FINAL

PRELIMINARY ENDANGERMENT ASSESSMENT

CENTENNIAL M-1 PROPERTY

10344 CENTENNIAL DRIVE
NEVADA COUNTY, CALIFORNIA

JUNE 12, 2020

PREPARED ON BEHALF OF:

RISE GRASS VALLEY INC.
333 CROWN POINT CIRCLE, SUITE 215
GRASS VALLEY, CA 95945

NV5

792 SEARLS AVENUE
NEVADA CITY, CA 95959

PROJECT NO. 5279.01

Project No. 5279.01
June 12, 2020

California Environmental Protection Agency
Department of Toxic Substances Control
Site Evaluation and Remediation Unit
8800 Cal Center Drive
Sacramento, CA 95826

Attention: Dean Wright, PG, Project Manager

Reference: **Centennial M-1 Property**
Docket No. HSA-FY18/19-014
DTSC Site Code 102370
10344 Centennial Drive
Nevada County, California

Subject: **Preliminary Endangerment Assessment**

Dear Mr. Wright:

On behalf of Rise Grass Valley, Inc. (the Proponent), NV5 prepared this report to present the findings of a Preliminary Endangerment Assessment (PEA) of the 56.4-acre Centennial M-1 Property located at 10344 Centennial Drive in Nevada County, California.

The PEA was performed pursuant to a Voluntary Cleanup Agreement (VCA; Docket No. HSA-FY18/19-014) between the Proponent and the California Department of Toxic Substances Control (DTSC). The purpose of the PEA is to investigate environmental conditions related to the historical disposal of mining waste to land on the subject property.

This report contains revisions to the Draft PEA (NV5; December 12, 2019) and Draft Final PEA (May 14, 2020) based on:

1. The results of additional laboratory testing of mine tailings samples for total and extractable metals concentrations, as presented in Addendum No. 1 to Draft Preliminary Endangerment Assessment (NV5; February 10, 2020);
2. Comments on the Draft PEA and Addendum No. 1 (DTSC; March 9, 2020); and
3. Comments on the Draft Final PEA (DTSC; June 11, 2020).

The DTSC comments and the associated revisions are summarized in Section 1.3 of this report.

The assessment findings indicate that the property is not suitable for unrestricted land use in its present condition, although it does not appear to present an immediate threat to human health. Preparation of a Remedial Action Plan (RAP) to describe procedures for consolidation of mine waste with elevated metals concentrations under a land use covenant is considered appropriate prior to commercial site development.

If you have any questions regarding the site characterization or conclusions presented in this report, please contact the undersigned.

Sincerely,

NV5

REGISTERED PROFESSIONAL ENGINEER
JASON W. MUIR
No. 60167
Exp. 06 / 20
CIVIL
STATE OF CALIFORNIA

Jason W. Muir, C.E. 60167
Associate Engineer

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ACRONYMS AND ABBREVIATIONS

ADMP	Asbestos Dust Mitigation Plan
AMSL	above mean sea level
APN	assessor parcel number
bgs	below ground surface
BLM	Bureau of Land Management
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CDMG	California Department of Conservation, Division of Mines and Geology
CFR	Code of Federal Regulations
COPEC	constituents of potential ecological concern
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Level
DWR	California Department of Water Resources
EDR	Environmental Database Resources, Inc.
Eco-SSL	Ecological Soil Screening Levels
ELAP	Environmental Laboratory Accreditation Program
Engeo	Engeo, Inc.
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
H&K	Holdrege & Kull, An NV5 Company
IMMC	Idaho Maryland Mining Corporation
Geocon	Geocon Consultants, Inc.
MDL	method detection limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
McClelland	McClelland Laboratories, Inc.
MQO	measurement quality objective
MS	matrix spike
MSD	matrix spike duplicate
NCEHD	Nevada County Environmental Health Department
NCGIS	County of Nevada Geographic Information System
ND	not detected
NID	Nevada Irrigation District
NOA	naturally occurring asbestos
NASQMD	Northern Sierra Air Quality Management District
OEHHA	California Office of Environmental Health Hazard Assessment
PEA	Preliminary Endangerment Assessment
PQL	practical quantitation limit
QC	quantity control
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RL	laboratory reporting limit, or practical quantitation limit
RPD	relative percent difference

RSL	Regional Screening Level
RWQCB	California Regional Water Quality Control Board, Central Valley Region
SL	screening level
SWRCB	California State Water Resources Control Board
TEM	transmission electron microscopy
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program
Vector	Vector Engineering, Inc.
VOC	volatile organic compounds
Weston	Weston Solutions, Inc.
µg/L	microgram per liter

DISTRIBUTION LIST

Dean Wright, PG, DTSC Project Manager
California Environmental Protection Agency
Department of Toxic Substances Control
Site Evaluation and Remediation Unit
8800 Cal Center Drive
Sacramento, CA 95826
916.255.3591
dean.wright@dtsc.ca.gov

Benjamin Mossman, President
Rise Grass Valley Inc.
PO Box 271
Grass Valley, CA 95945
604.260.4577
admin@risegrassvalley.com

Jason Muir, PE, GE, NV5 Project Manager
NV5 - Holdrege & Kull
792 Searls Avenue
Nevada City, CA 95959
530.478.1305
jason.muir@nv5.com

EXECUTIVE SUMMARY

NV5 performed a Preliminary Endangerment Assessment (PEA) pursuant to a Voluntary Cleanup Agreement (VCA; Docket No. HSA-FY18/19-014) between Rise Grass Valley Inc. (the Proponent) and the California Department of Toxic Substances Control (DTSC).

ES1 PURPOSE AND OBJECTIVES OF INVESTIGATION

The purpose of the PEA is to investigate environmental conditions and to address potential health risks associated with the disposal of mine waste to land at the site associated with historical gold mining and gold ore processing on adjacent property.

The PEA included supplemental site investigation, review of community demographics, compilation and validation of previous investigation data, delineation of assessment areas and statistical evaluation, human and ecological risk assessment, sensitive receptor survey and water quality evaluation.

ES2 SITE BACKGROUND AND CURRENT STATUS

The 56-acre site is located at 10344 Centennial Drive near the city limits of Grass Valley in unincorporated Nevada County. The site is immediately south of Centennial Drive and Idaho Maryland Road, and north of East Bennett Road.

The site is historically associated with the Idaho Maryland Mine, a former underground hardrock (lode) gold mining operation. Mining and milling structures associated with the former mine were generally located to the east of the site, and the site was used primarily for disposal of mine waste (tailings and waste rock) to land. The historical tailings ponds comprise approximately two-thirds of the site (37.1 acres of the 56.4-acre site).

The site is predominantly vacant, partially-forested open space. The Hap Warnke Lumber Mill currently operates intermittently in a three-acre area located in the northeast corner of the site. The mill is accessed from Centennial Drive near its intersection with Idaho Maryland Road.

ES2.1 Regulatory Status

The site is identified on the Envirostor database (DTSC, 2019 Sept) as:

- Centennial M-1 Property, DTSC Site Code 102370. Voluntary Cleanup Agreement (VCA) Docket No. HSA-FY18/19-014 was executed for DTSC oversight of this PEA.
- Portion of Idaho Maryland Mine Property, DTSC Site Code 101505. In 2007 IMMC submitted an application for DTSC oversight of the Idaho Maryland Mine Property, which included the site and surrounding properties comprising a total of 122 acres. The oversight agreement was not executed.

The USEPA Identification Number for the Site is CAN000908495. According to the Envirostor database (DTSC, 2019 Sept), the site was identified as an abandoned mine in 1989.

According to Weston (2018), the USEPA performed a Preliminary Assessment (PA) in June 2002. Based on the report, EPA recommended that further assessment was needed under CERCLA. Weston (2005) preformed a Preliminary Assessment (PA) on behalf of the USEPA. Weston

(2018) reports that the DTSC performed a Site Reassessment in 2011 on behalf of USEPA. Weston (2018) prepared a Site Reassessment Report on behalf of USEPA. Weston (2019) performed a Site Inspection in April 2019 on behalf of the USEPA, including soil, water and sediment sampling and analysis.

The site is not currently listed in the State Water Resources Control Board (SWRCB) GeoTracker database (http://geotracker.waterboards.ca.gov). According to Weston (2018):

> *...an evaluation of dewatering was conducted in 1995 in association with previous permitting activities. At that time, a discharge permit was issued by the California Regional Water Quality Control Board, Central Valley Region (RWQCB) under the National Pollutant Discharge Elimination System (NPDES) program to dewater and explore the Idaho-Maryland Mine workings. A technical assessment of impacts to wells was conducted and a groundwater monitoring program was implemented. Due to the slump in gold prices in the late 1990s, dewatering of the mine did not occur and the permit was cancelled by the company (Todd, 2007).*

The Nevada County Environmental Health Department (NCEHD) was reportedly involved with a proposed parcel split and sale of the property in 1993, and a subsurface investigation was conducted by Weston (1993) with NCEHD oversight.

ES2.2 Zoning and Potential Future Land Uses

The site is zoned for industrial development (M1). A specific development plan has not been prepared. Prior to site development for industrial/commercial use, the contaminated mine tailings are to be remediated under DTSC oversight. A Remedial Action Plan (RAP) is to be prepared to outline the proposed remedial action based on the results of the risk assessment presented in this PEA.

ES3 KNOWN AND POTENTIAL RELEASES

During its operations from approximately 1863 through 1956, the Idaho Maryland Mine was one of the most productive gold mines in the United States (AMEC, 2017). Mining and milling structures associated with the former mine were generally located to the east of the site, and the site was used primarily for storage of mining waste (tailings and waste rock), which are present in approximately two-thirds of the site (central and northern portions). The tailings ponds included berms to contain the tailings at the site and a dewatering system (decanting towers and drainage culverts) to remove water from the tailings pond surface.

Site investigation has identified mill tailings, waste rock and affected soil at the site that contain lead, arsenic, mercury and other metals at concentrations exceeding background soil metals concentrations and regulatory benchmark concentrations. Elevated metals concentrations present a potential human health risk resulting from routine, long-term exposures including ingestion, inhalation of dust or vapors, and dermal contact. In addition, contaminated mine waste presents potential risks to ecological health and water quality.

ES4 SIGNIFICANT CONTAMINATION

Results of 224 laboratory analyses for solid samples are summarized below:

- Arsenic concentrations exceeded site background (19 mg/kg) in 80 samples (36%). Arsenic concentrations exceeded the TTLC (500 mg/kg) in 6 samples (3%).
- Lead concentrations exceeded the commercial DTSC-SL (320 mg/kg) in 16 samples (7%). The lead exceedances were generally co-located with arsenic exceedances. Lead concentrations exceeded the TTLC (1,000 mg/kg) in 6 samples (3%).
- Mercury concentrations exceeded the commercial DTSC-SL (4.5 mg/kg) in 25 samples (11%). The mercury exceedances were commonly co-located with arsenic exceedances, while six were not. Mercury concentrations exceeded the TTLC (20 mg/kg) in 8 samples (4%).
-
- Nickel exceeded the TTLC (2,000 mg/kg) and commercial DTSC-SL (3,000 mg/kg) in one sample (IdT4-6; IMMC 2005 Nov).
- Thallium concentrations exceeded the commercial RSL (12 mg/kg) in 11 samples (5%). Some of these exceedances are associated with unvalidated data from previous investigations.

ES5 PATHWAYS DEMONSTRATING POTENTIAL THREAT

Exposure media for the mine tailings are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of airborne particulates and volatile mercury originating from impacted soil. Maximum dissolved metals concentrations detected in onsite surface water samples exceed the Secondary MCL for manganese and CTR values for copper, lead and mercury. DI-WET and humidity cell testing identified soluble concentrations of some metals in mine tailings at concentrations that exceed applicable water quality objectives.

ES6 POTENTIALLY EXPOSED POPULATIONS

The site is designated for commercial and industrial development. Potentially exposed populations include construction workers and future commercial and industrial workers. Ecological receptors at the site are potentially exposed to elevated metals concentrations under current conditions.

ES7 CONCLUSIONS AND RECOMMENDATIONS

ES2.1 Findings of Risk Assessment

Human Health Risk Assessment

Risk assessment findings for baseline conditions identified at each of the assessment areas are summarized in the following table.

Summary of Human Health Risk Assessment

Exposure Scenario	**Unrestricted**		**Industrial**		**Commercial Indoor**		**Construction Worker**	
Assessment Area	HI >1	Risk >1E-06	HI >1	Risk >1E-06	HI >1	Risk >1E-06	HI >1	Risk >1E-06
ETP-E	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
ETP Remainder (without hot spots)	**yes**	no	no	no	no	no	**yes**	no
WTP-N	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
WTP Remainder (without hot spots)	no	no	no	no	no	no	no	no
SIL	**yes**	no	no	no	no	no	**yes**	no
HWLM	no	no	no	no	no	no	no	no

ETP = Eastern Tailings Pond
WTP = Western Tailings Pond
ETP-E = older, deeper, eastern portion of ETP
WTP-N = older, deeper, northern portion of WTP
SIL = South Idaho Location
HWLM = Hap Warnke Lumber Mill

For the deeper, older sub-areas of the Eastern Tailings Pond (ETP-E) and Western Tailings Pond (WTP-N), the hazard index exceeds unity and the risk exceeds one-per million under all exposure scenarios.

The ETP Remainder (excluding ETP-E and the hot spots described in Section 8.5) is not suitable for unrestricted land use but is acceptable under the other exposure scenarios evaluated. The WTP Remainder (excluding WTP-N and hot spots described in Section 8.5) is acceptable under all exposure scenarios evaluated.

Arsenic is the primary contributor to hazard and risk associated with exposure to the mine tailings. Cobalt, mercury and thallium also contribute significantly to hazard, presenting hazard quotients greater than 1.0 for some assessment areas under some exposure scenarios. For the construction worker scenario, risk for cobalt exceeds one-per-million for some assessment areas.

Arsenic is not considered a constituent of concern for the South Idaho Location (SIL) and Hap Warnke Lumber Mill (HWLM) because it was detected within the background ranges designated for those assessment areas. Mercury presents a hazard greater than unity for SIL under the unrestricted and construction worker exposure scenarios. Risk is less than one-per-million under all exposure scenarios.

The baseline central-tendency lead concentrations associated with ETP-E and WTP-N are not suitable for unrestricted land use. Central tendency soil lead concentrations in the ETP Remainder, WTP Remainder, SIL and HWLM are below 80 mg/kg.

Ecological Scoping Assessment

Potentially complete exposure pathways exist for terrestrial receptors for mine tailings and contaminated soil if they remain at the site in an undeveloped condition. Therefore, it is appropriate to eliminate potential exposure pathways by incorporating the materials into subsurface engineered fill to support the future commercial/industrial site development:

- The deep, significantly contaminated tailings and soil (ETP-E and WTP-N) are to be excavated, transported on site, placed as engineered fill and capped with clean soil and rock as part of commercial/industrial site development.
- The shallow tailings with moderate metals concentrations (ETP Remainder, WTP Remainder and SIL) are to be reworked in place as engineered fill and covered with clean engineered fill to prepare the site for future commercial/industrial site development.
- Mercury was identified as a COPEC for HWLM, which is proposed for continued industrial land use. Significant ecological exposures are not expected in this area of continued industrial land use.

If mine tailings and associated soil are to remain in place outside of the proposed commercial/industrial site development, then soil verification sampling and analysis are appropriate to verify that the COPEC concentrations remaining in place are not significantly different than background conditions.

ES2.2 Findings of Water Quality Evaluation

The evaluation considers the leaching of metals from mine waste sampled at the site, and focuses on metals of concern that were identified by a comparison to background concentrations. Results of deionized water extraction (DI-WET) and humidity cell testing are used for the evaluation. The results of WET with citrate extractant are not considered representative of field conditions, and therefore are not used as a basis for the evaluation.

Maximum dissolved metals concentrations detected in onsite surface water samples exceed the Secondary MCL for manganese and CTR values for copper, lead and mercury. As summarized in DI-WET and humidity cell testing identified soluble concentrations of some metals in mine tailings at concentrations that exceed applicable water quality objectives. Therefore, it is appropriate to remove the mine tailings with elevated metals concentrations from locations that are subject to surface water erosion and leaching.

The evaluation considers the onsite placement of tailings at a location that is not subject to surface water erosion or leaching (e.g., engineered fill with appropriate surface and subsurface drainage controls), and assumes that the engineered fill will have a simplified environmental attenuation factor of 100 for protection of surface water and groundwater quality, pursuant to the Designated Level Methodology (DLM; RWQCB, 1989 Jun).

Laboratory results indicate that the potential for acid generation is low and the potential for discharge or leaching of heavy metals at concentrations that would significantly impact surface water or groundwater quality is low. Based on these results the mine waste, when considered as a whole, can be managed as Group C mine waste as defined in CCR Title 27 Section 2248(b).

ES2.3 Data Gaps

DTSC comments on the Draft PEA and Addendum No. 1 (DTSC; March 9, 2020) included a recommendation for additional extraction testing by Synthetic Precipitation Leaching Procedure (SPLP). The results of SPLP testing will be incorporated into the RAP.

As described in Section 8.5, anomalous arsenic and thallium detections in the ETP Remainder and WTP Remainder areas are considered hot spots. Remedial action (e.g., onsite consolidation) is recommended at the arsenic hot spot locations identified in Section 8.5, and verification sampling and analysis is recommended to confirm the success of the hot spot removal. Pre-excavation testing should be performed at the thallium hot spots to validate the anomalous thallium concentrations detected by Vector (1993). If the elevated thallium concentrations are verified, then remedial action (e.g., onsite consolidation) is recommended at these locations. Pre-excavation sampling and analysis (pH, ABA, metals and cyanide) is also recommended to verify the hot spot location at sample location TP-19.

ES2.4 Mitigation Measures

Remedial Action Plan

A Remedial Action Plan (RAP) should be prepared to evaluate remedial alternatives for cleanup of mine waste at the site.

The RAP is one of two remedy selection documents that may be prepared for a hazardous substance release site pursuant to Section 25356.1 of the California Health and Safety Code (HSC). A RAP is typically prepared in lieu of a Removal Action Work Plan (RAW) if the cost of the remedial action is projected to exceed a threshold cost of two million dollars.

The remedial action outlined in the RAP is to be conducted in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; Title 40 Code of Federal Regulations [40 CFR] 300.400 et seq). The NCP requires the use of an Engineering Evaluation/Cost Analysis (EE/CA) or equivalent. This RAP should serve as the equivalent of an EE/CA.

The RAP should evaluate remedial alternatives considering the effectiveness, implementability and cost associated with each alternative. Based on the evaluation, the RAP should select and describe a remedial alternative to effectively reduce the risks associated with environmental conditions identified at the site and support future commercial/industrial development.

Basis for RAP

Pursuant to Section 25356.1.5 of the HSC, the proposed remedial action shall be based upon, and be no less stringent than:

- Requirements established under federal regulation pursuant to Subpart E of the NCP (40 CFR 300.400 et seq), as amended, which pertains to remedial action and selection of remedial alternatives;
- Regulations established pursuant to Division 7 (commencing with Section 13000) of the California Water Code, which pertains to state and regional water quality control;
- Applicable water quality control plans adopted pursuant to Section 13170 of the California Water Code;
- Article 3 (commencing with Section 13240) of Chapter 4 of Division 7 of the California Water Code, which pertains to water quality control plans and waste discharge requirements;
- Applicable state policies for water quality control adopted pursuant to Article 3 (commencing with Section 13140) of Chapter 3 of Division 7 of the California Water Code, to the extent that those policies are consistent with the federal regulations;

- Applicable provisions of the California HSC, to the extent those provisions are consistent with the federal regulations; and
- The risk assessment findings presented herein.

Supplemental Investigation and Validation

Supplemental investigation should be performed as part of RAP development to refine the proposed remedial alternatives, as described above in Section 12.3. The RAP must contain a verification sampling plan to confirm that the proposed remedial goals are achieved.

Public Participation

Section 25356.1 of the HSC outlines public participation requirements for the RAP. Requirements include the preparation of a community profile report to determine public interest in the remedial action, notice of the RAP in a newspaper of general circulation, provision of a minimum 30-day public comment period, and preparation of a responsiveness summary.

Dust Mitigation

Naturally occurring asbestos (NOA) is present in serpentinite mine waste at the site and may also be present in tailings and waste rock originating from other mafic or ultramafic bedrock. The presence or potential presence of NOA in tailings and waste rock can be mitigated by implementation of conventional engineering controls to limit dust emissions during earthwork and other soil-disturbing activities. Earthwork and other disturbance of materials containing mafic and ultramafic rocks is regulated by the California Air Resources Board (CARB) and the Northern Sierra Air Quality Management District (NSAQMD). Pursuant to the California Code of Regulations Title 17, Section 93105, an Asbestos Dust Mitigation Plan (ADMP) is typically required to describe material handling protocols to be used during construction to reduce the release of NOA into the atmosphere during earthwork grading and other soil/rock disturbance.

1 INTRODUCTION

This Preliminary Endangerment Assessment (PEA) was performed pursuant to a Voluntary Cleanup Agreement (VCA; Docket No. HSA-FY18/19-014) between Rise Grass Valley Inc. (the Proponent) and the California Department of Toxic Substances Control (DTSC).

1.1 PURPOSE

The purpose of the PEA is to investigate environmental conditions and to address potential health risks associated with the disposal of mine waste at the site from historical hard rock gold mining and ore processing on adjacent property.

1.2 SCOPE OF WORK

The PEA included:

1. Supplemental site investigation (SSI).
    a. NV5 obtained soil samples on April 16 and 17 during a Site Inspection performed by the United States Environmental Protection Agency (USEPA).
    b. The USEPA Site Inspection and associated sampling and analysis were performed pursuant to a Sampling and Analysis Plan (SAP; Weston, 2019 Feb) and a Health and Safety Plan (NV5; 2019 Apr) prepared pursuant to USEPA and OSHA requirements.
    c. NV5 obtained 48 near-surface grab soil samples using hand tools at locations designated by the USEPA, and contracted with a California-certified laboratory for chemical analysis of total concentrations of Title 22 (CAM 17) Metals by USEPA Methods 6010B/7471A.
2. Data compilation and evaluation.
    a. Data validation. NV5 compiled and validated (when feasible) previous investigation data. The previous investigation data were accepted for use or qualified based on the available quality control data associated with each previous investigation.
    b. Assessment scoping. NV5 designated specific assessment areas within the site based on the results of previous geochemical characterization of the mining waste and the proposed future commercial/industrial land use.
    c. Statistical evaluation. For each assessment area, NV5 performed statistical evaluation to identify constituents of concern (COCs), exposure point concentrations (EPCs) and background threshold values (BTVs), where appropriate, in general accordance with current DTSC guidelines.
3. Risk Assessment.
    a. Human health risk assessment. NV5 performed a human health risk assessment (HHRA) in general accordance with guidelines set forth in DTSC's HHRA guidance (DTSC, 2019 Oct). Exposure scenarios included unrestricted land use, industrial land use, indoor commercial land use, and construction worker exposure.

   b. Ecological Scoping Assessment. NV5 performed an ecological scoping assessment in general accordance with guidelines set forth in DTSC's Ecological Risk Assessment guidance (DTSC, 2019 Oct).

4. Water Quality Evaluation.
   a. Sensitive Receptor Survey. NV5 performed a groundwater sensitive receptor survey using records available online from the California Department of Water Resources (DWR). Well locations, geologic logs, depths to first encountered groundwater, depths to static groundwater, and well completion data were reviewed.
   b. Data Evaluation. Procedures set forth in the following guidance documents were used to evaluate the potential impact to surface water and groundwater from metals concentrations above background concentrations, and to determine the appropriate water quality goals for the most restrictive beneficial use.
      i. The Designated Level Methodology (DLM) for Waste Classification and Cleanup Level Determination (California Regional Water Quality Control Board, Central Valley Region [RWQCB], June 1989)
      ii. A Compilation of Water Quality Goals, (RWQCB,2019 Nov)
      iii. Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan), Fifth Edition (RWQCB, 2018 May)
      iv. Antidegradation Policy, Resolution No. 68-16 (State Water Resources Control Board [SWRCB], 1968 Oct)
5. PEA Report.
   a. NV5 prepared this PEA Report to present:
      i. Site history and physical characteristics;
      ii. Local community demographics;
      iii. Previous investigation methodology and results;
      iv. Data validation and statistical analysis;
      v. Methodology and findings of human and ecological risk assessment;
      vi. Methodology and findings of water quality evaluation; and
      vii. General recommendations for preparation of a Remedial Action Plan (RAP) to support future commercial/industrial site development.

1.3 REVISIONS TO THE PRELIMINARY ENDANGERMENT ASSESSMENT

This report contains revisions to the Draft PEA (NV5; December 12, 2019) and Draft Final PEA (May 14, 2020) based on:

1. The results of additional laboratory testing of mine tailings samples for total and extractable metals concentrations, as presented in Addendum No. 1 to Draft Preliminary Endangerment Assessment (NV5; February 10, 2020);

2. Comments on the Draft PEA and Addendum No. 1 (DTSC; March 9, 2020); and
3. Comments on the Draft Final PEA (DTSC; June 11, 2020).

The DTSC comments and the associated revisions to the Draft PEA are summarized below.

1.3.1 Addendum No. 1 to Draft PEA

Addendum No. 1 to Draft PEA (NV5; December 12, 2019) presented the results of additional laboratory testing of mine tailings samples for total and extractable metals concentrations The additional laboratory results presented in Addendum No. 1 were evaluated in the context of the water quality evaluation presented in the Draft PEA.

Extraction was performed by Title 22 Waste Extraction Test using deionized water as the extractant solution (DI-WET). The testing was performed by ACZ Laboratories, Inc. (ACZ; ELAP No. 2935). ACZ tested tailings samples from the following locations.

Location	Depth	Assessment Area	Matrix
IMM-T-03	0-0.5	WTP-N	Tailings
IMM-T-19	0-0.5	WTP-N	Tailings
IMM-T-21	0-0.5	ETP-E	Tailings
IMM-T-22	0-0.5	ETP-E	Tailings
IMM-T-23	0-0.5	ETP-E	Tailings
IMM-T-37	0-0.5	ETP-E	Tailings
IMM-T-38	0-0.5	ETP-E	Tailings
IMM-T-39	0-0.5	ETP-E	Tailings

Notes:
WTP-N = Western Tailings Pond, Northern Portion
ETP-E = Eastern Tailings Pond, Eastern Portion

The eight locations were selected for additional analysis based on the results of previous CAM 17 metals testing in an attempt to represent both central-tendency and upper-range total metals concentrations.

The additional DI-WET results are intended:

1. To provide additional DI-WET data for the vicinity of previous sample location TP19 and other sample locations displaying elevated total metals concentrations, and
2. To provide additional DI-WET data for metals such as lead, nickel and silver, for which extractable metals concentrations were not previously detected but had reporting limits exceeding a water quality goal.

The water quality evaluation presented in Section 10 of this report was updated based on the additional DI-WET laboratory results.

1.3.2 DTSC Comments on the Draft PEA and Addendum No. 1

General Comments

1. *When duplicate samples exist, DTSC recommends using the result with the highest concentration to ensure remedial decisions for the Site are the most conservative.*

The statistical analysis, exposure assessment and risk characterization were revised by the exclusion of the lower concentration for each duplicate sample pair.

Toxicology Memorandum, General Comments

1. *HERO does not concur with the decision to exclude arsenic as a COC if there are identified hot spots within the exposure area (e.g., Eastern Tailings Pond and Western Tailings Pond Remainder). The purpose of a baseline risk assessment is to assess the existing risk prior to any remedial actions. The hotspots represent significant risk and should be included in the risk assessment and arsenic should be considered COCs for those areas with hotspots. As discussed in our January 30, 2020 team meeting, HERO recommends presenting the risk both with and without the hotspots data.*

The risk assessment was revised to present risk both with and without the hotspots data.

2. *HERO notes that for the sake of the baseline risk assessment, the exposure point concentrations (EPCs) based on 95% upper confidence level (UCL) of the mean for each parcel is acceptable, however, the final risk assessment following remediation will likely require 95% UCLs to be established on a more reasonable area. For example, for unrestricted land use, EPCs should be calculated in increments consistent with a residential lot, which is approximately 0.25 acres.*

This comment will be incorporated into the forthcoming RAP to establish parameters for the final risk assessment following remediation.

3. *Please note that the approach to evaluating cadmium in soils has changed as of the most recent version of DTSC Human Health Risk Assessment (HHRA) Note 3 (https://dtsc.ca.gov/wp-content/uploads/sites/31/2019/04/HHRA-Note-3-2019-04.pdf.) The correct version of HHRA Note 3 was cited in the document, however the methodology used was from a previous version of the Note. Please review the document cited for the appropriate methodology and recommended screening level.*

The risk assessment for cadmium was revised according to the current HHRA Note 3.

4. *HERO notes that the default arsenic bioavailability value of 60% from US EPA is only to be used in the absence of an ability to obtain site-specific data. It is appropriate for use with screening and baseline risk assessment, but it may not be appropriate in a final risk assessment. HERO notes, however, that the bioavailability of mine tailings are likely much lower than 60% (for example, the average at Empire Mine State Park, also in Grass Valley is 15%). HERO recommends the consideration of a site-specific bioavailability study per HHRA Note 6 (https://dtsc.ca.gov/wp-content/uploads/sites/31/2018/01/HHRA-Note-6- CAB-Method-09282017A.pdf). Furthermore, the document states that the 60% relative bioavailability (RBA) will be applied but the risk equations presented do not show where the RBA factor will be used. This should be transparent. HERO notes that for chemicals other than arsenic, RBA is considered 100% or 1 in the risk equations.*

A site-specific bioavailability study was not performed as part of this PEA; however, the United States Geological Survey (USGS) obtained tailings samples from the site during the April 2019 US EPA Site Inspection (Weston, 2019), and results are anticipated for CAB and mineralogical evaluation. These results will be incorporated into the forthcoming RAP if available.

Toxicology Memorandum, Specific Comments

1. *HERO recommends presenting the information currently in Section 8.8.5 on the risks associated with the background arsenic in soils prior to Sections 8.8.1-8.8.4 on the specific assessment areas. The excess risk and non-cancer hazard can then be presented for each receptor under each assessment area with the background arsenic subtracted.*

The report sections were rearranged pursuant to DTSC's recommendation.

2. *Appendix H, Table 3 Toxicity Values: HERO notes that the toxicity criteria promulgated under the toxicity criteria rule can all be found in HHRA Note 10 (https://dtsc.ca.gov/wp=contentluploads /sites/31/2019/02/HHRA-Note-10-2019-02-25. pdf), which includes Integrated Risk Information System (IRIS) toxicity values when there is not California-specific toxicity criteria. HERO recommends that HHRA Note 10 be used as the ultimate source for toxicity criteria.*

Comment and resource acknowledged.

Geological Support Unit Memorandum

1. *SPLP Analysis. Synthetic Precipitation Leaching Procedure (SPLP) analysis should be performed on representative samples of the mine tailings, waste rock, and soils containing elevated concentrations of metals. SPLP analysis will be more indicative of natural occurring conditions, because SPLP analysis utilizes nitric and sulfuric acid as the leachate to simulate the natural acidity of rainwater, as opposed to DI-WET which utilizes deionized water and has a neutral pH. SPLP analysis will simulate extractable concentrations of metals in the mine tailings, waste rock, and soils when in contact with rainwater recharge through the consolidated material that has been placed as engineered fill. The SPLP analysis will be used to evaluate the water quality evaluation presented in the PEA and the acid generating potential of the mine waste. Results of the SPLP analysis should be incorporated in the Removal Action Workplan proposed in Section 12.4 of the PEA.*

Results of SPLP testing will be incorporated in the RAP.

1.3.3 DTSC Comments on the Draft Final PEA

DTSC (June 11, 2020) issued a further action determination and conditional approval of the Draft Final PEA. The conditional approval is based on the following modifications to the Draft Final PEA, which have been implemented in this Final PEA:

1. *Section ES2.4 – References to the Removal Action Work Plan (RAW) throughout this section and Section 12 should be changed to Remedial Action Plan (RAP) based on DTSC's understanding of initial cost estimates prepared by NV5.*
2. *Section 8.8.2, Residential Land Use – Please check the information provided under Constituents of Concern. In particular the following sentence: "For the ETP Remainder including the arsenic and thallium hot spots, hazard is 26 and risk is 7.7 E-05." It appears that this is a typo and it should say "For the WTP Remainder."*
3. *Section 12.1.1, Human Health Risk Assessment – DTSC requests that the table provided in this section include the words "without hot spots" in parentheses after ETP Remainder and WTP Remainder as shown in the table provided in Section 8.11.*

1.4 ORGANIZATION OF THIS DOCUMENT

The PEA report is organized in the following sections:

1. *Introduction*. Describes the purpose of the PEA, scope of work, organization of the PEA report, data gaps and general limitations of the assessment.
2. *Site Description*. Describes the subject property, presents site identification information, and describes the physical setting.
3. *Background*. Describes the current regulatory status of the subject property, surrounding properties, ownership and operational history, and findings of previous investigation.
4. *Apparent Problem*. Describes the recognized environmental conditions identified at the subject property.
5. *Environmental Setting*. Presents a conceptual model and describes exposure pathways.
6. *Sampling Activities and Results*. Summarizes the PEA field sampling and laboratory analysis, presents the data, and discusses the results.
7. *Data Evaluation.* Summarizes, evaluates and validates the findings of previous investigation.
8. *Human Health Risk Assessment*. Discusses exposure pathways and media of concern, exposure concentrations and chemical groups, and human health screening levels.
9. *Ecological Risk Assessment*. An Ecological Scoping Assessment describes habitats and presents a pathway assessment and qualitative summary.
10. *Evaluation of Risk to Water Quality.* Establishes water quality objectives, environmental attenuations factors and soluble designated levels for comparison to extraction test results.
11. *Community Profile*. Describes the local demographics and community interest in the subject property.
12. *Conclusions and Recommendations*. Presents the PEA findings, opinions, conclusions and recommendations.
13. *Environmental Professional Statement.* Presents a statement regarding the qualifications and experience of the environmental professional.
14. *References*. Presents a list of references cited in this document.

1.5 DATA GAPS

NV5 did not encounter data gaps that are considered significant with respect to NV5's ability to perform the assessment in general accordance with the PEA Guidance Manual (DTSC, 2015). Supplemental investigation is recommended as part of RAP development, as summarized in Section 12.3, to address the fate of the hot spot locations identified in Section 8.5.

1.6 LIMITATIONS OF THE ASSESSMENT

NV5's professional services were performed consistent with the current generally accepted engineering principles and practices employed in northern California. This report does not represent a legal opinion. No warranty, expressed or implied, including any implied warranty of merchantability or fitness for the purpose is made or intended in connection with the work.

These services were performed per NV5's agreement with NV5's client. This report is solely for the use of the client and lead regulatory agency. Any reliance on this report by a third party is at the party's sole risk. NV5 is not responsible for any other party's interpretations of the reported information.

NV5 is not responsible for the impacts of any changes in environmental standards, practices or regulations subsequent to performance of environmental and engineering services. NV5 does not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

The information provided in this plan is not meant to be comprehensive, to identify all potential concerns, or to eliminate the risk associated with environmental conditions. NV5 used professional judgment and experience to arrive at the conclusions presented herein. Therefore, the conclusions are not to be considered scientific certainties.

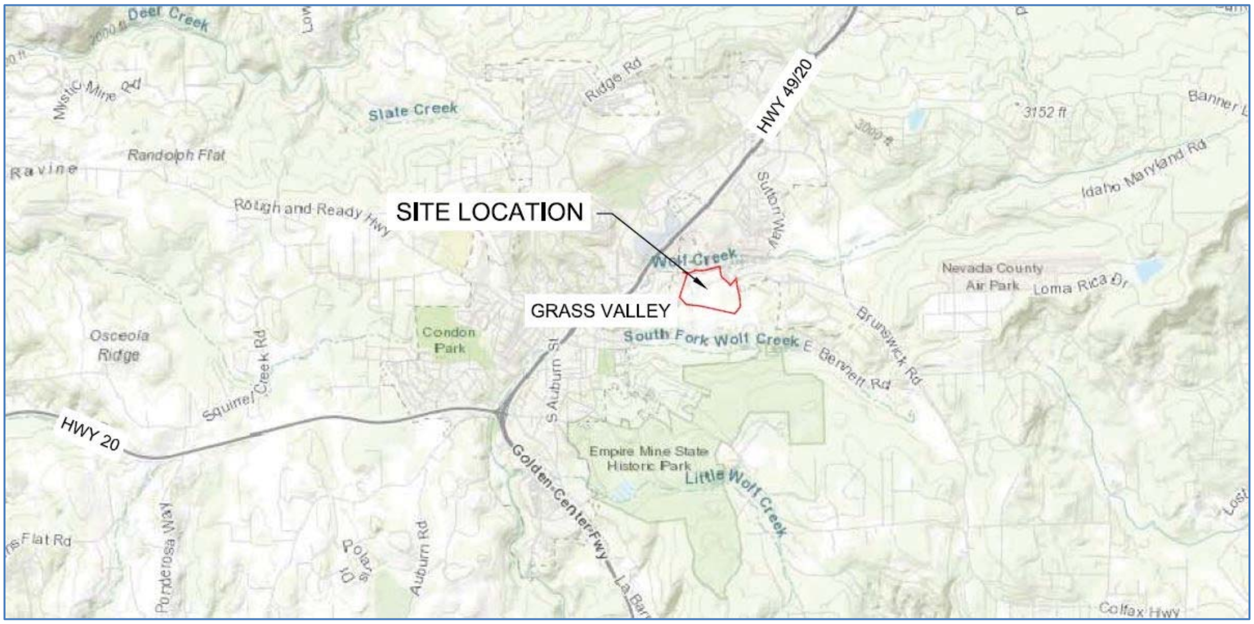
The findings of this report are valid as of the present date. However, changes in the conditions of the property can occur with the passage of time. The changes may be due to natural processes or to the works of man, on the project site or adjacent properties. Changes in regulations, interpretations, and/or enforcement policies may occur at any time. Such changes may affect the extent of mitigation required. NV5 is not responsible for the health and safety of non-NV5 personnel, on or off the project site.

2 SITE DESCRIPTION

This section describes the site and its physical setting.

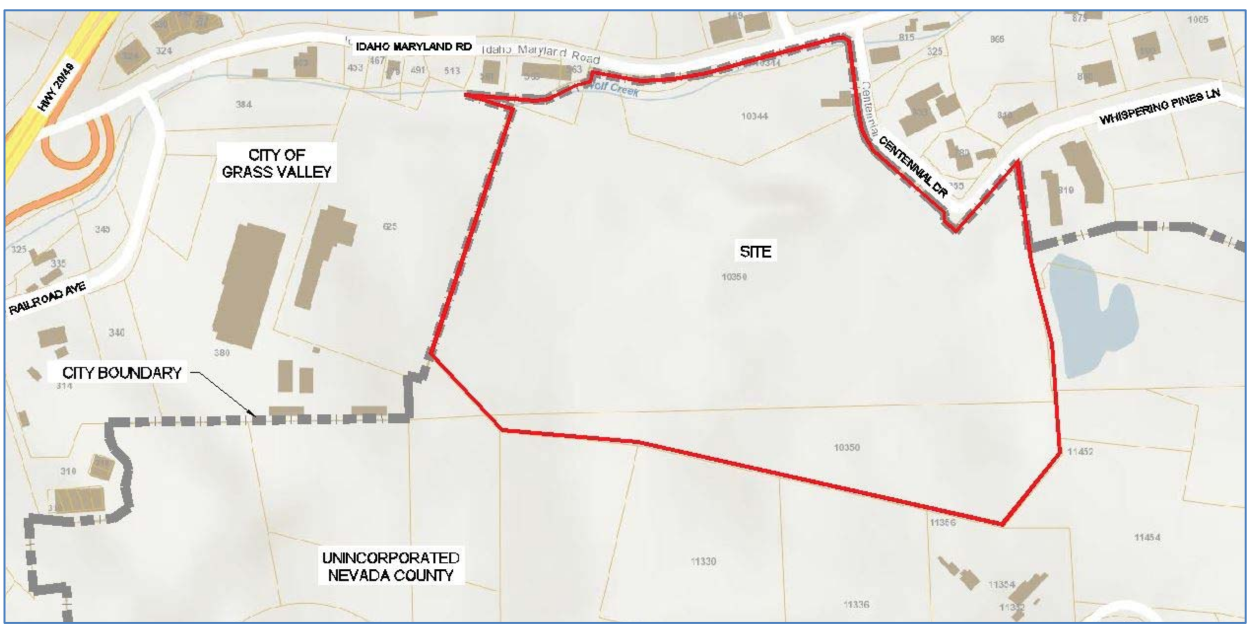
2.1 SITE LOCATION

The 56-acre site located at 110344 Centennial Drive in Nevada County, California. The site location is depicted on Figure 1. An excerpt of the location map is presented below.



Inset 2.1. Excerpt of Figure 1, Location Map.

As depicted on Figure 2, the site is located in unincorporated Nevada County at the boundary of the City of Grass Valley. The site is immediately south of Centennial Drive and Idaho Maryland Road, and north of Bennet Street. An excerpt of Figure 2 is presented below.



Inset 2.2. Excerpt of Figure 2, Vicinity Map.

The site is accessible from the northwest via a gated road from Idaho Maryland Road and from the northeast near the intersection of Centennial Road and Whispering Pines Lane. Site access from East Bennett Road to the southeast is through adjacent private property.

The site is historically associated with the Idaho Maryland Mine, a former underground hardrock (lode) gold mining operation. Mining and milling structures associated with the former mine were generally located to the east of the site, and the site was used primarily for disposal of mine waste (tailings and waste rock) to land. The historical tailings ponds comprise approximately two-thirds of the site (37.1 acres of the 56.4-acre site). Two concrete towers, historically used for decanting of water from the surface of the former tailings ponds, are located in the northwestern portion of the site.

2.2 SITE IDENTIFICATION

Site identification information is presented in the following table.

Site Identification Information

Site Name	Centennial M-1 Property
Address	10344 Centennial Drive, Grass Valley, CA 95945
Size	56.41 acres
DTSC Site Code	102370
Other Site Names	Idaho Maryland Mine Property (Site Code 101505)
USEPA Identification Number	CAN000908495
CalSites Identification Number	none
Assessor Parcel Numbers	009-550-032-000, 009-550-037-000, 009-550-038-000, 009-550-039-000, 009-550-040-000, 009-560-036-000
Section, Township and Range	E ½ Sec 26, T17N, R8E, MDM
Coordinates of site center	Latitude 39.2213°, Longitude -121.0424°
Land Use	Predominantly vacant; intermittent lumber milling operations at the Hap Warnke Mill near Idaho Maryland Road and Centennial Drive
Zoning	M1 (Light Industrial)
General Plan	Industrial
Site Owner	Rise Grass Valley Inc.
Mailing Address	PO Box 271, Grass Valley, CA 95945
Phone Number	604-260-4577
Email	admin@risegrassvalley.com
Consultant Point of Contact	Jason W. Muir, PE, GE
Mailing Address	792 Searls Avenue, Nevada City, CA 95959
Phone Number	530 478-1305
Email	jason.muir@nv5.com

The site is identified by the Nevada County assessor parcel numbers (APNs) listed below:

Parcel Identification

Parcel Number	Address	Owner	Acres
009-550-032-000	NL	Rise Grass Valley Inc.	0.48
009-550-037-000	10344 Centennial Dr	Rise Grass Valley Inc.	4.47
009-550-038-000	10350 Centennial Dr	Rise Grass Valley Inc.	40.10
009-550-039-000	10344 Centennial Dr	Rise Grass Valley Inc.	0.98
009-550-040-000	NL	Rise Grass Valley Inc.	0.13
009-560-036-000	10350 Centennial Dr	Rise Grass Valley Inc.	10.25
Total			**56.41**

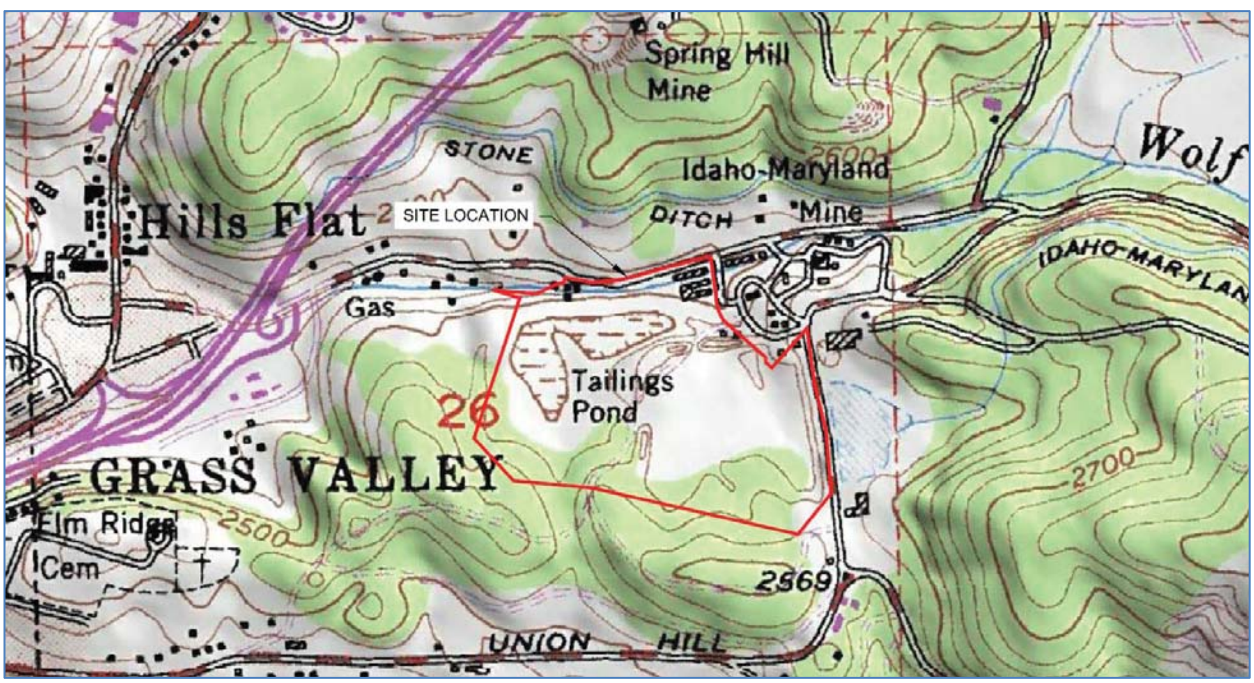
Notes:
Data from Parcelquest online database (https://parcelquest.com/)
NL = address not listed

Community demographics are described in Appendix A. Previous investigation documents are presented in Appendix B.

2.3 PHYSICAL SETTING

2.3.1 Regional Physiographic Conditions

The property is located in the Sierra Nevada physiographic province, on the west-facing slope of the Sierra Nevada foothills, at an elevation of approximately 2,500 feet above mean sea level (AMSL). Figure 3 depicts the approximate site boundaries on the United States Geological Survey (USGS) Grass Valley, California 7.5-minute quadrangle map (USGS, 1973). An excerpt of Figure 3 is presented below.



Inset 2.3. Excerpt of Figure 3, Topographic Map.

2.3.2 Geologic Conditions

According to Saucedo and Wagner (1981), the site location is underlain by gabbro and ultramafic rocks associated with the Lake Combie complex. Tuminas (1983) depicts the western quarter of the site location as being underlain by ultramafic rocks and the remainder of the site location as underlain by gabbro.

Johnston (1939) depicts the historical Maryland Mine approximately 400 feet northeast of the site, located on a gold-bearing quartz vein that dips beneath the site at an angle of 50 to 70 degrees. The South Idaho shaft is depicted near the southwestern corner of the site, located on a vein that dips away from the site to the south at approximately 60 degrees.

Engeo (2017) describes the geologic formations beneath the site as Mesozoic and Paleozoic rocks of an ophiolitic melange assemblage, and describes geologic mapping of rock types at the site as andesite pyroclastic rock, ultramafic rock, massive diabase, diorite, and gabbroic rock. According to the Engeo (2017) exploration and geologic data reviewed, the rocks have been slightly metamorphosed at low or medium grade.

The Grass Valley Fault system is mapped to the southwest of the site, and the Idaho Fault is mapped to the north of the site. Engeo (2017) reports that northwest-trending lineaments of the Grass Valley fault system were mapped by IMMC representatives in the southwest portion of the site. The Grass Valley Fault is not considered active.

2.3.3 Soil Conditions

According to the Soil Survey of Nevada County Area, California (United States Department of Agriculture Soil Conservation Service and Forest Service, 1975), soil conditions near the southern site boundary are mapped as Secca-Rock outcrop complex, which is described as moderately well-drained soils underlain by metabasic or basic rock. According to the soil survey, weathered rock is typically encountered at a depth of approximately four feet below the ground surface (bgs) in areas mapped as Secca-Rock outcrop complex, and rock outcrop typically comprises 10 to 40 percent of the mapped area. The Soil Survey maps the remainder of the site as mined land, although the Soil Survey incorrectly maps the hardrock tailings as placer tailings.

2.3.4 Nearest Surface Water

Surface water runoff from the site generally drains towards Wolf Creek, which flows from east to west along the northern site boundary. Wolf Creek flows approximately 14 miles south where it meets the Bear River. The Bear River flows through Camp Far West Reservoir and then into the Feather River south of Yuba City and north of Sacramento.

Nevada Irrigation District (NID) uses Wolf Creek downstream of the site as a waterway to transfer water between its canals and water distribution system. Wolf Creek downstream of the site is also used for fishing. Wetlands are located within the site tailings pond areas and along Wolf Creek.

South Fork Wolf Creek flows from east to west approximately ¼ mile south of the site, and is separated from the site hydraulically by a ridge. South Fork Wolf Creek flows into Wolf Creek in downtown Grass Valley, approximately one mile west-southwest of the site.

A dry pond is located on adjacent property immediately to the east of the site. The pond is associated with past lumber milling operations at the adjacent former Lausman Mill site. Drainage from the pond is routed onto the site via a concrete box culvert that crosses beneath the dam on the eastern site boundary.

2.3.5 Groundwater Hydrogeology

Local groundwater well completion reports are available on the California Department of Water Resources (DWR) Well Completion Report Map Application (DWR, 2019). The database reports that over 50 domestic and monitoring groundwater wells are on record within approximately 1 mile of the subject property. Reported well depths range from 11 to 550 feet below the ground surface (bgs). Static groundwater depths are reported as shallow as 3 feet bgs in shallow wells completed in permeable soil, but typical depths to usable groundwater are greater than 60 feet bgs within fractured bedrock.

Well completion reports for domestic wells installed within approximately 1 mile of the site are presented in Appendix C. Table 1 presents well data (as available from DWR) including parcel number, approximate distance and direction from the site, approximate well elevation, depth to first encountered groundwater, depth to static groundwater, and screened interval.

Engeo (2007) encountered groundwater at a depth of 50 feet in exploratory boring B22, which was terminated at a depth of 50.5 feet bgs in weathered bedrock (the boring extended approximately 11 feet into the weathered metavolcanic rock). This water was likely perched on the weathered rock rather than being representative of the actual groundwater surface, which is commonly encountered at greater depth in fractured bedrock. Perched groundwater was encountered in exploratory excavations TP2 and TP18 at depths of 9 and 3 feet bgs, respectively. Groundwater was not encountered in other exploratory borings or excavations during the Engeo (2007) investigation.

2.4 SURFACE CONDITIONS

The 56-acre site is typified by irregular rolling terrain. Elevations range from approximately 2,470 feet AMSL at Wolf Creek near the northwestern corner to approximately 2,580 feet AMSL in the southeastern corner of the site.

The upper, relatively undisturbed, southern portion of the site is typified by forested, moderate north-facing slopes. The remainder of the site is typified by irregular remnant tailings pond surfaces that slope gently to the west and north. The site generally drains to the north towards Wolf Creek, which flows from east to west along the northern site boundary.

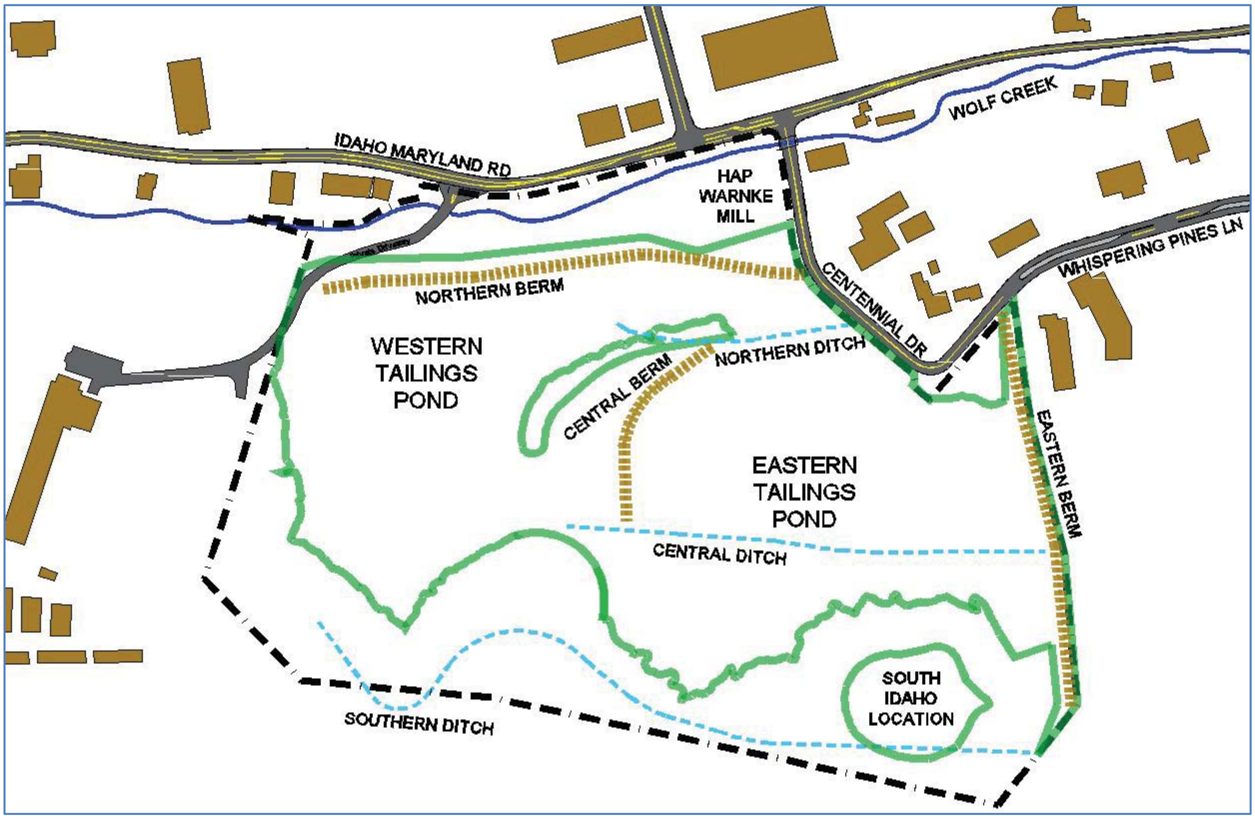
Remnant containment berms are located along the northern and eastern site boundaries, and at other locations within the site. The berms are typically constructed of mine waste rock, soil and tailings.

