APPENDIX J-3A

Removal Action Work Plan

DRAFT FINAL
REMOVAL ACTION WORK PLAN
for
SPRING HILL PROPERTY
APNs 35-260-62, 63 and 64
Grass Valley, California

Prepared for:

Department of Toxic Substances Control
8800 Cal Center Drive, Third Floor
Sacramento, California 95826

Prepared by:

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Project No. 3292-05
June 15, 2012

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

Project No. 3292-05
June 15, 2012

Department of Toxic Substances Control
8800 Cal Center Drive, Third Floor
Sacramento, California 95826

Attention: Mr. Dean Wright

Reference: ***Spring Hill Property***
APNs 35-260-62, 63, and 64
Grass Valley, California

Subject: ***Draft Final Removal Action Work Plan***

Dear Mr. Wright:

Holdrege & Kull (H&K) prepared this Removal Action Work Plan (RAW) to describe procedures for conducting soil excavation, off-site disposal and on-site placement activities at the Spring Hill Property (the site) located in Grass Valley, Nevada County, California. The approximately 26-acre site comprises assessor's parcel numbers (APNs) 35-260-62, 63, and 64, which are located immediately south of Dorsey Drive and southeast of Highway 49/20. This RAW summarizes the results of H&K's January 11, 2008 Preliminary Endangerment Assessment (PEA) of the site, evaluates remedial alternatives, presents the recommended remedial actions and describes procedures for conducting the remediation.

If you have any questions regarding this RAW, please contact the undersigned.

Sincerely,

HOLDREGE & KULL

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

copies: 2 DTSC /Attn: Mr. Dean Wright

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TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF ATTACHMENTS (continued)

APPENDICES

LIST OF ACRONYMS

AOC	Area of concern
APN	Assessor's Parcel Number
ARAR	Applicable, relevant and appropriate requirements
ASTM	American Society for Testing and Materials
ATCM	Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations
bgs	Below ground surface
BTV	Background threshold value
Cal/EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COPC	Constituent of potential concern
CHHSL	California Human Health Screening Level
DI	Deionized water
DLM	Designated Level Methodology
DMP	Dust Mitigation Plan
DTSC	California Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
HHSE	Human Health Screening Evaluation
HSC	California Health and Safety Code
H&K	Holdrege & Kull
LOS	Level of service
LUC	Land use covenant
mg/kg	Milligrams per kilogram
mg/m^3	Milligrams per cubic meter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOA	Naturally occurring asbestos
OMA	Operation and maintenance agreement
PEA	Preliminary Endangerment Assessment
RAO	Remedial action objective
RAW	Removal Action Workplan
RCRA	Resource Conservation and Recovery Act
RWQCB	California Regional Water Quality Control Board
SDL	Soluble designated level
SSP	Site Safety Plan
UCL	Upper confidence level

LIST OF ACRONYMS (continued)

UPL	Upper Percentile Limit
VCA	Voluntary Cleanup Agreement
VSAP	Verification Sampling and Analysis Plan
WET	Waste Extraction Test
XRF	X-ray fluorescence
µg/dL	Micrograms per deciliter
$\mu g/m^3$	Micrograms per cubic meter
µg/L	Micrograms per liter

EXECUTIVE SUMMARY

The R. Jeter Family Trust (the proponent) entered into a Voluntary Cleanup Agreement (VCA; Docket No. HSA-VCA 08/09-044) with the California Department of Toxic Substances Control (DTSC) to characterize and mitigate recognized environmental conditions at the Spring Hill Property (the site). On behalf of the proponent, Holdrege & Kull (H&K) prepared this Removal Action Workplan (RAW) to describe remedial action this is to be performed at the site

H&K prepared this RAW pursuant to California Health and Safety Code (HSC) Chapter 6.8, Sections 25323.1 and 25356.1, California Senate Bill 1706, and the National Contingency Plan (NCP). The purpose of this RAW is to describe procedures for conducting remedial activities to address recognized environmental conditions associated with past site use. The RAW presents remedial action objectives, proposes remedial procedures for the recommended remedial alternatives, and provides a verification soil sampling plan to document that remedial action objectives are achieved.

DTSC comments (October 2, 2008) on the Draft RAW (August 22, 2008) are included in Appendix A. Sections 6.2.4 and 6.3.5 of this RAW have been revised to address DTSC's comments on the Draft RAW.

Site Description

The approximately 26-acre site is located south of Dorsey Drive and southeast of State Highway 49/20 in Grass Valley, Nevada County, California. The site comprises Nevada County Assessor's Parcel Numbers (APNs) 35-260-62, 35-260-63 and 35-260-64.

The gently to moderately sloping site is currently undeveloped. Commercial site development has been proposed. Nearby land uses include State Highway 49/20, commercial development, and residential apartment complexes. Sierra Nevada Memorial Hospital is located west of the site, across State Highway 49/20.

The site is located in the Grass Valley Mining District at the former location of the Spring Hill Mine, which operated intermittently from the late 1800s to the early 1940s. Abandoned mine features identified at the site include horizontal and inclined excavations, pits, relic foundations, stockpiles of mine waste rock, and dry tailings ponds.

Preliminary Endangerment Assessment

H&K performed a Preliminary Endangerment Assessment (PEA) to provide information for use in determining whether past hard rock gold mining and ore processing activities resulted in the release of metals and/or cyanide at concentrations that pose a threat to human health or the environment. The PEA findings are presented in H&K's *Draft Final Preliminary Endangerment Assessment for Former Spring Hill Mine Property* (PEA report; January 11, 2008). DTSC approved the PEA report in a letter dated February 5, 2008.

An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of processed tailings are identified at the site. Of this, an estimated 1,700 cubic yards of mine waste and affected soil having elevated metals concentrations are identified adjacent to a former mill area. The former mill area is identified as area of concern (AOC) 1, and the remaining mine waste (generally located to the west of the mill) is identified as AOC 2.

A human health risk assessment was performed as part of the PEA to evaluate baseline conditions. Exposure media for the site are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of particulates originating from the affected soil. In general, soil arsenic concentrations govern the calculated chronic human health hazard and excess lifetime cancer risk.

Other metals (including antimony, copper, lead, mercury and vanadium) are also considered constituents of potential concern (COPCs). The COPCs were identified by comparing upper confidence limit (UCL) values or maximum concentrations for the assessment areas to UCL values or mean concentrations for ambient data, as available.

Based on the local geology, naturally occurring asbestos (NOA) may be encountered at the site during remediation and site development. In the Sierra Nevada foothills area, ultramafic rock and serpentinite are associated with NOA minerals such as chrysotile, actinolite and tremolite.

Based on the human health risk assessment performed as part of the PEA, mine waste and affected soil in AOC 1 are not acceptable for use under the three exposure scenarios considered: standard (unrestricted land use), commercial indoor worker and construction worker.

The mine waste and affected soil in AOC 2 are also not acceptable for use under the standard exposure scenario. Considering the commercial indoor worker and construction worker exposure scenarios, the hazard indices are less than the benchmark value of 1 and the risk values fall between the lower (1.E-06) and upper (1.E-04) benchmark values for risk management decision-making.

Results of acid-base accounting indicate that the mine waste rock and tailings are not acid-generating; thus, soluble metals were evaluated by Waste Extraction Test method using deionized water (DI-WET). Soluble arsenic and lead were detected by DI-WET at concentrations exceeding the calculated soluble designated level (SDL) for surface water and groundwater under current conditions. However, the mine waste rock and tailings in AOC 2 are considered suitable for on-site consolidation and burial beneath the proposed commercial development and can be classified as Group C mine waste per CCR Title 27.

Proposed Remedial Measures

The mine waste is to be cleaned up to background levels and either (1) consolidated and buried beneath the proposed commercial development or (2) excavated and removed from the site. The proposed remediation goals are based on the results of human health risk assessment and the evaluation of local background soil concentrations. The remediation goals are summarized below.

- Mine waste and soil that is to be consolidated and buried on-site: The 95% UCL on the mean total arsenic concentration in soil must be protective under the construction worker scenario (less than or equal to 22 milligrams per kilogram (mg/kg)). Soluble arsenic concentrations must not exceed the arsenic SDL (20 micrograms per liter (µg/L)). Cleanup goals for other metals (such as copper, lead, mercury and vanadium) are described in this RAW. Materials that exceed these goals are to be removed from the site.

- Mine waste and soil that is to remain at the site without consolidation and burial: Total arsenic concentrations in soil must be within the range of local background levels. Cleanup goals for other metals of potential concern (such as copper, lead, mercury and vanadium) are described in this RAW.

Cost Analysis

The NCP requires the use of an Engineering Evaluation/Cost Analysis (EE/CA) or equivalent. This RAW is to serve as the equivalent of an EE/CA. Three remedial alternatives are evaluated within the RAW for remediation of mine waste. The evaluation of the remedial alternatives is based on effectiveness, implementability and cost.

Excavation and Off-site Disposal is the recommended remedial alternative for AOC 1. An estimated 1,700 cubic yards of mine waste and affected soil are to be excavated from AOC 1 and transported to an appropriate Class I or Class II solid waste disposal facility. The estimated cost for off-site disposal is $275,000.

Excavation and On-site Placement is the recommended alternative for AOC 2. An estimated 62,300 cubic yards of mine waste and affected soil are to be excavated, transported within the site, and consolidated in an area that is not subject to surface water infiltration or groundwater seepage. A conceptual placement plan and general grading recommendations are presented in this RAW. Prior to implementation, site development plans depicting the final development layout and waste placement details are to be prepared for review and approval by DTSC. The estimated cost for on-site placement is $719,000. This cost does not include general construction items such as rock excavation, fill slope grading and paving, which are to be performed as part of the proposed commercial development process.

Restrictions on Site Use Prior to Remediation

If site activities are performed prior to the site remediation activities presented in this RAW, the remediation areas must be identified and marked in the field so that the areas may be avoided. Potential site activities that may result in disturbance of the mine waste stockpiles and impacted soil areas include timber harvest, grading and road construction, brush clearing for fire prevention, and other ground disturbing activities. DTSC must be allowed to review any proposed ground disturbing activities if the activities are to be performed prior to the implementation of the recommended remedial procedures.

Dust Mitigation Plan

Under California law, disturbance of soil and rock that contain ultramafic rock, serpentinite or NOA minerals must be handled as described in California Environmental Protection Agency (Cal/EPA) Air Resources Board Regulation 93105, *Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations* (ATCM). Per the ATCM, site work must be performed according to protocols established by an Asbestos Dust Mitigation Plan. The Dust Mitigation Plan (DMP) appended to this RAW outlines engineering controls to reduce the risk of release of metals and NOA fibers into the environment during mechanical soil disturbance. Mechanical soil disturbance includes site clearing, excavation, grading, underground utility work, transportation, and disposal activities.

