot test showed that a full-scale system would work with some modifications, AMI decided to revise the scope of the VRP work plan by replacing the passive water treatment plant with an active water treatment plant and building a lined tailing/waste rock storage facility and underdrain collection pond. The revised plan, presented in this document, is a more rigorous approach to achieving the project objectives.

1.3 Project Approach

The purpose of remedial actions to be conducted under the VRP is to address mine influenced water (MIW) discharges from the January Mine Adit and seepage from historic tailing and potentially acid generating (PAG) waste rock storage piles located on the Trench Camp, Norton, and January Mine property. This will be achieved through the following elements that are described in this revised Work Plan:

- Material from historic tailing storage piles #1, #2, #3, and #4 and PAG waste rock will be re-handled and placed on a lined tailing storage facility (TSF) for collection of solutions through an underdrain collection system. This will prevent future seeps from the toe of the historic tailing piles, and allow for collection of underdrain solutions.

- A double-lined underdrain collection pond will be constructed downgradient of the lined TSF according to prescriptive BADCT, to collect solutions from the re-handled historic tailings and PAG waste rock.

- An active water treatment plant (WTP) will be constructed to treat discharges from the January Mine workings and solutions captured in the underdrain collection pond from the historic tailings, PAG waste rock, and precipitation that falls within the lined facility.

Remedial design and operations will be conducted under the provisions of an Arizona Pollutant Discharge Elimination System (AZPDES) permit and an Aquifer Protection Permit (APP).

1.4 Constituents of Concern

As discussed in more detail in Section 1.6, ADEQ evaluated conditions along Alum Gulch and promulgated the Total Maximum Daily Loading (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. These are considered the Constituents of Concern (COCs).

1.5 Location

The Trench Camp, Norton, and January Mine claims (Property) are located approximately 5 miles south of the Town of Patagonia, Arizona within the Southeast Quarter of Section 32, Township 22 South and Range 16 East, Gila and Salt River Meridian, in Santa Cruz County, Arizona (Figure 1). AMI acquired the January, Trench Camp, and Norton claims in early 2016 from ASARCO, LLC. 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 (Figure 2, Santa Cruz County Assessor Map Book 105, Page 50). The Trench Camp and Josephine Mine claim parcel has been assigned parcel numbers 105-50-001A and 105-49-003. The U.S. Forest Service manages the surrounding adjacent lands, as part of the Coronado National Forest.

1.6 January Mine, Norton Mine, and Trench Camp Mine History

Mining in the Harshaw District dates from mid-18th century Spanish Colonial times, but is poorly documented before the 1870’s. Initially, oxide lead-silver vein ore was mined from small operations on the Trench property. This work continued intermittently until the late 19th century. Historical information from the late 1800s and early 1900s has been well documented (Schrader, 1915; Keith, 1975). The district's historic production is poorly reported but is believed to be around 250,000 tons, yielding approximately two million ounces of silver with by-product lead, zinc, copper and manganese. Production from the Harshaw district was dominated by the Trench-area mines, small mines on the Alta claim, the Hardshell Incline and the Hermosa mine.

Ownership of the Property prior to its acquisition by American Smelting and Refining Company, precursor to ASARCO, LLC (ASARCO) is not known. ASARCO began operating the Trench Camp Mine in 1939. The Trench area mines and sulfide flotation custom mill produced primarily silver ores with minor by-product lead from small underground operations. Approximately half of the production was direct-shipping oxide ore and the balance was milling ore. The Trench mill produced both lead and zinc concentrates with copper, silver and minor gold by-product production. The 150-ton per day Trench lead-zinc flotation mill also treated district ores between 1939 and 1964 on a custom basis. ASARCO continued ownership of the Property until it was acquired by AMI in 2016.

According to public records, the January mine was worked intermittently since the early 1870s. It was patented in 1894, and it was last operated by ASARCO in the period 1925 to 1949. Originally, the January and Norton Mines were operated jointly, extracting zinc, lead, silver, gold and manganese ore. In its later years ASARCO extracted mostly 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 (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. TP#3 is within the Harshaw Creek Watershed.

1.7 Mine Influenced Water Sources

The Property falls within the Alum Gulch and Harshaw Creek watersheds. The January and Norton claims and most of the Trench claim are within the Alum Gulch watershed; the eastern portion of the Trench claim is within the Harshaw Creek watershed (Figure 4).

Alum Gulch is a tributary of Sonoita Creek, joining it approximately 5.5 miles downstream from the January Mine and 2.25 miles southwest (and downstream from) from the Town of Patagonia. In addition to mining activities at the Property, several other historical mining ventures have extracted mineral ore from the upstream canyons that eventually drain into Alum Gulch. Historic mining activity in the watershed raised concerns about the presence of trace minerals in the natural drainage that eventually would reach the Sonoita Creek. To address the State of Arizona's Clean Water Act responsibilities, ADEQ evaluated conditions along Alum Gulch and promulgated the Total Maximum Daily Loading (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.

Two sources of mine influenced water (MIW) have been identified at the Trench/January/Norton sites:

- Discharges from the January Mine Adit into Alum Gulch: Testing of these discharges by ADEQ indicated the presence of cadmium, copper, zinc and acidity at levels exceeding the provisions of the TMDL Implementation Plan for Alum Gulch. ADEQ issued a discharge violation notice to ASARCO, who at that time owned the mining claim parcels.
- Seepage from Tailing Pile #1: In 2014, seepage from the base of the covered tailings into the unnamed wash in the Trench Mine property was observed. ADEQ issued a Notice of Violation to the ASARCO Multi-State Environmental Custodial Trust, the owner at the time. The Trust committed to the development and implementation of a SWPPP and initiated the application for an AZPDES Multi-Sector General Permit from ADEQ.

Both of these discharges are within the Alum Gulch watershed.

In response to these discharges, ASARCO implemented a plan to capture MIW discharges by capturing it and delivering it to a wetlands treatment system. This treatment system did not meet the treatment goals, resulting in exceedances of the surface water quality standards specified by ADEQ in an AZPDES permit that was issued for the wetlands. This permit was allowed to lapse by ASARCO. Because the initial wetlands treatment system implemented by ASARCO was not effective, after AMI acquired the property in 2016, they proposed to implement an alternative treatment under the provisions of VRP.

1.8 Responsible Party

ASARCO transferred the Trench Camp Mine claim to the ASARCO Multi-State Environmental Custodial Trust (Trust) in 2009. In early 2016, AMI purchased the January and Norton Mine Claims and the Trench Camp Mine Claims from the ASARCO Trust. The following provisions were included in the purchase agreement:

- AMI would enter ADEQ's VRP program and develop an acceptable work plan to remediate the MIW discharge from the January Adit and tailing pile seepage from the Trench Camp Mine.
- AMI must post a bond with the State of Arizona to cover long-term operations and maintenance expenses associated with the work plan.

2. GEOLOGY

2.1 Regional Geology

The Project Area is located in the Patagonia Mountains of southern Arizona within the Basin and Range physiographic province. The province is typified by north-northwest trending normal faults. The fault-bounded mountains, typically with large intrusive cores, are separated by deep basins filled with Tertiary and Quaternary sediments ("basin fill"). The core of the Patagonia Mountain range is a Laramide-age granodiorite pluton that has been dated at 60-65 million years (Graybeal, 2007).

2.2 Geologic Formations

The geology of the area was recently mapped by Graybeal et al (2015) (Figure 5). Much of Graybeal's work includes mapping of Simons (1974).

Surface rocks in the Trench Camp area consist primarily of:

- Cretaceous andesite (designated as *Ka* by Graybeal, 2015) - Gray, greenish-gray, or grayish-red, porphyritic to fine-grained, thin to very thick flows of trachyandesite or diorite; contains some rhyodacite or dacite. Maximum thickness of about 3000 feet.
- Tertiary Volcaniclastic Rocks of middle Alum Gulch (*Tv*) - Grayish to white, well consolidated and poorly sorted lapilli tuff and tuff breccia, probable crater-fill material of the Sunnyside porphyry Cu-Mo system. Contains clasts of Mesozoic volcanic and sedimentary rocks and clear quartz xenocrysts in fine-grained, illite-alunite-kaolinite-altered matrix. Numerous silicified zones. Bedded sequences have concentric strike and inward dips.
- Jurassic/Triassic volcanics (*JTrv*) - Light-colored rhyolitic, alkali rhyolitic, and quartz latitic lava, tuff, and welded tuff; locally much altered to sericite, epidote, carbonate, and chlorite, or strongly hornfelsed. Thickness uncertain but probably more than 6,000 feet.

North- to northwest-dipping Paleozoic sedimentary rocks underlie the *JTrv*. The Paleozoic-Mesozoic contact is unconformable. The Paleozoic units, from youngest to oldest, include:

- Naco group
  - Permian Concha Limestone (*Pcn*) - Gray to light-gray, fine-grained, medium to thick-bedded limestone with lenses and nodules of chert. About 155 m (510 ft) thick.
  - Permian Scherrer Formation (Ps) - Brownish-gray to gray, massive, sandy limestone and white to light-brownish-gray, fine-grained sandstone. About 46 m (150 ft) thick.

- Permian Epitaph Dolomite (*Pe*) - Gray fine-grained, thick-bedded limestone, silty limestone, gray dolomitic limestone, lesser sandstone and conglomerate, and sparse pods of chert and quartz. About 262 m (860 ft) thick.
    - Permian Colina Limestone (*Pc*) - Gray to dark-gray, fine-grained, and medium- to thin-bedded limestone and thin beds of dolomite. About 72–104 m (235–340 ft) thick.
    - Permian/Pennsylvanian Earp Formation (*P*e*) - Gray, light-gray, or pink thin-bedded to massive, sandy to silty limestone and dolomitic limestone, and lesser dolomite, chert and limestone conglomerate, and sandstone. About 229 m (750 ft) thick.
    - Pennsylvanian Horquilla Limestone (**h*) - Light-gray, gray, or pinkish-gray, fine- to coarse-grained, medium-bedded limestone and lesser dolomitic limestone and brown to maroon thin-bedded limestone. About 82 m (270 ft) thick. Unconformably overlies Escabrosa Limestone (unit Me).
- Mississippian Escabrosa Formation is below the Horquilla Limestone. The contact is disconformable.
- The Devonian Martin Limestone unconformably underlies the Escabrosa Formation.
- Cambrian Abrigo Limestone unconformably underlies the Martin Limestone.
- Cambrian Bolsa Quartzite underlies the Abrigo Limestone. This contact is generally conformable.
- Precambrian Quartz Monzonite is the basement rock in the area. The contact with the Bolsa Quartzite is a nonconformity.

2.3 Surficial Geology

Surface rock in the Project Area consist of the Cretaceous andesite (*Ka*) and the Tertiary Volcaniclastic Rocks of middle Alum Gulch (*Tv*), and the Jurassic/Triassic volcanics (*JTrv*) (Figure 5). The Cretaceous andesite is the surface unit throughout most of the Trench Camp claim and most of the Alta Claim. Underneath the Cretaceous andesite lies the Jurassic/Triassic volcanics (*JTrv*) which are present at the surface at the eastern part of the Alta claim. The Jurassic-Cretaceous contact is unconformable. The western side of the Trench Camp Claims is predominantly the Tertiary volcaniclastic rocks of middle Alum Gulch.

2.4 Site Specific Geology

2.4.1 Geologic Cross Sections

A geologic cross section through the Trench and Taylor deposits was included in Graybeal et al (2015). It is provided as Figure 6. This cross section depicts the Mesozoic volcanics underlain by the Paleozoic sedimentary units wherein lies the Taylor Deposit.

A major structural feature in the Project Area is the Harshaw Creek Fault, a north-northwest trending left-lateral strike slip fault that has more than 4 miles of displacement at its southern end. It is late Cretaceous in age (Laramide). According to Graybeal et al (2015), this fault appears to run west of the project site where it is covered by Tertiary volcanics.

2.4.2 Mineralization

The core of the Patagonia Mountain range is a Laramide-age granodiorite pluton that has been dated at 60-65 million years (Graybeal, 2007). Mineralization is associated with the pluton, which outcrops to the west of the Property. Following emplacement of the pluton, a quartz feldspar porphyry stock was intruded at about 60 million years (Paleocene). This porphyry generated a strong hydrothermal system that developed a zone of disseminated pyrite and resulted in additional mineralization. It is the quartz feldspar porphyry which is considered to be the source of the mineralization.

2.5 Seismicity

According to the Arizona Geological Survey (Fellows, 2000), the Property is located in an area of moderate to low seismic hazard. National Seismic Hazard Maps are available from the United States Geological Survey (USGS). These maps display earthquake ground motions for various probability levels across the United States. The motion is expressed as peak acceleration as a percent of gravity. In the vicinity of the Project, the Peak Horizontal Acceleration with a 10 percent probability of exceedance in 50 Years is between 3 and 4 percent of gravity. Statewide, the values range between 2 and 10 percent of gravity (Peterson et al., 2015).

NewFields conducted a seismic hazard assessment (SHA) to define the maximum probable earthquake event for the design of the lined TSF, as discussed in Attachment B. The SHA was completed to determine ground motions experienced at the project site associated with the maximum credible earthquake (MCE) and maximum probable earthquake (MPE), based on regional seismicity and the probable 100, 475 and 2,475-year return events. A deterministic seismic hazard assessment was performed using available historic earthquake data from several national and international earthquake catalogs and regional active faults from the United States Geological Survey (USGS) and the Arizona Geological Survey (AZGS) within a 124-mile (200 km) radius of the project. Attenuation calculations were applied to these events and fault sources to determine the peak ground acceleration (PGA) at the project site. A probabilistic assessment was also completed using the USGS interactive deaggregation tool, based on the published 2008 national seismic hazard map.

Based on the study, the MCE for the deterministic and probabilistic assessments are 0.11 gravity (g) and 0.10 g, respectively. The complete SHA report is appended to Attachment B.

2.6 Geologic Hazards

In addition to earthquakes (discussed in Section 2.5), geologic hazards in Arizona include earth fissures, landslides and debris flows, and floods. The risk from any of these hazards at the Project Area is low.

Earth fissures and land subsidence occur in alluvial basins where there have been extensive groundwater withdrawals. The Project is not located in an alluvial basin, and therefore the area is not susceptible to subsidence and earth fissure formation.

Debris flows are recognized as a hazard in mountainous areas (Pearthree and Youberg, 2006). Although these events are infrequent, generally occurring as the result of very high precipitation events, they can alter the landscape significantly. Loss of vegetation from wildfires can increase the chances for debris flows. Operations at the project site will be sited and designed to reduce risks from debris flows.

According to the Flood Insurance Rate Map (Federal Emergency Management Agency [FEMA, 2011]), the Project is located in a Zone D (Figure 7). The Zone D designation is used for areas where there are possible but undetermined flood hazards, as no analysis of flood hazards has been conducted. These areas are often undeveloped and sparsely populated.

3. HYDROLOGY

3.1 Climate

The climate in the Project area varies from high desert in the Sonoita Valley to the steppe-like climate of the higher elevation grasslands and scrub area (ADEQ, 2003). In this semi-arid climate, average rainfall is 17 inches per year, with the majority of precipitation occurring between June and October through "monsoonal" convective thunderstorms. Daytime temperatures in the summer may reach 90°F with warm to moderately cool nights. Temperatures are usually mild with periodic overnight frosts and occasional snowfall at higher elevations during the winter months that usually melts within a few days (WRCC, 2017).

Additional climate data can be found in Section 2.2 of Attachment B.

3.2 Surface Water Hydrology

The Project Area is located within the Middle Sonoita Creek (USGS Hydrologic Unit Code [HUC] #150503010206) and Harshaw Creek (HUC# 15050301-025A) watersheds. The upper Alum Gulch subwatershed[1] (HUC# 15050301-561A) of the Middle Sonoita Creek watershed drains the western portion of the Project Area. Portions of Alum Gulch are designated as ephemeral reaches: from its headwaters to the January Adit, and from 800 meters downstream of the World's Fair Mine to its confluence with Sonoita Creek. From the January Adit to 800 meters downstream of World's Fair Mine, Alum Gulch is designated as an intermittent reach. Harshaw Creek drains the eastern portion of the Project Area. Harshaw Creek and all of its tributaries are designated as ephemeral reaches (ADEQ, 2003). Both drainages are tributaries of Sonoita Creek, which is located to the northwest between the Santa Rita and Patagonia Mountains (Figure 4). Sonoita Creek flows to the west as a tributary of the Santa Cruz River.

Both Alum Gulch and Harshaw Creek in the Project Area are considered "Not Attaining" under the Clean Water Act §303(d). Segments of Alum Gulch are Not Attaining for cadmium, copper, zinc, and acidity while segments of Harshaw Creek are Not Attaining for copper and acidity. Another drainage basin to the west of Alum Gulch, the Three R Basin, is also Not-Attaining due to exceedances of cadmium, copper, zinc, and acidity. In the TMDL Implementation Plan for Alum Gulch (ADEQ, 2007), ADEQ notes that "all three waters are in areas of high mineralization and share similar historic mining practices". The sources of impairment for Alum

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[1] Alum Gulch subwatershed is divided into the upper watershed, HUC# 15050301-561 A, and the lower watershed, HUC# 15050301-561A.

Gulch "include adit drainage, waste rock and tailings piles, and sediments" and "the major portion of the loading originates from the World's Fair Mine and Humboldt Canyon areas with relatively minor contributions from Trench Camp Mine and January Adit". The TMDL document for Harshaw Creek (ADEQ, 2003) identifies the Trench mine's dump number 3 as a "minor source" of loading into Harshaw Creek. ADEQ considered mining residues from the Morning Glory Mine and the Endless Chain Mine, located upstream of the Trench Camp, to be significant sources of loading to Harshaw Creek.

3.3 Site Stormwater Analysis

The TSF, underdrain collection pond, and stormwater controls were designed for a 100-year/24 hour storm event, as described in Attachment B, Section 9. Newfields used the hydrological modeling system HEC-HMS (version 3.5), a precipitation-runoff simulation computer program developed by the Army Corps of Engineers, to calculate the magnitude and timing of the peak flows as well as volumes resulting from specified storm events. The watershed areas were divided into sub-basins such that flows and volumes could be calculated at various points within the watershed where design elements were located. Peak flows and volumes were developed for the 100-yr/24-hr storm event and are used to complete the design calculations.

4. HYDROGEOLOGY

Groundwater flows in bedrock fractures at the site. There is little to no alluvium present. Porosity of fractured bedrock aquifers is generally low, on the order of 1-2 percent. However mineralization can result in higher porosities.

4.1 Water Wells Within One-Half Mile of Property Boundary

The Wells 55 database was downloaded from the Arizona Department of Water Resources on January 29, 2017. Based on the download, there is reportedly one non-AMI water supply well registered within one half mile of the property (Figure 8). This well, 55-642746, is registered to Coronado National Forest. ADWR records indicate a total depth of “0” feet. The single-page imaged record on file with ADWR states the principle use of this well as stockwater/wildlife.

The location plotted on Figure 8 is a cadastral location from the ADWR database. The registered location corresponds to a square measuring ¼ mile by ¼ mile centered on the mapped location. ADWR well registry records are not always accurate, and are limited by the quality of data that was submitted when a well was registered. AMI intends to conduct a field reconnaissance to evaluate whether this well actually exists near its registered location, and if so, will record the well’s actual location with a GPS and evaluate whether the well appears to be in use.

4.2 Depth to Groundwater and Groundwater Flow

There is no alluvial aquifer in the Project Area. As noted in Section 2.1, the bedrock outcrops at the surface. Groundwater in the area is limited to faults, fractures, and voids within the bedrock complex.

4.2.1 Depth to Groundwater

A groundwater elevation map, based primarily on a water level sweep conducted in September 2017, is presented on Figure 9. Depths to water ranged from 17.1 feet bls at MW-3 near the January Adit at the northwest portion of the Project Area, to 338 feet bls at HDS-345. In general, depths to water decrease to the north as the land surface elevation decreases.

4.2.2 Water Level Trends

Monthly monitoring of selected boreholes began in July 2013. Since 2013, groundwater elevation has been stable with very little variation (2 to 5 feet) at most locations. The greatest variation (over 10 feet) in groundwater elevation is seen at HDS-321 and HDS-249 to the east of the Property near an unnamed tributary of Harshaw Creek. At these two boreholes the groundwater elevation has increased approximately 2 feet per year over the three years of monitoring (Figure 10). The higher variability of water levels in these wells may be due to their proximity to surface drainages. AMI continues to collect water level data at several locations at the Project site to characterize hydrogeologic conditions and trends.

4.2.3 Groundwater Flow Direction and Hydraulic Gradient

As shown on Figure 9, groundwater flow is generally towards the north, with localized northeast and northwest flows, depending on the location. Based on the September 2016 groundwater levels shown on Figure 9, the horizontal hydraulic gradient ranged from 0.025 at the southern part of the site to approximately 0.013 at the northeastern part of the site.

4.2.4 Recharge

Groundwater is recharged from precipitation at higher elevation. Based on water level trends observed in wells located in washes (as noted in Section 4.5.2), recharge also appears to occur in the washes and drainages which carry surface flows from rain events north and northwest out of the basins.

5. SITE CHARACTERIZATION

5.1 Previously Conducted Characterization

Previous characterization studies were documented in the October 19, 2016 Work Plan (CPE and Sovereign Consulting Inc., 2016) that was submitted to ADEQ and Public Noticed on October 21 and 28, 2016. The work plan characterized the quantity and quality of adit and tailings pile discharges. Samples of the adit and TP seepages were collected by AMI personnel in 2015. After AMI took ownership of the Trench Camp Mine property in January of 2016, AMI personnel conducted field measurements and sampling of both the adit and onsite seepages, in conjunction with installation of a Pilot RPTS. CPE and Sovereign Consulting Inc. used the data to characterize flows and levels of metals (including the constituents of concern) present in the subject seepages. Portions of the CPE and Sovereign Consulting Inc. characterizations that are pertinent to the revised Work Plan are summarized below.

5.1.1 January Adit and Seepage Flows and January Mine Workings Recharge Flows

CPE and Sovereign Consulting Inc. (2016) evaluated January adit seepage flow for the Work Plan as follows:

> *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:

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.

- *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.*

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

- *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.*

- *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.*

- *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.*

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.

CPE recently updated Figure 8 of their January Mine Workings Recharge Rate Analysis report for this work plan (Figure 11). Pumping at 28 gpm has continued to lower the water level in the January Mine, which will allow for additional storage volume when recharge rates increase during the monsoon season.

Tailings pile seepages volumes were also evaluated by CPE and Sovereign Consulting Inc. to determine the level of treatment needed for remediation. They examined pumping records for the dewatering pump installed at the TP#1 pond and concluded that seepages are generated at a rate of 3 gpm during the monsoon season. CPE and Sovereign Consulting Inc. estimated that the remediation passive treatment system should be designed based on a treatment flow rate of 23 gpm average flow, based on their estimates of January Mine Adit flows and TP seepage.

5.1.2 Pilot scale Remedial Passive Treatment System

CPE and Sovereign Consulting Inc. used water quality data from an initial water quality sample collected in 2015 from the January Adit and the TSF#1 seepage to arrive at a mixed water chemistry for the passive treatment system influent. A pilot scale RPTS (Pilot RPTS) was constructed near 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. The Work plan documented influent and effluent changes in pH, temperature, flow rate, oxidation-reduction potential (ORP), conductivity, dissolved oxygen, and ferrous iron. CPE and Sovereign Consulting Inc. concluded that the results obtained during the Pilot RPTS period indicated a successful removal of metals from the water sources treated. Based on what was learned from operating the Pilot RPTS, CPE and Sovereign Consulting Inc. recommended some design modifications to be included in a full-scale treatment.

The complete Pilot RPTS findings and conclusions are provided in Appendix C (Pilot Scale Test Report, Passive Treatment System January Mine) of the October 19, 2016 Work Plan.

5.1.3 Abandoned Passive Treatment Wetlands

Sovereign Consulting Inc. conducted soil characterization in the passive treatment wetlands that were constructed by ASARCO to act as a treatment system. Soil characterization was conducted to evaluate whether contaminants of concern may have precipitated in the soil or taken up in the vegetation. Elevated concentrations of metals (arsenic, lead) were identified that were consistent with the geology of the local bedrock. Sovereign concluded that the wetland soils could be managed or co-mingled with the historic tailings, or from the future ore processing mill, and placed in tailing facilities. The concentrations of RCRA metals in vegetation were below non-residential soil remediation levels. Refer to Appendix F of the CPE October 19, 2016 work plan.

5.2 Recent Site Characterization

AMI has conducted further site characterization since the previous Work Plan. The following characterization tasks are described below and in the relevant appendices, as noted.

- Geotechnical Investigation
- Historic Tailing and waste rock characterization
- January Mine Workings Recharge and Water Quality
- Tailings Piles Seepage Flows and Water Quality
- Surface Water Quality
- Water Balance

5.2.1 Geotechnical Investigation

Newfields conducted a geotechnical investigation in January 2017 to characterize the proposed site and define relevant engineering material properties for the design of the new lined tailing/waste rock storage facility and underdrain pond. The investigation consisted of borings, test pits, and geophysical surveys, and was focused on the existing tailings piles 1 through 4. The objectives of the investigation were to:

- define the tailings and PAG waste rock volumes within each facility

- identify potentially impacted material below the piles
- determine tailings and PAG waste rock material properties.

Additional boreholes, test pits and seismic refraction lines were placed outside the limits of the existing tailings piles, in order to define engineering characteristics of the near surface soil, bedrock depth and potential construction borrow sources. Samples were collected during the field investigation for laboratory testing for engineering characterization, standard soil and rock strength, liner interface shear strength, permeability, consolidation and a battery of geochemical testing. Refer to Drawing A030 in Attachment B for the geotechnical investigation plan view. No groundwater was encountered during the geotechnical investigation.

Boreholes were placed along the geophysics lines in order to correlate known depths of the logged materials to seismic velocities. Using the depth to tailings and waste rock identified in the boreholes in combination with the velocities generated during the geophysical survey, a velocity band was identified that correlated with the bottom of the tailings and waste rock material within the historic tailings deposits. Refer to Attachment B (Drawings A050 through A053) for a plan view of the geophysics survey lines, boreholes and test pits as well as profiles showing the estimated depth of tailings and PAG waste rock.

Newfields used the tailings depth data to estimate the volume of tailings or PAG waste rock within each pile. The estimated tailings and PAG waste rock volumes to be relocated onto the lined TSF are presented in the table below:

VRP TAILINGS PILES RELOCATED VOLUMES

Stage	Material Volumes (tons)				Material Source
	Tailings	Waste Rock	Native Material	Total Material	
Tailings Pile 1 on Tailings Pile 2 and 4 (Temporary Condition)	112,800	223,600	15,500	~352,000	Tailings Pile 1
Stage 1 TSF	112,800	223,600	15,500	~1,036,000	Tailings Pile 1
	649,900	0	33,700		Tailings Piles 2 and 4
Stage 2 TSF	213,800	0	12,300	~227,000	Tailings Pile 3

Supporting documentation and volume calculations are provided in Newfields' report in Attachment B.

During Newfields drilling program in January 2017, native materials from beneath the historic tailings were collected for geochemical testing. As documented in Attachment A, foundation (native) soil and rock samples were lower in sulfur than either tailings or waste rock but 4 of the 19 samples still had pyritic sulfur greater than 0.3%, which would likely generate acidic conditions after sufficient exposure to oxygen. These higher sulfide samples were encountered in boreholes 1 and 2 beneath tailing pile 2/4. It is possible that some of the foundation soil and rock material in this area consists of historic sulfide waste or may contain naturally occurring sulfides. However, any sulfides beneath the tailings in pile 2/4 will be covered by the liner for the new repository, which will prevent contact with infiltrating water.

5.2.2 Historic Tailing and Waste Rock Characterization

A range of geochemical tests were on representative samples of historic tailings, waste rock, foundation soils (underlying the unlined tailings), and development rock from an exploration decline and shaft to characterize the material that will be placed in the lined TSF. The methodology and results are provided in Attachment A.

5.2.3 January Mine Adit and January Mine Workings Water Quality

Water quality samples have been collected from the January Adit and January Mine workings (sampling locations denoted on Figure 12 as “JAN AD” and JA-1, respectively) since April 2016. The results of these samples are compared to SWQSs (Table 1), including the dissolved-metal standards, which are the focus of the TMDL Implementation Plan for Alum Gulch. The results of the comparison are provided on Table 1. For some dissolved metals (cadmium copper, lead, nickel, silver, and zinc), SWQSs are based on the hardness of the receiving water body (in this case, Alum Gulch) or the hardness of the water from the discharge when there is not a receiving flow of water (i.e., ephemeral).

Samples were analyzed for dissolved metals. Iron and zinc were identified to be above the SWQSs (Aquatic and Wildlife warm, chronic). Samples were also analyzed for total metals. Arsenic, cadmium, and lead were identified to be above the applicable SWQSs, as noted on Table 1. Discharges from the January Adit to the constructed wetlands ceased in August 2016 and the January mine workings water is pumped and used for exploration drilling.

5.2.4 Tailings Pile Seepage Water Quality

In addition to tailing seepage samples collected in 2015, seepage was collected on January 9, 2017 and the water quality data were used in the design of the active WTP. The seepage chemistry is provided on Table 3-1 in attachment C.

5.2.5 Surface Water Quality

AMI and its consultants have conducted surface water quality monitoring in the Alum Gulch and Harshaw Creek watersheds. The monitoring locations are shown on Figure 12. Results of surface water analyses are provided on Tables 2A (Alum Gulch) and 2B (Harshaw Creek).

The SWQS for pH is 6.5 to 9.0. The pH values measured in all of the Alum Gulch samples listed on Table 2A were below 6.5. In contrast, the pH values measured in samples from Harshaw Creek met the standard.

Several dissolved metals were identified to be elevated in the Alum Gulch watershed. Dissolved zinc, lead, iron, cadmium, nickel concentrations are above their respective SWQSs at for aquatic and wildlife (warm water, chronic). Total cadmium, copper, iron, lead, and zinc concentrations were also identified to be above their SWQSs.

5.2.6 Groundwater Quality

MW-3 is located downstream of the proposed WTP (Figure 12). AMI has collected two rounds of groundwater samples from this well. The results are summarized on Table 3. Dissolved cadmium was detected at a concentration of 0.0051 mg/L, above the AWQS of 0.005 mg/L, in February 2017. In March 2017, dissolved cadmium was below the AWQS. The other analytes met AWQSs.

6. REMEDIAL DESIGN

6.1 Remediation Goals

The remediation goal is to reduce the constituents of concern from the January Mine Adit and the tailing seep to meet the applicable discharge water quality parameters that will be specified in an AZPDES permit (to be issued). This goal will be achieved by placing the historic ASARCO tailings on a lined tailing storage facility and constructing an active water treatment plant to treat January Mine workings water, tailings seepage, and meteoric water that comes in contact with the tailings. Key assumptions are provided in Sections 6.2 and 6.3 below and in Attachments B and C.

6.2 Tailing Storage Facility and Underdrain Collection Pond

Placement of the historic tailings onto a lined permanent containment is an essential element of the remediation plan to be conducted under VRP. The Trench Camp TSF will be designed as a lined permanent storage area for remediation of the existing tailings piles that are shown on Figure 3. Tailings, PAG waste rock and impacted soils beneath the historic tailings facilities are to be excavated and placed in the lined Trench Camp TSF as an earthen material. PAG development rock from a planned exploration decline and shaft will also be stored in the lined TSF as a co-mingled material with the existing tailings and PAG waste rock. Additionally, it may be placed on the exterior face of the existing tailings and PAG waste rock thereby acting as rock armor, to prevent water and wind erosion.

Underdrain flows from the TSF will be directed via gravity to an underdrain collection pond located downstream of the TSF. Water collected in the underdrain collection pond will be pumped to the Water Treatment Plant (WTP) for treatment. This water may be used for exploration drilling makeup water, dust control, other operational uses, or released to a receiving stream downgradient of the WTP.

Construction level design drawings and supporting documentation are provided in Attachment B for the Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Final Design Report.

6.3 Water Treatment Plant

A preliminary engineering report is provided by Water Engineering Technologies, Inc. (WET) for the water treatment plant (WTP) located at the Trench Camp in Attachment C. The report contains sixty percent (65%) plans and sections on: WTP background; design criteria including water chemistry and flow rates; process design including a process flow diagram, process and instrumentation diagrams, mechanical equipment list, a facility general arrangement, and major equipment data sheets.

The water treatment plant is designed for treating underdrain seepage and storm water runoff from the TSF and water from the January Mine workings. The design accommodates variable flow rates from the TSF, using a nominal basis of design throughput of 120 gpm. The design allows for seasonal fluctuations in flow rates.

Treated water will be utilized for on-going mine exploration, dust control, construction soil conditioning, and future milling and mining operations. Periodic, short-term discharge of treated water or a portion of treated water to Alum Gulch may be necessary during periods of exploration or mine development. This discharge will be authorized under an AZPDES permit.

7. PERMITTING AND LEGAL REQUIREMENTS

7.1 Applicable Requirements

Aquifer Protection Permit (APP) – The lined tailing/waste rock storage facility and underdrain collection pond are categorical facilities under the Aquifer Protection Permit regulations (A.R.S. 49-241).

Arizona Pollutant Discharge Elimination System (AZPDES) Permit – This permit provides authorization to discharge treated water from the water treatment plant in compliance with applicable water quality standards.

Arizona State Mine Inspector (ASMI) – Site reclamation plan, health and safety, and financial assurance mechanisms.

Arizona Department of Water Resources (ADWR) – Dam safety procedures for any artificial barrier that is not an exempt structure.

7.2 Other Determinations

A request for Approved Clean Water Section 4040 Jurisdictional Determination covering the project area 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 Attachment D to this work plan document.

8. SAMPLING AND ANALYSIS PLAN (SAP)

Monitoring of the WTP effluent and the associated reporting and record keeping requirements will be specified in the AZPDES permit and the APP issued to AMI by ADEQ. A copy of the Sampling and Analysis Plan (SAP) will be provided to ADEQ-VRP.

9. SCHEDULE

A Gantt chart providing the proposed project schedule is provided in Attachment E.

10. COMMUNITY INVOLVEMENT PROPOSAL

As required by §49-176, the communities and stakeholders that could be affected by the work described in this work plan will be informed about the project goals and achievements. A copy of the Public Notice to be published for this project is included in Attachment F of this document. Public comments and additional pertinent information will be incorporated into the attachment as they are received.

11. CONCLUSIONS

AMI prepared this Work Plan in accordance with A.R.S. 49-175 and 176. The proposed Work Plan will address mine influenced water discharges from the January Mine Adit and seepages from historical tailing piles at the Trench Camp, Norton, and January Mine properties. AMI is confident that the approach described in this work plan will result in an efficient and effective remediation system to meet the project goals and achieve the water quality standards that have been established for Alum Gulch.

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TABLES

TABLE 1
January Adit and January Mine Workings

Analyte	Units	SWQS[2]	Date						
			JAN AD[1]	JA#1	JA#1	JAN AD	JA#1	JA#1	JA#1
			4/14/2016	**4/15/2016**	**6/20/2016**	**6/20/2016**	**8/15/2016**	**2/7/2017**	**3/14/2017**
Field Parameters									
Flow	**gpm**	NA	12	--	--	5	--	--	--
Conductivity	**µS/cm**	NA	3,180	3,425	3,480	3,790	3,687	3,200	3,498
pH	**SU**	6.5-9.0	**5.87**	**6.20**	6.75	**6.35**	**5.87**	**6.40**	**5.85**
ORP	**mV**	NA	--	--	--	--	--	--	--
Temperature	**°C**	NA	20.3	21.2	22.1	23.3	21.9	21.2	20.7
Dissolved Metals									
Aluminum	**mg/L**	NA	<2.0	<2.0	--	--	<10	<2.0	--
Antimony	**mg/L**	0.03	<0.0050	<0.0050	<0.00050	0.0032	0.0045	<0.0050	--
Arsenic	**mg/L**	0.15	0.089	0.066	0.024	0.072	0.13	0.085	--
Barium	**mg/L**	NA	--	--	0.0072	--	0.0047	<0.0050	--
Beryllium	**mg/L**	0.0053	<0.0025	<0.0025	<0.00025	0.00036	<0.0013	<0.0025	--
Calcium	**mg/L**	NA	--	--	470	520	--	480	--
Cadmium	**mg/L**	0.0062	0.0035	<0.0025	<0.00025	0.0022	0.00040	0.00038	--
Chromium	**mg/L**	1	<0.0050	<0.0050	0.0024	0.00093	0.0030	<0.0050	--
Copper	**mg/L**	0.0293	<0.0050	<0.0050	0.00093	0.0014	0.0014	<0.0050	--
Iron	**mg/L**	1	**36**	**31**	**23**	**38**	**42**	**36**	--
Lead	**mg/L**	0.0109	<0.025	<0.0050	<0.00050	0.0014	0.0078	<0.0050	--
Magnesium	**mg/L**	NA	--	--	260	260	--	250	--
Manganese	**mg/L**	130.667	68	66	48	62	61	53	--
Mercury	**mg/L**	0.00001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--
Nickel	**mg/L**	0.1680	0.055	0.042	0.034	0.057	0.057	0.050	--
Selenium	**mg/L**	NA	0.0031	0.0024	0.0031	0.0039	0.0026	0.0021	--
Silver	**mg/L**	0.0349	<0.0050	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	--
Thallium	**mg/L**	0.15	<0.025	<0.0050	<0.00050	<0.0010	<0.00050	<0.0050	--
Zinc	**mg/L**	0.379	**9.8**	0.27	<0.40	**8.9**	**6.0**	**4.8**	--
Total Metals									
Aluminum	**mg/L**	NA	<2.0	<2.0	--	--	<2.0	<2.0	--
Antimony	**mg/L**	0.64	<0.0050	0.011	0.0026	0.0030	0.0052	0.0063	--
Arsenic	**mg/L**	0.03	**0.097**	**0.092**	0.025	**0.077**	**0.10**	**0.11**	--
Barium	**mg/L**	98	--	--	0.020	--	0.013	0.0063	--
Beryllium	**mg/L**	0.084	<0.0025	<0.0025	<0.00025	<0.00025	<0.00025	0.00028	--
Calcium	**mg/L**	NA	470	450	460	510	450	520	--
Cadmium	**mg/L**	0.05	0.0043	0.035	0.0018	0.0020	0.0005	0.0006	--
Chromium	**mg/L**	1	<0.0050	<0.0050	0.0024	0.00069	0.0077	0.0010	--
Copper	**mg/L**	0.5	0.0053	0.010	0.0047	<0.0050	0.0044	0.0011	--
Iron	**mg/L**	NA	35	38	22	38	40	41	--
Lead	**mg/L**	0.015	0.0092	**0.32**	**0.050**	0.0091	0.0088	0.0088	--
Magnesium	**mg/L**	NA	240	250	250	270	260	270	--
Manganese	**mg/L**	130.667	61	61	45	59	64	59	--
Mercury	**mg/L**	0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--
Nickel	**mg/L**	4.6	0.0029	0.054	0.026	0.053	0.053	0.040	--
Selenium	**mg/L**	0.002	<0.0050	**0.0024**	0.0014	**0.0051**	0.00045	**0.0021**	--
Silver	**mg/L**	4.667	<0.0050	<0.0050	0.00077	<0.00050	<0.00050	<0.00050	--
Thallium	**mg/L**	0.0072	<0.0010	<0.0050	<0.00050	<0.0050	<0.00050	<0.00050	--
Zinc	**mg/L**	5.106	**10**	4.9	1.4	**8.1**	**5.7**	**5.2**	--
Inorganics									
Alkalinity, Bicarbonate (as $CaCO_3$)	**mg/L**	NA	--	--	--	--	170	--	--
Alkalinity, Carbonate (as $CaCO_3$)	**mg/L**	NA	--	--	--	--	<2.0	--	--
Alkalinity, Hydroxide (as $CaCO_3$)	**mg/L**	NA	--	--	--	--	<2.0	--	--
Alkalinity, Total (as $CaCO_3$)	**mg/L**	NA	--	--	--	--	170	--	--
Hardness -[CALC] Ca (as $CaCO_3$)	**mg/L**	NA	--	--	--	--	--	--	--
Hardness -[CALC] Ca/Mg (as $CaCO_3$) (Dissolved)	**mg/L**	NA	--	2100	--	2400	--	2200	--
Hardness -[CALC] Ca/Mg (as $CaCO_3$)	**mg/L**	NA	2200	--	2200	--	2400	2400	--
TSS (residue, non-filterable)	**mg/L**	NA	12	42	71	15	22	<10	--
TDS (residue filterable)	**mg/L**	NA	--	--	3100	3700	3900	3600	--
Anions									
Cyanide	**mg/L**	0.2	--	--	<0.10	--	<0.10	<0.10	--
Fluoride	**mg/L**	NA	--	--	0.68	--	0.62	0.95	--
Nitrate + Nitrite	**mg/L**	NA	--	--	<0.10	--	<0.10	<0.10	--
Sulfate	**mg/L**	NA	--	--	--	--	--	--	2200

Notes:

***Bold** indicates concentration above SWQS (Surface Water Quality Standard)*

[1] *Jan Ad = January Adit discharge; JA#1 = January Adit Well*

[2] *Designated Uses at Alum Gulch: Aquatic & wildlife warm water, full body contact, fish consumption, and Agricultural Livestock watering.*

[2] *SWQS - standards for cadmium, copper, lead, nickel, zinc based on a maximum hardness of 400 mg/L*

$CaCO_3$ *= calcium carbonate*

°C = degrees Celsius

gpm = gallons per minute

mg/L = milligrams per Liter

µS/cm = microsiemens per centimeter

SU = standard units

mV = millivolts

NA = no applicable standard

TDS = total dissolved solids

TSS = total suspended solids

-- indicates no sample

Duplicate Values separated by a '/'

Analyte	Units	Alum Gulch SWQS (mg/L)	FC-1 12/29/2016	FC-2 12/29/2016	HC-1 12/29/2016	SW-AL1 4/14/2016	SW-AL1 8/15/2016	SW-AL1 11/29/2016	SW-AL1 2/8/2017	SW-AL2 4/14/2016	SW-AL2 8/15/2016	SW-AL2 11/29/2016	SW-AL2 2/8/2017	SW-AL 3 4/14/2016	SW-AL 3 8/15/2016	SW-AL 3 11/29/2016	SW-AL 3 2/8/2017	SW-AL 4 4/14/2016	SW-AL 4 8/15/2016	SW-AL 4 8/15/16 DUP	SW-AL 4 11/29/2016	SW-AL 4 2/8/2017	SW-AL4 2/8/17 DUP
Field Parameters																							
Conductivity	µS/cm	NA	3680	2923	939.8	3541	Pooled water (No sample collected)	DRY	DRY	3334	3030	DRY	DRY	3233	3220	DRY	DRY	2573	2140	2140	375	2820	2820
pH	SU	6.5-9.0	**3.66**	**3.94**	**3.17**	**5.16**				**5.66**	**5.80**			**5.31**	**5.38**			**4.57**	**4.43**	**4.43**	**3.12**	**4.04**	**4.04**
Temperature	°C	NA	10.6	11.5	10.5	21.4				19.8	27.9			21.8	28.7			20.4	23.5	23.5	9.1	6.5	6.5
Flow	gpm	NA	0.025	0.2	0.004	0				3-4	9			3-4	12			7-8	25	25	0.2	1.0	1.0
Dissolved Metals																							
Aluminum	mg/L	NA	--	--	--	5.4	--	--	--	<2.0	<10	--	--	4.0	<10	--	--	24	19	18	--	18.0	16.6
Antimony	mg/L	0.03	<0.00050	<0.00050	<0.00050	<0.0050	--	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	<0.00050	<0.0050	<0.0050	<0.00050
Arsenic	mg/L	0.15	<0.0400	<0.0400	<0.0400	<0.0051	--	--	--	<0.0050	0.0013	--	--	<0.0050	0.0016	--	--	<0.0050	0.0012	0.0013	<0.0050	<0.0050	0.0013
Barium	mg/L	NA	0.05	<0.050	<0.050	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	mg/L	0.0053	0.016	0.0027	0.0026	<0.0025	--	--	--	<0.0025	<0.0013	--	--	<0.0025	0.0019	--	--	0.0029	0.0024	0.0023	0.0031	0.0027	0.0019
Cadmium	mg/L	0.0062	**0.21**	**0.18**	**0.031**	**0.092**	--	--	--	**0.043**	**0.040**	--	--	**0.074**	**0.058**	--	--	**0.074**	**0.084**	**0.083**	**0.11**	**0.20**	**0.18**
Calcium	mg/L	NA	380	350	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	430	320
Chromium	mg/L	1	0.043	<0.030	<0.030	<0.0050	--	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	--	--	<0.0050	0.00054	0.00068	<0.0050	<0.00050	<0.00050
Copper	mg/L	0.50	**2.1**	**0.51**	**3.2**	0.092	--	--	--	0.045	0.040	--	--	**0.16**	0.088	--	--	**0.42**	**0.71**	**0.76**	**0.32**	**0.72**	**0.64**
Iron	mg/L	1.0	**1.7**	0.42	**5.4**	**4.5**	--	--	--	<0.30	<1.5	--	--	<0.30	<1.5	--	--	0.33	**1.3**	**1.3**	0.60	<0.30	<0.30
Lead	mg/L	0.0109	**0.6**	**0.12**	<0.040	**0.68**	--	--	--	**0.058**	**0.027**	--	--	**0.070**	0.050	--	--	**0.18**	**0.13**	**0.12**	**0.13**	**0.11**	**0.1**
Magnesium	mg/L	NA	220	200	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	260	200
Manganese	mg/L	130.667	**190**	59	6.5	100	--	--	--	31	39	--	--	56	55	--	--	54	38	38	72	58	57
Mercury	mg/L	0.00001	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	<0.0010	<0.0010	--	--	<0.0010	<0.0010	--	--	<0.0010	<0.0010	<0.0010	--	--	--
Nickel	mg/L	0.1680	**0.39**	**0.21**	0.073	**0.25**	--	--	--	0.080	0.096	--	--	0.14	0.13	--	--	**0.18**	0.15	0.15	**0.26**	**0.22**	**0.23**
Potassium	mg/L	NA	7.1	6.1	5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/L	NA	<0.040	<0.040	<0.040	0.0073	--	--	--	0.0043	0.0027	--	--	0.0063	0.0032	--	--	0.0051	0.0022	0.0025	0.0071	0.0069	0.0035
Silver	mg/L	0.0349	**0.051**	0.017	<0.010	<0.0050	--	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	<0.00050	<0.0050	<0.0050	<0.00050
Sodium	mg/L	NA	78	72	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	mg/L	0.15	<0.00050	<0.00050	0.00058	<0.025	--	--	--	<0.025	<0.00050	--	--	<0.025	<0.00050	--	--	<0.025	0.00051	<0.00050	<0.0050	<0.0050	<0.0050
Uranium	mg/L	NA	0.014	0.0013	0.0045	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/L	0.379	**76**	**45**	**6.4**	**49**	--	--	--	**26**	**24**	--	--	**32**	**31**	--	--	**34**	**25**	**25**	**45**	**38**	**39**
Total Metals																							
Aluminum	mg/L	NA	--	--	--	5.2	--	--	--	<2.0	<2.0	--	--	3.9	2.6	--	--	21	19	19	--	20.6	20.6
Antimony	mg/L	0.64	--	--	--	<0.0050	--	--	--	<0.0050	0.00080	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	mg/L	0.03	--	--	--	<0.0050	--	--	--	<0.0050	0.0016	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	<0.00050	<0.0025	<0.00050	0.00050
Barium	mg/L	98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	mg/L	0.084	--	--	--	<0.0025	--	--	--	<0.0025	0.00051	--	--	0.0028	0.0017	--	--	0.0030	0.0026	0.0027	0.0029	0.0027	0.0021
Cadmium	mg/L	0.050	--	--	--	**0.11**	--	--	--	**0.052**	0.043	--	--	**0.089**	**0.062**	--	--	**0.085**	**0.089**	**0.090**	**0.110**	**0.19**	**0.18**
Calcium	mg/L	NA	--	--	--	480	--	--	--	410	420	--	--	470	460	--	--	320	230	230	320	320	340
Chromium	mg/L	1	--	--	--	<0.0050	--	--	--	<0.0050	0.0082	--	--	<0.0050	0.0078	--	--	<0.0050	0.0086	0.0083	<0.0025	0.0025	0.0026
Copper	mg/L	0.5	--	--	--	0.098	--	--	--	0.054	0.034	--	--	0.17	0.097	--	--	0.44	**0.74**	**0.73**	0.32	**0.66**	**0.66**
Iron	mg/L	NA	--	--	--	5.1	--	--	--	<0.30	0.74	--	--	<0.30	<0.30	--	--	0.33	1.3	1.4	0.67	<0.30	<0.30
Lead	mg/L	0.015	--	--	--	**0.63**	--	--	--	**0.049**	**0.059**	--	--	**0.068**	**0.046**	--	--	**0.17**	**0.12**	**0.12**	**0.11**	**0.11**	**0.10**
Magnesium	mg/L	NA	--	--	--	280	--	--	--	230	230	--	--	260	250	--	--	190	140	140	210	200	200
Manganese	mg/L	130.667	--	--	--	100	--	--	--	33	34	--	--	54	56	--	--	49	38	39	63	58	61
Mercury	mg/L	0.010	--	--	--	<0.0010	--	--	--	<0.0010	<0.0010	--	--	<0.0010	<0.0010	--	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nickel	mg/L	4.6	--	--	--	0.27	--	--	--	0.094	0.080	--	--	0.15	0.13	--	--	0.19	0.13	0.13	0.23	0.20	0.18
Potassium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/L	0.002	--	--	--	**0.0082**	--	--	--	**0.0050**	0.00089	--	--	**0.0067**	**0.0020**	--	--	**0.0054**	0.00082	0.00084	**0.0037**	**0.0039**	**0.0037**
Silver	mg/L	4.667	--	--	--	<0.0050	--	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Sodium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	mg/L	0.0072	--	--	--	<0.0050	--	--	--	<0.0050	<0.00050	--	--	<0.0050	<0.00050	--	--	<0.0050	0.00052	<0.00050	<0.00050	<0.00050	<0.0050
Uranium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/L	5.106	--	--	--	**50**	--	--	--	**21**	**20**	--	--	**30**	**30**	--	--	**31**	**24**	**24**	**38**	**36**	**38**
Inorganics																							
Nitrogen, Nitrate (as N)	mg/L	NA	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.55	<0.50
Nitrogen, Nitrite (as N)	mg/L	NA	<0.10	<0.10	<0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.10	<0.10
Hardness , Ca/Mg (as $CaCO_3$)	mg/L	NA	--	--	--	2300	--	--	--	2000	2000	--	--	2200	2200	--	--	1600	1100	1200	1700	2200	1600
TSS (residue, non-filterable)	mg/L	NA	--	--	--	41	--	--	--	<10	12	--	--	<10	<10	--	--	<10	<10	<10	<10	<10	<10
TDS (residue, filterable)	mg/L	NA	4100	3100	730	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2800	2800
Anions																							
Chloride	mg/L	NA	13	15.00	8.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	mg/L	0.0097	<0.10	<0.10	<0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	mg/L	140	1.5	0.54	<0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	NA	3200	2100	620	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Bold *indicates concentration above SWQS (Surface Water Quality Standard)*

[1] *Dissolved metals SWQSs: Only the most stringent hardness based calculated SWQS of all applicable designated uses is shown above.*

Designated Uses at Alum Gulch: Aquatic & wildlife warm water, full body contact, fish consumption, and Agricultural Livestock watering.