Notable site features are described below based on the PEA site reconnaissance and previous findings presented by Engeo (2007).

<u>Former Tailings Ponds</u>

Mine tailings overlie native soil and weathered rock across much of the central and northern portions of the site. Tailings areas include the older, mercury-treated, Eastern Tailings Pond

(ETP) and the more recent, cyanide-treated, Western Tailings Pond (WTP), as shown on the site maps presented as Sheets 1, 2 and 3. A simplified site map is presented below.



Inset 2.4. Simplified Site Map based on Sheet 1.

Inset 2.5. Typical WTP tailings surface. Relic decanting tower and northern berm visible in background.

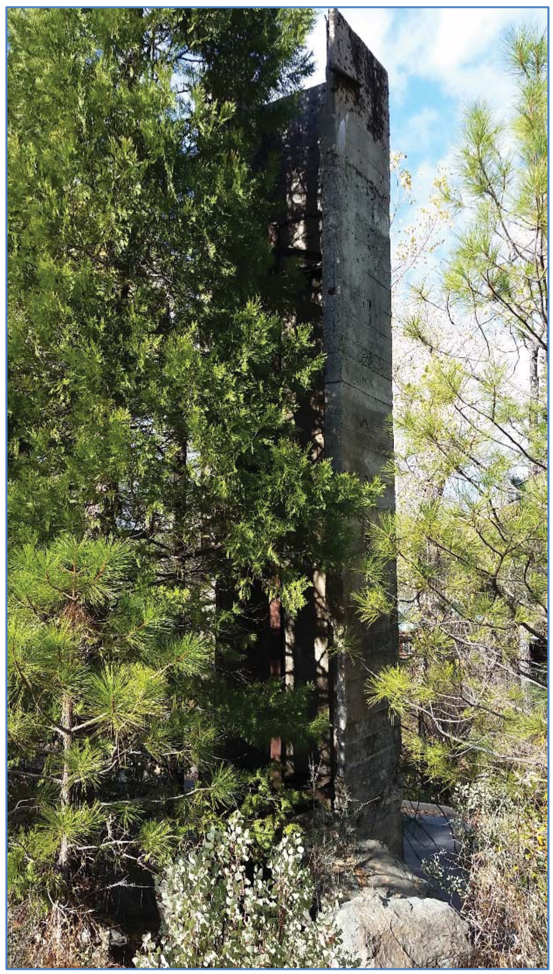
Based on subsurface investigations by Engeo (2007) and Vector (1993, 1990), as summarized below in Section 2.5, tailings depths are typically less than 5 feet bgs. Tailings depths range up to approximately 12 feet bgs in the older, eastern portion of the ETP (near Centennial Drive and adjacent to the Eastern Berm) and up to approximately 20 feet bgs on the northern edge of the WTP (adjacent to the Northern Berm).

Because metals concentrations are higher in the older, deeper tailings deposits near the berms, these areas are designated as specific assessment areas:

- Western Tailings Pond, Northern Portion (WTP-N), and
- Eastern Tailings Pond, Eastern Portion (ETP-E).

<u>Decanting Towers</u>

Two concrete decanting towers are located near the northwestern corner of the WTP. The towers were historically used to drain water from the surface of the WTP to Wolf Creek. The towers are open on one side and have grooves in which wooden batter boards were placed to control the inlet height and thus the height of the tailings surface.



Inset 2.6. Southern (left) and northern (right) decanting towers.

Inset 2.7. Southern decanting tower batter board and 36-inch diameter inlet.

Inset 2.8. Northern decanting tower inlet approximately 7 feet below tailings surface.

The decanting structures drain beneath a paved private driveway that leads to the adjacent DeMartini RV Sales facility.

Inset 2.9. Corrugated metal pipe outlet near Wolf Creek. Relic mining-era riveted pipe to right.

Retention Berms

The relic retention berms are generally comprised of waste rock, tailings and other undocumented fill. Angular rock and soil are generally exposed on the berm surfaces.

Inset 2.10. Crest of northern berm, view to east from near the western end.

The Northern Berm was historically constructed at the northern boundary of the WTP, between the tailings pond and Wolf Creek. It is up to approximately 20 feet tall from its northern toe to the crest and up to approximately 15 feet tall from its southern toe to the crest. The crest is up to approximately 25 feet wide and narrows to the east. The side slopes of the berm are generally moderate, but the eastern segment of the berm contains slopes steeper than 2:1, horizontal:vertical.

The Eastern Berm was historically constructed at the eastern boundary of the ETP as a dam for a pond located immediately east of the site. The western flank of the Eastern Berm is located on the site, and the eastern flank is located on adjacent property (the former location of the Lausman lumber mill). The berm is approximately 25 feet tall from the western toe to the crest. The crest is approximately 20 feet wide and supports a gravel road.

Inset 2.11. Eastern Berm, view from southwest.

Side slopes of the Eastern Berm are up to approximately 1½:1, horizontal:vertical. The lower portion of the western slope face is covered with rip-rap up to 12 inches in greatest dimension.

A 36-inch by 36-inch concrete box culvert extends through the base of the Eastern Berm near its midpoint and conveys water from the pond onto the site. Engeo (2007) describes an approximately 36-foot-tall inlet tower within the pond on adjacent property. The inlet structure was not observed due to dense vegetation in the dry pond at the time of the PEA reconnaissance.

Inset 2.12. Crest of Eastern Berm.

Inset 2.13. Outlet of 36-inch x 36-inch concrete box culvert at western toe of Eastern Berm.

Hap Warnke Lumber Mill

The Hap Warnke Lumber Mill (HWLM) operates intermittently in the northeastern corner of the site. This area is considered a specific assessment area for the purposes of risk assessment.

Inset 2.14. Hap Warnke Lumber Mill.

South Idaho Location

Mine waste and undocumented fill were identified in the southeastern corner of the site near the former South Idaho shaft location. The South Idaho Location (SIL) is designated as a specific assessment area for the purposes of risk assessment.

Inset 2.15. South Idaho Location.

Roads and Utilities

Engeo (2007) reported that a private underground water line is located within the gravel road alignment extending from the northern portion of the site in the vicinity of Centennial Drive (apparently along the Eastern Berm) through adjacent property to the south to East Bennett Road. Several dirt access roads meander through the site. Overhead power lines located along the south side of Idaho Maryland Road. No utility survey was performed as part of this PEA, and other utilities (underground and above ground) may be present at the site.

2.5 SUBSURFACE CONDITIONS

Exploratory borings and excavations performed by Engeo (2007), IMMC (2005, 2004) and Vector (1993, 1990) typically encountered mine tailings and waste rock fill overlying a thin native soil profile and weathered bedrock. Tailings depths are typically less than 5 feet bgs. Tailings depths range up to approximately 12 feet bgs in the northeastern corner of the eastern tailings pond (near Centennial Drive) and up to approximately 20 feet bgs on the northern edge of the western tailings pond (near the Northern Berm).

Thicker deposits of tailings and waste rock are present in the Northern Berm (extending up to approximately 20 feet above the ground surface and forming the northern boundary of the western tailings pond) and in the Eastern Berm (extending up to approximately 25 feet above the ground surface, previously retaining water to the east of the site). The berms are generally comprised of waste rock, tailings and other undocumented fill.

Engeo (2007) described the tailings as silt and sand with occasional gravel and clay. Bedrock underlying the tailings was typically described as weathered gabbro and diabase. In general, the gabbro was weak and highly weathered while the diabase was generally strong and moderately weathered. Engeo (2007) encountered approximately 30 feet of loose to medium dense "tailings fill" in exploratory boring B10, which was advanced through the northern waste rock berm.

Subsurface conditions reported by Engeo (2007) and Vector (1990, 1993) are summarized in the following table.

Summary of Subsurface Exploration

Exploratory Location	**Reference**	**Assessment Area**	**Tailings Depth** (ft bgs)	**Total Exploration Depth** (ft bgs)
SA-1	Vector (1993)	WTP	2.5	4.5
SA-2	Vector (1993)	WTP	2.0	5.0
SA-3	Vector (1993)	WTP	none	2.0
SA-4	Vector (1993)	WTP	6.0	10
SA-5	Vector (1993)	WTP-N	5.0	15
SA-6	Vector (1993)	WTP-N	>17	17
SA-7	Vector (1993)	WTP	7.0	12
SB-1	Vector (1993)	WTP-N	6.0 (WR)	9.0
SB-2	Vector (1993)	ETP	4.5 (WR)	7.0
SB-3	Vector (1993)	ETP-E	4.0 (WR)	7.0

Exploratory Location	**Reference**	**Assessment Area**	**Tailings Depth** (ft bgs)	**Total Exploration Depth** (ft bgs)
SB-4	Vector (1993)	ETP-E	2.0	3.5
SB-5	Vector (1993)	ETP-E	2.0	6.0
SB-6	Vector (1993)	ETP	3.0	6.5
SB-7	Vector (1993)	ETP	3.0	6.0
SB-8	Vector (1993)	ETP-E	4.0	7.0
SB-9	Vector (1993)	ETP	4.0	6.0
SB-10	Vector (1993)	ETP	none	2.0
SB-11	Vector (1993)	ETP-E	3.0	5.0
SB-12	Vector (1993)	none	NR	NR
SB-13	Vector (1993)	SIL	NR	NR
HS-1	Vector (1990)	WTP-N	4.5 (WR)	6.0
HS-2	Vector (1990)	WTP-N	>12	12
HS-3	Vector (1990)	ETP-E	>11	11
B1	Engeo (2007)	WTP-N	2.5 (possible WR)	10.5
TP2	Engeo (2007)	ETP	7.5	13.5
TP3	Engeo (2007)	ETP	3.5	11
B4	Engeo (2007)	WTP	6	20.5
B5	Engeo (2007)	WTP-N	none	11.5
B6	Engeo (2007)	HWLM	none	10
B7	Engeo (2007)	HWLM	none	10.5
B8	Engeo (2007)	ETP-E	10	15.5
B9	Engeo (2007)	WTP-N	10	15.5
B10	Engeo (2007)	Northern Berm	30 (WR/tailings berm)	30.5
TP11	Engeo (2007)	WTP	2.5	10
B12	Engeo (2007)	WTP-N	15	20.5
TP13	Engeo (2007)	WTP	1	5.5
TP14	Engeo (2007)	WTP	1	6.5
TP15	Engeo (2007)	WTP	1.5	5.5
TP16	Engeo (2007)	WTP	3.5	10
TP17	Engeo (2007)	ETP	1.5	10
TP18	Engeo (2007)	ETP	3.5	10
TP19	Engeo (2007)	ETP-E	6	11.5
B20	Engeo (2007)	Eastern Berm	20 (WR/tailings berm)	35.5
TP21	Engeo (2007)	ETP-E	4.5	11
B22	Engeo (2007)	Eastern Berm	25 (WR/tailings berm)	50.5

Notes:
ETP = Eastern Tailings Pond; ETP-E = Eastern Tailings Pond, Eastern (older, deeper portion)
WTP = Western Tailings Pond; WTP-N = Western Tailings Pond, Northern (older, deeper portion)
HWLM = Hap Warnke lumber mill
SIL = South Idaho location
NR = not recorded
WR = waste rock

3 BACKGROUND

This section describes the current regulatory status of the subject property, surrounding properties, ownership and operational history, and findings of previous investigation.

3.1 REGULATORY STATUS

3.1.1 California Department of Toxic Substances Control

The site is identified on the Envirostor database (DTSC, 2019 Sept) as:

- Centennial M-1 Property, DTSC Site Code 102370. Voluntary Cleanup Agreement (VCA) Docket No. HSA-FY18/19-014 was executed for DTSC oversight of this PEA.
- Portion of Idaho Maryland Mine Property, DTSC Site Code 101505. In 2007 IMMC submitted an application for DTSC oversight of the Idaho Maryland Mine Property, which included the site and surrounding properties comprising a total of 122 acres. The oversight agreement was not executed.

3.1.2 United States Environmental Protection Agency

The USEPA Identification Number for the Site is CAN000908495. According to the Envirostor database (DTSC, 2019 Sept), the site was identified as an abandoned mine in 1989.

According to Weston (2018), the USEPA performed a Preliminary Assessment (PA) in June 2002. Based on the report, EPA recommended that further assessment was needed under CERCLA. Weston (2005) preformed a Preliminary Assessment (PA) on behalf of the USEPA. Weston (2018) reports that the DTSC performed a Site Reassessment in 2011 on behalf of USEPA. Weston (2018) prepared a Site Reassessment Report on behalf of USEPA. Weston (2019) performed a Site Inspection in April 2019 on behalf of the USEPA, including soil, water and sediment sampling and analysis.

3.1.3 California Regional Water Quality Control Board

The site is not currently listed in the State Water Resources Control Board (SWRCB) GeoTracker database (http://geotracker.waterboards.ca.gov). According to Weston (2018):

> *...an evaluation of dewatering was conducted in 1995 in association with previous permitting activities. At that time, a discharge permit was issued by the California Regional Water Quality Control Board, Central Valley Region (RWQCB) under the National Pollutant Discharge Elimination System (NPDES) program to dewater and explore the Idaho-Maryland Mine workings. A technical assessment of impacts to wells was conducted and a groundwater monitoring program was implemented. Due to the slump in gold prices in the late 1990s, dewatering of the mine did not occur and the permit was cancelled by the company (Todd, 2007).*

3.1.4 Nevada County Environmental Health Department

The Nevada County Environmental Health Department (NCEHD) was reportedly involved with a proposed parcel split and sale of the property in 1993, and a subsurface investigation was conducted by Weston (1993) with NCEHD oversight.

3.2 LAND USE

3.2.1 Subject Property

The property is predominantly vacant, partially-forested open space. The Hap Warnke Lumber Mill currently operates intermittently in a three-acre area located in the north-central portion of the site. The mill is accessed from Centennial Drive near its intersection with Idaho Maryland Road. According to Geocon (2016), the lumber mill began operation in the late 1970s. A metal building and concrete slab-on-grade serve as a workshop and storage area for the lumber mill.

3.2.2 Adjacent Properties

Adjacent land uses include industrial, commercial and open space:

- To the west, commercial property including DeMartini RV Sales. This adjacent property to the west is generally paved and higher in elevation then the western portion of the site.

Inset 3.1. DeMartini RV Sales (background, left) viewed from southern site boundary.

- To the north, across Wolf Creek and Idaho Maryland Road, commercial property including business such as Consolidated Electrical Distribution, FedEx Shipping Center, Arrow Mountain Screen Printing. This adjacent property to the north is separated hydraulically from the site by Wolf Creek.
- To the northeast, commercial property including Foster & Son and Crystal Dairy Distributing. These adjacent properties to the northeast are generally higher than the northwestern portion of the site and are located in the vicinity of the historical gold mining and ore processing facilities.

Inset 3.2. Adjacent commercial and industrial properties northeast of site near former ore processing location.

- To the east, industrial property formerly occupied by the Lausman lumber mill. This adjacent property to the east is generally higher than the eastern portion of the site. The Eastern Berm is associated with a former pond located on this property, and a gravel road follows the crest of the berm parallel to the property line.

Inset 3.3. Adjacent industrial property to east at former Lausman lumber mill location.

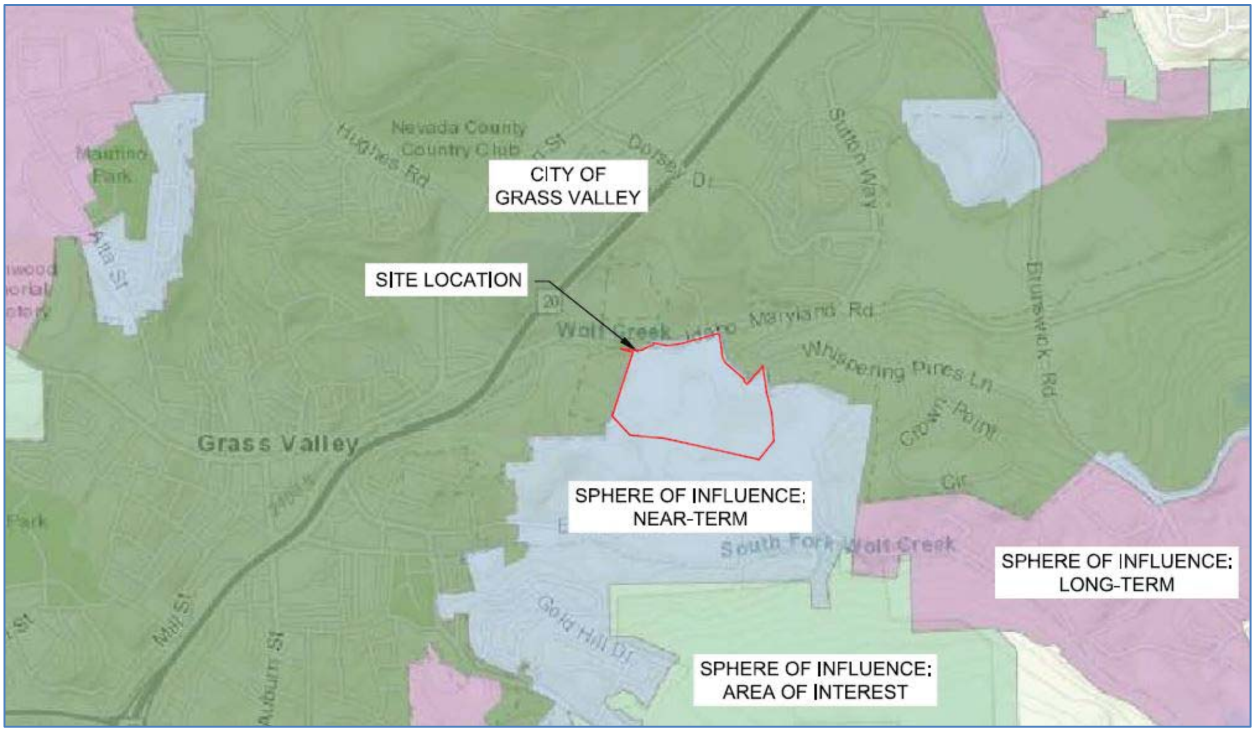
Inset 3.4. Nearby industrial property to northeast of site. Former location of the Idaho Shaft head frame location behind and above orange trailer.

- To the southeast, industrial property including Palmer Enterprise Truck Repair and a former lumber company. This adjacent property to the southeast is generally higher than the site.
- To the south and southwest, vacant commercial and residential property associated with the Bouma Erickson Toms Property (DTSC Site Code 102351). This adjacent property is separated hydraulically from the site by a ridge. The property is in the Voluntary Cleanup Program to address a former ore processing area and mineralized soil conditions.

3.2.3 Intended Use of the Property

The site is zoned for industrial development (M1). A specific development plan has not been prepared. As depicted on Figure 4, the site is within the City of Grass Valley's sphere of influence and is designated for near-term annexation. An excerpt of Figure 4 is presented below.

Prior to site development for industrial/commercial use, the contaminated mine tailings are to be remediated under DTSC oversight. A Remedial Action Plan (RAP) is to be prepared to outline the proposed remedial action based on the results of the risk assessment presented in this PEA.



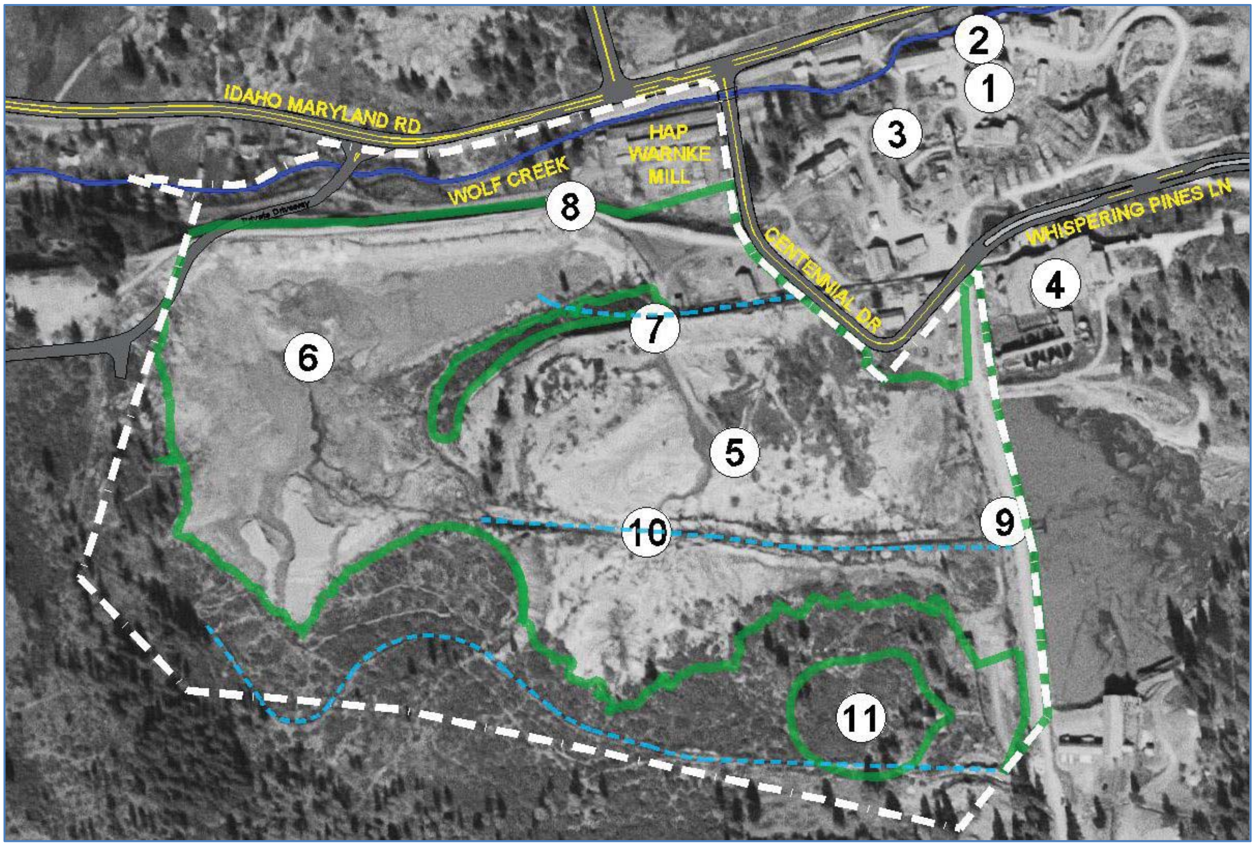
Inset 3.5. Excerpt of Figure 4, City of Grass Valley Sphere of Influence.

3.3 OWNERSHIP AND OPERATIONAL HISTORY

3.3.1 Subject Property

Amec (2017) describes the Idaho-Maryland Mine as one of the most productive and best known gold mines in the United States. Mining was performed by various operators from 1863 to 1956. The mine was a consolidation of several earlier mines including Eureka, Idaho, Maryland, Brunswick, and Union Hill (Amec, 2017). Historical production records indicate the consolidated mines produced a total of 2.4 million ounces of gold from 5.3 million tons of mill feed (Amec, 2017; Geocon, 2016). The mine was reportedly the second largest gold mine in the United States in 1941, producing up to 129,000 ounces of gold per year. The mine did not operate during World War II and did not produce significant gold after the war until its closure in 1956 (Amec, 2017).

The site was used for storage of mine waste (tailings and waste rock) during the mine's operation. As depicted on Sheet 3, infrastructure associated with the historical mining operations (including the main shaft portals, head frames, milling equipment and gold recovery plants) were located to the northeast of the site. The underground workings were accessed primarily by Idaho Shaft No. 1 (located immediately northeast of the site) and the New Brunswick Shaft (located near the intersection of Brunswick Road and East Bennet Road, approximately 1.3 miles southeast) (Amec, 2017). A simplified excerpt of Sheet 3 is presented below.



Inset 3.6. Simplified Historical Map based on Sheet 3. Aerial image date 1947.

Notes:

1 Idaho Shaft headframe
2 Idaho Shaft hoist house
3 Old 20-stamp mill
4 New mill and cyanide plant
5 Eastern tailings pond
6 Western tailings pond
7 Northern ditch
8 Northern berm
9 Eastern berm
10 Central ditch
11 South Idaho location

Ore was conveyed to the ground surface at the Idaho Shaft headframe (1) and hoist house (2). Prior to 1936, mercury was used to recover gold at the old 20-stamp mill (3), and tailings from this early process, as well as tailings from “toll milling” of ore imported from other mines, were reportedly deposited as a slurry in the unlined eastern tailings pond (5). Cyanide was used from 1936 onward at the new mill and cyanide plant (4), and a slurry of cyanide-treated tailings were reportedly deposited as slurry in the unlined western tailings pond (6). Tailings slurry was conveyed via ditches (7 and 10). The Northern Berm (8) was used to retain the tailings. The larger Eastern Berm (9) was previously associated with a lumber mill on adjacent property to the east.

Some of the older mercury-treated tailings were reportedly retreated with cyanide to extract additional gold from the tailings, and the re-treated tailings were reportedly placed into western tailings pond. Some tailings were historically removed from the site for off-site gold recovery.

The tailings cover an area of approximately 37 acres in the northern and central portions of the site. The tailings are not covered, and the former berms around the tailings pond have not been maintained since the mine closed.

The following operational and ownership history is based on information presented by Weston (2018 and 2005), Amec (2017), BLM (2008) and Geocon (2016):

1851 Mining claims were filed

1863 Mining operations commenced

1894 Maryland Gold Quartz Mining Company purchases the Idaho Quartz Mining Company and its Idaho Mine. The name is changed to Idaho Maryland Mine

1901 Idaho Maryland Mine closes due to insufficient capital

1902 Idaho Maryland Mine was bonded to Idaho Maryland Development Company. Mining focuses on the upper levels of the mine during surface repairs, mine dewatering and shaft retimbering

Early 1900s: The main shaft (Idaho Shaft No. 1) was sunk east of Centennial Drive (east of the site), and a 20-stamp mill was erected near the main shaft, on adjacent properties now occupied by office and industrial buildings. Mercury was used to recover gold from the crushed ore

1914 Idaho Maryland Development Co. ceases operations at the beginning of World War I

1914-1919: Adjacent mining claims are acquired

1919 Idaho-Maryland Mines Company is formed to operate the Idaho-Maryland Mine. The Metals Exploration Company continues to finance the operation

1926 Brunswick mine is acquired from the Brunswick Consolidated Gold Mining Company

1935 Idaho Maryland Consolidated Mines Inc. merges with its holding company, Idaho Maryland Mines Company

1936 Ball mill constructed near the stamp mill, and cyanide is used to recover gold from the crushed ore

1942 Mining operations are suspended by World War II Production Order L-208

1945 Mining operations resume

1955 Mining and milling of gold discontinued, and operations focused only on production of tungsten (which was subsidized by the federal government).

1956 Mining operations cease. Since 1956 the site has reportedly remained dormant with the exception of intermittent lumber milling operations at the Hap Warnke Mill.

1963 Idaho Maryland Industries executes a Quit Claim Deed to William and Marian Ghidotti.

1983 The property and mineral rights were inherited by Mary Bouma, Ericka Erickson and William Toms and/or their estates or companies. William Toms interest was transferred at a later date to Tangold LLP

1988-1989: From August 1988 through April 1989, Argo Associates excavated 7,756 tons of tailings from the eastern portion of the site and transported the tailings off-site for gold recovery at Homestake Mining Company near Clear Lake, California.

Early to late 1990s: Emgold, through its subsidiary Emperor Gold Corporation (now Idaho Maryland Mining Corporation, or IMMC) leased the site and mineral rights.

2002-2012: IMMC again leased the site and mineral rights and conducted technical studies on the site and surrounding properties in support of an Environmental Impact Report (EIR).

2017 The Proponent, Rise Grass Valley LLC, purchases the property and mineral rights.

3.3.2 Adjacent Properties

As depicted on Sheet 3, infrastructure associated with historical mining operations, including the main shaft portal, head frame, stamp mills and treatment plants, were located to the northeast of the site. The former Lausman lumber mill is located east and southeast of the site, and has been the subject of regulatory action (Old Lausman Mill leaky underground storage tank site, RWQCB Case No. 290165, Global ID No. T0605700132).

3.4 HAZARDOUS SUBSTANCES AND WASTE MANAGEMENT

Mining waste rock was used to construct berms to retaining tailings, and the tailings were placed in the unlined ponds. Weston (2005) reports two primary types of tailings:

- Mercury-treated tailings: A 20-stamp mill was erected near the main Idaho Shaft (east of the site) circa 1920. Crushed ore from the mill was treated with mercury for gold recovery. The resulting sand slurry (mercury-treated tailings) were deposited in a gully along the eastern site boundary, which drained to the north. For the purposes of this assessment, the older, mercury-treated tailings pond is designated as the Eastern Tailings Pond (ETP), and the original, deeper, eastern portion of the Eastern Tailings Pond is designated as ETP-E.
- Cyanide-treated tailings: A ball mill was constructed near the stamp mill in 1936, and cyanide was used to recover gold from the crushed ore. The cyanide was reportedly recovered in a “scrubber” system and reused. The resulting sand slurry (cyanide-treated tailings) were deposited in an unlined pond with mine waste rock berms in the northwestern portion of the site adjacent to Wolf Creek. For the purposes of this assessment, the newer, cyanide-treated tailings pond is designated as the Western Tailings Pond (WTP), and the deeper, northern portion of the WTP is designated as WTP-N. Some of the older, mercury-treated tailings originally disposed at ETP were subsequently excavated, reprocessed in the cyanide recovery plant, and disposed at WTP.

3.5 PREVIOUS INVESTIGATION

The scope and findings of previous investigations are summarized below. Selected investigation reports are presented in Appendix B. Boring and sample locations are depicted on Sheet 1. Analytical laboratory results are summarized in Tables 2 and 3. Previous investigations include:

- Weston (2019) Site Inspection Report
- Weston (2018) Site Reassessment Report (no sampling and analysis)

- Amec (2017) Technical Report (no sampling and analysis)
- Geocon (2016) Draft PEA Report (no sampling and analysis)
- McClelland (2010) Report on Kinetic Acid Rock Drainage Potential Evaluation
- ESA (2008) Draft Environmental Impact Report (no sampling and analysis)
- Engeo (2007) Geotechnical Report (geotechnical soil sampling and testing)
- Engeo (2007) Environmental Soil Sampling and Testing Report
- Weston (2005) Preliminary Assessment Report (no sampling and analysis)
- IMMC (2007) Data Supporting DTSC Voluntary Cleanup Application
- H&K (2004) Preliminary Geotechnical Engineering Report (no sampling and analysis)
- Vector (1993) Contaminant Assessment
- Vector (1990) Investigation Data
- Anderson (1989) Investigation Data

3.5.1 Weston (2019) Site Inspection Report

Weston (2019 Sept) conducted a site inspection report on behalf of the USEPA. Representatives from DTSC, Rise Grass Valley, Inc., and the City of Grass Valley were present during the SI sampling event. Representatives from USGS were present to conduct sampling for a bioavailability study, the results of which are to be presented in a future USGS report.

To document the presence of hazardous substances in the tailings, Weston (2019) collected surface tailings and soil samples throughout the tailings area. Surface water and sediment samples were collected from the wetlands in coordination with the USEPA wetland delineation team. Surface water and sediment samples were collected in Wolf Creek at upstream and downstream locations relative to the site.

Sampling was performed pursuant to a Sampling and Analysis Plan (SAP; Weston, 2019 Feb) that was approved by the USEPA on March 7, 2019. Samples were submitted under the EPA Contract Laboratory Program (CLP) to Chemtex for analysis by EPA CLP Method ISM02.4 for metals. The data were validated on behalf of EPA by the ICF Environmental Services Assistance Team.

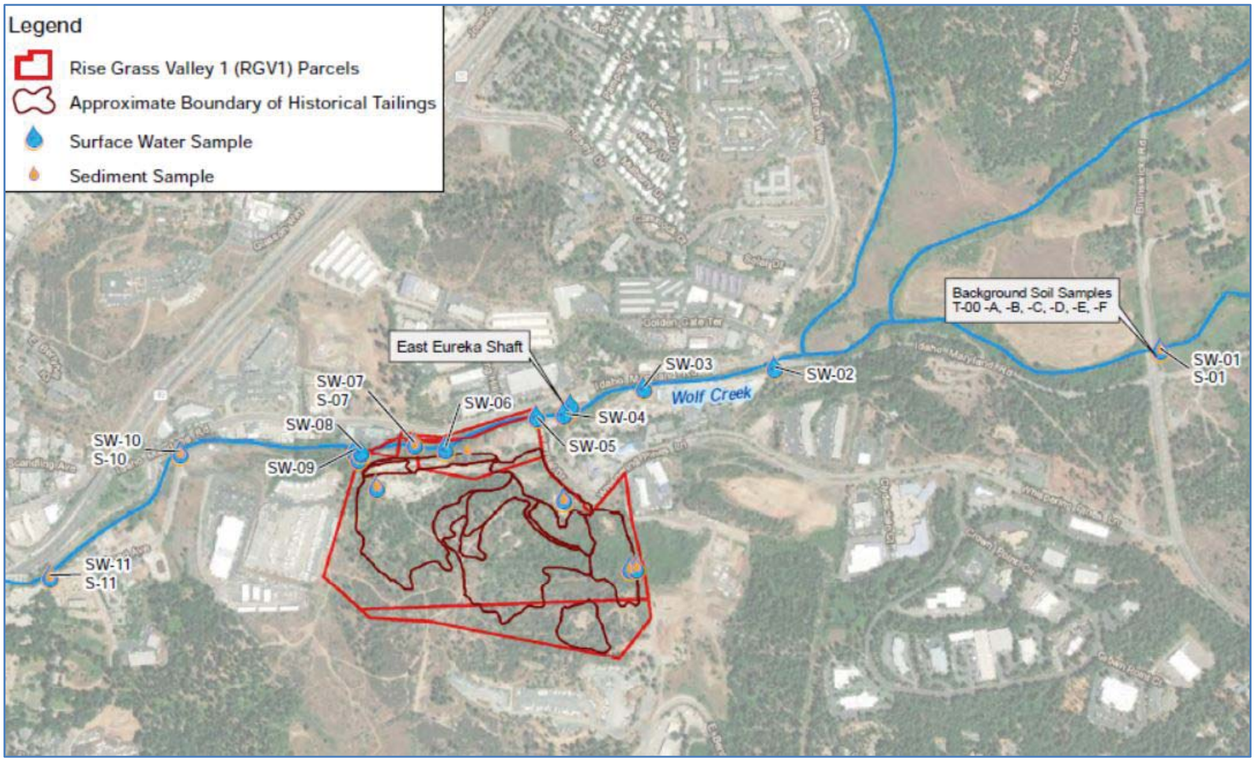
<u>Tailings/Soil Samples</u>

Weston (2019) obtained 48 surface (0 to 0.5 feet bgs) soil samples (IMM-T-01 through IMM-T-48) from the site. Locations were selected based on review of recorded tailings boundaries and results of previous investigation, and were refined in the field based on access and on visual observation of tailings.

Soil samples were collected using a sample-dedicated plastic disposable scoop and were transferred to a 4-ounce wide-mouth glass jar. Sampling locations were documented in the field using Global Positioning System (GPS). Laboratory results are presented in Table 2 with other previous investigation data.

Off-Site Soil Samples

Weston (2019) obtained six surface (0 to 0.5 feet bgs) soil samples (IMM-T-00-A through IMM-T-00-F) from an off-site location that was apparently not subject to past mining activities. The location of the off-site soil samples with respect to the site is depicted below in an excerpt of Weston (2019) Figure 5. Arsenic concentrations detected in these off-site background soil samples are consistent with the range of site background values described below in Section 7.6.



Inset 3.8. Excerpt of Weston (2019) Figure 5, Wolf Creek Surface Water/Sediment and Background Soil Sampling Locations.

Surface Water Samples from East Eureka Shaft Portal

Discharge from the East Eureka Shaft to Wolf Creek upstream of the site is not evaluated as part of this PEA. Weston (2019) obtained water samples from the East Eureka shaft portal. The location of the portal is depicted on the excerpt of Weston (2019) Figure 5 above. At each sampling location, a filtered water sample (-F) was collected for dissolved metals, and an unfiltered water sample (-T) was collected for total metals analysis.

- Samples SW-12-F/-T were collected from a culvert outlet at the East Eureka shaft portal, at the point immediately before it flowed into Wolf Creek. These samples were collected by submerging the sampling bottle directly into the flow. Weston (2019) observed that sample SW-12-F/-T includes any drainage from the adjacent parking lot in addition to the mineshaft groundwater.
- Samples SW-13-F/-T were collected directly from the East Eureka shaft through a polyvinyl chloride (PVC) sampling port using a dedicated Teflon bailer. Weston (2019) observed that

samples SW-13-F/-T represent the groundwater flowing from the subsurface mine workings.

Arsenic, total chromium, cobalt, copper, lead, nickel, and zinc were reported by Weston (2019) in the East Eureka Outflow.

Surface Water and Sediment Samples from On-Site Wetlands Sampling

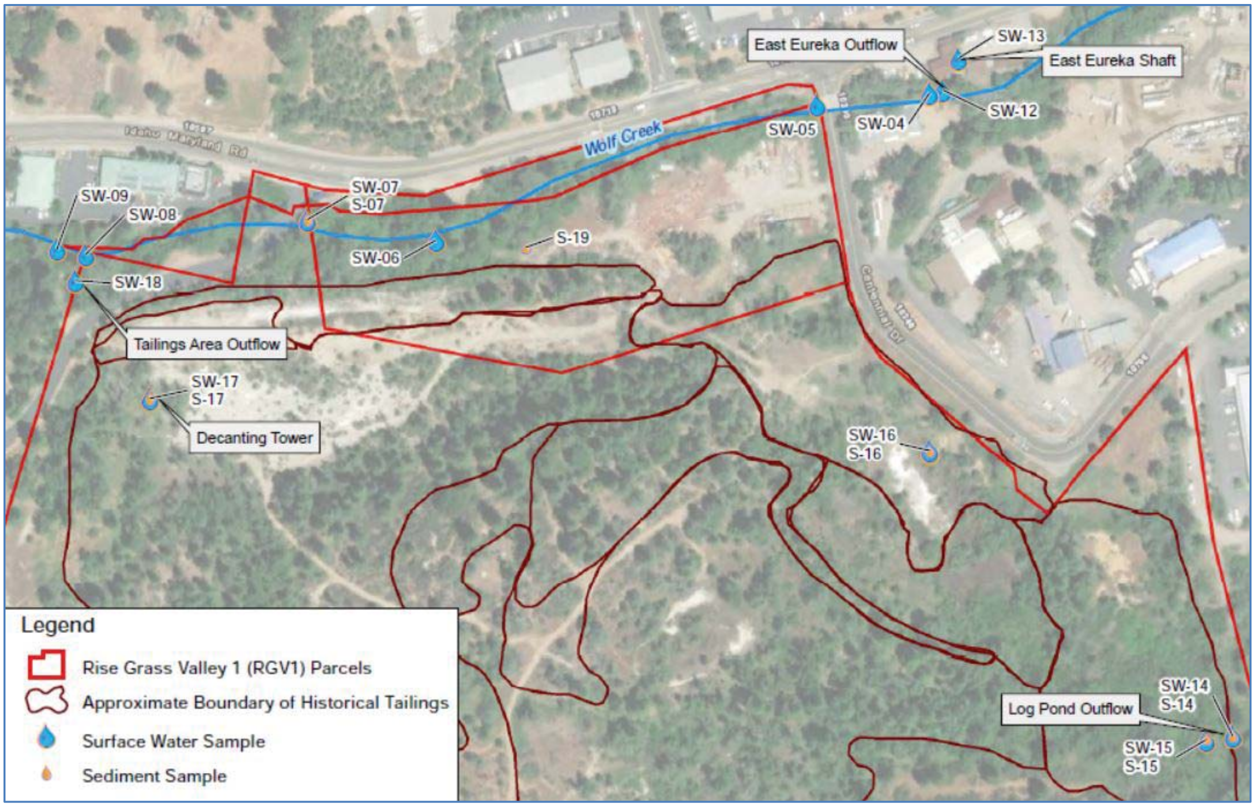
Weston (2019) obtained co-located surface water and sediment samples from three wetland locations within the site, as well as surface water samples near a decanting tower in the northwestern portion of the site. Sample locations are depicted on the following excerpt from Weston (2019) Figure 4. Locations were verified in the field in consultation with the EPA wetland delineation team.

Sediment samples were collected by using a dedicated plastic scoop. Surface water samples were collected by submerging the sample bottle beneath the surface of the water. At each sampling location, a filtered water sample (-F) was collected for dissolved metals, and an unfiltered water sample (-T) was collected for total metals analysis.

- Samples IMM-S-15 and IMM-SW-15-F/-T were collected immediately downstream of the outflow from the adjacent industrial pond.
- Samples IMM-S-16 and IMM-SW-16-F/-T were collected from an area where water was ponding just west of Centennial Drive.
- Samples IMM-S-17 and IMM-SW-17-F/-T were collected from an area where water was ponding before flowing through the decanting tower through the culvert to Wolf Creek.
- Surface water samples IMM-SW-18-F/-T were collected from the outflow culvert from the decanting tower before it flowed into Wolf Creek. Sediment was not available for sampling at this location.

The maximum concentrations of arsenic, lead, and mercury in sediment were detected in sample IMM-S-16 at 46.6 mg/kg, 349 mg/kg, and 4.8 mg/kg, respectively. The sediment samples were obtained within the former tailings ponds, and the metals concentrations detected in the samples are consistent with the metals concentrations detected in tailings elsewhere at the site.

Maximum dissolved metals concentrations detected in onsite surface water samples exceed the Secondary MCL for manganese and CTR values for copper, lead and mercury. Laboratory results for surface water are summarized in Table 4.



Inset 3.9. Excerpt of Weston (2019) Figure 4, Tailings Area Surface Water and Sediment Sampling Locations.

Surface Water Samples from Wolf Creek

Weston (2019) obtained surface water samples from eight locations in Wolf Creek downstream of the East Eureka shaft portal and adjacent to and downstream from the tailings. Sample locations are depicted on the excerpt of Weston (2019) Figure 4 presented above. Co-located sediment samples were obtained at three locations. Sediment sampling was not possible from the remaining locations due to the rocky nature of the bed of Wolf Creek. At each sampling location, a filtered water sample (-F) was collected for dissolved metals, and an unfiltered water sample (-T) was collected for total metals analysis.

- Surface water samples IMM-SW-04-F/-T were collected immediately downstream of the East Eureka shaft portal.
- Surface water samples IMM-SW-05-F/-T were collected immediately upstream of the tailings area.
- Surface water samples IMM-SW-06-F/-T were collected adjacent to the tailings at a location where a seep was observed flowing into Wolf Creek.
- Sediment and surface water samples IMM-S-07 and IMM-SW-07-F/-T were collected adjacent to the tailings at a location where an overland wetland drainage from the tailings to Wolf Creek was mapped by the EPA wetland team.
- Surface water samples IMM-SW-08-F/-T were collected downstream of the tailings and immediately upstream of the outflow from the decanting tower.

- Surface water samples IMM-SW-09-F/-T were collected immediately downstream of the outflow from the decanting tower.
- Sediment and surface water samples IMM-S-10 and IMM-SW-10-F/-T were collected approximately 1,200 feet downstream of the site.
- Sediment and surface water samples IMM-S-11 and IMM-SW-11-F/-T were collected approximately 2,400 feet downstream of the site.

Discharge from the East Eureka Shaft to Wolf Creek upstream of the site is not evaluated as part of this PEA. Arsenic concentrations in surface water samples obtained downstream of the East Eureka Shaft portal were generally higher than arsenic concentrations in surface water samples obtained upstream of the shaft portal. The detected concentrations did not exceed the MCL for arsenic in drinking water. Mercury was detected at a trace concentration in one downstream sample (IMM-SW-07-F; 0.21 ug/L), but was not detected in the corresponding unfiltered sample above the detection limit (0.20 ug/L), and was not detected in any other downstream surface water samples obtained from Wolf Creek above the detection limit of (0.20 ug/L). Weston (2019) reported that no other metals were detected in Wolf Creek surface water at concentrations significantly above background.

Weston (2019) reported that lead and mercury were detected in Wolf Creek sediment at concentrations above background. The maximum mercury concentration detected in Wolf Creek sediment was detected in sample IMM-S-10, approximately 1,200 feet downstream of the site. Weston (2019) reported that chromium and manganese were also detected in Wolf Creek sediment at concentrations above background.

3.5.2 Weston (2018) Site Reassessment Report

Weston (2018) conducted a Site Reassessment Report (SR Report) on behalf of the USEPA under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). This investigation did not include sampling and analysis.

Weston (2018) used existing information to evaluate the site based on the USEPA Hazard Ranking System (HRS) criteria to assess the relative threat associated with actual or potential releases of hazardous substances at the site. The HRS is the primary method of determining a site’s eligibility for placement on the National Priorities List (NPL). The NPL is a list compiled by USEPA of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response.

The SR Report addressed the following properties, focusing on the subject site:

- The Centennial M-1 Property (the subject site)
- Property owned by Rise Grass Valley on East Bennett Road near Brunswick Road at the New Brunswick Shaft location
- Property previously owned by Sierra Pacific on East Bennett Road near Brunswick Road at the New Brunswick Shaft location (the majority of this property was subsequently acquired by Rise Grass Valley)
- Property located south and southwest of the subject site owned by Loren Willman, et al.

Weston (2018) identified the tailings ponds at the site as the only remaining source of hazardous substances associated with the former Idaho Maryland Mine site, and developed hazard ranking factors considering the contamination source and potential exposure pathways.

3.5.3 Amec (2017) Technical Report

Amec (2017) prepared a technical report on the subject property and other properties owned by the Proponent, as well as mineral resources underlying the properties. The technical report included a description of the site, physical setting and operational history, which are referenced in the corresponding sections of the present report.

3.5.4 Geocon (2016) Draft PEA Report

On behalf of the City of Grass Valley, Geocon (2016) prepared a draft PEA report for the site as part of the Grass Valley 2013 Brownfield Community-Wide Assessment Grant (USEPA Grant No. BF-99T06401). This investigation did not include sampling and analysis.

The purpose of the PEA was to compile data from previous investigations of soil and mine tailings at the site and to perform a human health screening evaluation. Geocon (2016) concluded that the elevated metals concentrations in mining waste at the site does not currently appear to pose a significant threat to public health or the environment in its current state, and therefore an expedited response action does not appear to be warranted at this time. Remedial action (e.g., consolidation and capping of the mining waste with clean fill under deed restriction) was recommended to reduce risks to future site workers and occupants.

3.5.5 Geocon (2015) Phase I ESA

On behalf of the City of Grass Valley, Geocon (2015) prepared a Phase I Environmental Site Assessment (ESA) for the site as part of the Grass Valley 2013 Brownfield Community-Wide Assessment Grant (USEPA Grant No. BF-99T06401). This investigation did not include sampling and analysis.

3.5.6 McClelland (2010) Report on Kinetic Acid Rock Drainage Potential

McClelland (2010) performed kinetic testing (humidity cell testing) and static testing (Modified Sobek Acid-Base Accounting, ABA) using one tailings sample (TP3 Tailings) and one waste rock sample (Dev. Rock-1105). The laboratory report is attached to Geocon (2016) in Appendix B. McClelland (2010) reported that both samples had a net neutralizing potential and were not expected to produce acid in a natural weathering and oxidizing environment.

Static testing resulted in Acid Neutralizing Potential to Acid Generating Potential (ANP:AGP) ratios of 130.8 and 33.3, respectively, for samples TP3 Tailings and Dev. Rock-1105. AGP was 1.3 and 2.2 tons $CaCO_3$/1000 tons, ANP was 170 and 73.3 tons $CaCO_3$/1000 tons, total sulfur was 0.06 and 0.10% by weight, and pyritic sulfur was 0.04 and 0.07% by weight, respectively, for the tailings and waste rock sample.

The extractant solution was monitored six times during the 23-week kinetic tests. The extractant solution was alkaline. The following metals were detected in tailings extractant solution at concentrations exceeding the California Department of Public Health (CDPH) Maximum Contaminant Levels (MCLs) for drinking water:

- Arsenic (week 0, 0.012 mg/L, MCL = 0.010 mg/L) was not detected above the reporting limit (0.005 mg/L) after week 0
- Beryllium (weeks 5-8, 0.0060 mg/L, MCL = 0.004 mg/L) was not detected above the reporting limit (0.001 mg/L) during other weeks
- Cadmium (weeks 5-8, 0.0058 mg/L, MCL – 0.005 mg/L) was not detected above the reporting limit (0.001 mg/L) during other weeks
- Magnesium (week 0, 260 mg/L, MCL = 150 mg/L) was detected at concentrations ranging from 6.4 to 17 mg/L during subsequent weeks
- Sulfate (week 0, 1,500 mg/L, MCL = 500 mg/L) and TDS (week 0, 2,220 mg/L, MCL = 1,000) were also detected above the corresponding MCLs during week 0 only.

No metals were detected in the waste rock sample extractant solution at concentrations exceeding the corresponding MCLs.

Total metals concentrations for the tailings and waste rock sample were, respectively: arsenic 31.9 and 11.4 mg/kg, beryllium 0.55 and 9.37 mg/kg, 0.85 and 0.15 mg/kg, and magnesium 3.8 and 4.8%.

3.5.7 ESA (2008) Draft Environmental Impact Report

ESA (2008) prepared a Draft Environmental Impact Report (EIR) for a proposed mine project that included the subject property. The EIR technical studies did not include tailings sampling and analysis.

3.5.8 Engeo (2007) Geotechnical Report

Engeo (2007) performed a geotechnical engineering investigation of the Idaho Maryland Mine Property, which included the site and property to the south and southeast, comprising a total of 138 acres. The purpose of the investigation was to support the design of surface facilities and improvements.

The report presents the results of subsurface investigation, laboratory testing, engineering analysis and geotechnical recommendations for design of formerly proposed structures and roads, and an opinion regarding the stability of the Eastern Berm, which is located along the eastern site boundary and is associated with a former pond on adjacent property.

Engeo (2007) advanced 19 hollow-stem auger borings, 11 of which were located on the site, using CME 75 and CME 850 drill rigs. The maximum boring depth was approximately 50 feet bgs. Bulk soil samples were obtained from drill cuttings, and relatively undisturbed soil samples were obtained from the borings using a Modified California Sampler (3-inch outer diameter split spoon sampler with thin-walled metal liners). Standard Penetration Test (SPT) and Modified California Sampler blow counts were recorded for a 140-pound hammer and 30-inch free fall. Blow counts were typically recorded for the final 12 inches of the sample interval.

Engeo (2007) advanced 11 exploratory excavations at the site using a Caterpillar 320C excavator with a 24-inch-wide bucket. The maximum depth excavation depth was approximately 13 feet bgs. Bulk soil samples were obtained from the exploratory excavations.

Geotechnical laboratory testing included moisture content, dry density, unconfined compression, plasticity index, corrosion, direct shear, R-value, and grain size analysis.

Engeo (2007) concluded that the site was suitable for the proposed industrial development from a geotechnical engineering standpoint. Engeo (2007) provided geotechnical recommendations for the previously-proposed development, which included but were not limited to the following topics.

- Existing undocumented fill,
- Expansive soil,
- Shallow bedrock and excavation,
- Differential fill thickness,
- Soil corrosion potential,
- Groundwater, and
- Future operations of the culvert tower structure.

These conclusions are summarized below.

<u>Existing Undocumented Fill</u>

Undocumented (non-engineered) fill is present across the majority of the site (particularly the central and northern portions) and consists of mine tailings, lumber mill waste and fill associated with previous site use. The undocumented fill is subject to settlement and cannot be relied upon from a structural standpoint. Removal and replacement as engineered fill was recommended. Engeo (2007) found that majority of the fill encountered during the investigation meets typical geotechnical engineering criteria for reuse as engineered fill. Deeper fill was encountered in the north-central portion of the site (e.g., exploratory boring locations B9 and B12). This fill was up to approximately 15 feet deep and was described as gray and reddish brown, loose to medium dense sand with variable fine gravel content (tailings).

<u>Expansive Soil</u>

Engeo (2007) encountered potentially expansive clay layers within the mine tailings. The laboratory test results indicated that these soils exhibit low to moderate shrink/swell potential with variations in moisture content. Moderately to highly expansive clay layers were encountered in exploratory excavations TP3, TPI5, TP18 and TPI9, and may be encountered elsewhere at the site.

According to the exploratory trench logs, the clay layers encountered in exploratory excavations TP3, TPI5, TP18 and TPI9 were located at depths ranging from 0 to 4.5 feet bgs and were typically one to four feet thick.

Engeo (2007) concluded that the potentially expansive clays would not significantly effect the design of the proposed site improvements, provided that they are adequately blended with non-expansive materials and/or not located at shallow depth in building pads.

<u>Shallow Bedrock and Excavation</u>

Engeo (2007) encountered bedrock at depths as shallow as 1 foot bgs.

A Caterpillar 320C excavator with a 24-inch-wide bucket was used to excavate 11 exploratory excavations to depths ranging from 2.5 to 13.5 feet bgs. Engeo (2007) concluded that conventional grading equipment will likely be able to excavate the fill and native soil that was excavated with the exploratory equipment. The upper five feet of the andesite and gabbro bedrock was typically weathered to a degree that it appeared excavatable with larger equipment, such as a Cat 235 or larger excavator.

Cuts and excavations more than 5 feet into the andesite and gabbro or into the diabase bedrock will likely require significant effort with a Caterpillar D9 or larger bulldozer, equipped with a single-tooth ripping shank. A Caterpillar 235 or larger excavator will likely be necessary for economical trench excavations with significant effort. An air spade or blasting may be required where large boulders or resistant bedrock are encountered.

Differential Fill Thickness

Engeo (2007) recommended that the differential fill depth across any structure be no greater than 10 feet.

Soil Corrosion Potential

Engeo (2007) contracted for the analysis of 15 soil samples for pH, electrical resistivity, sulfate, and chloride. Eight of the samples were obtained from the site. Results for site samples are summarized below. Data are presented in Appendix B.

Summary of Soil Resistivity Test Results, Engeo (2007)

Parameter	Method	n	Min	Mean	Max
pH	CTM 643	8	6.77	7.38	8.15
Min. Resistivity	CTM 643	8	0.83	3.47	6.97
Chloride	CTM 422	8	4.20	8.24	14.20
Sulfate	CTM 417	8	5.90	65.74	206.2

Notes:
CTM = Caltrans Test Method
n = population (number of soil samples)
NL = address not listed

Engeo (2007) reported that the detected sulfate concentrations correspond to “negligible” sulfate exposure for concrete structures pursuant to the California Building Code. Soil samples TP3 @ 5 feet and B8 @ 3 feet (both located in the northeastern portion of the site) had anomalously low resistivities (0.83 and 0.88 ohm/cm x 1000) and higher sulfate concentrations (113.4 and 206.2 ppm), indicating that they are very severely corrosive to buried metal. Engeo (2007) recommended that a corrosion consultant be retained to develop specific recommendations for protection of steel if steel structures are to be constructed in the low-resistivity materials.