Mitigation of Physical Hazards

The abandoned mine excavations identified at the site, as well as other mine excavations that may be present on and adjacent to the site, present physical hazards and may not be suitable to support structural improvements. The excavations should be closed to address the possibility of entrapment, collapse, hazardous confined space conditions and other physical hazards. Temporary measures are appropriate to reduce the existing physical hazards. Final physical closure of the excavations is to be performed in accordance with recommendations from a qualified geotechnical engineer and with the approval of the local building department.

Public Participation

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

1 INTRODUCTION

Holdrege & Kull (H&K) prepared this Removal Action Workplan (RAW) on behalf of the R. Jeter Family Trust (the proponent) to describe procedures for conducting remedial activities associated with recognized environmental conditions at the Spring Hill Property (the site). The approximately 26-acre site is comprised of Nevada County Assessor's parcel numbers (APNs) 35-260-62, 63, and 64. Figure 1 is a site vicinity map.

The proponent is completing a Voluntary Cleanup Agreement (VCA; Docket No. HSA-VCA 08/09-044) with the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substance Control (DTSC). Pursuant to the VCA, H&K performed a Preliminary Endangerment Assessment (PEA) to evaluate site conditions and potential risks to human health and the environment resulting from historical site use. The PEA findings are presented in H&K's *Draft Final Preliminary Endangerment Assessment of Former Spring Hill Mine Property* (PEA report; January 11, 2008). A summary of the PEA investigation is presented in Section 2.2 of this RAW. The DTSC approved the PEA findings in a letter dated February 5, 2008.

The requirement for preparation of a RAW was created by Senate Bill 1706 in 1994. The RAW 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 RAW was chosen over a Remedial Action Plan because the proposed remediation is not an emergency action, and the estimated cost of the recommended remedial action is projected to be less than the threshold cost of $1,000,000.

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

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

1.1 BASIS FOR REMEDIAL ACTION

Pursuant to Section 25356.1.5 of the California 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 PEA risk assessment findings.

1.2 PURPOSE

The purpose of the RAW is to evaluate remedial alternatives and to select a remedial alternative that effectively reduces, to the extent feasible, the human health risks and water quality risks associated with mine waste and impacted soil at the site. The evaluation considers the effectiveness, implementability and cost associated with each alternative. This RAW presents the recommended remedial action, as well as a verification sampling plan to confirm that the proposed remedial goals are achieved.

1.3 ORGANIZATION

Per Section 25323.1 of the HSC, a RAW must include a plan for conducting the remedial action, a description of the on-site contamination, the goals to be achieved by the remedial action, and the rationale for consideration of alternative removal options.

This RAW contains components required by DTSC's Removal Action Workplans memorandum dated September 23, 1998, and is organized in the following sections:

1. *Introduction*. This section includes an overview of the proposed remedial action and associated regulations, purpose of the RAW, and organization of the RAW.

2. *Site Characterization*. This section includes site description, ownership and operational history, site conditions, brief description of site characterization activities conducted, nature and extent of contamination, and description of response actions taken, if any.

3. *Remedial Action Objectives*. This section includes a discussion of regulations, identification and review of applicable or relevant and appropriate requirements (ARARs), identification of media and constituents of concern, estimate of volumes, and remedial action goals.

4. *Evaluation of Remedial Action Alternatives*. This section includes a listing of alternative remedial measures and basis for selection of the recommended measure.

5. *Site Safety Plan*. This section includes a brief overall description of the methods that will be employed during the removal action to ensure the health and safety of workers and the public during the removal action.

6. *Remedial Procedures and Implementation*. This section includes a description of techniques and methods to be employed in the remedial action, including excavation, storing, handling, transportation, treating and disposing of material on or off the site, as applicable. The Verification Sampling and Analysis Plan (VSAP), which is intended to confirm the effectiveness of the RAW, is discussed in this section.

7. *Public Participation*. This section includes a discussion of public participation in the remedial action.

8. *Remedial Action Reporting*. This section includes a brief description of the post-remediation report which is to be prepared to summarize remedial activities and to document compliance with the RAW.

Appendix A presents a list of administrative record documents for the remedial action. DTSC comments (October 2, 2008) on the Draft RAW (August 22, 2008) are included in Appendix A. Sections 6.2.4 and 6.3.5 of this RAW have been revised to address DTSC's comments on the Draft RAW.

2 SITE CHARACTERIZATION

2.1 SITE LOCATION AND DESCRIPTION

The approximately 26-acre site is located south of Dorsey Drive and southeast of State Highway 49/20 within the Grass Valley city limits in Nevada County, California. The site comprises Nevada County APNs 35-260-62, 63 and 64.

Referencing the Grass Valley Quadrangle map (United States Geological Survey, provisional edition 1995), the site is located in the southern half of the southeast quarter of Section 23 and the northern half of the northeastern quarter of Section 26, Township 16 North, Range 8 East. Figure 1 is a vicinity map depicting the locations of other PEA investigations in the Grass Valley area. Figure 2 is a site map, showing APNs, existing site features, stockpile locations, selected sample locations and property boundaries.

2.1.1 Site Description and Current Site Uses

Surface topography at the site generally slopes toward the south and southwest from a relatively flat-lying area in the northern portion of the site and a knoll in the northern central portion of the site. The northern portion of the eastern edge of the site slopes toward the southeast. The site elevation ranges from approximately 2550 feet to approximately 2690 feet above mean sea level. The site is generally vegetated by oak, manzanita, pine and cedar. Rock outcrop is present at several locations on the north and west sides of the site.

The site is currently undeveloped. Foundations of structures from the historic mining operations remain at the site. Several roads and trails are located within the site, some of which are depicted on Figure 3. The roads and trails may be used periodically by trespassers. The site is zoned corporate business park by the City of Grass Valley Planning Department.

2.1.2 Adjacent Properties

The site is bordered by Dorsey Drive to the north, and across it an apartment complex; by State Highway 49/20 to the northwest, by Spring Hill Drive and commercial property to the south and southwest, and by an apartment complex to the east. Sierra Nevada Memorial Hospital is located approximately 500 feet west of the site, across State

Highway 49/20 and at a higher elevation. The Spring Hill Manor convalescent hospital is also located west of the site, across State Highway 49/20.

2.1.3 Geologic Setting

The site is located within a region underlain by a complex assemblage of igneous and metamorphic rocks in the western foothills of the Sierra Nevada. The regional structure of the foothills is characterized by the north-northwest trending Foothills Fault System, a feature formed during the Mesozoic era (between 65 million and 248 million years before present) in a compressional tectonic environment. A change to an extensional tectonic environment during the late Cenozoic (last nine million years) resulted in normal faulting, which has occurred coincident with some segments of the older faults in the region.

2.1.4 Geologic Conditions

Based on the Geologic Map of the Grass Valley - Colfax Area (A. Tuminas, 1983), the site is mapped as serpentine rocks of the Early Mesozoic aged Ultramafic-Mafic "Basement" Unit of the Lake Combie Complex. According to the Mineral Land Classification of Nevada County (Special Report 164, California Department of Conservation Division of Mines and Geology, 1990), the site geology is mapped as the ultramafic unit of the Jurassic-aged Lake Combie Complex. The Mesozoic era occurred from approximately 245 to 65 million years ago. The Jurassic period occurred from approximately 206 to 144 million years ago.

The Nevada City Special Folio, California (United States Geologic Survey; 1896) depicts an east-west trending quartz vein passing through the central portion of the site. The vein depicted dips to the north.

2.1.5 Soil Conditions

The *Soil Survey of Nevada County, California, Western Part* (United States Department of Agriculture, Soil Conservation Service, August 1993) indicates that soil conditions across the majority of the site are mapped as rock outcrop of the Dubakella Complex, 5 to 50% slopes. The central portion of the site is mapped as "Placer Diggings," although this classification is incorrect based on the identification of past hard rock gold mining in this area. A small part of the eastern portion of the site is mapped as Sites loam, 9 to 15% slopes.

H&K excavated exploratory trenches through native soil at the site. Native soil was encountered at the ground surface in some trenches and at depth beneath waste rock and tailings in other trenches. The native soil generally consisted of clay, sandy clay and gravelly sandy clay. Severely to moderately weathered diabase and serpentine was encountered in several trenches beneath the clay in the central portion of the site. In the trenches where rock was encountered, the clay was observed to be up to 2.5 feet thick.

2.1.6 Groundwater Conditions

H&K reviewed well completion reports provided by the California Department of Water Resources for wells in the site vicinity. The well completion reports indicate that depths to first encountered groundwater ranged from 60 to 152 feet in wells constructed within 2000 feet of the site. A well at Spring Hill Manor convalescent hospital (located approximately 300 feet west of the site) is screened from 65 to 85 feet below ground surface (bgs)). The water level in the Spring Hill Manor well was not reported. Based on the well completion reports, groundwater in the site vicinity is typically encountered within bedrock fractures.

The proposed site development likely will not include construction of water supply wells because the site is within the city limits and domestic water is provided by a treated municipal source.

2.1.7 Surface Water Conditions

Surface water was not encountered on the site during the PEA investigation, although seasonal surface water flow associated with storm water runoff is expected in the lower (southern) portion of the site. According to the 7.5-minute Grass Valley Quadrangle Map (U.S. Geological Survey, provisional edition 1995), Wolf Creek is located approximately 500 feet south and down-gradient of the site.

Wolf Creek flows approximately 14 miles south of its location near the site into the Bear River near the southern border of Nevada County. The Bear River then flows approximately nine miles northwest into Camp Far West Reservoir and then approximately 17 miles southwest from Camp Far West Reservoir into the Feather River.

2.1.8 Site History

H&K reviewed several topographic surveys, historical mining maps and documents relating to site mining history, as well as a Phase 1 Environmental Site Assessment of the Spring Hill Mine property prepared by others in 1997. Figure 4 depicts the locations of the identified mine features. The following documents were reviewed:

- *Nevada County Mining Review* (Grass Valley Daily Morning Union, 1895),
- Nevada City Special Folio, California (United States Geologic Survey; 1896),
- Map of the Vicinity of Grass Valley/Nevada City, California (Uren, 1897),
- *Gold Quartz Veins of Grass Valley* (Johnston, 1940),
- *State Mineralogists Report XXXVII*, (California State Mining Bureau, 1940),
- Map of Spring Hill Mining Co., (E. Uren, 1942), and
- *Phase I Environmental Site Assessment, Spring Hill Mine Area* (Anton Geological, July 10, 1997).

The 1897 Map of the Vicinity of Grass Valley/Nevada City, California depicts the Spring Hill Mine claim boundaries covering the site and extending onto adjacent property.

The 1896 Nevada City Special Folio shows an east-west trending quartz vein passing through the central portion of the site with three mine shafts on the site. The approximate shaft locations are indicated on Figure 4.