Designated Uses at Humboldt Canyon (SW-HU-1): Aquatic & wildlife ephemeral, partial body contact.

Hardness based SWQSs calculated using 400 mg/L in Alum Gulch; Humboldt Canyon uses hardness value of the collected sample

$CaCO_3$ = calcium carbonate

µS/cm = microsiemens per centimeter

SU = standard units

°C = degrees Celsius

gpm = gallons per minute

mg/L = milligrams per Liter

NA = no applicable standard

TDS = total dissolved solids

TSS = total suspended solids

-- indicates no data available

CLEAR CREEK ASSOCIATES

Analyte	Units	Humboldt Canyon SWQS (mg/L)	SW-HU 1 4/14/2016	SW-HU 1 8/15/2016	SW-HU 1 11/29/2016	SW-HU 1 2/8/2017
Field Parameters						
Conductivity	µS/cm	NA	DRY	717	DRY	DRY
pH	SU	6.5-9.0		**3.72**		
Temperature	°C	NA		26.0		
Flow	gpm	NA		10		
Dissolved Metals						
Aluminum	mg/L	NA	--	27	--	--
Antimony	mg/L	NA	--	<0.00050	--	--
Arsenic	mg/L	0.44	--	0.00068	--	--
Barium	mg/L	NA	--	NA	--	--
Beryllium	mg/L	NA	--	0.0020	--	--
Cadmium	mg/L	0.072	--	0.050	--	--
Calcium	mg/L	NA	--	--	--	--
Chromium	mg/L	NA	--	0.0021	--	--
Copper	mg/L	0.1506	--	**1.8**	--	--
Iron	mg/L	0.1	--	**0.59**	--	--
Lead	mg/L	0.1512	--	0.042	--	--
Magnesium	mg/L	NA	--	--	--	--
Manganese	mg/L	NA	--	4.4	--	--
Mercury	mg/L	0.005	--	<0.0010	--	--
Nickel	mg/L	0.1512	--	0.067	--	--
Potassium	mg/L	NA	--	--	--	--
Selenium	mg/L	NA	--	0.00070	--	--
Silver	mg/L	0.0038	--	<0.00050	--	--
Sodium	mg/L	NA	--	--	--	--
Thallium	mg/L	NA	--	0.00075	--	--
Uranium	mg/L	2.8	--	--	--	--
Zinc	mg/L	3.599	--	**5.3**	--	--
Total Metals						
Aluminum	mg/L	NA	--	26	--	--
Antimony	mg/L	0.747	--	<0.00050	--	--
Arsenic	mg/L	0.03	--	<0.00050	--	--
Barium	mg/L	98	--	--	--	--
Beryllium	mg/L	1.867	--	0.0022	--	--
Cadmium	mg/L	0.07	--	0.052	--	--
Calcium	mg/L	NA	--	17	--	--
Chromium	mg/L	NA	--	0.012	--	--
Copper	mg/L	1.3	--	**1.8**	--	--
Iron	mg/L	NA	--	0.57	--	--
Lead	mg/L	0.015	--	**0.028**	--	--
Magnesium	mg/L	NA	--	16	--	--
Manganese	mg/L	130.667	--	4.1	--	--
Mercury	mg/L	0.28	--	<0.0010	--	--
Nickel	mg/L	28	--	0.065	--	--
Potassium	mg/L	NA	--	--	--	--
Selenium	mg/L	0.033	--	<0.0025	--	--
Silver	mg/L	4.667	--	<0.00050	--	--
Sodium	mg/L	NA	--	--	--	--
Thallium	mg/L	0.075	--	0.00064	--	--
Uranium	mg/L	2.8	--	--	--	--
Zinc	mg/L	280	--	5.1	--	--
Inorganics						
Nitrogen, Nitrate (as N)	mg/L	NA	--	--	--	--
Nitrogen, Nitrite (as N)	mg/L	NA	--	--	--	--
Hardness , Ca/Mg (as $CaCO_3$)	mg/L	NA	--	110	--	--
TSS (residue, non-filterable)	mg/L	NA	--	<10	--	--
TDS (residue, filterable)	mg/L	NA	--	--	--	--
Anions						
Chloride	mg/L	NA	--	--	--	--
Cyanide	mg/L	0.084	--	--	--	--
Fluoride	mg/L	140	--	--	--	--
Sulfate	mg/L	NA	--	--	--	--

Notes:
Bold *indicates concentration above SWQS (Surface Water Quality Standard)*
[1] *Dissolved metals SWQSs: Only the most stringent hardness based calculated SWQS of all applicable designated uses is shown above.*
Designated Uses at Alum Gulch: Aquatic & wildlife warm water, full body contact, fish consumption, and Agricultural Livestock watering.
Designated Uses at Humboldt Canyon (SW-HU-1): Aquatic & wildlife ephemeral, partial body contact.
Hardness based SWQSs calculated using 400 mg/L in Alum Gulch; Humboldt Canyon uses hardness value of the collected sample
$CaCO_3$ = calcium carbonate
µS/cm = microsiemens per centimeter
SU = standard units
°C = degrees Celsius
gpm = gallons per minute
mg/L = milligrams per Liter
NA = no applicable standard
TDS = total dissolved solids
TSS = total suspended solids
-- indicates no data available

Harshaw Creek Surface Water Quality

Analyte	Units	SWQS[1,2]	SW-HA 1	SW-HA 1	SW-HA 1	SW-HA 1	SW-HA 2	SW-HA 2	SW-HA 2	SW-HA 2	SW-HA 3	SW-HA 3	SW-HA 3	SW-HA 3	SW-HA 4	SW-HA 4	SW-HA 4	SW-HA 4	SW-HA 5	SW-HA 5	SW-HA 5	SW-HA 5	SW-HA 6	SW-HA 6	SW-HA 6	SW-HA 6
		(mg/L)	4/14/2016	8/15/2016	11/29/2016	2/8/2017	4/14/2016	8/15/2016	11/29/2016	2/8/2017	4/14/2016	8/15/2016	11/29/2016	2/8/2017	4/14/2016	8/15/2016	11/29/2016	2/8/2017	4/14/2016	8/15/2016	11/29/2016	2/8/2017	8/15/2016	11/29/2016	11/29/16 DUP	2/8/2017
Field Parameters																										
Conductivity	µS/cm	NA									1802	1043	1416	1636					1435	942	1308	1519	1677	1448	1448	1633
pH	SU	6.5-9.0	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	6.95	7.20	7.47	7.42	DRY	DRY	DRY	DRY	6.87	7.71	7.33	8.04	7.25	6.88	6.88	7.29
Temperature	°C	NA									21.1	24.2	11.8	6.9					18.4	25.2	14.1	8.6	22.6	10.3	10.3	10.1
Flow	gpm	NA	0	0	0	0	0	0	0	0	15	4	25	2	0	0	0	0	4-5	40	15	0.2	5	15	15	3
Dissolved Metals																										
Aluminum	mg/L	NA	--	--	--	--	--	--	--	--	<2.0	<10	--	<0.0400	--	--	--	--	<2.0	<2.0	--	<0.0400	<10	--	--	<0.0400
Antimony	mg/L	NA	--	--	--	--	--	--	--	--	0.0010	0.0014	<0.0050	0.00054	--	--	--	--	0.0028	0.0024	<0.0050	0.0020	0.0037	<0.0050	<0.0050	0.0035
Arsenic	mg/L	0.28	--	--	--	--	--	--	--	--	0.0027	0.0035	<0.0050	0.0026	--	--	--	--	0.0038	0.0054	<0.0050	0.0031	0.0029	<0.0050	<0.0050	0.0021
Barium	mg/L	98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	mg/L	1.867	--	--	--	--	--	--	--	--	<0.00025	<0.00025	<0.00025	<0.00025	--	--	--	--	<0.00025	<0.00025	<0.00025	<0.00025	<0.00050	<0.00025	<0.00025	<0.00025
Cadmium	mg/L	0.290	--	--	--	--	--	--	--	--	<0.00025	0.00025	<0.0025	<0.00025	--	--	--	--	<0.00025	<0.00025	<0.0025	<0.00025	0.00037	<0.0025	<0.0025	<0.00050
Calcium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	270	--	--	--	--	--	--	--	240	--	--	--	280
Chromium	mg/L	NA	--	--	--	--	--	--	--	--	0.0016	0.00059	<0.00050	<0.00050	--	--	--	--	0.0011	0.00096	<0.00050	<0.00050	0.0010	<0.0050	<0.0050	<0.0010
Copper	mg/L	0.08588	--	--	--	--	--	--	--	--	0.0014	0.0031	0.0014	0.00081	--	--	--	--	0.0016	0.0019	0.0016	0.00097	0.0026	0.0017	0.0019	0.0011
Iron	mg/L	NA	--	--	--	--	--	--	--	--	<0.30	<1.5	<0.30	<0.30	--	--	--	--	<0.30	<0.30	<0.30	<0.30	<1.5	<0.30	<0.30	<0.30
Lead	mg/L	0.5927	--	--	--	--	--	--	--	--	<0.00050	<0.00050	<0.0050	<0.00050	--	--	--	--	0.00068	0.0033	<0.0050	<0.00050	0.0011	<0.0050	<0.0050	<0.00050
Magnesium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	42	--	--	--	--	--	--	--	45	--	--	--	44
Manganese	mg/L	130.7	--	--	--	--	--	--	--	--	0.11	0.038	0.11	0.085	--	--	--	--	0.022	0.025	0.020	0.016	0.030	0.073	0.062	0.0056
Mercury	mg/L	0.28	--	--	--	--	--	--	--	--	<0.0010	<0.0010	--	--	--	--	--	--	<0.0010	<0.0010	--	--	<0.0010	--	--	--
Nickel	mg/L	13.436	--	--	--	--	--	--	--	--	0.011	0.014	0.017	0.0078	--	--	--	--	0.0092	0.0062	0.012	0.0070	0.015	0.0096	0.0099	0.0081
Potassium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/L	4.667	--	--	--	--	--	--	--	--	0.0023	0.0013	<0.025	0.0012	--	--	--	--	0.0017	0.0013	<0.025	0.0011	0.0032	<0.025	<0.025	0.0015
Silver	mg/L	0.0349	--	--	--	--	--	--	--	--	<0.00050	<0.00050	<0.0050	<0.00050	--	--	--	--	<0.00050	<0.00050	<0.0050	<0.00050	<0.00050	<0.0050	<0.0050	<0.0010
Sodium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	mg/L	0.075	--	--	--	--	--	--	--	--	<0.0050	<0.00050	<0.0050	<0.00050	--	--	--	--	<0.00050	<0.00050	<0.0050	<0.00050	<0.00050	<0.0050	<0.0050	<0.00050
Uranium	mg/L	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/L	3.599	--	--	--	--	--	--	--	--	<0.040	<0.20	0.048	<0.040	--	--	--	--	<0.040	<0.040	<0.040	<0.040	<0.20	0.055	0.048	0.069
Total Metals																										
Aluminum	mg/L	NA	--	--	--	--	--	--	--	--	<2.0	<2.0	--	0.282	--	--	--	--	<2.0	<2.0	--	0.0896	<2.0	--	--	0.535
Antimony	mg/L	0.747	--	--	--	--	--	--	--	--	0.0010	0.0018	0.00065	0.00068	--	--	--	--	0.0028	0.0025	0.0020	0.0019	0.0036	0.0014	0.0014	0.0037
Arsenic	mg/L	0.28	--	--	--	--	--	--	--	--	<0.0050	0.0034	<0.0025	0.0029	--	--	--	--	0.0052	0.0037	0.0037	0.0022	0.0014	<0.0025	<0.0025	0.0024
Barium	mg/L	98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	mg/L	1.867	--	--	--	--	--	--	--	--	<0.0025	<0.00025	<0.00025	<0.0013	--	--	--	--	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.0013	<0.0013	<0.00025
Cadmium	mg/L	0.7	--	--	--	--	--	--	--	--	<0.00025	0.00031	<0.00025	<0.00025	--	--	--	--	<0.00025	<0.00025	<0.00025	<0.00025	0.00036	<0.00025	<0.00025	<0.00025
Calcium	mg/L	NA	--	--	--	--	--	--	--	--	300	320	280	300	--	--	--	--	270	150	260	250	340	340	290	300
Chromium	mg/L	NA	--	--	--	--	--	--	--	--	0.00099	0.0077	<0.0025	0.0027	--	--	--	--	0.0012	0.0065	<0.0025	0.0026	0.0067	0.0034	<0.0025	0.0040
Copper	mg/L	1.3	--	--	--	--	--	--	--	--	<0.0050	0.0097	0.0037	0.0060	--	--	--	--	<0.0050	0.0053	0.0065	0.0015	0.0061	<0.0025	<0.0025	0.0068
Iron	mg/L	NA	--	--	--	--	--	--	--	--	<0.30	0.78	<0.30	0.76	--	--	--	--	<0.30	<0.30	0.49	<0.30	<0.30	<0.30	<0.30	0.98
Lead	mg/L	0.015	--	--	--	--	--	--	--	--	<0.0050	0.020	0.0010	0.0048	--	--	--	--	<0.0050	0.0044	0.018	0.0012	0.0050	0.0017	0.0022	0.0035
Magnesium	mg/L	NA	--	--	--	--	--	--	--	--	44	48	39	45	--	--	--	--	51	30	50	49	54	43	44	48
Manganese	mg/L	130.7	--	--	--	--	--	--	--	--	0.057	0.12	0.11	0.14	--	--	--	--	0.024	0.072	0.17	0.023	0.081	0.051	0.062	0.078
Mercury	mg/L	0.28	--	--	--	--	--	--	--	--	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nickel	mg/L	28	--	--	--	--	--	--	--	--	0.018	0.019	0.011	0.0082	--	--	--	--	0.016	0.012	0.010	0.0078	0.019	0.011	0.011	0.010
Potassium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/L	4.667	--	--	--	--	--	--	--	--	0.0017	0.0013	0.0012	0.0010	--	--	--	--	0.0014	0.00079	0.00080	0.00075	0.0021	0.0012	0.0010	0.0019
Silver	mg/L	4.667	--	--	--	--	--	--	--	--	<0.00050	<0.00050	<0.00050	<0.00050	--	--	--	--	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Sodium	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	mg/L	0.075	--	--	--	--	--	--	--	--	<0.0050	<0.00050	<0.00050	<0.00050	--	--	--	--	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium	mg/L	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/L	280	--	--	--	--	--	--	--	--	<0.040	0.049	0.048	<0.040	--	--	--	--	<0.040	<0.040	<0.040	<0.040	0.093	0.042	0.048	0.088
Inorganics																										
Nitrogen, Nitrate (as N)	mg/L	3733	--	--	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	--	--	--	<0.50	--	--	--	0.52
Nitrogen, Nitrite (as N)	mg/L	233	--	--	--	--	--	--	--	--	--	--	--	<0.10	--	--	--	--	--	--	--	<0.10	--	--	--	<0.10
Hardness , Ca/Mg (as $CaCO_3$)	mg/L	NA	--	--	--	--	--	--	--	--	930	990	860	850	--	--	--	--	880	500	860	790	1100	1000	900	880
TSS (residue, non-filterable)	mg/L	NA	--	--	--	--	--	--	--	--	<10	18	<10	39	--	--	--	--	<10	<10	14	<10	<10	<10	<10	33
TDS (residue, filterable)	mg/L	NA	--	--	--	--	--	--	--	--	--	--	--	1400	--	--	--	--	--	--	--	1300	--	--	--	1400

Notes:

Bold *indicates concentration above SWQS (Surface Water Quality Standard)*

[1] *Dissolved metals SWQSs: Aquatic and Wildlife ephemeral (A&We) use. Hardness based standards (for dissolved cadmium copper, lead, nickel, silver, and zinc)are based on 400 mg/L hardness of the sample.*

[2] *Partial Body Contact (PBC) standard applies to total metals*

$CaCO_3$ = calcium carbonate
µS/cm = microsiemens per centimeter
SU = standard units
°C = degrees Celsius
gpm = gallons per minute
mg/L = milligrams per Liter
TDS = total dissolved solids
TSS = total suspended solids
NA = no applicable standard
-- indicates no data available

CLEAR CREEK ASSOCIATES

TABLE 3
MW-3 Groundwater Quality

Analyte	Units	AWQS (mg/L)	2/7/2017	4/17/2017
Field Parameters				
Conductivity	µS/cm	NA	2960	3191
pH	SU	NA	7.98	7.09
Temperature	°C	NA	19.8	19.7
Dissolved Metals				
Aluminum	mg/L	NA	<2.0	--
Antimony	mg/L	0.006	<0.00050	<0.00050
Arsenic	mg/L	0.05	0.0064	0.0087
Barium	mg/L	2	0.027	0.022
Beryllium	mg/L	0.004	<0.00025	0.00043
Cadmium	mg/L	0.005	**0.0051**	0.0044
Calcium	mg/L	NA	570	--
Chromium	mg/L	0.1	0.00053	<0.0050
Copper	mg/L	NA	0.00080	--
Iron	mg/L	NA	<0.30	--
Lead	mg/L	0.05	<0.0050	<0.00050
Magnesium	mg/L	NA	210	--
Manganese	mg/L	NA	24	--
Mercury	mg/L	0.002	<0.000094	<0.000094
Nickel	mg/L	0.1	0.070	0.071
Selenium	mg/L	0.05	0.0021	0.0065
Silver	mg/L	NA	<0.00050	--
Thallium	mg/L	0.002	<0.0050	<0.00050
Zinc	mg/L	NA	4.7	--
Total Metals				
Aluminum	mg/L		<2.0	--
Antimony	mg/L		<0.00050	<0.00050
Arsenic	mg/L		0.0061	0.0068
Barium	mg/L		0.033	0.026
Beryllium	mg/L		0.00066	0.00052
Cadmium	mg/L		0.0065	0.0042
Calcium	mg/L		580	520
Chromium	mg/L		0.0016	0.0066
Copper	mg/L		0.0011	--
Iron	mg/L		1.8	--
Lead	mg/L		0.00059	0.0027
Magnesium	mg/L		220	200
Manganese	mg/L		24	--
Mercury	mg/L		<0.00094	<0.000094
Nickel	mg/L		0.059	0.080
Selenium	mg/L		0.0021	0.0046
Silver	mg/L		<0.00050	--
Thallium	mg/L		<0.00050	<0.00050
Zinc	mg/L		5.8	--
Inorganics				
Hardness, Ca/Mg (as $CaCO_3$)	mg/L	NA	2300	--
Nitrogen, Nitrate (as N)	mg/L	10	<0.50	<0.50
Nitrogen, Nitrite (as N)	mg/L	1	<0.10	<0.10
TDS (residue, filterable)	mg/L	NA	3300	--
TSS (residue, non-filterable)	mg/L	NA	<10	--
Anions				
Cyanide	mg/L	0.2	<0.10	<0.10
Fluoride	mg/L	4	0.80	0.85
Sulfate	mg/L	NA	--	2100
Radionuclides				
Uranium-234	µg/L	NA	0.00015 ± 0.00004	--
Uranium-235	µg/L	NA	0.010 ± 0.001	--
Uranium-238	µg/L	NA	1.4 ± 0.5	--
Uranium Activity (U^{234}, U^{235}, U^{238})	pCi/L	NA	1.4 ± 0.5	--
Radium-226	pCi/L	NA	0.7 ± 0.2	<0.3
Radium-228	pCi/L	NA	<0.6	<0.6
Total Radium Activity	pCi/L	5	0.7 ± 0.2	<0.6
Gross Alpha Activity	pCi/L	15	--	3.3 ± 1.2

Notes:

Bold *indicates concentration above AWQS (Aquifer Water Quality Standard)*

$CaCO_3$ = calcium carbonate

°C = degrees Celsius

mg/L = milligrams per Liter

NA = no applicable standard

SU = standard units

TDS = total dissolved solids

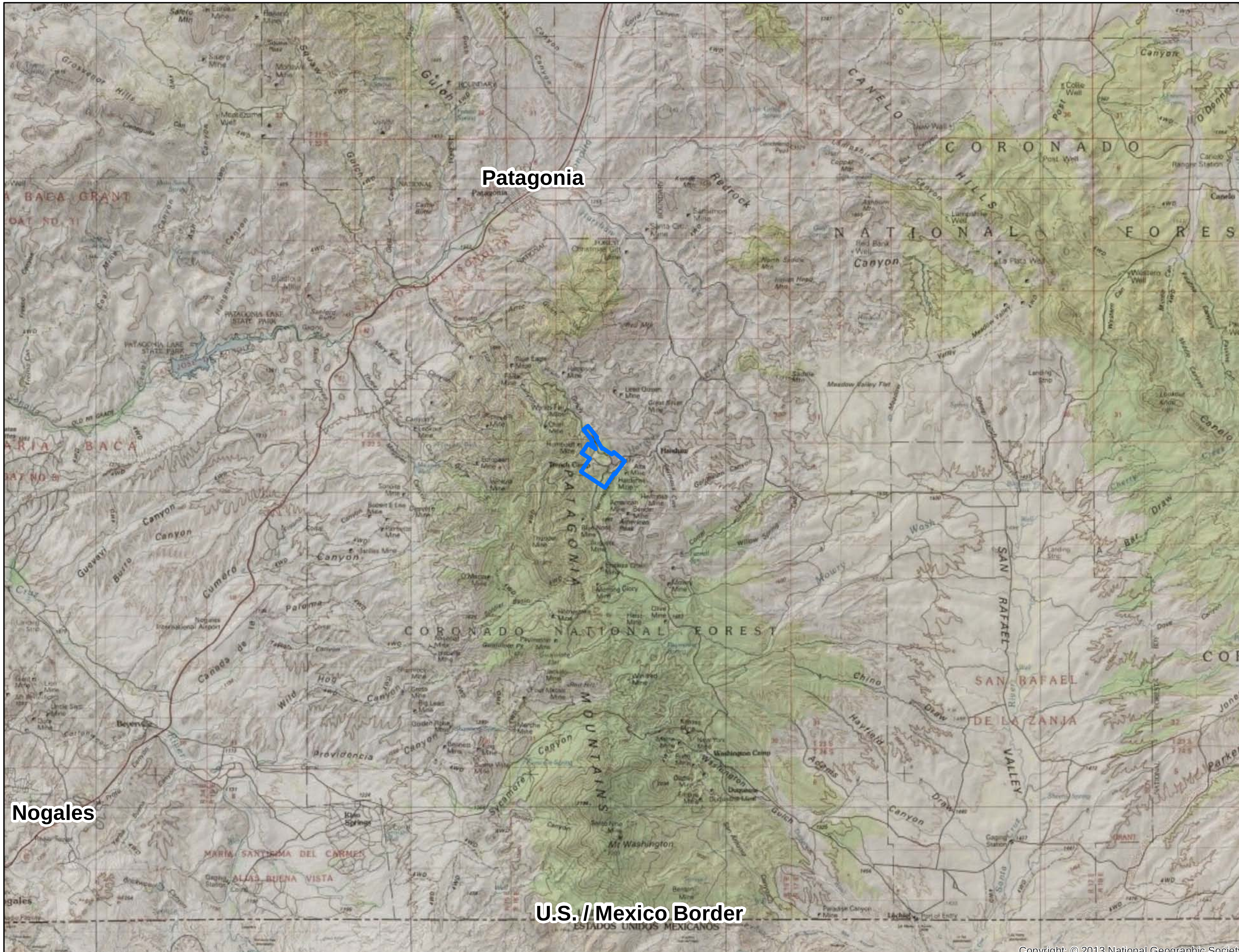
TSS = total suspended solids

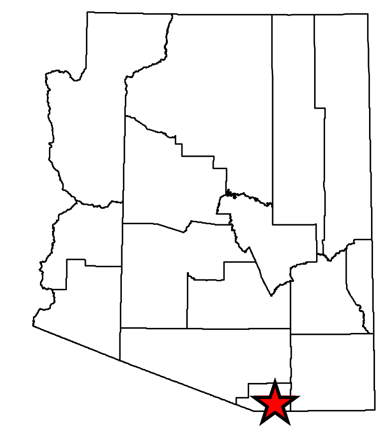
µS/cm = microsiemens per centimeter

-- indicates no data available

CLEAR CREEK ASSOCIATES

FIGURES





Legend

Project Area

0 1 2 4

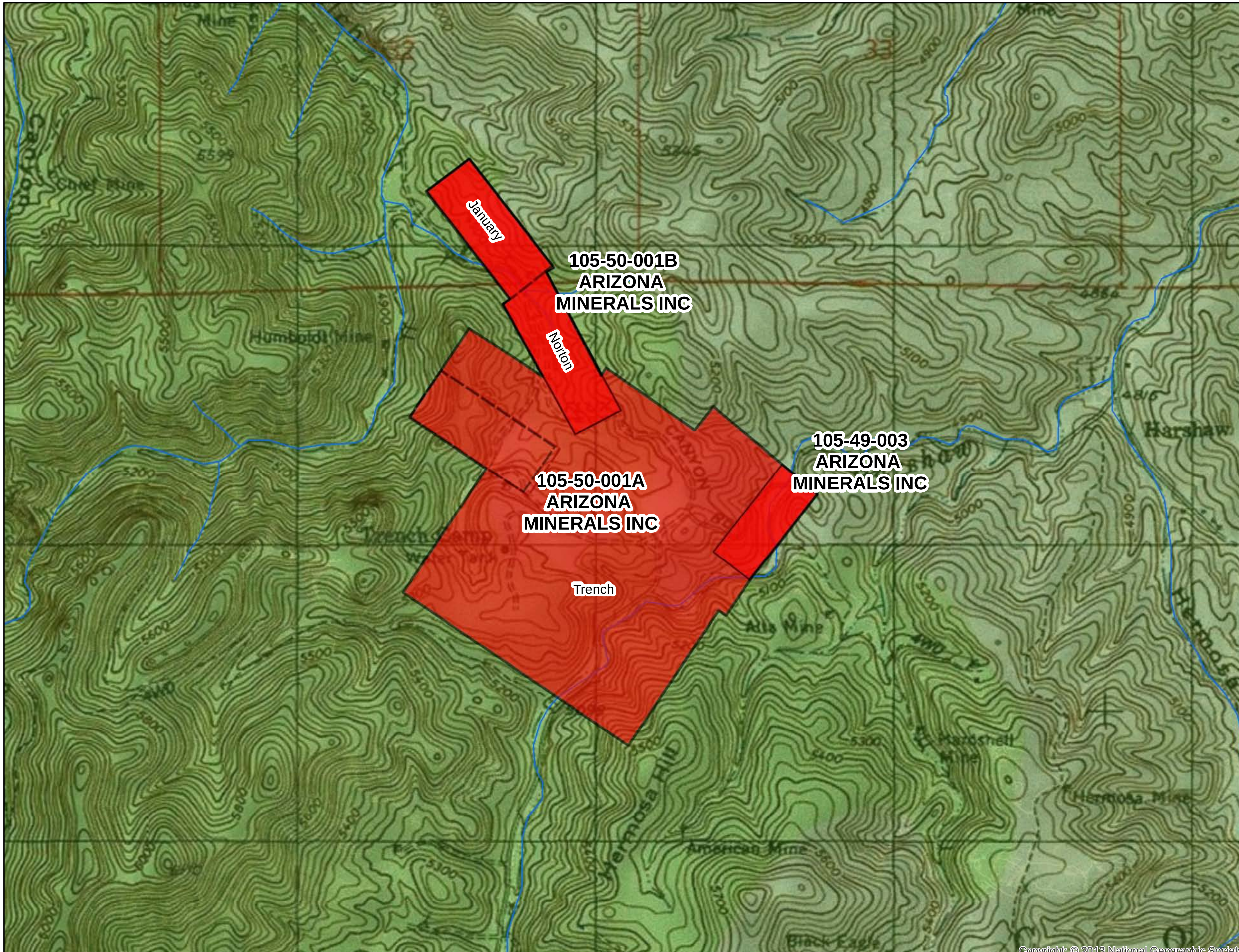
Miles

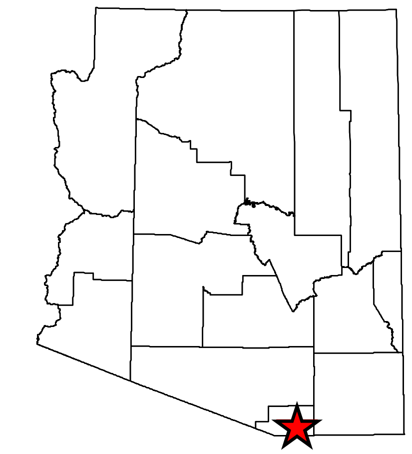
Projection: UTM Zone 12N NAD83

Date	File ID
3/3/2017	AZM-019

CLEAR CREEK ASSOCIATES

FIGURE 1
Project Location
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505143-02





Legend

January / Norton / Trench Claims

Source: https://gis.santacruzcountyaz.gov/arcgis/rest/services/ParcelSearch/Parcels/MapServer

0 500 1,000 2,000

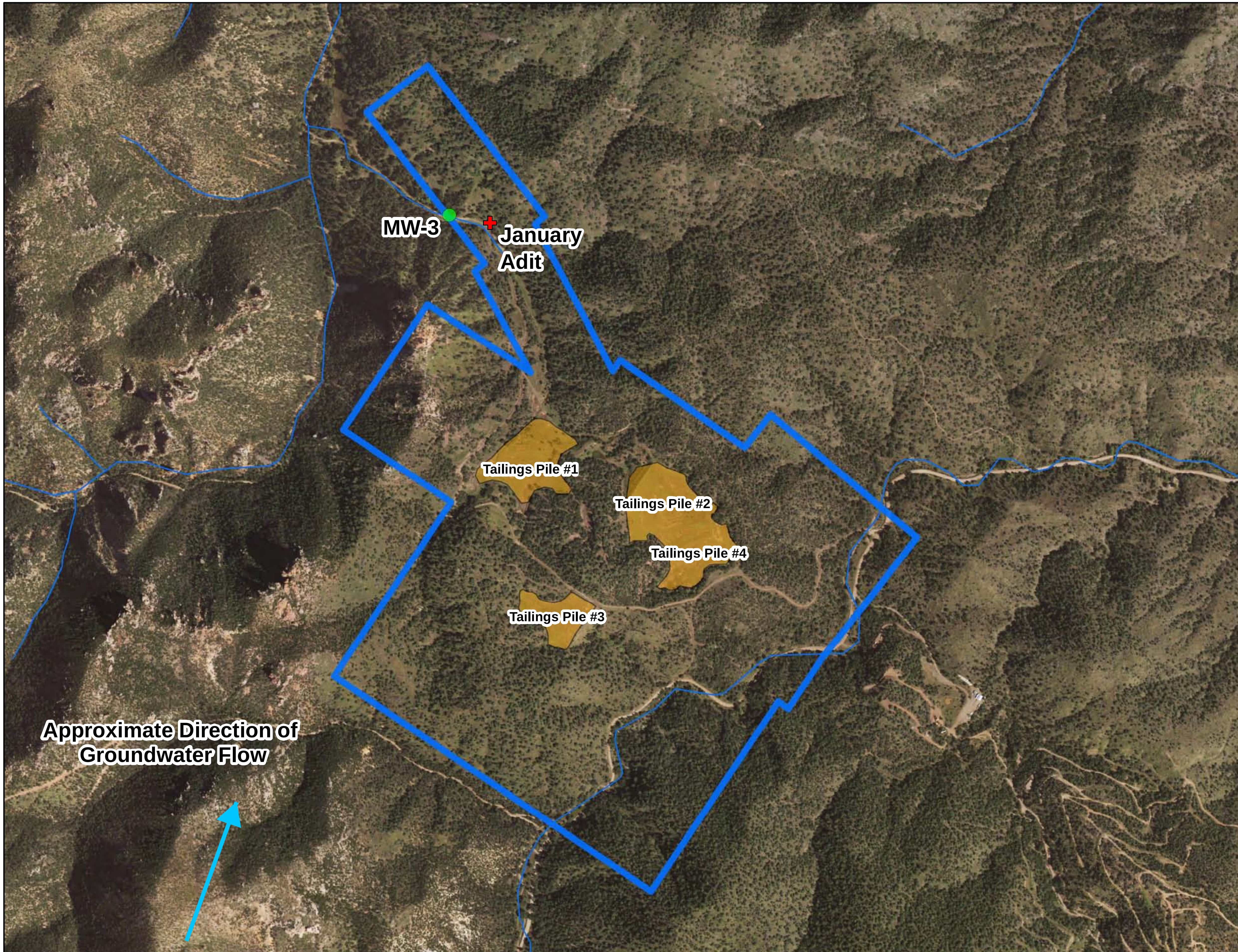
Feet

Projection: UTM Zone 12N NAD83

Date	File ID
3/3/2017	AZM-014

CLEAR CREEK ASSOCIATES

FIGURE 2
January, Norton, Trench
Claim Locations
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505143-02



Legend
- Project Area
- Existing Tailings Storage Facilities
- MW-3
- Location of January Adit

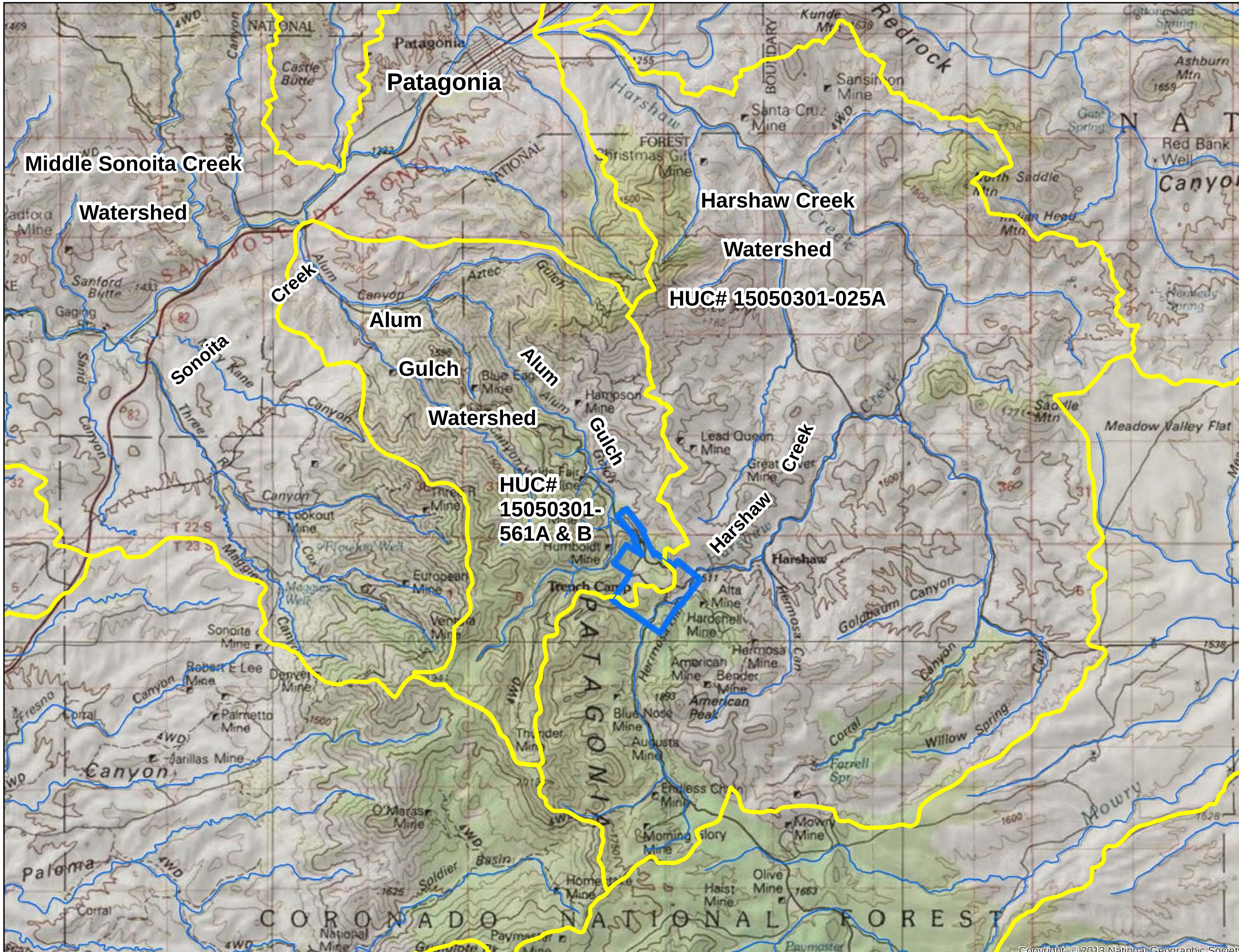
0 375 750 1,500
Feet

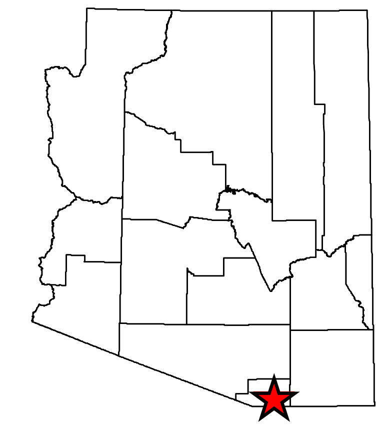
Projection: UTM Zone 12N NAD83

Date	File ID
4/24/17	AZM-013

CLEAR CREEK ASSOCIATES

FIGURE 3
Site Plan
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505143-02





Legend

- Project Area
- Stream / River Channels
- Watershed Divide

Source: https://prd-tnm.s3.amazonaws.com/StagedProducts/Hydrography/NHD/HU8/HighResolution/Shape/NHD_H_15050301_Shape.zip

0 0.5 1 2

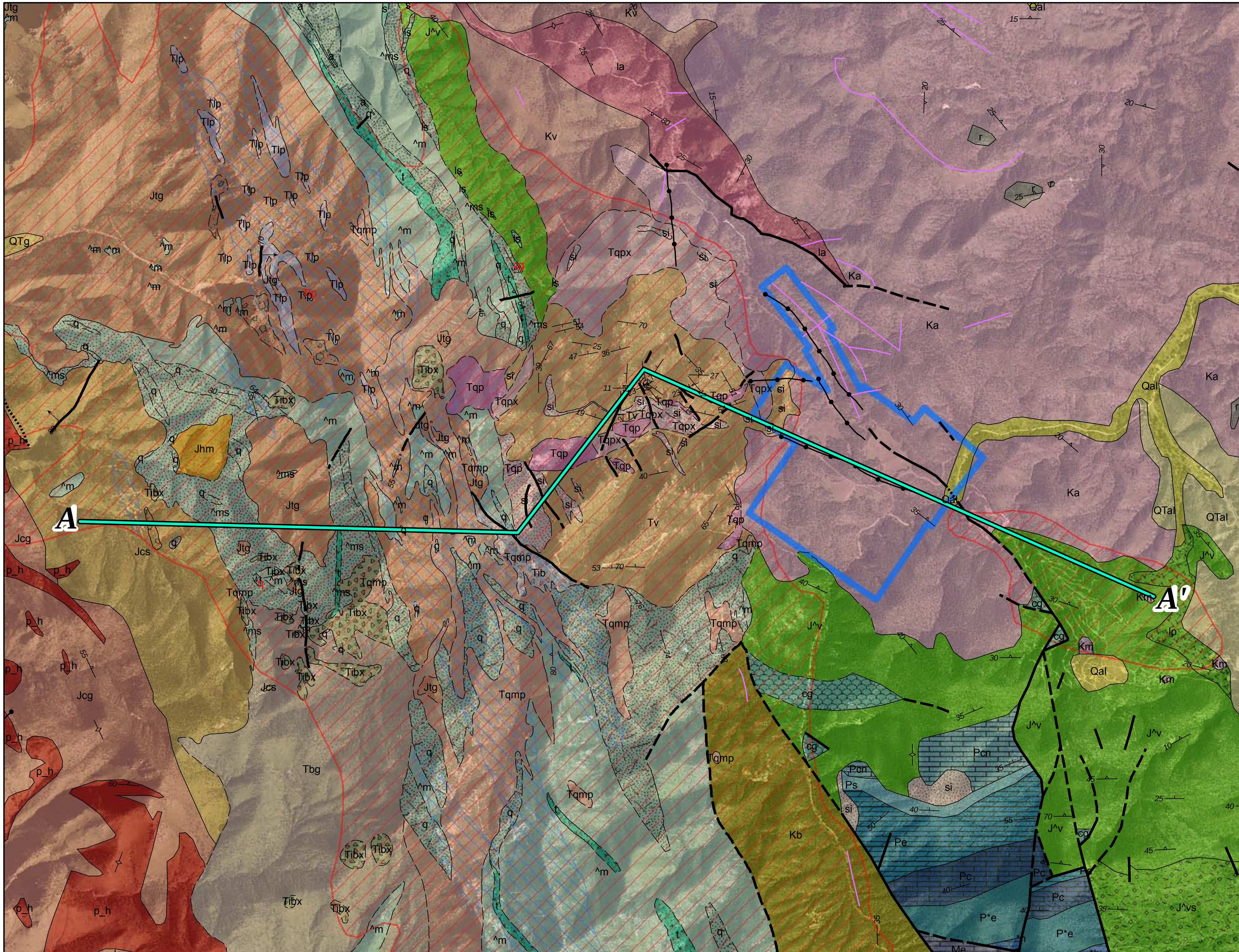
Miles

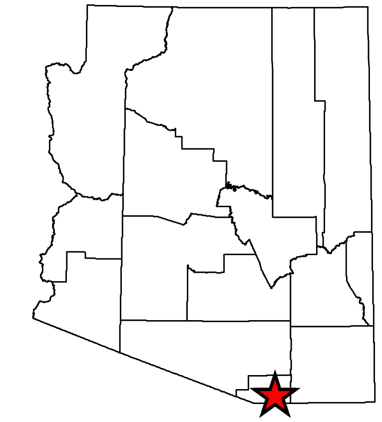
Projection: UTM Zone 12N NAD83

Date	File ID
4/24/17	AZM-012

CLEAR CREEK ASSOCIATES

FIGURE 4
Watershed Boundaries
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505143-02





Legend

- Project Area
- Geologic Cross Section Line

Note: Additional Legend items available on separate page

0 1,000 2,000 4,000

Feet

Projection: UTM Zone 12N NAD83

Source: Graybeal, F.T., Moyer, L.A., Vikre, P.G., Dunlap, P., and Wallis, J.C., 2015, Geologic map of the Patagonia Mountains, Santa Cruz County, Arizona: U.S. Geological Survey Open-File Report 2015–1023, 10 p., 1 sheet, scale 1:48,000, https://doi.org/10.3133/ofr20151023. ISSN 2331-1258 (online)

Date	File ID
3/3/2017	AZM-023

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FIGURE 5
Geologic Map
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505143-02

Legend

Project Area

Contacts, faults, folds, and linear units

- linear units
- contact, certain
- contact, dashed where approximately located
- contact, dotted where concealed
- fault, certain
- fault, dashed where approximately located
- fault, dotted where concealed
- thrust fault, certain
- anticline
- vein
- Extent of mapped area

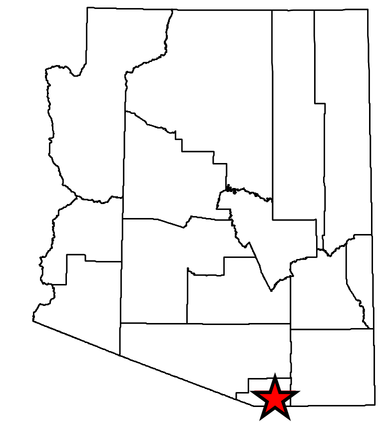
Shear zones

Pyrite zones

Map units

Symbol, Unit name

- Qal—Younger alluvium and talus
- QTal—Older alluvium
- QTg—Gravel and conglomerate
- Tl—Limestone
- Tt—Biotite rhyolite tuff
- si—Silicification
- Tv—Volcaniclastic rocks of middle Alum Gulch
- Tib—Intrusive breccia of middle Alum Gulch
- Tqp—Quartz feldspar porphyry of middle Alum Gulch
- Tqpx—Xenolithic quartz feldspar porphyry of middle Alum Gulch
- Tqmp—Quartz monzonite porphyry, in granodiorite of the Patagonia Mountains
- Tqmpb—Breccia, in quartz monzonite porphyry (unit Tqmp) of granodiorite of the Patagonia Mountains
- Tg—Granodiorite, in granodiorite of the Patagonia Mountains
- Tgb—Breccia, in granodiorite (unit Tg) of granodiorite of the Patagonia Mountains
- Tlp—Latite porphyry, in granodiorite of the Patagonia Mountains
- Tbq—Biotite quartz monzonite, in granodiorite of the Patagonia Mountains
- Tbqb—Breccia, in biotite quartz monzonite (unit Tbq) of granodiorite of the Patagonia Mountains
- Tbg—Biotite granodiorite, in granodiorite of the Patagonia Mountains
- Tibx—Intrusion breccia, in granodiorite of the Patagonia Mountains
- Tsy—Syenodiorite or mangerite, in granodiorite of the Patagonia Mountains
- Tag—Biotite augite quartz diorite, in granodiorite of the Patagonia Mountains
- Tmp—Quartz monzonite porphyry of Red Mountain
- TKr—Rhyolite of Red Mountain
- TKggt—Gringo Gulch Volcanics
- Ka—Trachyandesite
- r—Rhyolite or latite, in trachyandesite (unit Ka)
- Km—Pyroxene monzonite
- Kl—Biotite quartz latite(?)
- Kv—Silicic volcanics
- la—Biotite latite(?), in silicic volcanics (unit Kv)
- Kpg—Porphyritic biotite granodiorite
- Kb—Bisbee Formation
- Kbc—Conglomerate, in Bisbee Formation (unit Kb)
- Jtg—Granite of Three R Canyon, in granite of Cumero Canyon
- Jtgb—Breccia, in granite of Three R Canyon (unit Jtg) of granite of Cumero Canyon
- Jcm—Porphyritic granite, in granite of Cumero Canyon
- Jcs—Equigranular alkali syenite, in granite of Cumero Canyon
- Jcsb—Breccia, in equigranular alkalik syenite (unit Jcs) of granite of Cumero Canyon
- Jcg—Equigranular granite, in granite of Cumero Canyon
- Jcgb—Breccia, in equigranular granite (unit Jcg) of granite of Cumero Canyon
- Jhm—Hornblende monzonite of European Canyon
- JTRv—Volcanic rocks, in silicic volcanic rocks
- ha—Hornblende andesite dike and (or) plug, in volcanic rocks (unit JTRv)
- b—Volcanic breccia, in volcanic rocks (unit JTRv)
- s—Sedimentary rocks, in volcanic rocks (unit JTRv)
- cg—Limestone conglomerate, in volcanic rocks (unit JTRv)
- qz—Quartzite, in volcanic rocks (unit JTRv)
- ls—Exotic blocks of upper Paleozoic limestone, in volcanic rocks (unit JTRv)
- w—Rhyolitic welded(?) tuff, in volcanic rocks (unit JTRv)
- lp—Latite(?) porphyry, in volcanic rocks (JTRv)
- JTRvs—Volcanic and sedimentary rocks, in silicic volcanic rocks
- TRm—Mount Wrightson Formation
- q—Quartzite, in Mount Wrightson Formation (unit TRm)
- a—Biotite(?)-albite andesite lava(?), in Mount Wrightson Formation (unit TRm)
- t—Coarse volcaniclastic beds, in Mount Wrightson Formation (unit TRm)
- TRms—Sedimentary rocks, in the Mount Wrightson Formation (unit TRm)
- Pcn—Concha Limestone
- Ps—Scherrer Formation
- Pe—Epitaph Dolomite
- Pc—Colina Limestone
- PPe—Earp Formation
- Ph—Horquilla Limestone
- Me—Escabrosa Limestone
- Dm—Martin Limestone
- Ca—Abrigo Limestone
- Cb—Bolsa Quartzite
- pCq—Biotite or biotite-hornblende quartz monzonite
- pCh—Hornblende-rich metamorphic and igneous rocks
- pCm—Biotite quartz monzonite
- pCd—Hornblende diorite

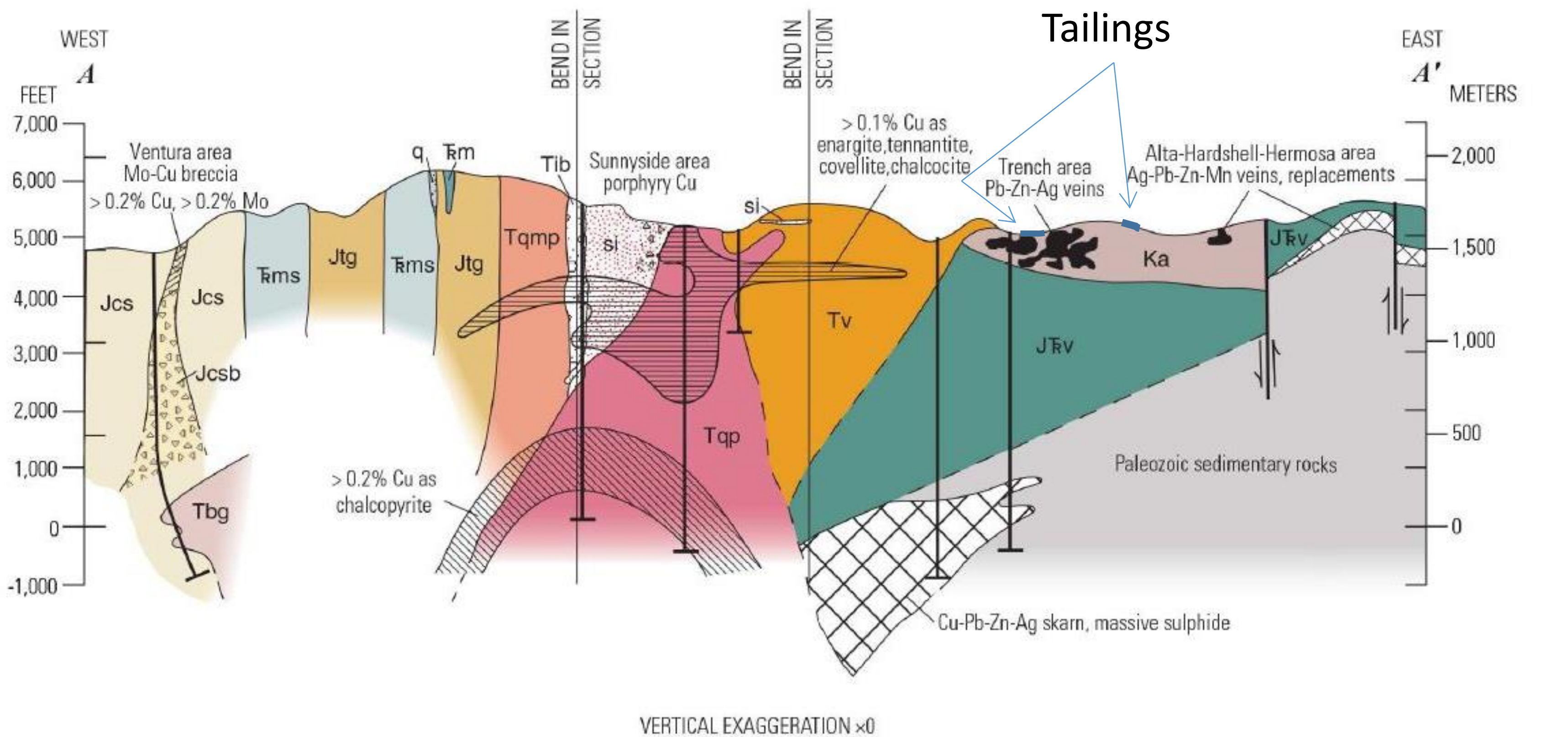


Source: Graybeal, F.T., Moyer, L.A., Vikre, P.G., Dunlap, P., and Wallis, J.C., 2015, Geologic map of the Patagonia Mountains, Santa Cruz County, Arizona: U.S. Geological Survey Open-File Report 2015–1023, 10 p., 1 sheet, scale 1:48,000, https://dx.doi.org/10.3133/ofr20151023. ISSN 2331-1258 (online)