Groundwater

Engeo (2019) encountered groundwater at a depth of 50 feet in exploratory boring B22, which was terminated at a depth of 50.5 feet bgs in weathered bedrock (the boring extended approximately 11 feet into the weathered metavolcanic rock). This water may have been perched on the weathered rock rather than being representative of the actual groundwater surface, which is commonly encountered at greater depth in fractured bedrock. Perched groundwater was encountered in exploratory excavations TP2 and TP18 at depths of 9 and 3 feet bgs, respectively. Groundwater was not encountered in other exploratory borings or excavations during the Engeo (2007) investigation.

3.5.9 Engeo (2007) Environmental Soil Sampling and Testing Report

Engeo (2007) performed soil sampling and analytical testing concurrently with the geotechnical investigation described above.

The geotechnical investigation included the following site exploration:

- Eleven hollow-stem auger borings using CME 75 and CME 850 drill rigs. The maximum boring depth was approximately 50 feet bgs.
- Eleven exploratory excavations using a Caterpillar 320C excavator with a 24-inch-wide bucket. The maximum excavation depth was approximately 13 feet bgs.

Engeo (2007) exploratory logs generally record mine tailings overlying weathered bedrock. A total of 17 soil samples were obtained for analytical testing from the northern portion of the site at depths ranging from one to 15 feet bgs. Samples were obtained using 2-inch-diameter, 6-inch long brass tubes, which were sealed using a Teflon™ sheet secured by a tight-fitting plastic cap on each end. The samples were labeled to indicate a unique sample number, location, time and date collected and sampler identification.

Inorganic Constituents

All 17 soil samples were analyzed by California Laboratory Services (CLS) of Rancho Cordova, California, for:

- Total CAM 17 Metals (EPA Method 6010B/7471A)
- pH (EPA Method 9045C)
- Oxidation reduction potential (ORP, Eh, or redox potential; Standard Method 2580)
- Sulfate as SO_4 (EPA Method 300.0)
- Sulfide (EPA Method 9030B)
- Total cyanide (EPA Method 9010B)

Total metals concentrations of note include arsenic (3 to 320 mg/kg), cadmium (9 to 87 mg/kg), mercury (<0.1 to 41 mg/kg) and lead (<2.5 to 290 mg/kg).

Not including location TP19 (discussed below), pH values ranged from 6.5 to 8.4, and the average detected pH value was 7.4. Not including location TP19, ORP ranged from 380 to 540 mV, sulfate as SO_4 ranged from 9.0 to 840 mg/kg, and sulfide was detected in only one sample (B5@1’; 24 mg/kg).

Location TP19

An anomalously low pH value (3.7) was detected at location TP19 (eastern portion of eastern tailings pond). pH values for three samples obtained from this location (TP19@1’, TP19@4’ and TP19@5’) were 5.55, 6.29 and 3.74, respectively. Sulfate concentrations (2,000 to 3,900 mg/kg as SO_4) were also anomalously high at location TP19. Sulfide was not detected above the laboratory reporting limit of 10 mg/kg. TP19 also had the only cyanide detections (0.64, <0.5 and 3.5 mg/kg, respectively). Reactive cyanide was not detected in either of the two samples analyzed for reactive cyanide (TP-19@1' and TP-19@5) above the laboratory reporting limit (0.5 mg/kg).

Extractable Metals by WET

Samples with total metals concentrations exceeding ten times the corresponding Soluble Threshold Limit Concentration (STLC) were analyzed for extractable metals using the Title 22 Waste Extraction Test (WET) with analysis by EPA Methods 6020 (arsenic), 6010B (copper, nickel and lead), and 7470A (mercury).

Extraction testing was performed for arsenic, copper, lead, mercury and nickel:

- WET arsenic ranged from 2.2 to 10 mg/L
- WET copper ranged from 1.8 to 11 mg/L
- WET mercury was not detected above the RL of 0.025 mg/L
- WET nickel ranged from 1.7 to 9.1 mg/L
- WET lead ranged from 1.8 to 5.9 mg/L

Extractable Metals by TCLP

Two of the WET metals concentrations exceeded the corresponding STLC, and those samples were also analyzed for extractable metals (arsenic and lead) using the Toxicity Characteristic Leaching Procedure (TCLP). Neither of the TCLP extractable metals concentrations exceeded the corresponding STLC.

Organic Constituents

All 17 soil samples were analyzed by CLS for:

- Organochlorine pesticides (OCP; EPA Method 8081A)
- Polychlorinated biphenyls (PCB; EPA Method 8082)

OCPs and PCBs were not detected.

Organic Constituents at Hap Warnke Mill Location

Soil samples from exploratory locations B5, B6 and B7 (within the Hap Warnke Mill location) were analyzed for:

- Total petroleum hydrocarbons as gasoline (TPHg; EPA Method 8015/8021)
- Total petroleum hydrocarbons as gasoline (TPHd; EPA Method 8015/8021)
- Benzene, toluene, ethylbenzene and xylenes (BTEX; EPA Method 8015/8021)
- Volatile organic compounds (VOC; EPA Method 8260B)
- Methyl tert-butyl ether (MTBE; Method EPA 8260B)
- Semivolatile organic compounds (SVOC; EPA Method 8270C)
- Polynuclear aromatic hydrocarbons (PAH; EPA Method 8270C)

No analytes were detected except for chloroform, which was detected in exploratory boring B7 (northeast corner of Hap Warnke Mill location) at a concentration of 8.3 micrograms per kilogram (ug/kg), which is lower than the RSL for chloroform in commercial soil (1.4 mg/kg or 1,400 ug/kg).

Arsenic Speciation

CLS subcontracted with Applied Speciation and Consulting LLC to perform arsenic speciation. Eight samples obtained from exploratory locations B1, B5, B10 and TP19 were speciated. Arsenate (As V) concentrations ranged from 10 to 143 mg/kg in the eight samples and reportedly comprised more than 99% of the total arsenic concentrations in seven of the eight samples. Arsenite (As III) was detected in the eighth sample (B1@1'; 94% arsenate) at a concentration (1.79 mg/kg) above the laboratory reporting limit (0.17 mg/kg) and in a second sample (B5@6') at a trace concentration (0.08 mg/kg).

Mercury Speciation

Two samples were analyzed for methylmercury (MeHg) by Frontier Geosciences Inc. using method FGS-070, which is briefly outlined in the laboratory reports. Sample locations are not known. MeHg was detected at concentrations ranging from 0.380 to 0.532 nanograms per gram (ng/g) based on dry weight.

Data Validation

Based on NV5's review of the Engeo (2007) field protocol, laboratory methods and laboratory quality control reports, the Engeo (2007) data were accepted for use without qualification. Laboratory reporting limits are generally lower than the corresponding screening levels or applicable site background levels. Laboratory quality control flags are summarized below.

CLS Work Order CQB0273

QM-1: Spike recovery was outside acceptance limits for LCS or LCSD. The batch was accepted based on acceptable MS/MSD recoveries and RPD values (cadmium, selenium).

QM-4X: Spike recovery was outside acceptance limits for LCS or LCSD due to analyte concentrations exceeding four times the spike concentration. The batch was accepted based on acceptable MS/MSD recoveries (chromium, copper, lead, nickel, vanadium, zinc).

QM-5: Spike recovery was outside acceptance limits for LCS or LCSD due to matrix interference. The batch was accepted based on acceptable MS/MSD recoveries (arsenic, antimony, cobalt, molybdenum, selenium, silver).

QM-7: Spike recovery was outside acceptance limits for LCS or LCSD. The batch was accepted based on acceptable MS/MSD recoveries (mercury).

CLS Work Order CQB0734

QC-2H: The recovery of one continuing calibration verification (CCV) sample was greater than the acceptance limit, but all sample results were non-detect and reanalysis was not performed (selenium).

QM-5: Spike recovery was outside acceptance limits for LCS or LCSD due to matrix interference. The batch was accepted based on acceptable MS/MSD recoveries (arsenic, antimony, copper, selenium).

CLS Work Order CQB0738

QM-1: Spike recovery was outside acceptance limits for LCS or LCSD. The batch was accepted based on acceptable MS/MSD recoveries and RPD values (mercury).

CLS Work Order CQB0739

QM-1: Spike recovery was outside acceptance limits for LCS or LCSD. The batch was accepted based on acceptable MS/MSD recoveries and RPD values (mercury).

HT-3: Hold time was exceeded for ORP Standard Method 2580, which specifies the procedure is to be performed within 24 hours of sample collection (reactive cyanide).

Applied Speciation Subcontract Orders CBQ0866 and CBQ0887

Arsenite recovery for all MS/MSD samples was below the laboratory control limit (75%). The laboratory performed a mass balance of all arsenic species and determined that the arsenite was being oxidized within the sample matrix upon spiking.

Arsenate matrix duplicate recoveries (26.8% and 53.6%) for sample B1@1' were above the laboratory control limit (25%). The sample was visibly heterogeneous, and the variation in duplicate recovery was assumed to be associated with sample heterogeneity.

Frontier Geosciences Laboratory ID 7020749-01 and 7020750-01

No QC flags related to MeHg analysis were reported by Frontier Geosciences Inc. The laboratory methodology references a laboratory-specific method that is described briefly in the laboratory reports.

3.5.10 Weston (2005) Preliminary Assessment Report

Weston (2005) conducted a Preliminary Assessment (PA) of the Idaho Maryland Mine Property, which included the site and surrounding properties comprising a total of 122 acres. This investigation did not include sampling and analysis. Weston (2005) used data obtained during previous investigations and the HRS to evaluate site eligibility for placement on the NPL. The HRS findings were not available for review. A copy of the report from Vector (1993) was presented in the Weston (2005) report. Weston (2005) also summarizes investigations performed by Vector (1990) and Anderson (1989).

3.5.11 IMMC (2007) Data Supporting DTSC Voluntary Cleanup Application

IMMC (2007), as a prospective purchaser of the site, prepared an application for DTSC oversight. Attachment C of the application presented site investigation data, including soil sampling and laboratory analysis in November 2004, February 2005 and November 2005. Laboratory reports were not available, and data were obtained from summary tables.

IMMC (2007) identified that variation in tailings compositional chemistry was due in part to the practice of "toll milling" conducted by the former Idaho Maryland Mine. Ore from smaller mines in the vicinity was imported for gold extraction at the Idaho Maryland mill site (located on adjacent property) and was subsequently disposed to land on the subject site.

IMMC (2005 Feb) obtained a total of 19 tailings/soil samples: 14 from the northeast "T1" tailings area, three from the northeast "T2" tailings area, and two from the south-central "T4" tailings area. Each sample was reported to be a composite of material from 0 to 12 inches, and was analyzed for selected total concentrations of 12 metals including arsenic (<10 to 239 mg/kg), cadmium (16 to 49 mg/kg), lead 13 to 2,088 mg/kg) and mercury (0.45 to 30.9 mg/kg).

IMMC (2005 Nov) obtained 39 tailings/soil samples from exploratory excavations to depths ranging up to ten feet. IMMC contracted for analysis of total concentrations of the CAM 17 metals including arsenic (<1 to 3,010 mg/kg), cadmium (0.7 to 3.1 mg/kg), lead 4.0 to 1,950 mg/kg) and mercury (0.08 to 34 mg/kg).

Seven of the samples were analyzed for soluble arsenic, chromium, copper, lead, nickel and/or mercury by Title 22 WET. Extractable lead (18 mg/kg) in sample IDT1-1b and extractable arsenic (62.2 mg/L) in sample IDT4-10-28" exceeded the corresponding STLCs for arsenic and lead.

Sample locations are based on information presented by Geocon (2005), which in turn is based on a map provided to Geocon (2005) by Robert Pease, PG, IMMC Chief Geologist, as part of IMMC's 2011 Revised Permit Application to the City of Grass Valley. According to Geocon (2005), the map depicts tailings deposits at the site and a volume estimate for soil with metals concentrations exceeding TTLCs. This map is presented in Appendix B with the other IMMC data as compiled by Geocon (2016).

IMMC (2004) obtained three tailings samples (IDTP1-B, IDTP1-C and IDTP1-R) from a single location within the "T1" northeast tailings area and contracted for analysis of total concentrations of 12 metals including arsenic (<10 to 182 mg/kg), cadmium (17 to 55 mg/kg), lead 98 to 35,111 mg/kg) and mercury (0.39 to 33 mg/kg). The surface at this location was described as having a white residue which the IMMC identified as a thin gypsum precipitate from evaporation of surface water.

Data Validation

IMMC (2005, 2004) data are presented in summary tables, and no laboratory reports, quality control reports or field procedures are available for review. Based on the lack of basic quality control data, the IMMC (2004, 2005) data are rejected for quantitative use in the risk assessment. The data are used qualitatively to develop the conceptual model and support the general spatial distribution of contaminants on the site.

IMMC (2005, 2004) did not list laboratory reporting limits, limiting the usefulness of non-detect data for chromium, selenium, silver and thallium.

The cadmium concentrations detected by IMMC (2004) and IMMC (2005 Feb) are anomalously high in comparison with other cadmium concentrations detected by other investigators in the same areas. The cadmium concentrations detected by IMMC (2005 Nov) are similar to those detected by other investigators, and are significantly lower than those reported by IMMC (2004) and IMMC (2005 Feb). None of the IMMC (2004, 2005) data are used quantitatively in the risk assessment.

3.5.12 H&K (2004) Preliminary Geotechnical Engineering Report

H&K (2004) performed a geotechnical feasibility study on behalf of IMMC for a 139-acre property that included the subject site. No sampling or analysis was performed.

3.5.13 Vector (1993) Contaminant Assessment

Vector (1993) performed soil sampling and laboratory analysis of approximately 124 acres of property owned by Bouma, Erickson and Toms, including the subject site. This report was available as an attachment to the Weston (2005) preliminary assessment report.

Vector (1993) excavated 19 exploratory trenches through tailings at the site and contracted for analysis of 28 discrete samples of tailings, soil and bedrock. Samples were tested for pH and total concentrations of metals.

WET with deionized water extractant (DI-WET) was performed for seven of the samples with the highest total metals concentrations, with analysis by EPA Methods 6010 and 245.1 (mercury). No metals were detected in the extractants except for mercury (0.0011 mg/L) in sample SA-6.2. Detection limits (arsenic, 0.075 mg/L; chromium, 0.01 mg/L; copper, 0.32 mg/L; lead, 0.075 mg/L; mercury, 0.10 mg/L; and nickel, 0.04 mg/L) were generally above the corresponding water quality goals.

Seven tailings/soil samples were analyzed for total cyanide (EPA Method 335.2), which was not detected above the RL of 1.0 mg/kg.

Analysis was performed by Nevada Environmental Laboratory (Job No. 904085.01). No QC summary or narrative was provided in the laboratory report.

Sierra Environmental Monitoring of Sparks, Nevada, performed ABA on one sample, resulting in a pH of 6.3, AGP <1 ton/1000 tons, ANP of 5 tons/1000 tons, and an ANP:AGP ratio greater than 5.

The data presented by Weston (2005) included additional laboratory data from 1989 and 1990 prepared by Alpha Analytical (Laboratory No. 90-0817-19-1), which is described under Vector (1990) below, and Eureka Laboratories (Order Nos. 89-08-063 and 89-38-063), which is described under Anderson (1989) below.

<u>Data Validation</u>

Based on NV5's review of the Vector (1993) available field protocol, laboratory methods and laboratory reports, the Vector (1993) data were accepted for use without qualification. Laboratory reporting limits are generally lower than the corresponding screening levels or applicable site background levels.

3.5.14 Vector (1990) Investigation Data

As reported by Weston (2005) and Geocon (2016), Vector (1990 Jun) obtained six grab samples from four exploratory excavations (BH-1 through BH-4) located in the northwestern "T3" cyanide-treated tailings area. Samples were obtained from depths up to 15 feet bgs. Arsenic, chromium, and lead were detected in samples from the test pits at maximum concentrations of 33 mg/kg, 261 mg/kg, and 24 mg/kg, respectively. Mercury was not detected and no cyanide analysis was performed.

As reported by Weston (2005) and Geocon (2016), Vector (1990 Aug) obtained four discrete samples from three exploratory locations (HS-1, HS-2 and HS-3) in the northeastern "T1" tailings area. Samples were obtained from depths up to 15 feet bgs. Arsenic, chromium, mercury, and lead were detected at maximum concentrations of 292 mg/kg, 383 mg/kg, 3.8 mg/kg and 115 mg/kg, respectively.

Data Validation

Based on NV5's review of the Vector (1990) available field protocol, laboratory methods and laboratory reports, the Vector (1990) data were accepted for use provided that the laboratory reporting limits were lower than the corresponding screening levels or range of site concentrations. Reporting limits for antimony, barium, cadmium, molybdenum, selenium, silver, thallium and vanadium were higher than the typical site values, and therefore these data were rejected.

3.5.15 Anderson (1989) Investigation Data

As reported by Weston (2005) and Geocon (2016), Anderson (1989) obtained five soil samples from the northeastern "T1" tailings area. Four of the samples were composites prepared using two to four grab soil samples from one to two exploratory locations. One of the samples referenced as "White PPT" was apparently obtained from white precipitate encountered at the ground surface. The remaining samples appear to be of tailings/soil. The laboratory report (Eureka Laboratories, Inc.; August 23, 1989) indicates that arsenic, lead, mercury and cyanide were detected at concentrations ranging from 40.6 to 254 mg/kg, 91.4 to 696 mg/kg, 2.4 to 7.3 mg/kg, and 0.17 to 2.2 mg/kg, respectively.

Data Validation

Anderson (1989) data are primarily associated with composite samples and were not used quantitatively in the risk assessment. The data are used qualitatively to develop the conceptual model and support the general spatial distribution of contaminants on the site.

3.6 INTERVIEWS

NV5 interviewed Benjamin Mossman, PE, President and CEO of Rise Grass Valley Inc., site owner. Mr. Mossman provided information regarding historical land use, previous investigation documents, and supplemental investigation data related to characterization of mine waste at the site. Mr. Mossman had no knowledge of recognized environmental conditions associated with the site other than those identified in this report.

3.7 STANDARD ENVIRONMENTAL RECORDS SOURCES

The discussion presented in this section is based on information obtained from environmental databases and review of regulatory agency records. The Environmental Database Resources, Inc. (EDR) database report (Appendix D) presents a listings of sites located within a 1-mile radius selected in accordance with the ASTM E1527-13 standard. The listings are collected from computerized databases of Federal, State, and local environmental records.

Regulatory agency databases searched and reported in the EDR report include:

- U.S. Environmental Protection Agency (U.S. EPA) – Comprehensive Environmental Response Compensation, and Liability Information System (CERCLIS)
- U.S. EPA – CERCLA NPL
- U.S. EPA – CERCLA Proposed NPL

- U.S. EPA – Federal Superfund Liens (NPL Liens)
- U.S. EPA – CERCLA No Further Remedial Action Planned Site (CERC-NFRAP)
- U.S. EPA – Resource Conservation and Recovery Information System (RCRAInfo), Treatment, Storage, or Disposal (TSD) facilities, and Small Quantity, Large Quantity, Conditionally Exempt Small Quantity and Non Generators (SQG, LQG, CESQG, and NonGen) of hazardous waste
- U.S. EPA – RCRA Corrective Action Report (CORRACTS)
- U.S. EPA – Land Use Control Information System; Engineering Controls Site List, and Sites with Institutional Controls (LUCIS, ENG CONTROLS, and INST CONTROLS)
- U.S. EPA – Emergency Response Notification System (ERNS)
- U.S. EPA – CERCLA Records of Decision (ROD)
- U.S. EPA – Facility Index System (FINDS)
- U.S. Department of Transportation – Hazardous Materials Information Reporting System (HMIRS)
- Department of Toxic Substances Control (DTSC) – Voluntary Cleanup Program (VCP)
- DTSC – EnviroStor Database (ENVIROSTOR)
- DTSC – Facility and Manifest Data (HAZNET)
- California State Water Resources Control Board (SWRCB) – Leaking Underground Storage Tank Listing (LUST) sites, including Indian Land
- SWRCB – Solid Waste Facilities (SWF/LF)
- SWRCB – Aboveground and Underground Storage Tank (AST and UST) sites
- SWRCB – Cleanup Program Sites and Spills, Leaks, Investigations and Cleanups (CPS-SLIC)
- SWRCB – Voluntary Cleanup Sites (VCP)
- SWRCB – Waste Management Units (WMUDS/SWAT)
- SWRCB – California Integrated Water Quality System (CIWQS)
- CalEPA – California Environmental Reporting System Regulated Site Portal (CERS)
- CalEPA – CERS Hazardous Waste Generator and AST and UST sites (CERS HAZ WASTE and CERS TANKS)
- California Air Resources Board – Emissions Control Inventory (EMI)
- California Office of Emergency Services – California Hazardous Materials Incident Report System (CHMIRS).

Additionally, NV5 searched the databases below for environmental records related to the subject property:

- SWRCB GeoTracker website: http://geotracker.swrcb.ca.gov/
- DTSC EnviroStor website: http://www.envirostor.dtsc.ca.gov/public/default.asp

3.7.1 Subject Property Environmental Database Listings

The subject property, as Idaho Maryland Mine, is listed on the ENVIROSTOR, US BROWNFIELDS, SEMS, and FINDS databases. The ENVIROSTOR database indicates the US EPA completed a Preliminary Assessment for the site in 2005. The US BROWNFIELDS database reports that the site is part of the US EPA Brownfields Assessment Cooperation Agreement. The listings are consistent with the previous investigations performed at the site as discussed above in Section 3.5.

3.7.2 Subject Property Regulatory Records Review

Reports available from DTSC concerning previous investigations on the subject property are discussed in above in Section 3.5.

3.7.3 Surrounding Area

Past investigation sites in the vicinity of the subject property are discussed in Section 3.5 of this report. The database listings did not identify other notable sites in the surrounding area.

3.7.4 Vapor Intrusion Evaluation

There is no current or historical record of the use or storage of volatile organic compounds (VOCs) at the subject property. Additionally, no evidence of VOCs in soil or groundwater at nearby properties was identified by this PEA. As a result, vapor intrusion is not considered an environmental concern at the subject property based on the information reviewed as part of this PEA.

4 APPARENT PROBLEM

During its operations from approximately 1863 through 1956, the Idaho Maryland Mine was one of the most productive gold mines in the United States (AMEC, 2017). Mining and milling structures associated with the former mine were generally located to the east of the site, and the site was used primarily for storage of mining waste (tailings and waste rock), which are present in approximately two-thirds of the site (central and northern portions). The tailings ponds included berms contain the tailings at the site and a dewatering system (decanting towers and drainage culverts) to remove water from the tailings pond surface. The tailings are located near Wolf Creek, which flows along the northern site boundary.

Site investigation has identified mill tailings, waste rock and affected soil at the site that contain lead, arsenic, mercury and other metals at concentrations exceeding background soil metals concentrations and regulatory benchmark concentrations. Elevated soil metals concentrations present a potential human health risk resulting from routine, long-term exposures including incidental soil ingestion, inhalation of soil dust, and dermal contact. In addition, contaminated mining waste presents potential risks to ecological health and water quality.

This PEA was conducted to characterize the mining waste and to address potential health risks and environmental impacts associated with elevated metals concentrations.

5 ENVIRONMENTAL SETTING

This section presents a conceptual model and describes exposure pathways.

5.1 CONCEPTUAL MODEL

A site conceptual model diagram is presented as Figure 5. The diagram depicts:

- Primary source media and release mechanisms;
- Secondary source media and transport mechanisms;
- Potential points of exposure (exposure media) and exposure routes; and
- Potential receptors.

The model components are described below.

5.1.1 Primary Source Media

Primary source media include:

1. Naturally-mineralized gold-bearing ore materials and mineralized waste materials (waste rock) that may contain elevated concentrations of heavy metals and metalloids (e.g., lead and arsenic). The naturally mineralized ore materials were brought to the surface as a result of adjacent underground mining operations (i.e., the Idaho Shaft located to the northeast of the site as depicted on Sheet 3) and from other nearby mining operations.
2. Chemicals used in the milling and extraction of gold from ore materials on adjacent property. Gold-bearing ore was crushed in a stamp mill or ball mill and was treated with imported mercury and cyanide. Mercury was commonly imported during the early days of gold mining as elemental mercury (quicksilver) for use in recovery of gold from ore materials. Cyanide was later used as a substitute for mercury to extract gold.

5.1.2 Primary Release Mechanisms

The primary release mechanism is offsite ore milling and processing:

1. The deep, mineralized ore deposits were transported to the ground surface as a result of historical gold mining operations, and heavy metals and metalloids (e.g., arsenic and lead) were liberated from the ore deposits as a result of crushing and chemical processing, and are present in the processed mining waste (tailings).
2. Some of the mercury and cyanide imported for use in the adjacent gold recovery plants was released during processing.
   a. Elemental mercury in liquid form tended to be introduced to the environment via tailings as a result of mercury loss during the amalgamation process.
   b. Mercury in vapor form tended to be released if there was incomplete recovery of mercury after heating of gold-mercury amalgam (e.g., in a distillation retort).
   c. Cyanide was also released to the tailings and to the atmosphere. Cyanide tends to be soluble and degradable, breaking down into carbon and nitrogen. Cyanide has generally not been encountered in the present-day tailings at significant concentrations.

5.1.3 Primary Transport Mechanisms and Secondary Source Media

The secondary source media are tailings, waste rock and contaminated soil at the site. Tailings were transported to the site via slurry from the adjacent processing plants. Waste rock and soil were transported to the site by truck for use in construction of the berms.

5.1.4 Secondary Transport Mechanisms

Secondary transport mechanisms are depicted on Figure 5 and described below.

<u>Surface Water Erosion</u>
Seasonal runoff from storm events may cause erosion and sediment transport of exposed tailings at the site.

<u>Leaching</u>
Precipitation and percolation may leach heavy metals from contaminated soil and mine waste and transport them in dissolved form.

<u>Wind Erosion</u>
Erosion of contaminated soil and mine waste by wind or mechanical disturbance may transport suspended particulates. The mine waste is exposed at the ground surface and is potentially subject to erosion due to wind and mechanical disturbance.

<u>Volatilization</u>
The constituents of potential concern (metals and metalloids) are not volatile with the exception of mercury. Volatilization is considered as an exposure pathway in the quantitative risk assessment, but is not expected to be a significant transport mechanism in the case of outdoor air exposure.

<u>Biological Uptake</u>
Heavy metals and metalloids may be incorporated in plant tissue as a result of biological uptake for plants growing in contaminated soil or mine waste. Heavy metals and metalloids may be incorporated in animal tissue through the food chain or as a result of direct contact (i.e., ingestion, dermal contact, inhalation of soil dust) with contaminated soil. No agriculture cultivation was observed at the site.

5.1.5 Exposure Media and Exposure Routes

Exposure media are soil and air, which may contain both suspended particulates (dust) and vapor (volatile mercury). Exposure routes are incidental ingestion and dermal contact with contaminated soil and mine waste, and inhalation of particulates or vapors originating from the contaminated soil and mine waste.

5.1.6 Potential Receptors

The site is primarily open space, and lumber milling operations are performed in its northeastern corner. Future site development is expected to be industrial and/or commercial. Therefore, construction workers and commercial/industrial workers may be subject to exposure.

6 SAMPLING ACTIVITIES AND RESULTS

This section summarizes NV5's field sampling and laboratory analysis, presents the data and discusses the results.

6.1 RATIONALE FOR SAMPLING STRATEGY

NV5 obtained soil samples during a USEPA site inspection in April 2019. Weston performed a Site Inspection on behalf of USEPA and presented the results in a Site Inspection Report (Weston, 2019 Sept). Weston's sampling was performed pursuant to a SAP (Weston, 2019 Feb) that was approved by the USEPA on March 7, 2019.

Sample locations were determined by Weston based on review of recorded tailings boundaries and results of previous investigation. Weston refined the sampling locations in the field based on access and on visual observation of tailings.

6.2 SOIL SAMPLING

NV5 obtained 48 surface (0 to 0.5 feet bgs) soil samples (IMM-TN-01 through IMM-TN-48) from the site on April 16 and 17, 2019. Sample locations are depicted on Sheet 1.

Soil samples were collected as grab samples (independent, discrete samples) using a new, single-use plastic scoop. Samples to be analyzed for metals were placed in laboratory-supplied, resealable plastic bags and were homogenized in the bag by shaking and kneading. New nitrile gloves were donned at each sample location and whenever the cleanliness or integrity of the gloves were compromised. The disposable, single-use equipment was not decontaminated but was packaged for appropriate disposal. Sample locations were recorded with GPS equipment.

Inset 6.1. Soil conditions north of Northern Berm at sample location IMM-TN-01.

Inset 6.2. Soil conditions near northern toe of Northern Berm at sample location IMM-TN-02.

Inset 6.3. Soil conditions at crest of central portion of Northern Berm at sample location IMM-TN-03.

Inset 6.4. Soil conditions at the Northern Berm at sample location IMM-TN-05.

Inset 6.5. Tailings exposed on the southern flank of the Northern Berm near sample location IMM-TN-05.

Inset 6.6. Decanting towers in Western Tailings Pond near sample location IMM-TN-07.

Inset 6.7. Tailings and waste rock near Northern Berm at sample location IMM-TN-10.


Inset 6.8. Tailings in Western Tailings Pond near sample location IMM-TN-11.


Inset 6.9. Typical tailings conditions in Western Tailings Pond at sample location IMM-TN-11.

Inset 6.10. Sample location IMM-TN-18 in the Eastern Tailings Pond.

Inset 6.11. Tailings at sample location IMM-TN-18 in the Eastern Tailings Pond.

Inset 6.12. Tailings at sample location IMM-TN-25 in the Western Tailings Pond.

Inset 6.13. Tailings in the Western Tailings Pond at sample location IMM-TN-26.

Inset 6.14. Tailings in the Western Tailings Pond at sample location IMM-TN-28.


Inset 6.15. Sample location IMM-TN-42 in the Eastern Tailings Pond.

Inset 6.16. Tailings at sample location IMM-TN-42 in the Eastern Tailings Pond.

Inset 6.17. Sample location IMM-TN-44 in the South Idaho Location.

Inset 6.18. Tailings at sample location IMM-TN-44 in the South Idaho Location.

6.3 LABORATORY ANALYSIS

Samples were delivered by mail under chain-of-custody documentation to Advanced Technology Laboratories (ATL) of Signal Hill, California. ATL is accredited by the Environmental Laboratory Accreditation Program (ELAP; Certificate No. 1838). Soil samples were analyzed for total concentrations of Title 22 (CAM 17) Metals using EPA Test Methods 6010B/7471A. Laboratory results are summarized in Table 2. The laboratory report and chain-of-custody documentation are presented in Appendix E.

NV5 (Addendum No. 1 to Draft PEA, 2020) contracted for analysis of eight mine tailings samples by DI-WET. The testing was performed by ACZ Laboratories, Inc. (ACZ; ELAP No. 2935). The ACZ laboratory report and chain of custody document are presented in Appendix E. The eight sample locations are listed below and are depicted on Figure 1.

Location	Depth	Assessment Area	Matrix
IMM-T-03	0-0.5	WTP-N	Tailings
IMM-T-19	0-0.5	WTP-N	Tailings
IMM-T-21	0-0.5	ETP-E	Tailings
IMM-T-22	0-0.5	ETP-E	Tailings
IMM-T-23	0-0.5	ETP-E	Tailings
IMM-T-37	0-0.5	ETP-E	Tailings
IMM-T-38	0-0.5	ETP-E	Tailings
IMM-T-39	0-0.5	ETP-E	Tailings

Notes:
WTP-N = Western Tailings Pond, Northern Portion
ETP-E = Eastern Tailings Pond, Eastern Portion

The eight locations were selected for additional analysis based on the results of previous CAM 17 metals testing in an attempt to represent both central-tendency and upper-range total metals concentrations. Table 8 lists the laboratory results.

6.4 DATA VALIDATION

Laboratory and field data were reviewed to assess the accuracy of data recording, processing and transmittal. Based on the findings of the data validation, the data were accepted for use. Data validation procedures and criteria are summarized in Appendix F.

Pursuant to DTSC comments (March 9, 2020) on the Draft PEA (December 12, 2019), for duplicate samples, the result with the highest concentration was used to ensure that remedial decisions for the site are conservative. Results for co-located duplicate samples obtained by Weston (2019) and NV5 (2019), the lower concentration for each metal was culled prior to statistical analysis and risk assessment.

7 DATA EVALUATION

This section summarizes the analytical data obtained by NV5 and others for site media.

7.1 SCREENING LEVELS

Screening levels are used in this data evaluation to provide a general overview of site conditions. The screening levels are not intended to take the place of the human health risk assessment presented in Section 8 of this report.

Pursuant to DTSC (2019 Apr) guidelines, screening levels related to protection of human health in the case of routine, long term exposure by direct pathways (i.e., ingestion, inhalation and dermal contact) commonly include EPA Regional Screening Levels (RSLs) and DTSC Screening Levels (DTSC-SLs). For inorganics, background concentrations are also used as a basis for comparison.

RSLs and DTSC-SLs include inorganic constituent concentrations that are based on the protection of public health. In California, DTSC-SLs are commonly used in lieu of RSLs when DTSC uses toxicity criteria that are different than the toxicity criteria used by EPA.

The screening levels are generally considered conservative. Under most circumstances, the presence of a chemical in media at concentrations less than the corresponding RSL or DTSC-SL can be assumed not to pose a significant, long-term (chronic) threat to human health. The presence of a chemical or inorganic constituent at a concentration in excess of a screening level does not necessarily indicate that adverse impacts to human health are occurring or will occur; however, further evaluation of potential human health concerns are generally appropriate if screening values are exceeded.

7.2 TAILINGS, WASTE ROCK AND SOIL

A total of 224 solid samples (tailings, waste rock and soil) were obtained from the site for chemical analysis by Weston (2019), Engeo (2007), IMMC (2005 and 2004), Vector (1993 and 1990) and Anderson (1989), as described in Section 3.5, and by NV5 (2019), as described in Section 6.

Laboratory reports are not available for the 61 samples obtained by IMMC (2005, 2004) and the five samples obtained by Anderson (1989). Therefore, the chemical data associated with these 66 samples were not used quantitatively in the risk assessment, but were used to evaluate the spatial distribution of the contamination and to provide general statistics.

The chemical data associated with the remaining 158 samples were validated and accepted for use in the risk assessment, as summarized in Section 3.5 and Appendix F.

Pursuant to DTSC comments (March 9, 2020) on the Draft PEA (December 12, 2019), for duplicate samples, the result with the highest concentration was used to ensure that remedial decisions for the site are conservative. Results for co-located duplicate samples obtained by Weston (2019) and NV5 (2019), the lower concentration for each metal was culled prior to statistical analysis and risk assessment.

7.2.1 Total Metals

Total metals data are presented in Table 2. Exceedances of screening levels or background concentrations were identified for arsenic, lead, mercury, nickel, cadmium and thallium. Of the 224 solid samples:

- Arsenic concentrations exceeded site background (19 mg/kg) in 80 samples (36%).
- Arsenic concentrations exceeded the TTLC (500 mg/kg) in 6 samples (3%).
- Lead concentrations exceeded the commercial DTSC-SL (320 mg/kg) in 16 samples (7%). The lead exceedances were generally co-located with arsenic exceedances.
- Lead concentrations exceeded the TTLC (1,000 mg/kg) in 6 samples (3%).
- Mercury concentrations exceeded the commercial DTSC-SL (4.5 mg/kg) in 25 samples (11%). The mercury exceedances were commonly co-located with arsenic exceedances, while six were not.
- Mercury concentrations exceeded the TTLC (20 mg/kg) in 8 samples (4%).
-
- Nickel exceeded the TTLC (2,000 mg/kg) and commercial DTSC-SL (3,000 mg/kg) in one sample (IdT4-6; IMMC 2005 Nov).
- Thallium concentrations exceeded the commercial RSL (12 mg/kg) in 11 samples (5%). Five of these exceedances are associated with unvalidated data from Anderson (1989), one is associated with unvalidated data from IMMC (2005 Nov), and the remaining five are associated with validated data from Vector (1993). Some reporting limits (Vector, 1990 Aug and 1990 Jun) are higher than the screening level.

7.2.2 Soluble Metals

Soluble metals data are presented in Table 3. A total of 26 solid samples were analyzed for extractable concentrations of arsenic, chromium, copper, lead, mercury and/or nickel. Results are discussed below.

<u>Extractable Metals by Title 22 WET</u>

Engeo (2007) contracted with CLS for analysis of 11 solid samples with total metals concentrations exceeding ten times the corresponding Soluble Threshold Limit Concentration (STLC) for extractable metals using the Title 22 Waste Extraction Test (WET; (standard citrate buffered extractant solution) with analysis by EPA Methods 6020 (arsenic), 6010B (copper, nickel and lead), and 7470A (mercury).

- WET arsenic ranged from 2.2 to 10 mg/L. The STLC for arsenic is 5 mg/L.
- WET lead ranged from 1.8 to 5.9 mg/L. The STLC for lead is 5 mg/L.
- WET copper ranged from 1.8 to 11 mg/L. The STLC for copper is 25 mg/L.
- WET nickel ranged from 1.7 to 9.1 mg/L. The STLC for nickel is 20 mg/L.
- WET mercury was not detected above the RL (0.025 mg/L). The STLC for mercury is 0.2 mg/L).

As summarized above and in Table 3, WET arsenic in sample B10-5’ exceeded the STLC for arsenic, and sample B10-1’ WET lead exceed the STLC for lead.

IMMC (2005 Nov) contracted for analysis of seven solid samples for extractable arsenic, chromium, copper, lead, nickel and/or mercury by Title 22 WET. As summarized in Table 3, extractable lead (18 mg/kg) in sample IDT1-1b and extractable arsenic (62.2 mg/L) in sample IDT4-10-28" exceeded the corresponding STLCs for arsenic and lead.

Extractable Metals by TCLP

For the two WET metals concentrations exceeded the corresponding STLCs, Engeo (2007) contracted for analysis of extractable metals (arsenic and lead) using the Toxicity Characteristic Leaching Procedure (TCLP). Neither of the TCLP extractable metals concentrations exceeded the corresponding STLC. Extractable metals were not detected by TCLP.

Extractable Metals by DI-WET

Vector (1993) contracted for analysis of extractable metals in seven solid samples with the highest total metals concentrations by WET with deionized water extractant (DI-WET) , with analysis by EPA Methods 6010 and 245.1 (mercury). As summarized in Table 3, no metals were detected in the DI-WET extractants except for mercury (0.0011 mg/L) in sample SA-6.2. Detection limits (arsenic, 0.075 mg/L; chromium, 0.01 mg/L; copper, 0.32 mg/L; lead, 0.075 mg/L; mercury, 0.10 mg/L; and nickel, 0.04 mg/L) were generally above the corresponding water quality goals listed in Table 3.

NV5 (Addendum No. 1 to Draft PEA, 2020) contracted for analysis of eight mine tailings samples by DI-WET. The testing was performed by ACZ Laboratories, Inc. (ACZ; ELAP No. 2935). The ACZ laboratory report and chain of custody document are presented in Appendix E. The eight sample locations are listed below and are depicted on Figure 1.

Location	Depth	Assessment Area	Matrix
IMM-T-03	0-0.5	WTP-N	Tailings
IMM-T-19	0-0.5	WTP-N	Tailings
IMM-T-21	0-0.5	ETP-E	Tailings
IMM-T-22	0-0.5	ETP-E	Tailings
IMM-T-23	0-0.5	ETP-E	Tailings
IMM-T-37	0-0.5	ETP-E	Tailings
IMM-T-38	0-0.5	ETP-E	Tailings
IMM-T-39	0-0.5	ETP-E	Tailings

Notes:
WTP-N = Western Tailings Pond, Northern Portion
ETP-E = Eastern Tailings Pond, Eastern Portion

The eight locations were selected for additional analysis based on the results of previous CAM 17 metals testing in an attempt to represent both central-tendency and upper-range total metals concentrations. Table 8 lists the laboratory results.

Humidity Cell Testing

McClelland (2010) performed kinetic testing (humidity cell testing) using one tailings sample (TP3 Tailings) and one waste rock sample (Dev. Rock-1105). Results are summarized in Tables 6 and 7. The extractant solution was monitored six times during the 23-week kinetic tests. The extractant solution was alkaline.

The following metals of concern (see Section 8.3 below for evaluation of COCs) were detected in the tailings sample extractant solution at concentrations exceeding the water quality objectives listed in Table 6b:

- Arsenic (12 ug/L) exceeded the MCL (10 ug/L) in extraction week 0, and was not detected above the reporting limit (5.0 ug/L) during the remaining weeks 1 through 20.
- Cadmium (5.8 ug/L) exceeded the MCL (5 ug/L) and the CTR CCC (0.62 ug/L, adjusted for receiving water hardness) in weeks 5-8, and was not detected above the reporting limit (1.0 ug/L) during other weeks.
- Mercury was detected at week 0 (0.40 ug/L) and weeks 9-12 (0.11 ug/L) at concentrations exceeding the CTR HH value (0.05 ug/L).
- Nickel (14 ug/L) exceeded the CTR value (11.57 ug/L) during week 0, and was not detected above the reporting limit (10 ug/L) during other weeks.
- Selenium (9.4 ug/L) exceeded the CTR value (5.0 ug/L) during week 0, and was not detected above the reporting limit (5 ug/L) during other weeks.

Reporting limits for copper (50 ug/L) and lead (10 ug/L) are lower than the corresponding MCLs (1,300 ug/L and 15 ug/L, respectively), but are higher than the corresponding CTR values (1.96 ug/L and 0.35 ug/L, respectively, as adjusted for hardness). Therefore, no comparison was made to the CTR values.

For some metals (e.g., arsenic, cadmium, cobalt, mercury), total concentrations in the tailings sample subjected to humidity cell testing were lower than the central tendency values for total metals concentrations in the tailings ponds. Therefore, the humidity cell testing results may tend to underestimate extractable metals concentrations in the tailings with higher total metals concentrations. Total metals concentrations for the tailings sample and 95% UCL values for the tailings ponds are listed in Table 6b for comparison.

Mercury (0.17 ug/L) was detected in development rock extractant exceeding the CTR value (0.05 ug/L) at week 0, and was not detected above the reporting limit (0.10 ug/L) during other weeks. No other metals of concern were detected in the development rock sample extractant.

7.2.3 pH, ORP, Electrical Resistivity, Sulfate and Chloride

Engeo (2007) contracted with CLS to analyze 17 solid samples for:

- pH (EPA Method 9045C)
- Oxidation reduction potential (ORP, Eh, or redox potential; Standard Method 2580)
- Sulfate as SO_4 (EPA Method 300.0)
- Sulfide (EPA Method 9030B)

Not including location TP19 (discussed below), pH values ranged from 6.5 to 8.4, and the average detected pH value was 7.4. Not including location TP19, ORP ranged from 380 to 540 mV, sulfate as SO_4 ranged from 9.0 to 840 mg/kg, and sulfide was detected in only one sample (B5@1'; 24 mg/kg).

An anomalously low pH value (3.7) was detected at location TP19 (eastern portion of eastern tailings pond). pH values for three samples obtained from this location (TP19@1', TP19@4' and TP19@5') were 5.55, 6.29 and 3.74, respectively. Sulfate concentrations (2,000 to 3,900 mg/kg as SO_4) were also anomalously high at location TP19. Sulfide was not detected above the laboratory reporting limit of 10 mg/kg.

7.2.4 Acid-Base Accounting

Vector (1993) contracted with Sierra Environmental Monitoring of Sparks, Nevada, to perform ABA on one sample, resulting in a pH of 6.3, AGP <1 ton/1000 tons, ANP of 5 tons/1000 tons, and an ANP:AGP ratio greater than 5.

On behalf of IMMC, McClelland (2010) performed ABA (Modified Sobek) using one tailings sample (TP3 Tailings) and one waste rock sample (Dev. Rock-1105). McClelland (2010) reported that both samples had a net neutralizing potential and were not expected to produce acid in a natural weathering and oxidizing environment. ANP:AGP ratios were 130.8 and 33.3, respectively, for samples TP3 Tailings and Dev. Rock-1105. AGP was 1.3 and 2.2 tons $CaCO_3$/1000 tons, ANP was 170 and 73.3 tons $CaCO_3$/1000 tons, total sulfur was 0.06 and 0.10 % by weight, and pyritic sulfur was 0.04 and 0.07 % by weight, respectively, for the tailings and waste rock sample.

7.2.5 Cyanide

Cyanide data are presented in Table 2. Engeo (2007) contracted for cyanide analysis for 17 solid samples. Location TP19 had the only cyanide detections (0.64, <0.5 and 3.5 mg/kg, respectively). Reactive cyanide was not detected in either of the two samples analyzed for reactive cyanide (TP-19@1' and TP-19@5) above the laboratory reporting limit (0.5 mg/kg).

Vector (1993) contracted with Nevada Environmental Laboratory for analysis of seven tailings/soil samples for total cyanide (EPA Method 335.2), which was not detected above the RL of 1.0 mg/kg.

7.2.6 Asbestos

Naturally-occurring asbestos (NOA) may be present in the serpentinite bedrock underlying the western portion of the site and locations north of the site. Therefore asbestos may be present in some tailings on the site.

7.3 SURFACE WATER

As described above in Section 3.5 and as summarized in Table 4, Weston (2019 Sept) obtained grab surface water samples from 18 locations that were analyzed for dissolved (filtered) and total (unfiltered) metals concentrations. A total of 18 filtered (-F) samples and 18 unfiltered (-T) samples were obtained.

Water hardness was calculated for offsite background sample locations SW-01, SW-02 and SW-03 based on reported calcium and magnesium concentrations. No significant difference was observed between total and dissolved calcium and magnesium concentrations in the surface water samples. Hardness values ranged from 14.3 to 19.5 mg/L as $CaCO_3$. The average hardness value (16.9 mg/L as $CaCO_3$) was used to represent the receiving water hardness to calculate benchmark values that are hardness-dependent.

Discharge from the East Eureka Shaft to Wolf Creek upstream of the site is not evaluated as part of this PEA. Maximum dissolved metals concentrations detected in onsite surface water samples exceed the Secondary MCL for manganese and CTR values for copper, lead and mercury. Laboratory results for surface water are summarized in Table 4. Comparison of maximum concentrations detected at the eastern site boundary to maximum concentrations detected in onsite surface water yields the following notable observations:

<u>Arsenic</u>
The maximum detected Onsite Downstream arsenic concentration in surface water (1.5 ug/L) is lower than the MCL (10 ug/L) for arsenic in drinking water. Arsenic was not detected in Onsite Upstream surface water samples above the laboratory reporting limit (10 ug/L).

<u>Chromium</u>
The maximum Onsite Upstream chromium concentration (1.6 ug/L) and maximum Onsite Downstream chromium concentration (2.5 ug/L) are below the Primary MCL for chromium (50 ug/L).

<u>Cobalt</u>
The maximum Onsite Upstream cobalt concentration (1.3 ug/L) and maximum Onsite Downstream chromium concentration (6.1 ug/L) are below the Primary MCL for cobalt (50 ug/L).

<u>Copper</u>
The maximum Onsite Upstream copper concentration (2.3 ug/L) and maximum Onsite Downstream copper concentration (8.2 ug/L) exceed the CTR CCC, which is hardness-dependent (1.96 ug/L) but do not exceed the Primary MCL (1,300 ug/L) or Secondary MCL (1,000 ug/L).

<u>Lead</u>
The maximum Onsite Upstream lead concentration is 0.12 ug/L (trace detection), and the maximum Onsite Downstream lead concentration is 1.7 ug/L. The maximum Onsite Downstream concentration exceeds he CTR CCC, which is hardness-dependent (0.35 ug/L), but does not exceed the MCL (15 ug/L).

<u>Manganese</u>
The maximum Onsite Upstream concentration (320 ug/L, trace detection) and the maximum Onsite Downstream concentration (1,040 ug/L) exceed the Secondary MCL (50 ug/L).

<u>Mercury</u>
The maximum Onsite Downstream concentration (0.083 ug/L) exceeds the CTR Human Health (HH) benchmark (0.05 ug/L). Mercury concentrations in upstream surface water may also exceed the CTR HH benchmark, but comparison is not possible due to an elevated reporting limit (0.20 ug/L).

<u>Nickel</u>
The maximum Onsite Downstream concentration (12.0 ug/L) exceeds the CTR CCC, which is hardness-dependent (11.57 ug/L).This concentration was detected in an unfiltered sample; filtered nickel concentrations do not exceed the CTR CCC.

Vanadium

The maximum Onsite Downstream concentration (11.5 ug/L) is for an unfiltered sample. Filtered (dissolved) vanadium concentrations in Onsite Downstream surface water do not exceed the maximum Onsite Upstream concentration, nor do they exceed the Agricultural water quality objective (100 ug/L).

Zinc

The maximum Onsite Downstream concentration (18.0 ug/L) is lower than the CTR CCC, which is hardness-dependent (26.0 ug/L).

7.4 SEDIMENT

As described above in Section 3.5 and as summarized in Table 5, Weston (2019 Sept) obtained grab sediment samples from eight onsite locations that were analyzed for total CAM 17 metals concentrations. Arsenic (46.6 mg/kg), lead (349 m/kg) and mercury (4.6 mg/kg) were detected in one of the four onsite samples (S-16) at concentrations above site background. The sediment sample appears to be mine tailings, and the detected total metals concentrations are consistent with the range of concentrations detected in mine tailings at the site.

7.5 SUMMARY OF DATA VALIDATION

Data validation for NV5 (2019) soil sampling and analysis is summarized in Appendix F. Data validation for previous investigations by others is summarized in Section 3.5 within the subsections for each of the previous investigations. NV5 (2019) data and previous investigation data were accepted for use in the risk assessment, with the exception of data associated with IMMC (2005, 2004) and Anderson (1989). These unvalidated data are used qualitatively to develop the conceptual model and support the general spatial distribution of contaminants on the site but are not used in the statistical analysis or risk assessment.

Pursuant to DTSC comments (March 9, 2020) on the Draft PEA (December 12, 2019), for duplicate samples, the result with the highest concentration was used to ensure that remedial decisions for the site are conservative. Results for co-located duplicate samples obtained by Weston (2019) and NV5 (2019), the lower concentration for each metal was culled prior to statistical analysis and risk assessment.

Summary statistics for selected total metals concentrations in solid samples are presented below, with and without the unvalidated data. Data with reporting limits exceeding site values, and non-detect data without a reporting limit, are not included in either data set. The summary statistics presented below include co-located field duplicate results. Summary statistics for the risk assessment are presented in Appendix H, Tables 1a through 1j. The exposure point concentrations presented in Appendix H are generally higher than the UCL values listed in the table below because the lower concentrations for duplicate samples were culled prior to the statistical evaluation presented in Appendix H.

Summary Statistics for Metals Concentrations in Solid Samples

Constituent/ Parameter	All Validated Site Data			All Site Data		
	As	Pb	Hg	As	Pb	Hg
Population	152	152	151	218	218	217
Detections	132	127	129	187	193	195
Max Non-Detect	10	10	1.0	10	10	1.0
Min Non-Detect	0.12	0.18	0.10	0.12	0.18	0.10
% Non-Detect	13.2	16.5	14.6	14.2	11.5	10.1
Minimum[1]	<0.12	<0.18	<0.1	<0.12	<0.18	<0.1
Maximum[1]	4,050	835	57.4	4,050	35,111	57.4
Mean Detect	113.6	66.7	2.58	113.2	301	3.36
SD[2]	417	126	7.00	415	2,535	7.52
CV[2]	3.67	1.89	2.71	3.67	8.41	2.24
Distribution[2]	Approx. Lognor-mal	Approx. Lognor-mal	Lognor-mal	Approx. Lognor-mal	None	Lognor-mal
UCL Method[2]	KM H-UCL	KM H-UCL	KM H-UCL	KM H-UCL	95% KM UCL[3]	KM H-UCL
UCL Value[2]	123	110	2.98	124	972	4.27

Notes:
1 Metals concentrations in solid samples are presented in milligrams per kilogram (mg/kg)
2 Distribution, UCL method, and CV, SD, UCL calculations by ProUCL 5.1 (USEPA, 2016 May)
3 95% KM (Chebyshev) UCL
< = constituent not detected above the listed laboratory limit
CV = coefficient of variation
H-UCL = UCL based upon Land's H-statistic
KM = Kaplan-Meier
KM (Chebyshev) = UCL based upon KM estimates using the Chebyshev inequality
SD = standard deviation
UCL = upper confidence limit on the arithmetic mean

7.6 BACKGROUND SOIL METALS EVALUATION

For the purposes of risk assessment, it is useful to distinguish between background metals concentrations occurring naturally in soil and elevated concentrations resulting from past waste disposal or releases of hazardous substances to the environment. According to the HERO HHRA Note No. 3 (DTSC, 2019 Apr), "HERO strongly recommends consideration of site-specific background concentrations of inorganic constituents."

DTSC (1997) provides a framework in which risk assessors may identify background metals concentrations. Pursuant to DTSC (2019 Oct) risk assessment guidance "risk assessments should eliminate from consideration those whose range of concentrations falls within the range of local ambient conditions." To do this, the local ambient data set may be defined by pooling all site data and determining ambient conditions in the presence of possible contamination. DTSC (1997) describes two methods of comparison:

1. Comparison of all detected site concentrations for a given metal to a single concentration representative of the upper range of local ambient conditions; and
2. Comparison of mean site concentrations for a given metal to mean ambient concentrations using the Wilcoxon Rank Sum test, a simple non-parametric statistical technique.

The two methods may be used to compare both high-end concentrations and mean concentrations to determine whether impacts exist.

ProUCL Version 5.1 (USEPA, 2016 May) was used to perform outlier tests on the metals data and to prepare box plots and normality plots (Q-Q Plots). Based on the outlier test results and visual interpretation of the plots, the datasets were culled so that only a single population nearest the graphical X, Y origin is used to represent background conditions. ProUCL was then used to perform background threshold value (BTV) statistics on the culled datasets.

Statistical evaluation of site soil metals data is summarized below. ProUCL 5.1 (USEPA, 2016 May) worksheets, statistical tests, plots and BTV statistics are presented in Appendix G. Statistical evaluation is summarized in Appendix G Tables 1a through 1f, respectively, for the entire site, the background population, and the assessment areas (WTP, ETP, WTP-N and ETP-E). The background population is described in Appendix H Table 1b.