The 1895 *Nevada County Mining Review* indicates two mining locations and one mill site were present at the Spring Hill Mine and that a 2400-foot quartz vein passes through the site, which is described as 3 to 4 feet wide with “heavy outcrops”.

The 1940 *Gold Quartz Veins of Grass Valley* states that the quartz vein passing through the site strikes east and dips to the south (contrary to the earlier map depicting shafts inclined to the north). Only shallow shafts were advanced in the “early days” and the mine reopened in 1931. The ore body was reportedly located along the

contact between serpentine and minor diorite rock. "Much carbonate" was present in the serpentine.

The 1940 *State Mineralogist's Report* indicates prospecting had occurred at the Spring Hill Mine for many years. A 100-ton ore processing plant employing floatation operated part time (the likely source of the mill tailings observed at the site). The main shaft had reportedly been sunk to a depth of 1900 feet with many thousands of feet of drift. Results as of 1940 were reported to be "not satisfactory."

The 1942 Map of the Spring Hill Mine Co. depicted the Spring Hill shaft, inclined to the north-northwest and numerous other features including apparent structures labeled "bin," "hoist," "compressor," "mill," "machine shop," "carpenter shop," "dry," "furnace," "superintendent residence," and "garage." Some labels on the map were not legible. The bin and hoist were depicted in-line with and south of the Spring Hill shaft. The mill was located to the east of the bin. Areas of mine waste labeled dump and tailings were depicted in the approximate locations where mine waste was observed during the site reconnaissance. Perimeter concrete foundations and slabs of former structures shown on the map were observed during site reconnaissance.

Record of mining activities at the site after the early 1940s was not encountered. Most hard rock gold mines in the area closed during World War II and did not reopen.

2.2 SUMMARY OF PEA INVESTIGATION

2.2.1 Field Investigation and Analytical Results

Details of site observations, field procedures, and sampling programs are included in the PEA report and are summarized below. PEA data are presented in Appendix B.

An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of processed tailings are identified at the site. Of this, an estimated 1,700 cubic yards of mine waste and affected soil having elevated metals concentrations are identified adjacent to a former mill area. The former mill area is identified as area of concern (AOC) 1, and the remaining mine waste (generally located to the west of the mill) is identified as AOC 2. H&K obtained approximately 92 soil samples from the AOCs and 8 ambient soil samples from apparently unimpacted portions of the site.

AOC 1

Approximately 20 soil samples were obtained from the ground surface and from trenches excavated in AOC 1. The samples were analyzed for total arsenic, total lead, total mercury and total nickel using EPA (United States Environmental Protection Agency) Methods 6010B and 7471A. The laboratory reported arsenic concentrations ranging from below a reporting limit of 1 milligram per kilogram (mg/kg) to 579 mg/kg. Lead concentrations ranged from below a reporting limit of 1 mg/kg to 810 mg/kg. Mercury concentrations ranged from 0.039 to 22.5 mg/kg. Nickel concentrations ranged from 104 to 1180 mg/kg.

Three soil samples from AOC 1 were analyzed for Title 22 metals using EPA Methods 6010B and 7471A. Excepting arsenic, lead, mercury (discussed above) and cadmium, Title 22 metals concentrations in the three samples did not exceed the respective California Human Health Screening Levels (CHHSLs) for residential or industrial soil.

Three soil samples from AOC 1 were analyzed for soluble arsenic, lead, nickel and mercury by DI-WET using EPA Methods 6010B and 7471A. Soluble arsenic was detected in soil samples S-10 and TP-21-0.75 at respective concentrations of 9.3 micrograms per liter (µg/L) and 11.6 µg/L, which exceeded the calculated site soluble designated level (SDL) for current conditions (2 µg/L). Soluble mercury was not detected in soil samples S-10 and TP-21-0.75. Soluble nickel detections in mine waste rock and tailings were within the range of soluble nickel concentrations detected in ambient soil (26.2 to 58.5 µg/L).

AOC 2

Approximately 72 soil samples were obtained from AOC 2. The samples were analyzed for total arsenic, total lead, total nickel and total mercury using EPA Methods 6010B and 7471A. The laboratory reported arsenic concentrations ranging from below a reporting limit of 1.0 mg/kg to 180 mg/kg. Lead concentrations ranged from below a reporting limit of 1.0 mg/kg to 310 mg/kg. Mercury concentrations ranged from below a reporting limit of 0.010 mg/kg to 19.5 mg/kg. Nickel concentrations ranged from 96.3 to 1290 mg/kg.

Six soil samples from AOC 2 were analyzed for Title 22 metals using EPA Methods 6010B and 7471A. Excepting arsenic, lead and mercury (as discussed above), Title 22 metals concentrations in the six samples did not exceed the respective CHHSLs for residential or industrial soil.

Sixteen soil samples from AOC 2 were analyzed for soluble arsenic, lead, nickel and mercury by DI-WET using EPA Methods 6010B and 7471A. Soluble arsenic was detected in eight of the soil samples at concentrations that exceeded the calculated site SDL for current conditions. However, the soluble arsenic concentrations for the samples are lower than the anticipated SDL for the proposed on-site consolidation. Soluble lead and mercury were not detected in soil samples at concentrations above the SDL for current site conditions. Soluble nickel detections in mine waste from AOC 2 were within the range of soluble nickel concentrations detected in ambient soil (26.2 to 58.5 µg/L).

Ambient Soil

Eight soil samples were obtained from the ground surface in areas of the site apparently unaffected by former mining activities. The samples were analyzed for total arsenic, total lead, total nickel and total mercury using EPA Methods 6010B and 7471A. The laboratory reported arsenic concentrations ranging from below a reporting limit of 1.0 mg/kg to 17 mg/kg. Lead concentrations ranged from 3.1 mg/kg to 20.4 mg/kg. Mercury concentrations ranged from below a reporting limit of 0.066 mg/kg to 0.140 mg/kg. Title 22 metals analysis was not performed on site ambient soil samples.

Two ambient soil samples, S-12 and S-13, were analyzed for soluble arsenic, lead, and nickel by DI-WET using EPA Method 6010B. Soluble arsenic was detected in one soil sample (S-13) at a concentration of 18.6 µg/L. Soluble lead was not detected in either of the samples above a reporting limit of 6 µg/L. Soluble nickel detections were 58.5 µg/L (S-12) and 26.2 µg/L (S-13).

2.2.2 Arsenic Concentrations in Local Background Soil

H&K compiled background soil arsenic data obtained from eight PEA sites (including the subject site) near Grass Valley, California. The local PEA sites include Spring Hill, North Star, Kenny Ranch, Winds Aloft, Osborne Hill, Loma Rica, La Barr Meadows and Bear River Mill. The locations of the above-listed sites with respect to the subject site are depicted on Figure 1 of Appendix C. Background arsenic concentrations are presented in Table 1 of Appendix C. DTSC has reviewed and approved the PEAs from which the background data were obtained.

The 208 local background arsenic concentrations range from non-detect to 48 mg/kg. The mean is 5.3 mg/kg, the standard deviation is 6.9 mg/kg and the coefficient of

variation is 1.3. Descriptive statistics for the non-transformed and base 10 log-transformed data are presented in Tables 2 and 3, respectively, of Appendix C.

DTSC (1997, 2007) provides a framework in which risk assessors may identify background arsenic concentrations. Based on these guidance documents, H&K performed visual and statistical evaluation of the local background arsenic data as described below.

Microsoft Excel Analyze-it™ version 1.73 was used to prepare normality plots of the non-transformed and log-transformed data. The plots are presented following Table 3 of Appendix C. The non-transformed data are clearly not normal, as is often the case with trace metals. Although the log-transformed data generally display a linear distribution, the data are not normally distributed based on the Shapiro-Wilk normality test. The coefficient of variation (1.29), as well as gaps and inflections observed in the log-transformed data, attest to the fact that the data were obtained from different sites and different geologic units.

With the exception of the Winds Aloft site, the eight local PEA sites share similar geology. Published geologic descriptions generally indicate that the sites are underlain by quartz diorite, diabase and/or ultramafic rock, as plotted on the QAP diagram presented as Figure 2 in Appendix C. The QAP in Figure 2 is a simplified depiction of the compositional ratio of quartz (Q), alkali feldspar (A), and plagioclase feldspar (P) in igneous plutonic rocks found at seven of the eight local PEA sites. Specific geologic descriptions are presented in Table 4 of Appendix C.

Outlying data were evaluated using the fourth spread procedure described by DTSC (2007). The fourth spread, f_s, is defined as the measure of spread in a data set that is resistant to outliers and is calculated according to the following equation: $f_s = Q_3 - Q_1$. By definition, any observation farther than $1.5f_s$ from the closest fourth is considered an outlier. For the log-transformed data set, $1.5f_s$ is equal to 1.25, and any observation below $Q_1 - 1.5f_s$ or above $Q_3 + 1.5f_s$ would be considered an outlier. By this method, none of the data were determined to be outliers.

The 95th percentile value for the local background arsenic data set is 17 mg/kg. This value is equal to the maximum arsenic concentration detected in background soil at the subject site.

2.2.3 Human Health Screening Evaluation

A human health screening evaluation (HHSE) was performed as part of the PEA to evaluate potential risks to human health from constituents of potential concern (COPCs) identified at the site. A site conceptual model diagram is presented as Figure 5. Exposure pathways and media of concern identified in the HHSE include:

- dermal contact and incidental ingestion of surface soil;
- inhalation of airborne particulates resulting from wind erosion of surface soil.

The potential for exposure associated with surface water or groundwater is considered to be low based on the results of solubility testing.

In general, the PEA findings indicate that arsenic is the most significant COPC relative to human health, and governs the proposed remedial action. Antimony, vanadium and other metals also contribute to the chronic human health hazard and are to be addressed as part of site remediation.

The HHSE included evaluation of residential, trespasser, commercial indoor worker and construction worker exposure scenarios. The results are summarized below and in Tables 10 and 11 of Appendix D. Details of the HHSE are presented in the PEA report. Appendix D of this RAW presents the HHSE data.

The mine waste in AOC 1 is not acceptable for unrestricted land use, and is also not acceptable for use under the other exposure scenarios considered.

The affected soil in AOC 2 is also not acceptable for unrestricted land use. Considering the commercial indoor worker and construction worker exposure scenarios, as the hazard indices are less than the benchmark value of 1 and the risk values fall between the lower (1.E-06) and upper (1.E-04) benchmark values for risk management decision-making.