Date	File ID
3/3/2017	AZM-023

CLEAR CREEK ASSOCIATES

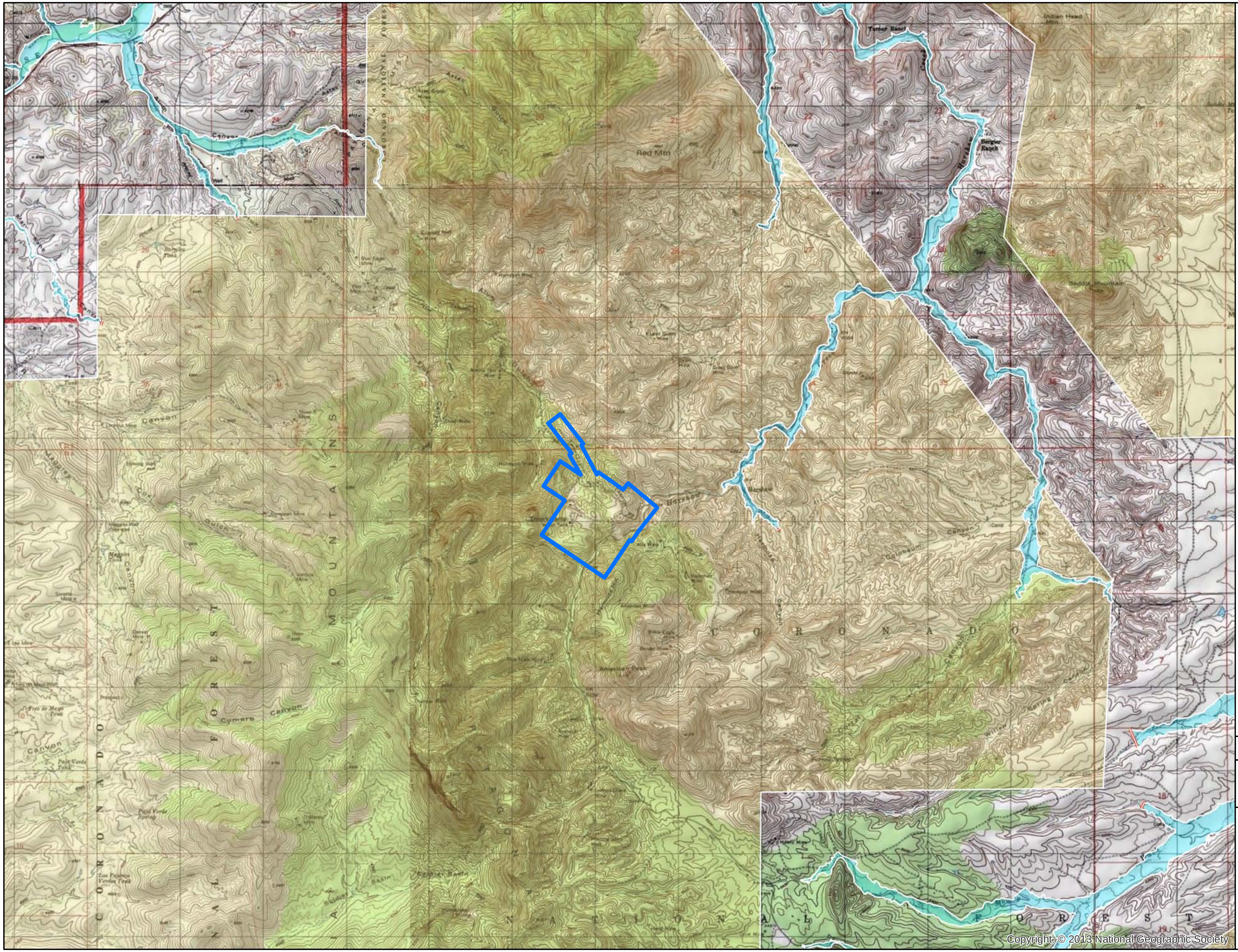
FIGURE 5
Legend
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505143-02

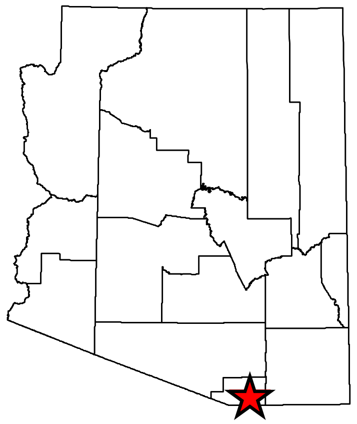


Source: Graybeal, F.T., Moyer, L.A., Vikre, P.G., Dunlap, P., and Wallis, J.C., 2015

CLEAR CREEK ASSOCIATES	File ID	AZM-024
	Date	3/3/2017

FIGURE 6
Cross Section A – A'





Legend

- Project Area
- 1% Annual Chance Flood Hazard
- Area Of Undetermined Flood Hazard

Source: FEMA 2011 FIRM Flood Insurance Rate Map
Map # 04023C0525C
http://hazards.fema.gov/gis/nfhl/services/public/NFHLWMS/MapServer/WMSServer

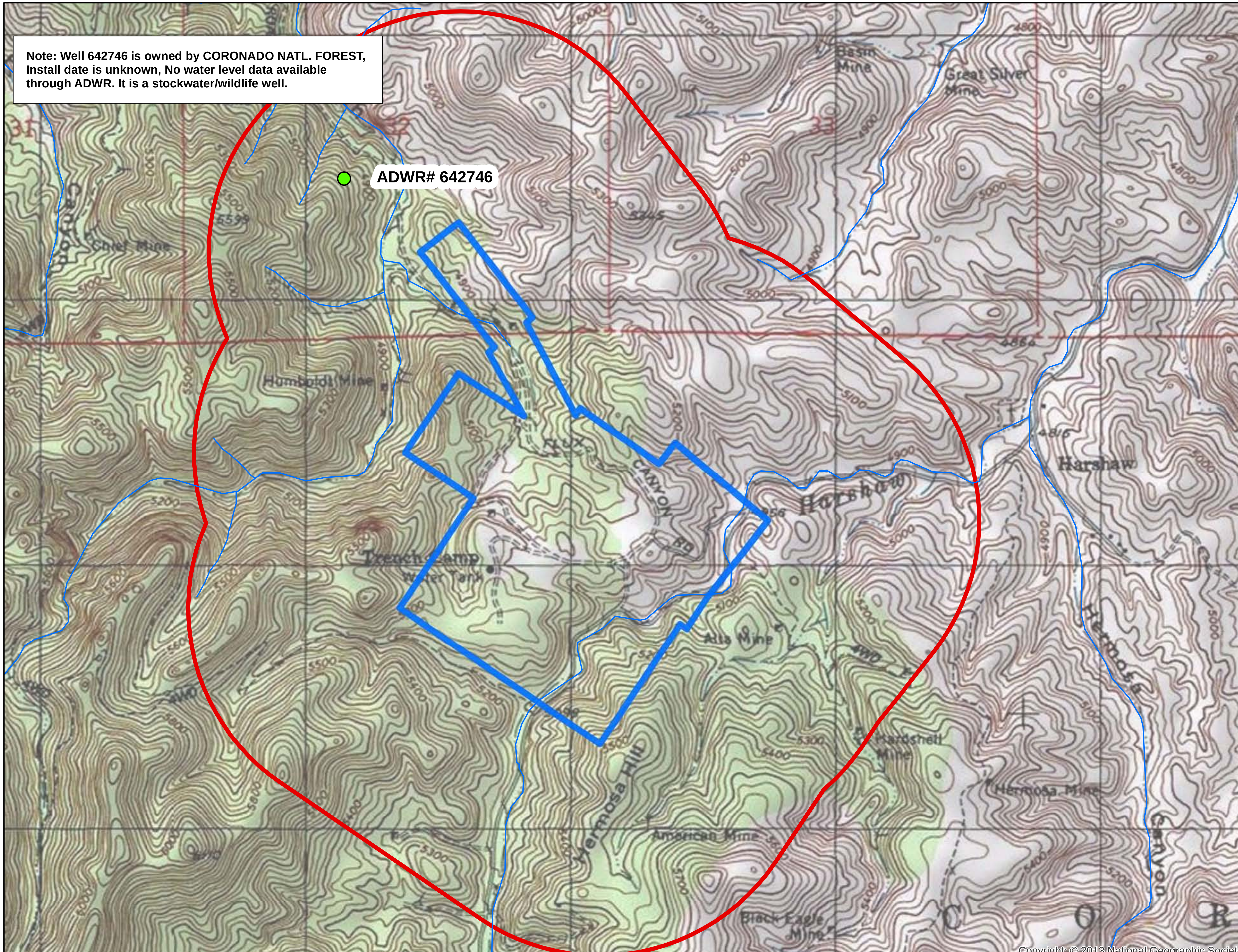
0 2,000 4,000 8,000
Feet

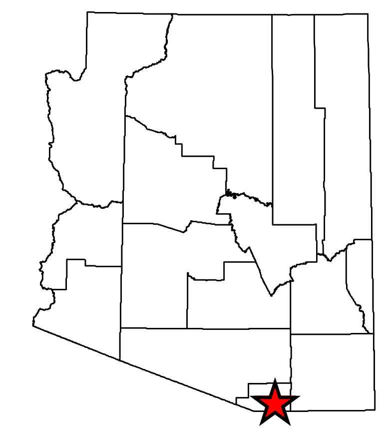
Projection: UTM Zone 12N NAD83

Date	File ID
3/3/2017	AZM-017

CLEAR CREEK ASSOCIATES

FIGURE 7
FEMA Floodplain Map
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505043-02





Legend

- Project Area
- Half-Mile
- Cadastral Locations

Source: http://gisdata-azwater.opendata.arcgis.com/datasets/cc05c93113ad489c93969353bba063ea_0
Date: 1/29/17

Note: Locations are cadastral coordinates.

0 500 1,000 2,000
Feet

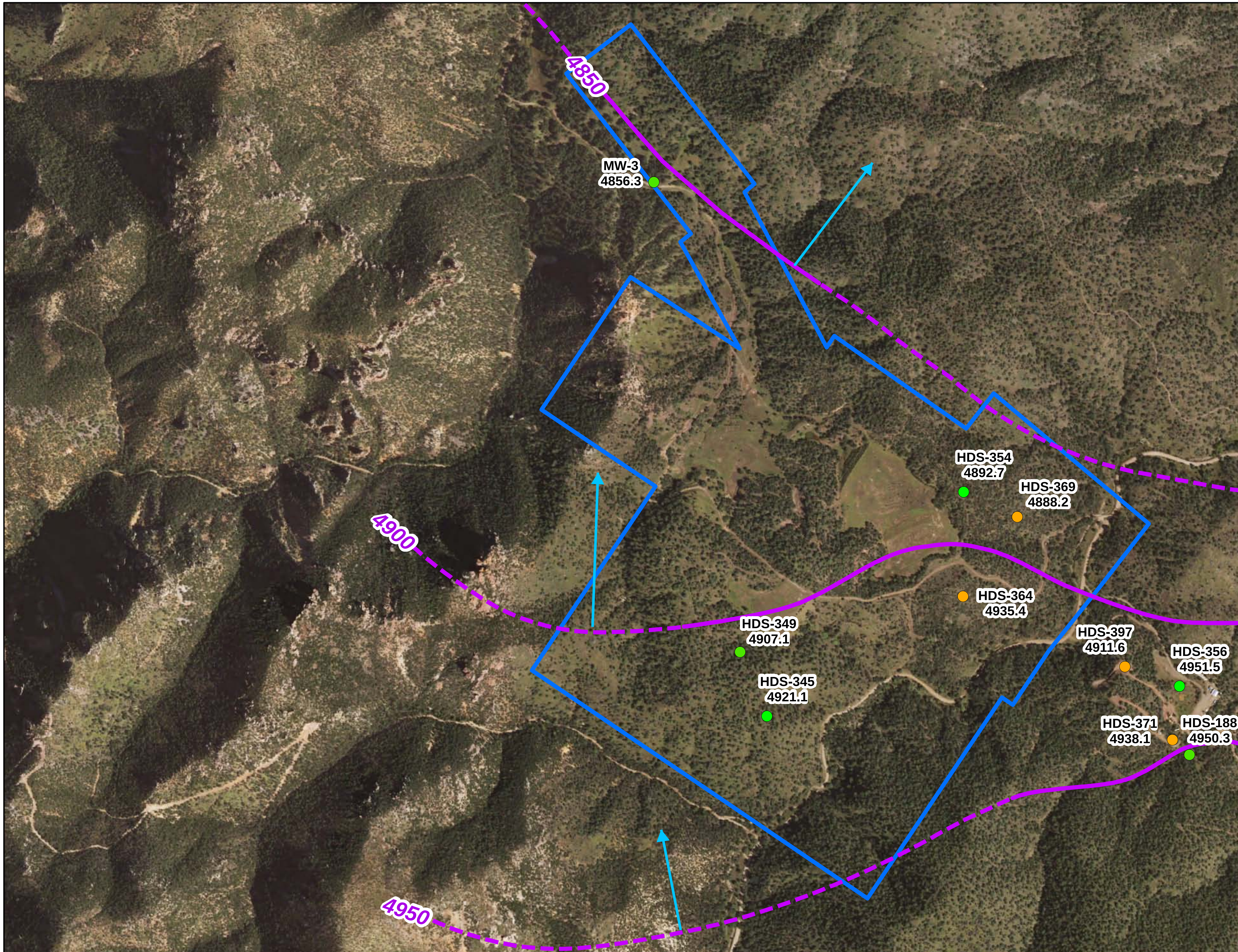
Projection: UTM Zone 12N NAD83

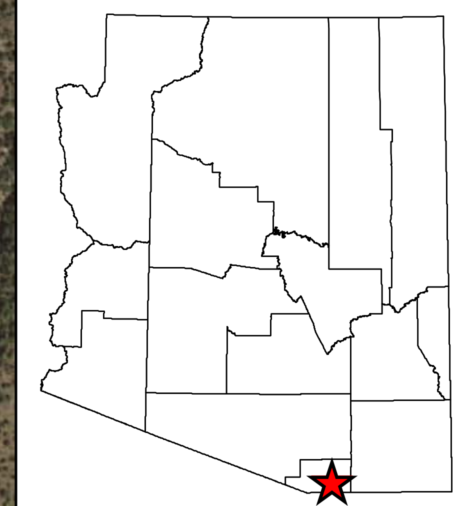
Date 4/24/17

File ID AZM-016

CLEAR CREEK ASSOCIATES

FIGURE 8
Water Well Locations within 1/2 mile
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505043-02





Legend

- Project Area
- Vibrating Wire Piezometer Array
- Wells with Static Water Level Data
- Groundwater Flow Direction

Note: All water levels from September 2016 unless otherwise noted.

Note: Water level data for MW-3 from January 2017.

0 250 500 1,000 1,500

Feet

Projection: UTM Zone 12N NAD83

Date	File ID
3/02/2017	AZM-018

N

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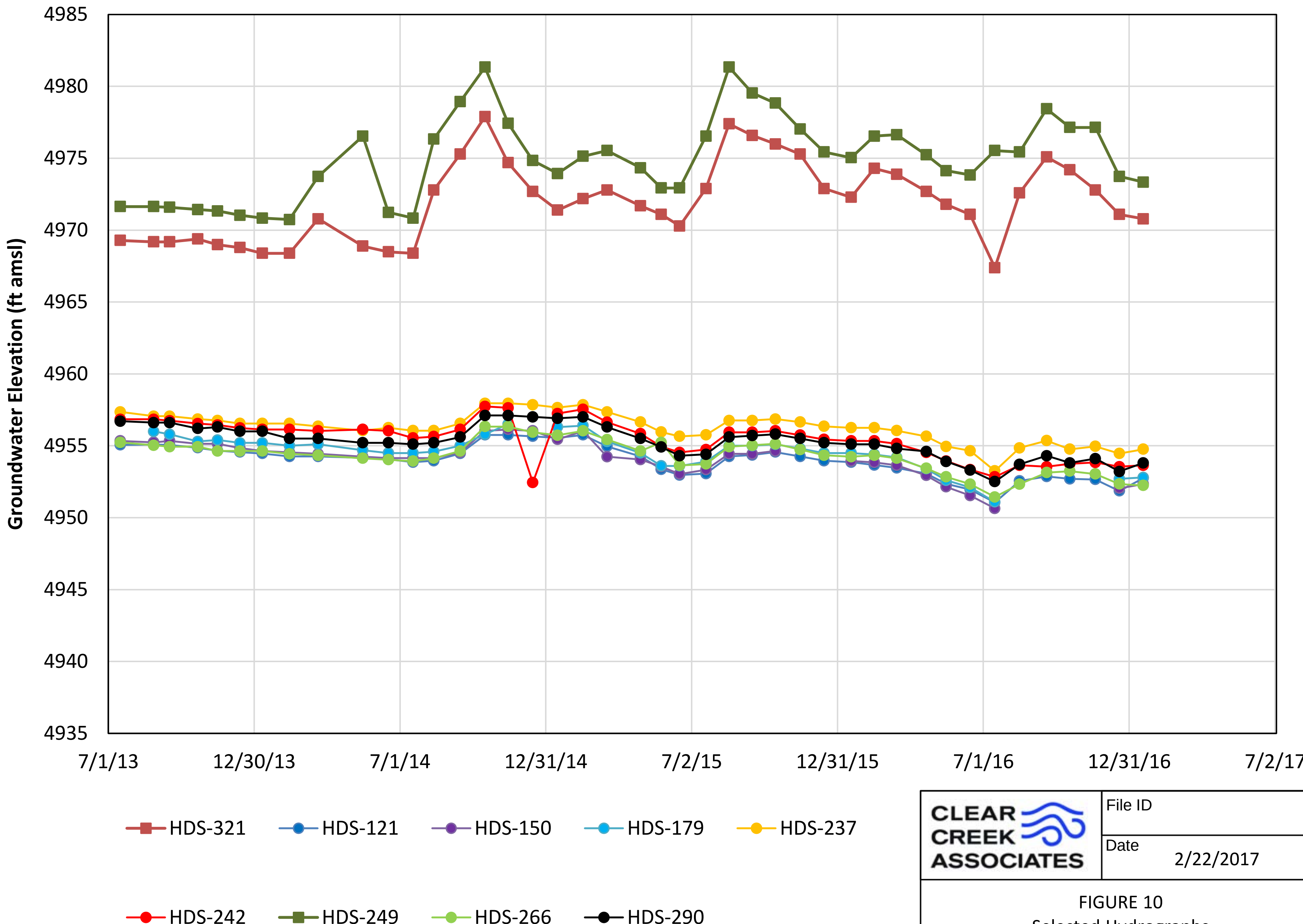
FIGURE 9
Groundwater Elevation Map
January Adit (Norton Mine)
Voluntary Remediation Program
Site 505043-02

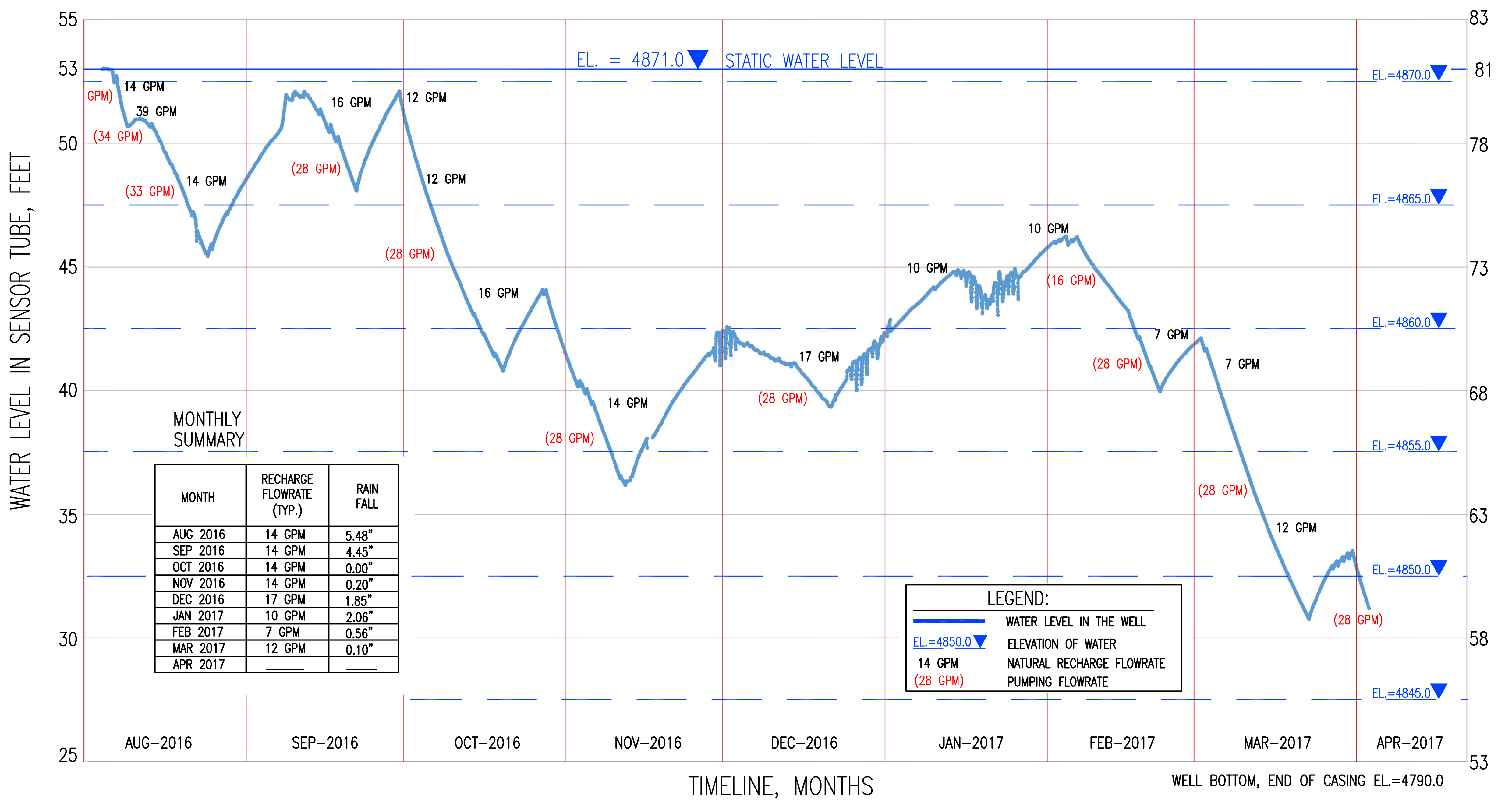


CLEAR CREEK ASSOCIATES

File ID	
Date	2/22/2017

FIGURE 10
Selected Hydrographs

JANUARY MINE WORKINGS PUMPING AND RECHARGE SUMMARY FOR AUGUST 2016 – APRIL 2017



MONTHLY SUMMARY

MONTH	RECHARGE FLOWRATE (TYP.)	RAIN FALL
AUG 2016	14 GPM	5.48"
SEP 2016	14 GPM	4.45"
OCT 2016	14 GPM	0.00"
NOV 2016	14 GPM	0.20"
DEC 2016	17 GPM	1.85"
JAN 2017	10 GPM	2.06"
FEB 2017	7 GPM	0.56"
MAR 2017	12 GPM	0.10"
APR 2017	_____	_____

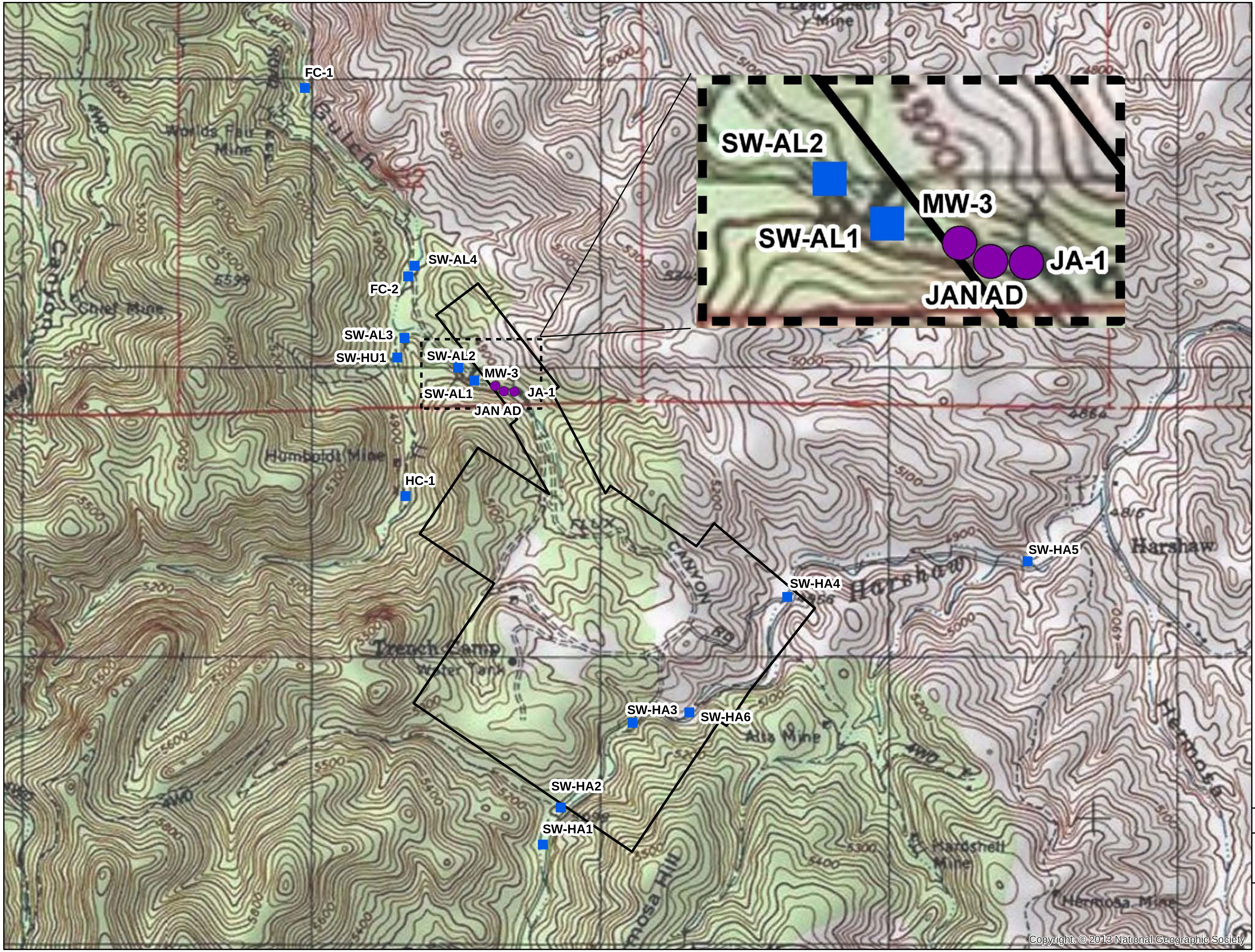
TOTAL WATER PUMPED OUT: 4,866,000 GALS (8/06/2016 to 3/31/2017)

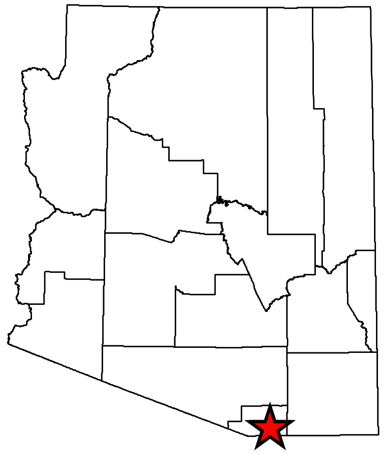
04.21.2017

CLEAR CREEK ASSOCIATES

File ID	AZM-A001
Date	4/20/17

FIGURE 11
January Mine Workings Pumping & Recharge Summary for August 2016 to April 2017





Legend

- Groundwater
- Surface water
- Project Location

0 500 1,000 2,000
Feet

Date	File ID
3/2/2017	AZM-020

CLEAR CREEK ASSOCIATES

FIGURE 12
Water Monitoring Locations

ATTACHMENT A

Trench Camp Historic Tailings Geochemistry and Material Characterization

Submitted to:
Arizona Minerals Inc.

Submitted by:
Schafer Limited LLC
Bozeman, MT

Date
April, 2017

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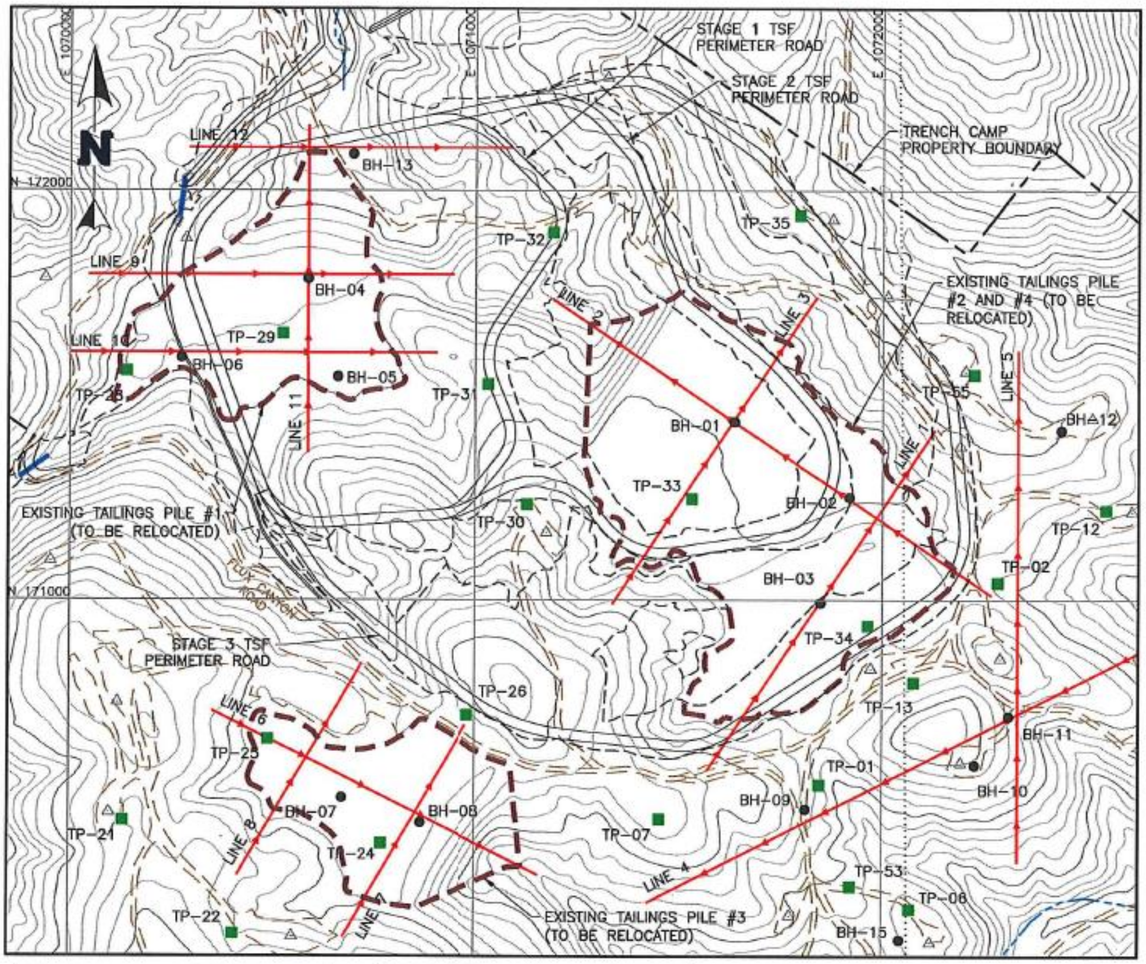
1.0 Material Characterization

1.1 Geochemical Characterization Plan

A range of geochemical tests (Table 1) was conducted on representative samples from the historic Trench Camp Tailings piles 1, 2/4 and 3 (Figure 1). Samples consisted of tailings, foundation soils underlying the unlined tailings, and waste rock material located near the base of tailings pile #1. In addition, samples of development rock that will be generated from an exploration decline and a shaft proposed as part of the Hermosa Taylor Deposit were also characterized.

Samples from the historic tailings are grouped into classes of similar materials (tailings, waste rock, and foundation soils) to facilitate test interpretation. Tests for metal solubility were conducted on composite samples. Three tailings composites included waste rock, shallow-oxidized, deeper-unoxidized and non acid-generating categories. The foundation layer soils underlying tailings were grouped by depth beneath base of the tailings (0-2 ft, 2-3 ft, 3-6 ft, and 8-20 ft). Drillhole samples were categorized into major rock units recognized in the Hermosa Taylor Deposit: Meadow Valley Volcanics, Hardshell Volcanics, Concha, Epitaph and Sherrer Formation.



TEST PIT LOCATIONS (JAN 2017)			
POINT	NORTHING	EASTING	ELEVATION
TP-01	170,548.03	1,071,846.74	5,114.72
TP-02	171,042.32	1,072,285.55	5,108.80
TP-06	170,244.73	1,072,068.89	5,094.13
TP-07	170,464.69	1,071,455.51	5,176.05
TP-12	171,219.43	1,072,550.65	5,106.08
TP-13	170,798.07	1,072,078.30	5,127.18
TP-21	170,461.94	1,070,133.19	5,230.00
TP-22	170,185.20	1,070,404.66	5,222.82
TP-24	170,405.67	1,070,766.81	5,185.94
TP-25	170,660.35	1,070,489.09	5,182.00
TP-26	170,718.48	1,070,981.20	5,188.99
TP-28	171,558.67	1,070,139.78	5,040.09
TP-29	171,650.11	1,070,522.92	5,041.43
TP-30	171,233.35	1,071,128.15	5,135.85
TP-31	171,526.23	1,071,031.00	5,085.63
TP-32	171,897.83	1,071,190.83	5,042.39
TP-33	171,247.24	1,071,534.42	5,102.44
TP-34	170,936.99	1,071,964.91	5,114.71
TP-35	171,939.49	1,071,797.34	5,166.58
TP-53	170,300.30	1,071,923.07	5,094.20
TP-55	171,549.36	1,072,226.65	5,168.14

BOREHOLE LOCATIONS (JAN 2017)			
POINT	NORTHING	EASTING	ELEVATION
BH-01	171,434.89	1,071,638.05	5,099.00
BH-02	171,251.10	1,071,918.68	5,098.30
BH-03	170,993.46	1,071,848.26	5,115.00
BH-04	171,783.52	1,070,582.77	5,038.76
BH-05	171,544.73	1,070,656.11	5,047.47
BH-06	171,591.49	1,070,273.94	5,041.04
BH-07	170,517.23	1,070,668.61	5,182.42
BH-08	170,456.57	1,070,864.19	5,187.44
BH-09	170,488.85	1,071,812.79	5,125.87
BH-10	170,596.56	1,072,228.21	5,146.81
BH-11	170,715.49	1,072,311.63	5,127.26
BH-12	171,414.06	1,072,440.26	5,149.59
BH-13	172,088.43	1,070,692.81	4,973.88
BH-15	170,170.13	1,072,044.06	5,089.30

LEGEND:

- EXISTING GROUND CONTOURS
- EXISTING ROADS/TRAILS
- EXISTING DRAINAGES
- PROPERTY BOUNDARY
- SECTION LINES
- BH-01 NEWFIELDS BOREHOLE (JAN 2017)
- TP-01 NEWFIELDS TEST PIT (JAN 2017)
- AMI DRILLING LOCATION
- GEOPHYSICAL SURVEY (JAN 2017)
- EXISTING TAILINGS PILE LIMITS

0 200 400 FEET

EXISTING GROUND TOPOGRAPHY DEVELOPED FROM JUNE 15TH, 2016 DATA PROVIDED BY ARIZONA MINERALS. REMAINING EXISTING GROUND TOPOGRAPHY OUTSIDE THE LIMITS OF AMI SURVEY DATA CREATED FROM USGS DATA. DATA PROJECTED TO STATE PLANE ARIZONA CENTRAL NAD 83 FEET.

NewFields | CLIENT: ARIZONA MINERALS INC

PROJECT: TAILINGS AND POTENTIALLY ACID GENERATING (PAG) MATERIAL REMEDIATION, PLACEMENT AND STORAGE

TITLE: EXISTING TRENCH CAMP TAILINGS GEOTECHNICAL INVESTIGATION

FILENAME: 14.008.019F | FIGURE NO.: 1 | REVISION: 0

Table 1. Number and kind of tests conducted on Trench Camp historic tailings and exploration core from the Hermosa Taylor Deposit.

Sample Type	Tests	Purpose
Trench Camp Area Tailings (n=29) Waste Rock (n=6) Foundation Soil and Rock (n=19)	Sobek Acid Base Accounting	Assess acid generation and neutralization risk
	Paste pH	Assess current degree of weathering and acidification
	MWMP and EPA 1312	Performed on composites of the waste rock, tailings (shallow and deep), and foundation samples to assess metal leaching risk
	Multi element analysis	Total metals in 4-acid digest of samples
Exploration Drillhole Core (n=35,000)	Sobek Acid Base Accounting	Assess acid generation and neutralization risk
	Paste pH	Assess current degree of weathering and acidification on 307 representative samples
	Multi element analysis	Total metals in 4-acid digest of samples

2.0 Trench Camp Historic Tailings Area Geochemistry

2.1 Historic Tailings Area

Static test results (Appendix A) for historic tailings samples (Figure 2 and 3) show the potential for rock to produce or to neutralize acidity as a result of weathering. The Acid Generation Potential (AGP) is based on the quantity of pyritic sulfur contained in a sample and expresses the amount of acidity that a sample could release if all pyrite was to fully oxidize. The AGP is expressed in units of kg/t as $CaCO_3$. Acid Neutralization Potential (ANP) is the capacity of a sample to neutralize acidity and is expressed in the same units as AGP. The ANP minus AGP is the Net Neutralization Potential (NNP) and in theory a sample is potentially acid generating if the NNP is less than zero. Conversely, a sample with a NNP greater than zero would be considered non-acid generating. In practice, there is some uncertainty for samples with NNP between -20 and +20 kg/t, and test results in this range are often considered uncertain in terms of the acid generation risk.

Virtually all historic tailings and waste rock samples would be considered acid generating (Figure 2) because of the NNP values that are less than -20 kg/t as $CaCO_3$. However, most of the tailings samples have not yet become acidic in pH owing to the abundance of carbonates in the tailings material. Only five tailings samples, all located in the upper few feet of the tailings piles, have developed a pH of less than 5 (Figure 3). Two of the lower pH samples were in Pile 3 and the others were in Pile 2/4. In these samples, oxidation of the sulfides has removed most the ANP, thus allowing the pH to drop from 7 to below 5. Given a long enough period of exposure to oxygen, all tailings would eventually become acid, but this would likely require many decades of exposure given the limited oxidation evidenced after more than 50 years of exposure of the historic Trench Camp tailings to weathering. Therefore, after the historic Trench Camp tailings are removed and replaced on a liner, they are not likely to change appreciably from the conditions currently found in surface tailings. Ultimately, the re-handled tailing piles, which are placed on the liner, will be compacted, sloped, and covered in a manner that limits infiltration of meteoric water and oxygen, thus minimizing long-term oxidation and acidification risk.

Samples were analyzed using the Net Acid Generation pH (NAG pH, Figure 4) test in which hydrogen peroxide is added to a sample and allowed to react with sulfides for 24 hours before pH is recorded. NAG pH provides a reliable indication of long-term pH that would develop is a sample after years of weathering. While most tailings samples had a NAG pH less than 4.5, which indicates acid generation risk, many samples with low NNP (<-100 kg/t as CaCO3) also had NAG pH above 4.5. These samples were likely dominated by lead and zinc sulfide minerals that may have high sulfur and low NNP but do not form acidity upon oxidation. Tailings samples with NAG pH above 4.5 were grouped for the soluble metals tests under the non potentially acid generating (non-PAG) tailings category.

Waste rock samples, although much lower in total sulfur than tailings also had much lower ANP values. The relative lack of ANP allowed these samples to acidify more quickly than tailings. As a result all waste rock samples had low pH values, even though they were buried by several feet of tailings in Tailings pile #1. Given their pH, water in contact with waste rock is likely to be more strongly acidic and have higher metals and sulfate than tailings contact water. To the extent possible, waste rock will be buried by tailings in the lined repository to minimize contact with water.

Foundation soil and rock samples were much lower in sulfur than either tailings or waste rock but 4 of the 19 samples still had pyritic sulfur greater than 0.3%, which would likely generate acidic conditions after sufficient exposure to oxygen. The higher sulfide samples were all encountered in boreholes 1 and 2 beneath pile 2/4. It is possible that some of the foundation soil and rock material in this area consist of historic sulfide waste or may contain naturally occurring sulfides. However, any sulfides beneath the tailings in pile 2/4 will be covered by the liner for the new repository, which will prevent any contact with water.

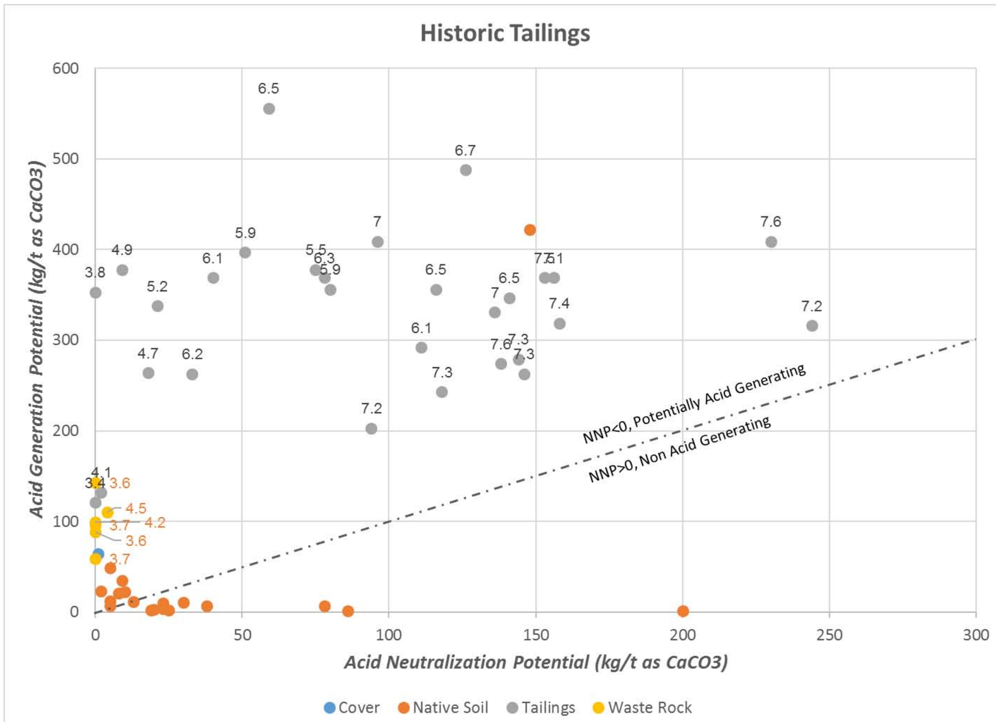


Figure 2. ANP and AGP of samples collected from the historic tailings area.

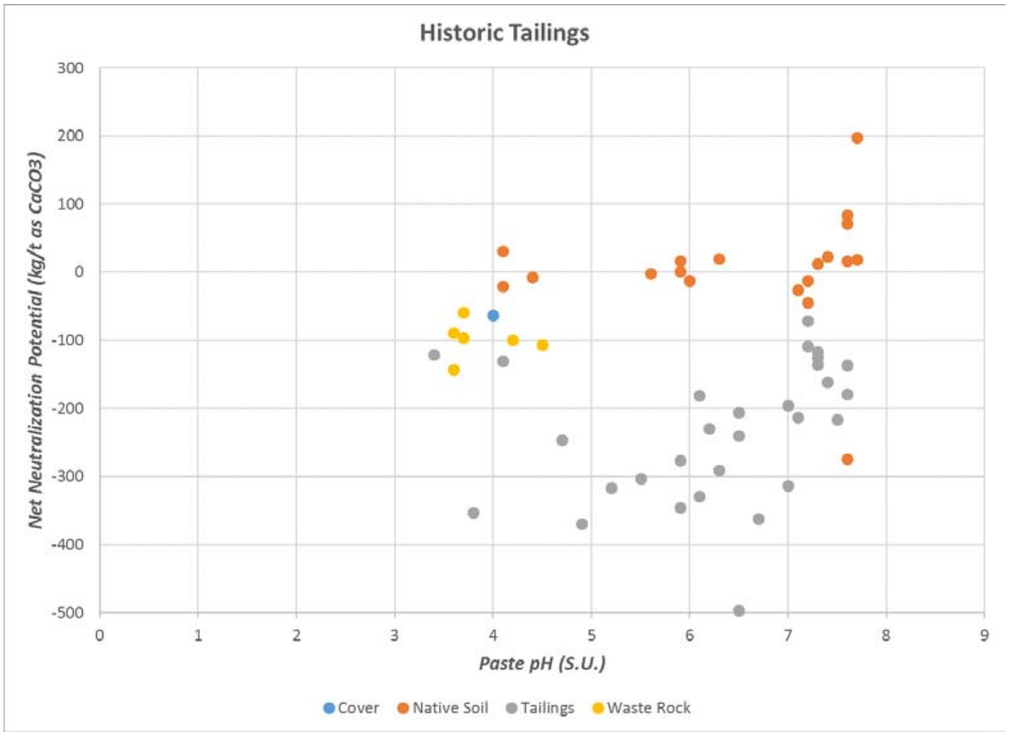


Figure 3. NNP and Paste pH of samples collected from the historic tailings area.

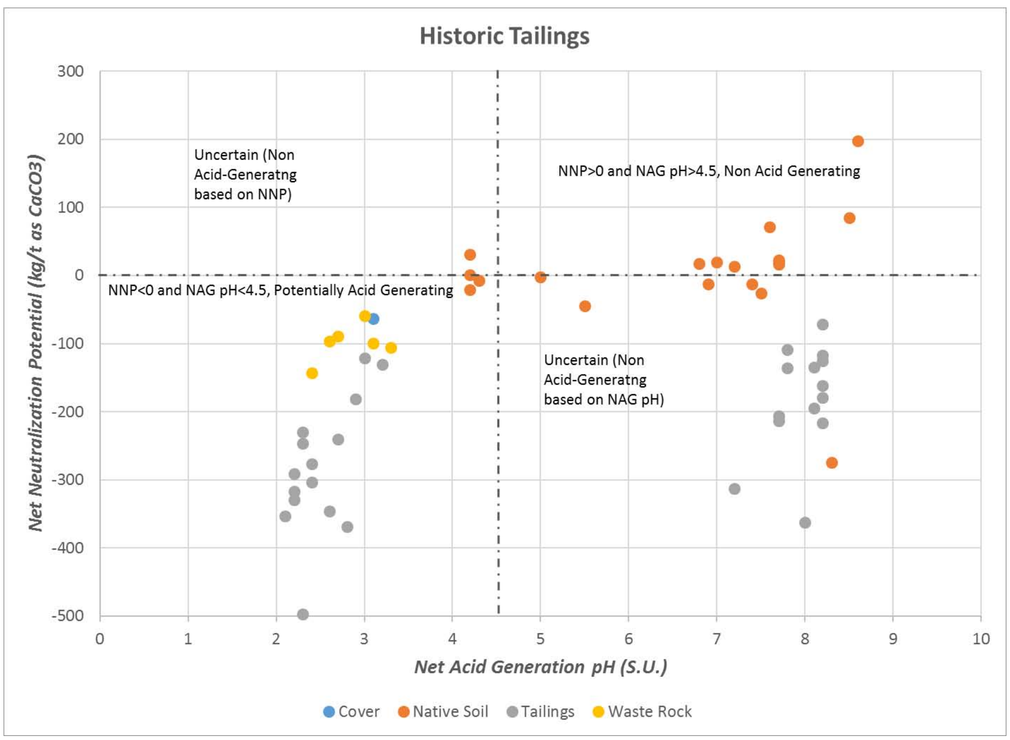


Figure 4. NNP and NAG pH of samples collected from the historic tailings area.

Soluble metals were determined using both Meteoric Water Mobility Procedure (MWMP) and Synthetic Precipitation Leaching Procedure (SPLP) tests. These methods differ primarily in the water to rock ratio. The SPLP is a more dilute extraction 20:1 than the MWMP, which is 1:1. Eight composite samples were tested including shallow oxidized and deeper unoxidized tailings, waste rock, and 4 foundation layers (Table 2 and 3). Soluble metals in SPLP extracts exceeded Arizona aquifer standards for four constituents in one or more samples: antimony, cadmium, lead, and nickel (Figures 5 to 8). Since contact water within the lined repository will be collected and treated, the elevated levels of metals will not pose an environmental risk. All other constituents met Arizona Ambient Water Quality Standards. The MWMP tests tended to have higher levels of soluble constituents than the SPLP tests due to differences in the water to rock ratio used in the tests. The MWMP tests were used to estimate contact water quality in section 2.3.

Table 2. Soluble constituents in composite samples using SPLP method.

Constituent (mg/L)	Unoxidized Tailings	Oxidized Tailings	Non PAG Tailings	Waste	Foundation (0 TO 2 ft)	Foundation (2 TO 3 ft)	Foundation (3 TO 6 ft)	Foundation (8 TO 20 ft)
Aluminum	<0.03	<0.03	0.1	13.8	<0.03	<0.03	0.09	<0.03
Antimony	<0.002	<0.002	0.0011	0.004	0.0088	0.0005	0.0016	0.0016
Arsenic	0.001	0.002	0.0008	0.005	0.0138	0.0054	0.0098	0.0011
Barium	0.01	0.014	0.014	0.011	0.023	0.004	0.018	0.016
Boron	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.02	0.01
Cadmium	0.069	0.145	0.0247	0.128	0.0019	0.0008	0.0066	0.0037
Calcium	586	582	318	267	30.3	14.1	22.1	86.5
Chloride	<0.5	6.5	23.3	<0.5	<0.5	<0.5	<0.5	16.6
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	0.05	0.13	<0.01	0.07	<0.01	<0.01	0.01	<0.01
Conductivity (uS/cm)	2350	2410	1470	1680	385	199	257	574
Copper	<0.01	<0.01	<0.01	0.12	<0.01	<0.01	0.02	<0.01
Cyanide, WAD	<0.003	0.013	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Fluoride	0.07	0.34	0.35	1.07	0.23	0.46	0.16	0.35
Iron	<0.02	<0.02	0.13	2	<0.02	<0.02	<0.02	<0.02
Lead	0.0467	0.599	0.118	2.6	0.0002	0.0004	0.001	0.0089
Magnesium	6.1	11.3	15.6	35	19.2	8.2	9	12.2
Manganese	47.9	68.8	9.3	37.9	3.79	3.75	4.81	5.61
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.026	0.077	<0.008	0.065	<0.008	<0.008	<0.008	<0.008
Nitrate/Nitrite as N	0.03	0.04	0.04	0.04	0.04	0.03	0.04	0.04
Phosphorus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium	0.4	0.8	1.3	2.4	4	1.6	2.2	2.3
Selenium	0.0046	0.0032	0.0019	0.0016	<0.0002	0.0002	<0.0002	0.0009
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	0.5	0.3	0.5	0.3	1.8	1.9	1.1	1.2
Strontium	0.164	0.186	0.129	0.054	0.104	0.045	0.077	0.111
Sulfate	1550	1550	809	1000	159	72.7	103	232
Thallium	<0.0005	0.0006	0.0007	<0.0005	0.0007	<0.0001	<0.0002	0.0002
Thorium	<0.005	<0.005	<0.002	<0.005	<0.002	<0.001	<0.002	<0.002
Tin	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Uranium	<0.0005	<0.0005	<0.0002	0.0005	<0.0002	<0.0001	<0.0002	<0.0002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	3.36	14.4	1	30.4	0.07	0.01	0.71	0.05

Table 3. Soluble constituents in composite samples using MWMP method.