7.6.1 Antimony

Antimony was detected in 74 of 122 solid samples at concentrations up to 10.5 mg/kg. Practical Quantitation Limits (PQLs) ranged from 2 to 100 mg/kg, although non-detect data with PQLs higher than the range of site values were not used. The linear quantile-quantile (Q-Q) plot suggests a single population of data. The BTV for antimony is based on the upper range of background concentrations (10.5 mg/kg). The detected concentrations are less than the USEPA Regional Screening Level (RSL) for antimony in commercial soil (470 mg/kg) and residential soil (31 mg/kg). Antimony does not occur above the site background range and is not considered a COC.

7.6.2 Arsenic

Arsenic was detected in 132 of 152 solid samples at concentrations ranging from <0.12 to 4,050 mg/kg. PQLs ranged from 0.12 to 10 mg/kg. Summary statistics for the soil arsenic data set for the entire Site are presented in Appendix H Table 1a. The data follow an approximate lognormal distribution. The range of concentrations, coefficient of variation, and Q-Q plots suggest multiple populations. Arsenic is considered a COC.

<u>Background Soil Arsenic Population, Entire Site</u>

Inspection of the Q-Q plots for non-transformed data indicates an inflection point at a soil arsenic concentration of 19 mg/kg. The Q-Q plot for soil arsenic concentrations below the inflection point is linear, indicating a single population nearest the origin. Rosner's Outlier Test identified no potential outliers for the 5% and 1% significance levels for arsenic data less than 19 mg/kg. Pursuant to DTSC (1997, 2009) guidance, this population is considered to be representative of background soil arsenic conditions for the Site. Summary statistics for the background soil arsenic population are presented in Appendix H Table 1b.

Per DTSC (1997), data drawn from just one population will typically display a range of detected concentrations of no more than two orders of magnitude and a coefficient of variation (CV) no greater than 1. The background soil arsenic data set consists of arsenic concentrations for 63 soil samples with a concentration range of <0.5 to 18.6 mg/kg, a mean of 9.17 mg/kg, a standard deviation of 4.77, and a CV of 0.52.

Probability plots were constructed for non-transformed data (Appendix G). The non-transformed probability plot for arsenic concentrations displays a normal, linear distribution up to approximately 19 mg/kg.

Pursuant to DTSC comments (March 9, 2020) on the Draft PEA (December 12, 2019), for duplicate samples, the lower concentration for each metal was culled prior to statistical analysis and risk assessment. The culled dataset (n = 63) has a 95% Upper Tolerance Level (UTL) of 18.0 mg/kg), which is used to represent the upper range of background soil arsenic concentrations.

Background Soil Arsenic Population, South Idaho Location

Additional background evaluation was performed for the South Idaho Location, which is located in the southeastern corner of the site. The Q-Q plot (Appendix G) is linear, indicating a single population. Dixon's Outlier Test (Appendix G) identifies no potential outliers for 1%, 5% and 10% significance levels. Pursuant to DTSC (1997, 2009) guidance, this population is considered to be representative of background soil arsenic conditions for the South Idaho Location.

Per DTSC (1997), data drawn from just one population will typically display a range of detected concentrations of no more than two orders of magnitude and a coefficient of variation (CV) no greater than 1. As summarized in Appendix H Table 1i, the soil arsenic data set for the South Idaho Location consists of arsenic concentrations for 12 soil samples with a detected concentration range of 3.3 to 33 mg/kg, a mean of 18.8 mg/kg, a standard deviation of 10.1, and a CV of 0.538.

7.6.3 Barium

Barium was detected in 119 of 122 solid samples at concentrations ranging from <20 to 146 mg/kg. The mean concentration is 23.0 mg/kg. Dixon's Outlier Test detected one outlier (146 mg/kg) at 5% significance level. The remaining barium detections range up to 90.8 mg/kg. The data appear gamma distributed at 5% significance level. Barium concentrations detected in site soil are less than the RSL for barium in commercial soil (220,000 mg/kg) and residential soil (15,000 mg/kg). Based on the single outlying value (146 mg/kg) barium is considered a COC.

7.6.4 Beryllium

Beryllium was detected in 8 of 122 solid samples at concentrations ranging from <0.03 to 1.0 mg/kg. The mean detected concentration (for the eight detections) is 0.45 mg/kg. The data do not follow a discernable distribution at the 5% significance level based on the Shapiro-Wilk or Lilliefors normality tests. The BTV for beryllium is based on the upper range of background concentrations (1.0 mg/kg). Beryllium concentrations detected in site soil are less than the DTSC-SL for beryllium in commercial soil (210 mg/kg) and residential soil (3 mg/kg). Beryllium does not occur above the site background range and is not considered a COC.

7.6.5 Cadmium

Cadmium was detected in 107 of 122 solid samples at concentrations ranging from <0.5 to 24.2 mg/kg. Several outlier concentrations (3 mg/kg and greater) were detected in solid samples. The Q-Q plot suggests two populations of data, with the population nearest the origin of up to approximately 2.4 mg/kg. The BTV for cadmium is based on the 95% UTL (2 mg/kg). The cadmium BTV is less than the DTSC-SL for cadmium in commercial soil (7.3 mg/kg) and residential soil (5.2 mg/kg). Cadmium is considered a COC.

7.6.6 Chromium

Chromium (total) was detected in 152 of 152 solid samples at concentrations ranging from 11 to 1,160 mg/kg. The mean concentration is 238 mg/kg. The highest concentration (1,160 mg/kg) and second highest concentration (980 mg/kg) are identified as outliers. After culling the outliers, ProUCL 5.1 (USEPA, 2016 May) determines that the data do not follow a discernable The BTV for chromium is based on the 95% UTL (625 mg/kg). Chromium concentrations detected in site soil are less than the RSL for total chromium in commercial soil (1,800,000 mg/kg) and residential soil (36,000 mg/kg). Chromium is considered a COC.

7.6.7 Cobalt

Cobalt was detected in 128 of 132 solid samples at concentrations ranging from 7.3 to 263 mg/kg. The mean detected concentration is 37.6 mg/kg. Dixon's Outlier Test detected potential outliers at the 5% significance level. The culled dataset ranges up to 87 mg/kg and follows an approximate lognormal distribution at 5% significance level. The Q-Q plot suggests two populations of data. The BTV for cobalt is based on the 95% UTL of the background population (68 mg/kg). The cobalt BTV exceeds the RSL for cobalt in residential soil of 23 mg/kg, but is less than the RSL for cobalt in commercial/industrial soil of 350 mg/kg. Cobalt is considered a COC.

7.6.8 Copper

Copper was detected in 152 of 152 solid samples at concentrations ranging from 8.0 to 784 mg/kg. The mean concentration is 104 mg/kg. The data do not follow a discernable distribution at 5% significance level based on the Shapiro-Wilk test. The Q-Q plot suggests at least two populations of data. The BTV for copper is based on the 95% UTL of the background population (160 mg/kg). All site soil copper concentrations are less than the RSL for copper in residential soil (3,100 mg/kg). Copper is considered a COC.

7.6.9 Lead

Lead was detected in 127 of 152 solid samples at concentrations ranging from <0.18 to 835 mg/kg. The mean concentration is 66.7 mg/kg. The data follow an approximate lognormal distribution at 5% significance level. The Q-Q plot suggests at least two populations of data. The BTV for lead is based on the 95% UTL of the background population (46.7 mg/kg). Lead concentrations in some solid samples exceed the DTSC-SL for lead in commercial soil (320 mg/kg). Lead is considered a COC.

7.6.10 Mercury

Mercury was detected in 129 of 151 solid samples at concentrations ranging from less than 0.10 to 57.4 mg/kg. The mean detected concentration is 2.58 mg/kg. The data follow lognormal distribution. A Q-Q plot suggests an inflection point at approximately 0.4 mg/kg. The population nearest the origin follows an approximate normal distribution at 5% significance level. The BTV for lead is based on the 95% UTL of the background population (0.4 mg/kg). Multiple mercury concentrations in solid samples exceed the DTSC-SL for mercury in commercial soil (4.5 mg/kg). Mercury is considered a COC.

7.6.11 Molybdenum

Molybdenum was detected in 33 of 74 solid samples at a concentrations ranging from less than 0.12 to 16 mg/kg. The maximum detected value (16 mg/kg) is considered a potential outlier at 5% significance level. The BTV for molybdenum is based on the 95% UTL for the background population (10 mg/kg). The RSL for molybdenum in residential soil is 390 mg/kg. Molybdenum is not considered a COC.

7.6.12 Nickel

Nickel was detected in 152 of 152 solid samples at concentrations ranging from 18 to 933 mg/kg. The mean concentration is 205 mg/kg. Dixon's Outlier Test detected six potential outliers at concentrations above 632 mg/kg. The culled data follow a lognormal distribution at 5% significance level based on the Shapiro-Wilk normality test. The linear Q-Q plot suggests a single population of data. The BTV for nickel is based on the 95% UTL of the background population (480 mg/kg). The nickel BTV is lower than the DTSC-SL for nickel in residential soil (490 mg/kg) and the DTSC-SL for nickel in commercial/industrial (3,100 mg/kg). Nickel is considered a COC based on the six outlying concentrations above 632 mg/kg.

7.6.13 Selenium

Selenium was detected in 59 of 122 solid samples at concentrations ranging from less than 0.12 to 12 mg/kg. The mean detected concentration is 3.29 mg/kg. The three highest detected concentrations (up to 12 mg/kg) are potential outliers. Excluding the outliers, the data follow an approximate lognormal distribution. Excluding the three outliers the linear Q-Q plot suggests a single population of data. The BTV for selenium is based on the 95% UTL for the background population (6.3 mg/kg). The selenium concentrations detected in site soil are less than the RSL for selenium in residential soil (390 mg/kg). Selenium is not considered a COC.

7.6.14 Silver

Silver was detected in 47 of 121 solid samples at concentrations ranging from less than 0.4 to 9.8 mg/kg. The mean detected concentration is 1.62 mg/kg. The two highest detected concentrations (up to 9.8 mg/kg) are potential outliers. Excluding the potential outliers, the linear Q-Q plot suggests a single population of data. The BTV for silver is based on the 95% UTL for the background population (3.9 mg/kg). The detected silver concentrations are less than the RSL for silver in residential soil of 390 mg/kg. Silver is not considered a COC.

7.6.15 Thallium

Thallium was detected in 7 of 122 solid samples at concentrations ranging from less than 0.38 to 67 mg/kg. The seven detected concentrations (up to 67 mg/kg) are outliers and are associated with previous investigation by Vector (1993). Thallium was not detected in investigations by others. No BTV is established for the remaining non-detect data. The RSL for thallium in residential soil is 0.78 mg/kg, and the RSL for thallium in commercial soil is 12 mg/kg. Thallium is considered a COC based on the anomalous detections by Vector (1993).

7.6.16 Vanadium

Vanadium was detected in 122 of 122 solid samples at concentrations ranging from 2.6 to 208 mg/kg. The mean detected concentration is 60.6 mg/kg. Rosner's Outlier Test detected one potential outlier (208 mg/kg) at 5% significance level. The data follow lognormal distribution at the 5% significance level. The Q-Q plot suggests a single population of data. The BTV for vanadium is based on the 95% UTL for the background population (132 mg/kg). The vanadium concentrations detected in site soil are less than the DTSC-SL for vanadium in residential soil of 390 mg/kg. Vanadium is considered a COC based on the single anomalous detection.

7.6.17 Zinc

Zinc was detected in 132 of 132 solid samples at concentrations ranging from 2.6 to 160 mg/kg. The mean detected concentration is 51.9 mg/kg. The data are non-parametric, and the Q-Q plot suggests multiple populations. Data ranging up to 106 mg/kg follow an approximate normal distribution. All site soil zinc concentration are less than the RSL for zinc in residential soil of 23,000 mg/kg. The 95% UTL for the background population is 91 mg/kg. Zinc is considered a COC.

7.6.18 Cyanide

Cyanide (CN) was detected in two of 22 solid samples at concentrations of 3.5 and 0.64 mg/kg. Cyanide is considered a COC based on the two detections.

8 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment (HHRA) was performed in general accordance with guidelines set forth in the DTSC (2019 Oct) HHRA guidance. HHRA methodology and results are summarized below.

8.1 EXPOSURE PATHWAYS AND MEDIA OF CONCERN

A site conceptual model (SCM) is described in Section 5, and an SCM diagram is presented as Figure 5. Exposure media for the site are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of airborne particulates and volatile mercury originating from impacted soil. Groundwater and surface water pathways are not considered in the human health risk assessment. A water quality evaluation is presented in Section 10.

8.2 EXPOSURE CONCENTRATIONS AND CHEMICAL GROUPS

The site is impacted by inorganics associated with mining waste. No other COCs have been identified.

Exposure Point Concentrations (EPCs) are generally represented by a reasonable maximum exposure (RME) concentration, using the 95% upper confidence limit (95% UCL) of the arithmetic mean COC concentration, as determined using the latest version of ProUCL (Version 5.1; USEPA, 2016 May). Statistical calculations are summarized in Appendix G. When UCL calculations are not possible based on a limited number of detections, the maximum detected concentration is used as the EPC.

An authoritative rather than random soil sampling approach was employed for the April 2019 USEPA site inspection and for previous investigations performed by others. Based on the authoritative sampling approach, there are inherent limitations to the data usability for statistical analysis.

8.3 CONSTITUENTS OF CONCERN

Statistical evaluation (Section 7.6) of all validated site data (Appendix H Table 1a) and comparison to background data (Appendix H Table 1b) identified the following constituents of concern (COCs):

- Arsenic (As)
- Barium (Ba)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Copper (Cu)
- Lead (Pb)
- Mercury (Hg)
- Molybdenum (Mo)
- Nickel (Ni)
- Selenium (Se)
- Silver (Ag)
- Thallium (Tl)
- Vanadium (V)
- Zinc (Zn)
- Cyanide (CN)

COCs are presented in Appendix H Tables 2a through 2i. Molybdenum, selenium and silver are identified as COCs based on one to three outlying values in the Eastern Tailings Pond (ETP).

Thallium is identified as a COC based on anomalous thallium concentrations detected by Vector (1993).

8.4 ASSESSMENT AREAS

Approximately 37.1 acres of the 56.4-acre site are occupied by former tailings ponds, which are separated into two primary assessment areas: Eastern Tailings Pond (ETP) and Western Tailings Pond (WTP). The ETP is located closer to the historical off-site gold ore processing facility and was reportedly constructed first, during the early days of the mining operation when the mercury amalgamation process was used to recover gold. The WTP was reportedly constructed later, when the cyanide recovery process was used to recover gold.

Although the ponds were reportedly constructed at different times, the metals concentrations and distribution within the ETP and WTP are similar. This is likely because the tailings were transported by surface water from the ETP into the WTP, and because some of the older, mercury-treated tailings were excavated from the ETP for additional gold extraction by the cyanide recovery process, and then placed in the WTP.

The elevated metals concentrations in tailings are generally confined to the older, deeper portions of the tailings ponds: the eastern portion of the eastern pond (ETP-E) and the northern portion of the western tailings pond (WTP-N) including its northern berm. Metals concentrations in the shallow tailings deposits located within the remaining portions of the tailings ponds (ETP Remainder and WTP Remainder) are generally lower, with the exception of the hot spots identified in Section 8.5.

The South Idaho Location (SIL) is located to the southeast of the tailings ponds and contains shallow mine waste deposits associated with historical mining operations at the South Idaho Shaft location. Elevated metals concentrations were not identified at the Hap Warnke Lumber Mill (HWLM), located in the northeastern corner of the site. Assessment area characteristics are summarized in the following table.

Assessment Areas

Assessment Area	Location	Description	Size (acres)	Estimated Area of Affected Soil (acres)	Estimated Quantity of Affected Soil (cubic yards)
ETP	Eastern Tailings Pond, Entire Area	Tailings and waste rock	21.6	21.6	120,000
ETP-E	The older, deeper, eastern portion of the ETP adjacent to the eastern site boundary	Deeper tailings and waste rock	7.5	7.5	46,000
ETP Remainder	ETP not including ETP-E	Tailings and waste rock at ground surface	14.1	14.1	74,000
WTP	Western Tailings Pond, Entire Areas	Tailings and waste rock	15.5	15.5	143,000
WTP-N	The older, deeper, northern portion of the WTP adjacent to the northern berm	Deeper tailings and waste rock	5.4	5.4	82,000
WTP Remainder	WTP not including WTP-N	Tailings and waste rock at ground surface	10.1	10.1	61,000
SIL	South Idaho Location (former location of South Idaho Shaft)	Tailings at ground surface	1.9	1.9	8,000
HWLM	Hap Warnke Lumber Mill (northeast corner of site)	Lumber mill, intermittently operated	1.3	0	0

Statistical summaries are presented in Appendix H Tables 1a through 1j for the entire site, the background population, and the individual assessment areas and subareas:

- Table 1a – All Validated Site Data
- Table 1b – All Validated Site Background Data
- Table 1c – Eastern Tailings Pond (ETP)
- Table 1d – Eastern Tailings Pond, Eastern Portion (ETP-E)
- Table 1e – Eastern Tailings Pond (ETP Remainder) not including ETP-E
- Table 1f – Western Tailings Pond (WTP)
- Table 1g – Western Tailings Pond, Northern Portion (WTP-N)
- Table 1h – Western Tailings Pond (WTP Remainder) not including WTP-N
- Table 1i – South Idaho Location (SIL)
- Table 1j – Hap Warnke Lumber Mill (HWLM)

COCs are identified in Appendix H Tables 2a through 2g for the entire site and the individual assessment areas. Metals and metalloids are considered COCs if the site concentrations exceed the site background range. The following metals are identified as COCs and are included in the risk characterization.

Constituents of Concern

Assessment Area	Reference Table	COCs
Entire Site	2a	As, Ba, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn, CN
ETP	2b	As, Ba, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn, CN
ETP-E	2c	As, Ba, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, Zn, CN
ETP Remainder, Excluding Hot Spots	2d	Cr, Co, Pb, Hg, Ni, V
WTP	2e	As, Ba, Cd, Cr, Co, Cu, Pb, Hg, Ni, Tl, Zn
WTP-N	2f	As, Ba, Cd, Co, Cu, Pb, Hg, Ni, Tl, Zn
WTP Remainder, Excluding Hot Spots	2g	Cr, Hg, Zn
SIL	2h	Cd, Pb, Hg, Se, V, Zn
HWLM	2i	Hg

Arsenic is not considered a COC for HWLM because the detected concentrations are lower than the site-wide arsenic BTV. Arsenic is not considered a COC for ETP Remainder and WTP Remainder if hot spots are removed, as discussed below in Section 8.5. Arsenic is not considered a COC for SIL because the detected concentrations are representative of background conditions at SIL.

8.5 HOT SPOT ASSESSMENT

The following anomalous arsenic and thallium detections in ETP Remainder and WTP Remainder are considered hot spots. The statistical evaluation and risk assessment are performed with and without the anomalous arsenic and thallium data for ETP Remainder and WTP Remainder. Remedial action (e.g., onsite consolidation) is required at the arsenic hot spot locations, and verification sampling and analysis is required to confirm the success of the hot spot removal.

Additional testing is required at the thallium hot spots to validate the anomalous thallium concentrations detected by Vector (1993). If the elevated thallium concentrations are detected, then remedial action (e.g., onsite consolidation) is required at these locations.

An anomalously low pH value (3.7) was detected at location TP19 in ETP-E. pH values for three samples obtained from this location (TP19@1’, TP19@4’ and TP19@5’) were 5.55, 6.29 and 3.74, respectively. Location TP19 also had the sole cyanide detections at the site. Sulfate concentrations (2,000 to 3,900 mg/kg as SO_4) were also anomalously high at location TP19. Sulfide was not detected above the laboratory reporting limit of 10 mg/kg. Additional testing for total and DI-WET metals performed by NV5 (2020) at the TP19 location (IMM-T-37 and IMM-T-38) indicated that the mine waste is suitable for on-site consolidation. Additional pre-excavation testing is recommended at location TP19 for pH, ABA and cyanide prior to consolidation. Nickel exceeded the TTLC (2,000 mg/kg) and commercial DTSC-SL (3,000 mg/kg) in one sample (IdT4-6; IMMC 2005 Nov).

<u>Hot Spots</u>

<table>
<tr><th>Assessment Area</th><th>Reference</th><th>Location</th><th>Depth (feet)</th><th>COC</th><th>Concentration (mg/kg)</th></tr>
<tr><td rowspan="7">ETP Remainder</td><td rowspan="2">NV5 (2019), Weston (2019)</td><td>IMM-T-13</td><td>0.0</td><td>As</td><td>44, 86.8</td></tr>
<tr><td>IMM T-16</td><td>0.0</td><td>As</td><td>30</td></tr>
<tr><td rowspan="4">Vector (1993)</td><td rowspan="2">SB-7</td><td>2.5</td><td>As</td><td>60</td></tr>
<tr><td>4.5</td><td>As</td><td>72.5</td></tr>
<tr><td>SB-2</td><td>3.0</td><td>Tl</td><td>17</td></tr>
<tr><td>SB-9</td><td>2.5</td><td>Tl</td><td>59</td></tr>
<tr><td>IMMC (2005)</td><td>IDT4-6</td><td>0-1</td><td>Ni</td><td>3,370</td></tr>
<tr><td rowspan="3">WTP Remainder</td><td>Weston (2019)</td><td>IMM-T-27</td><td>0.0</td><td>As</td><td>25</td></tr>
<tr><td rowspan="2">Vector (1993)</td><td rowspan="2">SA-4</td><td rowspan="2">6.5</td><td>As</td><td>27</td></tr>
<tr><td>Tl</td><td>33</td></tr>
<tr><td rowspan="4">ETP</td><td rowspan="4">Engeo (2007)</td><td rowspan="4">TP19</td><td rowspan="4">0 – 6.0</td><td colspan="2">pH</td></tr>
<tr><td colspan="2">ABA</td></tr>
<tr><td colspan="2">DI-WET Metals</td></tr>
<tr><td colspan="2">Cyanide</td></tr>
</table>

8.6 EXPOSURE PARAMETERS

Unrestricted (residential) land use is considered, as are other potential exposure scenarios including industrial, commercial indoor and construction worker exposure.

8.6.1 Residential Land Use

Exposure parameters for residential land use are adopted from the *PEA Guidance Manual* (DTSC, 2015) as updated by HERO HHRA Note No. 1 (DTSC, 2019 Apr) and Note No. 10 (DTSC, 2019 Feb), pursuant to guidance presented in *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (RAGS Part E, Supplemental Guidance for Dermal Risk Assessment; USEPA, OSWER 9285.7-02EP; July 2004) and *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, OSWER 9355.4-24; December 2002). Exposure parameters are summarized below:

- Child exposure is considered. Cadmium hazard is evaluated pursuant to guidelines set forth in HERO HHRA Note No. 3 (DTSC, 2019 Apr) considering 26-year adult exposure.
- Exposure frequency is 350 days per year.
- Body weight is 15 kilograms (kg) for child and 80 kg for adult.
- The incidental soil ingestion rate is 200 milligrams per day (mg/day) for child and 100 mg/day for adult. Pica is not considered.
- The inhalation rate is 10 cubic meters per day (m^3/day) for child and 20 m^3/day for adult.
- Averaging time is 70 years for carcinogenic effects.

- Exposure duration for adults is 20 years. Averaging time for non-carcinogenic effects is equal to the exposure duration.
- Exposed skin surface area is 2,900 square centimeters (cm^2) for children and 6,032 cm^2 for adults.
- Dermal adherence factor is 0.2 milligrams per square centimeter (mg/cm^2) for children and 0.07 mg/cm^2 for adults.
- Particulate emission factor (PEF) is 1.36×10^9 cubic meters per kilogram (m^3/kg).

8.6.2 Industrial Land Use

Exposure parameters for industrial land use are adopted from HERO HHRA Note No. 1 (DTSC, 2019 Apr):

- Adult exposure is considered.
- Exposure frequency is 250 days per year.
- Body weight is 80 kg.
- The incidental soil ingestion rate is 100 mg/day.
- The inhalation rate is 14 m^3/day.
- Averaging time is 70 years for carcinogenic effects.
- Exposure duration is 25 years.
- Averaging time for non-carcinogenic effects is equal to the exposure duration.
- Exposed skin surface area is 6,032 cm^2.
- Dermal adherence factor is 0.2 mg/cm^2.
- PEF is 1.36 x 109 m^3/kg.

8.6.3 Commercial Indoor Worker

Exposure parameters for the commercial indoor worker are adopted from RAGS (USEPA, 2004) and Supplemental Guidance (USEPA, 2002), and are identical to the parameters set forth above for industrial land use, with the following exceptions:

- Incidental soil ingestion rate is 50 mg/day instead of 100 mg/day.
- Exposed skin surface area is 3,300 cm^2 instead of 6,032 cm^2.

8.6.4 Construction Worker

Exposure parameters for the construction worker are adopted from HERO HHRA Note No. 1 (DTSC, 2019 Apr). Considering the expected duration of the cleanup (approximately one month), the default exposure duration (one year) used in this scenario is conservative.

- Adult exposure is considered.
- Exposure duration is one year.
- Exposure frequency is 250 days per year.
- Body weight is 80 kg.
- Incidental soil ingestion rate is 330 mg/day.
- Inhalation rate is 20 m^3/day for the eight-hour workday.
- Averaging time is 70 years for carcinogenic effects.
- Averaging time for non-carcinogenic effects is equal to the exposure duration.

- Exposed skin surface area is 6,032 cm^2.
- Dermal adherence factor is 0.08 mg/cm^2.
- PEF is 1.0 x 106 m^3/kg.

8.7 TOXICITY VALUES

Toxicity values and references are listed in Table 6.

8.8 RISK CHARACTERIZATION

Risk and hazard calculations are performed using the following equations for non-volatile constituents. For residential land use, hazard is evaluated for child exposure except for cadmium (DTSC, 2016). Calculations are summarized in the tables in Appendix H.

$Risk_{soil} = SF_o \times C_s \times [((IR_{s,child} \times EF \times ED_{child} \times 10^{-6}\ kg/mg) / (BW_{child} \times AT \times 365\ days/yr)) + ((SA_{child} \times AF \times ABS \times EF_{child} \times ED_{child} \times 10^{-6}\ kg/mg) / (BW_{child} \times AT \times 365\ days/yr)) + ((IR_{s,adult} \times EF \times ED_{adult} \times 10^{-6}\ kg/mg) / (BW_{adult} \times AT \times 365\ days/yr)) + ((SA_{adult} \times AF \times ABS \times EF_{adult} \times ED_{adult} \times 10^{-6}\ kg/mg) / (BW_{adult} \times AT \times 365\ days/yr))]$

$Hazard_{soil} = (C_s / RfD_o) \times [((IR_s \times EF \times ED \times 10^{-6}\ kg/mg) / (BW \times AT \times 356\ days/yr)) + ((SA \times AF \times ABS \times EF \times ED \times 10^{-6}\ kg/mg) / (BW \times AT \times 365\ days/yr))]$

$Risk_{air} = SF_i \times C_a \times [((IR_{child} \times EF \times ED_{child}) / (BW_{child} \times AT \times 365\ days/yr)) + ((IR_{adult} \times EF \times ED_{adult}) / (BW_{adult} \times AT \times 365\ days/yr))]$

$Hazard_{air} = (C_a / RfD_i) \times (IR \times EF \times ED) / (BW \times AT \times 365\ days/yr)$

Where:

ABS = absorption fraction of chemical from soil
AT = averaging time, years
AF = soil to skin adherence factor, mg/cm^2
BW = body weight, kg
C_a = concentration in air, mg/m^3 ($C_a = C_s$ / PEF)
C_s = concentration in soil, mg/kg
ED = exposure duration, years
EF = exposure frequency
PEF = particulate emission factor, m^3/kg
$Hazard_{air}$ = non-cancer chronic health hazard for air pathways
$Hazard_{soil}$ = non-cancer chronic health hazard for soil pathways
IR_a = inhalation rate, m^3/day
IR_s = incidental soil ingestion rate, mg/day
SA = exposed skin surface area, cm^2
SF_i = inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$
SF_o = oral cancer slope factor, $(mg/kg\text{-}day)^{-1}$
RfD_i = inhalation reference dose, mg/kg-day
RfD_o = oral reference dose, mg/kg-day

$Risk_{air}$ = lifetime excess cancer risk for air pathways

$Risk_{soil}$ = lifetime excess cancer risk for soil pathways

Pursuant to HHRA Note No. 3 (DTSC, 2019 Apr) and HHRA Note No. 6 (DTSC, 2016 Sept), USEPA's relative bioavailability (RBA) factor (0.6) is used for ingestion of soil-borne arsenic.

For volatile constituents (i.e., mercury) in soil, the following methodology is used to assess chronic health hazard related to air pathways pursuant to HERO HHRA Note No. 3 (DTSC, 2019 Apr).

$$Hazard_{air} = (C_a / RfC_i) \times (EF_i \times ED \times ET) / (AT_{nc} \times 24 \text{ hr/day} \times 365 \text{ day/yr})$$

Where:

RfC_i = reference concentration for inhalation exposure, mg/m^3 (mercury RfCi = 3.0E-05 mg/m^3 as established by OEHHA and as listed in Table 6)

AT_{nc} = averaging time for non-carcinogenic effects, years

C_a = concentration in air, mg/m^3 ($C_a = C_s / VF$)

VF = volatilization factor for soil, m^3/kg, as established by DTSC (2016) Table A-5 ($VF_{resident}$ = 3.52E+04 m^3/kg; VF_{worker} = 3.52E+04 m^3/kg)

C_s = concentration in soil, mg/kg

EF_i = exposure frequency for inhalation pathway, days/yr

ED = exposure duration, years

ET = exposure time, hr/day (24 hr/day for resident and 8 hr/day for worker)

8.8.1 Background Soil Arsenic Concentrations

This section estimates the risk (and hazard) associated with site-specific background soil arsenic. Background soil arsenic concentrations are described in Section 7.6.2.

For the tailings pond areas, an inflection point in the Q-Q plot (Appendix G) is observed at a soil arsenic concentration of 19 mg/kg, and values below the inflection point are considered to be representative of background. The data follow an approximate normal distribution, and the central tendency value is represented by the 95% KM(t) UCL (8.5 mg/kg). Based on the relatively small population of background soil arsenic data (n = 63) the 95% UTL (18.0 mg/kg) is used to represent the upper range of background soil arsenic concentrations. Statistics are summarized in Table 4b.

For the South Idaho Location (SIL), the Q-Q plot (Appendix G) is linear, indicating a single population up to 33 mg/kg. Dixon's Outlier Test (Appendix G) identifies no potential outliers for 1%, 5% and 10% significance levels. The data are distributed normally, and the central tendency value is represented by the 95% KM(t) UCL (23.0 mg/kg). The 95% UTL (33 mg/kg) is used to represent the upper range of background soil arsenic concentrations at the South Idaho Location. Statistics are summarized in Table 4g.

Hazard and risk associated with the UTL (upper range value) for background soil arsenic and the UCL (central tendency value) for background soil arsenic are summarized below.

Summary of Background Risk and Hazard, Constituents of Concern, Unrestricted Land Use

Tailings Ponds (All Data)	Background UCL	Background UTL
Soil arsenic concentration	8.5	18.0
Excess lifetime cancer risk	7.9 E-05	1.7 E-04
Non-cancer hazard index	21	45

South Idaho Location	Background UCL	Background UTL
Soil arsenic concentration	23.0	33.0
Excess lifetime cancer risk	2.1 E-04	3.0 E-04
Non-cancer hazard index	58	83

In the table below, background risk and hazard are compared to the risk and hazard due to contamination at the site. The "excess risk" values listed in the table below are equal to the site risk minus the background risk (central tendency value).

Summary of Background Risk and Hazard, Constituents of Concern, Unrestricted Land Use

Tailings Ponds (All Data)	Site, All COCs	Background As, UCL	Excess Risk/Hazard
Excess lifetime cancer risk	2.7 E-03	7.9 E-05	2.6 E-03
Non-cancer hazard index	740	21	719

South Idaho Location	Site, All COCs	Background As, UCL	Excess Risk/Hazard
Excess lifetime cancer risk	2.2 E-09	2.1 E-04	na[1]
Non-cancer hazard index	1.8	58	na[1]

Notes:

1 Arsenic is not considered a COC for the South Idaho Location based on background evaluation; therefore, calculation of excess risk is not applicable.

Site = Risk and hazard resulting from all site COCs based on 95% UCL values

Background = Risk and hazard resulting from 95% UCL value for background soil arsenic

Excess Risk/Hazard = Site Risk/Hazard – Background Risk/Hazard

8.8.2 Residential Land Use

Constituents of Concern

Human health risk and hazard under the standard unrestricted land use (residential) exposure scenario are characterized in Appendix H Tables 4a through 4k for all validated site data for the entire site, as well as for the individual assessment areas. For all assessment areas except the Hap Warnke Lumber Mill (HWLM), the chronic health hazard index (hazard, or HI) exceeds unity, and the lifetime excess cancer risk (risk) exceeds one-per million. Arsenic is the primary contributor to hazard and risk. Cobalt, mercury and thallium also contribute significantly to hazard, presenting hazard quotients greater than 1.0.

For the ETP Remainder including the arsenic and thallium hot spots, hazard is 100 and risk is 9.2 E-05. For the ETP Remainder excluding ETP-E and the hot spots described in Section 8.5, hazard is 2.7 (mercury HI = 1.9) and risk is less than one-per-million. For the WTP Remainder including the arsenic and thallium hot spots, hazard is 26 and risk is 7.7 E-05. For the WTP Remainder excluding WTP-N and the hot spots described in Section 8.5, hazard is less than one and risk is less than one-per-million.

Unrestricted Land Use, Constituents of Concern

All Validated Site Data	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**2.7 E-03**	1.9 E-07	**2.7 E-03**
Non-cancer hazard index	**740**	**14**	**720**

ETP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**5.2 E-03**	3.3 E-07	**5.2 E-03**
Non-cancer hazard index	**1400**	**23**	**1400**

ETP-E	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.1 E-02**	3.4 E-07	**1.1 E-02**
Non-cancer hazard index	**3200**	**44**	**3100**

ETP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**9.2 E-05**	3.4 E-08	**9.2 E-05**[1]
Non-cancer hazard index	**100**	**2.7**	**100**

WTP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.1 E-03**	1.5 E-07	**1.1 E-03**
Non-cancer hazard index	**300**	**7.6**	**290**

WTP-N	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.5 E-03**	2.0 E-07	**1.5 E-03**
Non-cancer hazard index	**430**	**13**	**420**

WTP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**7.7 E-05**	0.0 E+00	**7.7 E-05**
Non-cancer hazard index	**26**	0.6	**25**

SIL	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	2.2 E-09	2.2 E-09	na[1]
Non-cancer hazard index	**1.8**	**1.8**	na[1]

HWLM	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	0.0 E+00	0.0 E+00	na[1]
Non-cancer hazard index	0.64	0.64	na[1]

Notes:
1 Arsenic is not considered a COC for SIL and HWLM based on background evaluation; therefore, arsenic hazard and risk are not evaluated for these assessment areas. Background arsenic risk is discussed in Section 8.8.5.

All Detected Chemicals, Including Ambient Range

Appendix H Table 4j summarizes hazard and risk for all detected chemicals on the entire site, including ambient metals concentrations. Pursuant to guidelines set forth in HERO HHRA Note

No. 4 (DTSC, 2019), hazard and risk are calculated considering exposure to all detected chemicals, including those that are determined to be consistent with site-specific background or ambient concentrations. This information is intended to be useful for risk management decisions and to foster public transparency.

Unrestricted Land Use, All Detected Chemicals

All Validated Site Data	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	2.7 E-03	1.9 E-07	2.7 E-03
Non-cancer hazard index	740	14	720

As summarized above for all validated site data, the hazard index and cumulative risk are not significantly changed by inclusion of all detected chemicals. Arsenic remains the primary contributor to hazard and risk. The COCs cobalt, mercury and thallium also contribute significantly to hazard, presenting hazard quotients greater than 1.0. Chemicals not identified as COCs do not contribute significantly to hazard and risk.

8.8.3 Industrial Land Use

Human health hazard and risk are characterized under an industrial land use scenario in Appendix H Tables 5a through 5i. For all assessment areas except the South Idaho Location (SIL) and Hap Warnke Lumber Mill (HWLM), hazard exceeds unity and risk exceeds one-per million. Arsenic is the primary contributor to hazard and risk. Hazard quotients for mercury and thallium are also significant and exceed 1.0 for some assessment areas.

For the ETP Remainder and WTP Remainder (excluding ETP-E, WTP-N and the hot spots described in Section 8.5), hazard is less than one and risk is less than one-per-million.

Industrial Land Use, Constituents of Concern

All Validated Site Data	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**8.1 E-04**	6.5 E-08	**8.1 E-04**
Non-cancer hazard index	**69**	**1.4**	**68**

ETP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.6E-03**	1.1 E-07	**1.6 E-03**
Non-cancer hazard index	**140**	**2.7**	**130**

ETP-E	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**3.5 E-03**	1.2 E-07	**3.5 E-03**
Non-cancer hazard index	**300**	**5.1**	**290**

ETP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**1.7 E-05**	1.2 E-08	1.7 E-05
Non-cancer hazard index	**8.4**	0.5	**8.0**

WTP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**3.2 E-04**	5.2 E-08	**3.2 E-04**
Non-cancer hazard index	**28**	0.8	**27**

WTP-N	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**4.7 E-04**	6.8 E-08	**4.7 E-04**
Non-cancer hazard index	**41**	**1.6**	**39**

WTP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**1.5 E-05**	0.0 E+00	**1.5 E-05**
Non-cancer hazard index	**2.4**	0.1	**2.4**

SIL	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	7.7 E-10	7.7 E-10	na[1]
Non-cancer hazard index	0.4	0.4	na[1]

HWLM	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	0.0 E+00	0.0 E+00	na[1]
Non-cancer hazard index	0.1	0.1	na[1]

Notes:

1 Arsenic is not considered a COC for SIL and HWLM based on background evaluation; therefore, arsenic hazard and risk are not evaluated for these assessment areas. Background arsenic risk is discussed in Section 8.8.5.

8.8.4 Commercial Indoor Worker

Human health hazard and risk are characterized under a commercial indoor worker scenario in Appendix H Tables 6a through 6i. For all assessment areas except the South Idaho Location (SIL) and the Hap Warnke Lumber Mill (HWLM), hazard exceeds unity and risk exceeds one-per million. Arsenic is the primary contributor to hazard and risk. The hazard quotient for mercury exceeds 1.0 for some assessment areas.

For the ETP Remainder and WTP Remainder (excluding ETP-E, WTP-N and the hot spots described in Section 8.5), hazard is approximately one and risk is less than one-per-million.

Commercial Indoor Worker, Constituents of Concern

All Validated Site Data	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**4.2 E-04**	6.5 E-08	**4.2 E-04**
Non-cancer hazard index	**36**	1.0	**35**

ETP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**8.1 E-04**	1.1 E-07	**8.1 E-04**
Non-cancer hazard index	**71**	**2.2**	**69**

ETP-E	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.8 E-03**	1.2 E-07	**1.8 E-03**
Non-cancer hazard index	**160**	**3.9**	**150**

ETP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**8.7 E-06**	1.2 E-08	**8.7 E-06**
Non-cancer hazard index	**5.0**	0.5	**5.0**

WTP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.7 E-04**	5.2 E-08	**1.7 E-04**
Non-cancer hazard index	**15**	0.6	**14**

WTP-N	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**2.4 E-04**	6.8 E-08	**2.4 E-04**
Non-cancer hazard index	**22**	1.2	**20**

WTP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**7.4 E-06**	0.0 E+00	**7.4 E-06**
Non-cancer hazard index	**1.3**	0.1	**1.3**

SIL	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	7.7 E-10	7.7 E-10	na[1]
Non-cancer hazard index	0.3	0.3	na[1]

HWLM	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	0.0 E+00	0.0 E+00	na[1]
Non-cancer hazard index	0.1	0.1	na[1]

Notes:

1 Arsenic is not considered a COC for WTP Remainder, ETP Remainder, SIL and HWLM based on background evaluation; therefore, arsenic hazard and risk are not evaluated for these assessment areas. Background arsenic risk is discussed in Section 8.8.5.

8.8.5 Construction Worker

Human health hazard and risk are characterized under a construction worker scenario in Appendix H Tables 7a through 7i. For all assessment areas except the Hap Warnke Lumber Mill (HWLM), hazard exceeds unity. Risk exceeds one-per million for all assessment areas except the South Idaho Location (SIL) and HWLM. Arsenic is the primary contributor to hazard and risk. The hazard quotients for cobalt, mercury and thallium exceed 1.0 for some assessment areas. Risk for cobalt exceeds one-per-million for some assessment areas.

For the ETP Remainder (excluding ETP-E and the hot spots described in Section 8.5), hazard is 19 (nickel HI = 18) and risk is less than one-per-million. For the WTP Remainder (excluding WTP-N and the hot spots described in Section 8.5), hazard is less than one and risk is less than one-per-million.

Construction Worker, Constituents of Concern

All Validated Site Data	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**1.3 E-04**	5.0 E-06	**1.3 E-04**
Non-cancer hazard index	**280**	**25**	**250**

ETP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**2.6 E-04**	**8.8 E-06**	**2.5 E-04**
Non-cancer hazard index	**530**	**34**	**500**

ETP-E	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**5.6 E-04**	**9.2 E-06**	**5.5 E-04**
Non-cancer hazard index	**1100**	**42**	**1100**
ETP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**3.6 E-06**	9.2 E-07	**3.6 E-06**
Non-cancer hazard index	**47**	**28**	**47**
WTP	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**5.5 E-05**	**4.1 E-06**	**5.1 E-05**
Non-cancer hazard index	**120**	**19**	**100**
WTP-N	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	**7.9 E-05**	**5.3 E-06**	**7.4 E-05**
Non-cancer hazard index	**170**	**23**	**150**
WTP Remainder	All COCs	COCs Excluding As and Tl Hot Spots	As and Tl Hot Spots Only
Excess lifetime cancer risk	**2.3 E-06**	0.0 E+00	**2.3 E-06**
Non-cancer hazard index	**8.5**	0.1	8.4
SIL	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	6.0 E-08	6.0 E-08	na[1]
Non-cancer hazard index	**1.4**	**1.4**	na[1]
HWLM	All COCs	COCs Excluding Arsenic	Arsenic Only
Excess lifetime cancer risk	0.0 E +00	0.0 E +00	na[1]
Non-cancer hazard index	0.15	0.15	na[1]

Notes:

1 Arsenic is not considered a COC for WTP Remainder, ETP Remainder, SIL and HWLM based on background evaluation; therefore, arsenic hazard and risk are not evaluated for these assessment areas. Background arsenic risk is discussed in Section 8.8.5.

8.9 LEAD HAZARD ASSESSMENT

Lead hazards were assessed using the Lead Risk Assessment Spreadsheet Version 8 (LeadSpread 8; DTSC, 2011) for child exposure and the Modified USEPA Adult Lead Model (Modified ALM; DTSC, 2011) for adult exposure. LeadSpread and ALM worksheets are in Appendix I.

Calculations were performed using standard exposure parameters and the EPC concentrations (95% UCL concentrations) listed in Appendix H Tables 1a through 1g. Results are summarized below and in Appendix H Table 8.

Summary of Lead Hazard Assessment

Entire Site	95% UCL	Child[1]	Adult[2]	Max	Child[3]	Adult[4]
All validated soil lead data	112	**1.5**	0.2	835	**10.8**	**1.4**
ETP	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	271	**3.5**	0.4	835	**10.8**	**1.4**
ETP-E	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	244	**3.2**	0.4	835	**10.8**	**1.4**
ETP Remainder	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	33.5	0.4	0.1	86.2	**1.1**	0.1
WTP	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	68.0	0.9	0.1	290	**3.8**	0.5
WTP-N	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	103.6	**1.3**	0.2	290	**3.8**	0.5
WTP Remainder	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	12.3	0.2	0.0	24.9	0.3	0.0
South Idaho Location	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	34.7	0.5	0.1	51.0	0.7	0.1
Hap Warnke Lumber Mill	95% UCL	Child	Adult	Max	Child	Adult
All validated soil lead data	na	na	na	11.0	0.1	0.0

Notes:
1 90th percentile estimate of blood lead (ug/dl) for non-pica child based on 95% UCL
2 90th percentile estimate of blood lead (ug/dl) for adult worker based on 95% UCL
3 90th percentile estimate of blood lead (ug/dl) for non-pica child based on maximum detection
4 90th percentile estimate of blood lead (ug/dl) for adult worker based on maximum detection
UCL = upper confidence limit on the arithmetic mean soil lead detection (mg/kg)
Max = maximum detected soil lead concentration in the assessment area
mg/kg = milligrams per kilogram
ug/dl = micrograms per deciliter

As summarized above, the baseline central-tendency lead concentrations associated with the Eastern Tailings Pond (ETP) and the northern portion of the Western Tailings Pond (WTP-N) are not suitable for unrestricted land use. The central tendency lead concentrations for the WTP and the ETP Remainder (excluding ETP-E) are below 80 mg/kg. Central tendency and maximum detected soil lead concentrations in the WTP Remainder, South Idaho Location (SIL) and Hap Warnke Lumber Mill (HWLM) are below 80 mg/kg.

8.10 UNCERTAINTY ANALYSIS

Per OEHHA (2004), "systematic, logical and informed approaches to decision making about carcinogens in the environment call for quantitative assessments, because the absence of clearly definable thresholds does not permit identification of 'safe' levels of exposure.

Unfortunately, due to the frequent lack of sufficient data, assumptions have to be made in order to complete quantitative assessments of cancer risk."

Uncertainties include metals concentrations in waste and affected soil; the amount of exposure to waste and soil; the biological uptake of metals from waste and soil; and the toxicological effects of biologically available metals. Such uncertainty must be discussed so that the assessment does not result in a "higher degree of implied certainty in the overall assessment than is warranted" (OEHHA, 2004).

As a result of the uncertainties described below, confidence in the exposure assessment is considered low to moderate. Confidence in toxicity values range from low to high based on the data available for specific metals. This assessment assumes that soil arsenic is 60% bioavailable via ingestion, pursuant to DTSC (2016) guidance.

8.10.1 Sampling Uncertainty

Uncertainty related to contaminant concentrations in soil, as well as uncertainty related to the literature-derived exposure and toxicity parameters, contribute to the overall uncertainty of the risk assessment. Statistical analysis is performed as part of the risk assessment to develop a reasonable EPC for each COC. Confidence in a population mean and variance increases as the number of samples collected and analyzed increases. Based on the moderate number of samples and the authoritative sampling approach, confidence in the assessment is considered moderate.

Hazard and risk associated with thallium in soil is based on anomalous detections of thallium associated with a single investigation performed by Vector (1993). The thallium detections were not replicated in any of the other investigations. The Vector (1993) thallium data were conservatively included in the risk assessment, although their validity is suspect.

8.10.2 Model Uncertainty

The literature-derived exposure factors and toxicity factors used in the assessment were obtained with the goal of reducing uncertainty; however, limitations of existing data pertaining to activity patterns for future site occupants, as well as health effects from metals exposure, result in model uncertainty.

8.10.3 Laboratory Methods and Detection Limits

The metals concentrations generally exceed the corresponding laboratory detection limits. Therefore, detection limits are not expected to be a significant source of uncertainty. Non-detect data associated with previous investigations were culled when the quantification limit exceeded the typical range of site values.

8.10.4 Toxicity Values

Toxicity values are listed in Appendix H Table 3. When available, California toxicity values are used quantify risk and hazard. The California toxicity values are generally developed by OEHHA and are supported by HERO. When California toxicity values are not available, the risk assessment employs commonly-accepted federal toxicity criteria. The toxicity values are generally considered to be conservative with respect to estimation of risk and hazard.

8.11 CONCLUSIONS REGARDING HUMAN HEALTH RISK ASSESSMENT

Risk assessment findings for baseline conditions identified at each of the assessment areas are summarized below:

Summary of Human Health Risk Assessment

Exposure Scenario	**Unrestricted**		**Industrial**		**Commercial Indoor**		**Construction Worker**	
Assessment Area	HI >1	Risk >1E-06	HI >1	Risk >1E-06	HI >1	Risk >1E-06	HI >1	Risk >1E-06
ETP-E	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
ETP Remainder (without hot spots)	**yes**	no	no	no	no	no	**yes**	no
WTP-N	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
WTP Remainder (without hot spots)	no	no	no	no	no	no	no	no
SIL	**yes**	no	no	no	no	no	**yes**	no
HWLM	no	no	no	no	no	no	no	no

For the deeper, older sub-areas of the Eastern Tailings Pond (ETP-E) and Western Tailings Pond (WTP-N), the hazard index exceeds unity and the risk exceeds one-per million under all exposure scenarios.

The ETP Remainder (excluding ETP-E and the hot spots described in Section 8.5) is not suitable for unrestricted land use but is acceptable under the other exposure scenarios evaluated. The WTP Remainder (excluding WTP-N and hot spots described in Section 8.5) is acceptable under all exposure scenarios evaluated.

Arsenic is the primary contributor to hazard and risk associated with exposure to the mine tailings. Cobalt, mercury and thallium also contribute significantly to hazard, presenting hazard quotients greater than 1.0 for some assessment areas under some exposure scenarios. For the construction worker scenario, risk for cobalt exceeds one-per-million for some assessment areas.

Arsenic is not considered a constituent of concern for the South Idaho Location (SIL) and Hap Warnke Lumber Mill (HWLM) because it was detected within the background ranges designated for those assessment areas. Mercury presents a hazard greater than unity for SIL under the unrestricted and construction worker exposure scenarios. Risk is less than one-per-million under all exposure scenarios.

The baseline central-tendency lead concentrations associated with ETP-E and WTP-N are not suitable for unrestricted land use. Central tendency soil lead concentrations in the ETP Remainder, WTP Remainder, SIL and HWLM are below 80 mg/kg.

9 ECOLOGICAL RISK ASSESSMENT

An Ecological Scoping Assessment was performed in general accordance with guidelines set forth DTSC (2019 Oct) for Ecological Scoping Assessments.

9.1 ECOLOGICAL SCOPING ASSESSMENT

Scoping-level assessment is described in *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities, Part A: Overview* (DTSC, 1996 Jul). An Ecological Scoping Assessment is the first phase of assessment, and is intended to develop a conceptual site model, identify contaminants and receptors of concern and potential exposure pathways.

A scoping-level assessment consists of a chemical, physical, and biological characterization of the site, and an evaluation of the potential for complete exposure pathways. The results of this qualitative assessment may be used to determine the need for and the extent of further assessment. Components of the Ecological Scoping Assessment include:

- Site characterization;
- Biological characterization; and
- Pathway assessment.

9.1.1 Site Characterization

Site characterization findings are summarized in Sections 3 and through 7 of this report, and a site conceptual model (SCM) is developed in Section 5. Figure 5 is an SCM diagram depicting source media, release mechanisms, and transport mechanisms. Figure 6 is a generalized SCM diagram for ecological receptors.

The Site is divided into six assessment areas, which are depicted on Sheet 1 and described in the following table.

Assessment Areas

Assessment Area	**Location**	**Description**	**Size** (acres)	**Estimated Area of Affected Soil** (acres)	**Estimated Quantity of Affected Soil** (cubic yards)
ETP-E	The older, deeper, eastern portion of the ETP adjacent to the eastern site boundary	Deeper tailings and waste rock	7.5	7.5	46,000
ETP Remainder	ETP not including ETP-E and Hot Spots	Tailings and waste rock at ground surface	14.1	14.1	74,000
WTP-N	The older, deeper, northern portion of the WTP adjacent to the northern berm	Deeper tailings and waste rock	5.4	5.4	82,000
WTP Remainder	WTP not including WTP-N and Hot Spots	Tailings and waste rock at ground surface	10.1	10.1	61,000

SIL	South Idaho Location (former location of South Idaho Shaft)	Tailings at ground surface	1.9	1.9	8,000
HWLM	Hap Warnke Lumber Mill (northeast corner of site)	Lumber mill, intermittently operated	1.3	0	0

9.1.2 Proposed Site Development

Future remedial action and site development is to include:

1. Excavation and on-site transport of mine tailings and contaminated soil from ETP-E and WTP-N to the eastern edge of the site, where the mine tailings and contaminated soil are to be placed as engineered fill under a land use covenant (LUC) to support commercial/industrial site development.
2. Excavation and on-site transport of mine tailings from arsenic and thallium hot spots in ETP Remainder and WTP Remainder, and placement of the mine tailings and contaminated soil as engineered fill in the LUC area described above.
3. Development of all assessment areas for commercial/industrial use.

9.1.3 Chemicals of Potential Ecological Concern

Chemicals of potential ecological concern (COPECs) are identified based on comparison to ecological screening levels and background concentrations. Background statistics are summarized in Section 7.6. EPCs (typically 95% UCL concentrations) for the assessment areas are presented in Appendix H Tables 9a through 9f. The EPCs are compared to background statistics and ecological screening levels in Appendix H Tables 10a through 10f. The comparison addresses the following questions:

- Does the EPC exceed ecological soil screening levels (Eco-SSLs)?
- Does the EPC exceed the upper-end background concentration?

Constituents that meet both of these criteria are considered COPECs and are summarized below. Constituents that exceed background and for which Eco-SSLs are not listed are also considered COPECs. For EPCs represented by a central-tendency value (UCL), maximum detected site concentrations were also compared to upper-end background concentrations.

Chemicals of Potential Ecological Concern

Assessment Area	COPEC	95% UCL (mg/kg)	Max Detect (mg/kg)
ETP-E	Arsenic	819	4050
	Cadmium	7.55	24.2
	Chromium	372	1160
	Cobalt	81.6	263
	Copper	300	781
	Lead	226	835
	Mercury	10.5	57.4
	Nickel	387	933
	Thallium	16.9	67.0
	Zinc	95.6	247
	Cyanide	na	3.5
ETP Remainder	Chromium	439	980
	Copper	72.0	140
	Lead	27.2	86.2
	Mercury	1.19	3.0
	Vanadium	77.2	134
WTP-N	Arsenic	140	648
	Cadmium	1.53	6.9
	Cobalt	44.8	160
	Copper	101	300
	Lead	91.0	290
	Mercury	2.78	41
	Nickel	248	679
	Thallium	na	5.3
	Zinc	55.4	121
WTP Remainder	Mercury	0.54	1.9
SIL	Cadmium	1.46	3.0
	Mercury	1.47	2.8
	Selenium	9.0	16.5
	Vanadium	127.7	208
	Zinc	74.2	131
HWLM	Mercury	na	0.65

Notes:
COPEC = chemical of potential ecological concern
NA = not applicable (insufficient data for UCL calculation)
UCL = upper confidence limit on mean detected concentration

9.1.4 Biological Characterization

The following biological characterization of the site and surrounding property has been performed by others. Documents are presented in Appendix J.