Lead hazards were updated 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. These updated results are presented in Appendix D. Calculations were performed using standard exposure parameters and UCL values. The resulting 90th percentile blood lead levels for non-pica child are 5.3, 0.5 and 0.2 micrograms per deciliter (µg/dL), respectively, for the mill area (AOC 1), other waste (AOC 2), and background soil. The resulting 90th

percentile blood lead levels for an adult worker are 0.7, 0.1 and 0.0 µg/dL, respectively. The calculated child blood lead concentration for AOC 1 exceeds the 90th percentile benchmark blood lead concentration of 1 µg/dL and is not acceptable for unrestricted use. The calculated blood lead values for AOC 2 are below the benchmark blood lead concentration.

2.2.4 Evaluation of Risk to Surface Water and Groundwater

The potential risk to water quality (surface water and groundwater) was evaluated as part of the PEA using the Designated Level Methodology (DLM). The evaluation is summarized below, and details are presented in the PEA report:

AOC 1

Soluble arsenic and lead were detected by DI-WET at concentrations exceeding the calculated SDL for surface water and groundwater under current conditions.

AOC 2

The mine waste rock and tailings within the southern (down slope) portion of AOC 2 are subject to ephemeral storm water runoff. Soluble arsenic and lead were detected in AOC 2 by DI-WET at concentrations exceeding the calculated SDL for surface water and groundwater under current conditions. However, the mine waste in AOC 2 can be classified as Group C mine waste per CCR Title 27, and is considered suitable for on-site consolidation and burial beneath the proposed commercial development.

2.2.5 Additional Evaluation of Site Background Soil Metals Concentrations

As part of the development of this RAW, ten additional background soil samples (S-14 through S-23) were obtained from the northern portion of the site, up slope of the identified mining features, at locations depicted on Figure 4. The ten background soil samples were analyzed for total antimony, cadmium, cobalt, copper, and vanadium using EPA Method 6010B. Background soil metals data resulting from this analysis are presented in Table 13, and the laboratory report is presented in Appendix C. The data were used to characterize site background concentrations for these metals.

3 REMEDIAL ACTION OBJECTIVES

3.1 OVERVIEW

Pursuant to 40 CFR 300.430, remedial action objectives (RAOs) must be established. The RAOs must specify contaminants and media of concern, potential exposure pathways, and remediation goals. Remediation goals shall establish acceptable exposure levels that are protective of human health and the environment and shall be developed by considering applicable, relevant and appropriate requirements (ARARs) under federal environmental or state environmental laws, if available.

For known or suspected carcinogens, acceptable exposure levels are generally concentrations that represent an excess upper bound lifetime cancer risk to an individual of between one in ten thousand and one in one million, using information on the relationship between dose and response. For systemic toxicants, remediation goals shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety.

Remediation goals must also consider factors related to technical limitations such as metals concentrations in ambient soil; detection/quantification limits for contaminants; factors related to uncertainty; and other pertinent information.

3.2 ARARs

The NCP requires compliance with ARARs during remedial actions to the extent practicable. ARARs include federal, state, and local environmental laws, regulations, and standards that can be chemical-specific, location-specific, or action specific. Chemical-specific ARARs are health-based or environmentally-based numerical limits pertaining to the amount of a contaminant released to the environment or allowed to remain in the environment as a result of the proposed remedial activity. Location-specific ARARs may restrict remedial action if the proposed action is located in an environmentally sensitive or historically significant area. Action-specific ARARs may restrict remedial action based on the specific remedial action and/or byproducts of the remedial action.

3.2.1 Chemical-Specific ARARs

Resource Conservation and Recovery Act (RCRA)

RCRA Subtitle C, contained in 40 CFR, pertains to the characterization of hazardous waste. Some of the mine waste within AOC 1 may meet federal criteria for classification as hazardous waste. Analytical laboratory results for composite samples of excavated soil will be evaluated to determine appropriate waste disposal requirements. Disposal of impacted soil is to comply with RCRA Subtitle C. Some mine waste may be exempt from classification as a hazardous waste per Section 261.4(b)(7) of CFR Title 40.

California Code of Regulations (CCR) Title 22

Section 66261 of CCR Title 22 pertains to the characterization of hazardous waste. Some total arsenic and lead concentrations detected in mine waste within AOC 1 exceed the state benchmark values for hazardous waste. Some mine waste may be exempt from classification as a hazardous waste per CCR Title 22 Section 66261.4(b)(5)(A).

California Human Health Screening Levels (CHHSLs)

CHHSLs established by Cal/EPA for residential soil may be used as a screening tool for individual constituents of concern. The CHHSLs were developed using methodology and toxicological parameters set forth by Cal/EPA, which were also generally used in the site-specific human health risk assessment performed as part of the PEA. The CHHSLs are applicable to the proposed remedial action as a screening tool. The remedial goals established for the remedial action are generally consistent with the CHHSLs; however, the cleanup goal for arsenic in soil is based on background concentrations.

California Water Code

Division 7 of the California Water Code establishes priorities for the California Regional Water Quality Control Board (RWQCB). RWQCB guidance and numerical limits are presented in various documents. The RWQCB Basin Plan, DLM, Antidegradation Policy and Water Quality Goals establish policies, procedures and numerical limits for protection of surface water and groundwater quality. Based on the documents listed above, H&K evaluated the potential risk to water quality as part of the PEA. The findings of the evaluation indicate that site mine waste poses a

theoretical threat to water quality under current conditions. However, the mine waste that is to remain on-site was not found to have significant potential for acid generation, and investigation results indicate that soluble arsenic is attenuated in shallow, clayey, iron-rich soil that typifies the site vicinity, as demonstrated by the low metals concentrations in native soil below the waste. For these reasons, H&K's opinion is that significant water quality impact is not anticipated from the proposed on-site consolidation and burial of mine waste from AOC 2

3.2.2 Location-Specific ARARs

National Historic Preservation Act

The National Historic Preservation Act, as set forth in Sections 65 and 800 of CFR Title 36, pertains to cultural resources and historic sites. The type of mining activity performed at the site is common in the site vicinity. A cultural resources study and archeological report have not yet been performed for the site. The proposed site remediation will comply with the National Historic Preservation Act and will be performed in a manner that will not disturb significant cultural resources or historic sites, if such are identified in the study.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act, as set forth in Section 6.302 of CFR Title 40, pertains in part to wetlands protection and flood management. As wetlands or flood-prone areas have not been identified at the proposed remedial action areas, this regulation is not applicable.

Clean Water Act

The Clean Water Act, as set forth in Section 230 of CFR Title 40, pertains to flood-prone areas and wetlands. As such areas have not been identified at the site, this regulation is not applicable.

RCRA

Section 264.18 of CFR Title 40 pertains to the treatment, storage and disposal of hazardous waste. The mine waste and impacted soil at the site are not anticipated to be RCRA waste, and therefore this regulation is not likely applicable. Disposal characterization sampling and analysis will be performed during the course of the

RAW. Disposal of soil at a Class I or Class II facility shall comply with RCRA Subtitle C requirements.

3.2.3 Action-Specific ARARs

California Water Code

The California Water Code governs the characterization of waste for disposal to land. Waste disposal must comply with the provisions of the California Water Code.

CCR Title 27

Sections 22470 through 22490 of CCR Title 27 pertain to classification of mine waste for disposal citing purposes. The mine waste in AOC 2 can be classified as Group C mine waste per CCR Title 27, and is considered suitable for on-site consolidation and burial beneath the proposed commercial development.

Northern Sierra Air Quality Management District Rule 226

Northern Sierra Air Quality Management District Rule 226 requires that a dust control plan be prepared for construction activity disturbing over one acre of land. Rule 226 is applicable and is addressed by the Dust Mitigation Plan in Appendix E.

Air Resources Board Regulation 93105

Under California law, disturbance of soil and rock that contains ultramafic rock, serpentinite or NOA minerals must be handled as described in Cal/EPA Air Resources Board Regulation 93105, *Asbestos Airborne Toxic Control Measure for Construction, Grading,* Quarrying*, and Surface Mining Operations* (ATCM). Per the ATCM, site work must be performed according to protocols established by an Asbestos Dust Mitigation Plan. The Dust Mitigation Plan (DMP) appended to this RAW outlines engineering controls to reduce the risk of release of metals and NOA fibers into the environment during mechanical soil disturbance. Mechanical soil disturbance includes site clearing, excavation, grading, underground utility work, transportation, and disposal activities.

Public Resources Code 4581 and 4621

The proposed remedial activities are not expected to include significant timber operations that involve the removal of conifers. A “significant” timber operation is generally considered to involve the disturbance of more than 2.99 acres of timberland.

A Timber Harvesting Plan (THP; Public Resources Code 4581) and a Timberland Conversion Permit (TCP; Public Resources Code 4621) are not expected to be required for the proposed remedial activities.

3.3 MEDIA AND CONSTITUENTS OF CONCERN

The primary medium of concern at the site is mine waste, including waste rock and processed tailings. Potential exposure pathways are associated with soil and include dermal absorption through direct contact, incidental ingestion, and inhalation of soil dust. Elevated metals concentrations are present in processed and unprocessed mine waste and affected soil in the assessment areas identified at the site. In general, soil arsenic concentrations govern the calculated chronic human health hazard and excess lifetime cancer risk. Other metals (including antimony, copper, lead, mercury and vanadium) are also considered COPCs.

3.4 QUANTITY ESTIMATE

An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of tailings are identified at the site. Figure 4 depicts the areas of mine waste rock and tailings. These volume estimates are based on limited subsurface data and were not calculated using survey methods. Thus, the actual volume may vary significantly from the estimated volumes.

An estimated 1,700 cubic yards (approximately 2,300 tons) of mine waste rock, tailings and impacted native soil were identified at AOC 1, and the remainder of the mine waste was designated as being within AOC 2. The mine waste and soil identified within AOC 1 contains elevated levels of arsenic, lead and mercury which are not suitable to remain at the site under existing conditions. In addition, a pipe that originated from the former mill area may have deposited materials with elevated metals concentrations down slope of the former mill site. Although such deposits were not encountered as part of the PEA investigation, other deposits which require off-site disposal may be present at the site. The possibility of other “hot spots” is addressed in the Verification Sampling and Analysis Plan (VSAP) appended to this RAW.

3.5 REMEDIAL ACTION GOALS

The goal of the remedial action is to reduce to acceptable levels the potential human health risk and water quality impact associated with the elevated metals concentrations in mine waste and affected soil.

Target cleanup levels are presented in Table 1 and are summarized below. The target cleanup levels for total metals are based on the evaluation of local background levels and the results of human health risk assessment, considering land use and activity patterns associated with future site development and commercial use. The target cleanup levels for soluble metals are based on evaluation of risk to water quality per the DLM.