Constituent (mg/L)	Unoxidized Tailings	Oxidized Tailings	Non PAG Tailings	Waste	Foundation (0 TO 2 ft)	Foundation (2 TO 3 ft)	Foundation (3 TO 6 ft)	Foundation (8 TO 20 ft)
Aluminum	0.08	<0.06	<0.06	108	<0.06	<0.06	0.43	<0.06
Antimony	<0.002	0.002	0.004	0.013	0.0118	<0.0008	0.0022	0.0038
Arsenic	0.002	0.002	0.0016	0.012	0.0171	0.0085	0.0223	0.0019
Barium	0.024	<0.006	0.021	<0.006	0.031	0.018	0.025	0.048
Boron	0.02	0.04	0.04	0.04	0.09	0.03	0.13	0.16
Cadmium	1.96	1.05	0.182	1.43	0.0294	0.0138	0.0847	0.0429
Calcium	495	498	604	434	312	160	316	603
Chloride	0.9	94	265	5.8	2.2	0.6	1.3	159
Chromium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cobalt	1.7	1.68	0.14	0.66	<0.02	<0.02	0.08	0.04
Conductivity (uS/cm)	4390	4500	3230	5150	2750	1450	2110	3110
Copper	0.11	0.05	<0.02	0.33	<0.02	<0.02	0.05	<0.02
Cyanide, WAD	<0.003	0.097	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Fluoride	0.05	0.35	0.54	0.26	0.38	0.43	0.34	0.39
Iron	0.18	0.06	<0.04	14.3	<0.04	<0.04	<0.04	<0.04
Lead	0.88	3.2	0.586	2.65	0.0017	0.0026	0.0048	0.0828
Magnesium	106	241	188	362	250	91.2	121	147
Manganese	1110	761	75.6	428	50.8	37.4	67.5	69.5
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Nickel	0.93	1.48	0.1	0.67	<0.02	<0.02	0.12	<0.02
Nitrate/Nitrite as N	0.09	<0.02	0.03	<0.2	0.06	0.02	0.04	<0.1
Phosphorus	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Potassium	1.7	9.8	14.8	26.2	20.4	8.3	13.8	18.7
Selenium	0.0324	0.03	0.0147	0.0116	0.0012	0.0018	0.0011	0.0088
Silver	<0.2	<0.1	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02
Sodium	5.4	4.9	10.2	5.3	25.8	20	14.6	20.7
Strontium	0.77	0.28	0.56	0.16	1.1	0.46	0.78	1.07
Sulfate	3800	3620	2170	4440	1940	837	1400	2040
Thallium	<0.0005	0.0036	0.0031	0.0006	0.0019	0.0005	0.0005	0.0012
Thorium	<0.005	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002
Tin	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Uranium	<0.0005	<0.0005	0.0007	0.0029	<0.0002	<0.0002	<0.0002	0.0015
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	129	158	24.9	306	0.55	0.31	5.74	1.73

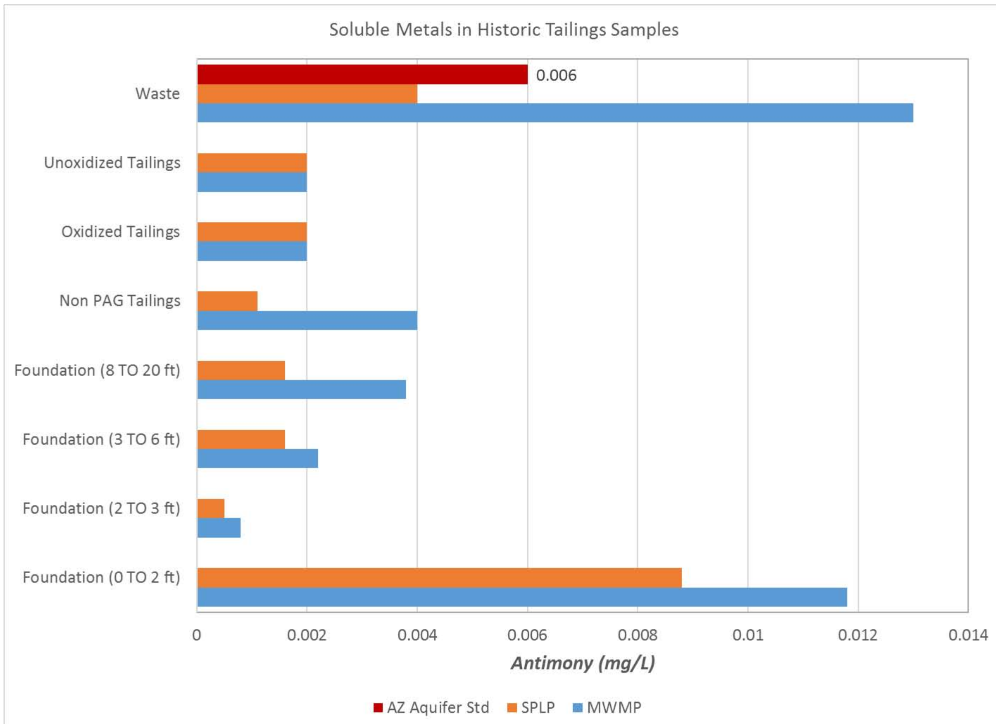


Figure 5. Soluble antimony in samples collected from the historic tailings area.

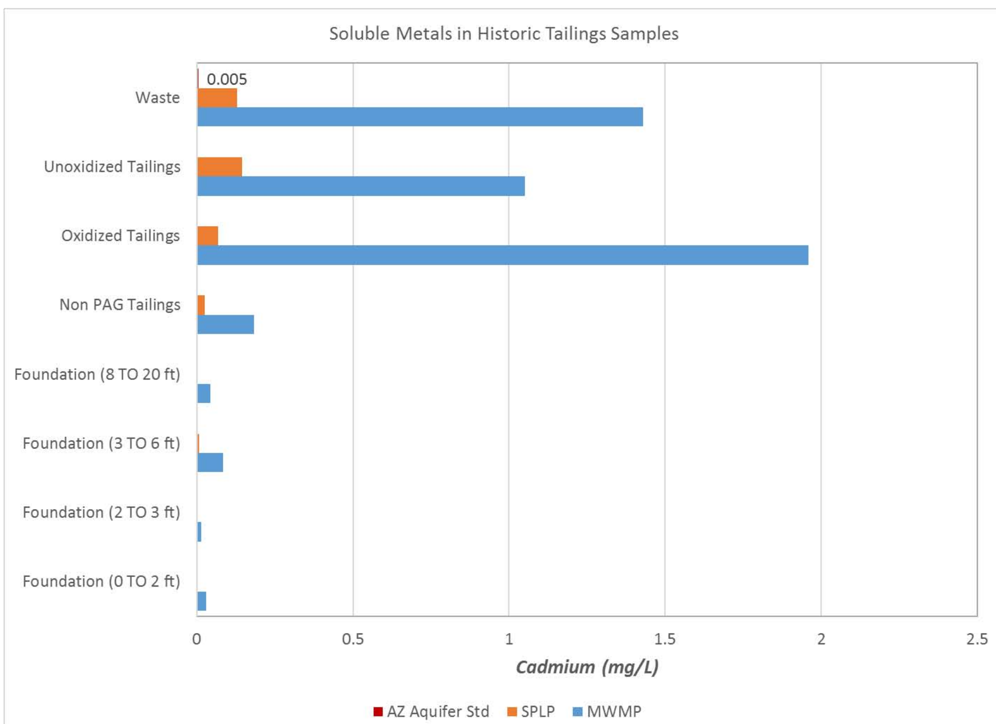


Figure 6. Soluble cadmium in samples collected from the historic tailings area.

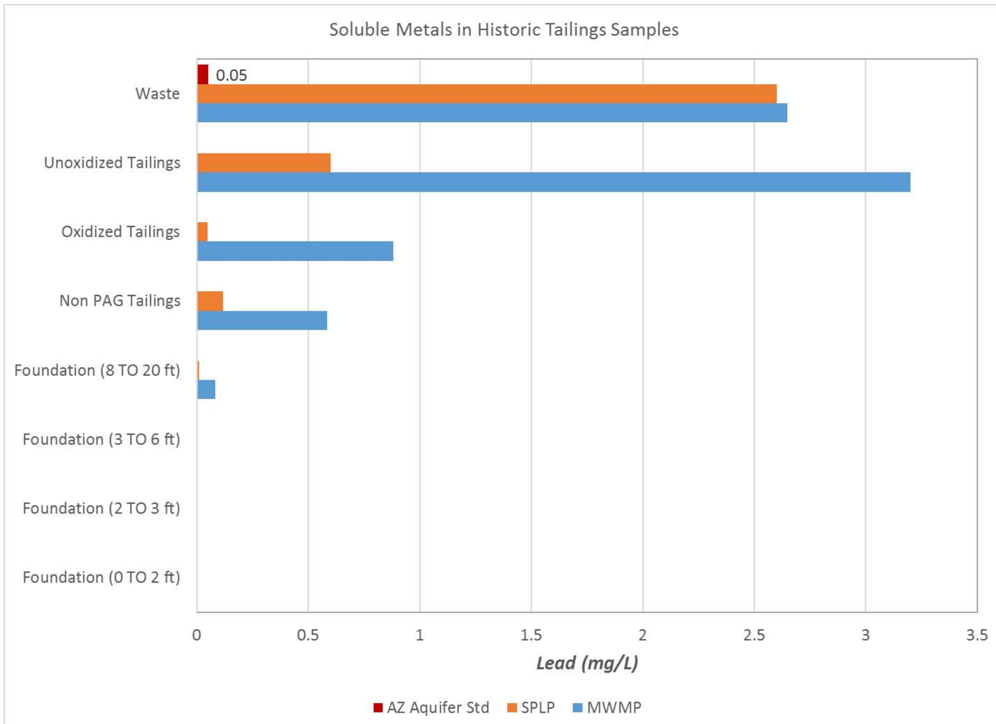


Figure 7. Soluble lead in samples collected from the historic tailings area.

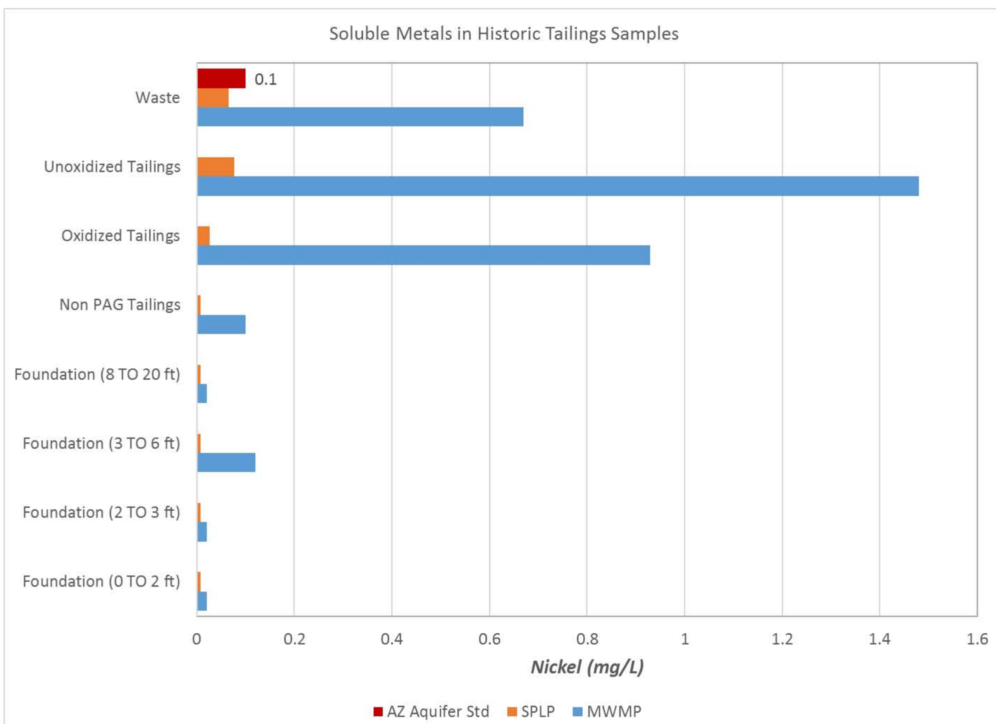


Figure 8. Soluble nickel in samples collected from the historic tailings area.

2.2 Development Rock

Potentially acid generating (PAG) development rock from the proposed Hermosa Taylor Deposit project will be placed in the same lined facility as the historic tailings and waste rock. Extensive data have been collected from rock units to be mined in the Taylor project including 307 samples from 2 representative boreholes (HDS-332 and HDS-364) that were analyzed for Sobek acid base accounting NAG pH and paste pH. In addition, total metals were measured on over 35,000 samples across all exploration holes.

The NAG pH and NNP of samples from boreholes HDS-332 and HDS-364 (Figure 9 and 10) show three distinct groups of samples (Figure 11). The vast majority of rocks encountered in the Taylor Deposit is strongly alkaline and not expected to become acidic or to leach appreciable levels of metals. Unlike the historic tailings and waste rock that was volcanic-hosted, the Taylor Deposit, the first group in Figure 11, is a deeper Carbonate Replacement Deposit, accounting for the preponderance of alkaline rock. The second group of materials is potentially acid generating (PAG), due to the pyritic sulfur content. In order to access the carbonate host rock, a decline will be developed through approximately 1,000 feet of volcanic rock. The surficial Meadow Valley Volcanics and deeper Hardshell Volcanics contain a proportion of PAG material with NNP <0 and NAG pH < 4.5. The third group of samples is zinc-lead-silver ore. Ore in the carbonate sequence had low NNP but also had high NAG pH. In these samples, the majority of sulfur is in the form of galena and sphalerite, which are not acid generating sulfides like pyrite. The Sobek test therefore overestimates acid generating risk in samples where pyrite is not the primary sulfide mineral. Ore samples will be processed to recover economic sulfides as a concentrate (that will be shipped off-site) and the resultant tailings will be non acid-generating based on preliminary tests.

The vertical distribution of ANP, AGP and lead plus zinc grade in HDS-332 and HDS-364 is shown in Figures 12 and 13, respectively. PAG Zones occur where the red bars are more pronounced than the blue bars. In the upper volcanic units, PAG material will be treated as waste and will be placed in the lined repository to prevent release of acidity or metals in contact water. Most zones that appear as PAG in the carbonate units are actually ore and will be processed to remove the economic sulfides.

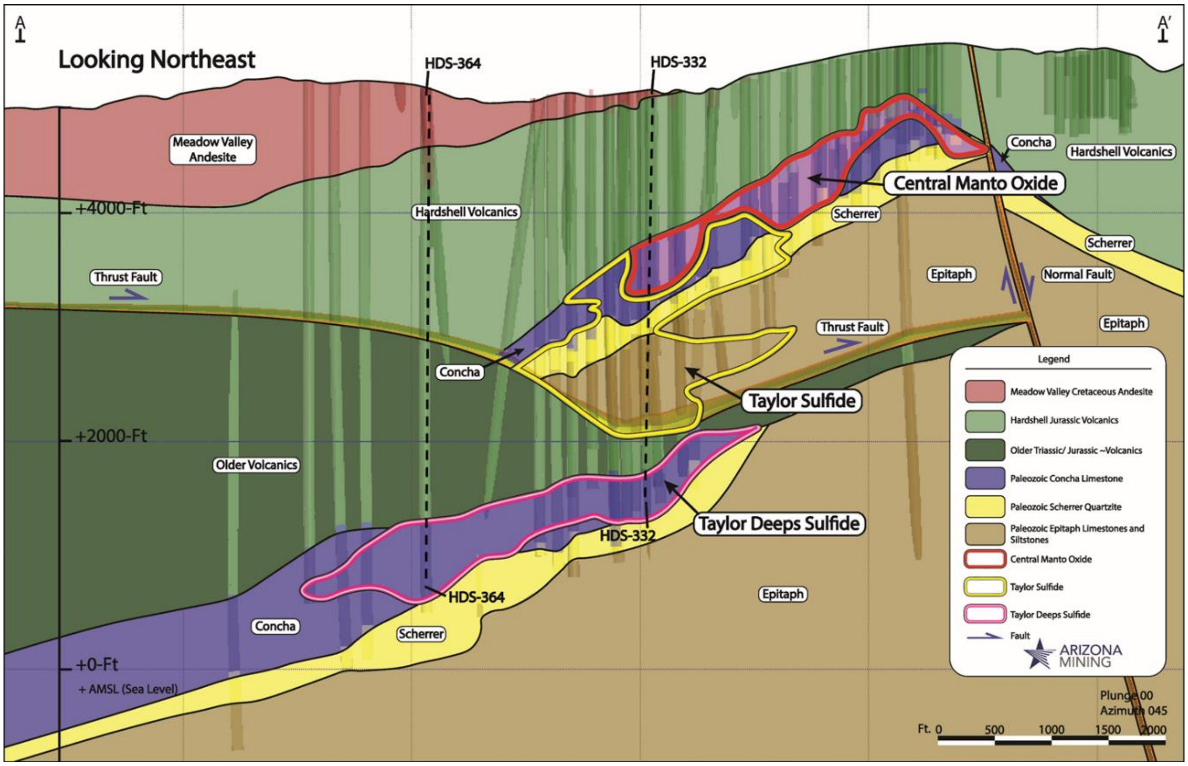


Figure 9. Cross section 1 through the Hermosa Taylor Deposit.

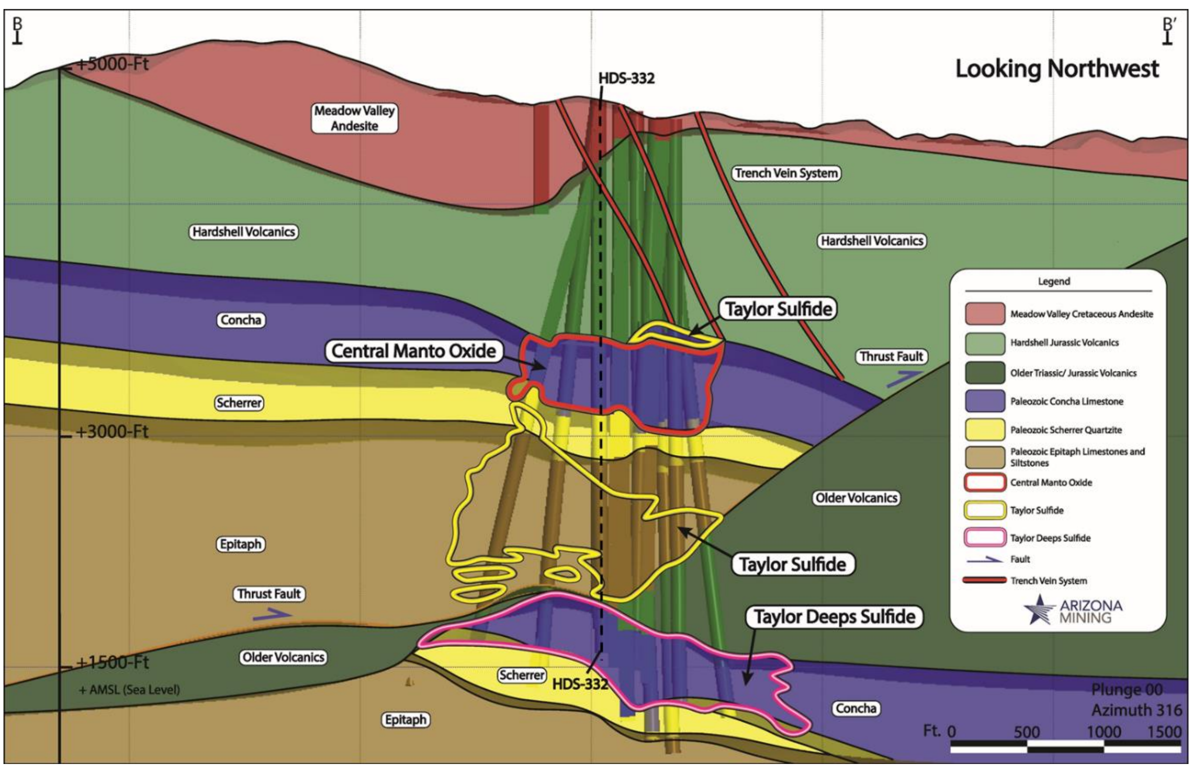


Figure 10. Cross section 2 through the Hermosa Taylor Deposit.

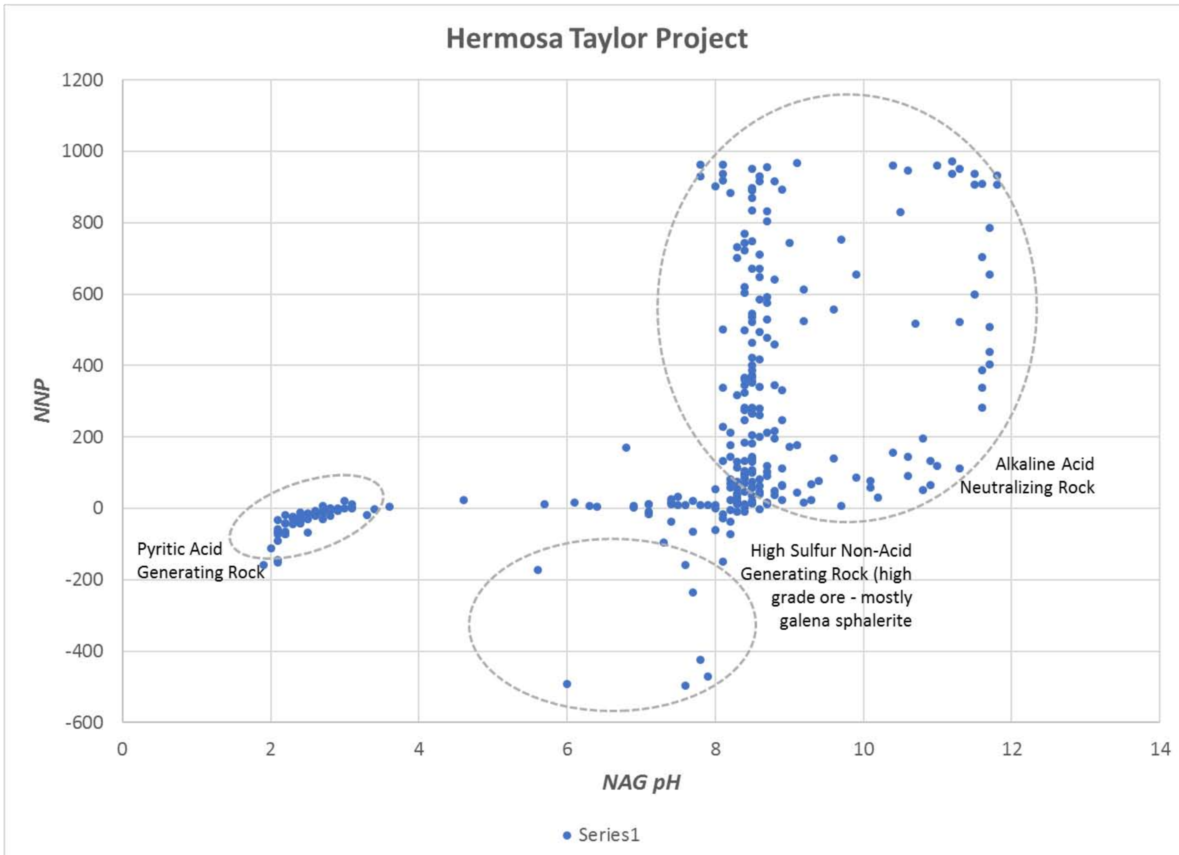


Figure 11. Distribution of NNP and NAG pH in select exploration samples.

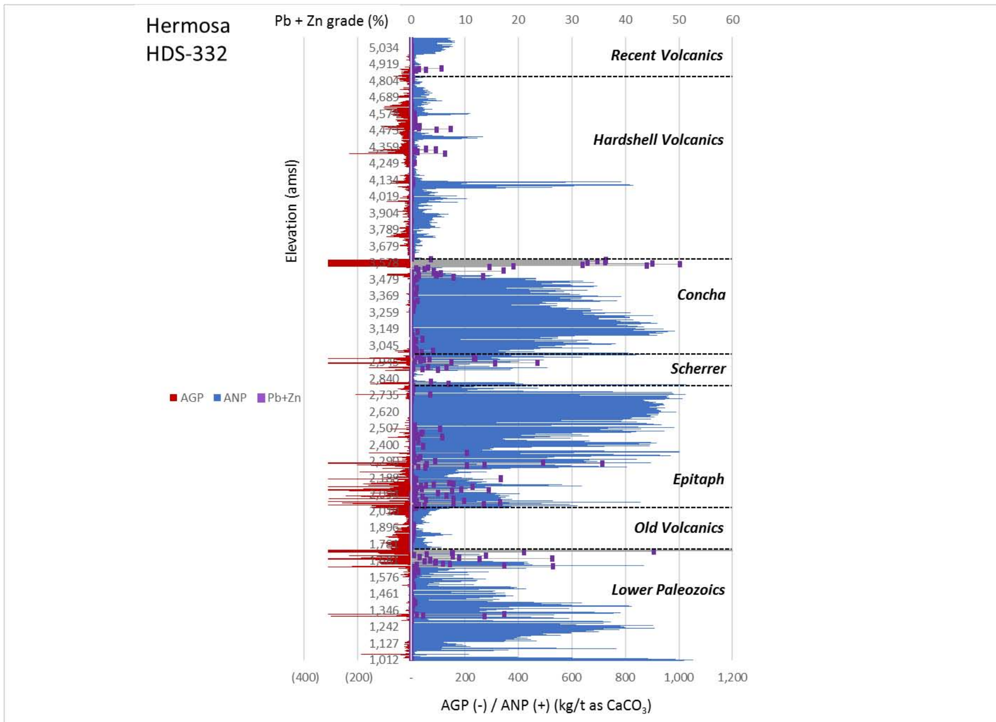


Figure 12. Distribution and ANP, AGP and Pb+Zn grade in borehole HDS-332.

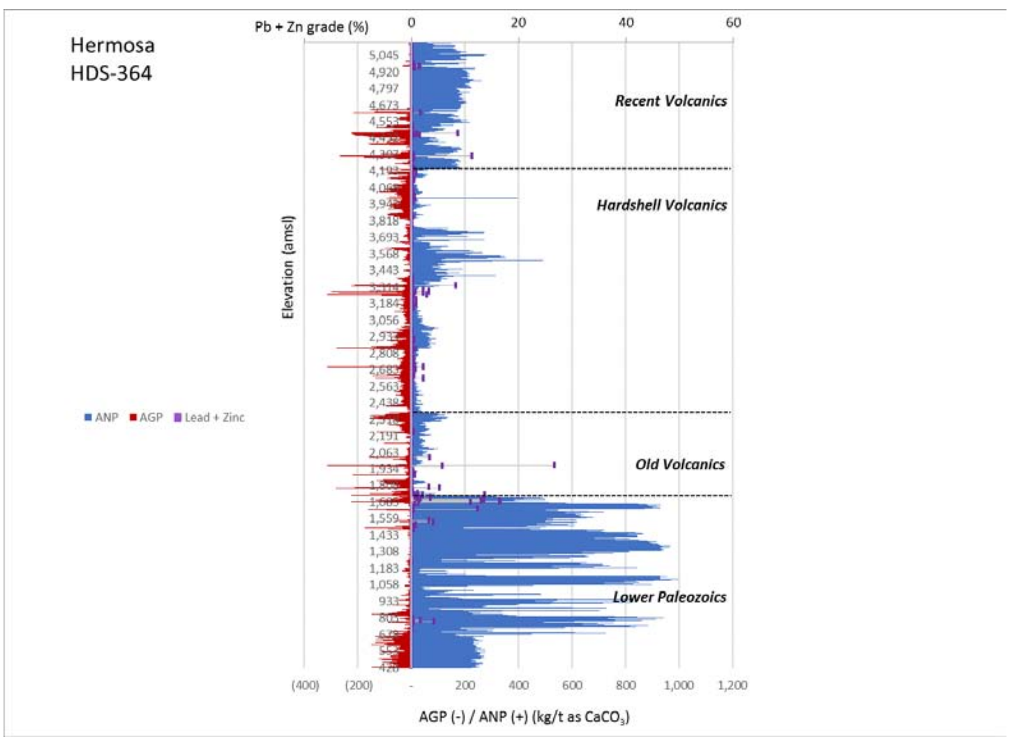


Figure 13. Distribution and ANP, AGP and Pb+Zn grade in borehole HDS-364.

2.2.1 Estimating ANP and AGP from Total Metals Data

Arizona Minerals Inc. has performed multi-element analyses on over 35,000 samples to date using a 4-acid digestion and ion determination by ICP AES and MS methods (ALS Chemex ME-MS61m). The ANP and AGP values for all 35,000 samples were estimated by assuming all calcium and magnesium are present as carbonate and all sulfur is pyrite according to equation [1]. The estimated ANP and AGP from multi element data will provide more spatially extensive information about the Hermosa Taylor deposit. However, it is important to establish whether the estimated ANP and AGP derived from equation 1 are in agreement with ANP and AGP measured using the standard Sobek method.

Estimated NNP (kg/t as CaCO3) = ANP (Total Ca % x 10 x 40.1/100 +
Total Mg % x 10 x 24.3/100) - AGP (Total S % x 31.25) [1]

Estimated ANP and AGP based on multi-element data (Figure 14 and 15) provided good correlation with the Sobek method as shown for the 307 samples tested by both methods. Estimated and measured AGP had an R^2 of 0.9888 and a slope of 1.01 while estimated and measured ANP had an R^2 of 0.9341 and a slope of 0.9865. Based on the strong correlation, the multi-element data available for all boreholes provide an accurate and precise estimate ANP and AGP.

Based on average composition (Table 4) all Paleozoic units (Concha, Epitaph and Sherrer plus older Paleozoics below the Sherrer) are strongly alkaline with ANP ranging from 320 to 610 kg/t as CaCO3. Some PAG material was found in the Paleozoic units in or near ore zones where mineralization caused increases in sulfide sulfur and significant loss of carbonates due to alteration. PAG abundance varied from 3 to 8% in the Concha, Epitaph, Scherrer and older Paleozoic rocks. Most drifts and ore development will occur in the Paleozoic units although much of the waste produced would likely be placed underground as backfill.

The volcanic units had somewhat lower alkalinity than the Paleozoic rocks with ANP averaging 161 kg/t as $CaCO_3$ in the Meadow Valley and 73 kg/t in the deeper Hardshell Volcanics. Pyritic sulfur averaged about 0.5% in the Meadow Valley (AGP = 18 kg.t) and was a little over 1% in the Hardshell (AGP = 39 kg/t). The Hardshell Volcanics had 20.5% PAG material and this PAG development rock will be placed on the lined facility. The upper volcanics in the Meadow Valley Unit had more carbonate so contain only 4% PAG material.

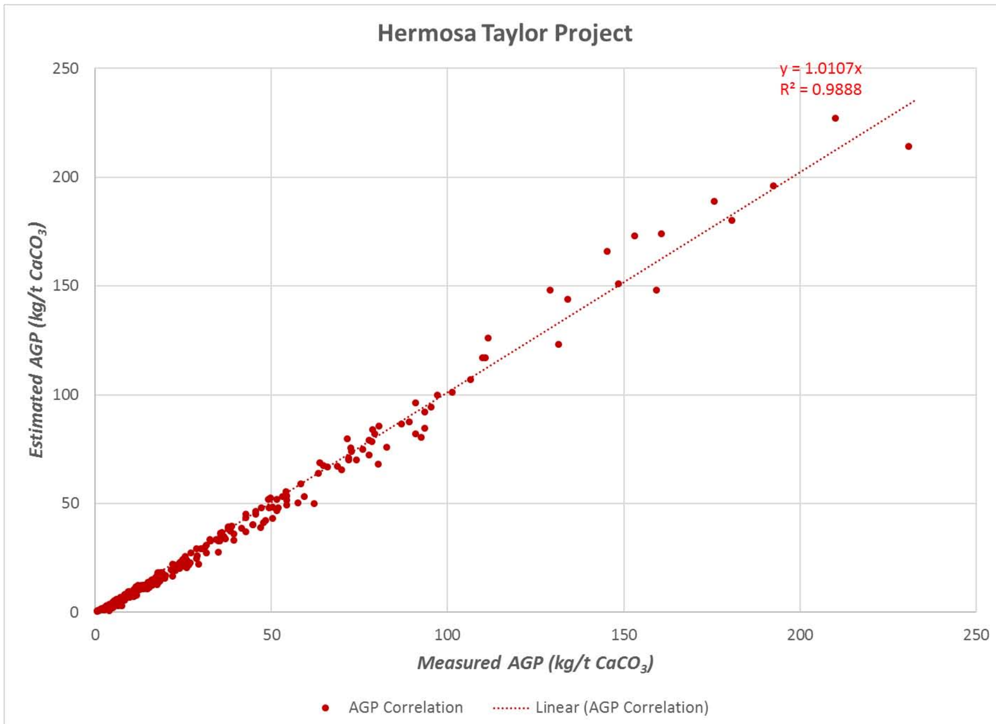


Figure 14. Correlation of measured and estimated AGP in boreholes HDS-332 and HDS-364.

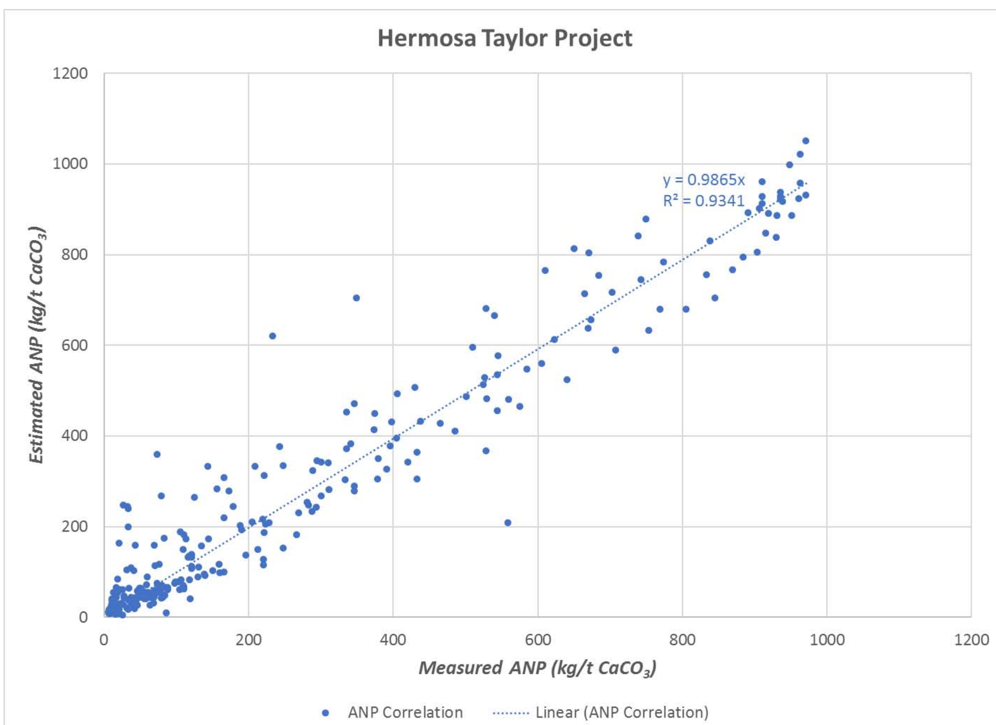


Figure 15. Correlation of measured and estimated ANP in boreholes HDS-332 and HDS-364.

Table 4. Average ANP, AGP and PAG abundance in each rock unit in the Hermosa Taylor Deposit.

Row Labels	n	Average of ANP	Average of AGP	Average of NNP	PAG (%)
Meadow Valley Volcanics	3,777	161	18	143	4.3%
Hardshell Volcanics	12,727	73	39	33	20.5%
Concha Formation	2,671	412	38	374	8.1%
Scherrer Formation	1,510	322	44	278	6.7%
Epitaph Formation	3,884	610	53	557	2.8%
Old Volcanics	4,723	57	45	12	17.5%
Lower Paleozoics	5,780	478	32	446	2.7%

2.3 Expected Water Quality of Contact Water

Water that comes into contact with materials placed on the liner will be directed to the lined underdrain pond where it will be stored for eventual treatment and re-use or discharge under an approved permit. Tests of different materials to be placed in the liner repository indicate that contact water quality may vary spatially depending on the kind of material contacted. This variability will cause some variation in water fed to the water treatment plant, although the variability will be less pronounced than the range of values in Table 5 because underdrain pond water will be an average across the facility. An overall average water quality was computed by assuming that about 40% of the contact water is represented by oxidized tailings, 25% by unoxidized tailings, 25% by non-PAG tailings and 10% by waste rock. The composite water quality was estimated by combining these three water types in a geochemical equilibrium model (PHREEQC). Reasonable low temperature solid phases were allowed to form and sorption on ferrihydrite was permitted. Contact water pH may range between 3.8 and 6.8 with a most likely pH of 4.2. Sulfate may range from 2,170 to 4,440 mg/L with a most likely concentration of around 3,300 mg/L. Most metals levels will be relatively low except for cadmium, manganese and zinc with likely concentrations of 1.1, 645 and 133 mg/L respectively.

Table 5. Likely range in quality of contact water in Trench Camp historic tailings underdrain pond.

Constituent (mg/L)	Minimum	Maximum	Expected
pH	3.8	6.8	4.17
Aluminum	<0.06	108	5.05
Antimony	<0.002	0.013	0.0036
Arsenic	0.0016	0.012	0.003
Barium	<0.006	0.024	0.003
Boron	<0.02	0.04	0.04
Cadmium	0.182	1.96	1.09
Calcium	434	604	480
Bicarbonate	<2	51.2	9.82
Chloride	0.9	265	105
Chromium	<0.02	<0.02	<0.02
Cobalt	0.14	1.7	1.20
Copper	<0.02	0.33	0.09
Fluoride	<0.05	0.54	0.31
Iron	<0.04	14.3	1.45
Lead	0.59	3.2	1.59
Magnesium	106	362	207.1
Manganese	75.6	1,110	645
Mercury	<0.0002	<0.0002	<0.0002
Molybdenum	<0.04	<0.04	<0.04
Nickel	<0.1	1.48	0.92
Nitrate/Nitrite as N	<0.02	0.2	0.06
Phosphorus	<0.2	<0.2	<0.2
Potassium	1.7	26.2	9.32
Selenium	0.0116	0.0324	0.025
Silver	<0.02	0.2	0.10
Sodium	4.9	10.2	6.42
Strontium	0.16	0.77	0.46
Sulfate	2,170	4,440	3,287
Thallium	0.0005	0.0036	0.002
Thorium	<0.002	<0.005	<0.005
Tin	<0.08	<0.08	<0.08
Uranium	0.0005	0.0029	0.001
Vanadium	<0.01	<0.01	<0.010
Zinc	24.9	306	133

Appendix A - Acid Base Accounting Data

Table A-1. Static test results for Trench Camp historic tailings area samples.

Sample	Acid Generation Potential (calc on Sulfur total)	Acid Neutralization Potential (calc)	Net Neutralization Potential (calc on Sulfur total)	Net Acid Generation Procedure	Neutralization Potential as CaCO3	pH, Saturated Paste
BH-01 / S-1	64.4	1	-63.4	3.1	0.1	4
BH-01 / S-2	356	116	-240	2.7	11.6	6.5
BH-01 / S-3	369	156	-213	7.7	15.6	7.1
BH-01 / S-4	409	230	-179	8.2	23	7.6
BH-01 / S-5	369	153	-216	8.2	15.3	7.5
BH-01 / S-6	422	148	-274	8.3	14.8	7.6
BH-01 / S-8	3.13	20	16.9	7.7	2	7.6
BH-02 / S-2	132	2	-130	3.2	0.2	4.1
BH-02 / S-3	378	9	-369	2.8	0.9	4.9
BH-02 / S-4	331	136	-195	8.1	13.6	7
BH-02 / S-6	316	244	-71.6	8.2	24.4	7.2
BH-02 / S-7	34.7	9	-25.7	7.5	0.9	7.1
BH-02 / S-8	49.1	5	-44.1	5.5	0.5	7.2
BH-03 / S-2	369	40	-329	2.2	4	6.1
BH-03 / S-3	369	78	-291	2.2	7.8	6.3
BH-03 / S-4	279	144	-135	8.1	14.4	7.3
BH-03 / S-5	263	146	-117	8.2	14.6	7.3
BH-03 / S-6	22.2	10	-12.2	7.4	1	7.2
BH-04 / S-1	121	0	-121	3		3.4
BH-04 / S-2	397	51	-346	2.6	5.1	5.9
BH-04 / S-3A	347	141	-206	7.7	14.1	6.5
BH-04 / S-3B	99.7	0	-99.7	3.1		4.2
BH-04 / S-4	88.8	0	-88.8	2.7		3.6
BH-04 / S-5	143	0	-143	2.4		3.6
BH-04 / S-6	23.1	2	-21.1	4.2	0.2	4.1
BH-05 / S-2	409	96	-313	7.2	9.6	7
BH-05 / S-3A	556	59	-497	2.3	5.9	6.5
BH-05 / S-3B	10	23	13	7.2	2.3	7.3
BH-05 / S-4	1.88	25	23.1	7.7	2.5	7.4
BH-05 / S-5	4.06	23	18.9	7.7	2.3	7.7
BH-06 / S-2	110	4	-106	3.3	0.4	4.5
BH-06 / S-3	59.1	0	-59.1	3		3.7
BH-06 / S-4	96.3	0	-96.3	2.6		3.7
BH-07 / S-2	353	0	-353	2.1		3.8
BH-07 / S-3	338	21	-317	2.2	2.1	5.2
BH-07 / S-4	263	33	-230	2.3	3.3	6.2
BH-07 / S-6A	203	94	-109	7.8	9.4	7.2
BH-07 / S-6B	11.6	13	1.4	4.2	1.3	5.9
BH-07 / S-7	12.5	5	-7.5	4.3	0.5	4.4
BH-07 / S-8	7.19	5	-2.2	5	0.5	5.6
BH-07 / S-9	1.88	19	17.1	6.8	1.9	5.9
BH-08 / S-2	378	75	-303	2.4	7.5	5.5
BH-08 / S-3	488	126	-362	8	12.6	6.7
BH-08 / S-4	319	158	-161	8.2	15.8	7.4
BH-08 / S-5	243	118	-125	8.2	11.8	7.3
BH-08 / S-6	274	138	-136	7.8	13.8	7.6
BH-08 / S-8	6.56	78	71.4	7.6	7.8	7.6
BH-08 / S-9	1.56	86	84.4	8.5	8.6	7.6
BH-08 / S-10	1.56	200	198	8.6	20	7.7
TP-24 / S-1	356	80	-276	2.4	8	5.9
TP-24 / S-2	10.6	30	19.4	7	3	6.3
TP-25 / S-1	264	18	-246	2.3	1.8	4.7
TP-25 / S-2	6.88	38	31.1	4.2	3.8	4.1
TP-34 / S-1	292	111	-181	2.9	11.1	6.1
TP-34 / S-2	20.6	8	-12.6	6.9	0.8	6

Table A-2. Static test results for Trench Camp historic tailings area samples.

Sample	Sulfur HCl Residue	Sulfur HNO3 Residue	Sulfur Organic Residual	Sulfur Pyritic Sulfide	Sulfur Sulfate	Sulfur Total	Total Sulfur minus Sulfate	Material	Depth
BH-01 / S-1	0.39	0.03	0.03	0.36	1.67	2.06	0.39	Cover	-1.5
BH-01 / S-2	7.11			7.11	4.26	11.4	7.11	Tailings	-5.75
BH-01 / S-3	7.67	0.01	0.01	7.66	4.11	11.8	7.67	Tailings	-15.75
BH-01 / S-4	10.1	0.01	0.01	10	3.01	13.1	10.1	Tailings	-25.75
BH-01 / S-5	10.9			10.9	0.95	11.8	10.9	Tailings	-35.75
BH-01 / S-6	12			12	1.51	13.5	12	Native Grounc	-45.75
BH-01 / S-8	0.05			0.05	0.05	0.1	0.05	Native Grounc	-53.25
BH-02 / S-2	0.54			0.54	3.69	4.23	0.54	Tailings	-5.75
BH-02 / S-3	7.66	0.01	0.01	7.65	4.48	12.1	7.66	Tailings	-15.75
BH-02 / S-4	9.78	0.04	0.04	9.74	0.78	10.6	9.78	Tailings	-25.75
BH-02 / S-6	9.42	0.05	0.05	9.37	0.71	10.1	9.42	Tailings	-35.75
BH-02 / S-7	1	0.69	0.69	0.31	0.11	1.11	1	Native Grounc	-38.25
BH-02 / S-8	1.56	1.17	1.17	0.39	0.01	1.57	1.56	Native Grounc	-40.75
BH-03 / S-2	7.78	0.02	0.02	7.76	3.98	11.8	7.78	Tailings	-4.75
BH-03 / S-3	8.99	0.03	0.03	8.96	2.77	11.8	8.99	Tailings	-15.75
BH-03 / S-4	7.88	0.03	0.03	7.85	1.06	8.94	7.88	Tailings	-25.75
BH-03 / S-5	5.79	0.03	0.03	5.76	2.61	8.4	5.79	Tailings	-35.8
BH-03 / S-6	0.67	0.47	0.47	0.2	0.04	0.71	0.67	Native Grounc	-43.75
BH-04 / S-1	1.48	0.02	0.02	1.46	2.38	3.86	1.48	Tailings	-1.3
BH-04 / S-2	8.52	0.02	0.02	8.5	4.13	12.7	8.52	Tailings	-5.75
BH-04 / S-3A	7.82	0.01	0.01	7.81	3.27	11.1	7.82	Tailings	-15.55
BH-04 / S-3B	1.2	0.02	0.02	1.18	1.99	3.19	1.2	Waste Rock	-16
BH-04 / S-4	0.95	0.01	0.01	0.94	1.89	2.84	0.95	Waste Rock	-20.75
BH-04 / S-5	2.2	0.03	0.03	2.17	2.38	4.58	2.2	Waste Rock	-25.75
BH-04 / S-6	0.22	0.19	0.19	0.03	0.52	0.74	0.22	Native Grounc	-40.75
BH-05 / S-2	11.3	0.02	0.02	11.3	1.87	13.1	11.3	Tailings	-5.75
BH-05 / S-3A	16.4	0.01	0.01	16.4	1.38	17.8	16.4	Tailings	-15.55
BH-05 / S-3B	0.16	0.04	0.04	0.12	0.16	0.32	0.16	Native Grounc	-16
BH-05 / S-4		0.01	0.01		0.06	0.06		Native Grounc	-18.25
BH-05 / S-5	0.06			0.06	0.07	0.13	0.06	Native Grounc	-20.75
BH-06 / S-2	0.94	0.12	0.12	0.82	2.58	3.52	0.94	Waste Rock	-10.75
BH-06 / S-3	0.73	0.01	0.01	0.72	1.16	1.89	0.73	Waste Rock	-20.75
BH-06 / S-4	1.79	0.03	0.03	1.76	1.29	3.08	1.79	Waste Rock	-22.65
BH-07 / S-2	7.94	0.01	0.01	7.93	3.31	11.3	7.94	Tailings	-5.75
BH-07 / S-3	7.47	0.01	0.01	7.46	3.35	10.8	7.47	Tailings	-10.75
BH-07 / S-4	6.14	0.03	0.03	6.11	2.27	8.41	6.14	Tailings	-20.75
BH-07 / S-6A	5.15	0.03	0.03	5.12	1.36	6.51	5.15	Tailings	-30.55
BH-07 / S-6B	0.23	0.04	0.04	0.19	0.14	0.37	0.23	Native Grounc	-31
BH-07 / S-7	0.21	0.18	0.18	0.03	0.19	0.4	0.21	Native Grounc	-33.25
BH-07 / S-8	0.16	0.15	0.15	0.01	0.07	0.23	0.16	Native Grounc	-35.75
BH-07 / S-9	0.01			0.01	0.05	0.06	0.01	Native Grounc	-40.75
BH-08 / S-2	7.12	0.11	0.11	7.01	5	12.1	7.12	Tailings	-5.75
BH-08 / S-3	14.7	0.26	0.26	14.4	0.97	15.6	14.7	Tailings	-15.75
BH-08 / S-4	9.51	0.22	0.22	9.29	0.67	10.2	9.51	Tailings	-25.75
BH-08 / S-5	6.33	0.16	0.16	6.17	1.46	7.79	6.33	Tailings	-35.75
BH-08 / S-6	7.14	0.3	0.3	6.84	1.64	8.78	7.14	Tailings	-45.75
BH-08 / S-8	0.11			0.11	0.1	0.21	0.11	Native Grounc	-50.75
BH-08 / S-9					0.05	0.05		Native Grounc	-53.25
BH-08 / S-10	0.02			0.02	0.03	0.05	0.02	Native Grounc	-55.75
TP-24 / S-1	7.98	0.13	0.13	7.85	3.4	11.4	7.98	Tailings	-7.5
TP-24 / S-2	0.06			0.06	0.28	0.34	0.06	Native Grounc	-9.5
TP-25 / S-1	5.44	0.14	0.14	5.3	3.02	8.46	5.44	Tailings	-9
TP-25 / S-2	0.02	0.01	0.01	0.01	0.2	0.22	0.02	Native Grounc	-15
TP-34 / S-1	5.56	0.08	0.08	5.48	3.78	9.34	5.56	Tailings	-6
TP-34 / S-2	0.61	0.41	0.41	0.2	0.05	0.66	0.61	Native Grounc	-9

ATTACHMENT B

ATTACHMENT C

Water
Engineering
Technologies, Inc.

TRENCH CAMP PROPERTY

WATER TREATMENT PLANT

PRELIMINARY ENGINEERING REPORT

Prepared For

Arizona Minerals, Inc.

April 20, 2017

65% COMPLETE ISSUED FOR VRP REVIEW

NOT FOR CONSTRUCTION

4691 Shandalyn Lane, Bozeman MT 59718 **(406) 585-7101 phone/fax**
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1.0 INTRODUCTION

This preliminary engineering report is provided by Water Engineering Technologies, Inc. (WET) to Arizona Minerals, Inc. (AMI) for the water treatment plant (WTP) located at the Trench Camp Property (Trench Camp, January Mine, and Norton Mine Claims) Project (Project) located in Santa Cruz County, AZ. This report contains sections on: WTP background; design criteria including water chemistry and flow rates; process design including a process flow diagram, process and instrumentation diagrams, mechanical equipment list, a facility general arrangement, and major equipment data sheets; and a cost estimate for capital expenditures (Capex) and annual operating expenditures (Opex).