- Centennial Industrial Site, Biological Resources Assessment (Greg Matuzak Environmental Consulting LLC, November 2019)
- Centennial Industrial Site, Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, October 2019)
- Centennial Industrial Site, Special Status Plant Survey Report (Wendy Boes, Botanical Consultant, November 2019)
- Draft Environmental Impact Report, Idaho-Maryland Mine Project, Section 4.3, Biological Resources (ESA, October 2008)

The information presented below is based primarily on the Biological Resources Assessment prepared by Matuzak (2019 Nov). The assessment included background research, reconnaissance-level biological surveys, data analysis, and impact assessment. Key findings include:

- Pine Hill flannelbush (Fremontodendron decumbens), a species listed on the federal Endangered Species Act (ESA), has been identified and mapped within the southern portion of the site. Sixty individual mature and flowering plants occupy an absolute area of 0.22 acres over approximately 4.5 acres.
- Perennial marsh wetlands within the eastern section of the site contain suitable habitat for several special-status aquatic wildlife species, including the California State ESA (CESA) listed California black rail (Laterallus jamaicensis coturiculus) and the federally ESA listed California red-legged frog (Rana aurora draytonii). None of these species were observed within the site and they are considered to have a low potential to occur within the site.
- The main stem of Wolf Creek along the northern boundary of the site includes a perennial stream and riparian vegetation, and the perennial stream contains marginally suitable habitat for the foothill yellow-legged frog (Rana boylii), a California State Candidate for listing under CESA. This species has not been observed within the site and is considered to have a low potential to occur within the site.
- The site contains two unlisted plant species. Neither species is rare or threatened. The two species fall under the California Native Plant Society (CNPS) List 4 Species, including the Humboldt lily (Lilium humboldtii ssp. humboldtii) and the Sierra brodiaea (Brodiaea sierra). A large population with thousands of individual Sierra brodiaea covering almost a quarter of the site was mapped during 2019 field surveys, and a single occurrence of the Humboldt lily consisting of individuals in an area less than 110 square feet was documented in the site during 2019 field surveys.
- Woodland and grassland habitats within the site contain suitable nesting habitat for protected raptors and birds. None of these species were observed within the site and they are considered to have a low to moderate potential to occur and nest within the site.
- A total of 4.97 acres of “waters of the U.S.,” including wetlands, and “waters of the State of California” were identified and mapped within the site in 2019. The 4.97 acres of wetland-waters includes 4.37 acres of mapped wetlands and 0.60 acres of mapped “other

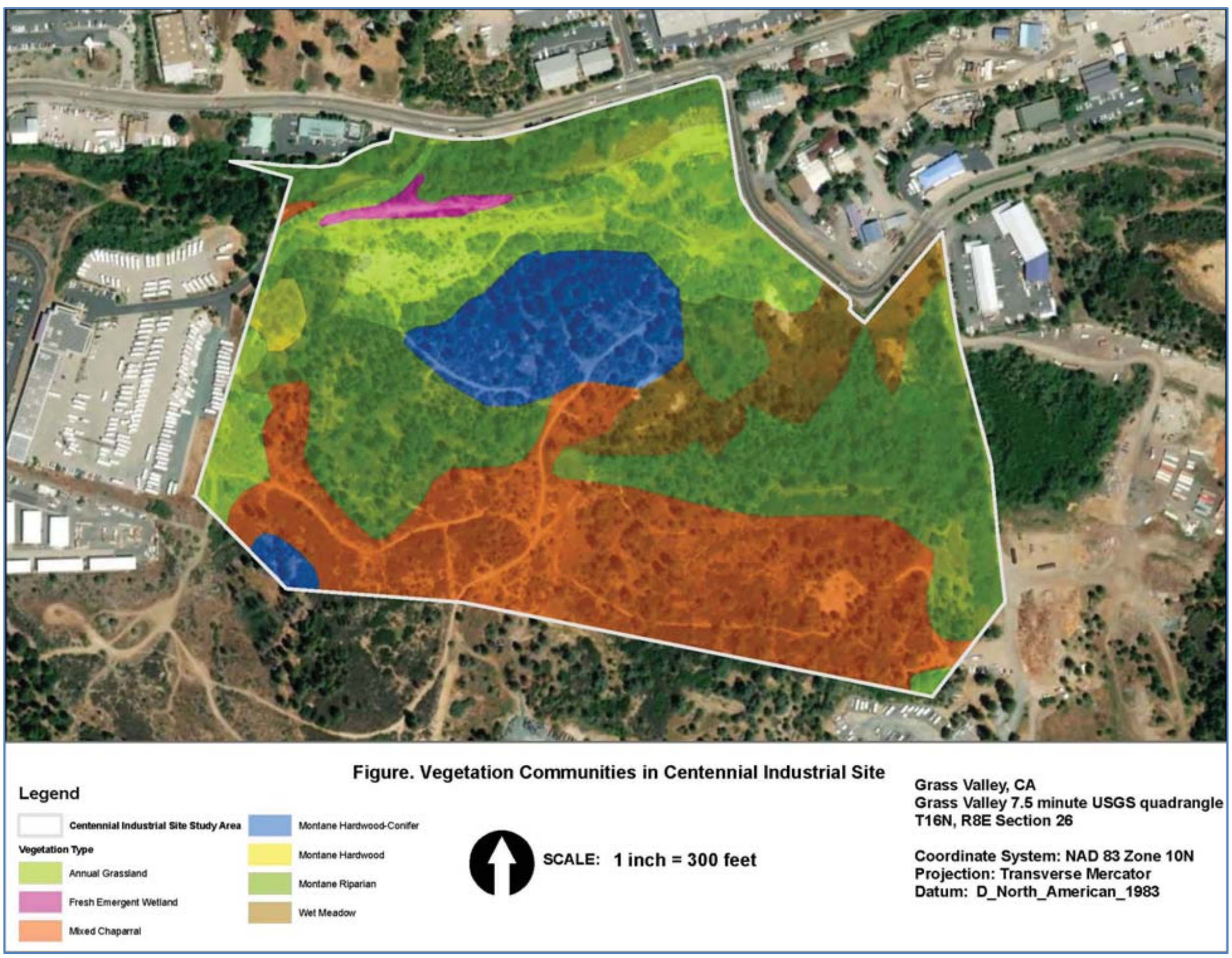
waters of the U.S.," including the main stem of Wolf Creek, as well as several intermittent and ephemeral streams.

Habitats

The following vegetation communities are identified and described by Matuzak (2019 Nov):

- Montane Hardwood
- Montane Hardwood-Conifer
- Mixed Chaparral
- Annual Grassland
- Montane Riparian
- Wet Meadow
- Freshwater Emergent Marsh Wetlands

A vegetation community map prepared by Matuzak (2019 Nov) is presented as Figure 7. An excerpt of the map is presented below.



Inset 9.1. Except of Vegetation Community Map (Matuzak, 2019 Nov).

Communities and size are listed in the following table as prepared by Matuzak (2019 Nov).

Species and Communities

Vegetation Community	**Size** (acres)
Montane Hardwood-Conifer	5.29
Montane Hardwood	0.48
Wolf Creek and Montane Riparian	20.07
Mixed Chaparral	16.24
Annual Grassland	9.74
Freshwater Emergent Marsh Wetland	0.58
Wet Meadow	4.01
Total	**56.41**

The following descriptions were prepared by Matuzak (2019 Nov).

- Montane Hardwood: Montane hardwood habitat is identified within the Centennial Site in small, localized stands. Montane hardwood is characterized here by stands of an overstory of California black oak and occasionally canyon live oak (Quercus chrysolepis). There is often homogeneity in the canopy structure, and canopy closure is variable between seasons as the dominant overstories species is deciduous, ranging from 5-45%. Due to the historic disturbance, there is abundant Himalayan blackberry (Rubus armenicus) in the understory along with other nonnatives including bristly dogtail (Cynosurus echinatus) and hedgenettle (Torilis arvensis).
- Montane Hardwood-Conifer: Montane hardwood-conifer habitat in the Sierra Nevada occurs at elevations between 1,000 and 4,000 feet above MSL and is comprised of a mosaic of hardwoods and conifers. The Centennial Site is likely a midpoint on the gradient between hardwood forest and conifer forest containing both hardwood and conifer tree species, often in a mosaic pattern with small pure stands of conifers interspersed with small stands of hardwoods. Species associated with montane hardwood-conifer include ponderosa pine, California black oak, canyon live oak, madrone and Douglas fir.
- Mixed Chaparral: Mixed chaparral is identified within the Centennial Site. Mixed chaparral is primarily associated with the gabbro soils of the Secca and Dubekella complexes that are known to occur within the southwestern section of the site. In the gabbro, this vegetation type is relatively intact and is characterized by whiteleaf manzanita, buck brush (Ceanothus cuneatus), Oregon white oak (Quercus garryana var. semota), chaparral pea (Pickeringia montana), and occasionally scattered foothill pine. McNab cypress (Hesperocyparis macnabiana) is occasional in the southwestern portions of the Centennial Site. With the exception of occasional natural and manmade openings within this habitat type, mixed chaparral forms almost continuous stands. Mixed chaparral is also present in heavily disturbed areas, both recent and historic disturbances. In the ruderal habitats there is a scattered formation of chaparral, usually characterized by whiteleaf manzanita with buck brush and coyote brush (Baccharis pilularis).
- Annual Grassland: Annual grassland are open vegetation types that are dominated by annual plant species, often nonnative. These species can occur within the understory of

other vegetation types like oak woodlands, but where annual grasslands are mapped there is little to no overstory or shrub cover. This vegetation type is common within the Centennial Site where there has been historic disturbance and little to no water source other than rainfall. The fall rainfall will spark germination and plants will grow through the cool months and in spring will grow rapidly and flower, fruit and senesce. Common to the environmental setting of this habitat type are yellow star thistle (Centaurea solstitalis), garden burnett (Poterium sanguisorba), soft chess (Bromus hordeaceous), bisnaga (Ammi visnaga), and patches of Himalayan blackberry.

- Montane Riparian: A structural gradient generally occurs from neighboring vegetation into montane riparian, resulting in oaks or pines grading in with the more riparian species. This vegetation type is characterized by two different ecological conditions, (1) placer diggings and (2) along the stretch of the main stem of Wolf Creek. The montane riparian in the placer diggings and areas created from earth movement are characterized by black cottonwood (Populus tremuloides), red willow (Salix laevigata), arroyo willow (Salix lasiolepis), and occasionally ponderosa pine in the overstory. Dense thickets are often resultant with Himalayan blackberry and Baltic rush (Juncus balticus ssp. atar) in the herbaceous layer. The montane riparian vegetation along both sides of the main stem of Wolf Creek is dominated by white alder (Alnus rhombifolia) with other overstory species from adjacent vegetation types, including California black oak, pine and Douglas fir. The understory of montane riparian along the stream is dominated by Himalayan blackberry.
- Wet Meadow: Wet meadows generally contain a single vegetation stratum and are generally dominated by forbs and gramanoids. Shrub and trees are sometimes present but generally make up a small portion of this vegetation type. This is typically a diverse plant community driven by hydrologic influences. The wet meadows in the Centennial Site are typically created where extreme disturbance has occurred in the past or the presence of placer diggings. These wet meadows are characterized by Agrostis, Juncus spp. and Baltic rush.
- Freshwater Emergent Marsh Wetlands: Freshwater emergent marsh wetlands are characterized by hydrophyllic plants and generally standing water. All emergent wetlands have soils that are saturated to the extent that the soils are always anaerobic. There are fresh emergent wetlands identified within the Centennial Site. This habitat type within the Centennial Site is dominated by cattails (Typha spp.), arroyo willow, and pacific rush (Juncus effuses ssp. pacificus).

Special Status Species

Matuzak (2019 Nov) concluded that the identified vegetation communities may provide habitat for several potentially occurring special-status species based on review of the CNDDB and database information provided by the United States Fish and Wildlife Service and California Native Plant Society as reconnaissance-level biological surveys. The following table prepared by Matuzak (2019 Nov) lists the vegetation communities identified within the site and the special-status species that could potentially occur within each of the vegetation communities.

Vegetation Community	Associated Special-Status Species
Montane Hardwood-Conifer	Brandegee's clarkia (Rank 4.2), Dubious pea (Rank 3), Cedar Crest popcorn flower (Rank 3), Chaparral sedge (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2), Sierra brodiaea (Rank 4.3), Humboldt lily (Rank 4.2), Butte County fritillary (Rank 3.2) Cooper's hawk and other nesting raptors and migratory birds (MBTA)
Montane Hardwood	Dubious pea (Rank 3), Brandegee's clarkia (Rank 1B.2), Cedar Crest popcorn flower (Rank 3), Chaparral sedge (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2), Sierra brodiaea (Rank 4.3), Humboldt lily (Rank 4.2), Butte County fritillary (Rank 3.2) Cooper's hawk and other nesting raptors and migratory birds (MBTA)
Wolf Creek and Montane Riparian	Sierra blue grass (Rank 1B.3) Foothill yellow-legged frog (CSC), Western pond turtle (CSC), migratory birds (MBTA)
Mixed Chaparral	Pinehill flannelbush (FE/CR), Stebbins' morning glory (FE/CE), Brandegee's clarkia (Rank 4.2), finger rush (Rank 1B.1), Chaparral sedge (Rank 1B.2), Cantelow's lewisia (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra brodiaea (Rank 4.3), Humboldt lily (Rank 4.2), Butte County fritillary (Rank 3.2) Coast horned lizard (CSC)
Annual Grassland	Cedar Crest popcorn flower (Rank 3) and Brownish beaked-rush (Rank 2B.2)
Freshwater Emergent Marsh Wetland	Scadden Flat checkerbloom (FT/CT) and Brownish beaked-rush (Rank 2B.2) California red-legged frog (FT, CSC), Western pond turtle (CSC), and California black rail (CT)
Wet Meadow	Brownish beaked-rush (Rank 2B.2) and finger rush (Rank 1B.1)

9.1.5 Pathway Assessment

Terrestrial receptors are potentially exposed to elevated metals concentrations in mine tailings and shallow contaminated soil. Figures 5 and 6 are SCM diagrams. The conceptual model is described in Section 5, and AOCs are described in Section 9.1.1.

The contaminated medium is soil. As described in Section 10, the potential for significant groundwater or surface water impact is expected to be low. Potentially complete exposure pathways include:

- Direct exposure to contaminated soil for producers and invertebrates;
- Indirect exposure for consumers via food-web transfer (ingestion of affected biota); and
- Secondary direct exposure for consumers (incidental soil ingestion, inhalation of airborne particulate sand dermal contact).

Terrestrial plants may be exposed via root contact, and herbivorous consumers may consume the contaminants with the affected plants. Terrestrial invertebrates may incorporate contaminants by contact with contaminated soil. Wildlife exposure may occur via food-web transfer or directly via inhalation of airborne particulates or incidental ingestion during activities such as foraging, grooming or burrowing.

Mercury is the only potentially volatile constituent. Wildlife exposures to chemicals in soil via inhalation of volatile constituents or dust and dermal contact are not evaluated quantitatively in this Ecological Scoping Assessment, pursuant to the Eco-SSL guidance (USEPA, 2005a, 2005b).

9.1.6 Findings of Ecological Scoping Assessment

The scoping assessment identified COPECs (arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, thallium, vanadium, zinc, cyanide) in mine tailings and contaminated soil. These constituents are most prevalent in the older, deeper portions of the tailings ponds (ETP-E and WTP-W) and some COPECs occur in isolated hot spots within the remainder of the tailings ponds (ETP Remainder and WTP Remainder). COPECs are selected based on their concentrations exceeding site background concentrations and one or more Eco-SSLs. AOCs, EPCs, and proposed removal actions are summarized below.

AOCs, EPCs and Proposed Actions

AOC	COPEC	95% UCL (mg/kg)	Max Detect (mg/kg)	Proposed Action
ETP-E	Arsenic	819	4050	Excavation and on-site transport of mine tailings and contaminated soil to the eastern edge of the site, and placement as engineered fill under a land use covenant (LUC) to support commercial/industrial site development
	Cadmium	7.55	24.2	
	Chromium	372	1160	
	Cobalt	81.6	263	
	Copper	300	781	
	Lead	226	835	
	Mercury	10.5	57.4	
	Nickel	387	933	
	Thallium	16.9	67.0	
	Zinc	95.6	247	
	Cyanide	na	3.5	
ETP Hot Spots	Arsenic	na	86.8	Excavation, on-site transport and placement as engineered fill in LUC area
	Thallium	na	59	
ETP Remainder	Chromium	439	980	Commercial/industrial site development
	Copper	72.0	140	
	Lead	27.2	86.2	
	Mercury	1.19	3.0	
	Vanadium	77.2	134	
WTP-N	Arsenic	140	648	Excavation and on-site transport of mine tailings and contaminated soil to the eastern edge of the site, and placement as engineered fill under a LUC to support commercial/industrial site development
	Cadmium	1.53	6.9	
	Cobalt	44.8	160	
	Copper	101	300	
	Lead	91.0	290	
	Mercury	2.78	41	
	Nickel	248	679	
	Thallium	na	5.3	
	Zinc	55.4	121	
WTP Hot Spots	Arsenic	na	27	Excavation, on-site transport and placement as engineered fill in LUC area
	Thallium	na	33	

WTP Remainder	Mercury	0.54	1.9	Commercial/industrial site development
SIL	Cadmium	1.46	3.0	Commercial/industrial site development
	Mercury	1.47	2.8	
	Selenium	9.0	16.5	
	Vanadium	127.7	208	
	Zinc	74.2	131	
HWLM	Mercury	na	0.65	Continued industrial land use (lumber mill)

Notes:
COPEC = chemical of potential ecological concern
na = not applicable (insufficient data for UCL calculation)
UCL = upper confidence limit on mean detected concentration

9.1.7 Conclusions of Ecological Scoping Assessment

Potentially complete exposure pathways exist for terrestrial receptors for mine tailings and contaminated soil if they remain at the site in an undeveloped condition. Therefore, it is appropriate to eliminate potential exposure pathways by incorporating the materials into subsurface engineered fill to support the proposed commercial/industrial site development:

- The deep, significantly contaminated tailings and soil (ETP-E and WTP-N) are to be excavated, transported on site, placed as engineered fill and capped with clean soil and rock as part of commercial/industrial site development.
- The shallow tailings with moderate metals concentrations (ETP Remainder, WTP Remainder and SIL) are to be reworked in place as engineered fill and covered with clean engineered fill to prepare the site for commercial/industrial site development.
- Mercury was identified as a COPEC for HWLM, which is proposed for continued industrial land use (lumber milling). Significant ecological exposures are not expected in this area of continued industrial land use.

If mine tailings and associated soil are to remain in place outside of the proposed commercial/industrial site development, then soil verification sampling and analysis are appropriate to verify that the COPEC concentrations remaining in place are not significantly different than background conditions.

10 EVALUATION OF RISK TO WATER QUALITY

10.1 REGULATORY FRAMEWORK

The regulatory framework governing the protection of water quality is described in the State Implementation Policy (SWRCB, 2005). Pursuant to state and federal regulation, the following water quality objectives and criteria are potentially applicable:

1. Federal water quality criteria set forth in the National Toxics Rule (NTR; USEPA, 1995) and in the California Toxics Rule (CTR; USEPA, 2000), which is promulgated by the USEPA in 40 CFR 131.38.
2. Water quality objectives from the Basin Plan (RWQCB, 2018 May), including Maximum Contaminant Levels (MCLs) specified in Title 22 of the California Code of Regulations (22 CCR).
3. USEPA ambient water quality recommended criteria and other criteria commonly used by the RWQCB to interpret narrative objectives in the Basin Plan, such as Office of Environmental Health Hazard Assessment (OEHHA) fish consumption benchmarks, federal and state antidegradation requirements, and waterway-specific benchmarks.

When federal standards appear to be over-protective or under-protective of the designated uses for a specific water body, the RWQCB may develop site-specific water quality criteria. The CWA 303(d) list of impaired water bodies contains such site-specific water quality criteria.

As described in Section 2.3.4, Wolf Creek flows east to west along the northern site boundary and empties into the Bear River approximately 14 miles south of the site. The Bear River flows through Camp Far West Reservoir and then into the Feather River south of Yuba City and north of Sacramento.

Wolf Creek has been placed on the CWA Section 303(d) list by the State Water Resources Control Board (SWRCB, 2019 Nov) as impaired for fecal coliform. Pursuant to the 303(d) listing, waterway-specific Total Maximum Daily Load (TMDL) limitations are expected to be developed in 2019. The upper Bear River (Combie Lake to Camp Far West Reservoir) is listed as impaired for mercury. Camp Far West Reservoir is listed for mercury. The lower Bear River (below Camp Far West Reservoir) is listed for metals (mercury and copper) and pesticides (chlorpyrifos and diazinon). TMDL development is in progress.

10.2 BENEFICIAL USES

10.2.1 Surface Water Receptors

According to the Basin Plan (RWQCB, 2018 May), California water bodies must be protected against water quality degradation for the most restrictive beneficial use. The Basin Plan does not specifically identify beneficial uses and water quality objectives for Wolf Creek. However, the beneficial uses of any water body that is specifically identified in the Basin Plan generally apply to its tributary streams (RWQCB, 2018 May). The Basin Plan identifies the following existing and potential beneficial uses for the Bear River:

- Municipal and domestic supply;
- Agricultural water supply;

- Hydropower generation;
- Water contact and non-contact recreation;
- Warm and cold freshwater habitat;
- Spawning, reproduction and/or early development of fish; and
- Wildlife habitat.

Although these beneficial uses do not necessarily apply to the Wolf Creek drainage, the corresponding water quality objectives may be used as a basis for a conservative comparison:

- Maximum Contaminant Level (MCL) values for drinking water;
- California Toxics Rule (CTR) values for protection of human health and aquatic life; and
- Agricultural (Ag) water quality objectives set forth in the Basin Plan.

The Basin Plan defines water quality objectives for metals as dissolved concentrations except for selenium, molybdenum and boron, which are defined as total concentrations (RWQCB, 2018 May). Laboratory test methods and detection limits are set forth in the RWQCB's Tech Note, Mining Waste Characterization (RWQCB, 2008), and are based on the criterion PQLs pursuant to the State Implementation Policy.

10.2.2 Groundwater Receptors

The site is located outside and adjacent to the Grass Valley city limits. Domestic water supply wells are not permitted within the city limits; however, the Basin Plan states that unless otherwise designated by the RWQCB, all groundwater in the region is considered suitable or potentially suitable, at a minimum, for municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply (RWQCB, 2018 May).

As discussed in Section 2.3.5, local groundwater well completion reports from DWR (2019) indicate that typical depths to usable groundwater are greater than 60 feet bgs within fractured bedrock. Groundwater wells identified near the site are listed on Table 1, based on the DWR well completion records.

10.3 CONSTITUENTS OF POTENTIAL CONCERN

10.3.1 Total Metals and Cyanide in Mine Waste

Constituents of potential concern have been identified in tailings, waste rock and contaminated soil as described in Section 8.3. Constituents that occur at the site above background levels are identified as COCs and are the subject of this water quality evaluation.

Constituents of Potential Concern, All Validated Site Data

Constituent	CAS No.	Maximum Detected Concentration (mg/kg)	95% UCL[1] on Mean Concentration (mg/kg)	Background Threshold Value (BTV) (mg/kg)	BTV Source
Arsenic	7440-38-2	4,050	123	18.0	95% UTL
Barium	7440-39-3	146	26.0	87.0	95% UTL
Cadmium	7440-43-9	24.2	2.64	2.0	95% UTL
Chromium	16065-83-1	1,160	305	625	95% UTL
Cobalt	7440-48-4	263	40.3	68.0	95% UTL

Copper	7440-50-8	784	149	114	95% UTL
Lead	7439-92-1	835	110	46.7	95% UTL
Mercury	7439-97-6	57.4	2.98	0.40	Upper Range Bkg
Molybdenum[2]	7439-98-7	16.0	3.01	10.0	95% UTL
Nickel	7440-02-0	933	267	480	95% UTL
Selenium[2]	7782-49-2	16.5	2.36	6.3	95% UTL
Silver[2]	7440-22-4	9.8	0.97	3.9	Upper Range Bkg
Thallium	7440-28-0	67.0	3.51	na	ND
Vanadium	7440-62-2	208	73.4	132	95% UTL
Zinc	7440-66-6	247	57.3	91.0	95% UTL
Cyanide	57-12-5	3.5	na	na	ND

Notes:
1 Statistical evaluation performed using ProUCL 5.1 (USEPA, 2016 May).
2 Exceedance based on outlying values (for all site data, Mo = 1 outlier; Se = 3 outliers; Ag = 2 outliers)
BTV = background threshold value
COC = constituent of concern
EPC = exposure point concentration
mg/kg = milligram per kilogram
na = not applicable
ND = not detected
UCL = 95% upper confidence limit on arithmetic mean value
UTL = upper tolerance limit

10.3.2 Soluble Metals in Mine Waste

The findings of Acid Base Accounting (ABA) and humidity cell testing indicate that the tailings and waste rock have a net neutralizing capacity (ANP:AGP > 3, neutral pH and low sulfide content). Therefore, the soluble metals concentrations used in this evaluation are based on deionized water extraction testing, as summarized in Table 8.

Additional DI-WET was performed as described in Addendum No. 1 to the Draft PEA (NV5, 2020). The additional DI-WET results are intended to provide additional DI-WET data for the vicinity of previous sample location TP19 and other sample locations displaying elevated total metals concentrations, and to provide additional DI-WET data for metals such as lead, nickel and silver, for which extractable metals concentrations were not previously detected but had reporting limits exceeding a water quality goal.

The maximum detected concentrations of soluble metals listed in Table 8, or the reporting limit for metals that were not detected, are used for the water quality evaluation, which is summarized in Table 9.

10.3.3 Cyanide in Mine Waste

Of the 24 solid samples analyzed for cyanide by Engeo (2007) and Vector (1993), cyanide was detected only at location TP19, in two of three samples obtained from that location, at concentrations of (0.64 and 3.5 mg/kg). Reactive cyanide was not detected in either of the two samples (TP-19@1’ and TP-19@5) above the laboratory reporting limit (0.5 mg/kg). Because cyanide was detected at only one location at the site, cyanide is not quantitatively evaluated in this section. Additional cyanide testing is recommended at the TP19 hot spot during RAP development to validate that cyanide at TP19 does not present a risk to water quality, as discussed in Section 8.5.

10.4 ATTENUATION FACTORS AND SOLUBLE DESIGNATED LEVELS

This evaluation considers the onsite placement of tailings with elevated metals concentrations at a location that is not subject to surface water erosion or leaching (e.g., engineered fill with appropriate surface and subsurface drainage controls), and assumes that the engineered fill will have a simplified environmental attenuation factor of 100 for protection of surface water and groundwater quality, pursuant to the Designated Level Methodology (DLM; RWQCB, 1989 Jun). Elevated metals concentrations have been identified primarily in the older, deeper portions of the tailings ponds (ETP-E and WTP-N) and at isolated hot spots in the remainder of the tailings ponds (see Section 8.5).

The lowest water quality objective listed in Table 8 is used to calculate an SDL for each constituent based on the attenuation factors described below for surface water and groundwater. SDLs and maximum DI-WET values are listed in Table 9.

The attenuation factor for surface water is based on review of the characteristics listed for surface water in Figure 10 of the Designated Level Methodology. An environmental attenuation factor of 100 is selected for assessing surface water conditions based on the rationale presented below.

- The site is located adjacent to Wolf Creek and is currently subject to ephemeral storm water runoff. The tailings contain fine sand and silt, which are erodible and permeable. Consolidation and capping of the tailings as engineered fill with appropriate surface and subsurface drainage controls will significantly reduce the potential for storm water erosion and infiltration.
- The metals of concern are not volatile or degradable, and based on the ABA results are generally not subject to other waste constituents that could affect their mobility.

The attenuation factor for groundwater is based on review of the characteristics listed for groundwater in Figure 10 of the Designated Level Methodology. An environmental attenuation factor of 100 is selected for assessing groundwater conditions based on the rationale presented below.

- Based on a review of local groundwater well completion reports (Section 2.3.5), usable groundwater occurs in bedrock fractures at depths generally greater than 60 feet below the ground surface.
- The tailings contain fine sand and silt, which are permeable and thus subject to water infiltration and leaching. Consolidation of the tailings as engineered fill with appropriate drainage controls will significantly reduce the potential for infiltration and leaching.
- The metals of concern are not volatile or degradable, and based on the ABA results are generally not subject to other waste constituents that could affect their mobility.

10.5 POTENTIAL FOR FUTURE SEDIMENT TRANSPORT

10.5.1 Transport of Sediment from Site

It is appropriate to manage the tailings with elevated metals content (ETP-E, WTP-N, and hot spots in ETP Remainder and WTP Remainder) to reduce the potential for future erosion and sediment transport. Consolidation and drainage controls are recommended as a remedial alternative to be evaluated as part of a RAP. Best Management Practices (BMPs) are also appropriate for exposed tailings and soil at non-elevated site locations (e.g., ETP Remainder and WTP Remainder) to control erosion and sediment transport.

10.5.2 Transport of Sediment to Site

Seasonal surface water runoff is conveyed from a pond on adjacent property through the Eastern Berm via a 36-inch by 36-inch concrete box culvert. The pond is located on the adjacent former Lausman lumber property. The pond does not currently retain water and is densely vegetated. Because the base of the pond is densely vegetated and because the pond's contributory drainage area is relatively small, it is unlikely that significant sediment will be transported from the pond to the site under current conditions. Disturbance of the pond sediment or alteration of drainage routing on the adjacent property may increase the potential for future sediment transport onto the site.

10.6 SUMMARY OF EVALUATION

The evaluation considers the leaching of metals from mine waste sampled at the site, and focuses on metals of concern that were identified by a comparison to background concentrations. Results of deionized water extraction (DI-WET) and humidity cell testing are used for the evaluation. The results of WET with citrate extractant are not considered representative of field conditions, and therefore are not used as a basis for the evaluation.

As summarized in Table 4, maximum dissolved metals concentrations detected in onsite surface water samples exceed the Secondary MCL for manganese and CTR values for copper, lead and mercury. As summarized in Table 8, DI-WET and humidity cell testing identified soluble concentrations of some metals in mine tailings at concentrations that exceed applicable water quality objectives. Therefore, it is appropriate to remove the mine tailings with elevated metals concentrations from locations that are subject to surface water erosion and leaching. Elevated metals concentrations have been identified primarily in the older, deeper portions of the tailings ponds (ETP-E and WTP-N) and at isolated hot spots in the remainder of the tailings ponds (see Section 8.5).

The evaluation considers the onsite placement of tailings at a location that is not subject to surface water erosion or leaching (e.g., engineered fill with appropriate surface and subsurface drainage controls), and assumes that the engineered fill will have a simplified environmental attenuation factor of 100 for protection of surface water and groundwater quality, pursuant to the Designated Level Methodology (DLM; RWQCB, 1989 Jun).

As summarized in Table 9, soluble metals concentrations generally do not exceed the corresponding SDLs based on an environmental attenuation factor of 100. The two highest DI-WET lead concentrations and the two highest DI-WET nickel concentrations exceed the corresponding SDLs for lead and nickel. In addition, one previous DI-WET mercury concentration (Vector, 1993) exceeds the SDL for mercury. The samples with DI-WET SDL exceedances are not considered representative of the waste mass as a whole, as discussed below.

- DI-WET lead concentrations in samples IMM-TN-21b (6.2 ug/L) and IMM-TN-22b (10.9 ug/L) exceed the SDL for lead (3.5 ug/L). The total lead concentrations detected in samples IMM-TN-21b (570 mg/kg) and IMM-TN-22b (628 mg/kg) are higher than the central-tendency values for total lead in ETP-E (226 mg/kg) and WTP-N (91 mg/kg). Therefore, these DI-WET SDL exceedances are not considered representative of the waste mass as a whole. Total lead concentrations for the remaining six samples obtained by NV5 (2020) range from 161 to 461 mg/kg, and their DI-WET lead concentrations did not exceed the SDL.
- The maximum detected DI-WET mercury concentration listed in Table 9 (1.1 ug/L; Vector, 1993) exceeds the SDL for mercury (0.5 ug/L). The exceedance is associated with a total mercury concentration (12.4 mg/kg; Vector (1993) sample designation SA6-2’) that is higher than the central-tendency (95% UCL) total mercury concentrations in ETP-E (10.5 mg/kg), WTP-N (2.78 mg/kg). Total mercury concentrations in the eight samples obtained by NV5 (2020) range from 4.37 to 15.0 mg/kg, and their DI-WET mercury concentrations did not exceed the SDL for mercury.
- DI-WET nickel concentrations in samples IMM-TN-37b (118 ug/L) and IMM-TN-38b (183 ug/L) exceed the SDL for nickel (116 ug/L). The mean DI-WET nickel concentration is 31.1 ug/L, which is lower than the SDL. The mean DI-WET nickel concentration was calculated using data from McClelland (2010) and NV5 (2020), as listed in Table 8. For non-detections, a value equal to the reporting limit was used for the non-detected value to calculate the mean value. Non-detected values from Vector (1993) were not used to calculate the mean value because of an elevated reporting limit.

Laboratory results indicate that the potential for acid generation is low and the potential for discharge or leaching of heavy metals at concentrations that would significantly impact surface water or groundwater quality is low. Based on these results the mine waste, when considered as a whole, can be managed as Group C mine waste as defined in CCR Title 27 Section 2248(b).

11 COMMUNITY PROFILE

A community profile is presented as Appendix A of this report. NV5 anticipates that public notification and public review during remedial planning and development of remedial action alternatives is appropriate and necessary. Specific public participation activities are to be set forth in the RAP and are subject to review and approval by DTSC.

12 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the PEA findings and data evaluation.

12.1 FINDINGS OF RISK ASSESSMENT

12.1.1 Human Health Risk Assessment

Risk assessment findings for baseline conditions identified at each of the assessment areas are summarized below:

Summary of Human Health Risk Assessment

Exposure Scenario	Unrestricted		Industrial		Commercial Indoor		Construction Worker	
Assessment Area	HI >1	Risk >1E-06	HI >1	Risk >1E-06	HI >1	Risk >1E-06	HI >1	Risk >1E-06
ETP-E	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
ETP Remainder (without hot spots)	**yes**	no	no	no	no	no	**yes**	no
WTP-N	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**
WTP Remainder (without hot spots)	no	no	no	no	no	no	no	no
SIL	**yes**	no	no	no	no	no	**yes**	no
HWLM	no	no	no	no	no	no	no	no

For the deeper, older sub-areas of the Eastern Tailings Pond (ETP-E) and Western Tailings Pond (WTP-N), the hazard index exceeds unity and the risk exceeds one-per million under all exposure scenarios.

The ETP Remainder (excluding ETP-E and the hot spots described in Section 8.5) is not suitable for unrestricted land use but is acceptable under the other exposure scenarios evaluated. The WTP Remainder (excluding WTP-N and hot spots described in Section 8.5) is acceptable under all exposure scenarios evaluated.

Arsenic is the primary contributor to hazard and risk associated with exposure to the mine tailings. Cobalt, mercury and thallium also contribute significantly to hazard, presenting hazard quotients greater than 1.0 for some assessment areas under some exposure scenarios. For the construction worker scenario, risk for cobalt exceeds one-per-million for some assessment areas.

Arsenic is not considered a constituent of concern for the South Idaho Location (SIL) and Hap Warnke Lumber Mill (HWLM) because it was detected within the background ranges designated for those assessment areas. Mercury presents a hazard greater than unity for SIL under the unrestricted and construction worker exposure scenarios. Risk is less than one-per-million under all exposure scenarios.

The baseline central-tendency lead concentrations associated with ETP-E and WTP-N are not suitable for unrestricted land use. Central tendency soil lead concentrations in the ETP Remainder, WTP Remainder, SIL and HWLM are below 80 mg/kg.

12.1.2 Ecological Scoping Assessment

Potentially complete exposure pathways exist for terrestrial receptors for mine tailings and contaminated soil if they remain at the site in an undeveloped condition. Therefore, it is appropriate to eliminate potential exposure pathways by incorporating the materials into subsurface engineered fill to support the proposed commercial/industrial site development:

- The deep, significantly contaminated tailings and soil (ETP-E and WTP-N) are to be excavated, transported on site, placed as engineered fill and capped with clean soil and rock as part of commercial/industrial site development.
- The shallow tailings with moderate metals concentrations (ETP Remainder, WTP Remainder and SIL) are to be reworked in place as engineered fill and covered with clean engineered fill to prepare the site for commercial/industrial site development.
- Mercury was identified as a COPEC for HWLM, which is proposed for future industrial land use. Significant ecological exposures are not expected in this area of continued industrial land use.

If mine tailings and associated soil are to remain in place outside of the proposed commercial/industrial site development, then soil verification sampling and analysis are appropriate to verify that the COPEC concentrations remaining in place are not significantly different than background conditions.

12.2 FINDINGS OF WATER QUALITY EVALUATION

The evaluation considers the leaching of metals from mine waste sampled at the site, and focuses on metals of concern that were identified by a comparison to background concentrations. Results of deionized water extraction (DI-WET) and humidity cell testing are used for the evaluation. The results of WET with citrate extractant are not considered representative of field conditions, and therefore are not used as a basis for the evaluation.

As summarized in Table 4, maximum dissolved metals concentrations detected in onsite surface water samples exceed the Secondary MCL for manganese and CTR values for copper, lead and mercury. As summarized in Table 8, DI-WET and humidity cell testing identified soluble concentrations of some metals in mine tailings at concentrations that exceed applicable water quality objectives. Therefore, it is appropriate to remove the mine tailings with elevated metals concentrations from locations that are subject to surface water erosion and leaching. Elevated metals concentrations have been identified primarily in the older, deeper portions of the tailings ponds (ETP-E and WTP-N) and at isolated hot spots in the remainder of the tailings ponds (see Section 8.5).

The evaluation considers the onsite placement of tailings at a location that is not subject to surface water erosion or leaching (e.g., engineered fill with appropriate surface and subsurface drainage controls), and assumes that the engineered fill will have a simplified environmental attenuation factor of 100 for protection of surface water and groundwater quality, pursuant to the Designated Level Methodology (DLM; RWQCB, 1989 Jun).

As summarized in Table 9, soluble metals concentrations generally do not exceed the corresponding SDLs based on an environmental attenuation factor of 100. Laboratory results indicate that the potential for acid generation is low and the potential for discharge or leaching of heavy metals at concentrations that would significantly impact surface water or groundwater quality is low. Based on these results the mine waste, when considered as a whole, can be managed as Group C mine waste as defined in CCR Title 27 Section 2248(b).

12.3 DATA GAPS

DTSC comments on the Draft PEA and Addendum No. 1 (DTSC; March 9, 2020) included a recommendation for additional extraction testing by Synthetic Precipitation Leaching Procedure (SPLP). The results of SPLP testing will be incorporated into the RAP.

As described in Section 8.5, anomalous arsenic and thallium detections in the ETP Remainder and WTP Remainder areas are considered hot spots. Remedial action (e.g., onsite consolidation) is recommended at the arsenic hot spot locations identified in Section 8.5, and verification sampling and analysis is recommended to confirm the success of the hot spot removal. Pre-excavation testing should be performed at the thallium hot spots to verify the anomalous thallium concentrations detected by Vector (1993). If the elevated thallium concentrations are detected, then remedial action (e.g., onsite consolidation) is recommended at these locations. Pre-excavation sampling and analysis (pH, ABA, metals and cyanide) is also recommended to verify the hot spot location at sample location TP-19.

12.4 MITIGATION MEASURES

12.4.1 Remedial Action Plan

A Remedial Action Plan (RAP) should be prepared to evaluate remedial alternatives for cleanup of mine waste at the site.

The RAP is one of two remedy selection documents that may be prepared for a hazardous substance release site pursuant to Section 25356.1 of the California Health and Safety Code (HSC). A RAP is typically prepared in lieu of a Removal Action Work Plan (RAW) if the cost of the remedial action is projected to exceed a threshold cost of two million dollars.

The remedial action outlined in the RAP is to be conducted in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; Title 40 Code of Federal Regulations [40 CFR] 300.400 et seq). The NCP requires the use of an Engineering Evaluation/Cost Analysis (EE/CA) or equivalent. The RAP should serve as the equivalent of an EE/CA.

The RAP should evaluate remedial alternatives considering the effectiveness, implementability and cost associated with each alternative. Based on the evaluation, the RAP should select and describe a remedial alternative to effectively reduce the risks associated with environmental conditions identified at the site and support future commercial/industrial development.

12.4.2 Basis for RAP

Pursuant to Section 25356.1.5 of the HSC, the proposed remedial action shall be based upon, and be no less stringent than:

- Requirements established under federal regulation pursuant to Subpart E of the NCP (40 CFR 300.400 et seq), as amended, which pertains to remedial action and selection of remedial alternatives;
- Regulations established pursuant to Division 7 (commencing with Section 13000) of the California Water Code, which pertains to state and regional water quality control;
- Applicable water quality control plans adopted pursuant to Section 13170 of the California Water Code;
- Article 3 (commencing with Section 13240) of Chapter 4 of Division 7 of the California Water Code, which pertains to water quality control plans and waste discharge requirements;
- Applicable state policies for water quality control adopted pursuant to Article 3 (commencing with Section 13140) of Chapter 3 of Division 7 of the California Water Code, to the extent that those policies are consistent with the federal regulations;
- Applicable provisions of the California HSC, to the extent those provisions are consistent with the federal regulations; and
- The risk assessment findings presented herein.

12.4.3 Supplemental Investigation and Validation

Supplemental investigation should be performed to refine the proposed remedial alternatives, as described above in Section 12.3. The RAP must contain a verification sampling plan to confirm that the proposed remedial goals are achieved.

12.4.4 Public Participation

Section 25356.1 of the HSC outlines public participation requirements for the RAP. Requirements include the preparation of a community profile report to determine public interest in the remedial action, notice of the RAP in a newspaper of general circulation, provision of a minimum 30-day public comment period, and preparation of a responsiveness summary.

12.4.5 Best Management Practices

It is appropriate to manage the tailings with elevated metals content (ETP-E, WTP-N, and hot spots in ETP Remainder and WTP Remainder) to reduce the potential for future erosion and sediment transport. Consolidation and capping with clean fill are recommended as a remedial alternative to be evaluated as part of a RAP. Best Management Practices (BMPs) are also appropriate for exposed tailings and soil at non-elevated site locations (e.g., ETP Remainder and WTP Remainder) to control erosion and sediment transport.

12.4.6 Dust Mitigation

Based on the geology of the site and underlying bedrock, naturally occurring asbestos (NOA) is likely to be present in serpentinite mine waste at the site and may also be present in tailings and waste rock originating from other mafic or ultramafic bedrock.

The presence or potential presence of NOA in tailings and waste rock can be mitigated by implementation of conventional engineering controls to limit dust emissions during earthwork and other soil-disturbing activities. Earthwork and other disturbance of materials containing mafic and ultramafic rocks is regulated by the California Air Resources Board (CARB) and the Northern Sierra Air Quality Management District (NSAQMD). Pursuant to the California Code of Regulations Title 17, Section 93105, an Asbestos Dust Mitigation Plan (ADMP) is typically required to describe material handling protocols to be used during construction to reduce the release of NOA into the atmosphere during earthwork grading and other soil/rock disturbance.

13 ENVIRONMENTAL PROFESSIONAL STATEMENT

We declare that to the best of our professional knowledge and belief, we meet the definition of Environmental Professional as defined in §312.10 of 40 CFR 312.

We have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. We have developed and performed the all appropriate inquires in conformance with the standards and practices set forth in 40 CFR Part 312. A resume of the Environmental Professional signing this report is presented in Appendix K.

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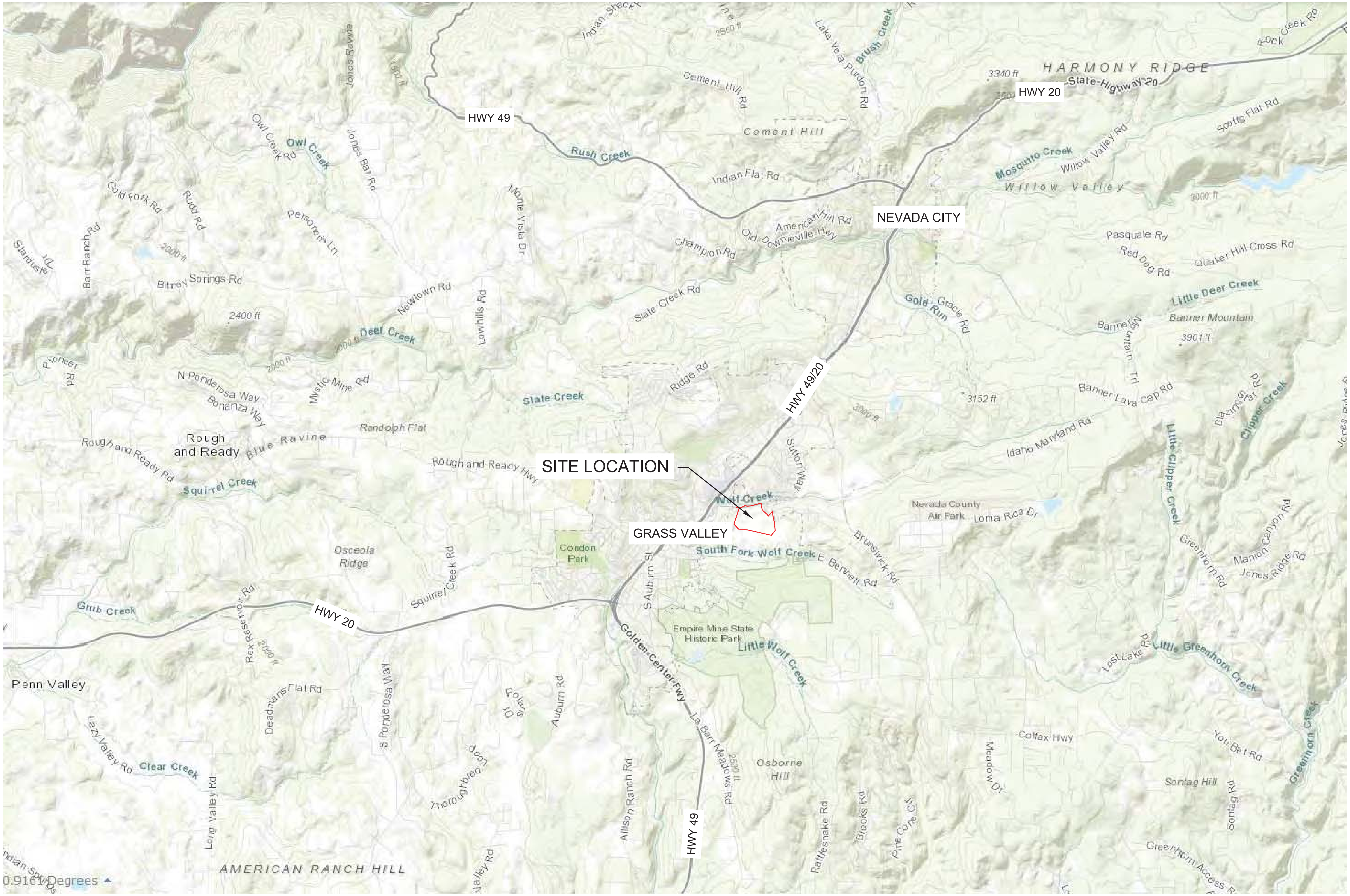
FIGURES



BASE MAP FROM NEVADA COUNTY GEOGRAPHIC INFORMATION SYSTEM

NV5

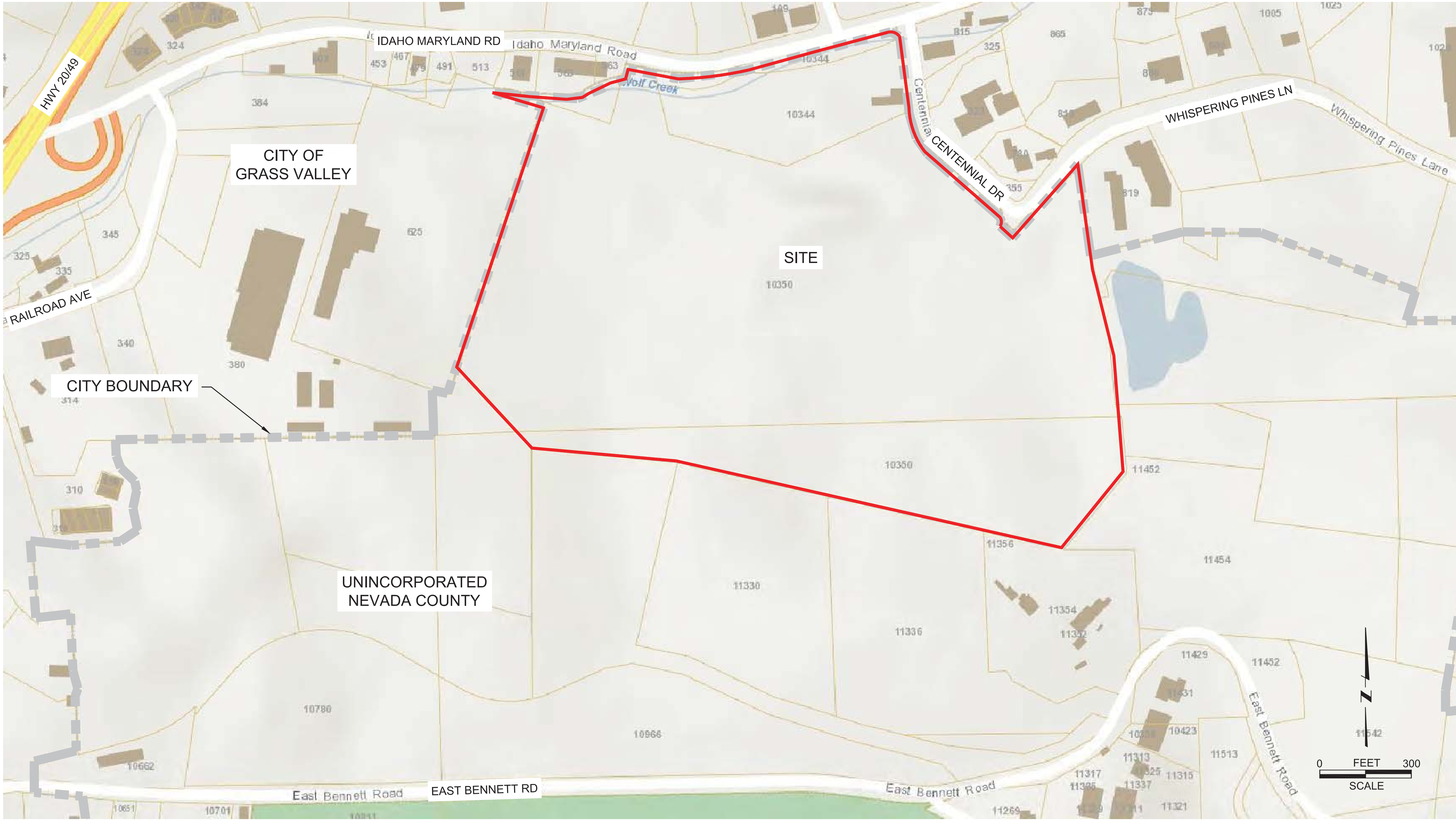
LOCATION MAP

CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

DOCKET NO.:	HSA-FY18/19-014
SITE CODE:	102370
NV5 PROJECT:	5279.01
DATE:	DECEMBER 2019

FIGURE 1



BASE MAP FROM NEVADA COUNTY GEOGRAPHIC INFORMATION SYSTEM

NV5

LOCATION MAP

CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

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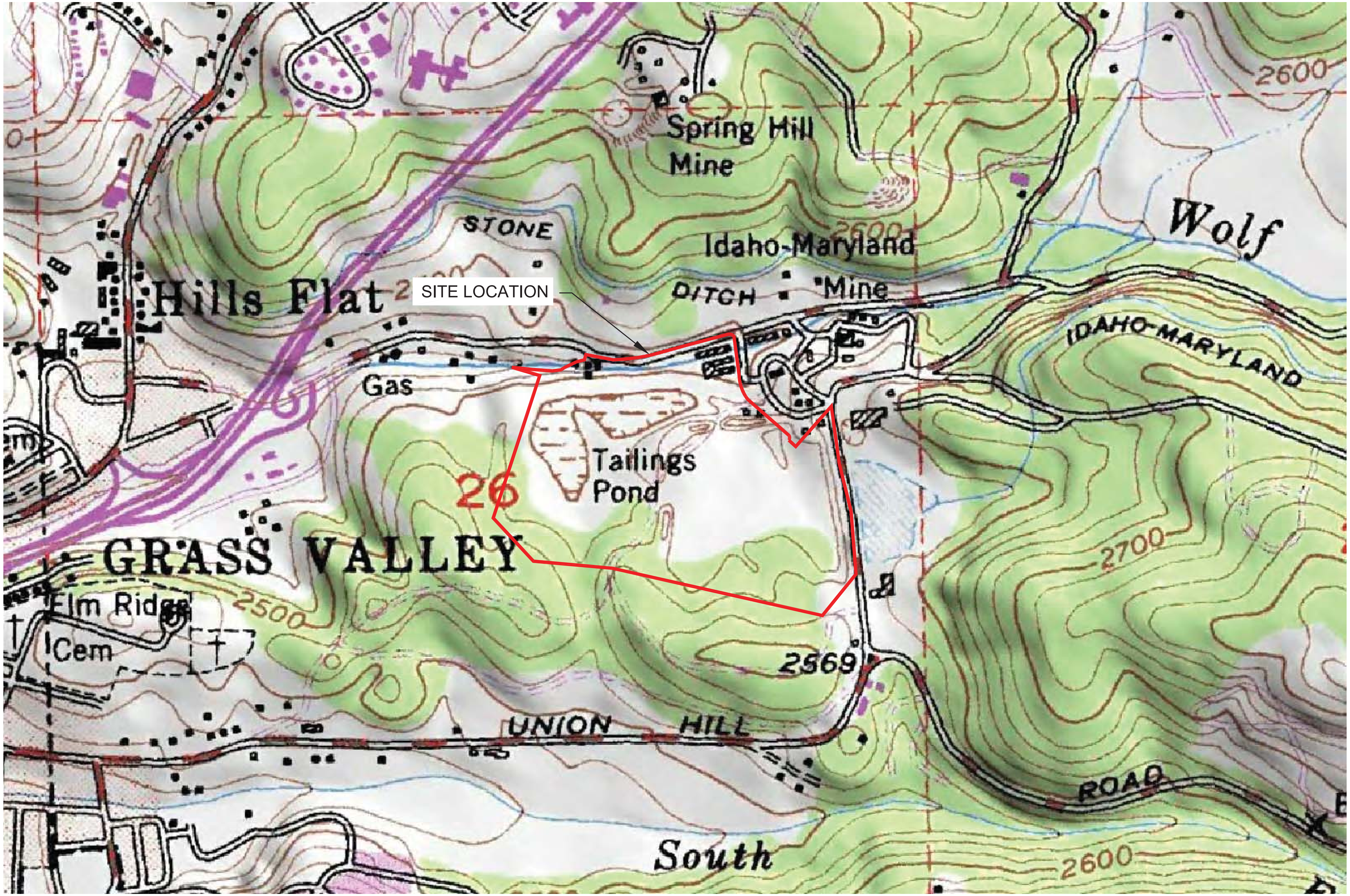
FIGURE 2



NOTES

FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY.