Protection of Human Health – Total Metals

Mine waste and soil that is to remain at the site without consolidation and burial shall have total arsenic concentrations within the range of local background levels. Arsenic was detected in site background soil up to 17 mg/kg. The range of background soil arsenic concentrations at the site is consistent with local background levels. Local background arsenic concentrations range from non-detect to 48 mg/kg, as discussed in Section 2.2.2 and Appendix C of this RAW. The 95th percentile value (17 mg/kg) for the local background arsenic data set is applicable as an estimated background threshold value (BTV) and is to be used as a not-to-exceed cleanup goal for total arsenic in mine waste and affected soil.

Mine waste and affected soil that is to be consolidated and buried on-site shall have total arsenic concentrations with a central tendency value that is protective under the construction worker exposure scenario. Specifically, the 95% upper confidence limit (UCL) on the mean total arsenic concentration in soil is to be less than or equal to 22 mg/kg.

Cleanup goals for lead and mercury are based on the results of human health risk assessment under the commercial indoor scenario, which generally correspond to the CHHSLs for commercial soil, as listed in Table 2.

During the development of this RAW, additional background soil samples were obtained and analyzed for antimony, cadmium, cobalt, copper and vanadium, as discussed in Section 2.2.5 of this RAW. Background soil metals data are presented in Table 13. UCL values for background soil metals data were calculated using ProUCL

Version 4.00.02 (USEPA, 2007). Statistical analyses are summarized in the ProUCL output in Appendix C. Results are presented in Table 1 of Appendix C and are summarized below.

- Antimony concentrations range from 8.9 to 26.8 mg/kg. The mean is 18.6 mg/kg. The distribution is assumed to be normal, and the Shapiro Wilk test statistic is 0.979. The 95% Student's-t UCL is 21.7 mg/kg. Dixon's outlier test identified no outlying data. The 95% Upper Percentile Limit (UPL; 26.8 mg/kg) is used as an estimated BTV. Because the maximum detected antimony concentration in mine waste is less than the UCL background value, antimony is ruled out as a COPC.

- Cadmium concentrations range from 7.4 to 13.8 mg/kg. The mean is 10.9 mg/kg. The distribution is assumed to be normal, and the Shapiro Wilk test statistic is 0.921. The 95% Student's-t UCL is 12.2 mg/kg. Dixon's outlier test identified no outlying data. The 95% UPL (13.8 mg/kg) is used as an estimated BTV. Because the maximum detected cadmium concentration in mine waste is less than the UCL background value, cadmium is ruled out as a COPC.

- Cobalt concentrations range from 86.4 to 185 mg/kg. The mean is 139 mg/kg. The distribution is assumed to be normal, and the Shapiro Wilk test statistic is 0.923. The 95% Student's-t UCL is 160 mg/kg. Dixon's outlier test identified no outlying data. The 95% UPL (185 mg/kg) is used as an estimated BTV. Because the maximum detected cobalt concentration in mine waste is less than the UCL background value, cobalt is ruled out as a COPC.

- Copper concentrations range from 19.7 to 61.7 mg/kg. The mean is 38.8 mg/kg. The distribution is assumed to be normal, and the Shapiro Wilk test statistic is 0.95. The 95% Student's-t UCL is 46.4 mg/kg. Dixon's outlier test identified no outlying data. The 95% UPL (62 mg/kg) is used as an estimated BTV. Because the maximum detected copper concentration in mine waste exceeds than the UCL background value, copper is considered a COPC.

- Vanadium concentrations range from 51.9 to 117 mg/kg. The mean is 81.4 mg/kg. The distribution is assumed to be normal, and the Shapiro Wilk test statistic is 0.966. The 95% Student's-t UCL is 93.1 mg/kg. Dixon's outlier test identified no outlying data. The 95% UPL (117 mg/kg) is used as an estimated BTV. Because the maximum detected vanadium concentration in mine waste AOC 1 exceeds the UCL background value, vanadium is considered a COPC for AOC 1. Vanadium is ruled out as a COPC for AOC 2, as the maximum

vanadium concentration detected in AOC 2 is less than the background UCL value.

If multiple metals are detected in verification soil samples at concentrations near their respective cleanup levels, additional human health risk assessment is to be performed to evaluate cumulative risk and hazard.

Risk-hazard calculations for site background soil are summarized in Table 14. Antimony and vanadium are the primary contributors to chronic health hazard, and arsenic is the primary contributor to cancer risk.

Protection of Water Quality – Soluble Metals

Soluble arsenic and lead were detected in mine waste at concentrations exceeding the corresponding SDLs based on the current location of the mine waste, as it may be subject to seepage and storm water runoff under current conditions.

The 95% UCL value for soluble arsenic detected in soil that is to remain on-site after the proposed remedial action shall not exceed the SDL for arsenic (20 µg/L) based on DI-WET. Similarly, the 95% UCL value for soluble lead detected in soil that is to remain on-site after the proposed remedial action shall not exceed the SDL for lead (20 µg/L) based on DI-WET. Soluble metals analysis may be required prior to landfill disposal of waste from AOC 1. Soluble metals concentrations for waste in AOC 2 were characterized as part of the PEA; therefore, additional soluble metals testing is not proposed for waste from AOC 2.

4 EVALUATION OF REMEDIAL ACTION ALTERNATIVES

H&K reviewed potentially applicable alternative soil remediation methods including: (1) No Action, (2) Excavation and On-Site Placement, and (3) Excavation and Off-Site Disposal. The review of potential soil remediation alternatives was conducted using an evaluation equivalent to an EE/CA as required by the NCP.

4.1 OVERVIEW

Pursuant to 40 CFR Part 300.430, as determined appropriate and to the extent sufficient information is available, the short- and long-term aspects of the following three criteria are to be used to guide the development and screening of remedial alternatives:

Effectiveness. This criterion focuses on the degree to which an alternative reduces toxicity, mobility, or volume through treatment, minimizes residual risks and affords long-term protection, complies with ARARs, minimizes short-term impacts, and how quickly it achieves protection. Alternatives providing significantly less effectiveness than other, more promising alternatives are eliminated. Alternatives that do not provide adequate protection of human health and the environment are also eliminated from further consideration.

Implementability. This criterion focuses on the technical feasibility and availability of the technologies each alternative would employ and the administrative feasibility of implementing the alternative. Alternatives that are technically or administratively infeasible or that would require equipment, specialists, or facilities that are not available within a reasonable period of time are eliminated from further consideration.

Cost. The costs of construction and any long-term costs to operate and maintain the alternatives are to be considered. Costs that are grossly excessive compared to the overall effectiveness of alternatives are considered as one of several factors used to eliminate alternatives. Alternatives providing effectiveness and implementability similar to that of another alternative by employing a similar method of treatment or engineering control, but at greater cost, may be eliminated.

The analysis of alternatives under review reflects the scope and complexity of site problems and alternatives being evaluated, and considers the relative significance of the factors within each of the following criteria:

Overall protection of human health and the environment. Alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance with ARARs. The alternatives are assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility citing laws or provide grounds for invoking waivers from such laws.

Long-term effectiveness and permanence. Alternatives are assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. As appropriate, the following factors are considered: (1) magnitude of residual risk (taking into account the volume, toxicity, mobility, and propensity to bioaccumulate); (2) compliance with ARARs; (3) long term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance.

Reduction of toxicity, mobility, or volume through treatment. The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume are assessed, including how treatment is used to address the principal threats posed by the site.

Short-term effectiveness. The short-term impacts of alternatives are assessed considering short-term risks that might be posed to the community during implementation of an alternative; potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and time until protection is achieved.

Implementability. The ease or difficulty of implementing the alternatives is assessed by considering technical feasibility, administrative feasibility, and availability of services and materials.

Cost. Costs include capital costs (direct and indirect) and operation and maintenance (O&M) costs.

State acceptance. State concerns include the state's position related to the preferred alternative and other alternatives, and state comments on ARARs or the proposed use of waivers.

Community acceptance. Public review is to be performed to assess community support, reservations and/or opposition of components of the proposed remedial action.

The nine criteria listed above are categorized into three groups:

Threshold criteria. Overall protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived) are threshold requirements that each alternative must meet in order to be eligible for selection.

Primary balancing criteria. The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.

Modifying criteria. State and community acceptance are modifying criteria that shall be considered in remedy selection.

The remedial alternative that best meets the requirements above is to be identified and presented to the public in this RAW. The RAW:

- Provides a brief summary description of the remedial alternatives;
- Provides a discussion of the rationale that supports the preferred alternative;
- Provides a summary of any formal comments received from the support agency; and
- Provides a summary explanation of any proposed waiver from an ARAR.

DTSC comments (October 2, 2008) on the Draft RAW (August 22, 2008) are included in Appendix A. Sections 6.2.4 and 6.3.5 of this RAW have been revised to address DTSC's comments on the Draft RAW.

4.2 REMEDIAL ACTION ALTERNATIVES

4.2.1 Alternatives for AOC 1

4.2.1.1 No Action for AOC 1

The No Action alternative includes leaving mine waste and affected soil at AOC 1 in its existing condition without engineering or institutional controls. The evaluation of this alternative is summarized below.

Effectiveness

- Does not provide adequate protection of human health and the environment
- Does not effectively reduce risks
- Does not afford short-term or long-term protection
- Does not comply with ARARs

Implementability

- Immediately implemented
- Labor, material, and equipment not needed
- Administratively infeasible based on ARARs

Cost

- No direct costs
- Unknown future costs

The No Action alternative provides significantly less effectiveness than the other remedial alternatives, and does not provide adequate protection of human health and water quality. Therefore, the No Action alternative was eliminated from further consideration.

4.2.1.2 Excavation and On-Site Placement for AOC 1

The Excavation and On-Site Placement alternative includes the excavation of mine waste and affected soil that exceeds the remedial goals for metals of concern; verification soil sampling and analysis to confirm that the remedial goals have been achieved; and consolidation of the mine waste and affected soil on-site beneath a proposed commercial development. A land use covenant (LUC) and operation and maintenance agreement (OMA) are typically required. Worker health and safety

would be addressed by Site Safety Plans (SSPs) prepared by the parties involved. Provided that soil verification sample results meet the proposed remedial goals, the former mine waste locations outside of the proposed on-site placement area would be suitable for unrestricted land use.

Effectiveness

- Burial of the mine waste effectively reduces human health risk by eliminating potential exposure pathways (incidental ingestion, inhalation of airborne particulates, and dermal contact with the impacted soil).
- On-site placement of mine waste associated with AOC 1 may not be compliant with ARARs based on the total and soluble metals concentrations detected in the mine waste associated with AOC 1.
- Short-term impacts associated with remediation would be reduced by provisions set forth in a Dust Mitigation Plan (DMP) and SSPs prepared by the parties involved.
- The Excavation and On-Site Placement alternative requires an LUC and OMA for the proposed placement location, which afford long-term protection of human health by restricting future disturbance.

Implementability

- Readily implemented
- Labor, material and equipment readily available
- Likely not acceptable to regulatory agencies and community based on the elevated metals content of mine waste within AOC 1.