2.0 WTP BACKGROUND

AMI wants to engineer and install a water treatment plant capable of treating underdrain seepage and storm water runoff from a tailings storage facility (TSF) located on the Project property and water from the January Mine (Mine) workings. The flow rate from the TSF Underdrain Collection Pond (UP) is estimated to fluctuate up to a maximum of 120 gallons per minute (gpm) in reaction to monsoon rains, then fall to a minimum of less than ten gpm during extended dry periods. The flow rate from the Mine also fluctuates because of hydrologic influences from monsoon rains and dry periods and is estimated to be between 39 and 7 gpm, respectively.

It is anticipated that treated water will be utilized for on-going mine exploration, dust control, construction soil conditioning, and future milling and mining operations. Periodic, short-term discharge of treated water or a portion of treated water to Alum Gulch may be necessary during periods of exploration or mine development. This discharge would be authorized under an AZPDES permit.

3.0 DESIGN CRITERIA

3.1 FLOW RATES

Water sources to the WTP consist of TSF UP flow and January Mine water flow. It is understood both sources are heavily influenced by meteoric precipitation events and thus highly variable.

Several factors in addition to source flow variability must also be considered when selecting a WTP throughput value, including:

(1) water storage availability in the TSF UP;
(2) desired mine water level and drawdown resulting from mine water pumping; and
(3) WTP operation shift schedule.

AMI has developed plans for installing a lined underdrain collection pond in conjunction with the TSF, so the amount of future water storage has already been determined. AMI has collected data that provide a good understanding of the effects of pumping and resulting drawdown of the January Mine workings, and have in place a dedicated mine water pumping system. AMI will operate the WTP on a variable shift schedule up to 24-hours per day as needed to respond to seasonal fluctuations in UP water volumes and mine water levels. Given all these factors, it was determined than a nominal WTP throughput to be used as a basis of design is 120 gpm. The two water sources will be combined prior to treatment, with the ratio of Mine water to UP water variable dependent on local meteorological conditions.

3.2 WATER CHEMISTRY

Water chemistry from mine water and the existing tailings seepage (worst-case surrogate for UP water) were characterized using water samples collected the week of January 9, 2017. In addition to characterizing the two separate water sources, these waters were combined in a 20:3 ratio (Mine to seep water) and characterized. Water chemistry of these three waters is shown in Table 3-1.

3.2.1 Water Treatability Jar Tests

Water treatability jar tests were performed using the two site waters and the combined site waters in a 20:3 ratio. The jar test protocol was developed using best professional judgement based on the site water chemistry and anticipated effluent requirements. Twelve different jar tests were undertaken on seep water and mixed water (mine to seep at 20:3) mimicking six different treatment processes consisting of:

- pH adjustment to 9.0
- pH adjustment to 9.0 plus aeration
- pH adjustment to 9.0 plus aeration and filtration
- pH adjustment to 10.5
- pH adjustment to 10.5 plus aeration
- pH adjustment to 10.5 plus aeration and filtration

The lab test protocol describing the treatment processes is provided in Appendix 1. The jar tests were performed by Veolia Water under WET direction.

The supernatant from each of the twelve jar tests was analyzed by Turner Laboratories for select anions and cations. Results of all twelve jar tests are summarized in Appendix 2, along with laboratory data from Turner Laboratories. Select results from the jar tests as well as potentially applicable Alum Gulch surface water quality standards that may be used as the basis for permit limits are shown in Table 3-1. Any discharge will be to a portion of Alum Gulch classified as ephemeral; Table 3-1 includes aquatic and wildlife EDW standards in the event they are used as the basis for permit limits pursuant to A.A.C. R18-11-113.

Table 3-1

							Surface Water Quality Standards			
Constituent	Units	Mine Raw	Seep Raw	Mine + Seep Mixed 20:3	Mixed pH 9.0	Mixed pH 10.5	A&W (EDW) chronic (1)	A&W (EDW) acute (1)	Partial Body Contact	Ag & Livestock Watering
Conductivity	µmhos/cm	4600	14000	6000						
Hardness	mg/L	2100	4200	2300	2900	2700				
Ca, Dissolved	mg/L	480	480	440	720	870				
Fe, Dissolved	mg/L	<0.0044	2.5	<0.0044	<0.0044	<0.022	1			
Mg, Dissolved	mg/L	220	740	280	280	130				
Al, Dissolved	mg/L	<0.0400	148	10.6	0.0701	<0.40				
As, Dissolved	mg/L	0.00099	0.027	0.0030	0.0010	<0.00050	0.15	0.34		
Be, Dissolved	mg/L	<0.00025	0.031	0.0045	<0.00025	<0.00025	0.0053	0.065		
Cd, Dissolved	mg/L	<0.00025	1.8	0.23	0.0080	<0.00025	0.00622	0.01912		
Cr, Dissolved	mg/L	0.00051	0.0027	0.00053	0.00072	<0.00050				
Cu, Dissolved	mg/L	0.0015	2.4	0.35	0.00093	0.00075	0.02928	0.04962		
Mn, Dissolved	mg/L	56	1200	210	96	0.30				
Ni, Dissolved	mg/L	0.062	1.2	0.23	0.051	0.040	0.16804	1.51289		
Pb, Dissolved	mg/L	<0.00050	0.015	<0.0050	<0.0050	<0.00050	0.01094	0.28085		
Se, Dissolved	mg/L	0.0022	0.073	0.0081	0.004	0.0017				
Tl, Dissolved	mg/L	<0.00050	<0.0050	<0.0050	<0.0050	<0.00050	0.15	0.7		
Zn, Dissolved	mg/L	6.3	670	84	0.071	<0.040	0.3793	0.3793		
Fe, Total	mg/L	21	2.5	21	<0.0044	<0.0044				
Al, Total	mg/L	<0.400	176	25.0	<0.40	<0.800				
As, Total	mg/L	0.048	0.029	0.054	<0.0050	<0.00050			0.28	0.2
Be, Total	mg/L	<0.0025	0.042	0.0058	<0.0025	<0.0050			1.867	
Cd, Total	mg/L	0.0010	1.3	0.25	0.021	0.0035			0.7	0.05
Cr, Total	mg/L	<0.0050	<0.025	<0.0050	<0.0050	<0.010				1
Cu, Total	mg/L	<0.0051	2.8	0.38	0.0051	0.0045			1.3	0.5
Mn, Total	mg/L	65	1200	200	110	4.5			130.667	
Ni, Total	mg/L	0.053	1.5	0.29	0.040	0.053			28	
Pb, Total	mg/L	0.0075	<0.025	0.011	0.0015	0.00090			0.015	0.1
Se, Total	mg/L	0.0031	0.063	0.011	0.0028	0.0011	0.002		4.667	0.05
Tl, Total	mg/L	<0.00050	<0.025	<0.00050	<0.00050	<0.00050			0.075	
Zn, Total	mg/L	6.6	680	91	0.83	0.60			280	25
TDS	mg/L	3200	13000	4400						
SO4	mg/L	2200	8800	3100						
Notes:	(1) limits or hardness-based metals (cadmium, copper, lead, nickel, silver, zinc) are based on a hardness of 400									

4.0 PROCESS DESIGN

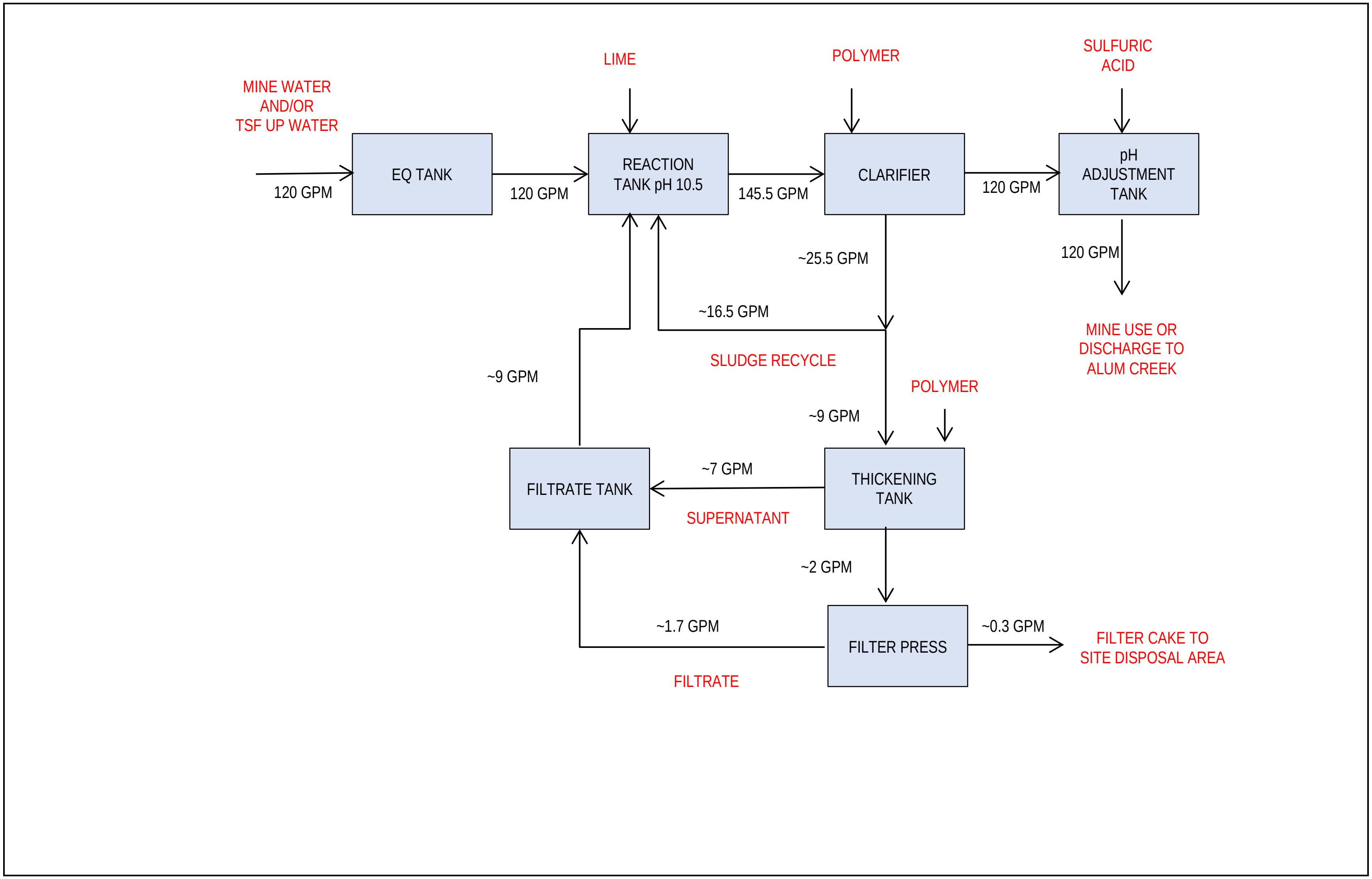
4.1 PROCESS SUMMARY

The selected treatment process for 100 percent mine water, 100 percent UP water, or a combination of both waters for a total combined flow of 120 gpm producing effluent capable of meeting potential effluent limits consists of pH adjustment to 10.5 followed by liquid/solids separation. This process is summarized as follows:

- Mine water & UP water routed to equalization (EQ) tank.
- Water from the EQ tank is routed to a reaction tank with agitator for pH adjustment to 10.5 using hydrated lime.
- Water from the reaction tank is routed to a clarifier for liquid/solids separation. A flocculant is added to the clarifier to enhance hydroxide floc formation and settling.
- Clarifier overflow is routed to a reaction tank for pH adjustment to less than 8.5 using sulfuric acid.
- Water from the acid reaction tank is pumped back to a tank or tanks for use in exploration, dust control, or mine (mill and mine operations) for re-use, or discharge to Alum Gulch.
- Clarifier underflow sludge is primarily routed to a sludge thickening tank, with a portion of sludge recycled back to the lime reaction tank;
- Thickening tank overflow is routed back to the lime reaction tank;
- Thickening tank underflow is routed to a sludge filter press for dewatering;
- Dewatered sludge is routed to the TSF for permanent storage;

A block flow diagram (BFD) showing this treatment process is shown in Figure 4-1.

Figure 4-1


MINE WATER
AND/OR
TSF UP WATER
120 GPM
EQ TANK
120 GPM
LIME
REACTION
TANK pH 10.5
145.5 GPM
POLYMER
CLARIFIER
120 GPM
SULFURIC
ACID
pH
ADJUSTMENT
TANK
120 GPM
MINE USE OR
DISCHARGE TO
ALUM CREEK
~25.5 GPM
~16.5 GPM
SLUDGE RECYCLE
~9 GPM
~9 GPM
POLYMER
THICKENING
TANK
~7 GPM
SUPERNATANT
FILTRATE TANK
~2 GPM
FILTER PRESS
~0.3 GPM
FILTER CAKE TO
SITE DISPOSAL AREA
~1.7 GPM
FILTRATE

4.2 PROCESS DESCRIPTION

A description of the treatment process is described in the following paragraphs. Refer to the process flow diagram (PFD) and process and instrumentation diagrams (PID) in Appendix A for further information on equipment sizes, pipe sizes and materials, and instrumentation. Equipment data are found in the equipment data sheets contained in Appendix B.

EQ Tank. Mine water and UP water are pumped at a combined flow rate of 120 gpm to the 10,000-gallon equalization (EQ) tank. These waters are co-mingled in this tank then routed via gravity through a tank overflow pipe to the reaction tank. Flow rates of mine water and UP water are both measured on the inlet piping to the EQ tank.

Reaction Tank. Water from the EQ tank overflow is piped to the 4,500-gallon reaction tank for pH adjustment using hydrated lime supplied from the lime system. This tank utilizes an agitator to ensure adequate lime mixing into solution with the untreated water. The pH is adjusted to a pre-determined set point, which for the purposes of this design is assumed to be 10.5 based on the jar testing described in previous sections. The amount of hydrated lime to be added based on the jar tests is 1.0 g/l; the actual lime addition rate will be determined upon WTP startup and commissioning. The hydraulic residence time in the reaction tank is 30 minutes at the 120 gpm design flow. pH is measured using in the reaction tank. As the pH of the untreated water changes due to differing ratios of mine water to UP water, the amount of hydrated lime required to reach the pH set point will be adjusted based on the output signal from the pH probe controlling the amount of hydrated lime pumped from the lime system. pH adjusted water is routed via gravity through a tank overflow pipe to the clarifier.

Hydrated Lime System. The lime system will utilize a silo sized to store 1,700 cubic feet of hydrated lime at 35 pounds per cubic feet. The silo includes a single discharge cone providing one feed train. The system includes a dry product metering system and dilution equipment to produce a lime slurry. Fresh water from the fresh water tank is used to make up the lime slurry. The lime slurry is pumped to the reaction tank for pH adjustment. The silo system will be controlled by a PLC and will include an operator interface with local indication of conditions and alarms.

Fresh Water System. The fresh water system consists of a 2,000-gallon tank and forwarding pump. Fresh water is supplied to the tank from an on-site fresh water well. Fresh water is pumped to the lime system for dilution; Water is also pumped for use as service water in the WTP.

Flocculation System. The flocculation system consists of a chemical tote containing a liquid anionic polymer flocculant and two chemical feed pumps. Flocculant is pumped to the clarifier to assist with particle flocculation. The amount of flocculant to be added based on the jar tests is 1.0 mg/l; the actual flocculant addition rate will be determined upon WTP startup and commissioning. Flocculant is also pumped to the thickening tank to assist with thickening the solids in the tank.

Clarification. Water from the reaction tank overflow is fed to the clarifier for liquid/solids separation. Flocculant from the flocculation system is added to the clarifier center well to assist with hydroxide floc formation. As the flocs settle in the water column, an internal impeller circulates the solids within the center well to mix with incoming solids formed in the reaction tank. Solids separate in the water column within the tank and settle in the bottom of the tank. Clarified water overflows the internal weir at the top of the tank and is piped to the pH reaction tank. Sludge is formed in the clarifier as the gypsum and metal hydroxide solids formed in the reaction tank settle in the cone-shaped area of the clarifier bottom. The clarifier utilizes a slow-moving rake powered by a 1 h.p. motor to ensure the sludge continuously moves toward the center of the cone at the bottom of the clarifier. The sludge is pumped from the cone bottom to the sludge thickening tank. A portion of the pumped sludge is diverted back to the reaction tank where it mixes with the lime and untreated water. This sludge recycle helps solids formation to occur in the reaction tank as well as utilize un-reacted lime contained in the sludge.

Final pH adjustment. Clarifier overflow is routed to pH adjustment tank for pH adjustment to 8.5 using sulfuric acid. The acid will be fed from the acid feed system. A pH probe in the tank will relay a signal to the acid feed pump to regulate the acid feed rate from the chemical feed pump. Overflow from the pH adjustment tank will be routed to the mine supply pump for use at the mine site or discharged to Alum Creek.

Acid Feed System. The sulfuric acid system consists of a chemical tote containing 92% sulfuric acid, a chemical feed pump, and a secondary containment tray. The acid is pumped to the pH adjustment tank using a feed rate determined by the pH in the tank.

Mine Supply Pump. Overflow from the pH adjustment tank is piped to the mine supply pump for use at the mine. This pump is rated at 20 h.p., with a flow rate of 120 gpm. Treated water not needed for mining is diverted through a tee to the discharge pipe for discharge into Alum Creek.

Clarifier Sludge Forwarding Pump. Clarifier underflow sludge is pumped to the sludge thickening tank using an 1 h.p. centrifugal pump. The pump discharge is piped to the thickening tank, with a diversion valve in the pipe that enables some sludge to be recycled back to the reaction tank. The operator controls the amount of sludge recycle based on manual observation of solids formation in the reaction tank and subsequent settling in the clarifier. This is an iterative procedure that is undertaken as the mine water to UP water flow ratio changes. During periods of steady water ratios, the sludge recycle rate will remain constant.

Sludge Thickening Tank. Sludge from the clarifier underflow is pumped to the sludge thickening tank. This tank has a cone shaped bottom and slow-moving rake to concentrate the sludge in the tank bottom. This allows water to separate from the solids to create a supernatant which then flows out of the tank through the effluent piping. The supernatant flows by gravity to the filtrate tank. The remaining sludge is expected to be greater than approximately 5 percent solids by weight. The thickened sludge is pumped from the tank bottom to the filter press. Anionic polymer is fed to this tank from the flocculation system. The flocculant feed rate will be optimized by the operator based on the actual sludge production rate occurring in the clarifier, but is expected to be on the order of 2-5 mg/l of clarifier sludge.

Thickened Sludge Forwarding Pump. Thickened sludge from the thickening tank is pumped to the filter press using a 0.75 h.p. progressive cavity pump. The pump operates in a non-continuous mode; that is, after the filter press completes a press cycle and is emptied the operator will manually engage this pump to remove sludge from the thickening tank and transfer it to the filter press for de-watering.

Filter Press. The 30-cubic foot (cf) filter press receives thickened sludge from the thickening tank and removes the free water from the sludge during a press run. Sludge is pumped in-between filter panels by the thickened sludge forwarding pump. The press uses pressurized air to force the water filtrate from the sludge to produce a filter cake, expected to be greater than 25 percent solids by weight. The press run is complete when the filtrate is completely removed from the solids. The filtrate flows by gravity pipe to the filtrate tank. The de-watered solids are manually removed from the filter panels by the operator. The filter cake falls from the filter panels into a collection area beneath the press. The operator removes the filter cake from the collection area using a backhoe or skid-steer type bucket for transport to the TSF. The frequency of the press run will be determined once the WTP is under operation, but is not expected to be more often than once per operating shift.

Filtrate Tank and Filtrate Pump. Supernatant from the sludge thickening tank and the filter press are routed by gravity to the filtrate tank. This tank supplies water to the 0.25 h.p. filtrate pump which transfers supernatant from the filtrate tank to the reaction tank for further treatment.

4.3 PROCESS AND INSTRUMENTATION DIAGRAMS

PIDs for the entire WTP process are included in Appendix A.

4.4 FACILITY GENERAL ARRANGEMENT

The general arrangement of the WTP is shown on Sheet GA-101 in Appendix A.

4.5 MAJOR EQUIPMENT

The major equipment list is shown on Sheet MEL-101 in Appendix A.

The major equipment data are shown on Equipment Data Sheets in Appendix B.

5.0 CHEMICAL FIRST FILL REQUIREMENTS

Chemicals designated for use in the WTP include and their respective on-site storage capacities are:

- Hydrated lime – 1,700 cubic feet, housed in the storage silo;
- Anionic polymer flocculant - 250-gallon tote; and
- Sulfuric acid – 330-gallon tote with secondary containment.

APPENDIX A

PROCESS FLOW DIAGRAM

PROCESS AND INSTRUMENTATION DIAGRAMS

GENERAL ARRANGEMENT DIAGRAM

MECHANICAL EQUIPMENT LIST

ARIZONA MINERALS

JANUARY ADIT (NORTON MINE) VRP SITE
SANTA CRUZ COUNTY, ARIZONA
WATER TREATMENT SYSTEM

LEGAL DESCRIPTION

JANUARY & NORTON MINING CLAIMS
MINERAL SURVEYS (MS) NO.'S 745 & 929
LYING IN A PORTION OF UNSURVEYED SECTION 5, TOWNSHIP 23 SOUTH,
RANGE 16 EAST, & SURVEYED SECTION 32, TOWNSHIP 22 SOUTH, RANGE 16 EAST,
GILA AND SALT RIVER BASE AND MERIDIAN, SANTA CRUZ COUNTY, ARIZONA.

HARDSHELL NO. 7; JOSEPHINE; TRENCH NO. 2, TRENCH NO. 3; TRENCH NO. 4; TRENCH NO. 5; TRENCH NO. 6; TRENCH NO. 7; TRENCH NO. 8; TRENCH EXTENTION NO. 1; TRENCH EXTENTION NO. 2; TRENCH EXTENTION NO. 3; AND TRENCH EXTENTION 4 LOAD MINING CLAIMS, DESIGNATED AS SURVEY NO. 4222, BEING A PORTION OF SECTIONS 4 AND 5, TOWNSHIP 23 SOUTH, RANGE 16 EAST OF GILA AND SALT RIVER BASE AND MERIDIAN, SANTA CRUZ COUNTY, ARIZONA.

EARTHWORK QUANTITIES

SITE
CUT: 50,930 CY
FILL: 1 CY

BENCHMARK

BASIS OF ELEVATION: NE CORNER OF NORTON MINERAL CLAIM MS 929.
POINT BEING A FOUND 1/2" REBAR WITH ALUMINUM CAP
ELEVATION = 4950.84 (NAVD 88)

BASIS OF BEARINGS

THE BASIS OF BEARING IS GRID, BASED ON ARIZONA STATE PLANE COORDINATES, CENTRAL ZONE NAD83. THE BASIS OF BEARING IS BETWEEN FOUND MONUMENTATION OF THE SE AND NE CORNER OF THE JANUARY MINERAL CLAIM MS 745.
BEARING BEING S 38°18'25" E.

MATERIAL QUANITIES

QTY	DESCRIPTION
____ LF	UGE – UNDERGROUND ELECTRIC
____ LF	3" SDR-11 HDPE
4350 LF	3" SDR-17 HDPE
5730 LF	4" SDR-17 HDPE
381 LF	6" SDR-17 HDPE
____ EA	3" CLEANOUT
____ EA	4" CLEANOUT
____ CY	RIP-RAP D_{50}=4", T=8"
____ CY	RIP-RAP D_{50}=12", T=24"

OWNER/DEVELOPER

ARIZONA MINERALS, INC.
3845 N. BUSINESS CENTER DRIVE, SUITE 115
TUCSON, ARIZONA 85705
CONTACT: JOHNNY PAPPAS
PHONE: (520) 485-1300
jpappas@arizonamining.com

ENGINEER

CPE CONSULTANTS
3895 N. BUSINESS CENTER DRIVE, SUITE 115
TUCSON, ARIZONA 85705
CONTACT: RAUL PINA, P.E., R.L.S.
PHONE: (520) 545-7001
raul.pina@cpeconsultants.com

PROCESS ENGINEER

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BOSEMAN, MT 59718
CONTACT: SCOTT BENOWITZ, P.E.
PHONE: (406) 585-7101
wetsib@benowitz.net

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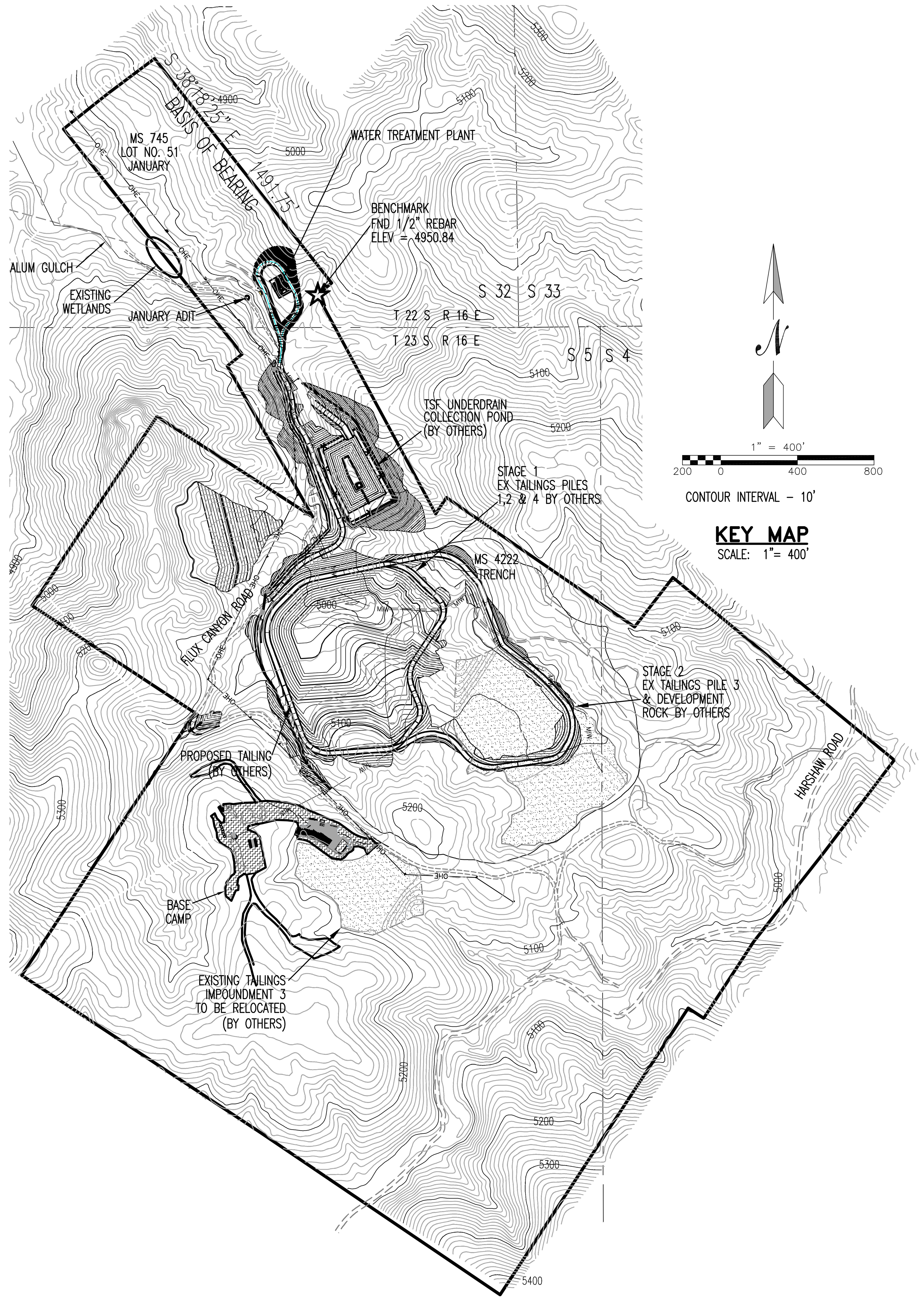
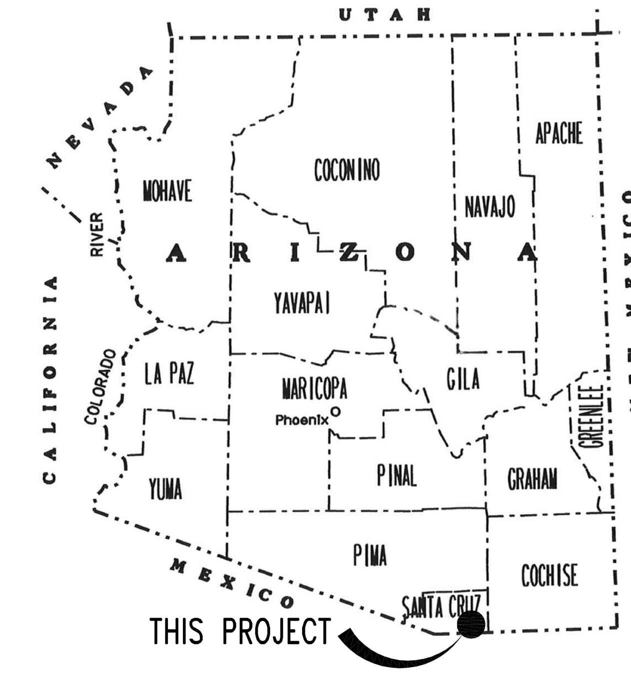
3845 N. BUSINESS CENTER DRIVE, SUITE 111
TUCSON, ARIZONA 85705
CONTACT: ALISTAIR RASQUINHA
PHONE: (520) 579-8315
alistair.rasquinha@sgs.com



KEY MAP

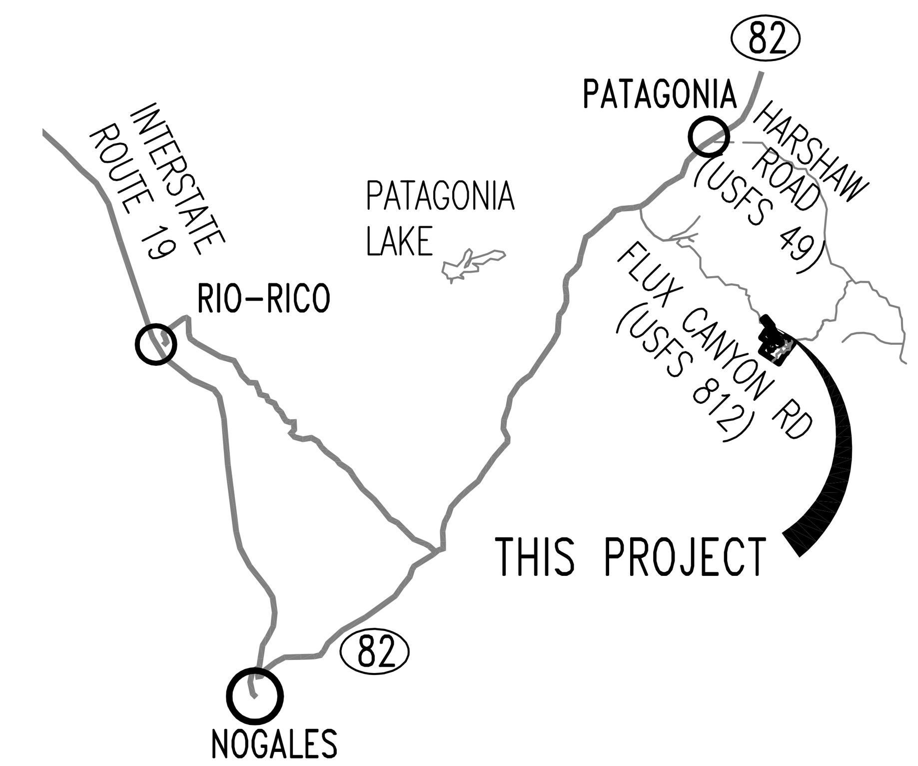
SCALE: 1"= 400'

SHEET INDEX



VICINITY MAP

NTS



LOCATION MAP

NTS

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED ENGINEER/LAND SURVEYOR DATE

REGISTRATION NUMBER

PRELIMINARY NOT FOR CONSTRUCTION

Water Engineering Technologies, Inc.
4691 Shandalyn Lane Bozeman, MT 59718
406-585-7101

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

CPE
CONSULTANTS
3895 N. Business Center Drive, Suite 115
Tucson, AZ 85705
520-545-7001

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
COVER SHEET
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

NO. | REVISION | APPV'D | DATE

DESIGNED BY :
DRAWN BY : VIG LMOB
CHK'D BY (DESIGN) :
CHK'D BY (FIELD ENGR) :

DATE: APRIL 2017
SCALE HORIZ. : AS-NOTED
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-01-COVER

SHEET : G-001
1 OF 20

65% PLANS PRINTED ON 04/24/2017

GENERAL NOTES

1. ALL CONSTRUCTION AND TEST METHODS SHALL BE IN ACCORDANCE WITH MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION, EDITION 2015, EXCEPT AS MODIFIED, SHOWN AND ACCEPTED BY DETAIL WITHIN THESE PLANS.

2. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS.

3. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL REGULATIONS AND REQUESTS BY THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY (ADEQ).

4. CONTRACTOR SHALL VERIFY AND OBTAIN ALL PERMITS REQUIRED BY THE GOVERNMENTAL AGENCIES, TO INCLUDE BUT NOT LIMITED TO: UNITED STATES FOREST SERVICE AND SANTA CRUZ COUNT, PRIOR TO CONSTRUCTION.

5. A STAMPED COPY SET OF THE LATEST APROVED PLANS SHALL BE ON THE JOB SITE AT ALL TIMES.

6. ALL REVISIONS TO THESE PLANS MUST BE APPROVED BY ARIZONA MINERALS, INC., CPE CONSULTANTS, AND THE APPLICABLE DESIGN ENGINEER SEALING THE PLANS PRIOR TO CONSTRUCTION.

7. ERRORS, OMISSIONS OR CONFLICTS BETWEEN VARIOUS ELEMENTS OF THE DRAWINGS, NOTES, AND DETAILS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND RESOLVED BEFORE PROCEEEDING WITH THE WORK.

8. EXISTING UTILITIES ARE SHOWN BASED UPON THE BEST INFORMATION AVAILABLE. THE CONTRACTOR SHALL VERIFY LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. THE CONTRACTOR SHALL CONTACT BLUE STAKE (CALL 811 OR CLICK Arizona811.com) TO VERIFY LOCATION OF ALL UTILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION.

9. DURING CONSTRUCTION, SHOULD CONFLICTS WITH ANY EXISTING UTILITIES BECOME EVIDENT, THE ENGINEER OF RECORD IS TO BE CONTACTED BEFORE ANY ADJUSTMENTS ARE MADE WHICH DIFFER FROM THIS PLAN.

10. THE CONTRACTOR IS NOT PERMITTED TO MAKE AUTONOMOUS DECISIONS TO CARRY OUT CONSTRUCTION FIELD CHANGES WITHOUT WRITTEN APPROVAL FROM THE ENGINEER OF RECORD AND ARIZONA MINERALS, INC.

11. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH, HAUL AND APPLY ALL WATER REQUIRED FOR COMPACTION AND FOR THE CONTROL OF DUST FROM CONSTRUCTION ACTIVITY. THE COST THEREOF IS TO BE INCLUDED IN THE GRADING CONSTRUCTION PRICE.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CARE, MAINTENANCE, REPAIR, OR REPLACEMENT OF EXISTING IMPROVEMENTS IN THE WORK AREA WHICH HAVE BEEN REMOVED OR DAMAGED DURING THE COURSE OF CONSTRUCTION. ALL REPAIR, REPLACEMENT, OR CLEANUP SHALL BE DONE TO THE SATISFACTION OF THE OWNER.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CARE AND MAINTENANCE OF EXISTING VEGETATION TO REMAIN IN THE WORK AREA.

14. ALL WORK TO BE LIMITED TO THE PROJECT SITE AND NO CONTRACTOR ACTIVITIES SHALL BE ON USFS LANDS OR PUBLIC RIGHT-OF-WAY WITHOUT PRIOR WRITTEN CONSENT OF THE APPROPRIATE PARTY.

15. THE ENGINEER OF RECORD OR HIS REPRESENTATIVE, SHALL OBSERVE, INSPECT, AND TEST ALL EARTHWORK OPERATIONS, INCLUDING BUT NOT LIMITED TO: CLEARING, GRUBBING, SUBGRADE PREPARATION, STRUCTURAL AND TRENCH EXCAVATION AND BACKFILL, TOGETHER WITH PLACEMENT AND COMPACTION AND FILL.

16. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND OR THE SURVEYOR PROVIDING THE CONSTRUCTION STAKING AND LAYOUT TO VERIFY THE BENCHMARK AND COMPARE THE SITE CONDITIONS WITH THE PLANS AND NOTIFY THE OWNER OR ENGINEER OF RECORD OF ANY DISCREPANCIES OBSERVED. SHOULD ANY BENCHMARK, GRADE, OR DESIGN INDICATED ON THE PLANS BE INTERPRETED TO BE INCORRECT, THE OWNER OR ENGINEER OF RECORD SHALL BE NOTIFIED BEFORE CONSTRUCTION BEGINS.

17. DRAINAGEWAYS AND ADJOINING AREAS ARE SUBJECT TO FLOODING. NO EQUIPMENT, TOOLS, OR MATERIALS SHALL BE STAGED, STOCKPILED, PARKED OR LEFT WITHIN A DRAINAGEWAY BEYOND OR OUTSIDE OF THE WORKING HOURS OF EACH DAY. THE OWNER ASSUMES NO LIABILITY FOR DAMAGE TO CONTRACTOR'S PROPERTY OR WORK AS THE RESULT OF STORMWATER RUNOFF.

SPECIFICATIONS AND CLARIFICATIONS:

GENERAL – THE FOLLOWING NOTES/SPECIFICATIONS ARE FOR CLARIFICATION AND/OR THE CONVENIENCE OF THE CONTRACTOR AND DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ALL SECTIONS, AS APPLICABLE, OF THE MAG UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION, EDITION 2015 (MAG SPECS).

1. THE FOLLOWING DEFINITIONS OF SECTION 101.2 DEFINITIONS AND TERMS OF THE MAG SPECS ARE REVISED TO READ: OWNER: ARIZONA MINERALS, INC.; ENGINEER: CPEC OR OTHER ENGINEER DESIGNATED BY OWNER.

2. THE CONTRACTOR SHALL PERFORM ALL WORK AS MAY BE NECESSARY TO COMPLETE THE CONTRACT IN A SATISFACTORY AND ACCEPTABLE MANNER IN FULL COMPLIANCE WITH THE PLANS, SPECIFICATIONS AND TERMS OF THE CONTRACT. IN THE EVENT A CONFLICT EXISTS BETWEEN CONTRACT DOCUMENTS THE ORDER OF PRECEDENCE LISTED IN DESCENDING ORDER SHALL BE AS FOLLOWS:
CHANGE ORDERS
ADDENDA
SPECIAL PROVISIONS
PROJECT PLANS
MAG UNIFORM STANDARD SPECIFICATIONS
MAG STANDARD DETAILS

3. CLEARING AND GRUBBING: THE AREAS OF THE CONSTRUCTION SITE TO BE IMPROVED PER THESE PLANS SHALL BE CLEARED OF ALL TREES, STUMPS, BRUSH, ROOTS, RUBBISH, DEBRIS AND OTHER OBJECTIONABLE MATTER, EXCEPT THAT THE CONTRACTOR SHALL AVOID, AS FAR AS PRACTICABLE, INJURY TO TREES, SHRUBBERY, PLANTS, GRASSES AND OTHER VEGETATION GROWING OUTSIDE OF THE AREAS TO BE IMPROVED. WITHIN EXCAVATED AREAS, ALL STUMPS, ROOTS AND OTHER OBSTRUCTIONS 3 INCHES OR OVER IN DIAMETER SHALL BE GRUBBED TO A DEPTH OF NOT LESS THAN 18 INCHES BELOW FINISH GRADE. IN EMBANKMENT AREAS ALL STUMPS, ROOTS AND OTHER OBSTRUCTIONS SHALL NOT BE LEFT HIGHER THAN SPECIFIED IN TABLE 201-1 OF THE MAG SPECS. ALL TREE TRUNKS, STUMPS, BRUSH, LIMBS, ROOTS, VEGETATION AND OTHER DEBRIS REMOVED IN CLEARING AND GRUBBING SHALL BE REMOVED, CHIPPED/MULCHED, AND STOCKPILED ONSITE, FOR FUTURE USE, AS DIRECTED BY THE OWNER/ENGINEER.

4. EXCAVATION: EXCAVATION SHALL CONSIST OF EXCAVATION INVOLVED IN THE GRADING AND CONSTRUCTION OF BASINS AND OTHER IMPROVEMENTS SHOWN ON THE PLANS, EXCEPT STRUCTURE EXCAVATION, TRENCH EXCAVATION AND ANY OTHER EXCAVATION SEPARATELY DESIGNATED.

5. UNSUITABLE MATERIAL: MATERIAL SHALL BE CONSIDERED UNSUITABLE FOR FILL, SUBGRADE, AND OTHER USES IF IT CONTAINS ORGANIC MATTER, SOFT SPONGY EARTH, OR OTHER MATTER OF SUCH NATURE THAT COMPACTION TO THE SPECIFIED DENSITY IS UNOBTAINABLE. MATERIAL THAT IS UNSUITABLE FOR THE INTENDED USE SHALL BE EXCAVATED AND STOCKPILED AT THE SITE OR OTHERWISE DISPOSED OF AS DIRECTED BY THE OWNER OR ENGINEER.

6. SURPLUS MATERIAL: SURPLUS SUITABLE MATERIAL SHALL BE STOCKPILED ONSITE, FOR FUTURE USE, AS DIRECTED BY THE OWNER/ENGINEER. SURPLUS SUITABLE MATERIAL, AS APPLICABLE, SHALL BE PLACED IN TWO STOCKPILES. ONE STOCKPILE SHALL CONSIST OF MATERIAL SUITABLE FOR PLACEMENT IN EMBANKMENTS (FILLS) AND THE SECOND SHALL CONSIST OF ROCK MATERIAL GENERALLY EXCEEDING 4 INCHES IN GREATEST DIMENSION. ROCK MATERIAL IS INTENDED FOR FUTURE USE AS ROCK RIP-RAP SLOPE PROTECTION. EMBANKMENT MATERIAL IS INTENDED FOR FUTURE USE IN FILL OF OTHER AREAS OF THE SITE AS DESIGNATED BY THE OWNER/ENGINEER.

7. FILL CONSTRUCTION: PLACEMENT OF FILL MATERIAL FOR THE CONSTRUCTION OF EMBANKMENTS SHALL BE IN ACCORDANCE WITH SECTION 211 OF THE MAG SPECS.

8. ROCK RIPRAP: RIPRAP CONSTRUCTION SHALL BE IN ACCORDANCE WITH SECTION 220 OF THE MAG SPECS AND CONSIST OF FURNISHING AND PLACING STONE, WITHOUT GROUT, AND UNDERLAIN WITH FILTER MATERIAL OF GRANULAR FILTER BLANKETS OR EROSION CONTROL GEOSYNTHETIC FABRIC. THE DEPTH AND TYPE OF RIPRAP FOR BASIN SLOPE PROTECTION SHALL BE 18" IN DEPTH AND D50=12". OTHER RIPRAP DEPTH AND TYPE SHALL BE AS SHOWN ON THE PLANS OR IN THE SPECIAL PROVISIONS.

9. CONCRETE STRUCTURES: CONCRETE STRUCTURES SHALL BE IN ACCORDANCE WITH SECTION 505 OF THE MAG SPECS AND SHALL CONSIST OF CLASS A CONCRETE UNLESS OTHERWISE SPECIFIED ON THE PLANS OR PROJECT SPECIFICATIONS.

10. TRENCHING: TRENCH EXCAVATION, BACKFILL, AND COMPACTIONS SHALL BE IN ACCORDANCE WITH SECTION 601 OF THE MAG SPECS EXCEPT WHERE MODIFIED BY THE PLANS AND/OR PROJECT SPECIAL PROVISIONS.

11. WARNING TAPE: UNDERGROUND MARKING TAPE SHALL BE A 4" WIDTH, DETECTABLE MARKING TAPE, WITH A MINIMUM 5.0 MIL OVERALL THICKNESS. TAPE SHALL BE MANUFACTURED USING A 0.8 MIL CLEAR VIRGIN POLYPROPYLENE FILM, REVERSE PRINTED AND LAMINATED TO A 0.35 MIL SOLID ALUMINUM FOIL CORE, AND THEN LAMINATED TO A 3.75 MIL CLEAR VIRGIN POLYETHYLENE FILM. TAPE SHALL BE PRINTED USING A DIAGONALLY STRIPED DESIGN FOR MAXIMUM VISIBILITY, AND MEET THE APWA COLOR-CODE STANDARD FOR IDENTIFICATION OF BURIED UTILITIES. TAPE SHALL MEET THESE SPECIFICATIONS OR AN APPROVED EQUAL.

12. FRENCH DRAIN FILTER FABRIC: FILTER FABRIC SHALL BE A NON-WOVEN, 100% POLYPROPYLENE GEOTEXTILE, US FABRICS US 180NW OR EQUAL. SHALL BE PLACED PER MANUFACTURER SPECIFICATIONS.

13. FRENCH DRAIN IMPERVIOUS LINER: IMPERVIOUS LINER SHALL BE IMPERVIOUS PLASTIC SHEETING, MINIMUM 60 MIL, DOUBLE THICKNESS. SHALL BE PLACED PER MANUFACTURER SPECIFICATIONS AND PLACED TO AVOID PUNCTURE DURING INSTALLATION.

14. GUNITE LINING: REPLACEMENT OF EXISTING GUNITE LINING REMOVED FOR THE FORCEMAIN INSTALLATION SHALL CONFORM TO SECTION 525 OF THE MAG SPECS OR AS APPROVED BY THE OWNER/ENGINEER.