N

0 FEET 600

SCALE

BASE MAP FROM TOPOGRAPHIC MAP OF GRASS VALLEY QUADRANGLE (USGS, 1973)

NV5

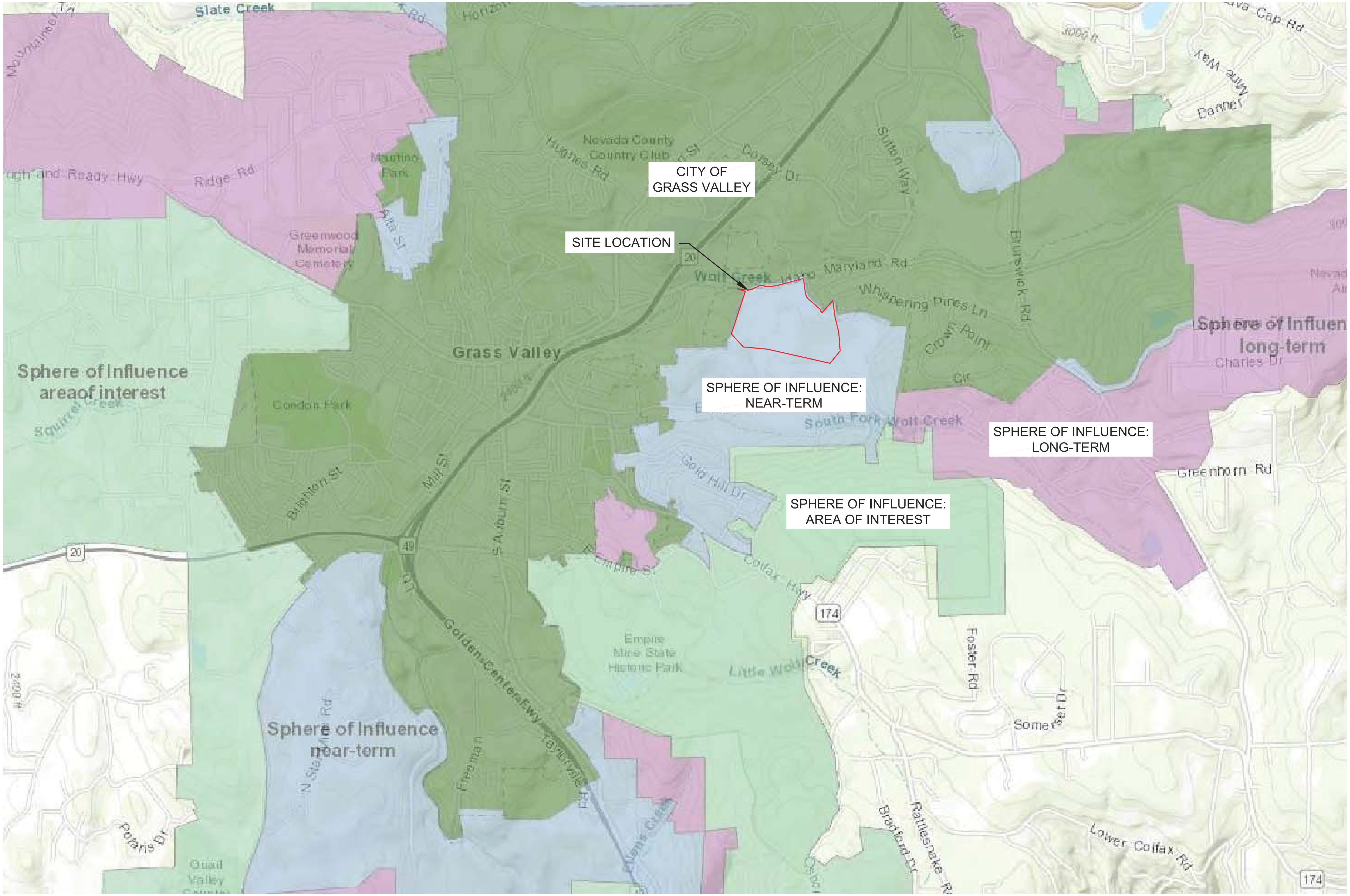
TOPOGRAPHIC MAP

CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

DOCKET NO.:	HSA-FY18/19-014
SITE CODE:	102370
NV5 PROJECT:	5279.01
DATE:	DECEMBER 2019

FIGURE 3



NOTES

FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY.

BASE MAP FROM NEVADA COUNTY GEOGRAPHIC INFORMATION SYSTEM

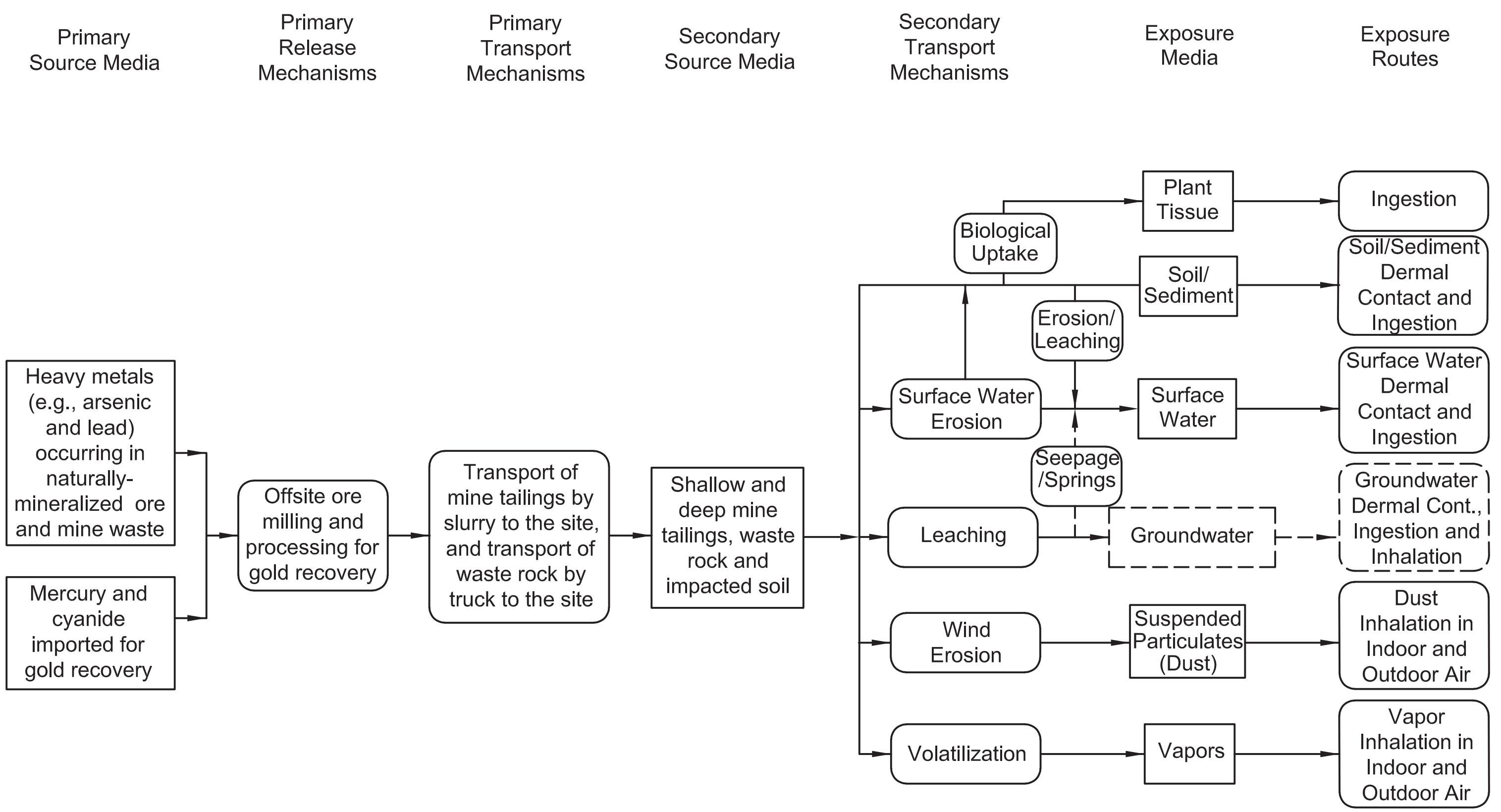
NV5

CITY OF GRASS VALLEY SPHERE OF INFLUENCE
CENTENNIAL M-1 PROPERTY
GRASS VALLEY, CALIFORNIA

DOCKET NO.:	HSA-FY18/19-014
SITE CODE:	102370
NV5 PROJECT:	5279.01
DATE:	DECEMBER 2019

FIGURE
4

TRANSPORT MECHANISMS AND EXPOSURE MEDIA FOR HUMAN RECEPTORS



Potential Receptors

Exposure Route	Offsite Residents	Future Site Residents	Construction Workers	Future Site Commercial Workers	Site Visitors
Ingestion	○	○	○	○	○
Soil/Sediment Dermal Contact and Ingestion	○	○	●	●	●
Surface Water Dermal Contact and Ingestion	●	○	○	○	○
Groundwater Dermal Cont., Ingestion and Inhalation	○	○	○	○	○
Dust Inhalation in Indoor and Outdoor Air	●	○	●	●	●
Vapor Inhalation in Indoor and Outdoor Air	○	○	●	●	●

LEGEND

- ——► Potentially complete pathway
- – – –► Potentially incomplete pathway
- ● Potentially complete exposure route
- ○ Potentially incomplete exposure route

Figure adapted from "Risk Management Criteria for Metals at BLM Mining Sites", Technical Note 390, October 2004, BLM/RS/ST-97/001+1703, Figure 1.

NV5

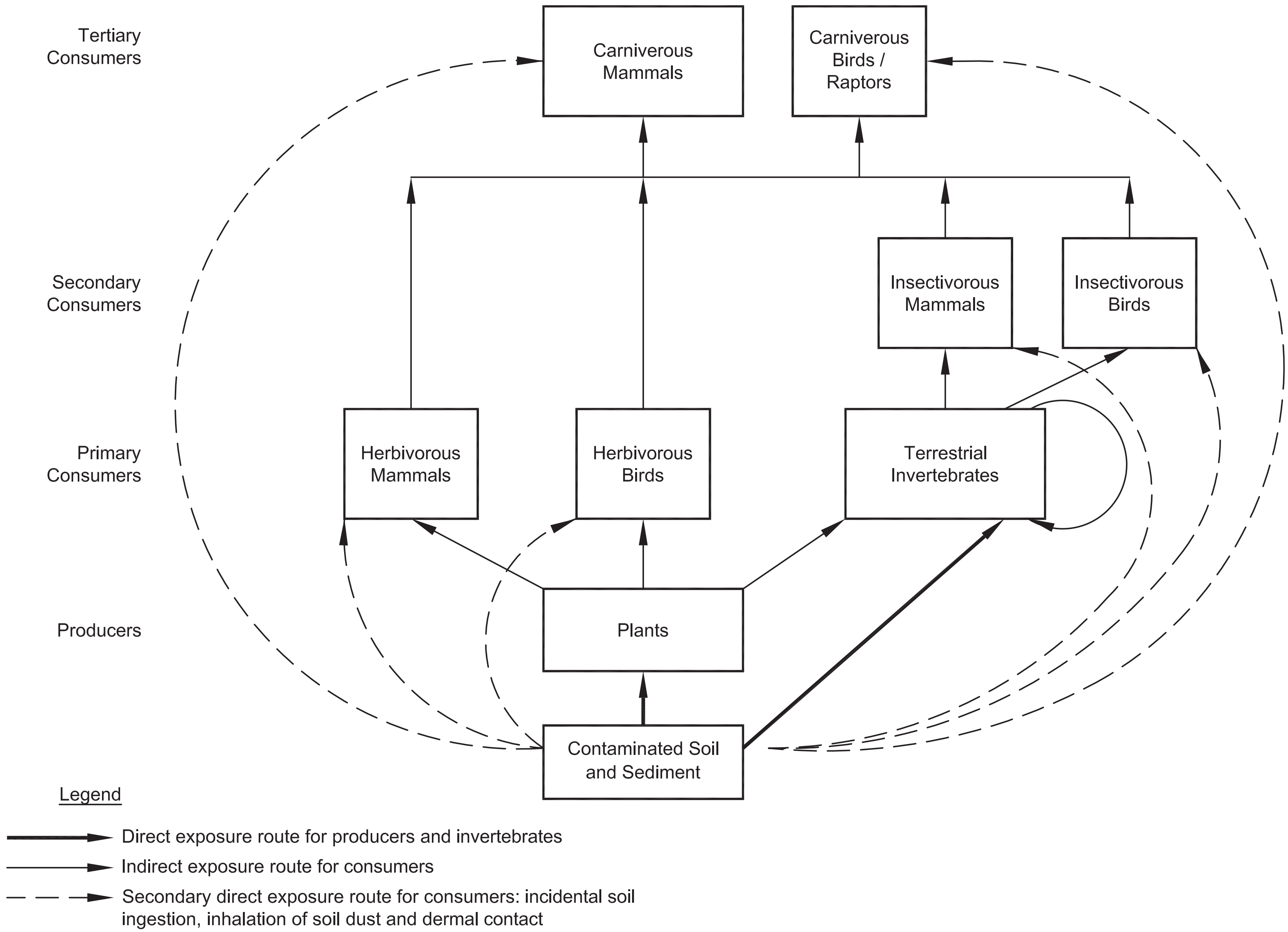
SITE CONCEPTUAL MODEL DIAGRAM

CENTENNIAL M-1 PROPERTY

NEVADA COUNTY, CALIFORNIA

DOCKET NO.:	HSA-FY18/19-014
SITE CODE:	102370
NV5 PROJECT:	5279.01
DATE:	DECEMBER 2019

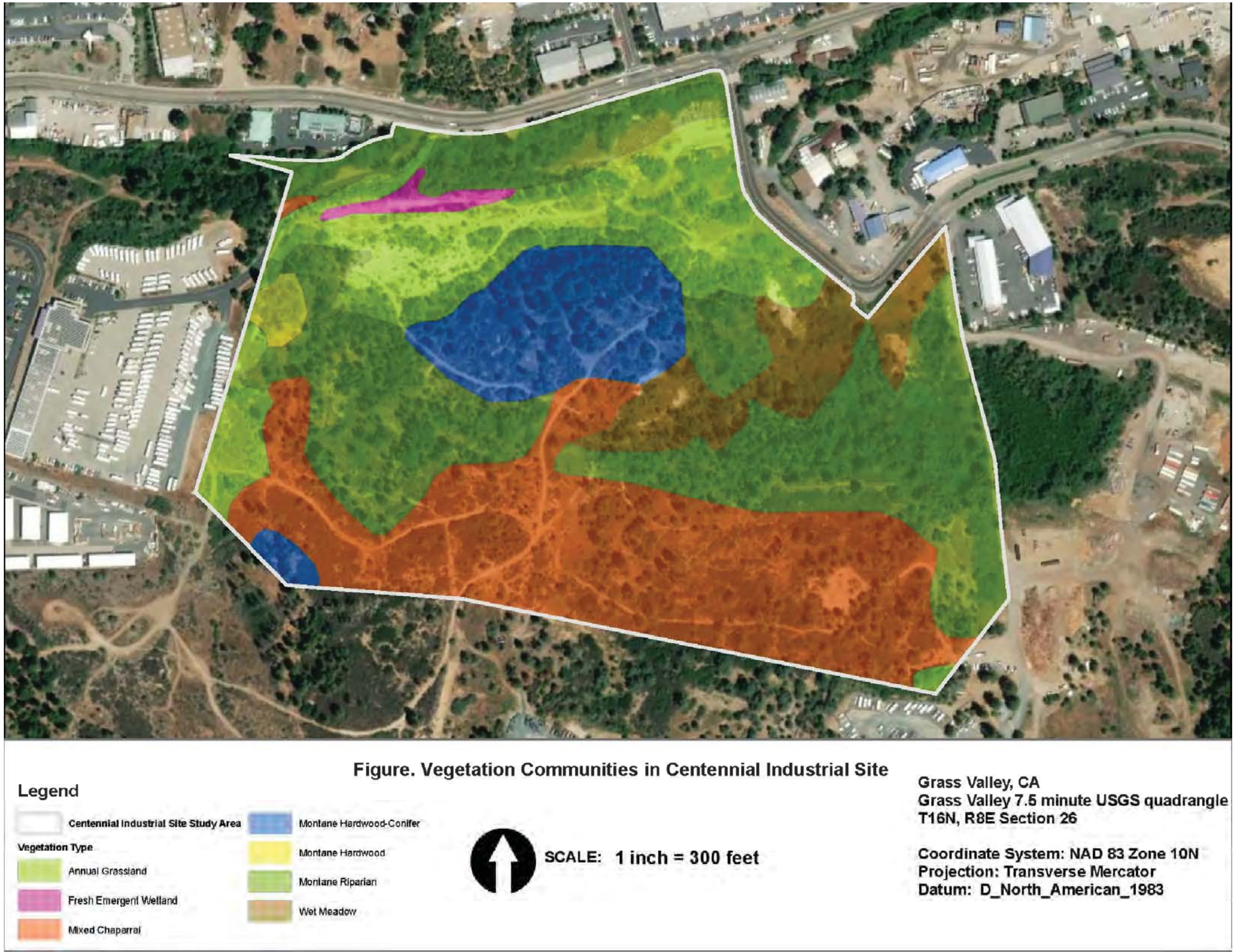
FIGURE 5

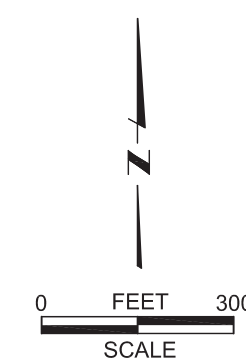


NV5	ECOLOGICAL SITE CONCEPTUAL MODEL DIAGRAM CENTENNIAL M-1 PROPERTY NEVADA COUNTY, CALIFORNIA	DOCKET NO.: HSA-FY18/19-014 SITE CODE: 102370 NV5 PROJECT: 5279.01 DATE: DECEMBER 2019	FIGURE 6

NOTES

FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY.





PREPARED BY MATUZAK (2019)

NV5

VEGETATION COMMUNITY MAP

CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

DOCKET NO.:	HSA-FY18/19-014
SITE CODE:	102370
NV5 PROJECT:	5279.01
DATE:	DECEMBER 2019

FIGURE
7

SHEETS

Sheet 1	Site Map
Sheet 2	Current Aerial Photograph
Sheet 3	Historical Aerial Photograph

NV5

Base map prepared by:
Rise Grass Valley Inc.
PO Box 271, Grass Valley, CA 95945
Horizontal Datum: NAD83 (2001)
Vertical Datum: GEOID 12B, NAVD 88
Projection: California State Plane Zone 2

SITE MAP
CENTENNIAL M-1 PROPERTY
NEVADA COUNTY, CALIFORNIA

NO.	REVISIONS	DATE

DTSC SITE CODE.:	102370
DOCKET NO.:	HSA-FY18/19-014
CHECKED BY:	MUIR
NV5 PROJECT NO.:	5729.01
DATE:	DECEMBER 2019

SHEET NO.:
1
OF 3

LEGEND

- Centennial Industrial Site Boundary
- Historical Mine Tailings Boundary
- Elevation Contour Line - 2 foot intervals
- Elevation Contour Line - 10 foot intervals
- Elevation Depression - 2 foot intervals
- Approximate Exploratory Location, NV5 (2019), Weston (2019)
- Approximate Exploratory Location, Engeo (2007)
- Approximate Exploratory Location, IMMC (2004, 2005)
- Approximate Exploratory Location, Vector (1993)
- Approximate Exploratory Location, Vector (1990)
- Approximate Exploratory Location, Anderson (1989)
- As Background Range
- As > Background and/or Pb and/or Hg > DTSC-SL
- Tl or Ni > Screening Level
- TTLC Exceedance: As, Pb and/or Hg

0 FEET 100
SCALE

NV5

Base map prepared by:
Rise Grass Valley Inc.
PO Box 271, Grass Valley, CA 95945
Horizontal Datum: NAD83 (2001)
Vertical Datum: GEOID 12B, NAVD 88
Projection: California State Plane Zone 2

CURRENT AERIAL PHOTOGRAPH
CENTENNIAL M-1 PROPERTY
NEVADA COUNTY, CALIFORNIA

NO.	REVISIONS	DATE

DTSC SITE CODE.:	102370
DOCKET NO.:	HSA-FY18/19-014
CHECKED BY:	MUIR
NV5 PROJECT NO.:	5729.01
DATE:	OCTOBER 2019

SHEET NO.:
2
OF 3

NV5

Base map prepared by:
Rise Grass Valley Inc.
PO Box 271, Grass Valley, CA 95945
Horizontal Datum: NAD83 (2001)
Vertical Datum: GEOID 12B, NAVD 88
Projection: California State Plane Zone 2

HISTORICAL AERIAL PHOTOGRAPH
CENTENNIAL M-1 PROPERTY
NEVADA COUNTY, CALIFORNIA

NO.	REVISIONS	DATE

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SHEET NO.:
3
OF 3

TABLES

Table 1. Nearby Groundwater Wells
Centennial M-1 Property
Nevada County, California

Index No.	DWR No.	Well Address (Grass Valley)	Distance (ft) and Direction	APN	Approx. Elevation (ft above MSL)	Reported Depth to First Water (feet bgs)	Reported Static Water Depth (feet bgs)	Reported Well Depth (feet bgs)	Reported Screened Interval (feet bgs)	Notes
1	375469	Idaho Maryland Rd ½ mile E of Hwy 20	400 E	09-570-17	2500	11	8	20	9 - 19	Cluster of 9 monitoring wells
2	466995	1005/1025 Idaho Maryland Rd.	1,640 E	09-680-09	2530	7	NR	15	5 - 15	Cluster of 10 monitoring wells
3	E0116101	384 Railroad Ave.	1,700 W	09-220-19	2500	250	60	550	260 - 550	
4	E033045	11269 E. Bennett St.	2,670 SSE	09-320-33	2565	45	20	200	45 - 65	
5	576671	319 Railroad Ave.	2,735 SW	09-240-02	2440	NR	10	19	4 - 19	Cluster of monitoring wells
6	820280	11273 Lava Rock Dr.	2,770 SSE	09-320-24	2550	10	10	140	120 - 140	
7	809812	115 Idaho Maryland Rd.	3,130 SSW	09-230-23	2435	11	10	11	4 - 11	Cluster of monitoring wells
8	559873	451 E. Main St.	3,230 W	09-213-16	2450	5	3	12	3 - 12	Cluster of monitoring wells
9	737047	438 E. Main St.	3,400 WSW	09-212-06	2435	4	NR	14	4 - 14	
10	809848	417 E. Main St.	3,410 SW	09-213-23	2465	10	NR	13	4 - 13	Cluster of monitoring wells
11	737591	11889 Slow Poke Ln.	3,430 SE	09-320-03	2600	335	70	340	300 - 340	
12	E0178249	640 E. Main St.	3,480 W	09-180-19	2475	~ 25		35	5 - 34	Cluster of monitoring wells

Index No.	DWR No.	Well Address (Grass Valley)	Distance (ft) and Direction	APN	Approx. Elevation (ft above MSL)	Reported Depth to First Water (feet bgs)	Reported Static Water Depth (feet bgs)	Reported Well Depth (feet bgs)	Reported Screened Interval (feet bgs)	Notes
13	168174	Cordell Ct.	3,595 SE	09-590-10	2775	75	75	230	NR	
14	E033837	130 Berryhill Rd.	4,025 W	09-190-36	2504	26	5	35	20 - 35	
15	306106	Berryhill Rd. (fitness ctr)	4,025 W	09-190-33	2505	30	NR	125	30 - 65	
16	272585	Amethyst Ct.	4,400 SE	09-590-07	2680	370	NR	400	NR	
17	064764	421 Colfax Ave.	4,570 SW	NR	2435	NR	7	16	6 - 16	Cluster of monitoring wells
18	392774	11903 E. Bennett St.	4,725 SE	09-581-36	2715	NR	60	150	110 - 140	
19	050120	Bennett St – 1 mi W of Brunswick	5,470 SE	NR	2700	130	60	200	130 - 150	Several wells present along Bennett St. are without adequate location information. In general, wells had similar well and water depths.
20	260837	Old Mine Rd.	6,518 SE	09-580-95	2780	120	NR	200	120 - 140	

Notes:
APN = Nevada County assessor parcel number
bgs = below ground surface
Locations without addresses are approximate
MSL = mean sea level
NR = not reported
Some well data may correspond to wells that have been destroyed

Table 2a - Total Metals and Cyanide in Solid Samples, Sorted by Date
Centennial M-1 Property
Nevada County, California

Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Results: Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
Chemical Identification	*USEPA Method*						*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*7471A*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*9010B*
	CAS No.						*7440-36-0*	*7440-38-2*	*7440-39-3*	*7440-41-7*	*7440-43-9*	*16065-83-1*	*7440-48-4*	*7440-50-8*	*7439-92-1*	*7439-97-6*	*7439-98-7*	*7440-02-0*	*7782-49-2*	*7440-22-4*	*7440-28-0*	*7440-62-2*	*7440-66-6*	*57-12-5*
	Unit						*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
Reporting and Detection Limits	*Method Detection Limit, NV5 (2019)*						*0.51*	*0.12*	*0.12*	*0.03*	*0.14*	*0.26*	*0.07*	*0.19*	*0.18*	*0.007*	*0.12*	*0.18*	*0.40*	*0.12*	*0.38*	*0.06*	*0.15*	*na*
	Reporting Limit, NV5 (2019)						*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.10*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*na*
	Reporting Limit, Engeo (2007)						*2.5*	*1.0*	*1.0*	*0.5*	*0.5*	*1.0*	*1.0*	*1.0*	*2.5*	*0.1*	*1.0*	*1.0*	*1.0*	*0.5*	*1.0*	*1.0*	*1.0*	*0.5*
	Reporting Limit, IMMC (2005 Nov)						*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*
	Reporting Limit, IMMC (2005 Feb)						*NL*	*10*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*5.0*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*
	Reporting Limit, IMMC (2004)						*NL*	*10*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*
	Reporting Limit, Vector (1993)						*2.5*	*5.0*	*0.25*	*0.1*	*0.5*	*0.5*	*0.4*	*0.1*	*3.8*	*0.1*	*0.5*	*2.0*	*5.0*	*0.75*	*3.8*	*0.1*	*0.5*	*1.0*
	Reporting Limit, Vector (1990 Aug)						*50*	*10*	*100*	*1*	*10*	*10*	*20*	*10*	*10*	*1*	*50*	*10*	*10*	*10*	*40*	*100*	*10*	*na*
	Reporting Limit, Vector (1990 Jun)						*100*	*10*	*100*	*1*	*10*	*10*	*20*	*10*	*10*	*1*	*50*	*10*	*10*	*10*	*100*	*100*	*10*	*na*
	Reporting Limit, Anderson (1989)						4.0	3.0	0.2	0.5	2.0	2.0	1.0	1.0	4.5	0.05	1.0	3.0	5.0	1.0	2.0	1.0	1.0	0.05
Screening Levels and Benchmark Concentrations	*Commercial Soil*						*470*	*0.25*	*220,000*	*210*	*7.3*	*1.8E+06*	*350*	*47,000*	*320*	*4.5*	*5,800*	*3,100*	*5,800*	*1,500*	*12*	*1,000*	*350,000*	*150*
	Basis for Screening Level						*RSL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*RSL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*RSL*	*RSL*	*RSL*	*DTSC-SL*	*RSL*	*RSL*
	TTLC						*500*	*500*	*10,000*	*75*	*100*	*2,500*	*8,000*	*2,500*	*1,000*	*20*	*3,500*	*2,000*	*100*	*500*	*700*	*2,400*	*5,000*	
	STLC						*15*	*5*	*100*	*0.75*	*1.0*	*5*	*80*	*25*	*5*	*0.2*	*350*	*20*	*1.0*	*5*	*7*	*24*	*250*	
IMM-TN-01	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Clayey silt	2.5	23	18	<0.03	0.76 J	210	25	63	19	0.51	<0.12	150	<0.40	<0.12	<0.38	62	35	--
IMM-TN-02	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	5.0	84	12	<0.03	1.1	320	31	97	56	1.4	2.0	280	1.1	<0.12	<0.38	54	51	--
IMM-TN-03	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	3.4	130	6.8	<0.03	1.8	270	37	170	120	3.3	2.3	250	1.7	<0.12	<0.38	59	60	--
IMM-TN-04	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Clayey silt (native)	1.8 J	15	89	<0.03	0.55 J	130	31	35	15	0.22	<0.12	160	2.5	<0.12	<0.38	94	49	--
IMM-TN-05	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	7.4	12	30	<0.03	0.48 J	480	50	86	12	0.15	<0.12	190	1.8	<0.12	<0.38	79	13	--
IMM-TN-06	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Clayey silt	2.4	6.4	35	<0.03	0.34 J	160	42	23	8.5	0.08 J	<0.12	200	<0.40	<0.12	<0.38	21	27	--
IMM-TN-07	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	<0.51	1.8	6.8	<0.03	0.54 J	46	8.9	15	2.0	0.17	<0.12	26	1.1	<0.12	<0.38	38	31	--
IMM-TN-08	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	<0.51	2.3	7.5	<0.03	0.51 J	57	10	12	2.1	0.31	<0.12	29	0.68 J	<0.12	<0.38	44	31	--
IMM-TN-09	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	<0.51	7.9	12	<0.03	0.71 J	73	11	36	17	1.3	1.1	50	<0.40	<0.12	<0.38	35	34	--
IMM-TN-10	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	4.4	48	9.1	<0.03	0.76 J	350	35	75	43	0.77	<0.12	280	1.7	<0.12	<0.38	52	30	--
IMM-TN-11	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	0.72 J	5.2	<0.03	0.48 J	45	8.2	29	1.2	0.17	<0.12	24	0.62 J	<0.12	<0.38	35	30	--
IMM-TN-12	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	5.6	14	<0.03	0.64 J	77	13	28	6.7	0.58	<0.12	42	2.6	<0.12	<0.38	59	42	--
IMM-TN-13	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.6	44	24	<0.03	0.62 J	290	26	76	41	0.81	<0.12	150	2.0	<0.12	<0.38	79	24	--
IMM-TN-14	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	7.4	0.38 J	42	<0.03	0.36 J	460	38	140	1.7	0.74	2.3	140	3.5	<0.12	<0.38	130	14	--
IMM-TN-15	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	6.6	5.3	20	<0.03	0.32 J	470	37	130	4.6	0.33	<0.12	240	1.5	<0.12	<0.38	65	16	--
IMM-TN-16	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	4.9	13	30	<0.03	0.32 J	370	38	80	22	0.59	2.1	150	2.5	<0.12	<0.38	100	19	--
IMM-TN-17	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.4	5.5	7.7	<0.03	0.44 J	280	27	41	14	0.18	<0.12	240	<0.40	1.1	<0.38	48	16	--
IMM-TN-18	04/16/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.1	11	23	<0.03	0.37 J	280	26	65	12	0.41	<0.12	280	<0.40	<0.12	<0.38	37	44	--
IMM-TN-19	04/17/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	4.3	330	16	<0.03	1.6	250	43	160	110	2.2	3.8	280	2.5	<0.12	<0.38	39	44	--
IMM-TN-20	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.7	41	15	<0.03	0.73 J	310	37	150	63	3.9	0.33 J	240	1.9	<0.12	<0.38	54	30	--
IMM-TN-21	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	5.4	38	14	<0.03	1.4	350	68	230	280	8.5	6.9	320	6.3	0.91 J	<0.38	49	35	--
IMM-TN-22	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.8	53	18	<0.03	0.87 J	260	24	190	350	6.5	8.8	160	6.8	0.20 J	<0.38	46	23	--
IMM-TN-23	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.6	37	0.20 J	<0.03	6.6	260	140	360	170	4.0	2.2	530	5.0	0.41 J	<0.38	31	91	--
IMM-TN-24	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.5	35	4.8	<0.03	1.1	260	34	410	95	1.6	<0.12	210	3.1	<0.12	<0.38	39	31	--
IMM-TN-25	04/17/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	0.36 J	10	<0.03	0.49 J	48	9.0	20	5.0	0.26	<0.12	26	0.81 J	<0.12	<0.38	42	32	--
IMM-TN-26	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	0.89 J	7.9	<0.03	0.39 J	47	10	35	1.0	0.02 J	<0.12	22	<0.40	<0.12	<0.38	44	29	--
IMM-TN-27	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	10	5.7	<0.03	0.48 J	36	8.1	35	6.7	0.36	<0.12	21	<0.40	<0.12	<0.38	36	30	--
IMM-TN-28	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	3.2	6.2	<0.03	0.48 J	28	7.3	38	ND	0.02 J	<0.12	18	<0.40	<0.12	<0.38	32	29	--
IMM-TN-29	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	2.9	8.2	<0.03	0.52 J	50	10	41	2.0	0.04 J	<0.12	25	<0.40	<0.12	<0.38	44	36	--
IMM-TN-30	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	2.1	8.6	<0.03	0.80 J	33	8.4	30	3.9	0.08 J	<0.12	19	<0.40	<0.12	<0.38	32	38	--
IMM-TN-31	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.1	1.2	0.70 J	<0.03	0.39 J	260	16	32	17	0.44	0.37 J	190	<0.40	1.5	<0.38	30	14	--
IMM-TN-32	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.7	1.5	1.3	<0.03	0.34 J	320	15	21	23	1.7	2.4	220	0.61 J	1.2	<0.38	40	18	--
IMM-TN-33	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	4.0	4.1	2.0	<0.03	0.57 J	310	19	40	28	0.66	ND	270	<0.40	1.8	<0.38	38	22	--
IMM-TN-34	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	5.9	3.3	3.5	<0.03	0.52 J	390	17	33	19	1.1	0.35 J	270	1.9	0.72 J	<0.38	43	23	--
IMM-TN-35	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	0.99 J	3.3	12	<0.03	0.31 J	110	12	21	4.3	0.3	<0.12	99	1.1	ND	<0.38	32	20	--
IMM-TN-36	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	1.3 J	0.87 J	4.7	<0.03	0.28 J	180	11	8.7	5.7	0.04 J	<0.12	140	<0.40	0.29 J	<0.38	24	12	--
IMM-TN-37	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.5	1,800	27	<0.03	1.0	180	14	300	150	3.5	<0.12	110	5.6	<0.12	<0.38	40	40	--

Table 2a - Total Metals and Cyanide in Solid Samples, Sorted by Date
Centennial M-1 Property
Nevada County, California

							Results																
Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
IMM-TN-38	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	2.1	51	26	<0.03	0.74 J	150	94	400	56	6.2	<0.12	220	1.9	<0.12	<0.38	62	64	--
IMM-TN-39	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	2.2	280	34	<0.03	1.7	130	58	170	70	3.5	<0.12	420	1.9 J	<0.12	<0.38	69	93	--
IMM-TN-40	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.1	11	19	<0.03	0.38 J	250	22	58	13	0.38	<0.12	140	2.0	<0.12	<0.38	95	27	--
IMM-TN-41	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	4.1	950	47	<0.03	1.3	200	46	370	500	31.0	2.5	160	4.1	5.8	<0.38	74	71	--
IMM-TN-42	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	1.8 J	14	87	<0.03	0.66 J	150	37	77	30	1.3	<0.12	140	2.9	<0.12	<0.38	82	87	--
IMM-TN-43	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	27	22	<0.03	1.1	62	17	57	25	0.29	<0.12	50	2.3	<0.12	<0.38	47	64	--
IMM-TN-44	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	10	31	<0.03	1.8	63	19	68	17	0.10 J	<0.12	47	6.3	<0.12	<0.38	47	57	--
IMM-TN-45	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	7.6	38	<0.03	0.96 J	81	20	62	14	0.17	<0.12	45	6.2	<0.12	<0.38	81	43	--
IMM-TN-46	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	12	24	<0.03	1.1	73	21	75	15	0.08 J	<0.12	49	5.0	<0.12	<0.38	55	44	--
IMM-TN-47	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	0.71 J	<0.12	16	<0.03	0.16 J	120	36	50	<0.18	0.05 J	<0.12	46	1.4	<0.12	<0.38	160	26	--
IMM-TN-48	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	1.8 J	33	25	<0.03	0.37 J	120	26	55	51	2.8	<0.12	40	1.2	<0.12	<0.38	110	29	--
IMM-T-00-A	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	5.4 J	11.1	115	0.24 J	0.32 J	361	72.5	44.3	18.8 J	0.29	--	735	<4.5	<1.3	<3.2	128	72.8	--
IMM-T-00-B	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	2.8 J	8.6	77.7	0.40 J	0.25 J	201	43.2	37.4	13.8	0.089 J	--	389	<4.1	<1.2	<2.9	81.4	89.3	--
IMM-T-00-C	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	2.9 J	10.8	119	0.29 J	0.28 J	188	31.9	38.8	20.5	0.13	--	307	<3.5	<1.0	<2.5	105	66.6	--
IMM-T-00-D	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	3.2 J	7.5	161	0.18 J	0.33 J	228	46.6	29.7	11.5	0.13 J	--	814	<4.5	<1.3	<3.2	72.7	52.1	--
IMM-T-00-E	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	3.2 J	14.2	149	0.16 J	0.40 J	199	45.7	57.7	35.3	0.14	--	340	<4.4	<1.3	<3.1	111	93.7	--
IMM-T-00-F	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	8.8	11.1	73.4	0.18 J	0.29 J	612	111	41.2	13.7	0.075 J	--	1,270	<4.2	<1.2	<3.0	118	58.3	--
IMM-T-01	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Clayey silt	3.3 J	56.0	20.4 J	<0.58	1.1	220	32.1	66.2	27.9	0.63	--	171	<4.1	<1.2	<2.9	75.6	56.2	--
IMM-T-02	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	4.3 J	77.8	17.1 J	<0.57	1.6	279	36.4	76.2	54.3	1.8	--	286	<4.0	0.36 J	<2.9	63.7	73.0	--
IMM-T-03	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	4.7 J	209	11.3 J	<0.57	4.1	317	55.2	225	198	3.4	--	380	1.3 J	0.87 J	<2.8	73.5	121	--
IMM-T-04	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Clayey silt (native)	1.7 J	14.8	90.2	<0.56	0.28 J	109	35.5	36.7	18.3	0.27	--	157	<3.9	<1.1	<2.8	92.8	64.5	--
IMM-T-05	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	7.0	21.2	40.4	<0.52	0.32 J	488	59.2	88.4	10.3	0.11	--	250	<3.6	<1.0	<2.6	121	23.3	--
IMM-T-06	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Clayey silt	5.1 J	15.9	44.2	<0.79	0.37 J	379	160	33.8	10.8	0.074 J	--	679	<5.5	<1.6	<3.9	34.9	43.2	--
IMM-T-07	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	<6.1	4.7	7.4 J	<0.51	0.61	51.1	11.8	16.8	8.8	0.21	--	32.7	<3.6	<1.0	<2.6	43.7	47.0	--
IMM-T-08	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	<6.5	4.8	7.5 J	<0.54	0.60	63.8	14.3	14.6	8.5	0.27	--	40.8	<3.8	<1.1	<2.7	52.0	48.4	--
IMM-T-09	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	<7.1	15.9	12.6 J	<0.59	1.0	90.8	18.9	53.8	26.4	0.98	--	79.9	<4.1	<1.2	<2.9	49.5	59.0	--
IMM-T-10	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	5.1 J	107	12.8 J	<0.46	2.0	378	62.0	100	71.7	0.93	--	632	<3.2	0.72 J	<2.3	53.1	53.3	--
IMM-T-11	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<7.0	3.9	7.4 J	<0.59	0.56 J	65.1	13.5	32.1	7.4	0.14	--	37.6	<4.1	<1.2	<2.9	51.1	53.9	--
IMM-T-12	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.3	7.4	21.6	<0.52	0.66	84.6	19.0	23.4	13.4	0.79	--	50.7	<3.7	<1.0	<2.6	81.0	71.4	--
IMM-T-13	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	5.2 J	86.8	33.3	<0.58	1.4	347	44.4	98.1	86.2	0.90	--	243	<4.1	<1.2	<2.9	112	50.3	--
IMM-T-14	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	8.4	13.4	51.4	<0.52	0.37 J	537	62.3	124	13.1	1.5	--	377	<3.6	0.51 J	<2.6	134	30.0	--
IMM-T-15	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	10.5	16.2	26.4	<0.56	0.38 J	539	52.6	77.7	13.5	0.32	--	364	<3.9	0.32 J	<2.8	87.4	24.9	--
IMM-T-16	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	9.7	30.0	35.0	<0.58	0.51 J	493	53.7	98.5	22.7	0.56	--	275	<4.0	<1.2	<2.9	130	33.6	--
IMM-T-17	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	4.4 J	9.2	8.4 J	<0.55	0.42 J	224	27.4	36.5	19.1	0.27	--	265	<3.8	2	<2.7	40.6	19.3	--
IMM-T-18	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	4.8 J	14.9	22.5	<0.49	0.46 J	239	33.7	37.0	14.2	0.59	--	280	<3.5	0.49 J	<2.5	32.8	39.0	--
IMM-T-19	04/17/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	6.0	438	14.6 J	<0.48	6.9	276	63.8	296	219	5.6	--	425	2.9 J	1.7	<2.4	47.4	73.1	--
IMM-T-20	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.9	74.0	19.8 J	<0.54	1.6	392	61.4	148	87.5	2.8	--	418	1.2 J	0.89 J	<2.7	76.0	54.9	--
IMM-T-21	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.4	66.3	26.9	<0.62	2.3	346	113	366	513	12.2	--	481	6.3	3.9	<3.1	64.7	63.2	--
IMM-T-22	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	8.1 J	79.8	18.3 J	<0.68	1.2	329	30.4	273	677	18.1	--	209	7.9	3.5	<3.4	74.6	32.6	--
IMM-T-23	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.7	59.0	5.5 J	<0.50	10.1	385	193	389	280	6.1	--	825	5.0	2.5	<2.5	38.8	111	--
IMM-T-24	04/16/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	6.5 J	64.1	8.1 J	<0.70	2.4	309	55.6	597	220	3.6	--	340	4.6 J	1.3 J	<3.5	47.4	59.4	--
IMM-T-25	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	1.9 J	3.6	13.5 J	<0.56	0.6	62.7	14.7	25.9	11.1	0.28	--	43.5	<3.9	<1.1	<2.8	58.7	56.2	--
IMM-T-26	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	1.7 J	1.8	9.3 J	<0.58	0.41 J	53.3	13.2	48.6	5.7	<0.11	--	30.7	<4.1	<1.2	<2.9	56.8	49.9	--
IMM-T-27	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.1	25.0	7.4 J	<0.51	0.85	44.9	12.5	50.8	24.9	0.76	--	34.6	0.99 J	0.40 J	<2.5	46.9	49.4	--
IMM-T-28	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.0	7.1	6.8 J	<0.50	0.57	35.3	10.6	48.7	4.7	<0.12	--	26.6	1.1 J	<1.0	<2.5	43.9	49.5	--
IMM-T-29	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	1.5 J	3.7	9.4 J	<0.51	0.58	53.0	14.0	51.2	7.0	<0.11	--	32.5	1.2 J	<1.0	<2.6	54.3	52.8	--
IMM-T-30	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.3	4.3	9.4 J	<0.53	0.86	35.2	11.4	34.1	8.2	0.12	--	25.4	1.1 J	0.27 J	<2.6	36.3	54.1	--
IMM-T-31	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	5.8 J	4.8	<19.8	<0.50	0.59	270	23.2	35.5	27.0	0.35	--	277	<3.5	2.6	<2.5	42.3	26.1	--
IMM-T-32	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	7.9	7.9	<22.2	<0.55	0.55	396	24.3	33.9	46.7	3.0	--	347	<3.9	2.7	<2.8	57.8	32.0	--
IMM-T-33	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	7.1 J	11.3	<24.1	<0.60	0.83	350	29.3	53.1	49.3	1.0	--	393	<4.2	3.9	<3.0	49.6	38.1	--
IMM-T-34	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	9.5	10.0	6.5 J	<0.56	0.69	477	28.2	50.5	42.1	1.6	--	433	<3.9	2.2	<2.8	63.4	44.6	--
IMM-T-35	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	3.6 J	9.9	19.2 J	<0.51	0.44 J	186 J	29.6	76.0	11.7	0.34	--	283	1.3 J	0.38 J	<2.6	2.6	35.5	--
IMM-T-36	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	3.3 J	5.1	7.3 J	<0.49	0.40 J	187 J	16.7	10.9	13.2	<0.11	--	190	<3.4	1.5	<2.5	47.2	20.0	--
IMM-T-37	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	6.9 J	4,050	43.9	<0.59	24.2	318 J	29.5	552	197	6.1	--	196	1.7 J	2.0	<2.9	29.1	78.6	--

Table 2a - Total Metals and Cyanide in Solid Samples, Sorted by Date
Centennial M-1 Property
Nevada County, California

							Results																
Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
IMM-T-38	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	5.2 J	62	41.2	<0.75	1.7	260 J	263	781	123	12.0	--	784	1.6 J	1.0 J	<3.7	52.0	247	--
IMM-T-39	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	3.9 J	645	90.8	<0.80	10.9	171 J	153	333	129	6.7	--	933	3.2 J	2.2	<4.0	132	227	--
IMM-T-40	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	6.2 J	9.9	23.1 J	<0.62	0.43 J	331 J	32.1	68	25.5	0.54	--	220	1.8 J	0.56 J	<3.1	116	39.9	--
IMM-T-41	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.6 J	1,470	86.8	<0.74	19.1	287 J	105	662	835	57.4	--	297	3.5 J	9.8	<3.7	119	150	--
IMM-T-42	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	4.2 J	24.5	146	<0.70	1.2	210 J	71.4	114	58.6	2.8	--	257	2.3 J	1.0 J	<3.5	114	194	--
IMM-T-43	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	1.9 J	31.4	25.4	<0.59	3.0	61.4 J	22.3	98.5	42.2	0.28	--	59.0	5.4	0.38 J	<2.9	134	131	--
IMM-T-44	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	2.9 J	18.6	34.1	<0.52	1.1	66.0 J	25.7	66.6	33.1	0.15	--	59.4	14.5	0.30 J	<2.6	48.5	76.1	--
IMM-T-45	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	3.6 J	18.0	62.9	<0.52	0.91	86.0 J	36.5	77.1	33.0	0.29	--	61.9	16.5	0.26 J	<2.6	48.7	74.2	--
IMM-T-46	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	2.8 J	17.1	34.0	<0.54	1.3	66.2 J	28.1	74.2	28.8	0.11	--	61.5	12.4	0.24 J	<2.7	83.7	73.8	--
IMM-T-47	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	2.7 J	3.3	18.9 J	<0.56	0.17 J	113 J	53.7	57.8	2.9	<0.11	--	60.4	<3.9	<1.1	<2.8	54.2	51.5	--
IMM-T-48	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	3.7 J	29.1	29.6	<0.57	0.65	152 J	41.0	65.4	49.5	1.2	--	58.2	1.2 J	0.46 J	<2.9	208	46.7	--
B1-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Clayey gravel (WR)	<2.5	130/0.9	5	<0.5	4	160	87	300/1.8	290/<0.5	41/<0.025	10	430/5.6	1	2	<1.0	30	110	<0.5
B1-5'	02/01/07	5	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	100/1.6	16	<0.5	1	11	22	82	14	0	<1.0	64	<1.0	<0.5	<1.0	56	37	<0.5
B1-10'	02/01/07	10	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	33	50	<0.5	1	240	39	60	8	2	3	180	<1.0	<0.5	<1.0	87	32	<0.5
B5-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	56/0.86	11	<0.5	1	210	26	100	26	2	1	170	<1.0	<0.5	<1.0	42	58	<0.5
B5-6'	02/01/07	6	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	56/0.73	20	<0.5	1	360	44	90	23	1	1	410/1.7	<1.0	<0.5	<1.0	45	81	<0.5
B5-10'	02/01/07	10	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	2.8	58	<0.5	<0.5	74	14	34	<2.5	<0.10	<1.0	100	<1.0	<0.5	<1.0	5	8	<0.5
B6-1'	02/01/07	1	HWLM	Engeo (2007)	Y	Silty gravel	<2.5	10	68	<0.5	<0.5	150	25	36	11	1	2	98	<1.0	<0.5	<1.0	100	28	<0.5
B6-5'	02/01/07	5	HWLM	Engeo (2007)	Y	Weathered bedrock	<2.5	11	15	<0.5	<0.5	260	14	29	<2.5	<0.10	<1.0	100	<1.0	<0.5	<1.0	15	6	<0.5
B7-3'	02/01/07	3	HWLM	Engeo (2007)	Y	Sandy gravel	<2.5	9.1	53	<0.5	<0.5	120	14	78	<2.5	<0.10	<1.0	100	<1.0	<0.5	<1.0	59	31	<0.5
B7-6.5'	02/01/07	6.5	HWLM	Engeo (2007)	Y	Sandy gravel	<2.5	11	38	<0.5	<0.5	110	24	69	<2.5	<0.10	<1.0	73	<1.0	<0.5	<1.0	47	26	<0.5
B8-3'	02/01/07	3	ETP-E	Engeo (2007)	Y	Tailings	<2.5	2.7	7	<0.5	1	66	19	150	<2.5	<0.10	<1.0	29	<1.0	<0.5	<1.0	79	32	<0.5
B8-10'	02/01/07	10	ETP-E	Engeo (2007)	Y	Weathered bedrock	<2.5	2.8	5	<0.5	<0.5	82	22	120	<2.5	1	<1.0	120	<1.0	<0.5	<1.0	20	53	<0.5
B10-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Soil/rock berm	<2.5	110/0.8	2	<0.5	1	93	30	100	86/5.9/<0.5	2.2/<0.025	10	140	<1.0	<0.5	<1.0	22	41	<0.5
B10-5'	02/01/07	5	WTP-N	Engeo (2007)	Y	Soil/rock berm	<2.5	98/10/<0.2	11	<0.5	1	120	9	11	6	1	4	110	<1.0	<0.5	<1.0	23	14	<0.5
B10-15'	02/01/07	15	WTP-N	Engeo (2007)	Y	Soil/rock berm	<2.5	320/1.4	2	<0.5	1	170	22	34	21	0	2	190	<1.0	1	<1.0	28	20	<0.5
TP19-1'	01/31/07	1	ETP-E	Engeo (2007)	Y	Tailings	<2.5	9.0	2	<0.5	<0.5	370	53	66	25	1	13	470/5.3	<1.0	<0.5	<1.0	43	82	0.64
TP19-4'	01/31/07	4	ETP-E	Engeo (2007)	Y	Tailings	<2.5	19	2	<0.5	<0.5	330	30	67	22	2	10	290/4.1	<1.0	<0.5	<1.0	41	60	<0.5
TP19-5'	01/31/07	5	ETP-E	Engeo (2007)	Y	Tailings	<2.5	250/1.3	25	<0.5	2	290	69	420/11	280/1.8	4.3/<0.025	4	480/9.1	<1.0	2	<1.0	87	160	3.5
IdT1-1b	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Bedrock at 20"	13	198/ND	43	ND	3	63.2/ND	16	348	1610/18	34	41	126	ND	8	ND	57	30	--
IdT2-1b-30"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	9	126/ND	26	ND	2	52	17	156	724/0.3	17	31	108	ND	3	ND	48	37	--
IdT2-1b-59"	11/08/05	5	ETP-E	IMMC (2005 Nov)	N	Tailings	6	11	14	ND	2	58	35	102	41	1	1	217	ND	ND	ND	50	45	--
IdT3-1	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	2.2	5	ND	1	56	12	24	5	0	ND	42	ND	ND	ND	28	40	--
IdT3-10b-115"	11/08/05	9.5	WTP-N	IMMC (2005 Nov)	N	Tailings	3	ND	ND	ND	1	41	14	48	24	1	ND	155	ND	3	ND	34	16	--
IdT3-10b-44"	11/08/05	4	WTP-N	IMMC (2005 Nov)	N	Tailings	1	1.3	3	ND	2	46	9	39	6	0	ND	25	ND	ND	ND	30	47	--
IdT3-10b-75"	11/08/05	6	WTP-N	IMMC (2005 Nov)	N	Tailings	3	77.8/0.3	10	ND	2	54	16	67	54.2/0.6	3	ND	83	ND	8	ND	39	54	--
IdT3-11-120"	11/08/05	10	WTP-N	IMMC (2005 Nov)	N	Tailings	4	1.1	ND	ND	1	42	16	36	32	1	ND	179	ND	2	ND	33	14	--
IdT3-11-36"	11/08/05	3	WTP-N	IMMC (2005 Nov)	N	Tailings	3	9.9	8	ND	2	63	20	57	63	1	ND	89	ND	ND	ND	49	60	--
IdT3-11-96"	11/08/05	8	WTP-N	IMMC (2005 Nov)	N	Tailings	7	8.3	10	ND	2	66	21	43	33	1	3	209	ND	ND	ND	58	39	--
IdT3-2b-48"	11/08/05	4	WTP	IMMC (2005 Nov)	N	Tailings	1	ND	10	ND	1	70	12	24	4	0	ND	26	ND	ND	ND	54	41	--
IdT3-2b-75"	11/08/05	6	WTP	IMMC (2005 Nov)	N	Tailings	2	ND	13	ND	1	86	15	31	6	0	ND	35	ND	ND	ND	67	50	--
IdT3-3	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	ND	20	ND	2	90	18	39	13	1	ND	40	ND	ND	ND	72	59	--
IdT3-4b-42"	11/08/05	3.5	WTP	IMMC (2005 Nov)	N	Tailings	1	7.0	22	ND	1	70	14	27	16	2	ND	38	ND	ND	ND	50	50	--
IdT3-4b-78"	11/08/05	6.5	WTP	IMMC (2005 Nov)	N	Tailings	1	3.4	7	ND	2	62	12	32	14	0	ND	38	ND	ND	ND	44	49	--
IdT3-5	11/08/05	0-1[A]	WTP-N	IMMC (2005 Nov)	N	Tailings	2	5.3	18	ND	1	56	12	16	12	2	ND	29	ND	3	ND	52	47	--
IdT3-6	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	3.2	15	ND	1	66	13	15	14	1	ND	29	ND	ND	ND	56	49	--
IdT3-7	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	1.8	22	ND	1	58	14	20	10	2	ND	34	ND	ND	ND	49	44	--
IdT3-8-46"	11/08/05	4	WTP	IMMC (2005 Nov)	N	Tailings	1	11.9	20	ND	1	48	11	21	17	1	1	23	ND	ND	ND	44	46	--
IdT3-8-84"	11/08/05	7	WTP	IMMC (2005 Nov)	N	Tailings	2	6.8	13	ND	1	59	14	25	18	2	ND	41	ND	ND	ND	50	50	--
IdT3-9b-44"	11/08/05	3.5	WTP-N	IMMC (2005 Nov)	N	Tailings	2	1.8	8	ND	1	49	10	33	8	0	ND	27	ND	ND	ND	36	38	--
IdT3-9b-99"	11/08/05	8	WTP-N	IMMC (2005 Nov)	N	Tailings	4	1.9	ND	ND	1	41	17	8	5	0	ND	209	ND	ND	ND	37	18	--
IdT4-1	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	2	3.2	11	ND	2	82	14	34	10	0	ND	40	ND	ND	ND	60	55	--
IdT4-10-28"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	19	3010/62.2	4	ND	2	47	55	498	1950/3.9	7	8	374	ND	10	ND	19	63	--
IdT4-10-53"	11/08/05	4.5	ETP-E	IMMC (2005 Nov)	N	Tailings	11	20	4	ND	1	61	27	51	55	3	6	417	ND	ND	ND	65	34	--