Cost

- Relatively low capital costs (approximately $20,000) associated with excavation; on-site transportation; placement, moisture-conditioning and compaction; and quality assurance observation and testing. A cost estimate is presented in Table 15.
- Moderate indirect costs associated with engineering design, development of an LUC and OMA, and periodic reporting.

Based on the elevated metals concentrations detected in mine waste associated with AOC 1, as well as the potential for incompatibility with the California Water Code, the Excavation and On-Site Placement alternative was ruled out as a remedial option for AOC 1.

4.2.1.3 Excavation and Off-Site Disposal for AOC 1

The Excavation and Off-Site Disposal alternative for AOC 1 includes excavation of soil having metals concentrations that exceed the cleanup goals; verification soil sampling and analysis to confirm that the remedial goals are achieved; characterization of the excavated soil for disposal in accordance with landfill acceptance criteria; and transportation of the impacted soil for disposal at a licensed facility in accordance with applicable regulations. Procedures required for dust and erosion control would be addressed in a DMP. Worker health and safety would be addressed in SSPs prepared by the parties involved. The evaluation of this alternative is summarized below.

Effectiveness

- Effectively protects human health by eliminating the potential exposure pathways.
- Short-term impacts associated with remediation would be reduced by provisions set forth in a DMP and SSPs prepared by the parties involved.
- Affords long-term protection of human health and the environment.
- Complies with ARARs.

Implementability

- Readily implemented
- Technically feasible
- Administratively feasible
- Likely acceptable to regulatory agencies and community. Based on preliminary volume estimates from the PEA report, truck traffic is estimated to be approximately 150 truck loads for off-haul and approximately 150 truck loads for import of clean fill. The trucks used for off-haul will exit the site via Spring Hill Drive (a public roadway with single lanes in each direction) to the south and Idaho Maryland Road (a public roadway with single lanes in each direction) to the west. Trucks will enter State Highway 49 southbound from Idaho-Maryland Road, approximately one mile southwest of the site.
- Can be performed in a relatively short time frame immediately prior to commercial site development.

Cost

- Based on preliminary volume estimates from the PEA report, the direct cost of Excavation and Off-Site Disposal for AOC 1 is approximately $275,000, as summarized in Table 16. The cost estimate includes a 10% contingency, which is

primarily related to uncertainties regarding the volume estimate. The cost estimate does not includes the importation of clean soil to replace the off-hauled material, nor does it include costs associated with erosion control and site structural development. These tasks are not included in the remediation cost estimate, as the remediation is to be performed immediately prior to and as part of site development.

- Indirect costs associated with Excavation and Off-Site Disposal for AOC 1 include verification soil sampling and analysis, landfill characterization sampling and analysis, possible air monitoring, and reporting. Engineering tasks such as the preparation of grading plans and storm water pollution prevention plans, surveying and obtaining grading permits are not included in the cost estimate, as the remediation is to be performed immediately prior to and as part of site development.
- No on-going costs associated with off-site disposal are anticipated.

Excavation and Off-Site Disposal is the recommended alternative for AOC 1 because it is compliant with ARARs and protective of human health and the environment.

4.2.2 Alternatives for AOC 2

4.2.2.1 No Action for AOC 2

The No Action alternative includes leaving mine waste and affected soil at AOC 2 in its existing condition without engineering or institutional controls. The evaluation of this alternative is summarized below.

Effectiveness

- Does not provide adequate protection of human health and the environment
- Does not effectively reduce risks
- Does not afford short-term or long-term protection
- Does not comply with ARARs

Implementability

- Immediately implemented
- Labor, material, and equipment not needed
- Administratively infeasible based on ARARs

Cost

- No direct costs
- Unknown future costs

The No Action alternative provides significantly less effectiveness than the other remedial alternatives, and does not provide adequate protection of human health and water quality. Therefore, the No Action alternative was eliminated from further consideration.

4.2.2.2 Excavation and On-Site Placement for AOC 2

The Excavation and On-Site Placement alternative includes the excavation of mine waste and affected soil that exceeds the remedial goals for metals of concern; verification soil sampling and analysis to confirm that the remedial goals have been achieved; and consolidation of the mine waste and affected soil on-site beneath a proposed commercial development. An LUC and OMA are typically required. Worker health and safety would be addressed by SSPs prepared by the parties involved. Provided that soil verification sample results meet the proposed remedial goals, the former mine waste locations outside of the proposed on-site placement area would be suitable for unrestricted land use.

Effectiveness

- Burial of the mine waste effectively reduces human health risk by eliminating potential exposure pathways (incidental ingestion, inhalation of airborne particulates, and dermal contact with the impacted soil).
- On-site placement of mine waste associated with AOC 2 is compliant with ARARs.
- Short-term impacts associated with remediation would be reduced by provisions set forth in a DMP and SSPs prepared by the parties involved.
- The Excavation and On-Site Placement alternative requires an LUC and OMA for the proposed placement location, which afford long-term protection of human health and water quality by restricting future disturbance.

Implementability

- Readily implemented
- Labor, material and equipment readily available
- Likely acceptable to regulatory agencies and community based on the protection of human health and the environment.

Cost

- Moderate direct costs (approximately $719,000) associated with excavation; on-site transportation; placement, moisture-conditioning and compaction; and quality assurance observation and testing. A cost estimate is presented in Table 17.
- Moderate indirect costs associated with engineering design, development of an LUC and OMA, and periodic reporting.

Excavation and On-Site Placement is the recommended alternative for AOC 2 because it is compliant with ARARs and protective of human health and the environment. The Excavation and On-Site Placement alternative does not afford significantly less protection than the more costly off-site disposal alternative, which is described below.

4.2.2.3 Excavation and Off-Site Disposal for AOC 2

The Excavation and Off-Site Disposal alternative for AOC 2 includes excavation of soil having metals concentrations that exceed the cleanup goals; verification soil sampling and analysis to confirm that the remedial goals are achieved; characterization of the excavated soil for disposal in accordance with landfill acceptance criteria; and transportation of the impacted soil for disposal at a licensed facility in accordance with applicable regulations. Procedures required for dust and erosion control would be addressed in a DMP. Worker health and safety would be addressed in SSPs prepared by the parties involved. The evaluation of this alternative is summarized below.

Effectiveness

- Effectively protects human health and the environment.
- Short-term impacts associated with remediation would be reduced by provisions set forth in a DMP and SSPs prepared by the parties involved.
- Affords long-term protection of human health and the environment.
- Complies with ARARs.

Implementability

- Readily implemented
- Technically feasible
- Administratively feasible
- Potentially unacceptable to regulatory agencies and community based on the excessive truck traffic required for off-haul. Based on preliminary volume

estimates from the PEA report, truck traffic is estimated to be approximately 4,000 truck loads for off-haul and approximately 4,000 truck loads for import of clean fill. The trucks used for off-haul would exit the site via Spring Hill Drive (a public roadway with single lanes in each direction) to the south and Idaho Maryland Road (a public roadway with single lanes in each direction) to the east. Trucks will enter State Highway 49 southbound from Idaho-Maryland Road, approximately one mile southeast of the site.

- Would require significant time for soil removal.

Cost

- Based on preliminary volume estimates from the PEA report, the direct cost of Excavation and Off-Site Disposal for AOC 2 is estimated to be approximately $5,400,000, as summarized in Table 18. The cost estimate includes a 10% contingency, which is primarily related to uncertainties regarding the volume estimate. The cost estimate includes the importation of a similar quantity of clean soil to replace the off-hauled material. Direct costs associated with regrading and erosion control after excavation are not included in the cost estimate, as the remediation is to be performed immediately prior to and as part of site development.
- Indirect costs associated with Excavation and Off-Site Disposal for AOC 2 include verification soil sampling and analysis, landfill characterization sampling and analysis, possible air monitoring, and reporting. Engineering tasks such as the preparation of grading plans and storm water pollution prevention plans, surveying and obtaining grading permits are not included in the cost estimate, as the remediation is to be performed immediately prior to and as part of site development.
- No on-going costs associated with off-site disposal are anticipated.

The Excavation and Off-Site Disposal alternative for AOC 2 is likely compliant with ARARs and protective of human health and the environment. The large amount of truck traffic required for off-site disposal is cause for community concern. Because the cost of off-site disposal is grossly excessive of the cost for on-site placement, Excavation and Off-Site Disposal for AOC 2 is eliminated from further consideration.

4.3 PROPOSED REMEDIAL ACTIONS

As described above, Excavation and Off-Site Disposal is the recommended remedial alternative for AOC 1, and Excavation and On-Site Placement is the recommended remedial alternative for AOC 2.

Costs associated with the proposed remedial action are estimated in Tables 16 and 17, and the overall cost estimate is summarized in Table 19. The estimates were based on (1) the removal and disposal of an estimated 1,700 cubic yards (2,210 tons) of Class I waste from AOC 1; and (2) the excavation and on-site placement of approximately 62,000 cubic yards (80,600 tons) of mine waste and affected soil from AOC 2. Costs for erosion control, soil import and construction of site structural improvements were not included in the cost estimate, and are expected to be performed as part of site development scheduled to take place immediately after the remedial action.

Capital costs for Excavation and Off-Site Disposal for AOC 1 are estimated to be approximately $275,000, and capital costs for Excavation and On-Site Placement for AOC 2 are estimated to be approximately $719,000, for a total estimated cost of approximately $993,000. The cost estimates presented in this RAW are based on preliminary waste volume estimates as presented in the PEA report. The cost estimate includes a 10% contingency. Uncertainty associated with the volume estimate may result in cost variation. Variation of subsurface conditions between locations sampled may also significantly affect the actual cost of the remediation. Preparation of volume estimates based on survey results, as well as additional subsurface investigation between the locations previously sampled, would help to reduce these cost uncertainties. H&K recommends that bids be obtained from remediation contractors prior to performing the remedial action.

The proposed remedial procedures are set forth in the following section. The proposed remedial actions are summarized below.

- Excavate the mine waste and impacted soil at AOC 1, and characterize the mine waste for landfill disposal;
- Transport the excavated and characterized soil from AOC 1 off-site to a licensed disposal facility in accordance with applicable regulations;
- Relocate on-site and consolidate soil from AOC 2 that exceeds the remediation goals for unrestricted land use;
- Obtain and analyze soil samples from areas of soil excavation at AOC 1 and AOC 2 to verify that remedial goals have been achieved; and
- Establish land use controls for the proposed soil relocation area, where elevated concentrations of COPCs will remain in place under a proposed commercial development, to provide additional protection of human health and water quality.