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

Water Engineering Technologies, Inc.
4691 Shandalyn Lane Bozeman, MT 59718
406-585-7101

CPE CONSULTANTS
[redacted]
3695 N. Business Center Dr.
Suite 115 Tucson, AZ 85705
520-545-7001

NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
GENERAL NOTES, SPECIFICATIONS AND CLARIFICATIONS
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED BY :
DRAWN BY : WG LMOB
CHK'D BY (DESIGN) :
CHK'D BY (FIELD ENGR) :

DATE: APRIL 2017
SCALE: HORIZ. : N/A
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-02-GENERAL NOTES

SHEET : G-002
2 OF 20

65% PLANS PRINTED ON 04/24/2017

ABBREVIATIONS

ABBREVIATION	WORDS
A	
@	AT
AB	AGGREGATE BASE
ABC	AGGREGATE BASE COURSE
ABDN	ABANDONED
AC	ACRES
ACI	AMERICAN CONCRETE INSTITUTE
ADDL	ADDITIONAL
ADEQ	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
ADJ	ADJACENT, ADJUSTABLE
AFF	AT FINISH FLOOR
AGG	AGGREGATE
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ALUM	ALUMINUM
ALT	ALTERNATE
AMT	AMOUNT
ANG	ANGLE
APPROX	APPROXIMATE, APPROXIMATELY
APW	AEROBIC POLISHING WETLAND
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
ASSY	ASSEMBLY
ATS	ACTIVE TREATMENT SYSTEM
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
B	
BAL	BALANCE
BCR	BIOCHEMICAL REACTOR
BCSM	BRASS CAP SURVEY MONUMENT
BDRY	BOUNDARY
BF	BLIND FLANGE, BOTTOM FACE
BGN	BEGIN
BK	BACK, BOOK
BKFL	BACKFILL
BLDG	BUILDING
BM	BENCH MARK
BOR	BORROW
BOTT	BOTTOM
BP	BANK PROTECTION
BRG	BEARING
BTWN	BETWEEN
BW	BARBED WIRE
BV	BALL VALVE, BUTTERFLY VALVE
C	
C TO C	CENTER TO CENTER
C IN PL	COMPLETE IN PLACE
CALC OR (C)	CALCULATED
CAP	CAPACITY
CEM	CEMENT
CF	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CHAN	CHANNEL
CHDPEPP	CORRUGATED HIGH-DENSITY POLYETHYLENE PLASTIC PIPE
C-I-P	CAST IN PLACE
℄	CENTER LINE
CLR	CLEAR
C/L	CHAIN LINK, CONTROL LINE
CMP	CORRUGATED METAL PIPE
CO.	COUNTY
COMP	COMPACT OR COMPACTION
CONC	CONCRETE
CONN	CONNECTION
COND	CONDUIT
CONST	CONSTRUCTION, CONSTRUCT
CONT	CONTINUOUS
COORD	COORDINATE
COR	CORNER
CORR	CORRECTION
CP	CONTROL POINTS
CPLG	COUPLING
CTR	CENTER
CTRD	CENTERED
CU	CUBIC
CULV	CULVERT
CV	CHECK VALVE
CWS	CALCULATED WATER SURFACE
CY, CU YD	CUBIC YARD OR CUBIC YARDS
D	
Δ	DELTA
DEG OR °	DEGREES
D	DEGREE OF CURVE
D	DEPTH
DA	DRAINAGE AREA
DBL	DOUBLE
DEMO	DEMOLITION
DEPT	DEPARTMENT
DG	DOWN GUY
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DN	DOWN
DR	DRIVE
DRN	DRAIN OR DRAINAGE
DTL	DETAIL
DWG	DRAWING
DWS	DESIGN WATER SURFACE
DWY	DRIVEWAY

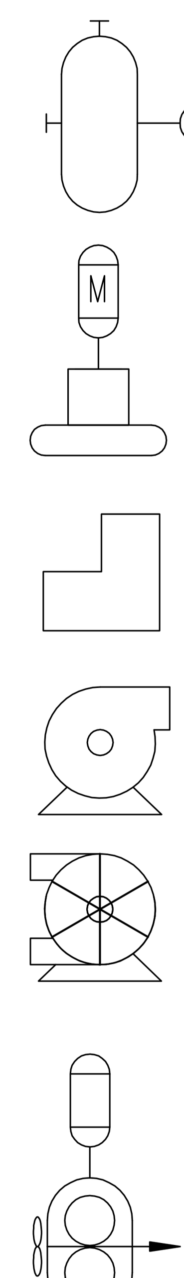
ABBREVIATION	WORDS
E	
E	EAST
ELEC	ELECTRIC, ELECTRICITY
EA	EACH
ECC	ECCENTRIC
EF	EACH FACE
EG	EXISTING GRADE
EL	ELECTRICAL
ELEV	ELEVATION
ELB	ELBOW
EMB	EMBANKMENT
ENGR	ENGINEER
ENT	ENTRANCE
EP OR EOP	EDGE OF PAVEMENT
EQ	EQUATION
EQPMT	EQUIPMENT
EST	ESTIMATE
E/W	EACH WAY
EXC	EXCAVATION
EX, EXST	EXISTING
EXP	EXPOSED
EXP JT	EXPANSION JOINT
EXT	EXTEND OR EXTENSION
EXT	EXTERNAL
F	
'/FT	FEET PER FOOT
FAB	FABRICATION
FC	FLEXIBLE COUPLING
FCA	FLANGED COUPLING ADAPTER
FD	FOUND
FDN	FOUNDATION
FED	FEDERAL
F.F.E.	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
FIG.	FIGURE
FIN	FINISH
FL	FLOWLINE
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FM	FORCE MAIN
FND	FOUND
FOW	FACE OF WALL
FPS	FEET PER SECOND
FR	FRAME
FST	FOREST
FT OR '	FOOT, FEET
FTG	FOOTING, FILLING
FURN	FURNISH OR FURNISED
FUT	FUTURE
FWD	FORWARD
G	
G	GAS
GA	GAUGE
GA	GENERAL ARRANGEMENT
GAL	GALLON
GB	GRADE BREAK
GND	GROUND
GND COMP	GROUND COMPACTION
GOV'T	GOVERNMENT
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRADE
GRB	GRUBBING
GSRM	GILA & SALT RIVER MERIDIAN
GV	GATE VALVE, GAS VALVE
H	
H, HT	HEIGHT
HDPE	HIGH DENSITY POLYETHYLENE
HDWR	HARDWARE
HGL	HYDRAULIC GRADE LINE
HGT	HEIGHT
HORIZ	HORIZONTAL
HP	HORSEPOWER
HW	HEADWATER
HWS	HIGH WATER SURFACE
I	
I	INDICATE
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IMPR	IMPROVEMENT
IN OR "	INCH OR INCHES
INCL	INCLUDE, INCLUDED, OR INCLUSIVE
INSTM	INSTRUMENTATION
INSUL	INSULATE
INT	INTERIOR
INV	INVERT
IP	IRON PIN
J	
JT	JOINT
JCT	JUNCTION
L	
L	LEVEL, LENGTH
LAT	LATERAL
LB	POUND
LF	LINEAR FEET
LIN	LINE
LIN FT	LINEAR FEET
LOC	LOCATION

ABBREVIATION	WORDS
M	
(M)	MEASURED
MAG	MARICOPA ASSOCIATION OF GOVERNMENTS
MAINT	MAINTENANCE, MAINTAIN
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEL	MECHANICAL EQUIPMENT LIST
MFR	MANUFACTURER
MH	MANHOLE
M&I	MUNICIPAL AND IDUSTRIAL
MI	MILE OR MILES
MIN	MINIMUM
MIW	MINE INFLUENCED WATER
'	MINUTES
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MO	MONTH
MOD	MODIFY OR MODIFIED
MON	MONUMENT
MRB	MANGANESE REMOVAL BED
MT	MOUNTAIN
MTD	WALL MOUNTED
MTG	MOUNTING
MTL	MATERIAL
MTL	METAL
MW	MONITORING WELL
MWS	MAXIMUM WATER SURFACE
N	
N	NORTH
N/A	NOT APPLICABLE
NATL	NATIONAL
NAD	NORTH AMERICAN DATUM
NAVD	NORHT AMERICAN VERTICAL DATUM
NE	NORTHEAST
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NORM	NORMAL
NPI	NON PAY ITEM
NPT	NATIONAL PIPE TREAD
NTS	NOT TO SCALE
NW	NORTHWEST
NWS	NORMAL WATER SURFACE
O	
O&M	OPERATION & MAINTENANCE
OC	OF CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE, OVERFLOW
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
ORIG	ORIGINAL
OVFL	OVERFLOW
P	
PAR	PARCEL
PE	POLYETHYLENE
PFD	PROCESS FLOW DIAGRAM
PG	PAGE
PIP	PROTECT IN PLACE
P&ID	PROCESS & INSTRUMENTATION DIAGRAM
PL	PLACE
P/L	PROPERTY LINE
POB	POINT OF BEGINNING
POE	POINT OF ENDING
PP	POWER POLE
PRELIM	PRELIMINARY
PREFAB	PREFABRICATED
PRESS	PRESSURE
PRI	PRIMARY
PRJ	PROJECT
PROP	PROPOSED
PROP	PROPERTY
PRT	PROTECTION
PRV	PROVISION OR PROVIDE
PS	PUMP STATION, PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH, GAUGE
PSF	POUNDS PER SQUARE FOOT
PT	POINT
PV	PLUG VALVE, PRESSURE VALVE
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
Q	
Q	QUANTITY OF DRAINAGE RUNOFF, FLOW RATE (CFS)
QTY	QUANTITY OR QUANTITIES
QUAD	QUADRANT
R	
R	RANGE
(R)	RECORD
RAD	RADIUS
RB	REBAR
RC	REINFORCED CONCRETE
RD	ROAD
RDWY	ROADWAY
REBAR	REINFORCING BAR
RED	REDUCER
REF	REFER, REFERENCE

ABBREVIATION	WORDS
R	
REINF	REINFORCE, REINFORCED, REINFORCING
RELOC	RELOCATE, RELOCATION OR RELOCATED
REM	REMOVE
REQD	REQUIRED
RET	RETAIN OR RETAINING
REV	REVISED OR REVISION
RT	RIGHT
RTE	ROUTE
RTN	RETURN
RWGV	RESILIENT WEDGE GATE VALVE
S	
S	SOUTH
SALV	SALVAGE
SB	SOIL BORING
SCHED	SCHEDULE
SD	STORM DRAIN
SDR	STANDARD DIMENSION RATIO
SE	SOUTHEAST
SEC	SECTION
SEC OR "	SECONDS
SF	SQUARE FEET
SG	SUBGRADE
SGL	SINGLE
SH	SHEET
SHLDR	SHOULDER
SHR	SHRINKAGE
SIM	SIMILAR
SK	SKEW
SL, S	SECTION LINE, SURVEY LINE
SM	SELECT MATERIAL
SP	SPACE, SPACES
SPCL	SPECIAL
SPEC	SPECIFICATIONS
SPEC'D	SPECIFIED
SPLY	SUPPLY
SQ	SQUARE
SQ FT	SQUARE FEET
SQ YD	SQUARE YARD
SR	STATE ROUTE
SST, SS	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
STRL	STRUCTURAL
STRUCT	STRUCTURE
SUR	SURVEY
SURF	SURFACE
SUSP	SUSPEND
SW	SOUTHWEST
SW	SWELL
SY	SQUARE YARDS
SYMM	SYMMETRICAL
T	
T	TOWNSHIP
T&B	TOP & BOTTOM
TB	THRUST BLOCK
TBM	TEMPORARY BENCH MARK
TDH	TOTAL DYNAMIC HEAD
TECH	TECHNICAL
TEMP	TEMPORARY
TF	TOP FACE
THD	THREAD
THK	THICK
THRD	THREADED
TO	TOP OF
TOP	TOP OF BANK
TOL	TOP OF LINING
TOP	TOP OF PIPE
TOPO	TOPOGRAPHY
TRANS	TRANSITION
TS	TOP OF SLOPE
TW	TOP OF WALL
TYP	TYPICAL
U	
U/G	UNDERGROUND
UBC	UNIFORM BUILDING CODE
UGND	UNDERGROUND
UNK	UNKNOWN
UNO	UNLESS NOTED OTHERWISE
USFS	UNITED STATES FOREST SERVICE
V	
VAR	VARIABLE
VERT	VERTICAL
VOL	VOLUME
W	
W	WATER, WEST
W	WIDE OR WIDTH
W/	WITH
WS	WATER STOP, WATER SURFACE
WSEL	WATER SURFACE ELEVATION
WWF	WELDED WIRE FABRIC
WV	WATER VALVE
X	
XFMR	ELECTRICAL TRANSFORMER
X-ING	CROSSING
X-SECT	CROSS SECTION
Y	
YD	YARD
YR	YEAR

PROCESS FLOW DIAGRAM LEGEND

PUMP DESIGNATIONS



HORIZONTAL CENTRIFUGAL PUMP

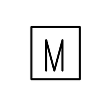
SUBMERSIBLE PUMP

CHEMICAL INJECTION PUMP

UNSPECIFIED PUMP

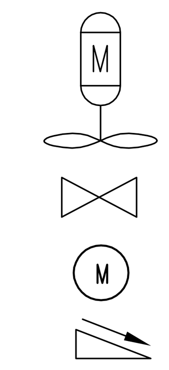
PERISTALTIC PUMP

ROTARY SCREW COMPRESSOR



MAGNETIC FLOW METER

MISC. DESIGNATIONS



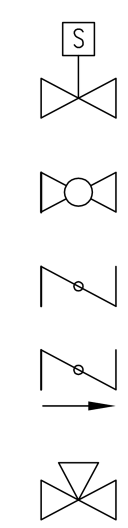
MIXER

VALVE

MOTOR OPERATED

GRAVITY FLOW

VALVE DESIGNATIONS



SOLENOID

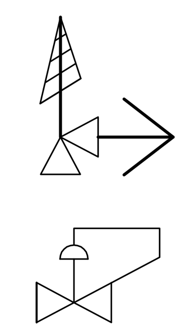
GLOB VALVE

BUTTERFLY VALVE

CHECK VALVE

THREE WAY VALVE

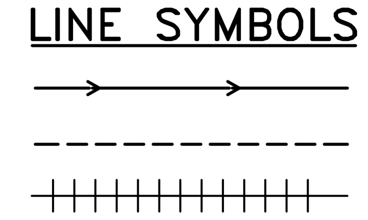
PRESSURE RELIEF DEVICES



PRESSURE RELEIEF (SAFETY) VALVE

PRESSURE REDUCING REGULATOR

LINE SYMBOLS

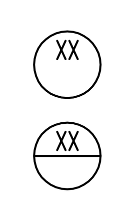


PRIMARY LINE SEGMENT

ELECTRIC SIGNAL

PNEUMATIC SIGNAL

CONTROLS



FIELD/LOCAL MOUNTED DEVICE

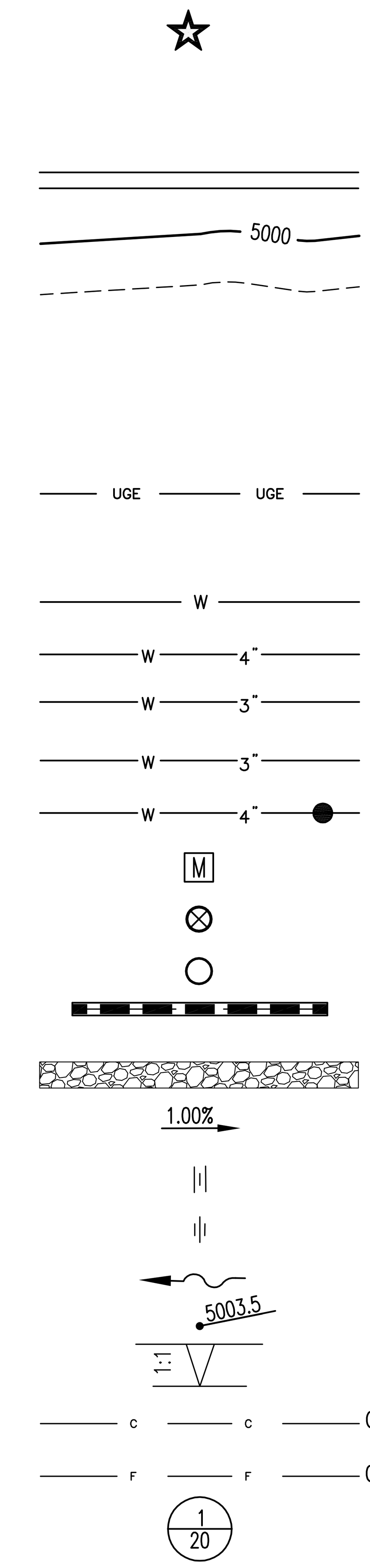
PANEL MOUNTED DEVICE

TAG DESCRIPTIONS

AC	AIR COMPRESSOR
AIC	ANALYSIS INDICATOR CONTROL
AS	AIR SUPPLY
CF	CHEMICAL FEED PUMP
CL	CLARIFIER
F	FLOW
FIC	FLOW INDICATOR CONTROL
FP	FILTER PRESS
P	PUMP
PL	PIPELINE
S	SCREEN
TK	TANK
V	VALVE

LEGEND

PROPOSED



BENCH MARK

PROPERTY LINE

SECTION LINE

UNPAVED ROAD

INDEX CONTOUR

INTERMEDIATE CONTOUR

FENCE

POWER/UTILITY POLE

OVERHEAD POWER LINE

UNDERGROUND ELECTRIC

MINE INFLUENCED WATER

PROCESS PIPING

SEEP WATER MAIN – 4" HDPE

WELL WATER MAIN – 3" HDPE

FRESH WATER MAIN – 3" HDPE

CLEANOUT

FLOW METER

WATER VALVE

CONCRETE VAULT

DRAINAGE PIPE CULVERT

RIP-RAP

GRADE

LOW POINT

HIGH POINT

STORM WATER FLOW DIRECTION

SPOT ELEVATION

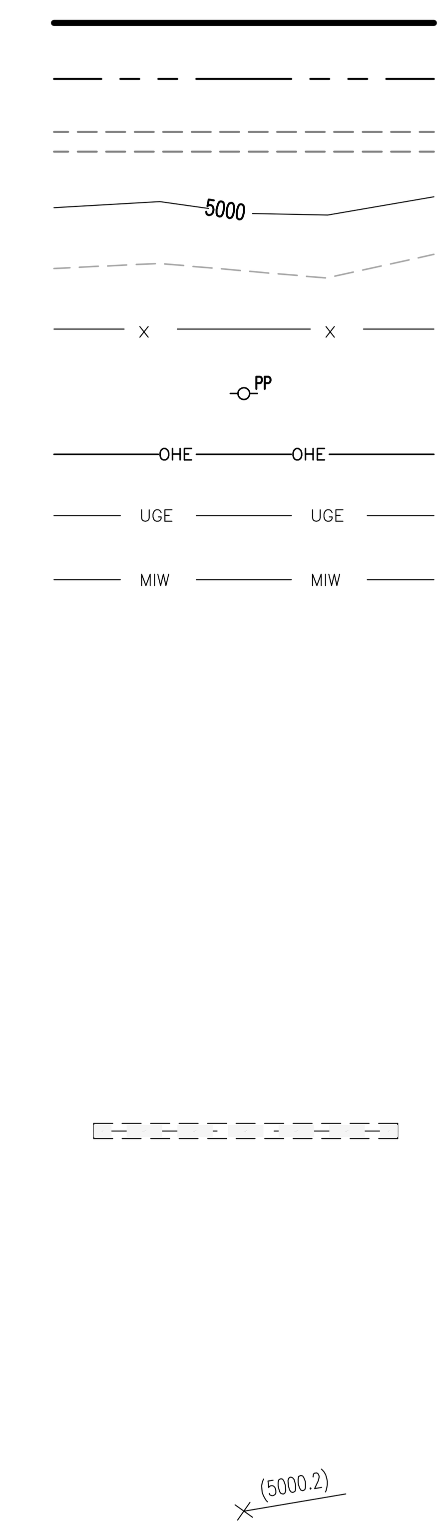
SLOPE AND DIRECTION ARROW

GRADING LIMIT – DAYLIGHT LINE (CUT AREA)

GRADING LIMIT – DAYLIGHT LINE (FILL AREA)

DETAIL NUMBER/SHEET NUMBER

EXISTING



INSTRUMENT IDENTIFICATION LETTERS					
	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, FLAME, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE (TYPICALLY CONDUCTIVITY - ELECTRICAL)			CONTROL	CLOSED
D	USER'S CHOICE (TYPICALLY DENSITY OR SPECIFIC GRAVITY)	DIFFERENTIAL			DIVERT
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE OR GAUGING (DIMENSIONAL)		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE (TYPICALLY MOISTURE OR HUMIDITY)	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY OR HEAT DUTY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	TRANSMIT
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL	

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NO.	REVISION			APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE

WATER TREATMENT SYSTEM

ABBREVIATIONS AND LEGEND

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED BY :

DRAWN BY : VIG LMOB

CHK'D BY (DESIGN) :

CHK'D BY (FIELD ENGR) :

DATE: APRIL 2017

SCALE HORIZ. : N/A

SCALE VERT. : N/A

JOB NO: 346.5

FILE NAME: 346.5-03-LEGEND

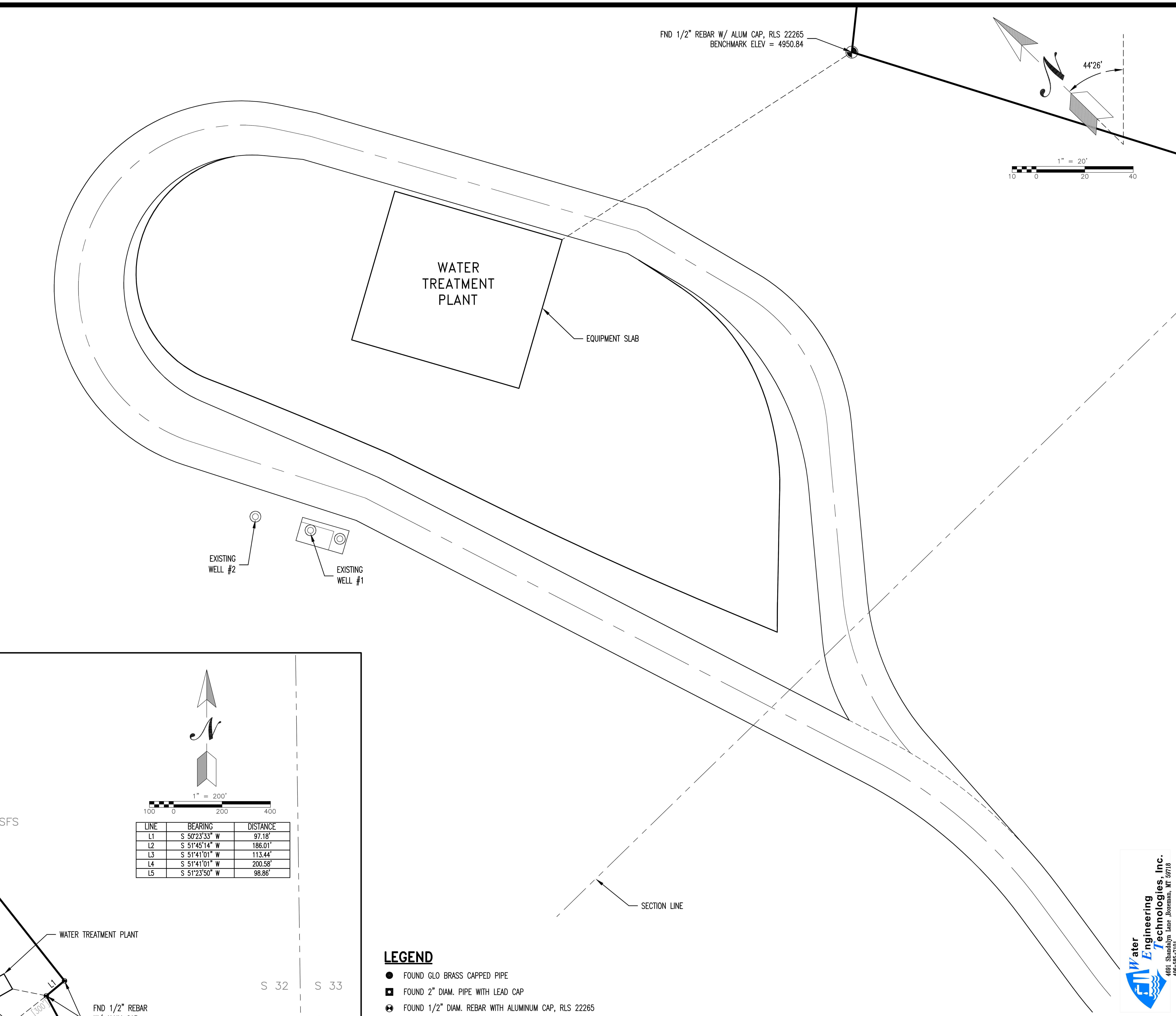
SHEET : G-003

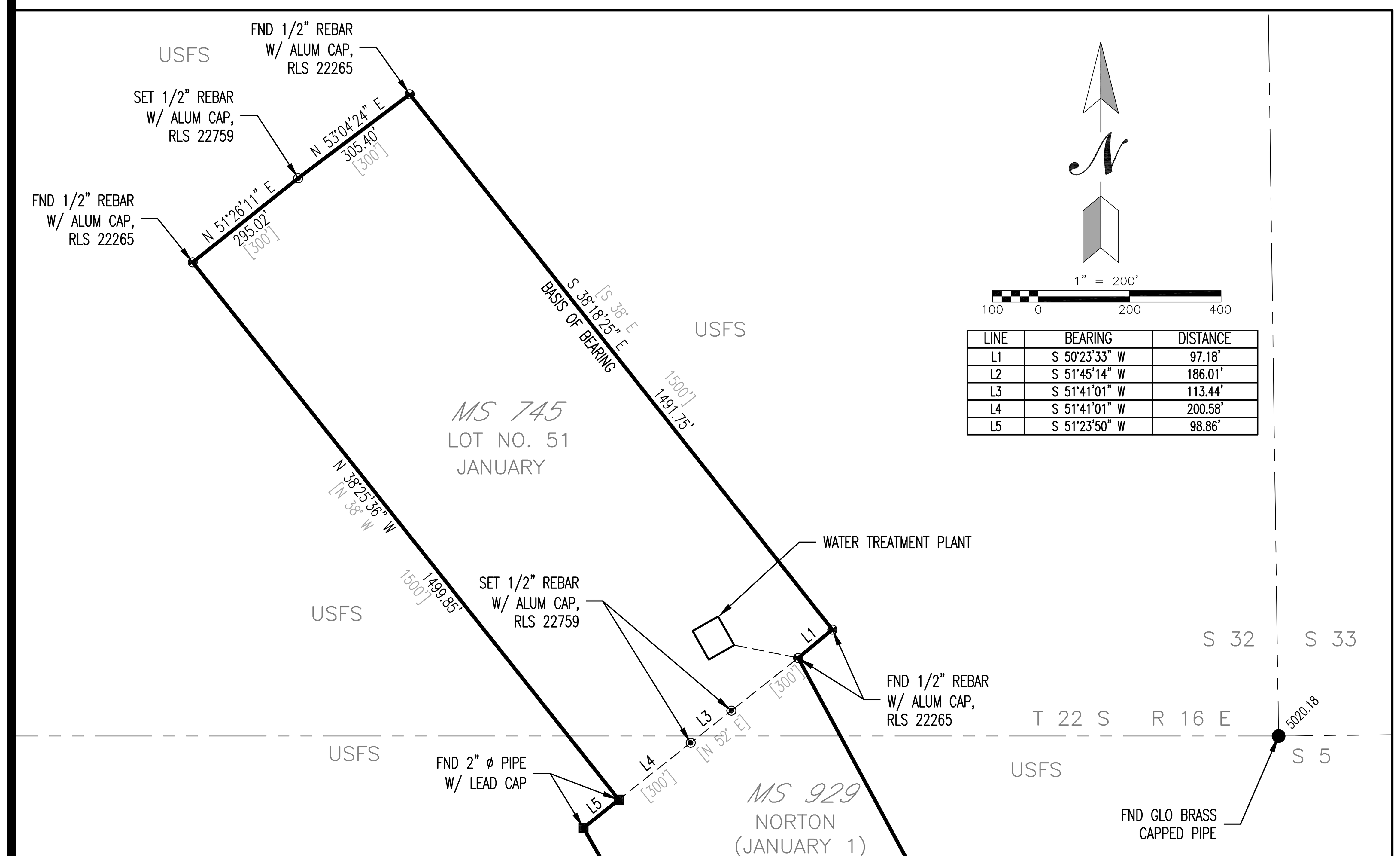
3 OF 20

65% PLANS PRINTED ON 04/24/2017

LINE TABLE		
LINE	LENGTH	BEARING

CURVE TABLE		
CURVE	LENGTH	RADIUS





LINE	BEARING	DISTANCE
L1	S 50°23'33" W	97.18'
L2	S 51°45'14" W	186.01'
L3	S 51°41'01" W	113.44'
L4	S 51°41'01" W	200.58'
L5	S 51°23'50" W	98.86'

LEGEND

- FOUND GLO BRASS CAPPED PIPE
- FOUND 2" DIAM. PIPE WITH LEAD CAP
- FOUND 1/2" DIAM. REBAR WITH ALUMINUM CAP, RLS 22265
- FOUND MOUND OF STONES, NOTHING SET
- SET 1/2" DIAM. REBAR WITH AN ALUMINUM CAP, RLS 22759 IN FOUND MOUND OF STONES
- [ ] RECORD BEARING AND OR DISTANCE, VARIOUS MINERAL SURVEYS
- ( ) RECORD BEARING AND OR DISTANCE, RLS 22265

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JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
HORIZONTAL CONTROL PLAN

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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Suite 115 Tucson, AZ 85705
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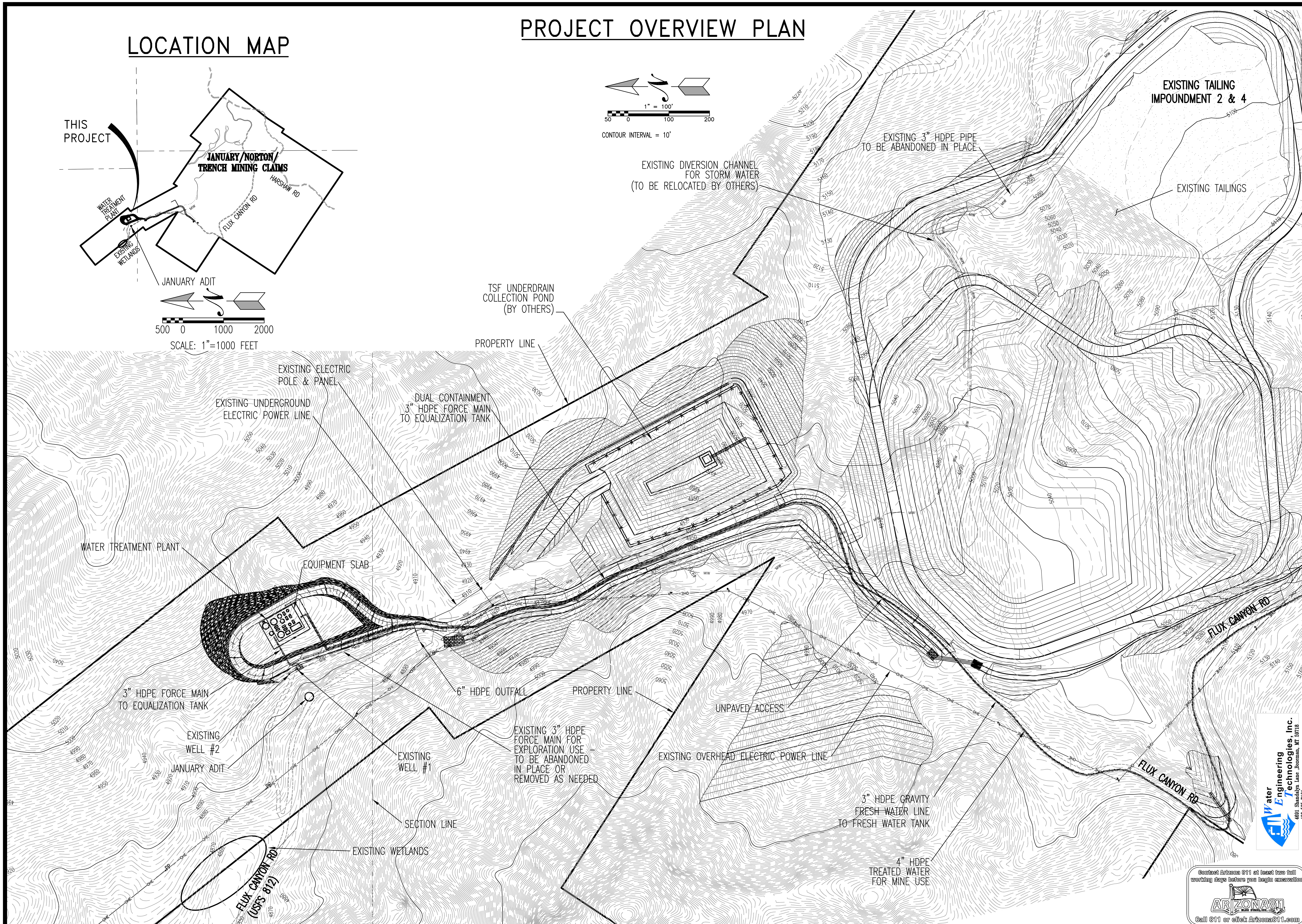
DATE: APRIL 2017
SCALE HORIZ. : AS NOTED
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-04-HORIZ-CTRL

SHEET : C-101
4 OF 20

65% PLANS PRINTED ON 04/24/2017



NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
PROJECT OVERVIEW

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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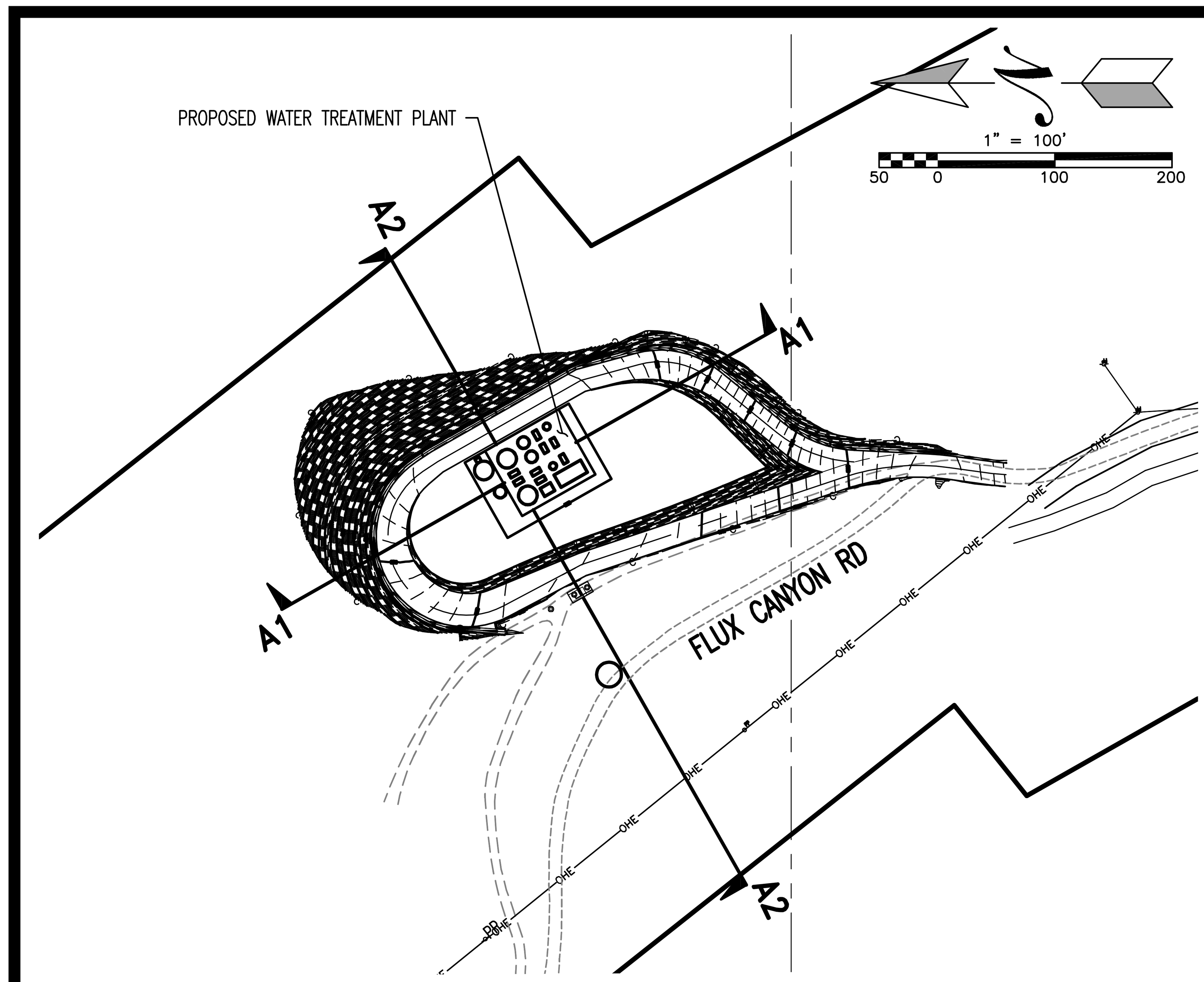
DATE: APRIL 2017
SCALE HORIZ. : 1" = 100'
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-05-OVERVIEW

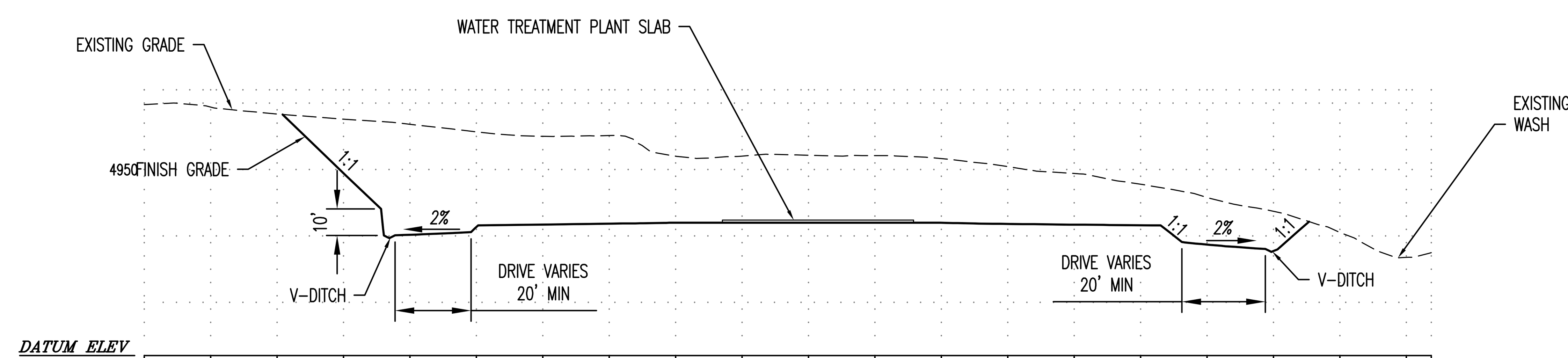
SHEET : C-102
5 OF 20

65% PLANS PRINTED ON 04/24/2017



PROJECT OVERVIEW PLAN

SCALE: 1" = 100'

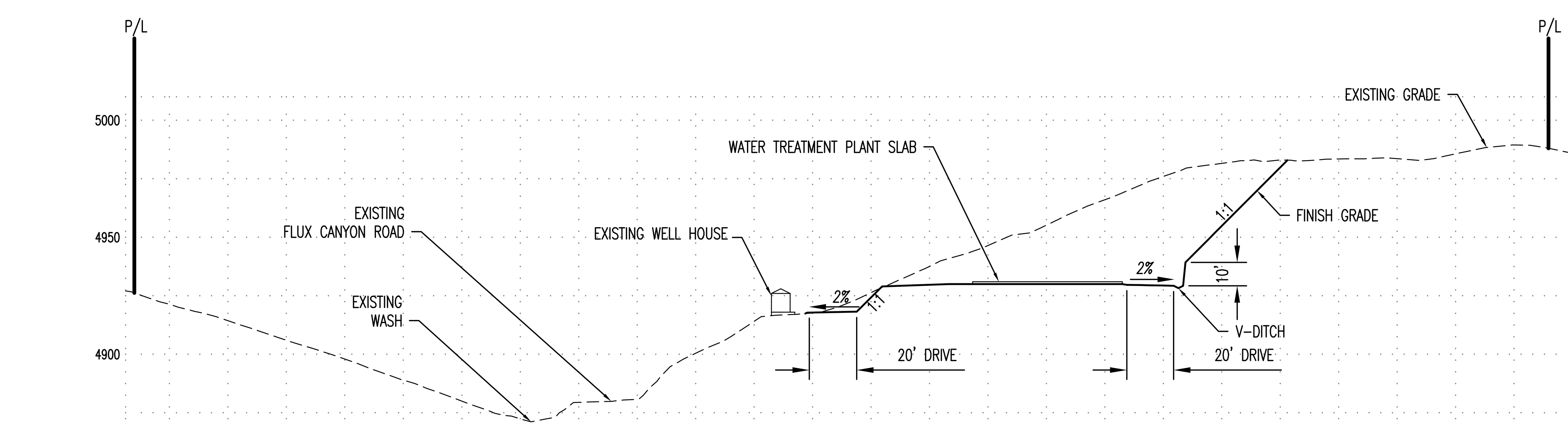


4974.5	4973.6	4970.9	4969.0	4967.1	4964.2	4962.5	4962.8	4955.1	4955.1	4955.4	4955.3	4954.1	4951.1	4948.6	4944.5	4939.5	4934.3	4926.3	4917.0	4918.7

0+00 0+50 1+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50

SECTION A1

SCALE: 1" = 40'



4927.0	4921.4	4914.4	4906.0	4898.0	4888.9	4880.0	4872.4	4879.5	4880.8	4900.5	4914.1	4917.7	4926.3	4937.6	4946.5	4955.2	4966.0	4976.0	4981.6	4983.1	4983.5	4983.6	4985.7	4989.4	4986.0

0+50 1+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50 5+00 5+50 6+00

SECTION A2

SCALE: 1" = 40'

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JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
PROJECT OVERVIEW SECTIONS

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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DATE: APRIL 2017
SCALE HORIZ. : 1" = 40'
VERT. : 1" = 40'
JOB NO: 346.5
FILE NAME: 346.5–06–OVERVIEW–SECTIONS

SHEET : C–103
6 OF 20

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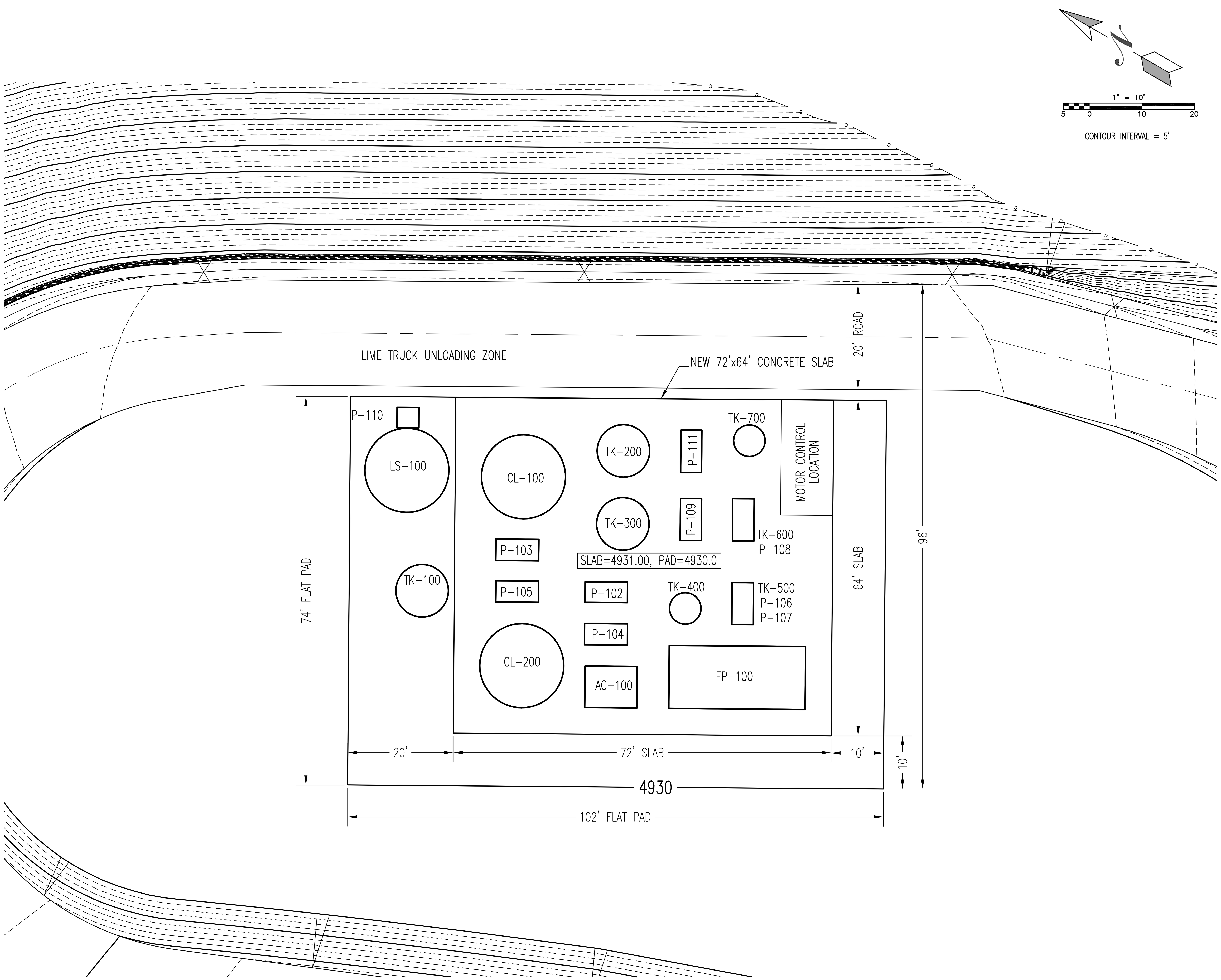

WATER TREATMENT PLANT
GENERAL ARRANGEMENT DIAGRAM

LEGEND

AC-100	AIR COMPRESSOR
FP-100	FILTER PRESS
CL-100	SOLIDS CONTACT CLARIFIER
CL-200	SLUDGE THICKENING TANK
LS-100	LIME SILO AND DILUTION TANK
TK-100	EQUALIZATION TANK
TK-200	REACTION TANK
TK-300	pH ADJUSTMENT TANK
TK-400	FILTRATE TANK
TK-500	POLYMER TOTES
TK-600	ACID TOTES
TK-700	FRESH WATER TANK
P-102	REACTION TANK & FORWARDING PUMP
P-103	SLUDGE PUMP
P-104	FILTER PRESS PUMP
P-105	FILTRATE PUMP
P-106	POLYMER FEED PUMP
P-107	POLYMER FEED PUMP
P-108	ACID FEED PUMP
P-109	RE-USE PUMP
P-110	LIME SLURRY PUMP
P-111	FRESH WATER PUMP

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JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
WATER TREATMENT PLANT
GENERAL ARRANGEMENT DIAGRAM
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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VERT.: N/A
JOB NO: 346.5
FILE NAME: 346.5-07-WTP PLANT OVERVIEW

SHEET: GA-101
7 OF 20

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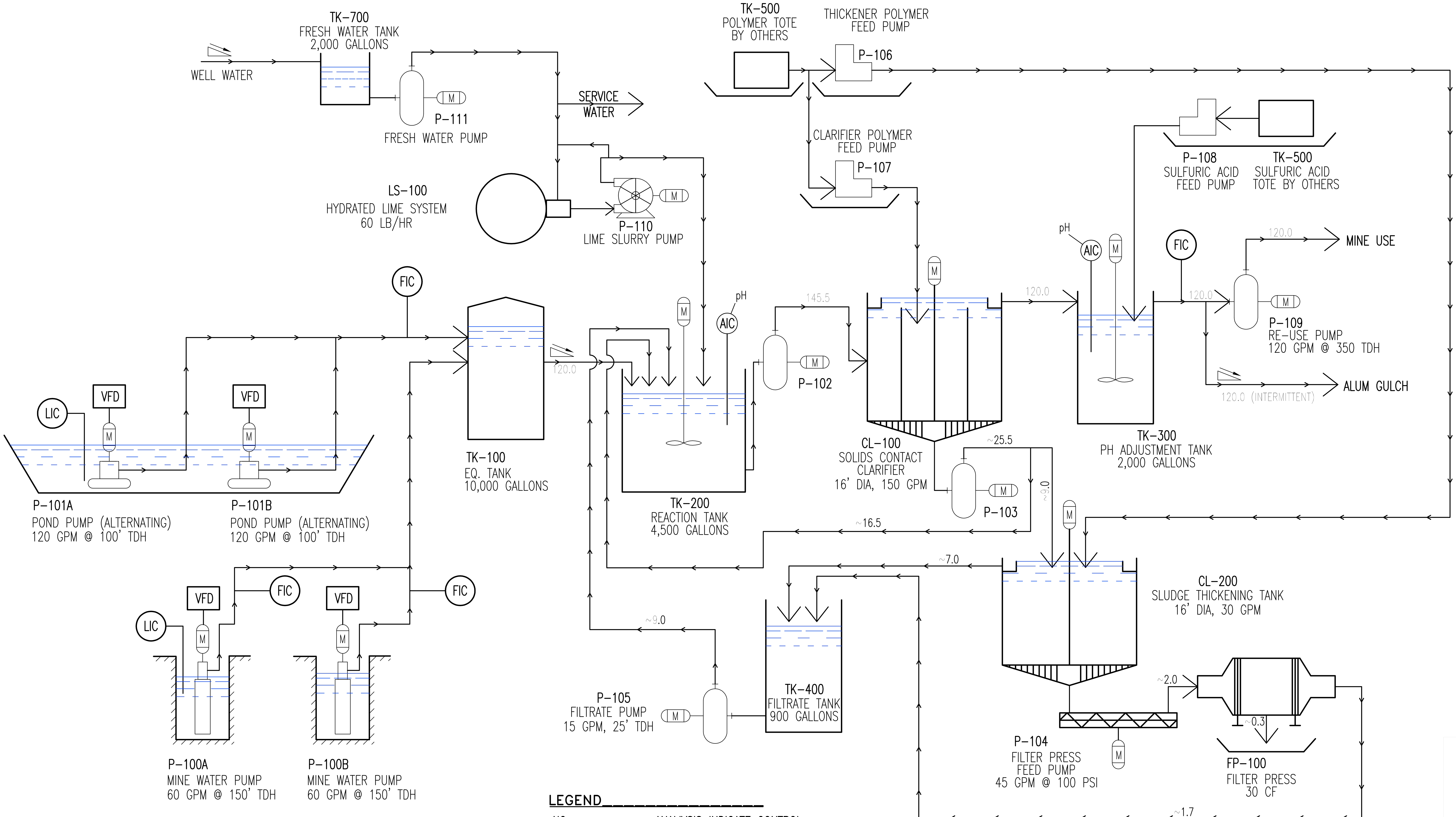

LEGEND

AIC	ANALIYSIS INDICATE CONTROL
LIC	LEVEL INDICATE CONTROL
VFD	VARYABLE FREQUENCY DRIVE
40.0	FLOW RATE
FIC	FLOW MEASUREMENT
pH	pH MEASUREMENT
(symbol)	GRAVITY FLOW

NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE

WATER TREATMENT SYSTEM

WTP PROCESS FLOW DIAGRAM

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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DATE: APRIL 2017
SCALE HORIZ. : N/A
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-08-PFD
101-WTP-PROCESS FLOW

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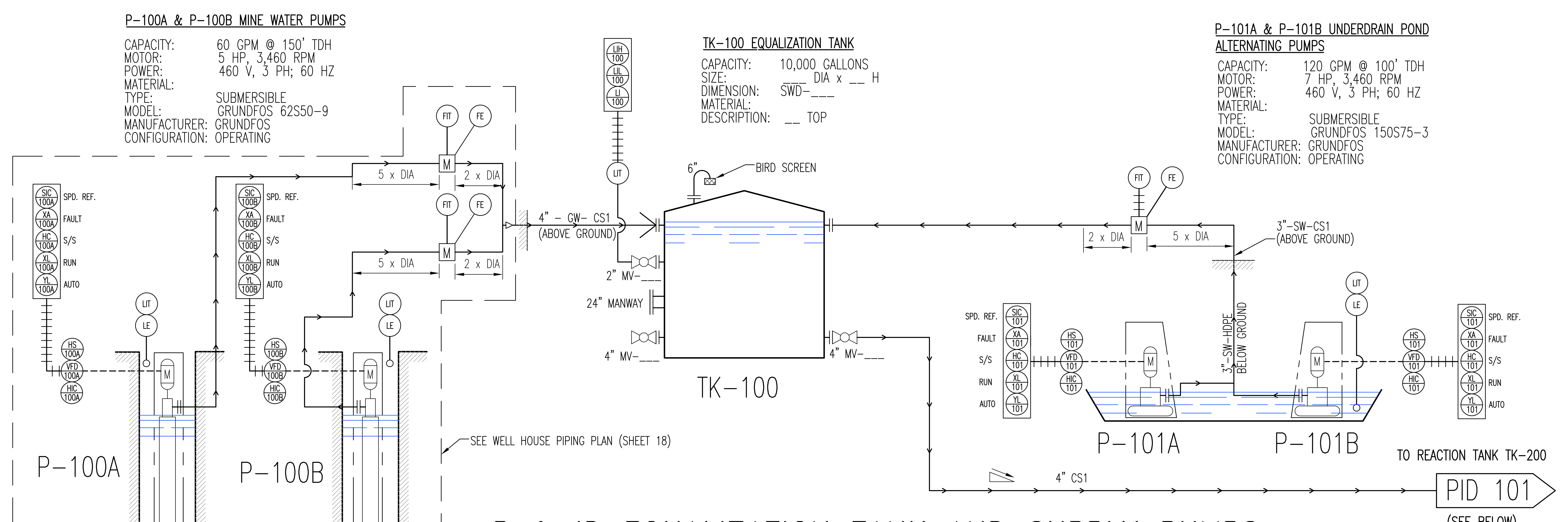
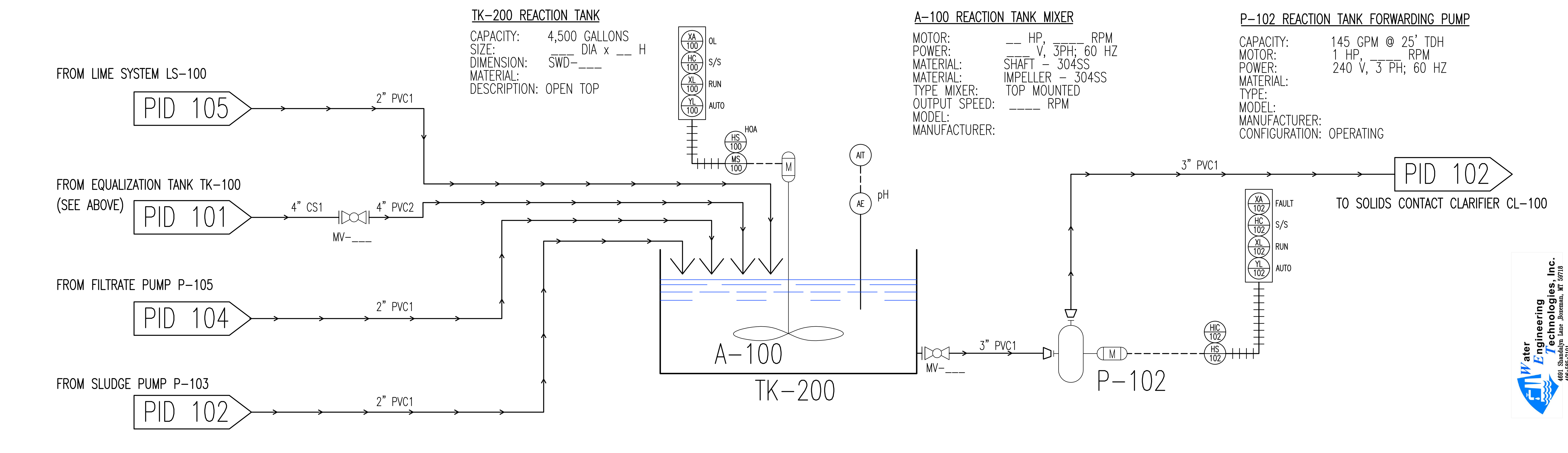


P & ID EQUALIZATION TANK AND SUPPLY PUMPS



P & ID REACTION TANK AND FORWARDING PUMP

NO. | REVISION | APPV'D | DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
P & ID
EQUALIZATION TANK & FORWARDING PUMPS
REACTION TANK & FORWARDING PUMP
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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520-545-7001