Table 2a - Total Metals and Cyanide in Solid Samples, Sorted by Date
Centennial M-1 Property
Nevada County, California

Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Results																	
							Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
IdT4-11	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	6	6.9	22	ND	1	743	25	56	25	0	ND	197	ND	ND	ND	77	61	--
IdT4-12	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	14	805/1.4	101	ND	3	133/0.2	44	353/8.4	388/0.6	28	3	224/3.0	ND	5	ND	130	99	--
IdT4-2	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	12	ND	7	ND	2	74	30	37	50	3	1	461	ND	3	ND	78	40	--
IdT4-3b-30"	11/08/05	2.5	ETP	IMMC (2005 Nov)	N	Tailings	3	9.0	12	ND	2	89	22	54	9	1	ND	60	ND	ND	ND	76	64	--
IdT4-3b-36"	11/08/05	3	ETP	IMMC (2005 Nov)	N	Tailings	5	3.6	2	ND	1	44	18	45	9	0	ND	222	ND	ND	ND	40	18	--
IdT4-3b-58"	11/08/05	5	ETP	IMMC (2005 Nov)	N	Tailings	7	13	11	ND	2	90	28	99	53	3	ND	226	ND	2	ND	88	43	--
IdT4-3b-76"	11/08/05	6	ETP	IMMC (2005 Nov)	N	Tailings	11	2.2	5	ND	1	78	24	35	44	3	12	402	ND	2	ND	81	38	--
IdT4-5	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	7	ND	2	ND	3	nd	104	94	9	0	6	250	ND	ND	ND	48	21	--
IdT4-6	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	17	5.5	7	ND	2	83	35	56	50	3	540	3370/2.2	ND	4	ND	121	52	--
IdT4-7	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	108	ND	8	ND	1	63	32	56	51	3	23	559/0.4	ND	3	ND	88	47	--
IdT4-8	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	8	2.4	3	ND	1	55	17	38	20	0	1	262	ND	3	ND	51	25	--
IdT4-9b-28"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	9	5.0	4	ND	1	62	20	55	29	3	3	299	ND	ND	ND	60	28	--
IdT4-9b-77"	11/08/05	6.5	ETP-E	IMMC (2005 Nov)	N	Tailings	10	10	9	ND	1	75	26	71	39	2	4	319	ND	ND	ND	76	39	--
IdT5-2b	11/08/05	0-1[A]	SIL	IMMC (2005 Nov)	N	NR	5	4.6	57	ND	3	274	31	79	51	0	nd	58	18	ND	49	91	69	--
IdTP1-2	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	239	99	--	49	390	31	350	2,088	24	68	543	--	--	--	139	67	--
IdTP1-3	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	23	67	--	43	892	169	400	258	5	7	885	--	--	--	159	107	--
IdTP1-4	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	30	88	--	25	631	22	135	895	14	9	581	--	--	--	54	35	--
IdTP1-5	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	18	44	--	24	805	75	100	52	1	<5	748	--	--	--	132	61	--
IdTP1-6	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	28	44	--	28	860	69	159	115	3	<5	869	--	--	--	123	67	--
IdTP1-7	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	26	55	--	25	896	77	122	62	2	<5	812	--	--	--	138	68	--
IdTP1-8	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	50	60	--	32	859	73	175	158	3	<5	787	--	--	--	138	81	--
IdTP1-9	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	37	37	--	24	760	65	130	85	2	<5	818	--	--	--	97	66	--
IdTP1-10	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	44	357	--	33	678	93	173	177	2	<5	626	--	--	--	152	94	--
IdTP1-11	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	74	67	--	40	912	107	275	163	2	<5	1,040	--	--	--	109	82	--
IdTP1-12	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	103	80	--	22	555	63	89	70	2	<5	670	--	--	--	117	78	--
IdTP1-13	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	47	62	--	25	479	61	111	50	2	<5	421	--	--	--	170	79	--
IdTP1-14	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	15	62	--	25	568	62	171	159	3	<5	663	--	--	--	75	68	--
IdTP2-1	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	111	120	--	41	473	35	442	1,040	31	43	466	--	--	--	132	78	--
IdTP2-2	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	<10	36	--	31	1,210	127	231	196	9	5	1,286	--	--	--	126	153	--
IdTP2-3	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	10	56	--	32	966	67	75	68	5	<5	873	--	--	--	218	130	--
IdTP4-1	02/27/05	0-1	ETP	IMMC (2005 Feb)	N	Tailings	--	<10	124	--	16	155	12	60	13	1	<5	55	--	--	--	162	83	--
IdTP4-2	02/27/05	0-1	ETP	IMMC (2005 Feb)	N	Tailings	--	<10	51	--	16	609	27	32	26	0	5	600	--	--	--	82	46	--
IdTP1-1	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	67	58	--	49	546	30	244	351	7	11	327	--	--	--	194	61	--
IdTP1-B	11/10/04	NR	ETP-E	IMMC (2004)	N	Tailings	--	50	331	--	30	169	49	196	35,111	33	30	346	--	--	--	161	76	--
IdTP1-C	11/10/04	NR	ETP-E	IMMC (2004)	N	Tailings	--	<10	51	--	17	267	37	93	98	0.39	1	429	--	--	--	78	58	--
IdTP1-R	11/10/04	NR	ETP-E	IMMC (2004)	N	Tailings	--	182	91	--	55	396	37	281	1,236	23	33	772	--	--	--	79	94	--
SA1-2'	09/09/93	2	WTP	Vector (1993)	Y	Tailings	--	7.5	--	--	--	94	--	57	18	1	--	56	--	--	--	--	--	--
SA2-2'	09/09/93	2	WTP	Vector (1993)	Y	Weathered bedrock	--	<5.0	--	--	--	25	--	68	<3.8	0	--	144	--	--	--	--	--	--
SA3-1'	09/09/93	1	WTP	Vector (1993)	Y	Sand (native)	--	10	--	--	--	54	--	31	4	0	--	26	--	--	--	--	--	--
SA4-2'	09/09/93	2	WTP	Vector (1993)	Y	Tailings	--	<5.0	--	--	--	74	--	23	12	0	--	34	--	--	--	--	--	<1.0
SA4-10'	09/09/93	10	WTP	Vector (1993)	Y	Silty sand (native)	--	<5.0	--	--	--	715/<0.01	--	60	<3.8	<0.1	--	255/<0.04	--	--	--	--	--	--
SA4-6.5'	09/09/93	6.5	WTP	Vector (1993)	Y	Sandy silt (native)	5	27	31	1	<0.5	580/<0.01	59	78	6	<0.1	4	400/<0.04	<5.0	<0.75	33	30	43	--
SA5-2'	09/09/93	2	WTP-N	Vector (1993)	Y	Tailings	<2.5	6.5	7	0	<0.5	70	14	35	5	0	3	43	<5.0	<0.75	5	46	41	--
SA5-8'	09/09/93	8	WTP-N	Vector (1993)	Y	Tailings	--	136/<0.075	--	--	--	385	--	32	13	1	--	249	--	--	--	--	--	<1.0
SA6-2'	09/09/93	2	WTP-N	Vector (1993)	Y	Tailings	--	168/<0.075	--	--	--	410/<0.01	--	224/<0.002	172/<0.075	12.4/0.0011	--	352/<0.04	--	--	--	--	--	--
SA6-8'	09/09/93	8	WTP-N	Vector (1993)	Y	Tailings	--	80	--	--	--	217	--	14	<3.8	0	--	176	--	--	--	--	--	--
SA6-17'	09/09/93	17	WTP-N	Vector (1993)	Y	Center of waste rock be	--	648/<0.075	--	--	--	278/<0.01	--	168	127/<0.075	4.4/<0.1	--	292/<0.04	--	--	--	--	--	<1.0
SA7-2'	09/09/93	2	WTP	Vector (1993)	Y	Tailings	--	<5.0	--	--	--	73	--	20	10	1	--	33	--	--	--	--	--	--
SA7-8'	09/09/93	8	WTP	Vector (1993)	Y	Tailings	<2.5	6.8	26	0	1	81	16	31	21	2	6	40	<5.0	<0.75	<3.8	62	81	<1.0
SB1-3'	09/09/93	3	WTP-N	Vector (1993)	Y	Waste rock	<2.5	6.0	6	0	<0.5	68	14	37	4	0	3	40	<5.0	<0.75	5	46	43	--
SB2-3'	09/09/93	3	ETP	Vector (1993)	Y	Tailings	<2.5	<5.0	38	0	<0.5	348	35	91	<3.8	0	4	126	<5.0	<0.75	17	86	35	--
SB2-7'	09/09/93	7	ETP	Vector (1993)	Y	Weathered bedrock	--	<5.0	--	--	--	250	--	39	<3.8	0	--	102	--	--	--	--	--	--
SB3-4'	09/09/93	4	ETP-E	Vector (1993)	Y	Sand (native)	--	<5.0	--	--	--	373	--	26	<3.8	0	--	241	--	--	--	--	--	--
SB4-1'	09/09/93	1	ETP-E	Vector (1993)	Y	Tailings	<2.5	<5.0	11	0	<0.5	379	29	45	20	1	6	296	<5.0	2	24	56	49	--

Table 2a - Total Metals and Cyanide in Solid Samples, Sorted by Date
Centennial M-1 Property
Nevada County, California

							Results																
Sample ID	**Sample Date**	**Sample Depth** (ft)	**Assessment Area**	**Reference**	**Validated**	**Sample Description**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**	**Cyanide**
SB4-3'	09/09/93	3	ETP-E	Vector (1993)	Y	Sandy clay (native)	--	<5.0	--	--	--	625	--	22	<3.8	0	--	120	--	--	--	--	--	--
SB5-3'	09/09/93	3	ETP-E	Vector (1993)	Y	Sandy clay (native)	--	<5.0	--	--	--	352	--	144	<3.8	<0.1	--	112	--	--	--	--	--	--
SB6-2'	09/09/93	2	ETP	Vector (1993)	Y	Tailings	--	<5.0	--	--	--	740	--	50	31	3	--	466	--	--	--	--	--	--
SB7-2.5'	09/09/93	2.5	ETP	Vector (1993)	Y	Tailings	--	60/<0.075	--	--	--	980/<0.01	--	39	20	3	--	535/<0.04	--	--	--	--	--	--
SB7-4.5'	09/09/93	4.5	ETP	Vector (1993)	Y	Sandy silt (native)	--	73	--	--	--	190	--	58	<3.8	0	--	59	--	--	--	--	--	--
SB8-2.5'	09/09/93	2.5	ETP-E	Vector (1993)	Y	Tailings	<2.5	<5.0	5	1	<0.5	1160/<0.01	32	39	16	3	7	687/<0.04	<5.0	2	67	79	58	--
SB8-4.5'	09/09/93	4.5	ETP-E	Vector (1993)	Y	Sandy silt (native)	--	<5.0	--	--	--	254	--	62	<3.8	1	--	186	--	--	--	--	--	--
SB9-2.5'	09/09/93	2.5	ETP	Vector (1993)	Y	Tailings	<2.5	<5.0	6	0	<0.5	735	34	47	34	0	16	575	<5.0	3	59	70	52	--
SB10-2'	09/09/93	2	ETP	Vector (1993)	Y	Sandy silt (native)	--	7.6	--	--	--	282	--	8	<3.8	<0.1	--	69	--	--	--	--	--	--
SB11-2.5'	09/09/93	2.5	ETP-E	Vector (1993)	Y	Tailings	--	<0.5	--	--	--	740	--	63	21	0	--	429	--	--	--	--	--	--
HS-1 (4.5')	08/13/90	4.5	WTP-N	Vector (1990 Aug)	Y	Gravelly silt (native)	<50	<10	<100	<1	<10	218	43	47	<10	<1	<50	144	<10	<10	<40	118	54	--
HS-2A (6')	08/13/90	6	WTP-N	Vector (1990 Aug)	Y	Talings/waste rock	<50	292	<100	<1	<10	349	30	69	115	4	<50	281	<10	<10	<40	<100	65	--
HS-2B (11.5')	08/13/90	11.5	WTP-N	Vector (1990 Aug)	Y	Waste rock	<50	<10	<100	<1	<10	383	25	83	<10	<1	<50	222	<10	<10	<40	<100	30	--
HS-3 (10')	08/13/90	10	ETP-E	Vector (1990 Aug)	Y	Waste rock	<50	<10	<100	<1	<10	119	34	170	<10	<1	<50	193	<10	<10	<40	<100	43	--
BH-1 (5.5-6)	06/14/90	6	WTP	Vector (1990 Jun)	Y	Tailings	<100	16	<100	<1	<10	40	<20	14	14	<1	<50	26	<10	<10	<100	<100	47	--
BH-1 10'COMP	06/14/90	NR	WTP	Vector (1990 Jun)	Y	Tailings	<100	14	<100	<1	<10	259	<20	58	<10	<1	<50	164	<10	<10	<100	<100	46	--
BH-2 (15 to 15.5)	06/14/90	15	WTP	Vector (1990 Jun)	Y	Weathered bedrock	<100	12	<100	<1	<10	261	20	63	<10	<1	<50	205	<10	<10	<100	<100	106	--
BH-3 (6-6.5)	06/14/90	6	WTP-N	Vector (1990 Jun)	Y	Tailings	<100	20	<100	<1	<10	38	<20	57	24	<1	<50	49	<10	<10	<100	<100	92	--
BH-4 (5.5-6)	06/14/90	6	WTP-N	Vector (1990 Jun)	Y	Tailings	<100	<10	<100	<1	<10	18	<20	48	<10	<1	<50	23	<10	<10	<100	<100	70	--
BH-4 (11-11.5)	06/14/90	11	WTP-N	Vector (1990 Jun)	Y	Tailings	<100	33	<100	<1	<10	110	67	86	15	<1	<50	269	<10	<10	<100	124	40	--
AG-1/3 (1A,1B, 3A,3B-Soil)	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings, composite	5	88	6	<0.5	<2.0	149	61	294	342	6	12	232	16	3	210	36	43	2
AG-1/3 (1A,1B, 3A,3B-White PPT)	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings, composite	<4	41	3	<0.5	<2.0	76	50	140	162	3	10	169	8	1	57	18	3	1
AG-2 (2A,2B)	Aug-89	NR	WTP-N	Anderson (1989)	N	Tailings, composite	8	132	21	1	<2.0	387	48	158	91	2	8	324	8	2	164	81	62	2
AG-4 (4B)	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings	15	254	8	<0.5	<2.0	166	177	1,430	696	7	19	414	45	8	650	49	363	0
AG-5 (5A,5B)	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings, composite	10	128	6	<0.5	<2.0	166	88	639	364	4	10	302	25	5	345	40	173	0

Notes:
1 Total chromium (CAS No. 7440-47-3) results compared to RSLs for Chromium III (CAS No. 16065-83-1) Results in bold font exceed a commercial screening level or estimated background range.
2 Results in **bold** font exceed a commercial screening level or estimated background range.
A = Sample depth not recorded. IMMC (2007) narrative description suggests samples were obtained from 0 to 1 foot bgs.
CAS = Chemical Abstracts Service registry number
DTSC-SL = California Department of Toxic Substances Control Screening Level (Human Health Risk Assessment Note 3 (DTSC, 2019)
ETP = Eastern Tailings Pond (older, mercury-treated tailings)
ETP-E = Eastern Tailings Pond, Eastern (older, deeper portion)
HWLM = Hap Warnke lumber mill
J = concentration is estimated (detected below the RL but above or equal to the MDL
MDL = method detection limit
mg/kg = milligrams per kilogram, or parts per million (ppm)
na = not applicable
ND = not detected above listed MDL RL = laboratory reporting limit
NL = reporting limit not listed (laboratory report not available for review)
NR = not recorded
RL = reporting limit, or pratical quantitation limit
RSL = USEPA Region 9 Regional Screening Level
SIL = South Idaho Location
STLC = Soluble Threshold Limit Concentration
TTLC = Total Threshold Limit Concentration
WTP = Western Tailings Pond (more recent, cyanide-treated tailings)
WTP-N = Western Tailings Pond, Northern (older, deeper portion)

Table 2b - Total Metals and Cyanide in Solid Samples, Sorted by Area
Centennial M-1 Property
Nevada County, California

Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Results																	
							Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
Chemical Identification	*USEPA Method*						*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*7471A*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*9010B*
	CAS No.						*7440-36-0*	*7440-38-2*	*7440-39-3*	*7440-41-7*	*7440-43-9*	*16065-83-1*	*7440-48-4*	*7440-50-8*	*7439-92-1*	*7439-97-6*	*7439-98-7*	*7440-02-0*	*7782-49-2*	*7440-22-4*	*7440-28-0*	*7440-62-2*	*7440-66-6*	*57-12-5*
	Unit						*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
Reporting and Detection Limits	*Method Detection Limit, NV5 (2019)*						*0.51*	*0.12*	*0.12*	*0.03*	*0.14*	*0.26*	*0.07*	*0.19*	*0.18*	*0.007*	*0.12*	*0.18*	*0.40*	*0.12*	*0.38*	*0.06*	*0.15*	*na*
	Reporting Limit, NV5 (2019)						*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.10*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*na*
	Reporting Limit, Engeo (2007)						*2.5*	*1.0*	*1.0*	*0.5*	*0.5*	*1.0*	*1.0*	*1.0*	*2.5*	*0.1*	*1.0*	*1.0*	*1.0*	*0.5*	*1.0*	*1.0*	*1.0*	*0.5*
	Reporting Limit, IMMC (2005 Nov)						*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*
	Reporting Limit, IMMC (2005 Feb)						*NL*	*10*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*5.0*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*
	Reporting Limit, IMMC (2004)						*NL*	*10*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*
	Reporting Limit, Vector (1993)						*2.5*	*5.0*	*0.25*	*0.1*	*0.5*	*0.5*	*0.4*	*0.1*	*3.8*	*0.1*	*0.5*	*2.0*	*5.0*	*0.75*	*3.8*	*0.1*	*0.5*	*1.0*
	Reporting Limit, Vector (1990 Aug)						*50*	*10*	*100*	*1*	*10*	*10*	*20*	*10*	*10*	*1*	*50*	*10*	*10*	*10*	*40*	*100*	*10*	*na*
	Reporting Limit, Vector (1990 Jun)						*100*	*10*	*100*	*1*	*10*	*10*	*20*	*10*	*10*	*1*	*50*	*10*	*10*	*10*	*100*	*100*	*10*	*na*
	Reporting Limit, Anderson (1989)						4.0	3.0	0.2	0.5	2.0	2.0	1.0	1.0	4.5	0.05	1.0	3.0	5.0	1.0	2.0	1.0	1.0	0.05
Screening Levels and Benchmark Concentrations	*Commercial Soil*						*470*	*0.25*	*220,000*	*210*	*7.3*	*1.8E+06*	*350*	*47,000*	*320*	*4.5*	*5,800*	*3,100*	*5,800*	*1,500*	*12*	*1,000*	*350,000*	*150*
	Basis for Screening Level						*RSL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*RSL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*RSL*	*RSL*	*RSL*	*DTSC-SL*	*RSL*	*RSL*
	TTLC						*500*	*500*	*10,000*	*75*	*100*	*2,500*	*8,000*	*2,500*	*1,000*	*20*	*3,500*	*2,000*	*100*	*500*	*700*	*2,400*	*5,000*	
	STLC						*15*	*5*	*100*	*0.75*	*1.0*	*5*	*80*	*25*	*5*	*0.2*	*350*	*20*	*1.0*	*5*	*7*	*24*	*250*	
IMM-TN-13	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.6	44	24	<0.03	0.62 J	290	26	76	41	0.81	<0.12	150	2.0	<0.12	<0.38	79	24	--
IMM-TN-14	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	7.4	0.38 J	42	<0.03	0.36 J	460	38	140	1.7	0.74	2.3	140	3.5	<0.12	<0.38	130	14	--
IMM-TN-15	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	6.6	5.3	20	<0.03	0.32 J	470	37	130	4.6	0.33	<0.12	240	1.5	<0.12	<0.38	65	16	--
IMM-TN-16	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	4.9	13	30	<0.03	0.32 J	370	38	80	22	0.59	2.1	150	2.5	<0.12	<0.38	100	19	--
IMM-TN-17	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.4	5.5	7.7	<0.03	0.44 J	280	27	41	14	0.18	<0.12	240	<0.40	1.1	<0.38	48	16	--
IMM-TN-31	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.1	1.2	0.70 J	<0.03	0.39 J	260	16	32	17	0.44	0.37 J	190	<0.40	1.5	<0.38	30	14	--
IMM-TN-32	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	3.7	1.5	1.3	<0.03	0.34 J	320	15	21	23	1.7	2.4	220	0.61 J	1.2	<0.38	40	18	--
IMM-TN-33	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	4.0	4.1	2.0	<0.03	0.57 J	310	19	40	28	0.66	ND	270	<0.40	1.8	<0.38	38	22	--
IMM-TN-34	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	5.9	3.3	3.5	<0.03	0.52 J	390	17	33	19	1.1	0.35 J	270	1.9	0.72 J	<0.38	43	23	--
IMM-TN-35	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	0.99 J	3.3	12	<0.03	0.31 J	110	12	21	4.3	0.3	<0.12	99	1.1	ND	<0.38	32	20	--
IMM-TN-36	04/16/19	0-0.5	ETP	NV5 (2019)	Y	Tailings	1.3 J	0.87 J	4.7	<0.03	0.28 J	180	11	8.7	5.7	0.04 J	<0.12	140	<0.40	0.29 J	<0.38	24	12	--
IMM-T-13	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	5.2 J	86.8	33.3	<0.58	1.4	347	44.4	98.1	86.2	0.90	--	243	<4.1	<1.2	<2.9	112	50.3	--
IMM-T-14	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	8.4	13.4	51.4	<0.52	0.37 J	537	62.3	124	13.1	1.5	--	377	<3.6	0.51 J	<2.6	134	30.0	--
IMM-T-15	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	10.5	16.2	26.4	<0.56	0.38 J	539	52.6	77.7	13.5	0.32	--	364	<3.9	0.32 J	<2.8	87.4	24.9	--
IMM-T-16	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	9.7	30.0	35.0	<0.58	0.51 J	493	53.7	98.5	22.7	0.56	--	275	<4.0	<1.2	<2.9	130	33.6	--
IMM-T-17	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	4.4 J	9.2	8.4 J	<0.55	0.42 J	224	27.4	36.5	19.1	0.27	--	265	<3.8	<1.1	<2.7	40.6	19.3	--
IMM-T-31	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	5.8 J	4.8	<19.8	<0.50	0.59	270	23.2	35.5	27.0	0.35	--	277	<3.5	2.6	<2.5	42.3	26.1	--
IMM-T-32	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	7.9	7.9	<22.2	<0.55	0.55	396	24.3	33.9	46.7	3.0	--	347	<3.9	2.7	<2.8	57.8	32.0	--
IMM-T-33	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	7.1 J	11.3	<24.1	<0.60	0.83	350	29.3	53.1	49.3	1.0	--	393	<4.2	3.9	<3.0	49.6	38.1	--
IMM-T-34	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	9.5	10.0	6.5 J	<0.56	0.69	477	28.2	50.5	42.1	1.6	--	433	<3.9	2.2	<2.8	63.4	44.6	--
IMM-T-35	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	3.6 J	9.9	19.2 J	<0.51	0.44 J	186 J	29.6	76.0	11.7	0.34	--	283	1.3 J	0.38 J	<2.6	2.6	35.5	--
IMM-T-36	04/16/19	0-0.5	ETP	Weston (2019)	Y	Tailings	3.3 J	5.1	7.3 J	<0.49	0.40 J	187 J	16.7	10.9	13.2	<0.11	--	190	<3.4	1.5	<2.5	47.2	20.0	--
IdT4-1	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	2	3	11	ND	2	82	14	34	10	0	ND	40	ND	ND	ND	60	55	--
IdT4-2	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	12	nd	7	ND	2	74	30	37	50	3	1	461	ND	3	ND	78	40	--
IdT4-3b-30"	11/08/05	2.5	ETP	IMMC (2005 Nov)	N	Tailings	3	9	12	ND	2	89	22	54	9	1	ND	60	ND	ND	ND	76	64	--
IdT4-3b-36"	11/08/05	3	ETP	IMMC (2005 Nov)	N	Tailings	5	4	2	ND	1	44	18	45	9	0	ND	222	ND	ND	ND	40	18	--
IdT4-3b-58"	11/08/05	5	ETP	IMMC (2005 Nov)	N	Tailings	7	13	11	ND	2	90	28	99	53	3	ND	226	ND	2	ND	88	43	--
IdT4-3b-76"	11/08/05	6	ETP	IMMC (2005 Nov)	N	Tailings	11	2	5	ND	1	78	24	35	44	3	12	402	ND	2	ND	81	38	--
IdT4-5	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	7	nd	2	ND	3	nd	104	94	9	0	6	250	ND	ND	ND	48	21	--
IdT4-6	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	17	6	7	ND	2	83	35	56	50	3	540	3370/2.2	ND	4	ND	121	52	--
IdT4-7	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	108	nd	8	ND	1	63	32	56	51	3	23	559/0.4	ND	3	ND	88	47	--
IdTP4-1	02/27/05	0-1	ETP	IMMC (2005 Feb)	N	Tailings	--	<10	124	--	16	155	12	60	13	1	<5	55	--	--	--	162	83	--
IdTP4-2	02/27/05	0-1	ETP	IMMC (2005 Feb)	N	Tailings	--	<10	51	--	16	609	27	32	26	0	5	600	--	--	--	82	46	--
SB2-7'	09/09/93	7	ETP	Vector (1993)	Y	Weathered bedrock	--	<5.0	--	--	--	250	--	39	<3.8	0	--	102	--	--	--	--	--	--
SB2-3'	09/09/93	3	ETP	Vector (1993)	Y	Tailings	<2.5	<5.0	38	0	<0.5	348	35	91	<3.8	0	4	126	<5.0	<0.75	17	86	35	--
SB6-2'	09/09/93	2	ETP	Vector (1993)	Y	Tailings	--	<5.0	--	--	--	740	--	50	31	3	--	466	--	--	--	--	--	--
SB7-2.5'	09/09/93	2.5	ETP	Vector (1993)	Y	Tailings	--	60/<0.075	--	--	--	980/<0.01	--	39	20	3	--	535/<0.04	--	--	--	--	--	--

Table 2b - Total Metals and Cyanide in Solid Samples, Sorted by Area
Centennial M-1 Property
Nevada County, California

							Results																	
Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
SB7-4.5'	09/09/93	4.5	ETP	Vector (1993)	Y	Sandy silt (native)	--	73	--	--	--	190	--	58	<3.8	0	--	59	--	--	--	--	--	--
SB9-2.5'	09/09/93	2.5	ETP	Vector (1993)	Y	Tailings	<2.5	<5.0	6	0	<0.5	735	34	47	34	0	16	575	<5.0	3	59	70	52	--
SB10-2'	09/09/93	2	ETP	Vector (1993)	Y	Sandy silt (native)	--	8	--	--	--	282	--	8	<3.8	<0.1	--	69	--	--	--	--	--	--
IMM-TN-18	04/16/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.1	11	23	<0.03	0.37 J	280	26	65	12	0.41	<0.12	280	<0.40	<0.12	<0.38	37	44	--
IMM-TN-20	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.7	41	15	<0.03	0.73 J	310	37	150	63	3.9	0.33 J	240	1.9	<0.12	<0.38	54	30	--
IMM-TN-21	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	5.4	38	14	<0.03	1.4	350	68	230	280	8.5	6.9	320	6.3	0.91 J	<0.38	49	35	--
IMM-TN-22	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.8	53	18	<0.03	0.87 J	260	24	190	350	6.5	8.8	160	6.8	0.20 J	<0.38	46	23	--
IMM-TN-23	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.6	37	0.20 J	<0.03	6.6	260	140	360	170	4.0	2.2	530	5.0	0.41 J	<0.38	31	91	--
IMM-TN-24	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.5	35	4.8	<0.03	1.1	260	34	410	95	1.6	<0.12	210	3.1	<0.12	<0.38	39	31	--
IMM-TN-37	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.5	1,800	27	<0.03	1.0	180	14	300	150	3.5	<0.12	110	5.6	<0.12	<0.38	40	40	--
IMM-TN-38	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	2.1	51	26	<0.03	0.74 J	150	94	400	56	6.2	<0.12	220	1.9	<0.12	<0.38	62	64	--
IMM-TN-39	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	2.2	280	34	<0.03	1.7	130	58	170	70	3.5	<0.12	420	1.9 J	<0.12	<0.38	69	93	--
IMM-TN-40	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	3.1	11	19	<0.03	0.38 J	250	22	58	13	0.38	<0.12	140	2.0	<0.12	<0.38	95	27	--
IMM-TN-41	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	4.1	950	47	<0.03	1.3	200	46	370	500	31.0	2.5	160	4.1	5.8	<0.38	74	71	--
IMM-TN-42	04/17/19	0-0.5	ETP-E	NV5 (2019)	Y	Tailings	1.8 J	14	87	<0.03	0.66 J	150	37	77	30	1.3	<0.12	140	2.9	<0.12	<0.38	82	87	--
IMM-T-18	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	4.8 J	14.9	22.5	<0.49	0.46 J	239	33.7	37.0	14.2	0.59	--	280	<3.5	0.49 J	<2.5	32.8	39.0	--
IMM-T-20	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.9	74.0	19.8 J	<0.54	1.6	392	61.4	148	87.5	2.8	--	418	1.2 J	0.89 J	<2.7	76.0	54.9	--
IMM-T-21	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.4	66.3	26.9	<0.62	2.3	346	113	366	513	12.2	--	481	6.3	3.9	<3.1	64.7	63.2	--
IMM-T-22	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	8.1 J	79.8	18.3 J	<0.68	1.2	329	30.4	273	677	18.1	--	209	7.9	3.5	<3.4	74.6	32.6	--
IMM-T-23	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.7	59.0	5.5 J	<0.50	10.1	385	193	389	280	6.1	--	825	5.0	2.5	<2.5	38.8	111	--
IMM-T-24	04/16/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	6.5 J	64.1	8.1 J	<0.70	2.4	309	55.6	597	220	3.6	--	340	4.6 J	1.3 J	<3.5	47.4	59.4	--
IMM-T-37	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	6.9 J	4,050	43.9	<0.59	24.2	318 J	29.5	552	197	6.1	--	196	1.7 J	2.0	<2.9	29.1	78.6	--
IMM-T-38	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	5.2 J	62	41.2	<0.75	1.7	260 J	263	781	123	12.0	--	784	1.6 J	1.0 J	<3.7	52.0	247	--
IMM-T-39	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	3.9 J	645	90.8	<0.80	10.9	171 J	153	333	129	6.7	--	933	3.2 J	2.2	<4.0	132	227	--
IMM-T-40	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	6.2 J	9.9	23.1 J	<0.62	0.43 J	331 J	32.1	68	25.5	0.54	--	220	1.8 J	0.56 J	<3.1	116	39.9	--
IMM-T-41	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	7.6 J	1,470	86.8	<0.74	19.1	287 J	105	662	835	57.4	--	297	3.5 J	9.8	<3.7	119	150	--
IMM-T-42	04/17/19	0-0.5	ETP-E	Weston (2019)	Y	Tailings	4.2 J	24.5	146	<0.70	1.2	210 J	71.4	114	58.6	2.8	--	257	2.3 J	1.0 J	<3.5	114	194	--
B8-3'	02/01/07	3	ETP-E	Engeo (2007)	Y	Tailings	<2.5	3	7	<0.5	1	66	19	150	<2.5	<0.10	<1.0	29	<1.0	<0.5	<1.0	79	32	<0.5
B8-10'	02/01/07	10	ETP-E	Engeo (2007)	Y	Weathered bedrock	<2.5	3	5	<0.5	<0.5	82	22	120	<2.5	1	<1.0	120	<1.0	<0.5	<1.0	20	53	<0.5
TP19-1'	01/31/07	1	ETP-E	Engeo (2007)	Y	Tailings	<2.5	9	2	<0.5	<0.5	370	53	66	25	1	13	470/5.3	<1.0	<0.5	<1.0	43	82	0.64
TP19-4'	01/31/07	4	ETP-E	Engeo (2007)	Y	Tailings	<2.5	19	2	<0.5	<0.5	330	30	67	22	2	10	290/4.1	<1.0	<0.5	<1.0	41	60	<0.5
TP19-5'	01/31/07	5	ETP-E	Engeo (2007)	Y	Tailings	<2.5	250/1.3	25	<0.5	2	290	69	420/11	280/1.8	4.3/<0.025	4	480/9.1	<1.0	2	<1.0	87	160	3.5
IdT1-1b	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Bedrock at 20"	13	198/ND	43	ND	3	63.2/ND	16	348	1610/18	34	41	126	ND	8	ND	57	30	--
IdT2-1b-30"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	9	126/ND	26	ND	2	52	17	156	724/0.3	17	31	108	ND	3	ND	48	37	--
IdT2-1b-59"	11/08/05	5	ETP-E	IMMC (2005 Nov)	N	Tailings	6	11	14	ND	2	58	35	102	41	1	1	217	ND	ND	ND	50	45	--
IdT4-10-28"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	19	3010/62.2	4	ND	2	47	55	498	1950/3.9	7	8	374	ND	10	ND	19	63	--
IdT4-10-53"	11/08/05	4.5	ETP-E	IMMC (2005 Nov)	N	Tailings	11	20	4	ND	1	61	27	51	55	3	6	417	ND	ND	ND	65	34	--
IdT4-11	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	6	7	22	ND	1	743	25	56	25	0	ND	197	ND	ND	ND	77	61	--
IdT4-12	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	14	805/1.4	101	ND	3	133/0.2	44	353/8.4	388/0.6	28	3	224/3.0	ND	5	ND	130	99	--
IdT4-8	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	8	2	3	ND	1	55	17	38	20	0	1	262	ND	3	ND	51	25	--
IdT4-9b-28"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	9	5	4	ND	1	62	20	55	29	3	3	299	ND	ND	ND	60	28	--
IdT4-9b-77"	11/08/05	6.5	ETP-E	IMMC (2005 Nov)	N	Tailings	10	10	9	ND	1	75	26	71	39	2	4	319	ND	ND	ND	76	39	--
IdTP1-2	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	239	99	--	49	390	31	350	2,088	24	68	543	--	--	--	139	67	--
IdTP1-3	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	23	67	--	43	892	169	400	258	5	7	885	--	--	--	159	107	--
IdTP1-4	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	30	88	--	25	631	22	135	895	14	9	581	--	--	--	54	35	--
IdTP1-5	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	18	44	--	24	805	75	100	52	1	<5	748	--	--	--	132	61	--
IdTP1-14	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	15	62	--	25	568	62	171	159	3	<5	663	--	--	--	75	68	--
IdTP2-1	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	111	120	--	41	473	35	442	1,040	31	43	466	--	--	--	132	78	--
IdTP2-2	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	<10	36	--	31	1,210	127	231	196	9	5	1,286	--	--	--	126	153	--
IdTP2-3	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	10	56	--	32	966	67	75	68	5	<5	873	--	--	--	218	130	--
IdTP1-1	02/27/05	0-1	ETP-E	IMMC (2005 Feb)	N	Tailings	--	67	58	--	49	546	30	244	351	7	11	327	--	--	--	194	61	--
IdTP1-B	11/10/04	NR	ETP-E	IMMC (2004)	N	Tailings	--	50	331	--	30	169	49	196	35,111	33	30	346	--	--	--	161	76	--
IdTP1-C	11/10/04	NR	ETP-E	IMMC (2004)	N	Tailings	--	<10	51	--	17	267	37	93	98	0.39	1	429	--	--	--	78	58	--
IdTP1-R	11/10/04	NR	ETP-E	IMMC (2004)	N	Tailings	--	182	91	--	55	396	37	281	1,236	23	33	772	--	--	--	79	94	--

Table 2b - Total Metals and Cyanide in Solid Samples, Sorted by Area
Centennial M-1 Property
Nevada County, California

Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Results																
							Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
SB3-4'	09/09/93	4	ETP-E	Vector (1993)	Y	Sand (native)	--	<5.0	--	--	--	373	--	26	<3.8	0	--	241	--	--	--	--	--	--
SB4-1'	09/09/93	1	ETP-E	Vector (1993)	Y	Tailings	<2.5	<5.0	11	0	<0.5	379	29	45	20	1	6	296	<5.0	2	24	56	49	--
SB4-3'	09/09/93	3	ETP-E	Vector (1993)	Y	Sandy clay (native)	--	<5.0	--	--	--	625	--	22	<3.8	0	--	120	--	--	--	--	--	--
SB5-3'	09/09/93	3	ETP-E	Vector (1993)	Y	Sandy clay (native)	--	<5.0	--	--	--	352	--	144	<3.8	<0.1	--	112	--	--	--	--	--	--
SB8-2.5'	09/09/93	2.5	ETP-E	Vector (1993)	Y	Tailings	<2.5	<5.0	5	1	<0.5	1160/<0.01	32	39	16	3	7	687/<0.04	<5.0	2	67	79	58	--
SB8-4.5'	09/09/93	4.5	ETP-E	Vector (1993)	Y	Sandy silt (native)	--	<5.0	--	--	--	254	--	62	<3.8	1	--	186	--	--	--	--	--	--
SB11-2.5'	09/09/93	2.5	ETP-E	Vector (1993)	Y	Tailings	--	<0.5	--	--	--	740	--	63	21	0	--	429	--	--	--	--	--	--
HS-3 (10')	08/13/90	10	ETP-E	Vector (1990 Aug)	Y	Waste rock	<50	<10	<100	<1	<10	119	34	170	<10	<1	<50	193	<10	<10	<40	<100	43	--
AG-1/3 (1A,1B,	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings, composite	5	88	6	<0.5	<2.0	149	61	294	342	6	12	232	16	3	210	36	43	2
AG-1/3 (1A,1B,	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings, composite	<4	41	3	<0.5	<2.0	76	50	140	162	3	10	169	8	1	57	18	3	1
AG-4 (4B)	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings	15	254	8	<0.5	<2.0	166	177	1,430	696	7	19	414	45	8	650	49	363	0
AG-5 (5A,5B)	Aug-89	NR	ETP-E	Anderson (1989)	N	Tailings, composite	10	128	6	<0.5	<2.0	166	88	639	364	4	10	302	25	5	345	40	173	0
B6-1'	02/01/07	1	HWLM	Engeo (2007)	Y	Silty gravel	<2.5	10	68	<0.5	<0.5	150	25	36	11	1	2	98	<1.0	<0.5	<1.0	100	28	<0.5
B6-5'	02/01/07	5	HWLM	Engeo (2007)	Y	Weathered bedrock	<2.5	11	15	<0.5	<0.5	260	14	29	<2.5	<0.10	<1.0	100	<1.0	<0.5	<1.0	15	6	<0.5
B7-3'	02/01/07	3	HWLM	Engeo (2007)	Y	Sandy gravel	<2.5	9	53	<0.5	<0.5	120	14	78	<2.5	<0.10	<1.0	100	<1.0	<0.5	<1.0	59	31	<0.5
B7-6.5'	02/01/07	6.5	HWLM	Engeo (2007)	Y	Sandy gravel	<2.5	11	38	<0.5	<0.5	110	24	69	<2.5	<0.10	<1.0	73	<1.0	<0.5	<1.0	47	26	<0.5
IMM-T-00-A	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	5.4 J	11.1	115	0.24 J	0.32 J	361	72.5	44.3	18.8 J	0.29	--	735	<4.5	<1.3	<3.2	128	72.8	--
IMM-T-00-B	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	2.8 J	8.6	77.7	0.40 J	0.25 J	201	43.2	37.4	13.8	0.089 J	--	389	<4.1	<1.2	<2.9	81.4	89.3	--
IMM-T-00-C	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	2.9 J	10.8	119	0.29 J	0.28 J	188	31.9	38.8	20.5	0.13	--	307	<3.5	<1.0	<2.5	105	66.6	--
IMM-T-00-D	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	3.2 J	7.5	161	0.18 J	0.33 J	228	46.6	29.7	11.5	0.13 J	--	814	<4.5	<1.3	<3.2	72.7	52.1	--
IMM-T-00-E	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	3.2 J	14.2	149	0.16 J	0.40 J	199	45.7	57.7	35.3	0.14	--	340	<4.4	<1.3	<3.1	111	93.7	--
IMM-T-00-F	04/17/19	0-0.5	off-site	Weston (2019)	Y	Off-site background	8.8	11.1	73.4	0.18 J	0.29 J	612	111	41.2	13.7	0.075 J	--	1,270	<4.2	<1.2	<3.0	118	58.3	--
IMM-TN-43	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	27	22	<0.03	1.1	62	17	57	25	0.29	<0.12	50	2.3	<0.12	<0.38	47	64	--
IMM-TN-44	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	10	31	<0.03	1.8	63	19	68	17	0.10 J	<0.12	47	6.3	<0.12	<0.38	47	57	--
IMM-TN-45	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	7.6	38	<0.03	0.96 J	81	20	62	14	0.17	<0.12	45	6.2	<0.12	<0.38	81	43	--
IMM-TN-46	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	<0.51	12	24	<0.03	1.1	73	21	75	15	0.08 J	<0.12	49	5.0	<0.12	<0.38	55	44	--
IMM-TN-47	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	0.71 J	<0.12	16	<0.03	0.16 J	120	36	50	<0.18	0.05 J	<0.12	46	1.4	<0.12	<0.38	160	26	--
IMM-TN-48	04/16/19	0-0.5	SIL	NV5 (2019)	Y	Tailings	1.8 J	33	25	<0.03	0.37 J	120	26	55	51	2.8	<0.12	40	1.2	<0.12	<0.38	110	29	--
IMM-T-43	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	1.9 J	31.4	25.4	<0.59	3.0	61.4 J	22.3	98.5	42.2	0.28	--	59.0	5.4	0.38 J	<2.9	134	131	--
IMM-T-44	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	2.9 J	18.6	34.1	<0.52	1.1	66.0 J	25.7	66.6	33.1	0.15	--	59.4	14.5	0.30 J	<2.6	48.5	76.1	--
IMM-T-45	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	3.6 J	18.0	62.9	<0.52	0.91	86.0 J	36.5	77.1	33.0	0.29	--	61.9	16.5	0.26 J	<2.6	48.7	74.2	--
IMM-T-46	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	2.8 J	17.1	34.0	<0.54	1.3	66.2 J	28.1	74.2	28.8	0.11	--	61.5	12.4	0.24 J	<2.7	83.7	73.8	--
IMM-T-47	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	2.7 J	3.3	18.9 J	<0.56	0.17 J	113 J	53.7	57.8	2.9	<0.11	--	60.4	<3.9	<1.1	<2.8	54.2	51.5	--
IMM-T-48	04/16/19	0-0.5	SIL	Weston (2019)	Y	Tailings	3.7 J	29.1	29.6	<0.57	0.65	152 J	41.0	65.4	49.5	1.2	--	58.2	1.2 J	0.46 J	<2.9	208	46.7	--
IdT5-2b	11/08/05	0-1[A]	SIL	IMMC (2005 Nov)	N	NR	5	5	57	ND	3	274	31	79	51	0	nd	58	18	ND	49	91	69	--
IMM-TN-11	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	0.72 J	5.2	<0.03	0.48 J	45	8.2	29	1.2	0.17	<0.12	24	0.62 J	<0.12	<0.38	35	30	--
IMM-TN-12	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	5.6	14	<0.03	0.64 J	77	13	28	6.7	0.58	<0.12	42	2.6	<0.12	<0.38	59	42	--
IMM-TN-25	04/17/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	0.36 J	10	<0.03	0.49 J	48	9.0	20	5.0	0.26	<0.12	26	0.81 J	<0.12	<0.38	42	32	--
IMM-TN-26	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	0.89 J	7.9	<0.03	0.39 J	47	10	35	1.0	0.02 J	<0.12	22	<0.40	<0.12	<0.38	44	29	--
IMM-TN-27	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	10	5.7	<0.03	0.48 J	36	8.1	35	6.7	0.36	<0.12	21	<0.40	<0.12	<0.38	36	30	--
IMM-TN-28	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	3.2	6.2	<0.03	0.48 J	28	7.3	38	ND	0.02 J	<0.12	18	<0.40	<0.12	<0.38	32	29	--
IMM-TN-29	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	2.9	8.2	<0.03	0.52 J	50	10	41	2.0	0.04 J	<0.12	25	<0.40	<0.12	<0.38	44	36	--
IMM-TN-30	04/16/19	0-0.5	WTP	NV5 (2019)	Y	Tailings	<0.51	2.1	8.6	<0.03	0.80 J	33	8.4	30	3.9	0.08 J	<0.12	19	<0.40	<0.12	<0.38	32	38	--
IMM-T-11	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<7.0	3.9	7.4 J	<0.59	0.56 J	65.1	13.5	32.1	7.4	0.14	--	37.6	<4.1	<1.2	<2.9	51.1	53.9	--
IMM-T-12	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.3	7.4	21.6	<0.52	0.66	84.6	19.0	23.4	13.4	0.79	--	50.7	<3.7	<1.0	<2.6	81.0	71.4	--
IMM-T-25	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	1.9 J	3.6	13.5 J	<0.56	0.6	62.7	14.7	25.9	11.1	0.28	--	43.5	<3.9	<1.1	<2.8	58.7	56.2	--
IMM-T-26	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	1.7 J	1.8	9.3 J	<0.58	0.41 J	53.3	13.2	48.6	5.7	<0.11	--	30.7	<4.1	<1.2	<2.9	56.8	49.9	--
IMM-T-27	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.1	25.0	7.4 J	<0.51	0.85	44.9	12.5	50.8	24.9	0.76	--	34.6	0.99 J	0.40 J	<2.5	46.9	49.4	--
IMM-T-28	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.0	7.1	6.8 J	<0.50	0.57	35.3	10.6	48.7	4.7	<0.12	--	26.6	1.1 J	<1.0	<2.5	43.9	49.5	--
IMM-T-29	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	1.5 J	3.7	9.4 J	<0.51	0.58	53.0	14.0	51.2	7.0	<0.11	--	32.5	1.2 J	<1.0	<2.6	54.3	52.8	--
IMM-T-30	04/16/19	0-0.5	WTP	Weston (2019)	Y	Tailings	<6.3	4.3	9.4 J	<0.53	0.86	35.2	11.4	34.1	8.2	0.12	--	25.4	1.1 J	0.27 J	<2.6	36.3	54.1	--
IdT3-1	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	2	5	ND	1	56	12	24	5	0	ND	42	ND	ND	ND	28	40	--
IdT3-2b-48"	11/08/05	4	WTP	IMMC (2005 Nov)	N	Tailings	1	ND	10	ND	1	70	12	24	4	0	ND	26	ND	ND	ND	54	41	--
IdT3-2b-75"	11/08/05	6	WTP	IMMC (2005 Nov)	N	Tailings	2	ND	13	ND	1	86	15	31	6	0	ND	35	ND	ND	ND	67	50	--

Table 2b - Total Metals and Cyanide in Solid Samples, Sorted by Area
Centennial M-1 Property
Nevada County, California

							Results																	
Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
IdT3-3	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	ND	20	ND	2	90	18	39	13	1	ND	40	ND	ND	ND	72	59	--
IdT3-4b-42"	11/08/05	3.5	WTP	IMMC (2005 Nov)	N	Tailings	1	7	22	ND	1	70	14	27	16	2	ND	38	ND	ND	ND	50	50	--
IdT3-4b-78"	11/08/05	6.5	WTP	IMMC (2005 Nov)	N	Tailings	1	3	7	ND	2	62	12	32	14	0	ND	38	ND	ND	ND	44	49	--
IdT3-6	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	3	15	ND	1	66	13	15	14	1	ND	29	ND	ND	ND	56	49	--
IdT3-7	11/08/05	0-1[A]	WTP	IMMC (2005 Nov)	N	Tailings	2	2	22	ND	1	58	14	20	10	2	ND	34	ND	ND	ND	49	44	--
IdT3-8-46"	11/08/05	4	WTP	IMMC (2005 Nov)	N	Tailings	1	12	20	ND	1	48	11	21	17	1	1	23	ND	ND	ND	44	46	--
IdT3-8-84"	11/08/05	7	WTP	IMMC (2005 Nov)	N	Tailings	2	7	13	ND	1	59	14	25	18	2	ND	41	ND	ND	ND	50	50	--
IdTP1-6	02/27/05	0-1	WTP	IMMC (2005 Feb)	N	Tailings	--	28	44	--	28	860	69	159	115	3	<5	869	--	--	--	123	67	--
IdTP1-7	02/27/05	0-1	WTP	IMMC (2005 Feb)	N	Tailings	--	26	55	--	25	896	77	122	62	2	<5	812	--	--	--	138	68	--
SA1-2'	09/09/93	2	WTP	Vector (1993)	Y	Tailings	--	8	--	--	--	94	--	57	18	1	--	56	--	--	--	--	--	--
SA2-2'	09/09/93	2	WTP	Vector (1993)	Y	Weathered bedrock	--	<5.0	--	--	--	25	--	68	<3.8	0	--	144	--	--	--	--	--	--
SA3-1'	09/09/93	1	WTP	Vector (1993)	Y	Sand (native)	--	10	--	--	--	54	--	31	4	0	--	26	--	--	--	--	--	--
SA4-2'	09/09/93	2	WTP	Vector (1993)	Y	Tailings	--	<5.0	--	--	--	74	--	23	12	0	--	34	--	--	--	--	--	<1.0
SA4-6.5'	09/09/93	6.5	WTP	Vector (1993)	Y	Sandy silt (native)	5	27	31	1	<0.5	580/<0.01	59	78	6	<0.1	4	400/<0.04	<5.0	<0.75	33	30	43	--
SA4-10'	09/09/93	10	WTP	Vector (1993)	Y	Silty sand (native)	--	<5.0	--	--	--	715/<0.01	--	60	<3.8	<0.1	--	255/<0.04	--	--	--	--	--	--
SA7-2'	09/09/93	2	WTP	Vector (1993)	Y	Tailings	--	<5.0	--	--	--	73	--	20	10	1	--	33	--	--	--	--	--	--
SA7-8'	09/09/93	8	WTP	Vector (1993)	Y	Tailings	<2.5	7	26	0	1	81	16	31	21	2	6	40	<5.0	<0.75	<3.8	62	81	<1.0
BH-1 (5.5-6)	06/14/90	6	WTP	Vector (1990 Jun)	Y	Tailings	<100	16	<100	<1	<10	40	<20	14	14	<1	<50	26	<10	<10	<100	<100	47	--
BH-1 10'COMP	06/14/90	NR	WTP	Vector (1990 Jun)	Y	Tailings	<100	14	<100	<1	<10	259	<20	58	<10	<1	<50	164	<10	<10	<100	<100	46	--
BH-2 (15 to 15.5)	06/14/90	15	WTP	Vector (1990 Jun)	Y	Weathered bedrock	<100	12	<100	<1	<10	261	20	63	<10	<1	<50	205	<10	<10	<100	<100	106	--
IMM-TN-01	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Clayey silt	2.5	23	18	<0.03	0.76 J	210	25	63	19	0.51	<0.12	150	<0.40	<0.12	<0.38	62	35	--
IMM-TN-02	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	5.0	84	12	<0.03	1.1	320	31	97	56	1.4	2.0	280	1.1	<0.12	<0.38	54	51	--
IMM-TN-03	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	3.4	130	6.8	<0.03	1.8	270	37	170	120	3.3	2.3	250	1.7	<0.12	<0.38	59	60	--
IMM-TN-04	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Clayey silt (native)	1.8 J	15	89	<0.03	0.55 J	130	31	35	15	0.22	<0.12	160	2.5	<0.12	<0.38	94	49	--
IMM-TN-05	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	7.4	12	30	<0.03	0.48 J	480	50	86	12	0.15	<0.12	190	1.8	<0.12	<0.38	79	13	--
IMM-TN-06	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Clayey silt	2.4	6.4	35	<0.03	0.34 J	160	42	23	8.5	0.08 J	<0.12	200	<0.40	<0.12	<0.38	21	27	--
IMM-TN-07	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	<0.51	1.8	6.8	<0.03	0.54 J	46	8.9	15	2.0	0.17	<0.12	26	1.1	<0.12	<0.38	38	31	--
IMM-TN-08	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	<0.51	2.3	7.5	<0.03	0.51 J	57	10	12	2.1	0.31	<0.12	29	0.68 J	<0.12	<0.38	44	31	--
IMM-TN-09	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	<0.51	7.9	12	<0.03	0.71 J	73	11	36	17	1.3	1.1	50	<0.40	<0.12	<0.38	35	34	--
IMM-TN-10	04/16/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	4.4	48	9.1	<0.03	0.76 J	350	35	75	43	0.77	<0.12	280	1.7	<0.12	<0.38	52	30	--
IMM-TN-19	04/17/19	0-0.5	WTP-N	NV5 (2019)	Y	Tailings	4.3	330	16	<0.03	1.6	250	43	160	110	2.2	3.8	280	2.5	<0.12	<0.38	39	44	--
IMM-T-01	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Clayey silt	3.3 J	56.0	20.4 J	<0.58	1.1	220	32.1	66.2	27.9	0.63	--	171	<4.1	<1.2	<2.9	75.6	56.2	--
IMM-T-02	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	4.3 J	77.8	17.1 J	<0.57	1.6	279	36.4	76.2	54.3	1.8	--	286	<4.0	0.36 J	<2.9	63.7	73.0	--
IMM-T-03	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	4.7 J	209	11.3 J	<0.57	4.1	317	55.2	225	198	3.4	--	380	1.3 J	0.87 J	<2.8	73.5	121	--
IMM-T-04	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Clayey silt (native)	1.7 J	14.8	90.2	<0.56	0.28 J	109	35.5	36.7	18.3	0.27	--	157	<3.9	<1.1	<2.8	92.8	64.5	--
IMM-T-05	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	7.0	21.2	40.4	<0.52	0.32 J	488	59.2	88.4	10.3	0.11	--	250	<3.6	<1.0	<2.6	121	23.3	--
IMM-T-06	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Clayey silt	5.1 J	15.9	44.2	<0.79	0.37 J	379	160	33.8	10.8	0.074 J	--	679	<5.5	<1.6	<3.9	34.9	43.2	--
IMM-T-07	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	<6.1	4.7	7.4 J	<0.51	0.61	51.1	11.8	16.8	8.8	0.21	--	32.7	<3.6	<1.0	<2.6	43.7	47.0	--
IMM-T-08	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	<6.5	4.8	7.5 J	<0.54	0.60	63.8	14.3	14.6	8.5	0.27	--	40.8	<3.8	<1.1	<2.7	52.0	48.4	--
IMM-T-09	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	<7.1	15.9	12.6 J	<0.59	1.0	90.8	18.9	53.8	26.4	0.98	--	79.9	<4.1	<1.2	<2.9	49.5	59.0	--
IMM-T-10	04/16/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	5.1 J	107	12.8 J	<0.46	2.0	378	62.0	100	71.7	0.93	--	632	<3.2	0.72 J	<2.3	53.1	53.3	--
IMM-T-19	04/17/19	0-0.5	WTP-N	Weston (2019)	Y	Tailings	6.0	438	14.6 J	<0.48	6.9	276	63.8	296	219	5.6	--	425	2.9 J	1.7	<2.4	47.4	73.1	--
B1-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Clayey gravel (possible	<2.5	130/0.9	5	<0.5	4	160	87	300/1.8	290/<0.5	41/<0.025	10	430/5.6	1	2	<1.0	30	110	<0.5
B1-5'	02/01/07	5	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	100/1.6	16	<0.5	1	11	22	82	14	0	<1.0	64	<1.0	<0.5	<1.0	56	37	<0.5
B1-10'	02/01/07	10	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	33	50	<0.5	1	240	39	60	8	2	3	180	<1.0	<0.5	<1.0	87	32	<0.5
B5-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	56/0.86	11	<0.5	1	210	26	100	26	2	1	170	<1.0	<0.5	<1.0	42	58	<0.5
B5-6'	02/01/07	6	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	56/0.73	20	<0.5	1	360	44	90	23	1	1	410/1.7	<1.0	<0.5	<1.0	45	81	<0.5
B5-10'	02/01/07	10	WTP-N	Engeo (2007)	Y	Clayey gravel	<2.5	3	58	<0.5	<0.5	74	14	34	<2.5	<0.10	<1.0	100	<1.0	<0.5	<1.0	5	8	<0.5
B10-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Soil/rock berm	<2.5	110/0.8	2	<0.5	1	93	30	100	86/5.9/<0.5	2.2/<0.025	10	140	<1.0	<0.5	<1.0	22	41	<0.5
B10-5'	02/01/07	5	WTP-N	Engeo (2007)	Y	Soil/rock berm	<2.5	98/10/<0.2	11	<0.5	1	120	9	11	6	1	4	110	<1.0	<0.5	<1.0	23	14	<0.5
B10-15'	02/01/07	15	WTP-N	Engeo (2007)	Y	Soil/rock berm	<2.5	320/1.4	2	<0.5	1	170	22	34	21	0	2	190	<1.0	1	<1.0	28	20	<0.5
IdT3-10b-115"	11/08/05	9.5	WTP-N	IMMC (2005 Nov)	N	Tailings	3	ND	ND	ND	1	41	14	48	24	1	ND	155	ND	3	ND	34	16	--
IdT3-10b-44"	11/08/05	4	WTP-N	IMMC (2005 Nov)	N	Tailings	1	1	3	ND	2	46	9	39	6	0	ND	25	ND	ND	ND	30	47	--
IdT3-10b-75"	11/08/05	6	WTP-N	IMMC (2005 Nov)	N	Tailings	3	77.8/0.3	10	ND	2	54	16	67	54.2/0.6	3	ND	83	ND	8	ND	39	54	--