5 SITE SAFETY PLAN

An SSP has been prepared for H&K employees, which provides information regarding potential chemical and physical hazards that may exist at the site and describes safety measures to be followed by field personnel during remedial activities. The SSP conforms to requirements of Hazardous Waste Operations and Emergency Response, Title 8 CCR, Section 5192 and Title 8 CCR, Section 5155. Appendix F presents the SSP.

Remediation contractors and subcontractors selected to perform work associated with the remediation are responsible for their own health and safety and will be required to prepare a SSP for their activities. H&K will not be responsible for the safety of contractors and site visitors.

All personnel working at the site shall have completed 40 hours of comprehensive health and safety training, which meets the requirements of 29 CFR 1910.120.

During the remedial activities, soil moisture content is to be maintained to reduce the potential for dust generation and the need for respiratory protection. Details are provided in the SSP and DMP. Employee training and certification, dust monitoring and record keeping may be required to comply with OSHA regulations and to mitigate dust-related employee exposure during the cleanup. Permissible exposure limits and action levels for remediation workers should be determined by a Certified Industrial Hygienist.

Based on the required application of water for dust suppression during soil excavation, airborne levels of metals are expected to be low and air monitoring will not be necessary if soil moisture is maintained. If visible dust is generated during excavation or placement of the mine waste, air monitoring is to be performed, and additional dust suppression is to be performed as required to maintain dust concentrations below the permissible exposure level.

6 REMEDIAL PROCEDURES AND IMPLEMENTATION

Section 6.1 below describes pre-excavation sampling activities for AOC 1 and AOC 2. Section 6.2 describes procedures for excavation and off-site disposal of waste and affected soil from AOC 1, including verification soil sampling and landfill characterization sampling. Section 6.3 describes procedures for excavation and on-site placement of waste and affected soil from AOC 2, including verification soil sampling and LUCs for the proposed soil placement area. Section 6.4 presents recommendations for site restoration.

If site activities are performed prior to the site remediation activities presented in this RAW, the remediation areas must be identified and marked in the field so that the areas may be avoided. Potential site activities that may result in disturbance of the mine waste stockpiles and impacted soil areas include timber harvest, grading and road construction, brush clearing for fire prevention, and other ground disturbing activities.

Disturbance of soil and/or waste at the remediation areas could potentially result in human exposure and health hazard from soil ingestion, dermal contact and inhalation of airborne soil particulates. In addition, the soil disturbance could potentially cause inappropriate transport of mine waste by wind, surface water, or mechanical disturbance.

In the event that ground disturbing activities are to be performed at the site prior to site remediation activities, assessment areas AOC 1 and AOC 2 must be identified and precluded from disturbance.

DTSC must be allowed to review any proposed ground disturbing activities if the activities are to be performed prior to the implementation of the recommended remedial procedures.

6.1 PRE-EXCAVATION SOIL SAMPLING

Prior to initiation of soil excavation activities associated with site remediation, the perimeters of areas proposed for cleanup are to be marked in the field. Additional soil sampling and analysis may be performed to better define the lateral extent of soil exceeding the remediation goals. After the areas are marked, samples may be obtained approximately 100 feet apart along the marked perimeter from the upper 6

inches of soil. Such samples may be analyzed for metals of concern. Additional samples may be obtained at locations stepped-in or stepped-out from the marked perimeter to refine the remediation area boundaries. The lateral extent of the proposed remedial areas may be modified based on the results of pre-excavation soil sampling and consultation with DTSC.

6.2 EXCAVATION AND OFF-SITE DISPOSAL FOR AOC 1

Excavation and Off-site Disposal is recommended for mine waste and affected soil at AOC 1 that is not suitable for Excavation and On-site Placement. Verification soil sampling and analysis is to be performed after excavation of the affected soil. The excavated material is to be loaded onto trucks and transported to an appropriate off-site landfill for disposal. Protocol for reducing dust emissions during remediation activities is presented in the DMP in Appendix E. Remedial procedures are described below.

6.2.1 Excavation

The soil excavation methods will include mechanical excavation using rubber-tired or track-mounted backhoe excavators and loaders. Soil will be excavated and stockpiled on plastic sheeting, and covered with plastic sheeting, adjacent to the excavation. After characterization sampling, analysis, and landfill acceptance, the soil will be loaded into trucks and transported to an off-site landfill for disposal. During excavation, stockpiling and loading, soil will be moistened as necessary to reduce dust generation using water trucks or hoses.

Before removing the affected soil, vegetation in the areas to be excavated will be cut off at the ground surface, segregated, and removed from the work area. Removal of vegetation is to be performed using hand-held mechanical equipment to minimize disturbance of soil prior to excavation.

6.2.2 Post-Excavation Verification Soil Sampling

After excavation of affected soil, verification soil samples will be obtained from the base and perimeter of the excavations to confirm that the cleanup goals have been achieved. Table 1 presents cleanup goals. Sampling procedures are summarized below. Details are presented in the VSAP in Appendix G.

Soil samples will be obtained using a pre-cleaned hand trowel or individually wrapped disposable scoops, and placed in glass containers provided by the analytical laboratory. The laboratory will perform total metals analysis by EPA Method 6010B and 7471A. Sample handling, labeling, documentation and chain of custody procedures will be performed as described in the VSAP.

Alternately, verification soil samples may be analyzed in the field using a hand-held X-ray fluorescence (XRF) device. If field XRF analysis is performed, a minimum of ten percent of the field-analyzed samples will also be analyzed in the laboratory by EPA Method 6010B. XRF results will be compared to the corresponding laboratory results for data validation purposes.

The minimum sample frequency will be one soil sample per 400 square feet of footprint area. In addition, soil samples will be obtained from the perimeter of the excavation area at a maximum spacing of one sample per 100 feet.

The lateral and vertical extent of the excavations may be increased locally to facilitate removal of soil containing metals concentrations that exceed the target cleanup levels. Additional samples will be obtained if needed to achieve the minimum sample frequency, based on the actual footprint area of the excavation.

If the verification sample analysis indicates target cleanup levels have been attained, no further excavation will be conducted. If the results of verification sample analysis indicate target cleanup levels have not been attained, further excavation will be conducted. Excavation will continue until the results of further verification sampling and analysis indicate that the RAOs are achieved.

6.2.3 Soil/Waste Characterization

Sampling and analysis for soil/waste characterization is to be performed for stockpiled soil excavated from AOC 1. The stockpiled waste will be tested for COPCs according to frequencies and procedures required by the appropriate Class I or Class II solid waste facility.

6.2.4 Transportation to Off-Site Landfill

Affected soil from AOC 1 is to be transported off-site to appropriately permitted waste disposal facilities. Class II (non-hazardous) waste will be transported to and disposed at Norcal Waste Systems' Ostrom Road Landfill Inc., in Wheatland, California. Class I

waste will be transported to and disposed at the Chem Waste Management facility in Kettleman Hills, California.

Transportation and disposal of waste from the site is to be conducted in accordance with applicable local, state and federal regulations. Safe work practices and traffic control measures are to be employed during the remediation. Truck drivers will have Class A licenses. The proposed staging area for truck loading is to be located immediately west of AOC 1. The staging area for waste to be transported off-site is accessible by Spring Hill Drive, which is a paved road near the southern property boundary.

Based on the volume of soil to be removed, approximately 150 truck loads will be removed from the site, in either closed-top bins or end dumps with tarp covers. H&K anticipates that off-haul of mine waste and impacted soil from AOC 1 that is not suitable for on-site placement will take ten working days. The soil will be loaded into trucks on-site adjacent to AOC 1. During loading, trucks shall be parked in the on-site staging areas at the site and shall not inhibit traffic on public roads. After loading and before leaving the site, the trucks and loading equipment will be decontaminated by removing visible soil, especially from the tires, using brooms, brushes and shovels according to the provisions of the DMP presented in Appendix E. Manifest records will be maintained for transportation and disposal of the waste.

The trucks used for off-haul will exit the site via Spring Hill Drive (a public roadway with single lanes in each direction) to the south. The trucks will turn right from Spring Hill Drive onto Idaho Maryland Road, proceed under State Route (SR) 20/49, and enter State Highway 20/49 south towards Auburn. H&K does not anticipate adverse impacts to the level of service at the listed intersections due to site remediation activities. Appendix H presents the transportation route maps for the waste disposal facilities identified above.

According to a traffic study prepared for Community Recovery Resources in Grass Valley (Kimley-Horn and Associates, Inc., July 24. 2009), the existing level of service (LOS) for the SR 20/49 ramps and Idaho Maryland intersection during PM peak hours is LOS A. Projected LOS for the intersection, assuming construction of approved projects, was determined to be LOS B. We also reviewed a traffic study prepared by RBF Consulting as a part of the *Loma Rica Ranch Specific Plan Environmental Impact Report* (September 2010). The existing LOS for the Spring Hill Drive/Idaho Maryland Road intersection during PM peak hours was rated LOS A overall, with the “worst approach” (the approach from the minor street) being LOS C. We contacted Trisha Tillotson, Senior Civil Engineer/Deputy Director for the City of Grass Valley and Mr.

Jim Brake, Caltrans District 3. Neither Ms. Tillotson nor Mr. Brake found the proposed truck traffic to be significant.

6.3 EXCAVATION AND ON-SITE PLACEMENT FOR AOC 2

Excavation and On-site Placement is recommended for mine waste and affected soil at AOC 2. Verification soil sampling and analysis are to be performed after excavation of the mine waste and impacted soil from the existing locations. The excavated material is to be placed as engineered fill beneath a proposed commercial building area.

A conceptual placement plan and cross section are presented in Sheets 1 and 2, respectively. Placement design details are to be provided as part of a grading plan for the proposed improvements, which must be approved by DTSC and the local building department prior to implementation. The waste is located centrally within the fill prism to reduce the likelihood of surface water infiltration or subsurface seepage through the waste. Drainage conditions and recommendations shall be verified during project geotechnical engineering design. Clean fill shall be placed above the waste so that excavation can be performed for utilities without disturbing the waste. The waste placement location shall be the subject to a LUC and OMA to reduce the chance of future unauthorized disturbance. Protocol for reducing dust emissions during remediation activities is presented in the DMP in Appendix E. Remedial procedures are described below.

6.3.1 Excavation

The soil excavation methods will include mechanical excavation using rubber-tired or track-mounted backhoe excavators and loaders. During excavation and loading onto trucks for on-site transport, soil in the affected areas will be moistened as necessary to reduce dust generation using water trucks or hoses.

Before removing the mine waste and impacted soil, vegetation in the areas to be excavated will be cut off at the ground surface, segregated, and removed from the work area. Removal of vegetation is to be performed using hand-held mechanical equipment to minimize disturbance of soil before removal.

6.3.2 Post-Excavation Verification Soil Sampling

After excavation of mine waste and affected soil, verification soil samples will be obtained from the base and perimeter of the excavations to confirm that the RAOs

have been achieved. Sampling procedures are summarized below. Details are presented in the VSAP in Appendix G.