DATE: APRIL 2017
SCALE: HORIZ. : N/A VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-09-PID 101-EQ & REACTION TANKS

SHEET : PID-101
9 OF 20

65% PLANS PRINTED ON 04/24/2017

CL-100 PACKAGE

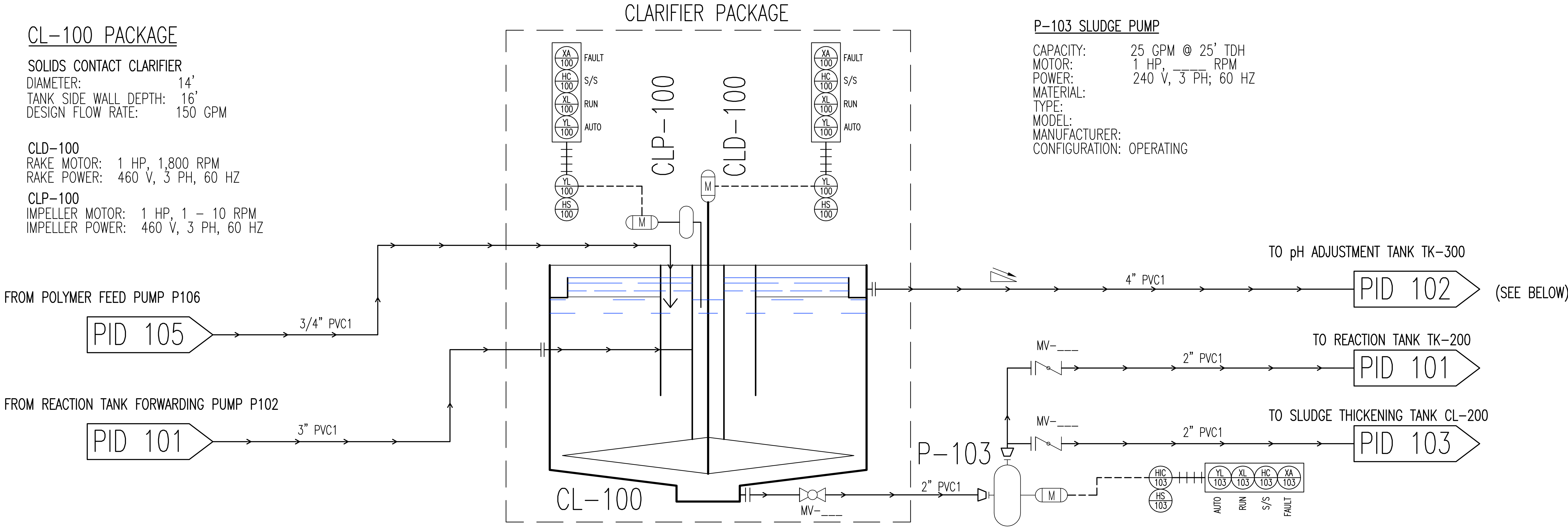
SOLIDS CONTACT CLARIFIER
DIAMETER: 14'
TANK SIDE WALL DEPTH: 16'
DESIGN FLOW RATE: 150 GPM

CLD-100
RAKE MOTOR: 1 HP, 1,800 RPM
RAKE POWER: 460 V, 3 PH, 60 HZ

CLP-100
IMPELLER MOTOR: 1 HP, 1 - 10 RPM
IMPELLER POWER: 460 V, 3 PH, 60 HZ

P-103 SLUDGE PUMP

CAPACITY: 25 GPM @ 25' TDH
MOTOR: 1 HP, _____ RPM
POWER: 240 V, 3 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION: OPERATING



P & ID SOLIDS CONTACT CLARIFIER & SLUDGE PUMP

A-200 pH ADJUSTMENT TANK MIXER

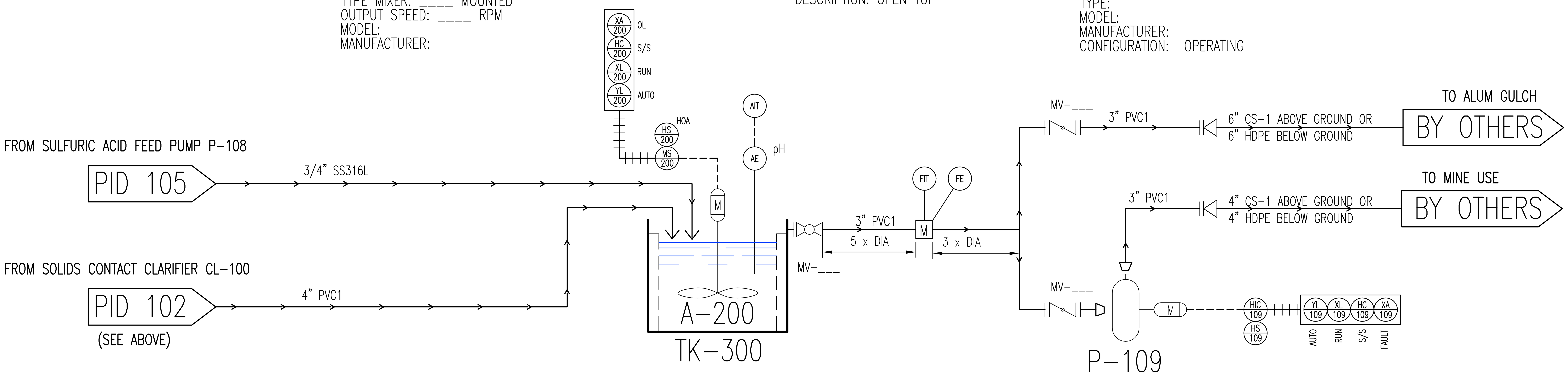
MOTOR: __ HP, _____ RPM
POWER: ___ V, 3PH; 60 HZ
MATERIAL: SHAFT - 304SS
MATERIAL: IMPELLER - 304SS
TYPE MIXER: _____ MOUNTED
OUTPUT SPEED: ____ RPM
MODEL:
MANUFACTURER:

TK-300 pH ADJUSTMENT TANK

CAPACITY: 2,000 GALLONS
SIZE: ____ DIA x __ H
DIMENSION: SWD-___
MATERIAL:
DESCRIPTION: OPEN TOP

P-109 RE-USE PUMP

CAPACITY: 120 GPM @ 350' TDH
MOTOR: 20 HP, _____ RPM
POWER: 240 V, 3 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION: OPERATING



P & ID pH ADJUSTMENT TANK & RE-USE PUMP

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
P & ID
SOLIDS CONTACT CLARIFIER & SLUDGE PUMP
pH ADJUSTMENT TANK & RE-USE PUMP
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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DRAWN BY: VG LMOB

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DATE: APRIL 2017
SCALE HORIZ.: N/A
VERT.: N/A
JOB NO: 346.5
FILE NAME: 346.5-10-PID 102-CLARIFIER & pH ADJ

65% PLANS PRINTED ON 04/24/2017

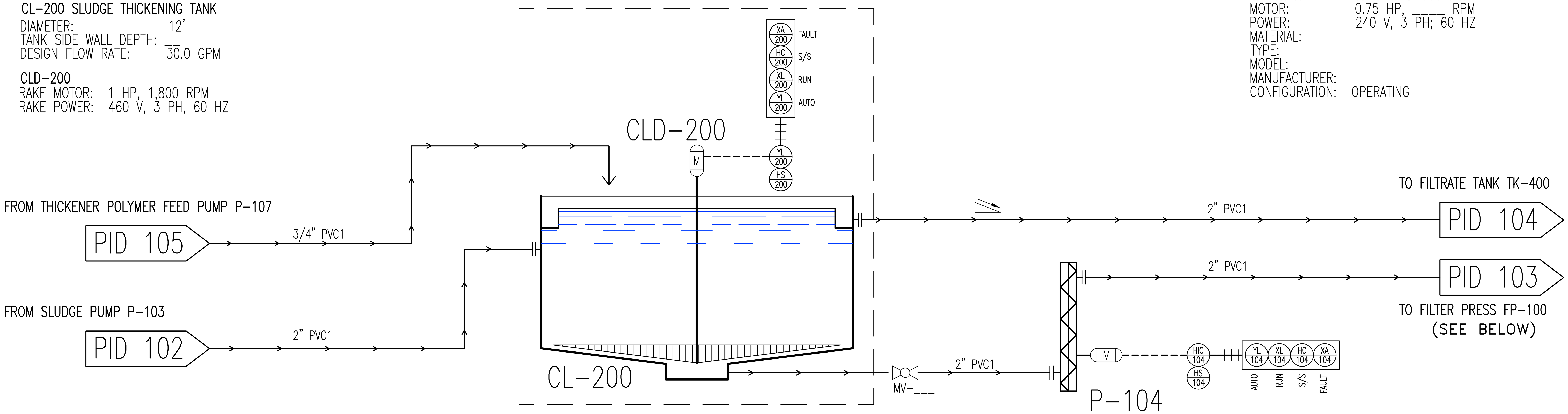
CL-200 SLUDGE THICKENING TANK PACKAGE

CL-200 SLUDGE THICKENING TANK
DIAMETER: 12'
TANK SIDE WALL DEPTH: __
DESIGN FLOW RATE: 30.0 GPM

CLD-200
RAKE MOTOR: 1 HP, 1,800 RPM
RAKE POWER: 460 V, 3 PH, 60 HZ

P-104 FILTER PRESS FEED PUMP

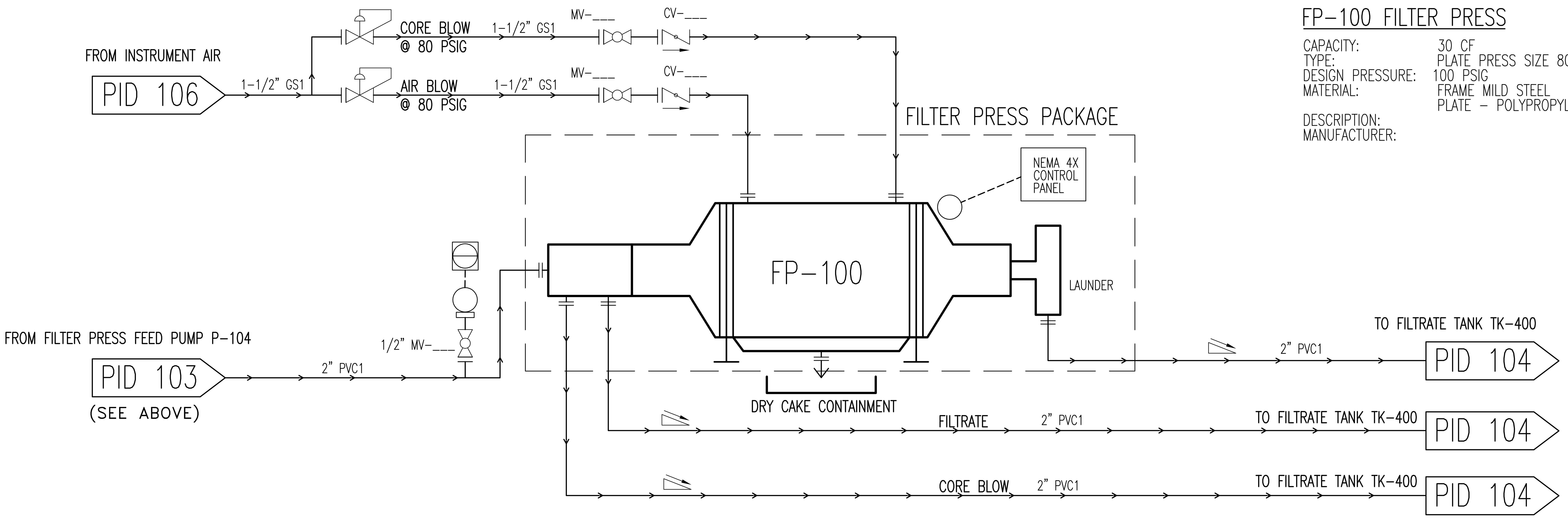
CAPACITY: 45 GPM @ 100 PSI
MOTOR: 0.75 HP, ____ RPM
POWER: 240 V, 3 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION: OPERATING



P & ID SLUDGE THICKENING TANK & FILTER PRESS FEED PUMP

FP-100 FILTER PRESS

CAPACITY: 30 CF
TYPE: PLATE PRESS SIZE 800 MM
DESIGN PRESSURE: 100 PSIG
MATERIAL: FRAME MILD STEEL
PLATE - POLYPROPYLENE
DESCRIPTION:
MANUFACTURER:



P & ID FILTER PRESS

NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
P & ID
SLUDGE THICKENING TANK & FILTER PRESS FEED PUMP
FILTER PRESS
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY
NOT FOR
CONSTRUCTION

DESIGNED BY : SIB
DRAWN BY : VIG LMOB
CHK'D BY (DESIGN) :
CHK'D BY (FIELD ENGR) :

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CPE CONSULTANTS
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520-545-7001

DATE: APRIL 2017
SCALE HORIZ. : N/A
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-11-PID 103-SLUDGE THICK TANK &

SHEET : PID-103
11 OF 20

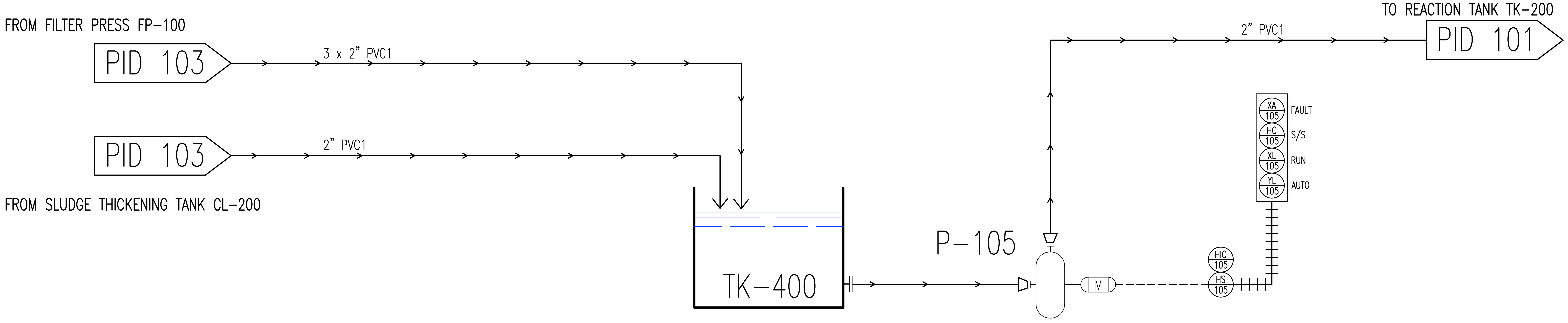
65% PLANS PRINTED ON 04/24/2017

TK-400 FILTRATE TANK

CAPACITY: 900 GALLONS
SIZE: ___ DIA x __ H
DIMENSION: SWD-___
MATERIAL:
DESCRIPTION: OPEN TOP

P-105 FILTRATE PUMP

CAPACITY: 15 GPM @ 25' TDH
MOTOR: 0.25 HP, ____ RPM
POWER: 240 V, 3 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION: OPERATING



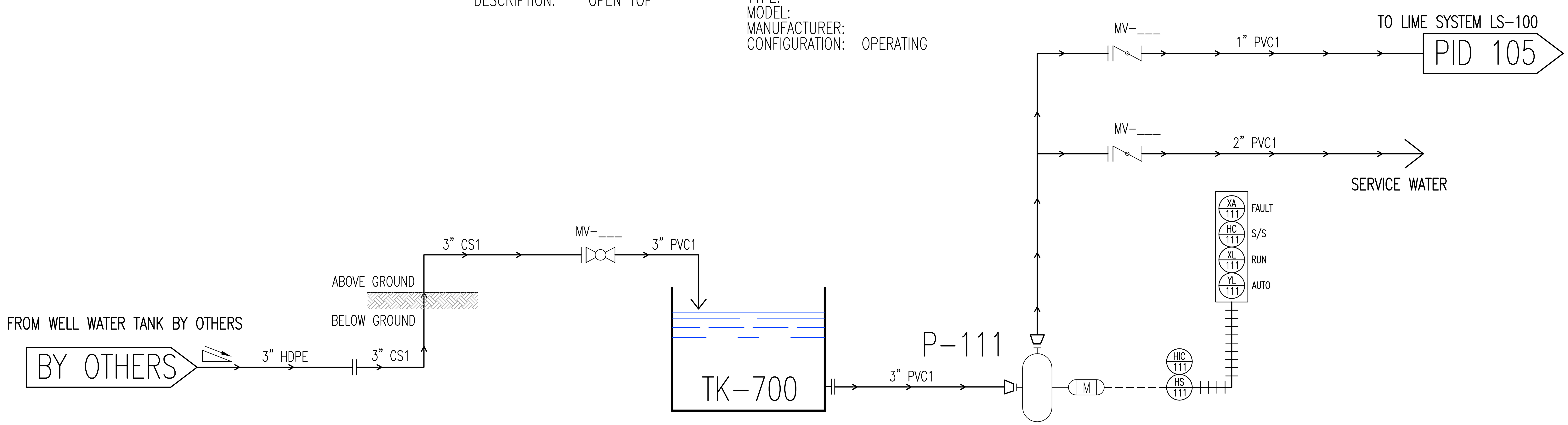
P & ID FILTRATE TANK & FILTRATE PUMP

TK-700 FRESH WATER TANK

CAPACITY: 2,000 GALLONS
SIZE: ___ DIA x __ H
DIMENSION: SWD-___
MATERIAL:
DESCRIPTION: OPEN TOP

P-111 FRESH WATER PUMP

CAPACITY: 10 GPM @ 20' TDH
MOTOR: 0.25 HP, ____ RPM
POWER: 240 V, 3 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION: OPERATING



P & ID FRESH WATER TANK & PUMP

NO. | REVISION | APPV'D | DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
P & ID
FILTRATE TANK & FILTRATE PUMP
FRESH WATER TANK & PUMP
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED BY: SIB
DRAWN BY: VIG LMOB
CHK'D BY (DESIGN):
CHK'D BY (FIELD ENGR):

Water Engineering Technologies, Inc.
4691 Shandalyn Lane Bozeman, MT 59718
406-585-7101

CPE CONSULTANTS
3895 N. Business Center Dr. Suite 115 Tucson, AZ 85705
520-545-7001

DATE: APRIL 2017
SCALE: HORIZ.: N/A VERT.: N/A
JOB NO: 346.5
FILE NAME: 346.5-12-PID 104-FILTRATE & FRESH WAT

SHEET: PID 104
12 OF 20

65% PLANS PRINTED ON 04/24/2017

LS-100 HYDRATED LIME SYSTEM PACKAGE

LS-100A
OVERALL DIMENSIONS: 20' H x 10' DIA
STORAGE CAPACITY: 1700 CF
MATERIAL:STEEL
EQUIPMENT ROOM WITH EXHAUST
TRUCKFILL LINE: 4" DIA

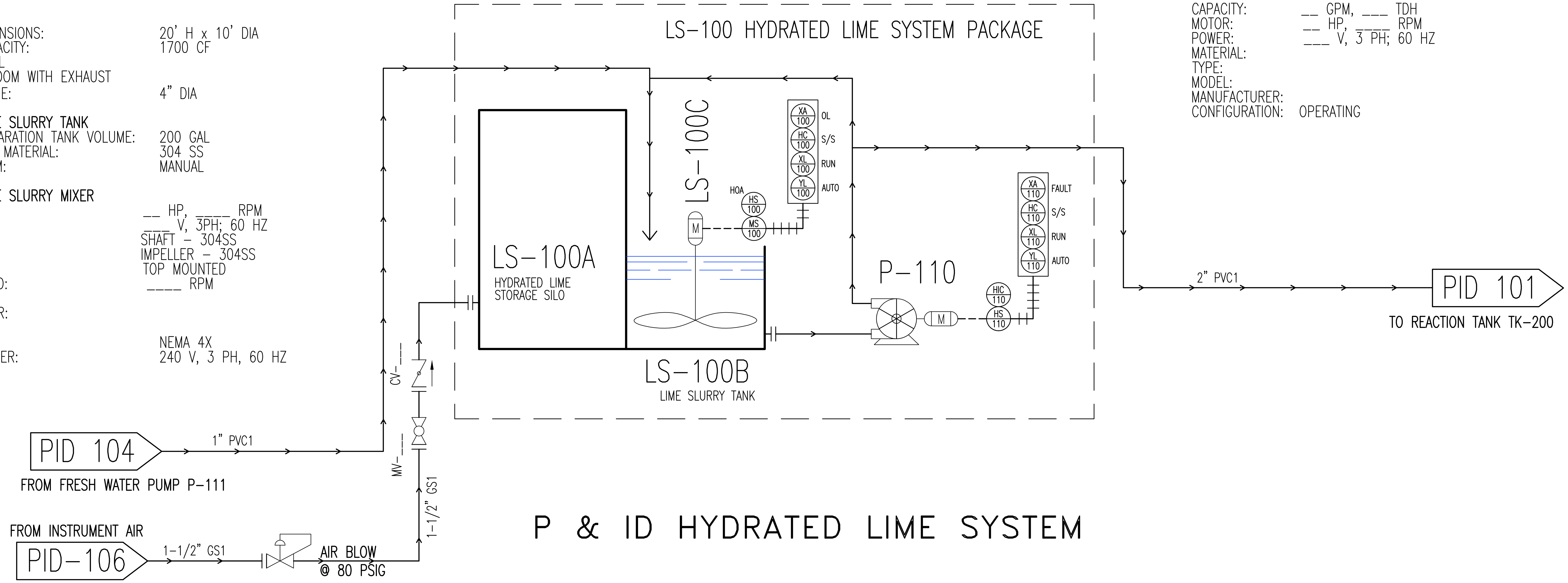
LS-100B LIME SLURRY TANK
SLURRY PREPARATION TANK VOLUME: 200 GAL
SLURRY TANK MATERIAL: 304 SS
FLUSH SYSTEM: MANUAL

LS-100C LIME SLURRY MIXER
MOTOR: __ HP, ____ RPM
POWER: ____ V, 3PH; 60 HZ
MATERIAL: SHAFT - 304SS
MATERIAL: IMPELLER - 304SS
TYPE MIXER: TOP MOUNTED
OUTPUT SPEED: ____ RPM
MODEL:
MANUFACTURER:

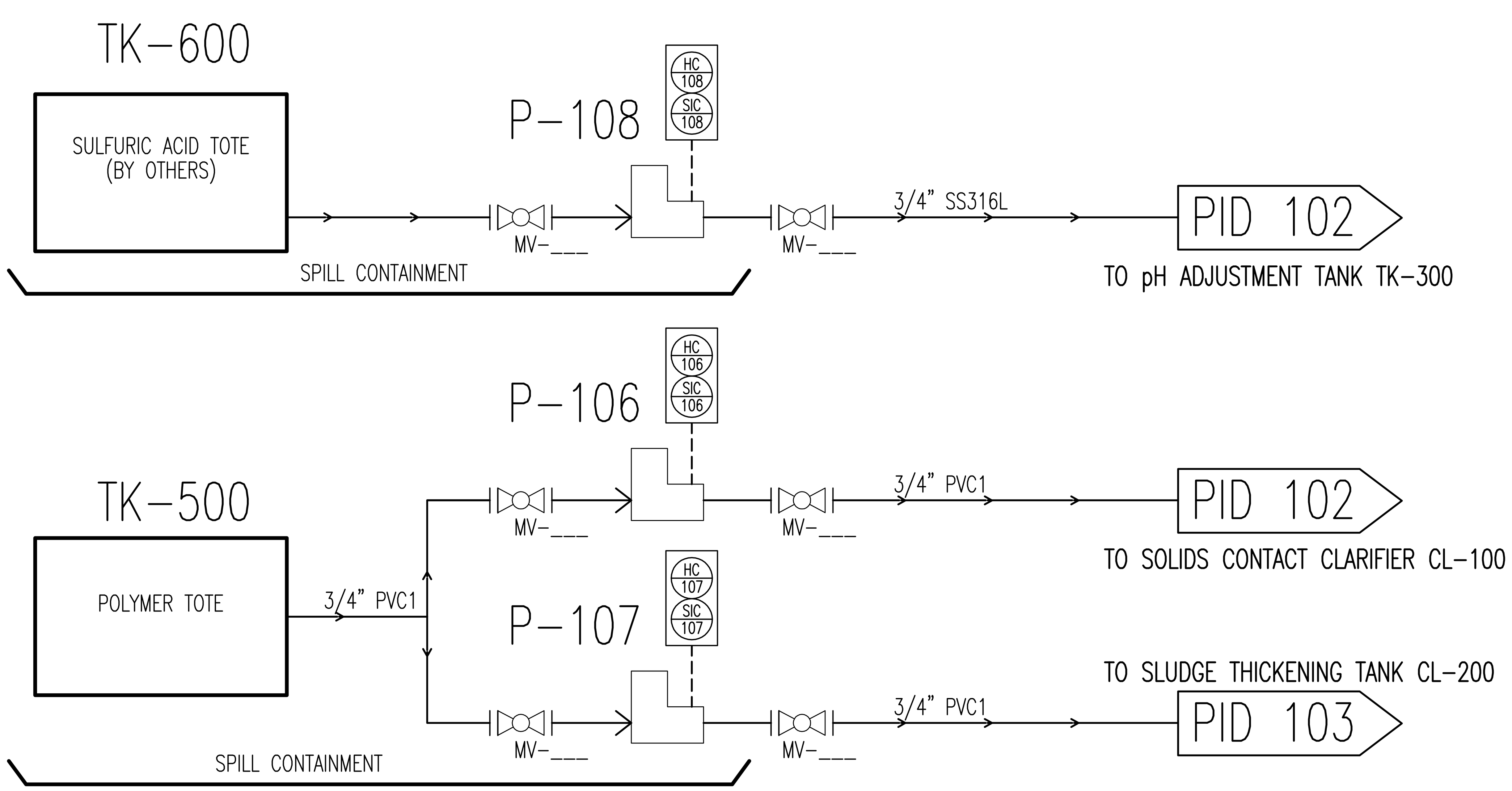
CONTROLS: NEMA 4X
CONTROL POWER: 240 V, 3 PH, 60 HZ

P-110 LIME SLURRY PUMP

CAPACITY: __ GPM, ___ TDH
MOTOR: __ HP, ____ RPM
POWER: ___ V, 3 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION: OPERATING



P & ID HYDRATED LIME SYSTEM



P-108 SULFURIC ACID FEED PUMP

CAPACITY: __ GPM, ___ TDH
MOTOR: __ HP, ____ RPM
POWER: 120 V, 1 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION:

P-106, POLYMER FEED PUMP

CAPACITY: __ GPM, ___ TDH
MOTOR: __ HP, ____ RPM
POWER: 120 V, 1 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION:

P-107 POLYMER FEED PUMP

CAPACITY: __ GPM, ___ TDH
MOTOR: __ HP, ____ RPM
POWER: 120 V, 1 PH; 60 HZ
MATERIAL:
TYPE:
MODEL:
MANUFACTURER:
CONFIGURATION:

P & ID CHEMICAL FEED PUMPS

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
P & ID
HYDRATED LIME SYSTEM
CHEMICAL FEED PUMPS
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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DATE: APRIL 2017
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VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-13-PID 105-LIME SYSTEM & CHEM

65% PLANS PRINTED ON 04/24/2017

AC–100 AIR COMPRESSOR

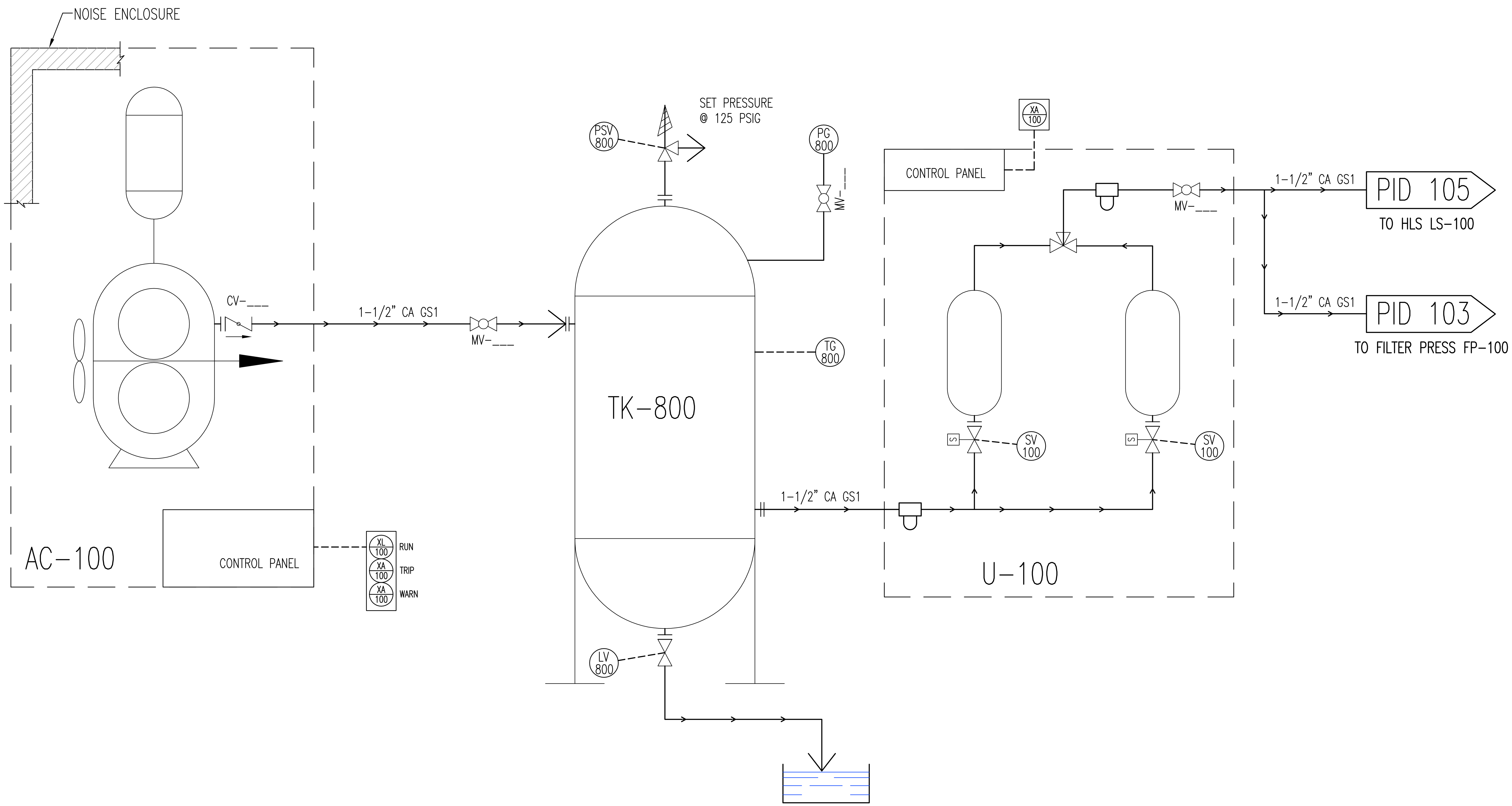
CAPACITY:	100 CFM @ 125 PSIG
MOTOR:	__ HP
POWER:	480 V, 3 PH, 60 HZ
MATERIAL:	CAST IRON
TYPE:	ROTARY SCREW AIR COOLED
MANUFACTURER:	
MODEL:	

TK–800 PLANT AIR RECEIVER

CAPACITY:	250 GALLONS
SIZE:	___ DIA x __ H
MATERIAL:	CS
DESCRIPTION:	ASME VESSEL

U–100 INSTRUMENT DRYER

CAPACITY:	100 CFM
SIZE:	___ DIA x __ H
TYPE:	HL DESICCANT DRYER
MANUFACTURER:	
MODEL:	



P & ID AIR COMPRESSOR SYSTEM

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
P & ID
AIR COMPRESSOR SYSTEM
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY NOT FOR CONSTRUCTION

NO.	REVISION	APPV'D	DATE

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DATE: APRIL 2017
SCALE: HORIZ. : N/A VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5–14–PID 105–LIME SYSTEM & CHEM

SHEET : PID 106
14 OF 20

65% PLANS PRINTED ON 04/24/2017

MECHANICAL EQUIPMENT LIST

REV NO.	EQUIPMENT NO.	EQUIPMENT DESCRIPTION	EQUIPMENT TYPE	DESIGN CAPACITY/MISC. INFO.	EQUIPMENT SUPPLIED BY	P&ID NO.	P&ID REV.	SPEC NUMBER	MODEL/SIZE/ MANUFACTURER	DESIGN PRESS. (psig)	DESIGN TEMP. (F)	MATERIAL OF CONSTRUCTION	PUMP DIFF. HEAD (ft)	MOTOR RATING HP/RPM	VFD	VOLT/PHASE/HZ	DIMENSIONS	WEIGHT (lbs)	TECHNICAL NOTES
A	P-100A, P-100B	MINE WATER PUMP	SUBMERSIBLE	60 GPM @ 150 FT TDH EACH	TBD	101	A	TBD	62S50-9/5 HP/GRUNFOS	TBD	AMBIENT	304 SS	150	5/3460	YES	460/3/60	TBD	TBD	
A	TK-100	EQUALIZATION TANK	VERTICAL DOMED	10,000 GAL	TBD	101	A	TBD	15' DIA X 8'H	N/A	AMBIENT	STEEL	N/A	N/A	N/A	N/A	TBD	TBD	
A	P-101	UNDERDRAIN POND PUMP	SUBMERSIBLE	120 GPM @ 100 FT TDH	TBD	101	A	TBD	150S73-3/7 HP/GRUNFOS	TBD	AMBIENT	304 SS	100	7/3460	YES	460/3/60	TBD	TBD	
A	TK-200	REACTION TANK	VERTICAL OPEN TOP	4,500 GAL	TBD	101	A	TBD	TBD	N/A	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	
A	A-100	REACTION TANK MIXER	AGITATOR	N/A	TBD	101	A	TBD	14Q2/2 HP/LIGHTIN	N/A	AMBIENT	316 SS	N/A	2/1200	NO	230/3/60	SHAFT 2" x 68.5" 38" IMPELLER DIA	TBD	
A	P-102	REACTION TANK FORWARDING PUMP	HORIZONTAL CENTRIFUGAL	145 GPM @ 25 FT TDH	TBD	101	A	TBD	TBD	TBD	AMBIENT	TBD	TBD	1/TBD	NO	240/3/60	TBD	TBD	
A	CL-100	SOLIDS CONTACT CLARIFER	LIQUID/SOLIDS SEPARATION	150GPM	TBD	102	A	TBD	CONTACT CLARIFIER /14-FT/TBD	N/A	AMBIENT	304 SS	N/A	N/A	N/A	N/A	TBD	TBD	
A	CLD-100	CLARIFIER RAKE DRIVE MOTOR	DIRECT COUPLED	500 FT-LBS @ 12 FPM	TBD	102	A	TBD	TBD	N/A	AMBIENT	304 SS	N/A	1/1800	NO	460/3/60	TBD	N/A	INCLUDED IN CLARIFIER PACKAGE
A	CLP-100	CLARIFER IMPELLER PUMP	IMPELLER PUMP	TBD	TBD	102	A	TBD	TBD	N/A	AMBIENT	304SS	N/A		NO	480/3/60	TBD	N/A	INCLUDED IN CLARIFIER PACKAGE
A	P-103	SLUDGE PUMP	HORIZONTAL CENTRIFUGAL	25 GPM @ 25 FT TDH	TBD	102	A	TBD	TBD	TBD	AMBIENT	304 SS	TBD	1/TBD	NO	240/3/60	TBD	TBD	
A	TK-300	pH ADJUSTMENT TANK	VERTICAL OPEN TOP	2,000 GAL	TBD	102	A	TBD	TBD	N/A	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	
A	A-200	pH ADJUSTMENT TANK MIXER	AGITATOR	N/A	TBD	102	A	TBD	X6Q150/1.5 HP/LIGHTIN	N/A	AMBIENT	316 SS	N/A	1.5/1725	NO	230/3/60	SHAFT 1" x 56" 19" IMPELLER DIA	TBD	
A	P-109	RE-USE PUMP	HORIZONTAL CENTRIFUGAL	120 GPM @ 350 FT TDH	TBD	102	A		TBD	TBD	AMBIENT	304 SS	TBD	20/TBD	NO	240/3/60	TBD	TBD	
A	CL-200	THICKENING TANK	LIQUID/SOLIDS SEPARATION	30 GPM/10,000 GAL	TBD	103	A	TBD	CONVENTIONAL THICKENER/12'/TBD	N/A	AMBIENT	304 SS	N/A	N/A	NO	N/A	TBD	TBD	
A	CLD-200	THICKENER RAKE DRIVE MOTOR	DIRECT COUPLED	5000 FT-LBS @ 20 FPM	TBD	103	A	TBD	TBD	N/A	AMBIENT	304 SS	N/A	1/1800	NO	460/3/60	TBD	INCLUDED	INCLUDED IN THICKENER PACKAGE
A	P-104	FILTER PRESS FEED PUMP	PROGRESSIVE CAVITY	45 GPM @ 100 PSI	TBD	103	A	TBD	TBD	100	AMBIENT	304 SS	TBD	0.75/TBD	NO	240/3/60	TBD	TBD	
A	FP-100	FILTER PRESS	PLATE/FRAME/CLOTH	30 FT3, 100 PSIG	TBD	103	A	TBD	TBD	100	AMBIENT	PP PLATES/CLOTHS/304 SS FRAME	N/A	N/A	N/A	N/A	TBD	TBD	
A	TK-400	FILTRATE TANK	VERTICAL OPEN TOP	900 GAL	TBD	104	A	TBD	TBD	N/A	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	
A	P-105	FILTRATE PUMP	HORIZONTAL CENTRIFUGAL	15 GPM @ 25 FT TDH	TBD	104	A	TBD	TBD	TBD	AMBIENT	TBD	TBD	0.25/TBD	NO	240/3/60	TBD	TBD	
A	TK-700	FRESH WATER TANK	VERTICAL OPEN TOP	2,000 GAL	TBD	104	A	TBD	TBD	N/A	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	
A	P-111	FRESH WATER PUMP	HORIZONTAL CENTRIFUGAL	10 GPM @ 20 FT TDH	TBD	104	A	TBD	TBD	TBD	AMBIENT	TBD	TBD	0.25/TBD	NO	240/3/60	TBD	TBD	
A	LS-100	HYDRATED LIME SYSTEM	HYDRATED LIME SYSTEM	60 LB/HR	TBD	105	A	TBD	TBD	N/A	AMBIENT	SEE INDIVIDUAL COMPONENTS	N/A	N/A	N/A	N/A	SEE COMPONENTS	TBD	
A	LS-100A	LIME SILO	STORAGE SILO	1700 CF	TBD	105	A	TBD	TBD	N/A	AMBIENT	STEEL	N/A	N/A	N/A	N/A	20' H X 10' DIA	TBD	INCLUDED IN LIME SYSTEM
A	LS-100B	LIME SLURRY TANK	MIXING TANK	200 GAL	TBD	105	A	TBD	TBD	N/A	AMBIENT	304SS	N/A	N/A	N/A	N/A	TBD	TBD	INCLUDED IN LIME SYSTEM
A	LS-100C	LIME SLURRY MIXER	AGITATOR	N/A	TBD	105	A	TBD	TBD	N/A	AMBIENT	304 SS	N/A	2/TBD	NO	240/3/60	TBD	TBD	INCLUDED IN LIME SYSTEM
A	P-110	LIME SLURRY PUMP	PERISTALTIC	_ GPM @ 25 FT TDH	TBD	105	A	TBD	TBD	TBD	AMBIENT	304 SS	TBD	TBD	YES	240/3/60	TBD	TBD	
A	TK-600	SULFURIC ACID TOTE	VERTICAL CLOSED TOP	~ 345 LBS/DAY	VENDOR	105	A	TBD	TBD	TBD	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	
A	P-108	SULFURIC ACID FEED PUMP	DIAPHRAM METERING PUMP	1.5 GPH @ 50 PSIG	TBD	105	A	TBD	TBD	TBD	AMBIENT	PVC	TBD	TBD	NO	120/1/60	TBD	TBD	> 92% SULFURIC ACID
A	TK-500	POLYMER TOTE	VERTICAL CLOSED TOP	~ 1.4 LBS/DAY	VENDOR	105	A	TBD	TBD	TBD	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	
A	P-106	CLARIFIER POLYMER FEED PUMP	DIAPHRAM METERING PUMP PRE-PIPED AND PRE-WIRED	0.5 GPH @ 50 PSIG	TBD	105	A	TBD	TBD	TBD	AMBIENT	PVC	TBD	TBD	NO	120/1/60	TBD	TBD	
A	P-107	THICKENER POLYMER FEED PUMP	DIAPHRAM METERING PUMP PRE-PIPED AND PRE-WIRED	0.5 GPH @ 50 PSIG	TBD	105	A	TBD	TBD	TBD	AMBIENT	PVC	TBD	TBD	NO	120/1/60	TBD	TBD	
A	AC-100	AIR COMPRESSOR	ROTARY SCREW AIR COOLED	100 CFM @ 125PSIG	TBD	106	A	TBD	TBD	125	AMBIENT	CAST IRON	N/A	TBD	N/A	480/3/60	TBD	TBD	
A	TK-800	AIR RECEIVER TANK	ASME VESSEL	250 GAL	TBD	106	A	TBD	TBD	125	AMBIENT	CS	N/A	TBD	N/A	N/A	TBD	TBD	
A	U-100	INSTRUMENT DRYER	DESICCANT DRYER	100 CFM	TBD	106	A	TBD	TBD	125	AMBIENT	TBD	N/A	N/A	N/A	N/A	TBD	TBD	

NO. REVISION APPV'D DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
MECHANICAL EQUIPMENT LIST
SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED BY :
DRAWN BY : VIG LMOB
CHK'D BY (DESIGN) :
CHK'D BY (FIELD ENGR) :

Water Engineering Technologies, Inc.
4691 Shandalyn Lane, Bozeman, MT 59718
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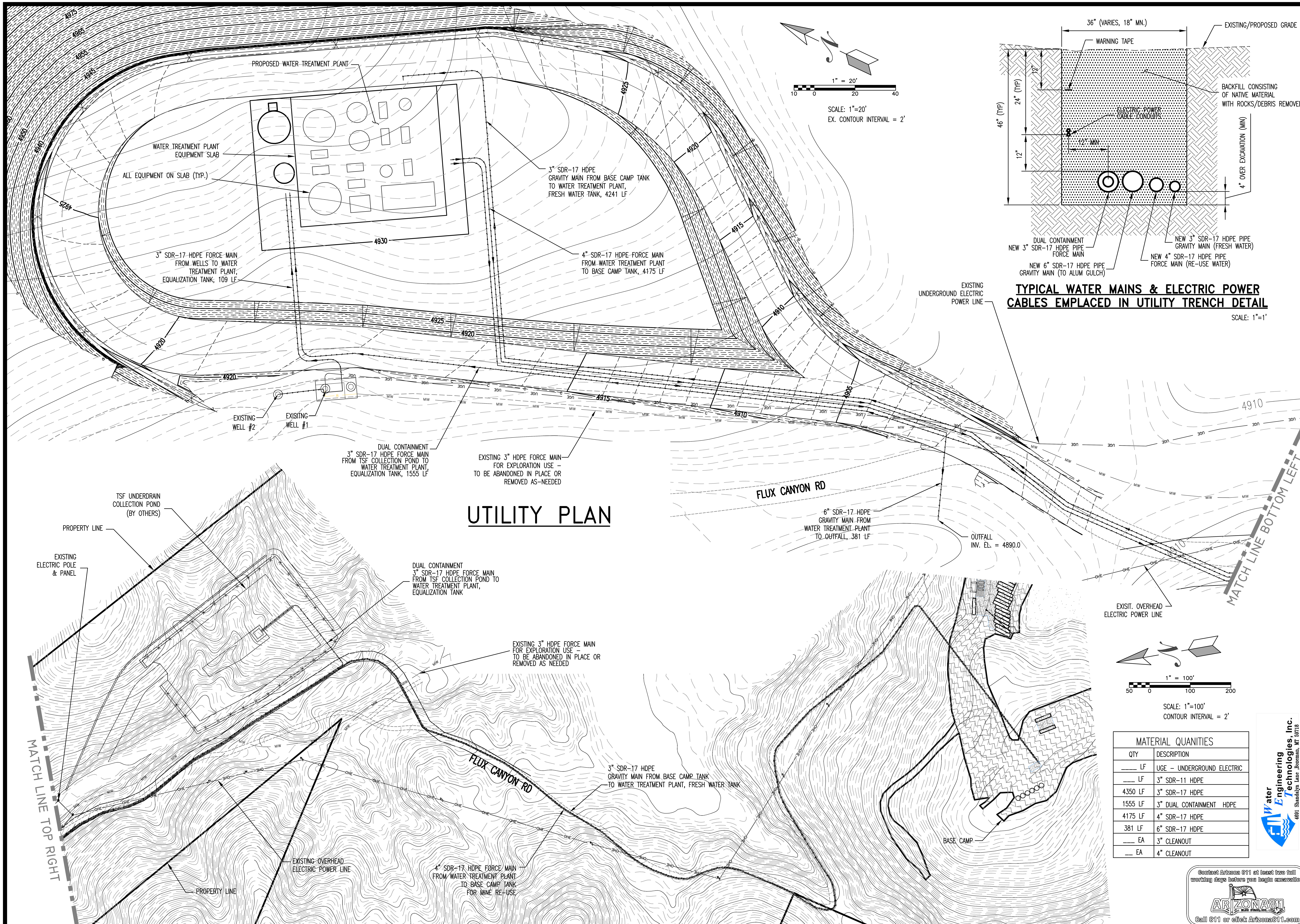
CPE CONSULTANTS [redacted]
3895 N. Business Center Dr.
Suite 115 Tucson, AZ 85705
520-545-7001

DATE: APRIL 2017
SCALE HORIZ. : N/A
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-15-MEL

65% PLANS PRINTED ON 04/24/2017



MATERIAL QUANITIES	
QTY	DESCRIPTION
____ LF	UGE - UNDERGROUND ELECTRIC
___ LF	3" SDR-11 HDPE
4350 LF	3" SDR-17 HDPE
1555 LF	3" DUAL CONTAINMENT HDPE
4175 LF	4" SDR-17 HDPE
381 LF	6" SDR-17 HDPE
___ EA	3" CLEANOUT
__ EA	4" CLEANOUT

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 BLUE STAKE, INC.
Call 811 or click Arizona811.com

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
UTILITY PLAN

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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406-585-7101

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

DATE: APRIL 2017
SCALE HORIZ. : 1" = 50'
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-16-UTILITY

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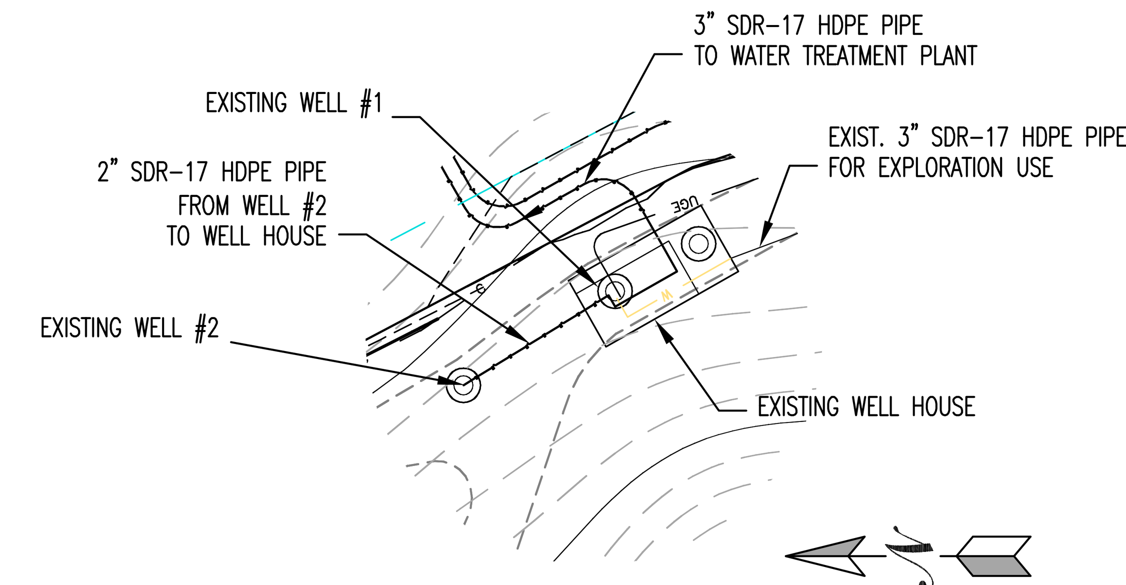
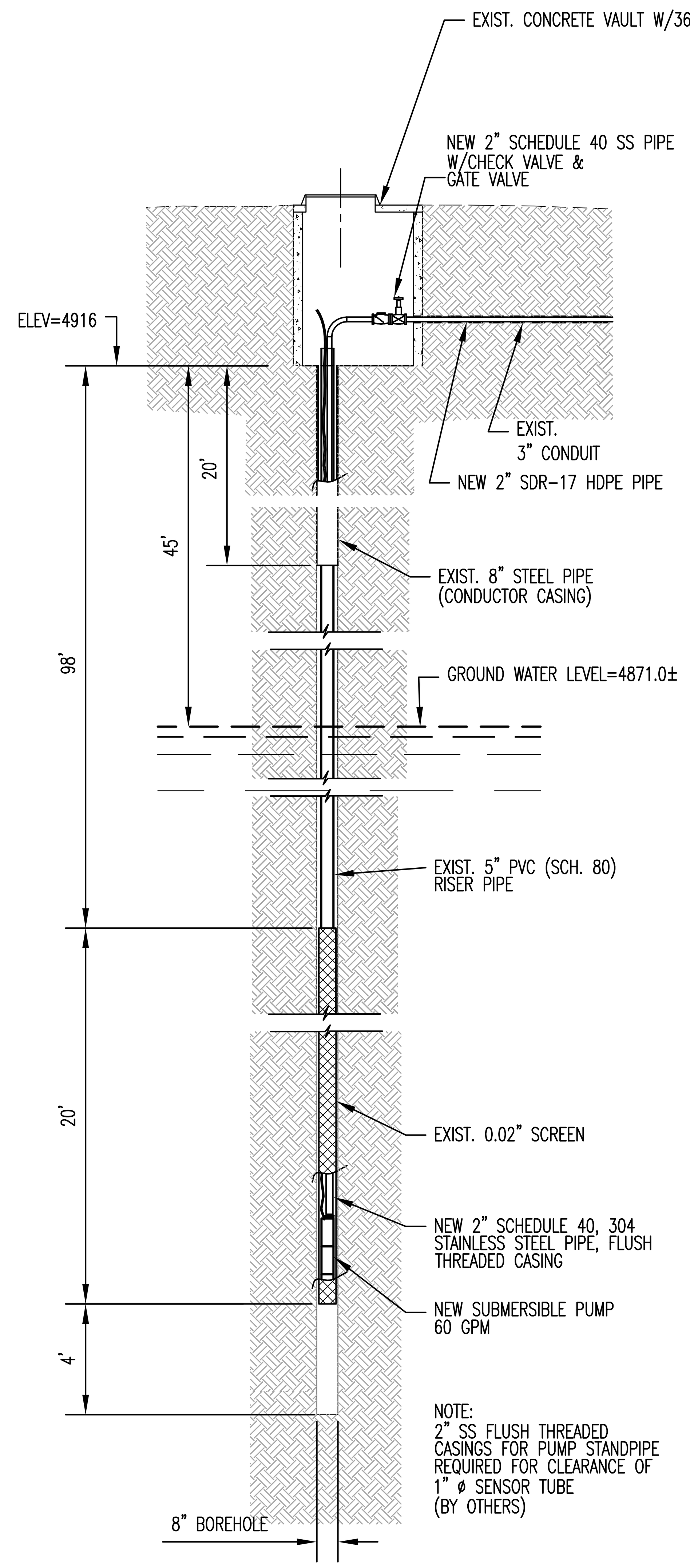