Table 2b - Total Metals and Cyanide in Solid Samples, Sorted by Area
Centennial M-1 Property
Nevada County, California

Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Results																
							Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide
IdT3-11-120"	11/08/05	10	WTP-N	IMMC (2005 Nov)	N	Tailings	4	1	ND	ND	1	42	16	36	32	1	ND	179	ND	2	ND	33	14	--
IdT3-11-36"	11/08/05	3	WTP-N	IMMC (2005 Nov)	N	Tailings	3	10	8	ND	2	63	20	57	63	1	ND	89	ND	ND	ND	49	60	--
IdT3-11-96"	11/08/05	8	WTP-N	IMMC (2005 Nov)	N	Tailings	7	8	10	ND	2	66	21	43	33	1	3	209	ND	ND	ND	58	39	--
IdT3-5	11/08/05	0-1[A]	WTP-N	IMMC (2005 Nov)	N	Tailings	2	5	18	ND	1	56	12	16	12	2	ND	29	ND	3	ND	52	47	--
IdT3-9b-44"	11/08/05	3.5	WTP-N	IMMC (2005 Nov)	N	Tailings	2	2	8	ND	1	49	10	33	8	0	ND	27	ND	ND	ND	36	38	--
IdT3-9b-99"	11/08/05	8	WTP-N	IMMC (2005 Nov)	N	Tailings	4	2	ND	ND	1	41	17	8	5	0	ND	209	ND	ND	ND	37	18	--
IdTP1-8	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	50	60	--	32	859	73	175	158	3	<5	787	--	--	--	138	81	--
IdTP1-9	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	37	37	--	24	760	65	130	85	2	<5	818	--	--	--	97	66	--
IdTP1-10	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	44	357	--	33	678	93	173	177	2	<5	626	--	--	--	152	94	--
IdTP1-11	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	74	67	--	40	912	107	275	163	2	<5	1,040	--	--	--	109	82	--
IdTP1-12	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	103	80	--	22	555	63	89	70	2	<5	670	--	--	--	117	78	--
IdTP1-13	02/27/05	0-1	WTP-N	IMMC (2005 Feb)	N	Tailings	--	47	62	--	25	479	61	111	50	2	<5	421	--	--	--	170	79	--
SB1-3'	09/09/93	3	WTP-N	Vector (1993)	Y	Waste rock	<2.5	6	6	0	<0.5	68	14	37	4	0	3	40	<5.0	<0.75	5	46	43	--
SA5-2'	09/09/93	2	WTP-N	Vector (1993)	Y	Tailings	<2.5	7	7	0	<0.5	70	14	35	5	0	3	43	<5.0	<0.75	5	46	41	--
SA5-8'	09/09/93	8	WTP-N	Vector (1993)	Y	Tailings	--	136/<0.075	--	--	--	385	--	32	13	1	--	249	--	--	--	--	--	<1.0
SA6-2'	09/09/93	2	WTP-N	Vector (1993)	Y	Tailings	--	168/<0.075	--	--	--	410/<0.01	--	224/<0.002	172/<0.075	12.4/0.0011	--	352/<0.04	--	--	--	--	--	--
SA6-8'	09/09/93	8	WTP-N	Vector (1993)	Y	Tailings	--	80	--	--	--	217	--	14	<3.8	0	--	176	--	--	--	--	--	--
SA6-17'	09/09/93	17	WTP-N	Vector (1993)	Y	Center of waste rock b	--	648/<0.075	--	--	--	278/<0.01	--	168	127/<0.075	4.4/<0.1	--	292/<0.04	--	--	--	--	--	<1.0
HS-1 (4.5')	08/13/90	4.5	WTP-N	Vector (1990 Aug)	Y	Gravelly silt (native)	<50	<10	<100	<1	<10	218	43	47	<10	<1	<50	144	<10	<10	<40	118	54	--
HS-2A (6')	08/13/90	6	WTP-N	Vector (1990 Aug)	Y	Talings/waste rock	<50	292	<100	<1	<10	349	30	69	115	4	<50	281	<10	<10	<40	<100	65	--
HS-2B (11.5')	08/13/90	11.5	WTP-N	Vector (1990 Aug)	Y	Waste rock	<50	<10	<100	<1	<10	383	25	83	<10	<1	<50	222	<10	<10	<40	<100	30	--
BH-3 (6-6.5)	06/14/90	6	WTP-N	Vector (1990 Jun)	Y	Tailings	<100	20	<100	<1	<10	38	<20	57	24	<1	<50	49	<10	<10	<100	<100	92	--
BH4 (5.5-6)	06/14/90	6	WTP-N	Vector (1990 Jun)	Y	Tailings	<100	<10	<100	<1	<10	18	<20	48	<10	<1	<50	23	<10	<10	<100	<100	70	--
BH-4 (11-11.5)	06/14/90	11	WTP-N	Vector (1990 Jun)	Y	Tailings	<100	33	<100	<1	<10	110	67	86	15	<1	<50	269	<10	<10	<100	124	40	--
AG-2 (2A,2B)	Aug-89	NR	WTP-N	Anderson (1989)	N	Tailings, composite	8	132	21	1	<2.0	387	48	158	91	2	8	324	8	2	164	81	62	2

Notes:
1 Total chromium (CAS No. 7440-47-3) results compared to RSLs for Chromium III (CAS No. 16065-83-1) Results in bold font exceed a commercial screening level or estimated background range.
2 Results in bold font exceed a commercial screening level or estimated background range.
A = Sample depth not recorded. IMMC (2007) narrative description suggests samples were obtained from 0 to 1 foot bgs.
CAS = Chemical Abstracts Service registry number
DTSC-SL = California Department of Toxic Substances Control Screening Level (Human Health Risk Assessment Note 3 (DTSC, 2019)
ETP = Eastern Tailings Pond (older, mercury-treated tailings)
ETP-E = Eastern Tailings Pond, Eastern (older, deeper portion)
HWLM = Hap Warnke lumber mill
J = concentration is estimated (detected below the RL but above or equal to the MDL
MDL = method detection limit
mg/kg = milligrams per kilogram, or parts per million (ppm)
na = not applicable
ND = not detected above listed MDL RL = laboratory reporting limit
NL = reporting limit not listed (laboratory report not available for review)
NR = not recorded
RL = reporting limit, or pratical quantitation limit
RSL = USEPA Region 9 Regional Screening Level
SIL = South Idaho Location
STLC = Soluble Threshold Limit Concentration
TTLC = Total Threshold Limit Concentration
WTP = Western Tailings Pond (more recent, cyanide-treated tailings)
WTP-N = Western Tailings Pond, Northern (older, deeper portion)

Table 3 - Soluble Metals in Solid Samples
Centennial M-1 Property
Nevada County, California

Sample ID	Sample Date	Sample Depth (ft)	Assessment Area	Reference	Validated	Sample Description	Results: Arsenic				Chromium			Copper			Lead				Mercury			Nickel		
							Total	WET	TCLP	DI-WET	Total	WET	DI-WET	Total	WET	DI-WET	Total	WET	TCLP	DI-WET	Total	WET	DI-WET	Total	WET	DI-WET
Chemical Identification	*USEPA Method*						*6010B*	*6020*	*6020*	*6010*	*6010B*	*6010B*	*6010*	*6010B*	*6010B*	*6010*	*6010B*	*6010B*	*6010B*	*6010*	*7471A*	*7470A*	*245.1*	*6010B*	*6010B*	*6010*
	CAS No.						*7440-38-2*				*16065-83-1*			*7440-50-8*			*7439-92-1*				*7439-97-6*			*7440-02-0*		
	Unit						*mg/kg*	*mg/L*	*mg/L*	*mg/L*	*mg/kg*	*mg/L*	*mg/L*	*mg/kg*	*mg/L*	*mg/L*	*mg/kg*	*mg/L*	*mg/L*	*mg/L*	*mg/kg*	*mg/L*	*mg/L*	*mg/kg*	*mg/L*	*mg/L*
Reporting Limits	*Reporting Limit, Engeo (2007)*						*1.0*	*0.5*	*0.2*	--	*1.0*	--	--	*1.0*	*0.5*	--	*2.5*	*0.5*	*0.5*	--	*0.1*	*0.025*	--	*1.0*	*0.5*	--
	Reporting Limit, IMMC (2005 Nov)						*NL*	*NL*	--	--	*NL*	*NL*	--	*NL*	*NL*	--	*NL*	*NL*	--	--	*NL*	*NL*	--	*NL*	*NL*	--
	Reporting Limit, Vector (1993)						*5.0*	--	--	*0.075*	*0.5*	--	*0.01*	*0.1*	--	*0.32*	*3.8*	--	--	*0.075*	*0.1*	--	*0.10*	*2.0*	--	*0.04*
Screening Levels for Total Metals	*Total Metals in Commercial Soil*						*0.25*	--	--	--	*1.8E+06*	--	--	*47,000*	--	--	*320*	--	--	--	*4.5*	--	--	*3,100*	--	--
	Basis for Screening Level						*DTSC-SL*	--	--	--	*RSL*	--	--	*RSL*	--	--	*DTSC-SL*	--	--	--	*DTSC-SL*	--	--	*DTSC-SL*	--	--
Waste Classification	*TTLC*						*500*	--	--	--	*2,500*	--	--	*2,500*	--	--	*1,000*	--	--	--	*20*	--	--	*2,000*	--	--
	STLC						--	*5*		--	--	*5*		--	*25*	--	--	*5*		--	--	*0.2*	--	--	*20*	--
Water Quality Goals	*Primary MCL*						--	--	--	*0.010*	--	--	*50*	--	--	*1.300*	--	--	--	*0.015*	--	--	*0.002*	--	--	0.100
	Secondary MCL						--	--	--	*na*	--	--	*na*	--	--	*1.000*	--	--	--	*na*	--	--	*na*	--	--	na
	CTR						--	--	--	*0.150*	--	--	*na*	--	--	*0.009**	--	--	--	*0.0015**	--	--	*0.00005*	--	--	69.6
	CTR Source						--	--	--	*CCC*	--	--	*na*	--	--	*CCC*	--	--	--	*CCC*	--	--	*HH*	--	--	CCC
	Ag						--	--	--	*0.100*	--	--	*na*	--	--	*0.200*	--	--	--	*5.000*	--	--	*0.200*	--	--	0.200
IdT4-6	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	5.5	--	--	--	83	--	--	56	--	--	50	--	--	--	2.8	--	--	3,370	2.2	--
IdT4-7	11/08/05	0-1[A]	ETP	IMMC (2005 Nov)	N	Tailings	nd	--	--	--	63		--	56	--	--	51	--	--	--	2.9	--	--	559	0.4	--
SB7-2.5'	09/09/93	2.5	ETP	Vector (1993)	Y	Tailings	60	--	--	<0.075	980	--	<0.01	39	--	--	20	--	--	--	2.8	--	--	535		<0.04
TP19-1'	01/31/07	1	ETP-E	Engeo (2007)	Y	Tailings	9.0	--	--	--	370	--	--	66	--	--	25	--	--	--	0.7	--	--	470	5.3	--
TP19-4'	01/31/07	4	ETP-E	Engeo (2007)	Y	Tailings	19	--	--	--	330	--	--	67	--	--	22	--	--	--	1.5	--	--	290	4.1	--
TP19-5'	01/31/07	5	ETP-E	Engeo (2007)	Y	Tailings	250	1.3	--	--	290	--	--	420	11	--	280	1.8	--	--	4.3	<0.025	--	480	9.1	--
IdT1-1b	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Bedrock at 20"	198	ND	--	--	63	ND	--	348	--	--	1,610	18	--	--	34	--	--	126	--	--
IdT2-1b-30"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	126	ND	--	--	52	--	--	156	--	--	724	0.3	--	--	17	--	--	108	--	--
IdT4-10-28"	11/08/05	2.5	ETP-E	IMMC (2005 Nov)	N	Tailings	3010	62.2	--	--	47		--	498	--	--	1,950	3.9	--	--	6.7	--	--	374	--	--
IdT4-12	11/08/05	0-1[A]	ETP-E	IMMC (2005 Nov)	N	Tailings	805	1.4	--	--	133	0.2	--	353	8.4	--	388	0.6	--	--	28	--	--	224	3.0	--
SB8-2.5'	09/09/93	2.5	ETP-E	Vector (1993)	Y	Tailings	<5.0	--	--	--	1,160	--	<0.01	39	--	--	16	--	--	--	2.8	--	--	687	--	<0.04
SA4-6.5'	09/09/93	6.5	WTP	Vector (1993)	Y	Sandy silt (native)	27	--	--	--	580	--	<0.01	78	--	--	5.5	--	--	--	<0.1	--	--	400	--	<0.04
SA4-10'	09/09/93	10	WTP	Vector (1993)	Y	Silty sand (native)	<5.0	--	--	--	715	--	<0.01	60	--	--	<3.8	--	--	--	<0.1	--	--	255	--	<0.04
B1-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Clayey gravel (WR)	130	0.9	--	--	160	--	--	300	1.8	--	290	<0.5	--	--	41	<0.025	--	430	5.6	--
B1-5'	02/01/07	5	WTP-N	Engeo (2007)	Y	Clayey gravel (WR)	100	1.6	--	--	11	--	--	82	--	--	14	--	--	--	0.3	--	--	64	--	--
B5-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Clayey gravel (WR)	56	0.86	--	--	210	--	--	100	--	--	26	--	--	--	1.5	--	--	170	--	--
B5-6'	02/01/07	6	WTP-N	Engeo (2007)	Y	Clayey gravel (WR)	56	0.73	--	--	360	--	--	90	--	--	23	--	--	--	1.4	--	--	410	1.7	--
B5-10'	02/01/07	10	WTP-N	Engeo (2007)	Y	Clayey gravel (WR)	2.8	--	--	--	74	--	--	34	--	--	<2.5	--	--	--	<0.10	--	--	100	--	--
B10-1'	02/01/07	1	WTP-N	Engeo (2007)	Y	Soil/rock berm (WR)	110	0.8	--	--	93	--	--	100	--	--	86	5.9	<0.5	--	2.2	<0.025	--	140	--	--
B10-5'	02/01/07	5	WTP-N	Engeo (2007)	Y	Soil/rock berm (WR)	98	10	<0.2	--	120	--	--	11	--	--	5.9	--	--	--	0.5	--	--	110	--	--
B10-15'	02/01/07	15	WTP-N	Engeo (2007)	Y	Soil/rock berm (WR)	320	1.4	--	--	170	--	--	34	--	--	21	--	--	--	0.3	--	--	190	--	--
IdT3-10b-75"	11/08/05	6	WTP-N	IMMC (2005 Nov)	N	Tailings	77.8	0.3	--	--	54	--	--	67	--	--	54	0.6	--	--	3.1	--	--	83	--	--
SA5-8'	09/09/93	8	WTP-N	Vector (1993)	Y	Tailings	136	--	--	<0.075	385	--	--	32	--	--	13	--	--	--	1.2	--	--	249	--	--
SA6-2'	09/09/93	2	WTP-N	Vector (1993)	Y	Tailings	168	--	--	<0.075	410	--	<0.01	224	--	<0.002	172	--	--	<0.075	12.4	--	0.0011	352	--	<0.04
SA6-17'	09/09/93	17	WTP-N	Vector (1993)	Y	Waste rock berm	648	--	--	<0.075	278	--	<0.01	168	--	--	127	--	--	<0.075	4.4	--	<0.1	292	--	<0.04

Notes:
1 Total chromium (CAS No. 7440-47-3) results compared to RSLs for Chromium III (CAS No. 16065-83-1) Results in bold font exceed a commercial screening level or estimated background range.
* CTR value is hardness dependent
Ag = Agricultrual Water Quality Goal
CAS = Chemical Abstracts Service registry number
CCC = Criteria Continuous Concentration (CCC): highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects.
CMC = Criterion Maximum Concentration, freshwater, short-term exposure.
CTR = California Toxics Rule
DTSC-SL = California Department of Toxic Substances Control Screening Level (Human Health Risk Assessment Note 3 (DTSC, 2019)
EPA = United States Environmental Protection Agency
ETP = Eastern Tailings Pond (older, mercury-treated tailings)
ETP-E = Eastern Tailings Pond, Eastern (older, deeper portion)

HH = Human health (one-per-million risk for carcinogens) for consumption of water and aquatic organisms.
J = analyte concentration detected at a value between MDL and RL. The associated value is an estimated quantity.
MCL = Maximum Contaminant Level
MDL = laboratory method detection limit
mg/kg = milligrams per kilogram of solid sample, or parts per million (ppm)
mg/L = milligrams per liter of extractant solution, or ppm
na = not applicable
na = not available
ND = not detected above listed reporting/detection limit
NL = reporting limit not listed (laboratory report not available for review)
NR = not recorded
RL = laboratory reporting limit, or pratical quantitation limit
RSL = USEPA Region 9 Regional Screening Level
STLC = Soluble Threshold Limit Concentration
TTLC = Total Threshold Limit Concentration
ug/L = migrogram per liter
WTP = Western Tailings Pond (more recent, cyanide-treated tailings)
WTP-N = Western Tailings Pond, Northern (older, deeper portion)

Table 4a. Weston (2019 Sep) Total and Filterable Metals (ug/L) in Grab Surface Water Samples

Centennial M-1 Property

Nevada County, California

Sample Number	CLP Number	Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Wolf Creek Upstream																			
IMM-SW-01-T	MYANA1	4/17/19	<2.0	0.23J	33.5	<1.0	<1.0	0.49J	<1.0	0.32J	<2.0	8.9J	<0.20	0.44J	<5.0	<1.0	<2.0	<5.0	1.6J
IMM-SW-01-F	MYANA2	4/17/19	<2.0	0.23J	30.9	<1.0	<1.0	0.52J	<1.0	0.43J	<1.0	5.7J	<0.20	0.53J	<5.0	<1.0	<1.0	<5.0	8.7
IMM-SW-02-T	MYANA3	4/17/19	<2.0	0.33J	22.2	<1.0	<1.0	0.64J	0.14J	0.55J	<1.0	16.1J	<0.20	0.84J	<5.0	<1.0	<1.0	<5.0	1.2J
IMM-SW-02-F	MYANA4	4/17/19	<2.0	0.39J	20.0	<1.0	<1.0	0.59J	<1.0	0.43J	<1.0	7.3J	<0.20	0.77J	<5.0	<1.0	<1.0	<5.0	2.2
IMM-SW-03-T	MYANA5	4/17/19	<2.0	0.35J	22.6	<1.0	<1.0	0.67J	<1.0	0.59J	0.16J	14.9J	<0.20	1.1	<5.0	<1.0	<1.0	<5.0	1.7J
IMM-SW-03-F	MYANA6	4/17/19	<2.0	0.23J	20.3	<1.0	<1.0	0.63J	<1.0	0.58J	<1.0	7.2J	<0.20	1.5	<5.0	<1.0	<1.0	<5.0	3.5
Wolf Creek Downstream																			
IMM-SW-04-T	MYANA7	4/17/19	<2.0	1.6	25.8	<1.0	<1.0	0.89J	0.35J	1.1J	0.26J	34.7J	<0.20	1.9	<5.0	<1.0	<1.0	<5.0	4.4
IMM-SW-04-F	MYANA8	4/17/19	<2.0	1.2	22.9	<1.0	<1.0	0.63J	<1.0	0.52J	<1.0	12.7J	<0.20	1.1	<5.0	<1.0	<1.0	<5.0	6.6
IMM-SW-05-T	MYANA9	4/17/19	<2.0	1.1	24.5	<1.0	<1.0	0.69J	<1.0	0.53J	<1.0	18.5J	<0.20	1.0	<5.0	<1.0	<1.0	<5.0	1.5J
IMM-SW-05-F	MYANB0	4/17/19	<2.0	1.1	23.8	<1.0	<1.0	0.32J	<1.0	0.51J	<2.0	10.5J	<0.20	1.0	<5.0	<1.0	<2.0	<5.0	1.6J
IMM-SW-06-T	MYANB1	4/17/19	<2.0	1.1	24.9	<1.0	<1.0	0.89J	0.34J	0.88J	0.17J	42.4J	<0.20	1.7	<5.0	<1.0	<1.0	<5.0	2.8
IMM-SW-06-F	MYANB2	4/17/19	<2.0	0.89J	21.9	<1.0	<1.0	0.63J	<1.0	0.63J	<1.0	21.7J	<0.20	1.3	<5.0	<1.0	<1.0	<5.0	1.9J
IMM-SW-07-T	MYANB3	4/17/19	<2.0	1.2	23.2	<1.0	<1.0	0.72J	<1.0	0.54J	<1.0	20.5J	<0.20	1.1	<5.0	<1.0	<1.0	<5.0	1.4J
IMM-SW-07-F	MYANB4	4/17/19	<2.0	0.88J	21.5	<1.0	<1.0	0.48J	<1.0	0.44J	<1.0	12.6J	0.21	0.92J	<5.0	<1.0	<1.0	<5.0	3.2
IMM-SW-08-T	MYANB5	4/17/19	<2.0	1.0	24.3	<1.0	<1.0	0.78J	0.34J	1.2J	0.22J	34.6J	<0.20	1.8	<5.0	<1.0	<1.0	<5.0	4.8
IMM-SW-08-F	MYANB6	4/17/19	<2.0	0.92J	22.1	<1.0	<1.0	0.59J	<1.0	0.63J	<1.0	13.8J	<0.20	1.3	<5.0	<1.0	<1.0	<5.0	2.0
IMM-SW-09-T	MYANB7	4/17/19	<2.0	1.0	23.7	<1.0	<1.0	0.72J	0.15J	0.71J	<1.0	23.1J	<0.20	1.3	<5.0	<1.0	<1.0	<5.0	2.1
IMM-SW-09-F	MYANB8	4/17/19	<2.0	1.0	21.0	<1.0	<1.0	0.64J	<1.0	1.1J	<1.0	13.5J	<0.20	1.8	<5.0	<1.0	<1.0	<5.0	4.4
IMM-SW-10-T	MYANB9	4/17/19	<2.0	1.0	22.7	<1.0	<1.0	0.75J	<1.0	0.63J	<1.0	20.8J	<0.20	1.2	<5.0	<1.0	<1.0	<5.0	1.9J
IMM-SW-10-F	MYANC0	4/17/19	<2.0	0.99J	21.8	<1.0	<1.0	0.67J	<1.0	0.57J	<1.0	13.5J	<0.20	1.2	<5.0	<1.0	<1.0	<5.0	8.3
IMM-SW-11-T	MYANC1	4/17/19	<2.0	<10	24.6	<1.0	<1.0	0.65J	0.24J	0.85J	0.16J	29.6J	<0.20	1.7	<5.0	<1.0	<1.0	<5.0	3.0
IMM-SW-11-F	MYANC2	4/17/19	<2.0	<10	21.7	<1.0	<1.0	0.55J	<1.0	0.61J	<1.0	12.8J	<0.20	1.3	<5.0	<1.0	<1.0	<5.0	1.4J
East Eureka Shaft Discharge to Wolf Creek																			
IMM-SW-12-T	MYANC3	4/17/19	<2.0	41.8	177	<1.0	0.21J	2.9	2.8	14.4	74.8	197J	<0.20	17.9	<5.0	<1.0	<1.0	3.3J	93.3
IMM-SW-12-F	MYANC4	4/17/19	<2.0	33.6	127	<1.0	<1.0	0.44J	0.14J	0.49J	0.12J	170J	<0.20	5.1	<5.0	<1.0	<1.0	<5.0	14.2
IMM-SW-13-T	MYANC5	4/17/19	<2.0	102	151	<1.0	<1.0	0.94J	0.37J	3.3	2.2	203J	<0.20	3.8	<5.0	<1.0	<1.0	4.9J	19.6
IMM-SW-13-F	MYANC6	4/17/19	<2.0	42.0	141	<1.0	<1.0	0.40J	<1.0	0.40J	0.14J	179J	<0.20	1.0	<5.0	<1.0	<1.0	1.2J	10.8
On-Site Upstream																			
IMM-SW-14-T	MYANC7	4/17/19	<2.0	<10	16.4	<1.0	<1.0	1.6J	1.3	2.3	0.12J	320J	<0.20	5.8	<5.0	<1.0	<1.0	2.5J	2.8
IMM-SW-14-F	MYANC8	4/17/19	<2.0	<10	16.1	<1.0	<1.0	1.4J	1.2	1.3J	<1.0	314J	<0.20	5.6	<5.0	<1.0	<1.0	2.0J	2.4
On-Site Downstream																			
IMM-SW-15-T	MYANC9	4/17/19	<2.0	2.9J	36.8	<1.0	<1.0	2.5	6.1	6.9	1.7	1,040J	<0.20	12.0	<5.0	<1.0	<1.0	11.5	17.5

Table 4a. Weston (2019 Sep) Total and Filterable Metals (ug/L) in Grab Surface Water Samples

Centennial M-1 Property

Nevada County, California

Sample Number	CLP Number	Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
IMM-SW-15-F	MYAND0	4/17/19	<2.0	<10	14.7	<1.0	<1.0	1.4J	0.99J	6.1	0.37J	248J	<0.20	6.1	<5.0	<1.0	<1.0	1.4J	18.0
IMM-SW-16-T	MYAND1	4/17/19	<2.0	0.66J	10.4	<1.0	<1.0	0.77J	1.4	8.2	0.32J	40.9	0.083J	11.9	<5.0	<1.0	<1.0	<5.0	3.9
IMM-SW-16-F	MYAND2	4/17/19	<2.0	0.59J	10.1	<1.0	<1.0	0.71J	0.85J	6.6	<1.0	21.8	<0.20	11.3	<5.0	<1.0	<1.0	<5.0	2.2
IMM-SW-17-T	MYAND3	4/17/19	<2.0	1.4	13.4	<1.0	<1.0	0.72J	0.33J	5.1	0.17J	15.8	<0.20	7.8	<5.0	<1.0	<1.0	<5.0	1.6J
IMM-SW-17-F	MYAND4	4/17/19	<2.0	1.4	12.9	<1.0	<1.0	0.59J	0.29J	4.6	<1.0	14.0	<0.20	7.4	<5.0	<1.0	<1.0	<5.0	7.6
IMM-SW-18-T	MYAND5	4/17/19	<2.0	1.5	13.0	<1.0	<1.0	0.79J	0.32J	5.2	0.20J	16.5	<0.20	7.8	<5.0	<1.0	<1.0	<5.0	1.9J
IMM-SW-18-F	MYAND6	4/17/19	<2.0	1.5	12.8	<1.0	<1.0	0.60J	0.28J	4.8	<1.0	14.2	<0.20	7.3	<5.0	<1.0	<1.0	<5.0	1.9J
Benchmark Values																			
Primary MCL			*6*	*10*	*1000*	*4*	*5*	*50*	*NL*	*1300*	*15*	*NL*	*NL*	*100*	*50*	*NL*	*2*	*NL*	*NL*
Secondary MCL			*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*NL*	*1000*	*NL*	*50*	*NL*	*NL*	*NL*	*100*	*NL*	*NL*	*5000*
Ag			*NL*	*100*	*NL*	*100*	*10*	*NL*	*50*	*200*	*5000*	*200*	*NL*	*200*	*20*	*NL*	*NL*	*100*	*2000*
CTR			*4300*	*150*	*NL*	*NL*	*0.62**	*NL*	*NL*	*1.96**	*0.35**	*NL*	*0.05*	*11.57**	*5.0*	*0.16**	*1.7*	*NL*	*25.98**
CTR source			*HH*	*CCC*	*NL*	*NL*	*CCC*	*NL*	*NL*	*CCC*	*CCC*	*NL*	*HH*	*CCC*	*CCC*	*CMC*	*HH*	*NL*	*CCC*

Notes:

* CTR value is hardness dependent. Converted values were calculated based on a hardness of 16.98 mg/L as $CaCO_3$ (mean value of SW-01, -02 and -03).

Ag = Agricultrual Water Quality Goal

CCC = Criteria Continuous Concentration (CCC): aquatic life extended exposure (4 days) without observed deleterious effects.

CLP = Contract Laboratory Program

CMC = Criterion Maximum Concentration, freshwater, short-term exposure.

CTR = California Toxics Rule

EPA = United States Environmental Protection Agency

F = filtered

HH = Human health (one-per-million risk for carcinogens) for consumption of water and aquatic organisms.

J = analyte concentration detected at a value between MDL and RL. The associated value is an estimated quantity.

MCL = Maximum Contaminant Level

MDL = laboratory method detection limit

NL = not listed in RWQCB Compilation of Water Quality Goals

RL = laboratory reporting limit

T = total (unfiltered)

ug/L = migrograms per liter

Table 4b. Maximum Detected Values, Weston (2019 Sep) Metals (ug/L) in Suface Water Samples

Centennial M-1 Property

Nevada County, California

Constituent	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mn	Hg	Ni	Se	Ag	Tl	V	Zn
Maximum Detected Concentrations																	
Wolf Creek Upstream	<2.0	0.39J	33.5	<1.0	<1.0	0.67J	0.14J	0.59J	0.16J	16.1J	<0.20	1.5	<5.0	<1.0	<1.0	<5.0	8.7
Wolf Creek Downstream	<2.0	1.6	25.8	<1.0	<1.0	0.89J	0.35J	**1.2J**	**0.26J**	42.4J	**0.21**	1.9	<5.0	<1.0	<1.0	<5.0	8.3
East Eureka Portal	<2.0	**102**	**141**	<1.0	**0.21J**	**2.9**	**2.8**	**14.4**	**74.8**	**203J**	<0.20	**17.9**	<5.0	<1.0	<1.0	4.9J	**93.3**
Onsite Upstream	<2.0	<10	16.4	<1.0	<1.0	**1.6**	**1.3**	**2.3**	0.12J	**320J**	<0.20	**5.8**	<5.0	<1.0	<1.0	2.5J	2.8
Onsite Downstream	<2.0	1.5	36.8	<1.0	<1.0	**2.5**	**6.1**	**8.2**	**1.7**	**1,040**	**0.083**	**12.0**	<5.0	<1.0	<1.0	**11.5**	**18.0**
Benchmark Concentrations																	
Primary MCL	6	10	1000	4	5	50	NL	1300	15	NL	NL	100	50	NL	2	NL	NL
Secondary MCL	NL	NL	NL	NL	NL	NL	NL	1000	NL	50	NL	NL	NL	100	NL	NL	5000
Ag	NL	100	NL	100	10	NL	50	200	5000	200	NL	200	20	NL	NL	100	2000
CTR	4300	150	NL	NL	0.62*	NL	NL	1.96*	0.35*	NL	0.05	11.57*	5.0	0.16*	1.7	NL	25.98*
CTR source	HH	CCC	NL	NL	CCC	NL	NL	CCC	CCC	NL	HH	CCC	CCC	CMC	HH	NL	CCC

Notes:

The lowest benchmark value for each constituent is underlined.

Results in **bold** font are notably higher than upstream results for Wolf Creek.

Results in **bold underlined** font exceed a benchmark concentration.

* CTR value is hardness dependent. Converted values were calculated based on a hardness of 16.98 mg/L as $CaCO_3$ (mean value of SW-01, -02 and -03).

Ag = Agricultrual Water Quality Goal

CCC = Criteria Continuous Concentration (CCC): aquatic life extended exposure (4 days) without observed deleterious effects

CMC = Criterion Maximum Concentration, freshwater, short-term exposure

CTR = California Toxics Rule

EPA = United States Environmental Protection Agency

F = filtered

HH = Human health (one-per-million risk for carcinogens) for consumption of water and aquatic organisms.

J = analyte concentration detected at a value between MDL and RL. The associated value is an estimated quantity.

MCL = Maximum Contaminant Level

MDL = laboratory method detection limit

NL = not listed in RWQCB Compilation of Water Quality Goals

RL = laboratory reporting limit

T = total (unfiltered)

ug/L = migrograms per liter

Table 5. Weston (2019 Sep) Total Metals (mg/kg) in Sediment Samples

Centennial M-1 Property

Nevada County, California

Sample Number	CLP Number	Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Wolf Creek Upstream																			
IMM-S-01	MYAN77	4/17/19	1.7J	6.3	176	0.8	0.17J	55.7	15.2	28.9	15.6J	498	<0.11	56.5	<3.9	<0.57	<0.57	102	56.4
Wolf Creek Downstream																			
IMM-S-07	MYAN88	4/17/19	5.3J	10.7	119	0.7	0.21J	207	30.1	30.5J	184	1,610	<0.13	137	<4.7	<0.59	<0.59	174	134
IMM-S-10	MYAN96	4/17/19	2.8J	18.5	101	0.44J	0.24J	129	31.9	32.9	19.4	774	0.26	162	<4.1	<0.59	<0.59	92J	91.4
IMM-S-11	MYAN97	4/17/19	2.4J	10.5	113	0.48J	0.25J	97.5	25.3	33.5	12.1	735	0.17	122	1.0J	<0.58	<0.58	89.3	121
On-Site Upstream																			
IMM-S-14	MYANA0	4/17/19	3.3J	5.3	21.3	<0.49	0.69	177	21.9	30.4	5.5	760	0.15	165	<4.1	<0.49	<0.49	59.6	56.9
On-Site Downstream																			
IMM-S-15	MYAN78	4/17/19	<1.2	16.5	292	0.15J	0.87	74.8	81.4	38.8	15.6J	10,100	0.65	123	4	1.7	<0.6	95.9J	137
IMM-S-16	MYAN79	4/17/19	3.9J	46.6	21.3	0.19J	1.5	175	43.1	386	349	544	4.8	145	4.7	1.7	<0.54	18.5J	61.9
IMM-S-17	MYAN80	4/17/19	5.4J	17.7	23.7	0.17J	0.53	283	60.9	145	29.8	441	1.5	948	1.2J	0.22J	<0.57	55J	47.2

Notes:

CLP = Contract Laboratory Program

J = analyte concentration detected at a value between MDL and RL. The associated value is an estimated quantity.

MDL = laboratory method detection limit

mg/kg = milligrams per kilogram

RL = laboratory reporting limit

Table 6a. McClelland (2010) Metals in Humidity Cell Extracts, Tailings Sample TP3
Centennial M-1 Property
Nevada County, California

Analysis (mg/l)	Week 0	Weeks 1-4	Weeks 5·8	Weeks 9-12	Weeks 13-16	Weeks 17-20
Alkalinity, $CaCO_3$	44	54	82	44	42	48
CO_3, $CaCO_3$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO_3	54	66	100	54	51	58
Hydroxide, OH	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aluminum	<0.045	<0.045	<O.o45	<0.045	<0.045	<0.045
Antimony	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic	0.012	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Barium	0.058	0.027	0.014	<0.010	<0.010	0.11
Beryllium	<0.0010	<0.0010	0.0060	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	0.0058	<0.0010	<0.0010	<0.0010
Calcium	220	17	13	11	12	13
Chloride	8.3	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	0.0060	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	1.3	<0.10	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	0.017	0.014	0.013	<0.010	0.035	0.062
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	260	17	14	6.9	6.4	8.2
Manganese	0.028	0.0071	0.011	<0.0050	0.0060	<0.0050
Mercury	0.0004	<0.00010	<0.00010	0.00011	<0.00010	<0.00010
Molybdenum	0,063	0.036	0.045	0.015	0.013	0.016
Nickel	0.014	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	<0.010	<0.010	<0.010	<0.025	<0.025	<0.025
pH, su	7.12	7.90	7.61	8.69	8.09	4.89
Phosphorus	1.6	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	17	2.6	2.0	0.97	0.79	0.77
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	0.0094	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050'	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	27	2.8	0.83	<0.50	<0.50	0.74
Strontium	0.82	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate	1,500	54	38	17	15	23
Thallium	<0.0010	<0.0010	<0.0010	<0,0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	2,220	140	120	61	87	77
Vanadium	0.070	0.018	0.018	<0.010	0.012	<0.010
Zinc	0.022	<0.010	<0.010	<0.010	<0.010	<0.010

Table 6b. McClelland (2010) Metals Concentrations in Humidity Cell Extracts, Comparison to Benchmark Values

Centennial M-1 Property

Nevada County, California

Extractant Concentrations (ug/L)																	
Week:	**As**	**Ba**	**Be**	**Cd**	**Cr**	**Co**	**Cu**	**Pb**	**Hg**	**Mo**	**Mn**	**Ni**	**Se**	**Ag**	**Tl**	**V**	**Zn**
0	**<u>12</u>**	58	<1.0	<1.0	<5.0	<10	<50	<10	**<u>0.40</u>**	**<u>63</u>**	28	**<u>14</u>**	**<u>9.4</u>**	<5.0	<1.0	70	22
1-4	<5.0	27	<1.0	<1.0	<5.0	<10	<50	<10	<0.10	**<u>36</u>**	7.1	<10	<5.0	<5.0	<1.0	18	<10
5-8	<5.0	14	**<u>6.0</u>**	**<u>5.8</u>**	6.0	<10	<50	<10	<0.10	**<u>45</u>**	11	<10	<5.0	<5.0	<1.0	18	<10
9-12	<5.0	<10	<1.0	<1.0	<5.0	<10	<50	<10	**<u>0.11</u>**	**<u>15</u>**	<5.0	<10	<5.0	<5.0	<1.0	<10	<10
13-16	<5.0	<10	<1.0	<1.0	<5.0	<10	<50	<10	<0.10	**<u>13</u>**	6.0	<10	<5.0	<5.0	<1.0	12	<10
17-20	<5.0	11	<1.0	<1.0	<5.0	<10	<50	<10	<0.10	**<u>16</u>**	<5.0	<10	<5.0	<5.0	<1.0	<10	<10
Benchmark Concentrations (ug/L)																	
Primary MCL	<u>10</u>	<u>1000</u>	<u>4</u>	5	<u>50</u>	NL	1300	15	NL	NL	NL	100	50	NL	2	NL	NL
Secondary MCL	NL	NL	NL	NL	NL	NL	1000	NL	NL	NL	<u>50</u>	NL	NL	100	NL	NL	5000
Ag	100	NL	100	10	na	<u>50</u>	200	5000	NL	<u>10</u>	200	200	20	NL	NL	<u>100</u>	2000
CTR	150	NL	NL	<u>0.62*</u>	NL	NL	<u>1.96*</u>	<u>0.35*</u>	<u>0.05</u>	NL	NL	<u>11.57*</u>	<u>5.0</u>	<u>0.16*</u>	<u>1.7</u>	NL	<u>25.98*</u>
CTR source	CCC	NL	NL	CCC	NL	NL	CCC	CCC	HH	NL	NL	CCC	CCC	CMC	HH	NL	CCC
Total Concentrations in Solid Sample (mg/kg)																	
TP3 Tailings	31.9	170	0.55	0.85	235	23.6	63.4	42.3	1.38	3.37	975	146.5	1.0	0.65	0.16	193	75
95% UCL Total Metals Concentration, Tailings Ponds (mg/kg)																	
ETP	248	31.3	0.13	4.57	386	75.9	213	192	6.47	4.06	na	332	2.79	1.86	6.54	72.8	65.9
WTP	112	22.5	0.14	1.69	252	42.3	77.3	44.3	1.69	3.54	na	232	1.18	0.37	2.54	55.1	54.1

<u>Notes:</u>

The lowest benchmark value for each constituent is <u>underlined</u>.

Results in **<u>bold underlined</u>** font exceed a benchmark concentration.

* CTR value is hardness dependent. Converted values were calculated based on a hardness of 16.98 mg/L as $CaCO_3$ (mean value of Wolf Creek upstream surface water samples SW-01, -02 and -03).

Ag = Agricultrual Water Quality Goal

CCC = Criteria Continuous Concentration (CCC): aquatic life extended exposure (4 days) without observed deleterious effects

CMC = Criterion Maximum Concentration, freshwater, short-term exposure

CTR = California Toxics Rule

EPA = United States Environmental Protection Agency

HH = Human health (one-per-million risk for carcinogens) for consumption of water and aquatic organisms.

MCL = Maximum Contaminant Level

NL = not listed in RWQCB Compilation of Water Quality Goals

T = total (unfiltered)

ug/L = migrograms per liter

Table 7. McClelland (2010) Metals in Humidity Cell Extracts, Development Rock Sample 1105
Centennial M-1 Property
Nevada County, California

Ana1ysis, mg/l	Week 0	Weeks 1-4	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20
Alkalinity, $CaCO_3$	68	54	46	34	40	32
CO_3, $CaCO_3$	<1.0	2.4	<1.0	<1.0	<1.0	<1.0
HCO_3	83	61	56	42	49	39
Hydroxide, OH	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aluminum	0.16	<0.045	<0.045	0.080	0.065	<O.D45
Antimony	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Barium	0.20	<0.010	<0.010	<0.010	<0.010	0.11
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	0.13	0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	8.0	6.8	5.1	5.7	7.6	6.4
Chloride	9.6	1.4	<1.0	<1.0	<1.0	<1.0
Chromium	0.0067	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	<1.00	0.13	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	0.18	<0.010	<0.010	0.014	0.018	0.032
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	3.5	6.2	5.1	3.4	4.0	3.1
Manganese	0.0057	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Mercury	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001
Molybdenum	<0.010	<0.100	<0.010	<0.010	<0,010	<0.010
Nickel	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.34	<0.010	<0.010	<0.025	<0.025	<0.025
pH, stu	7.47	8.39	7.73	&.71	&.51	7.26
Phosphorus	0.73	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	6.3	4.1	4.2	2.6	2.9	2.0
Scandiwn	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	49	19	12	3.9	3.5	2.5
Strontium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate	47	24	27	7.6	9.5	7.7
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	190	94	&4	25	56	41
Vanadium	<0.010	<0.010	<0.010	<0.010	0.012	<0.010
Zinc	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

Table 8 - Summary of Deionized Water Extraction Testing for Metals of Potential Concern

Centennial M-1 Property

Nevada County, California

Constituent	As	Ba	Cd	Cr	Co	Cu	Pb	Hg	Mo	Mn	Ni	Se	Ag	Tl	V	Zn
McClelland (2010) Humidity Cell Test Extractant Concentrations (ug/L)																
Week 0	**12**	58	<1.0	<5.0	<10	<50	<10	**0.40**	**63**	28	**14**	**9.4**	<5.0	<1.0	70	22
Week 1-4	<5.0	27	<1.0	<5.0	<10	<50	<10	<0.10	**36**	7.1	<10	<5.0	<5.0	<1.0	18	<10
Week 5-8	<5.0	14	**5.8**	6.0	<10	<50	<10	<0.10	**45**	11	<10	<5.0	<5.0	<1.0	18	<10
Week 9-12	<5.0	<10	<1.0	<5.0	<10	<50	<10	**0.11**	**15**	<5.0	<10	<5.0	<5.0	<1.0	<10	<10
Week 13-16	<5.0	<10	<1.0	<5.0	<10	<50	<10	<0.10	**13**	6.0	<10	<5.0	<5.0	<1.0	12	<10
Week 17-20	<5.0	11	<1.0	<5.0	<10	<50	<10	<0.10	**16**	<5.0	<10	<5.0	<5.0	<1.0	<10	<10
McClelland (2010) Total Concentrations in Solid Sample (mg/kg)																
TP3 Tailings	31.9	170	0.85	235	23.6	63.4	42.3	1.38	3.37	975	146.5	1.0	0.65	0.16	193	75
Vector (1993) DI-WET Concentrations (ug/L)																
SB7-2.5'	<75	--	--	<10	--	--	--	--	--	--	<40	--	--	--	--	--
SB8-2.5'	--	--	--	<10	--	--	--	--	--	--	<40	--	--	--	--	--
SA4-6.5'	--	--	--	<10	--	--	--	--	--	--	<40	--	--	--	--	--
SA4-10'	--	--	--	<10	--	--	--	--	--	--	<40	--	--	--	--	--
SA6-2'	<75	--	--	<10	--	<2.0	<75	**1.1**	--	--	<40	--	--	--	--	--
SA6-17'	<75	--	--	<10	--	--	<75	<100	--	--	<40	--	--	--	--	--
Vector (1993) Total Concentrations in Solid Samples (mg/kg)																
SB7-2.5'	60	--	--	980	--	--	--	--	--	--	535	--	--	--	--	--
SB8-2.5'	--	--	--	1,160	--	--	--	--	--	--	687	--	--	--	--	--
SA4-6.5'	--	--	--	580	--	--	--	--	--	--	400	--	--	--	--	--
SA4-10'	--	--	--	715	--	--	--	--	--	--	255	--	--	--	--	--
SA6-2'	168	--	--	410	--	224	172	12.4	--	--	352	--	--	--	--	--
SA6-17'	648	--	--	278	--	--	127	4.4	--	--	292	--	--	--	--	--
NV5 (2019) DI-WET Concentrations (ug/L)																
IMM-TN-03b	**12.5**	0.8	<0.05	1.1	0.17	**3.4**	**1.6**	<0.2	**16.0**	--	2.1	0.2 J	<0.1	<0.1	<0.5	<4
IMM-TN-19b	4.0	1.6	<0.05	0.8	0.18	**2.7**	**0.9**	<0.2	**20.9**	--	2.8	0.2 J	<0.1	<0.1	<0.5	<4
IMM-TN-21b	0.8	2.8	<0.05	1.2	0.47	**4.7**	**6.2**	**0.2 J**	8.2	--	4.9	0.4	<0.1	<0.1	<0.5	<4
IMM-TN-22b	1.9	3.6	<0.05	4.0	0.26	**6.1**	**10.9**	<0.2	1.9	--	3.8	0.3	<0.1	<0.1	0.9 J	<4
IMM-TN-23b	<0.2	9.0	**1.00**	<0.5	2.05	<0.8	<0.5	<0.2	1.1	--	**27.2**	0.2 J	<0.1	<0.1	<0.5	<4
IMM-TN-37b	0.6	5.3	0.34	<0.5	16.8	**10.2**	0.1 J	<0.2	<0.2	--	**118**	<0.1	<0.1	<0.1	<0.5	10
IMM-TN-38b	0.3	8.8	**0.72**	0.7	21.4	**16.7**	0.2 J	<0.2	<0.2	--	**183**	<0.1	<0.1	<0.1	<0.5	25
IMM-TN-39b	7.7	2.1	<0.05	1.7	0.34	**8.1**	**0.90**	<0.2	3.0	--	**29.7**	<0.1	<0.1	<0.1	1.2 J	<4

Table 8 - Summary of Deionized Water Extraction Testing for Metals of Potential Concern

Centennial M-1 Property

Nevada County, California

Constituent	As	Ba	Cd	Cr	Co	Cu	Pb	Hg	Mo	Mn	Ni	Se	Ag	Tl	V	Zn
NV5 (2019) Total Concentrations in Solid Samples (mg/kg)																
IMM-TN-03b	188	13.2	2.9	325	45	190	161	6.70	6.0	--	313	6	2	<10	63.5	94
IMM-TN-19b	580	15.3	3.4	372	61	231	205	3.49	10	--	425	6	4	<10	57.8	78
IMM-TN-21b	71	29.0	3.6	533	124	361	570	11.0	19	--	559	13	6	<10	76.2	72
IMM-TN-22b	97	34.4	3.7	523	39	300	628	15.0	24	--	315	15	7	<10	85.9	46
IMM-TN-23b	66	8.5	10.2	426	286	671	317	5.80	9.0	--	1,040	12	5	<10	53.6	170
IMM-TN-37b	2,440	42.3	4.3	347	22	444	282	4.37	7.0	--	168	7	8	<10	65.8	71
IMM-TN-38b	509	41.7	4.7	641	152	1310	461	9.70	7.0	--	984	9	7	<10	125	294
IMM-TN-39b	690	80.6	5.8	314	136	356	164	7.01	4.0	--	984	6	6	<10	171	220
Benchmark Concentrations (ug/L)																
Primary MCL	10	1000	5	50	NL	1300	15	NL	NL	NL	100	50	NL	2	NL	NL
Secondary MCL	NL	NL	NL	NL	NL	1000	NL	NL	NL	50	NL	NL	100	NL	NL	5000
Ag	100	NL	10	na	50	200	5000	NL	10	200	200	20	NL	NL	100	2000
CTR	150	NL	0.62*	NL	NL	1.96*	0.35*	0.05	NL	NL	11.57*	5.0	0.16*	1.7	NL	25.98*
CTR source	CCC	NL	CCC	NL	NL	CCC	CCC	HH	NL	NL	CCC	CCC	CMC	HH	NL	CCC
95% UCL Total Metals Concentration, Tailings Ponds (mg/kg)																
ETP	248	31.3	4.57	386	75.9	213	192	6.47	4.06	na	332	2.79	1.86	6.54	72.8	65.9
WTP	112	22.5	1.69	252	42.3	77.3	44.3	1.69	3.54	na	232	1.18	0.37	2.54	55.1	54.1

Notes:

The lowest benchmark value for each constituent is underlined.

Results in **bold underlined** font exceed a benchmark concentration.

* CTR value is hardness dependent. Converted values were calculated based on a hardness of 16.98 mg/L as $CaCO_3$ (mean value of Wolf Creek upstream surface water samples SW-01, -02 and -03).

Ag = Agricultural Water Quality Goal

CCC = Criteria Continuous Concentration (CCC): aquatic life extended exposure (4 days) without observed deleterious effects

CMC = Criterion Maximum Concentration, freshwater, short-term exposure

CTR = California Toxics Rule

DI-WET = Title 22 Waste Extraction Test using deionized water as the extraction solution

HH = Human health (one-per-million risk for carcinogens) for consumption of water and aquatic organisms.

MCL = Maximum Contaminant Level

NL = not listed in RWQCB Compilation of Water Quality Goals

ug/L = micrograms per liter

Table 9 - Summary of Water Quality Evaluation
Centennial M-1 Property
Nevada County, California

Constituent	Maximum Detection by DI-WET (ug/L)	Benchmark Value for Water Quality (ug/L)	Source of Benchmark Value	Environmental Attenuation Factor	SDL[1] (ug/L)
Arsenic	12.5	10	Primary MCL	100	100
Barium	58	1,000	Primary MCL	100	10,000
Cadmium	5.8	0.62	CTR CCC*	100	6.2
Chromium	6.0	50	Primary MCL	100	500
Cobalt	21.4	50	Ag	100	500
Copper	16.7	1.96	CTR CCC*	100	20
Lead	10.9	0.35	CTR CCC*	100	3.5
Mercury	1.1	0.05	CTR HH	100	0.5
Molybdenum	63	10	Ag	100	100
Manganese	28	50	Secondary MCL	100	500
Nickel	183	11.57	CTR CCC*	100	116
Selenium	9.4	5.0	CTR CCC	100	50
Silver	<0.1	0.16	CTR CCC*	100	1.6
Thallium	<0.1	1.7	CTR HH	100	17
Vanadium	70	100	Ag	100	1,000
Zinc	25	25.98	CTR CCC*	100	260

Notes:
1 SDL (for extract of a solid waste constituent, ug/L) = Water Quality Goal (ug/L) x Environmental Attenuation Factor / 10 (Designated Level Methodology, RWQCB, 1989, Equation 4)
* CTR value is hardness dependent. Converted values were calculated based on a hardness of 16.98 mg/L as $CaCO_3$ (mean value of Wolf Creek upstream surface water samples SW-01, -02 and -03).
Ag = Agricultrual Water Quality Goal
CCC = Criteria Continuous Concentration (CCC): aquatic life extended exposure (4 days) without observed deleterious effects
CMC = Criterion Maximum Concentration, freshwater, short-term exposure
CTR = California Toxics Rule
DI-WET = Title 22 Waste Extraction Test using deionized water as the extraction solution
HH = Human health (one-per-million risk for carcinogens) for consumption of water and aquatic organisms.
MCL = Maximum Contaminant Level
NL = not listed in RWQCB Compilation of Water Quality Goals
ug/L = micrograms per liter