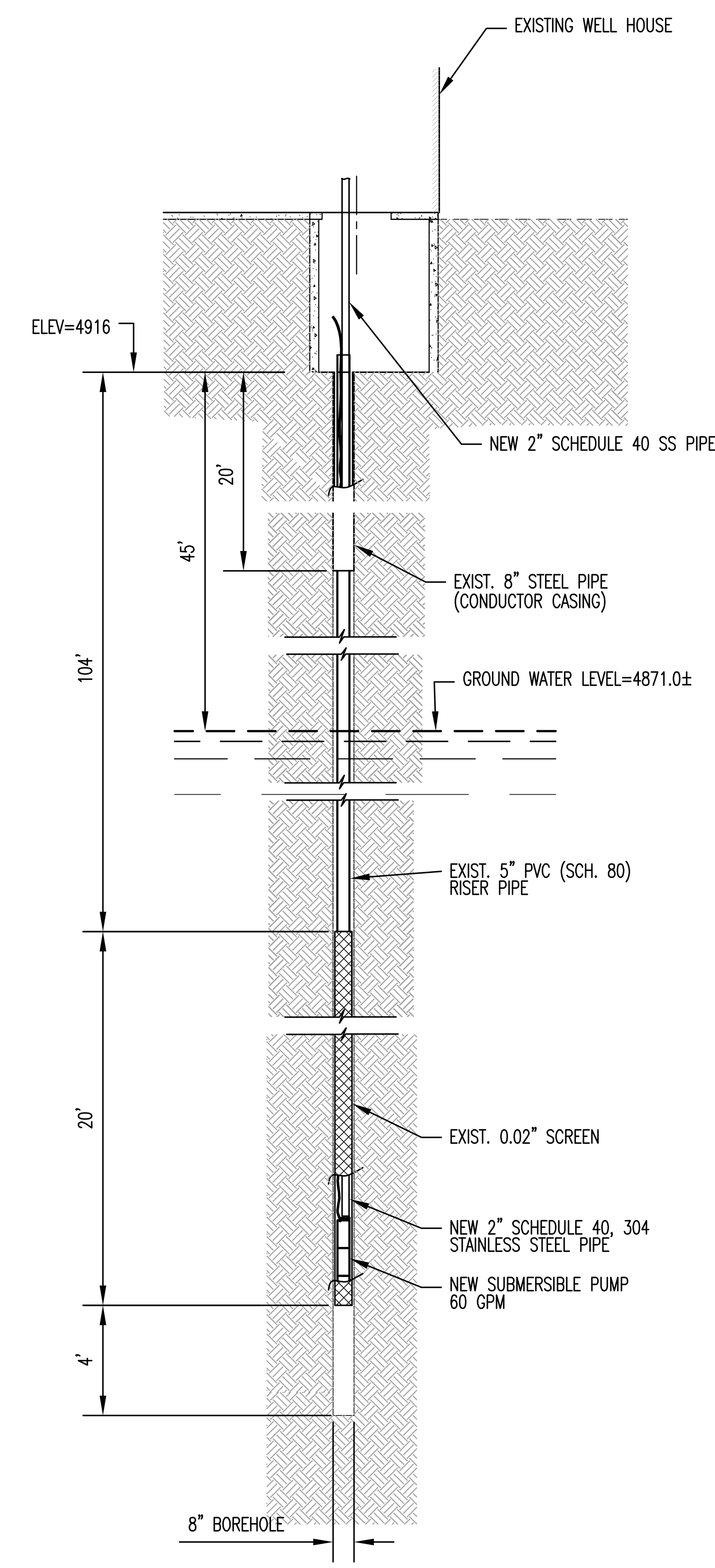
WELL PLAN

SCALE: 1"=20'



EXISTING WATER WELL #2
SECTION FOR ADIT

SCALE: 1"=4'



EXISTING WATER WELL #1
SECTION FOR ADIT

SCALE: 1"=4'

NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
WATER WELL AND PUMP DETAILS

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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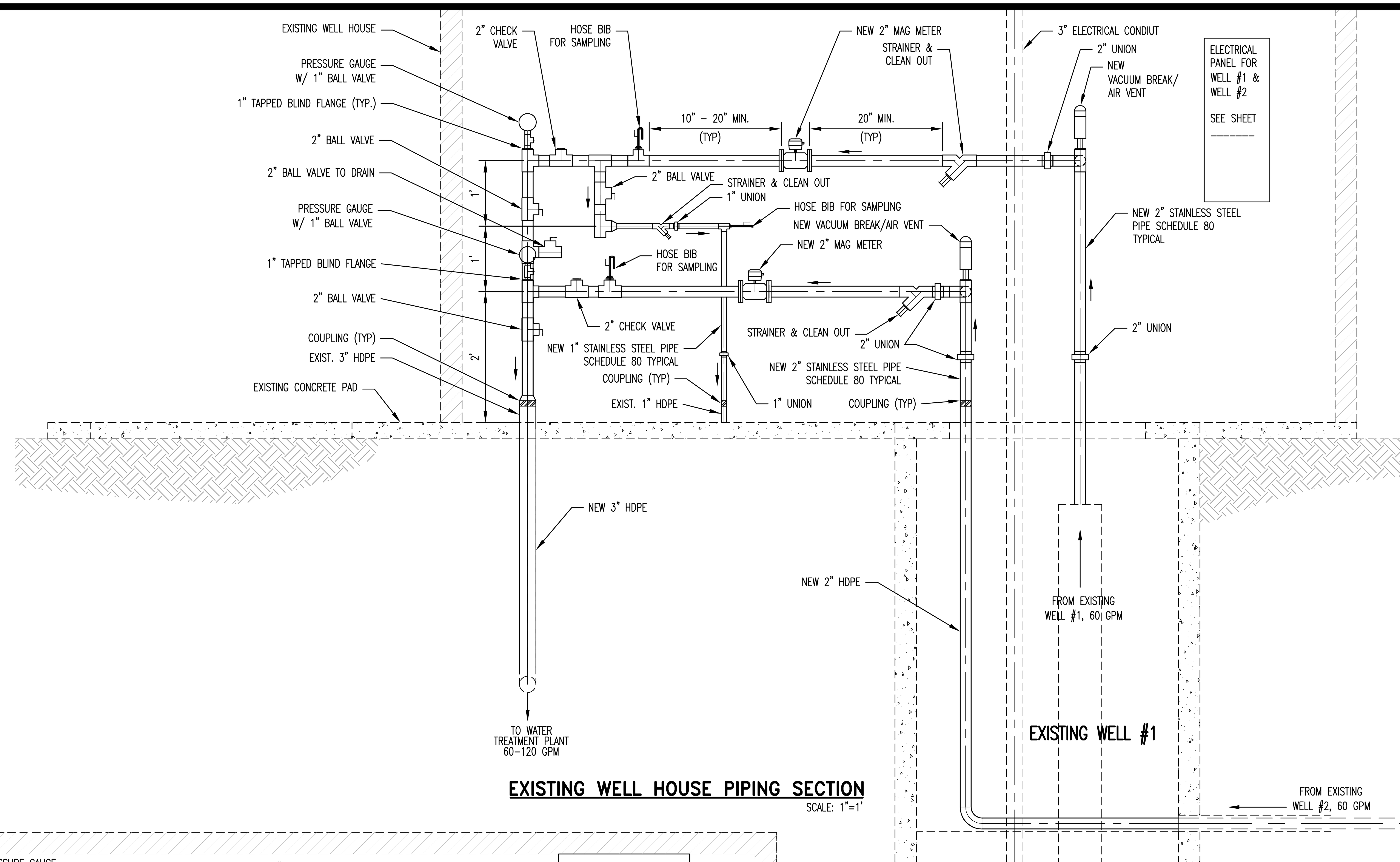
DATE: APRIL 2017
SCALE HORIZ. : AS NOTED
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-17-WELL-DETAILS

65% PLANS PRINTED ON 04/24/2017

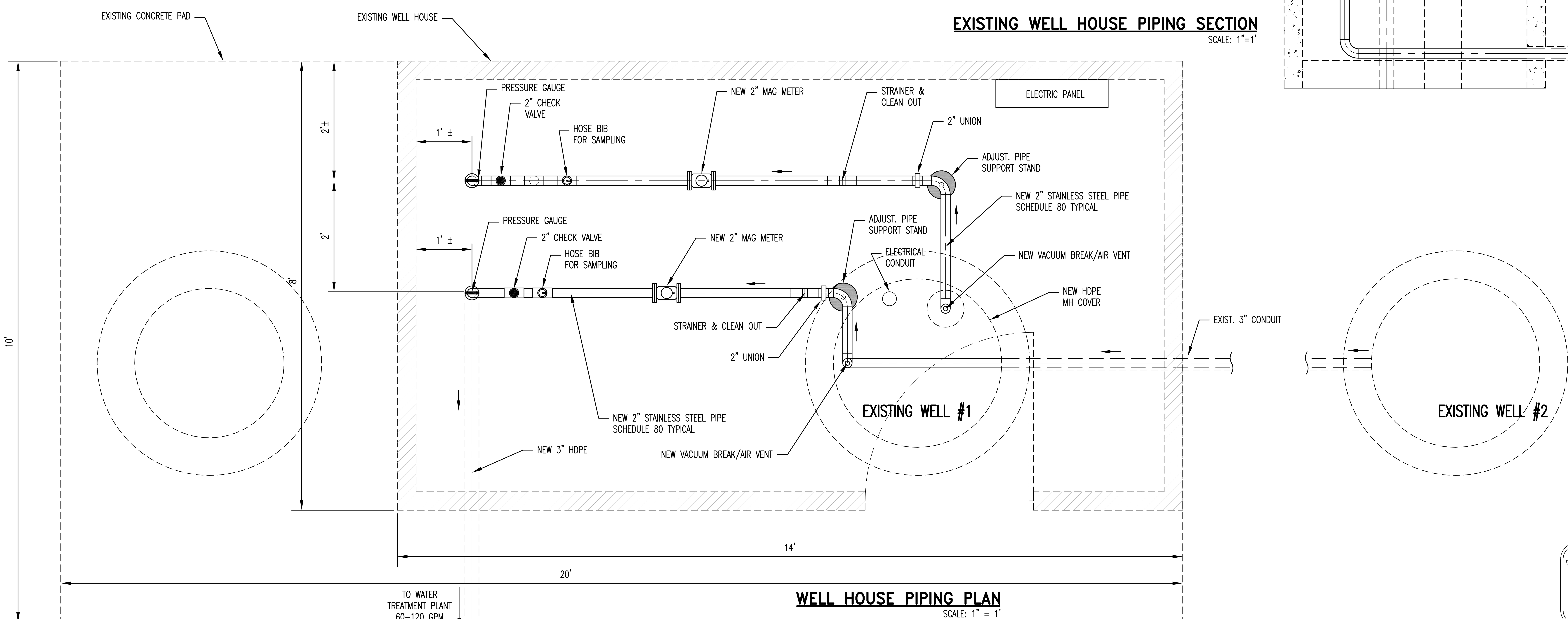
PARTS LIST

QTY	DESCRIPTION
32 LF	2" STAINLESS STEEL PIPE, SCHEDULE 80
4 EA	COUPLING – HDPE TO STAINLESS STEEL
4 EA	2" UNION
2 EA	VACUUM BREAK/AIR VENT
2 EA	2" STRAINER/CLEANOUT
2 EA	2" MAG METER
2 EA	2" HOSE BIB/SAMPLING POINT
2 EA	2" CHECK VALVE
2 EA	PRESSURE GAUGE W/ 1" BALL VALVE, W/ 1" TAPPED BLIND FLANGE
4 EA	2" BALL VALVE
7 EA	2"x2" TEE
2 EA	2" 90° BEND
2 EA	3"x2" REDUCER
1 EA	2"x1" REDUCER
5 LF	1" STAINLESS STEEL PIPE, SCHEDULE 80
1 EA	1" HOSE BIB/SAMPLING POINT
2 EA	1" UNION
1 EA	1"x1" TEE
2 EA	ADJUSTABLE PIPE SUPPORT STAND
1 EA	36" HDPE MANHOLE COVER



EXISTING WELL HOUSE PIPING SECTION

SCALE: 1"=1'



WELL HOUSE PIPING PLAN

SCALE: 1" = 1'

NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE
WATER TREATMENT SYSTEM
WELL HOUSE PIPING PLAN

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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DATE: APRIL 2017
SCALE HORIZ. : AS NOTED
VERT. : N/A
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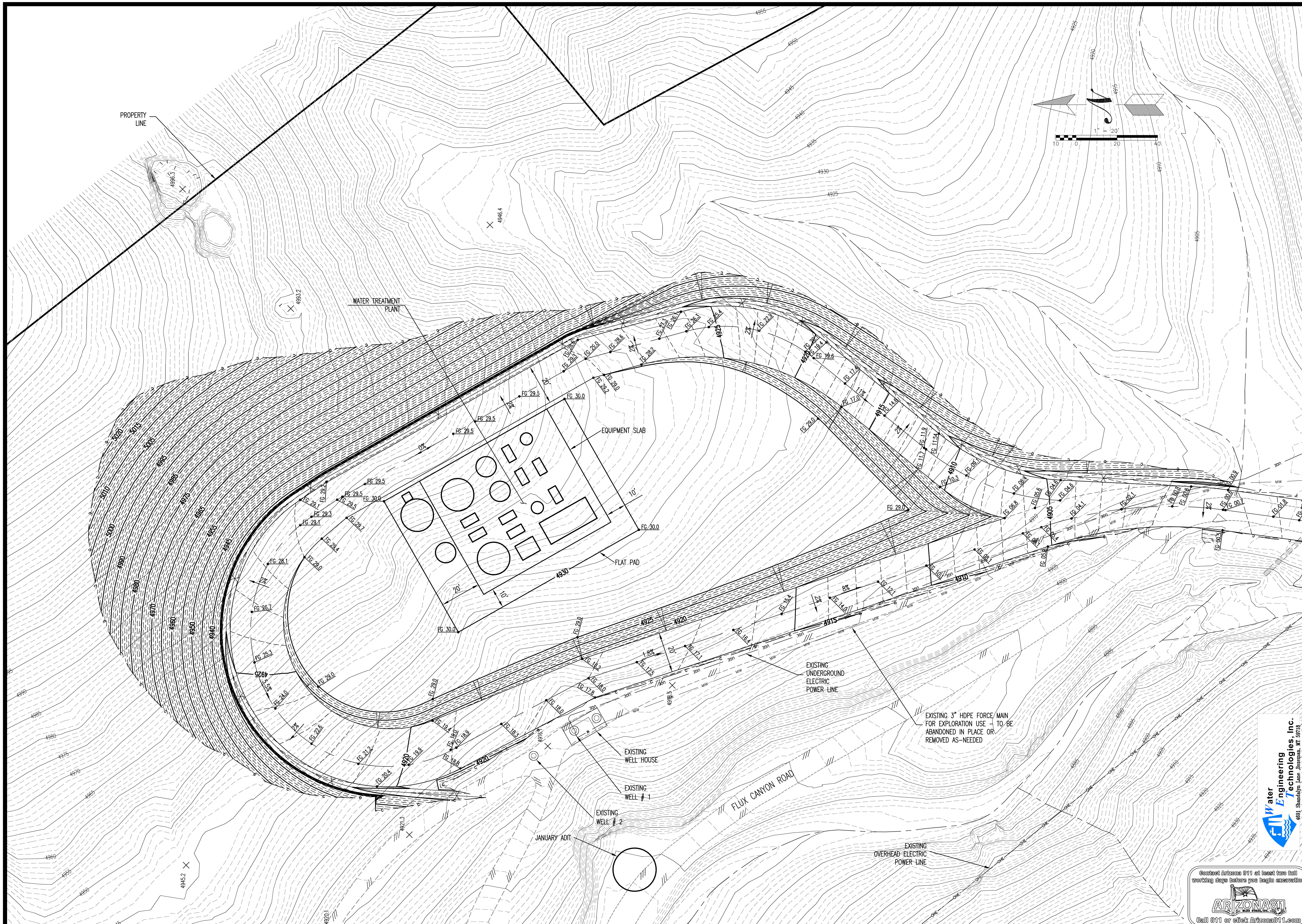
FILE NAME: 346.5–18–WELL–PIPING–PLAN

65% PLANS PRINTED ON 04/24/2017



JANUARY ADIT (NORTON MINE) VRP SITE

WATER TREATMENT SYSTEM

GRADING AND DRAINAGE OVERVIEW PLAN

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

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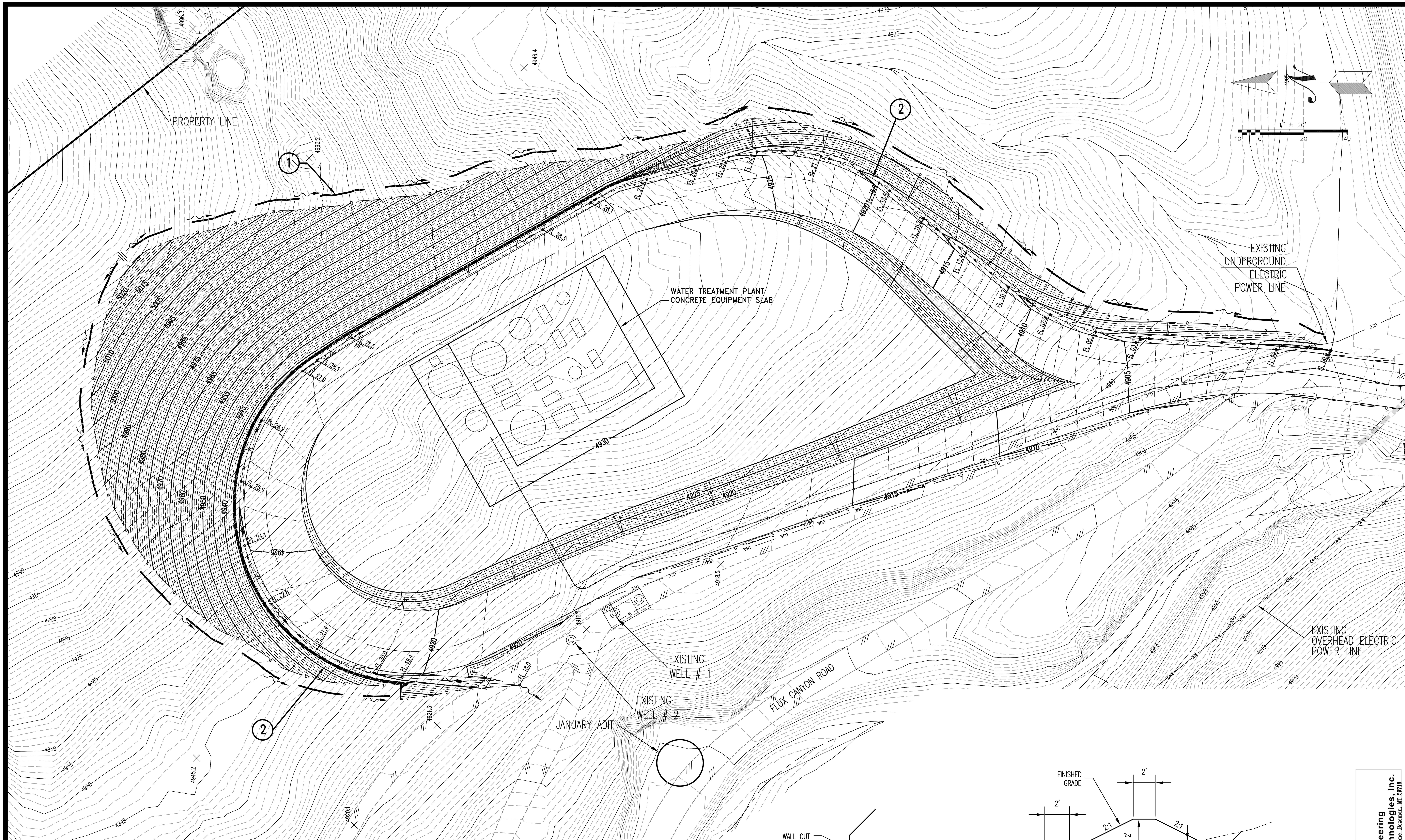
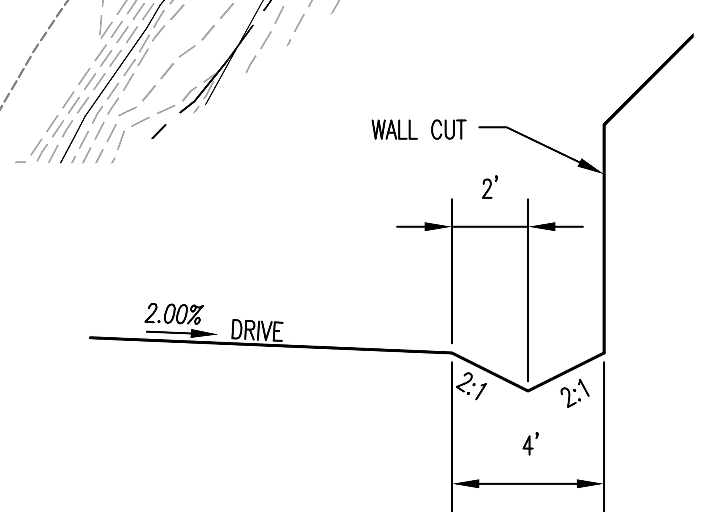
520-545-7001

DATE: APRIL 2017
SCALE HORIZ. : 1" = 20'
VERT. : N/A
JOB NO: 346.5
FILE NAME: 346.5-19-GRADING-OV

SHEET : C-107
19 OF 20

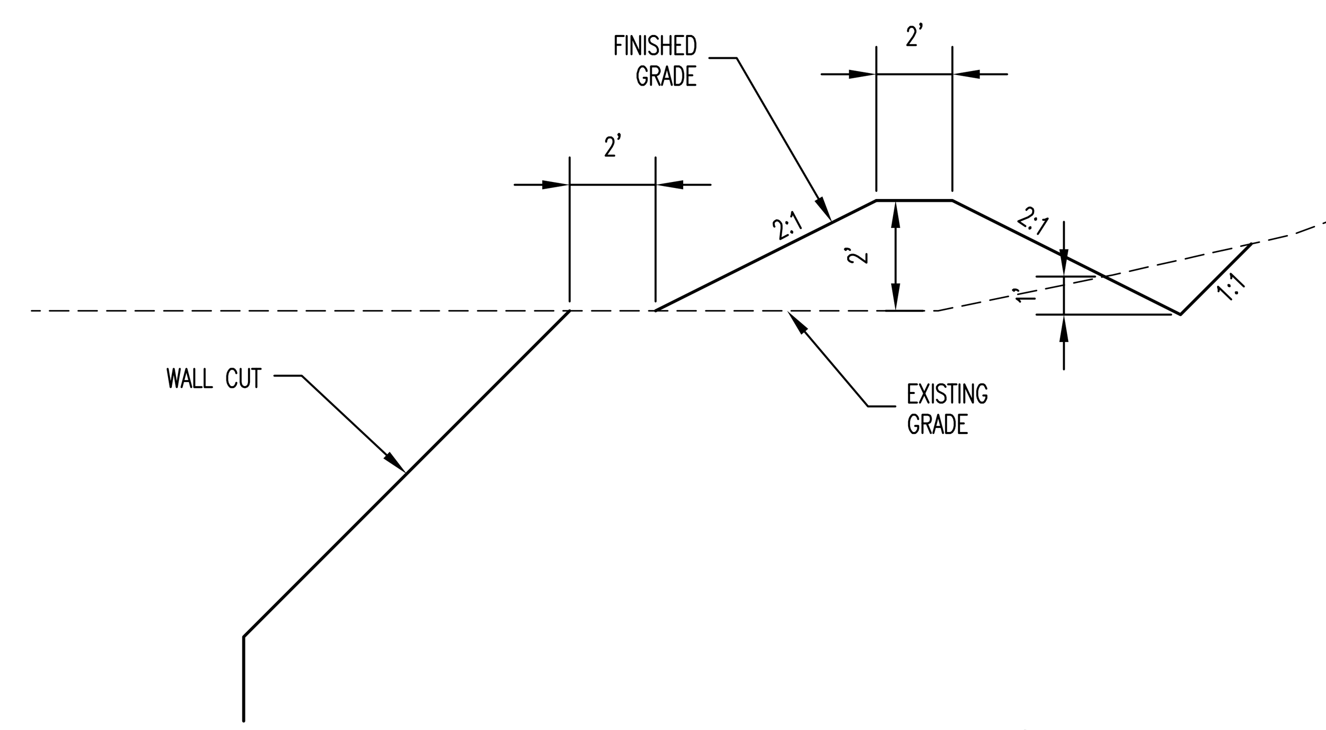
65% PLANS PRINTED ON 04/24/2017





2 DRAINAGE SWALE DETAIL

SCALE: N.T.S.



1 STORM WATER DIVERSION BERM/SWALE DETAIL

SCALE: N.T.S.

NO.	REVISION	APPV'D	DATE

JANUARY ADIT (NORTON MINE) VRP SITE

WATER TREATMENT SYSTEM

DRAINAGE PLAN & DETAILS

SECTION 32, T22S, R16E & SECTION 5, T23S, R16E, G&SRM, SANTA CRUZ COUNTY, ARIZONA

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED BY:
DRAWN BY: VIC LMOB
CHK'D BY (DESIGN):
CHK'D BY (FIELD ENGR):

Water Engineering Technologies, Inc.
4691 Shandalyn Lane, Bozeman, MT 59718
406-585-7101

CPE CONSULTANTS
3695 N. Business Center Dr.
Suite 115 Tucson, AZ 85705
520-545-7001

DATE: APRIL 2017
SCALE HORIZ.: 1" = 20'
VERT.: N/A
JOB NO: 346.5
FILE NAME: 346.5-20-DRAINAGE-OV

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

SHEET: C-108
20 OF 20

65% PLANS PRINTED ON 04/24/2017

APPENDIX B

EQUIPMENT DATA SHEETS

EQUIPMENT DATA SHEET

DATE	Arizona Minerals Inc Water Treatment Plant	
PROJECT		
Equipment Type:	**Agitator**	
Item:	Reaction Tank Mixer	
Tag No.	A-100	

Manufacturer	Lightin	
Model	14Q2	
Size	2 HP	
Mounting	Overhead, center	
RPM	1200	rpm
Design BHP	2	hp
Coupling Type		
Reaction Forces		
Vertical (Direction)	1100	lb
Bending Moment	15000	in-lb
Torsional	3150	in-lb
Drive:		
Reducer Model Number		
Reducer Ratio	14.06	
AGMA Service Rating		
V-Belt Sheaves		
Drive		
Driven		
Electric Motor:		
Manufacturer		
HP	2	hp
RPM	1200	rpm
Volts	230	
Cycle	60	
Phase	3	
Temperature Rise (°C over 40 °C ambient)		°C
Insulation Class		
Enclosure	TEFC	
Frame Size	184TC	
FLA		
Impeller:		
Quantity	1	
Diameter	38	in
Type	A510E	
Material	316 SS	
Lining		
Speed	84	rpm
Shaft:		
Material	316 SS	
Diameter	2	in
Length	68.5	in
Lining		
Static Runout of Shaft		in/ft
Shaft/Impeller will operate at % of the System Critical Frequency		
Seal Type		
Lining: List Rubber Specification Used		
Weight:		
Shipping	464	lb
Heaviest Item for Installation	464	lb
Heaviest Item for Maintenance	464	lb

EQUIPMENT DATA SHEET

DATE	Arizona Minerals Inc Water Treatment Plant	
PROJECT		
Equipment Type:	**Agitator**	
Item:	pH Adjustment Tank Mixer	
Tag No.	A-200	
Manufacturer	Lightin	
Model	X6Q150	
Size	1.5 HP	
Mounting	Overhead, center	
RPM	1725	rpm
Design BHP	1.5	hp
Coupling Type		
Reaction Forces		
Vertical (Direction)	510	lb
Bending Moment	8700	in-lb
Torsional	650	in-lb
Drive:		
Reducer Model Number		
Reducer Ratio	6	
AGMA Service Rating		
V-Belt Sheaves		
Drive		
Driven		
Electric Motor:		
Manufacturer		
HP	1.5	hp
RPM	1725	rpm
Volts	230	
Cycle	60	
Phase	3	
Temperature Rise (°C over 40 °C ambient)		°C
Insulation Class		
Enclosure	TFEC	
Frame Size		
FLA		
Impeller:		
Quantity	1	
Diameter	19	in
Type	A310	
Material	316 SS	
Lining		
Speed	280	rpm
Shaft:		
Material	316 SS	
Diameter	1	in
Length	56	in
Lining		
Static Runout of Shaft		in/ft
Shaft/Impeller will operate at % of the System Critical Frequency		
Seal Type		
Lining: List Rubber Specification Used		
Weight:		
Shipping	216	lb
Heaviest Item for Installation	216	lb
Heaviest Item for Maintenance	216	lb

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plant

EQUIPMENT TYPE	**Solids Contact Clarifier**
Item:	Mine water clarifier
Tag No.	CL-100
FUNCTIONAL DESCRIPTION	Liquid/solids separator to remove suspended solids from water stream

PROCESS DESIGN REQUIREMENTS

Design flow, gpm @ mgl/ TSS	135gpm @ 1,200 mg/l
Pressure	ATM
Water temperature, °F	40-85

GENERAL

Pumped Liquid	Water
Specific Gravity (SG)	1
pH	10.5

PROCESS TANKS

Diameter, feet-inches	14-0
Tank side wall height, feet-inches	16-0
Tank side wall water depth, feet-inches	15-0
Design flow rate	135 gpm
Location of use	Inside

EQUIPMENT ASSEMBLY

Bridge structures	Beam, mild steel
Bridge walkway type	Full-span, 42" wide
Rake arm type	Beam, 304LSS
Rake arm quantity	2
Tank type	Anchor channel, steel bottom, false bottom, 304SS
Tank bottom slope	0:12
Shell thickness, inches	0.25
Floor thickness, inches	0.25
Shipping wieght, pounds	TBD
Design style	Shop assembled
Center Shaft diameter, inches	2, 304SS
Feedwell type	Cylindrical
Feedwell diameter, feet	3
Impeller diameter,feet	1
Number of launders	TBD
Inlet pipe diameter, inches	TBD

DRIVE ASSEMBLY

Continuous Torque	2000 ft-lbs
Rake tip speed	12 fpm
Rake motor size, h.p.	1
Motors, RPM/VAC/ph/Hz	1800/460/3/60
Impeller motor size,h.p.	1
Impeller speed, RPM	1-11

INSTRUMENTATION

Control Panel	NEMA 4X, 304SS

SURFACE PREPARATION AND COATINGS

Non-submerged coating, 1st, 2nd	Epoxy, Urethane
Drive, 1st, 2nd	Epoxy, Urethane

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plant

EQUIPMENT TYPE	**Thickening Tank**
Item:	Thickening Tank
Tag No.	CL-200
FUNCTIONAL DESCRIPTION	Liquid/solids separator to thicken suspended solids in clarifier sludge

PROCESS DESIGN REQUIREMENTS

Design flow, gpm @ mgl/ TSS	10 gpm @ 20,000 mg/l
Pressure	ATM
Water temperature, °F	40-85

GENERAL

Pumped Liquid	Water
Specific Gravity (SG)	1
pH	10.5

PROCESS TANKS

Diameter, feet-inches	12-0
Tank side wall height, feet-inches	10-0
Tank side wall water depth, feet-inches	9-0
Design flow rate	10 gpm
Location of use	Inside

EQUIPMENT ASSEMBLY

Bridge structures	Half span
Bridge walkway type	Beam design
Rake arm type	Low-drag beam
Rake arm quantity	2
Tank type	Anchor channel, steel bottom, false bottom, 304SS
Tank bottom slope	0:12
Shell thickness, inches	0.25
Floor thickness, inches	0.25
Shipping wieght, pounds	TBD
Design style	Shop assembled
Center Shaft diameter, inches	4"

DRIVE ASSEMBLY

Continuous Torque	TBD
Rake tip speed	TBD
Rake motor size, h.p.	TBD
Motors, RPM/VAC/ph/Hz	TBD

INSTRUMENTATION

Control Panel	NEMA 4X, 304SS

SURFACE PREPARATION AND COATINGS

Non-submerged coating, 1st, 2nd	Epoxy, Urethane
Drive, 1st, 2nd	Epoxy, Urethane

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plant

EQUIPMENT TYPE	**Hydrated Lime System**
Item:	Lime System
Tag No.	LS-100

Storage Silo	
Material of Construction	Steel
Diameter x Overall Height	12' x 32'
Manway	
Size	24"
Location	Roof
Cone Bottom Angle	
Discharge Nozzle Size	
Bin Activator (Option)	
Quantity	1
Manufacturer	TBD
Size	1700 cf
Model Number	
Air Consumption	
Electrical Requirement	
Air Connection	
Size	
Type	
Fill Pipe	
Diameter	4"
Wall Thickness	sch 40
Material of Construction	carbon steel
Bin Vent Filter	
Manufacturer	
Size	
Model Number	
Area of Media	
Media Material	
Nominal Rating	micron
Cleaning Device	
Controls (Describe)	
Electrical Enclosure	
Feeder	
Manufacturer/Model	
Maximum Capacity	
Minimum Capacity	
Motor HP	
SCR Drive Manufacturer	
Slurry Tank	
Capacity	200 gal
Diameter	
Height	
Materials of Construction	304 SS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plant

EQUIPMENT TYPE	**Hydrated Lime System**
Item:	Lime System
Tag No.	LS-100

Agitator		
Manufacturer/Model		
Motor	480V/3PH/60HZ	
RPM		
Motor HP	2	
Instrumentation		
Level Probes		
Flowmeters		
Programmable Controller		
Number of Pieces to Assemble		
Largest Component for:		
Shipping		lb
Erection		lb
Maintenance		lb
Largest Piece for Shipping		ft x ft x ft
Number of Boxes Shipped		
Total Shipping Volume		
Total Shipping Weight		
Heaviest Item Handled for Erection		
Heaviest Item Handled for Maintenance		

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Submersible Pump**
Item:	Mine Water Pump
Tag No.	P-100A, P-100B

OPERATING DATA

Pumped Liquid	Water
Liquid Temperature, °F	50
Specific Gravity (SG)	1
pH	5.8
Flow Rate, gpm	60
Total Dynamic Head, feet	150

MATERIALS

Pump	304 Stainless Steel
Impeller	304 Stainless Steel
Motor	

INSTALLATION

Pump outlet, " NPT	2

ELECTRICAL DATA

Rated Power, HP	5
Frequency, Hz	60
Phase	3
Voltage, V	460
Rated Speed, RPM	3460

OTHERS

VFD	P-100A yes

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Horizontal Centrifugal Pump**
Item:	Underdrain Pond Pump
Tag No.	P-101

OPERATING DATA

Pumped Liquid	TSF Underdrain Water and Stormwater
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.00
pH	5.8 - 6.5
Flow Rate, gpm	120
Total Dynamic Head, feet	100

MATERIALS

Pump	304 Stainless Steel
Impeller	304 Stainless Steel
Motor	

INSTALLATION	Outside
Pump outlet, " NPT	TBD

ELECTRICAL DATA

Rated Power, HP	7
Frequency, Hz	60
Phase	3
Voltage, V	460
Rated Speed, RPM	3460

OTHERS

VFD	Yes

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Horizontal Centrifugal Pump**
Item:	Reaction Tank Forwarding Pump
Tag No.	P-102

OPERATING DATA

Pumped Liquid	Water
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.0
pH	10.5
Flow Rate, gpm	145.5
Total Dynamic Head, feet	25

MATERIALS

Pump	304 SS
Impeller	304 SS
Motor	

INSTALLATION	Inside
Pump outlet, " NPT	TBD

ELECTRICAL DATA

Rated Power, HP	1
Frequency, Hz	60
Phase	3
Voltage, V	240
Rated Speed, RPM	TBD

OTHERS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Horizontal Centrifugal Pump**
Item:	Sludge Pump
Tag No.	P-103

OPERATING DATA

Pumped Liquid	Clarifier sludge
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.02
pH	10.5
Flow Rate, gpm	26
Total Dynamic Head, feet	25

MATERIALS

Pump	TBD
Impeller	TBD
Motor	
INSTALLATION	Inside
Pump outlet, " NPT	TBD

ELECTRICAL DATA

Rated Power, HP	1
Frequency, Hz	60
Phase	3
Voltage, V	240
Rated Speed, RPM	TBD

OTHERS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Progressive Cavity Pump**
Item:	Filter Press Feed Pump
Tag No.	P-104

OPERATING DATA

Pumped Liquid	Water
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.1
pH	10.5
Flow Rate, gpm	45
Total Dynamic Head, feet	45

MATERIALS

Pump	304 SS
Impeller	304 SS
Motor	

INSTALLATION	Inside
Pump outlet, " NPT	TBD

ELECTRICAL DATA

Rated Power, HP	0.75
Frequency, Hz	60
Phase	3
Voltage, V	240
Rated Speed, RPM	TBD

OTHERS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Horizontal Centrifugal Pump**
Item:	Filtrate Pump
Tag No.	P-105

OPERATING DATA

Pumped Liquid	Water
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.0
pH	10.5
Flow Rate, gpm	15
Total Dynamic Head, feet	25

MATERIALS

Pump	304 SS
Impeller	304 SS
Motor	

INSTALLATION	Inside
Pump outlet, " NPT	2

ELECTRICAL DATA

Rated Power, HP	0.25
Frequency, Hz	60
Phase	3
Voltage, V	240
Rated Speed, RPM	TBD

OTHERS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizaon Minerals Inc Water Treatment Plan

EQUIPMENT TYPE	**Chemical Feed Pump**
Item:	Sulfuric acid feed pump
Tag No.	P-108

OPERATING REQUIREMENTS

Utility Requirements

Voltage, V	110
Phase	1
Frequency, Hz	60

Environment:

Indoor/outdoor	Indoor
Corrosive	No

General Requirements

Pump	1 x 100%, each
Flow rate, gph	TBD
Motor h.p./rpm	TBD
Speed control	local/PLC
Inlet/Outlet diameter, inches	TBD
Maturation tank	N/A
Valves	TBD

Notes

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Horizontal Centrifugal Pump**
Item:	Re-use Pump
Tag No.	P-109

OPERATING DATA

Pumped Liquid	Water
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.0
pH	8.5
Flow Rate, gpm	120
Total Dynamic Head, feet	350

MATERIALS

Pump	304 SS
Impeller	304 SS
Motor	

INSTALLATION	Inside
Pump outlet, " NPT	TBD

ELECTRICAL DATA

Rated Power, HP	20
Frequency, Hz	60
Phase	3
Voltage, V	240
Rated Speed, RPM	TBD

OTHERS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Pla

EQUIPMENT TYPE	**Horizontal Centrifugal Pump**
Item:	Fresh Water Pump
Tag No.	P-111

OPERATING DATA

Pumped Liquid	Water
Liquid Temperature, °F	40-85
Specific Gravity (SG)	1.0
pH	7
Flow Rate, gpm	10
Total Dynamic Head, feet	20

MATERIALS

Pump	304 SS
Impeller	304 SS
Motor	

INSTALLATION	Inside
Pump outlet, " NPT	2

ELECTRICAL DATA

Rated Power, HP	0.25
Frequency, Hz	60
Phase	3
Voltage, V	240
Rated Speed, RPM	TBD

OTHERS

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plan

EQUIPMENT TYPE	**Carbon Steel Storage Tank**
Item:	Equalization Tank
Tag No.	TK-100
FUNCTIONAL DESCRIPTION	Mixing and equalization of mine water and Underdrain Pond water
GENERAL REQUIREMENTS	
Location, Inside/outside	Outside
Tank life, years	20
Standard design guidelines	AWWA, NSF
FLUID PARAMETERS	
Fluid Description	Water
Specific Gravity	1
Fluid Temperature Range, °F	40-90
pH	5.8-6.5
Solids Content	N/A
Particle Size	N/A
TANK PARAMETERS	
Diameter, feet-inches	9-0
Height, feet-inches	20-0
Nominal Volume, gallons	10,000
Working Volume, gallons	10,000
Material of Construction	carbon steel, bolted or welded
Bottom Option	Flat bottom
Minimum Thickness:	
Shell	
Bottom	
Baffles	None
Foundation to be Provided	By Owner
Exterior Paint	Epoxy coated
FLANGE OPENINGS	
Inlet diameter, inches	4
Inlet diameter, inches	
Probe diameter, inches	TBD
Outlet diameter, inches	4
Outlet diameter, inches	4
Drain diameter, inches	4
Overflow diameter, inches	4

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plan

EQUIPMENT TYPE	**Reaction Tank**
Item:	Reaction Tank
Tag No.	TK-200
GENERAL REQUIREMENTS	
Location, Inside/outside	Inside
Tank life, years	20
FLUID PARAMETERS	
Fluid Description	Water
Specific Gravity	1
Fluid Temperature Range, °F	40-85
pH	10.5
Solids Content	
Particle Size	
TANK PARAMETERS	
Diameter, feet-inches	12-0
Height, feet-inches	6-0
Nominal Volume, gallons	4,500
Working Volume, gallons	4,500
Material of Construction	High Density Polyethylene
Corrosion Allowance	
Minimum Thickness:	
Shell	
Bottom	
Roof	
Roof	Open top
Bottom	Flat
Upcomers	N/A
Baffles	Three
Foundation to be Provided	By others
Exterior Paint	NA
FLANGE OPENINGS	
Inlet diameter, inches	
Inlet diameter, inches	N/A
Manhole diameter, inches	N/A
Probe diameter, inches	N/A
Outlet diameter, inches	4
Outlet diameter, inches	
Drain diameter, inches	4
Overflow diameter, inches	4
Vent diameter, inches	

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plan

EQUIPMENT TYPE	**pH Adjustment Tank**
Item:	pH Adjustment Tank
Tag No.	TK-300
GENERAL REQUIREMENTS	
Location, Inside/outside	Inside
Tank life, years	20
FLUID PARAMETERS	
Fluid Description	Water
Specific Gravity	1
Fluid Temperature Range, °F	40-85
pH	8.5
Solids Content	
Particle Size	
TANK PARAMETERS	
Diameter, feet-inches	8-0
Height, feet-inches	5-7
Nominal Volume, gallons	2,000
Working Volume, gallons	2,000
Material of Construction	High Density Polyethylene
Corrosion Allowance	
Minimum Thickness:	
Shell	
Bottom	
Roof	
Roof	Open top
Bottom	Flat
Upcomers	N/A
Baffles	None
Foundation to be Provided	By others
Exterior Paint	NA
FLANGE OPENINGS	
Inlet diameter, inches	
Inlet diameter, inches	N/A
Manhole diameter, inches	N/A
Probe diameter, inches	N/A
Outlet diameter, inches	2
Outlet diameter, inches	
Drain diameter, inches	2
Overflow diameter, inches	2
Vent diameter, inches	

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plan

EQUIPMENT TYPE	**Filtrate Tank**
Item:	Filtrate Tank
Tag No.	TK-400
GENERAL REQUIREMENTS	
Location, Inside/outside	Inside
Tank life, years	20
FLUID PARAMETERS	
Fluid Description	Water
Specific Gravity	1
Fluid Temperature Range, °F	40-85
pH	10.5
Solids Content	
Particle Size	
TANK PARAMETERS	
Diameter, feet-inches	5-4
Height, feet-inches	6-0
Nominal Volume, gallons	900
Working Volume, gallons	900
Material of Construction	High Density Polyethylene
Corrosion Allowance	
Minimum Thickness:	
Shell	
Bottom	
Roof	
Roof	Open top
Bottom	Flat
Upcomers	N/A
Baffles	None
Foundation to be Provided	By others
Exterior Paint	NA
FLANGE OPENINGS	
Inlet diameter, inches	
Inlet diameter, inches	N/A
Manhole diameter, inches	N/A
Probe diameter, inches	N/A
Outlet diameter, inches	2
Outlet diameter, inches	
Drain diameter, inches	2
Overflow diameter, inches	2
Vent diameter, inches	

EQUIPMENT DATA SHEET

DATE	10-Apr-17
PROJECT:	Arizona Minerals Inc Water Treatment Plan

EQUIPMENT TYPE	**Water Tank**
Item:	Fresh Water Tank
Tag No.	TK-700
GENERAL REQUIREMENTS	
Location, Inside/outside	Inside
Tank life, years	20
FLUID PARAMETERS	
Fluid Description	Water
Specific Gravity	1
Fluid Temperature Range, °F	40-85
pH	7
Solids Content	
Particle Size	
TANK PARAMETERS	
Diameter, feet-inches	8-0
Height, feet-inches	5-7
Nominal Volume, gallons	2,000
Working Volume, gallons	2,000
Material of Construction	High Density Polyethylene
Corrosion Allowance	
Minimum Thickness:	
Shell	
Bottom	
Roof	
Roof	Open top
Bottom	Flat
Upcomers	N/A
Baffles	None
Foundation to be Provided	By others
Exterior Paint	NA
FLANGE OPENINGS	
Inlet diameter, inches	
Inlet diameter, inches	N/A
Manhole diameter, inches	N/A
Probe diameter, inches	N/A
Outlet diameter, inches	2
Outlet diameter, inches	
Drain diameter, inches	2
Overflow diameter, inches	2
Vent diameter, inches	

ATTACHMENT D

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, U.S. ARMY CORPS OF ENGINEERS
3636 N. CENTRAL AVE, SUITE 900
PHOENIX, AZ 85012-1939

October 13, 2016

Tom Klimas
WestLand Resources, Inc.
1750 South Woodlands Village Blvd.
Flagstaff, Arizona 86001

SUBJECT: Approved Jurisdictional Determination Regarding Geographic Jurisdiction

Dear Mr. Klimas:

I am responding to your request (File No. SPL-2016-00752-MWL) dated June 10, 2016, for an approved Department of the Army jurisdictional determination (JD) for the January Adit Passive Treatment System project site (Sections 4 and 5, Township 23 South, Range 16 East) located southeast of the Town of Patagonia, Santa Cruz County, Arizona.

Based on available information, I have determined waters of the United States do not occur on the project site. The basis for our determination can be found in the enclosed Approved Jurisdictional Determination (JD) form(s).

This letter includes an approved jurisdictional determination for the January Adit Passive Treatment System project site. If you wish to submit new information regarding this jurisdictional determination, please do so within 60 days. We will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination. If you object to this or any revised or reissued jurisdictional determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you wish to appeal this decision, you must submit a completed RFA form within 60 days of the date on the NAP to the Corps South Pacific Division Office at the following address:

Tom Cavanaugh
Administrative Appeal Review Officer
U.S. Army Corps of Engineers
South Pacific Division, CESPD-PDS-O, 2042B
1455 Market Street
San Francisco, California 94103-1399

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5 (see below), and that it has been received by the Division Office by December 12, 2016.

This determination has been conducted to identify the extent of the Corps' Clean Water Act jurisdiction on the particular project site identified in your request, and is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

Thank you for participating in the regulatory program. If you have any questions, please contact me at 602-230-6953 or via e-mail at Michael.W.Langley@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Sallie Diebolt

Sallie Diebolt
Chief, Arizona Branch
Regulatory Division

Enclosure(s)

ATTACHMENT E

Attachment E

VRP Active Water Treatment System and Lined Tailing and Potentially Acid (PAG) Material Storage and Placement

ASARCO January Adit (Norton Mine) and Trench Camp - VRP Site Code #505143-02

Task	Task Description	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018
1	Project Management																	
2	ASARCO Tailing Geotechnical and Geophysical Studies																	
3	Active Water Treatment Treatability Studies and Design																	
4	ASARCO Tailing and PAG Waste Rock Storage Liner Engineering and Design																	
5	VRP Work Plan Submittal																	
6	Work Plan Review and Public Notice and Comment Period																	
7	AZPDES Water Treatment Plant Design Review and Permitting																	
8	Construct Active Water Treatment Plant and Commission																	
9	APP Lined Tailing Design Review and Permitting																	
10	Install Liner, Re-Handle and Place Historic Tailings and PAG Material on Liner																	

ATTACHMENT F

NOTICE OF 45-DAY PUBLIC COMMENT PERIOD
ASARCO JANUARY ADIT (NORTON MINE)
VOLUNTARY REMEDIATOIN PROGRAM (VRP) SITE
REMEDIAL ACTION WORK PLAN

The Arizona Department of Environmental Quality (ADEQ) has received a work plan for remedial actions to be conducted at the ASARCO January Adit (Norton Mine) VRP Site (VRP Site Code 505143-02). The Work Plan was submitted in accordance with Arizona Revised Statutes (A.R.S.) §49-175 and §176. The Work Plan will address mine influenced water discharges from the January Mine Adit and seepage from historic tailing piles at the Trench Camp, Norton, and January Mine properties. This will be achieved through the following elements that are described in the Work Plan:

- An active water treatment plant (WTP) will be constructed to treat discharges from the January Mine workings and solutions captured in the underdrain collection pond from the historic tailings, waste rock, and precipitation that falls within the lined facility.

The work plan is available for review online at: http://www.azdeq.gov/notices, at the Patagonia Public Library, 346 Duquesne Ave., Patagonia (520) 394-2010 and at the ADEQ Records Center, 1110 W. Washington St., Phoenix, (602) 771-4380, or (800) 234-5677, ext. 6022345677. Please call for hours of operation and to schedule an appointment.

PARTIES WISHING TO SUBMIT WRITTEN COMMENTS regarding the Work Plan for the ASARCO January Adit (Norton Mine) VRP Site may do so to Arizona Mining Inc., attn: Johnny Pappas at 3845 North Business Center Drive, Suite 115, Tucson, AZ 85705. Comments may also be submitted to ADEQ, attn: John Patricki, VRP, 1110 W. Washington St., Phoenix, AZ 85007, or jp10@azdeq.gov and reference this listing. **Comments must be postmarked to Arizona Minerals and/or ADEQ no later than June 19, 2017.**

Dated this 5 and 12 day of May, 2017

Johnny Pappas, Arizona Mining Inc.

ADEQ will take reasonable measures to provide access to department services to individuals with limited ability to speak, write, or understand English and/or to those with disabilities. Requests for language interpretation services or for disability accommodations must be made at least 48 hours in advance by contacting: 7-1-1 for TDD; (602) 771-2215 for Disability Accessibility; or Ian Bingham, Title VI Nondiscrimination Coordinator at (602) 771-4322 or idb@azdeq.gov. **Disclaimer: Any ADEQ translation or communication in a language other than English is unofficial.**

ADEQ tomará medidas razonables para proveer acceso a los servicios del departamento para personas con capacidad limitada para hablar, escribir o entender Inglés y / o para las personas con discapacidad. Las solicitudes de servicios de interpretación del lenguaje o de alojamiento de discapacidad deben hacerse por lo menos 48 horas de antelación poniéndose en contacto con Ian Bingham, Title VI Nondiscrimination Coordinator al (602) 771-4322 o idb@azdeq.gov. **Cualquier traducción o comunicado de ADEQ en un idioma diferente al inglés no es oficial**