Soil samples will be obtained using a pre-cleaned hand trowel or individually wrapped disposable scoops, and placed in glass containers provided by the analytical laboratory. Laboratory total metals analysis will be performed by EPA Methods 6010B/7471A. Sample handling, labeling, documentation and chain of custody procedures will be performed as described in the VSAP.

Alternately, verification soil samples may be analyzed in the field using a hand-held XRF device. If field XRF analysis is performed, a minimum of ten percent of the field-analyzed samples will also be analyzed in the laboratory by EPA Method 6010B. XRF results will be compared to the corresponding laboratory results for data validation purposes.

The minimum sample frequency will be one soil sample per 400 square feet of footprint area. In addition, soil samples will be obtained from the perimeter of the excavation area at a maximum spacing of one sample per 100 feet.

The lateral and vertical extent of the excavations may be increased locally to facilitate removal of soil containing metals concentrations that exceed the target cleanup levels. Additional samples will be obtained if needed to achieve the minimum sample frequency, based on the actual footprint area of the excavation.

If the verification sample analysis indicates target cleanup levels have been attained, no further excavation will be conducted. If the results of verification sample analysis indicate target cleanup levels have not been attained, further excavation will be conducted. Excavation will continue until the results of further verification sampling and analysis indicate that the RAOs are achieved.

6.3.3 Soil/Waste Characterization

Characterization of mine waste was performed as part of the PEA investigation. Mine waste and affected soil that are to be placed on-site will not require further characterization.

6.3.4 On-Site Transportation

Transportation of mine waste and affected soil is to be performed within the site boundaries. Minor clearing and grading may be necessary to facilitate truck access to some mine waste locations. Mine waste and soil will be loaded onto trucks at staging areas adjacent to AOC 2 and will be transported to the placement area. In accordance with the DMP, truck speed is to be limited and soil moisture is to be maintained so that dust is not generated during transport.

6.3.5 On-Site Placement

An estimated 62,000 cubic yards of mine waste are to be placed and compacted in an area designated to support a future commercial building and paved parking area located in the western portion of the site. Sheet 1 depicts the location of the proposed on-site placement area. The 4.3-acre placement area measures approximately 330 feet by 570 feet. The mine waste fill will be up to approximately 30 feet deep.

H&K anticipates that clean fill may also be placed in the proposed mine waste placement area, as the capacity of the placement area is larger than the estimated waste volume. Fill that is imported to the site is to be sampled as per the DTSC Information Advisory titled *Clean Imported Fill Material (October 2001)* to demonstrate that the imported fill meets the cleanup standards established in this RAW.

The conceptual plan (Sheet 1) and cross-section (Sheet 2) were prepared using topography, conceptual site layout and cross-sectional elevation data provided by Genesis Engineering, of Marysville, California. Final design of the placement area is to be based on the final site development plan. Geotechnical design criteria are to be verified based on the findings of a geotechnical engineering investigation. DTSC must be allowed to review the final design drawings for the on-site placement area prior to commencement of the remedial action.

Placement and compaction of the mine waste and soil are to be performed in general accordance with the specifications presented below. The mine waste and impacted soil are to be covered with ten feet of clean soil that is imported or borrowed from an on-site location. The grading plan shall incorporate these recommendations, modified as necessary based on the results of a geotechnical engineering investigation, and shall provide specific provisions for slope gradients, slope protection and/or retaining wall design, surface and subsurface drainage, and erosion and sediment control.

1. Native Soil Preparation for Fill Placement

    a. Strip and remove organic debris and loose soil from the existing ground surface.

    b. Scarify native soil to a depth of 8 inches below the existing ground surface, and then uniformly moisture condition to within approximately 2 percentage points of the American Society for Testing and Materials (ASTM) D1557 optimum moisture content.

    c. Compact native soil to a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

    d. The moisture content, density and relative percent compaction must be verified by an H&K construction quality assurance (CQA) monitor prior to fill placement. The earthwork contractor shall assist the CQA monitor by excavating test pads with on-site earth moving equipment.

2. Fill Placement

    a. Maintain moisture content in mine waste and associated soil to minimize the generation of visible dust during preparation, placement and compaction.

    b. Avoid contact with mine waste and associated soil.

    c. Oversize rock (rock that is greater than 12 inches in greatest dimension) shall be incorporated into deep fill by windrowing, so that compaction is performed around the rock, as approved by H&K.

    d. Mine waste and associated soil shall be uniformly moisture conditioned to the ASTM D1557 optimum moisture content or within approximately 3 percentage points above optimum moisture content.

    e. Fill shall be constructed by placing uniformly moisture conditioned soil in maximum 8-inch-thick loose lifts (layers) prior to compacting.

    f. Fill shall be compacted to a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

    g. The moisture content, density and relative percent compaction of fill must be verified by the CQA monitor during construction. The earthwork

contractor shall assist the CQA monitor by excavating test pads with the on-site earth moving equipment.

h. The average fill thickness will be less than approximately 30 feet.

3. Cover Soil Placement

a. Cover soil shall be imported from an approved source or native soil borrowed from an approved on-site source.

b. Clean soil is to be used to construct the slope. No mine waste or affected soil is to be placed within 10 horizontal feet of the finished slope face, as measured from the finished slope face back into the fill.

c. Cover soil shall be uniformly moisture conditioned to within two percentage points of the ASTM D1557 optimum moisture content.

d. Cover soil shall be constructed by placing uniformly moisture conditioned soil in maximum 8-inch-thick loose lifts (layers) prior to compacting.

e. Cover soil shall be compacted to a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. The upper 8 inches of cover soil shall be compacted to a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density.

f. The moisture content, density and relative percent compaction of cover soil must be verified by the CQA monitor during construction. The earthwork contractor shall assist our CQA monitor by excavating test pads with the on-site earth moving equipment.

g. Thickness of the cover soil shall be at least 10 feet to allow for future placement and repair of utilities associated with the proposed commercial development.

4. Fill Slope Grading

a. Place fill in horizontal lifts.

b. Clean soil is to be used to construct the slope. No mine waste or affected soil is to be placed within 6 horizontal feet of the finished slope face, as measured from the finished slope face back into the fill.

c. Benching must extend through loose surface soil into firm native soil in the side walls of the excavation, and be performed at intervals such that no loose surface soil is left beneath the fill. An equipment width bench should be made at least every 3 vertical feet.

d. Fill slopes shall be constructed by overbuilding the slope face and then cutting back into the compacted fill surface to the design slope gradient. Fill slopes shall not be constructed or extended horizontally by placing soil on an existing slope face and/or compacted by track walking.

e. Fill slope gradients shall be designed based on the results of a geotechnical engineering investigation.

f. Surface water drainage design shall allow for the redirection of surface water away from the fill placement area. The intercepted water shall be discharged into natural drainage courses.

g. The finished slope contours shall drain at a minimum slope of 2 percent towards natural drainage channels and shall not allow surface water to pond. Under no circumstances shall surface water flow be directed over the constructed fill slope.

6. Erosion Controls

a. Specific erosion and sediment control recommendations shall be presented as part of the grading plan for the development project.

b. Exposed fill surfaces that are not covered by gravel, and areas disturbed by construction activity, shall be hydroseeded or hand seeded/strawed with an appropriate seed mixture compatible with the soil and climate conditions of the site as recommended by the local Resource Conservation District.

c. Jute netting, tackifiers and/or binding agents shall be placed on the seeded slopes to retain the seed and straw on the slope.

d. Straw wattles shall be installed at the down slope perimeter of the placement area and on contour within the placement area as needed to retain sediment on the slope.

e. The earthwork contractor shall maintain and protect exposed soil from wind and water erosion. If a storm is forecasted for the area, exposed fill areas

shall be sloped to drain and compacted to facilitate runoff. Plastic sheeting shall be secured over the fill prior to storm events. All existing surface drainage facilities must be kept free of soil and debris during construction. The contractor shall provide siltation control and management during construction.

Best management practices shall be implemented to reduce the chance of potential sediment discharges. Best management practice types are described in Section 6.4.1 of this RAW.

6.3.6 Land Use Covenant Agreement for On-Site Placement Area

An LUC agreement and OMA are recommended for the on-site placement area. LUC agreements are intended to protect public health and the environment by: 1) preventing inappropriate land use, 2) increasing the probability that the public will have information about residual contamination, 3) disclosing information for real estate transactions about residual contamination, 4) ensuring that long-term mitigation measures are carried out by protecting the engineering controls and remedy; and 5) ensuring that subsequent owners assume responsibility for preventing exposure to contamination.

6.3.6.1 Deed Restriction

Deed restriction pertaining to the approximately 330-foot by 570-foot on-site placement area will comply with the following general provisions:

1. No activities that will disturb the mine waste within the on-site placement area (e.g., excavation, grading, removal, trenching, filling, earth movement or mining) shall be allowed on the property without a soil management plan approved by DTSC. Appendix I contains the soil management plan.

2. Restriction of the land use within the on-site placement area is to be established by LUC agreement between the property owner and DTSC. Successive owners, heirs and assignees are to be expressly bound by the covenant.

4. Prior to the sale, lease or sublease of the property containing the on-site placement area, the owner, lessor, or sublessor shall give the buyer, lessee, or sublessee notice that hazardous substances are located in the area.

5. The land use controls shall be incorporated by reference in each and all deeds and leases for the property.

6. The owner shall provide notice to DTSC not later than 30 days after any conveyance of any ownership interest in the property containing the on-site placement area (excluding mortgages, liens, and other non-possessory encumbrances). DTSC shall not, by reason of the covenant, have authority to approve, disapprove, or otherwise affect proposed conveyance, except as otherwise provided by law or by administrative order.

7. The LUC shall be recorded in the County of Nevada.

8. The terms of the deed restriction run with the land and will continue in perpetuity unless a variance is granted or unless terminated. The property owner agrees to pay DTSC's costs in administering the deed restriction.

9. An OMA agreement will establish requirements for monitoring, reporting and financial assurance.

10. Commercial site development will coincide with site remediation. Upon construction of the proposed commercial building and paved parking area over the soil repository area, in accordance with the project development plans, DTSC will be notified that the development project is complete. The structures and pavement are intended to provide access restriction. If structures and pavement are not immediately constructed upon completion of site remediation, the waste placement area shall be fenced and posted until the structures and pavement are constructed.

11. Periodic monitoring of the pavement condition and annual reporting to DTSC will continue to be required after the commercial development is complete. Periodic monitoring of temporary fencing and posting, if used, and annual reporting to DTSC will be required until structures and pavement are constructed over the waste placement area.

6.3.6.2 Financial Assurance

DTSC may require an OMA that includes provisions for financial assurance adopted from the Hazardous Waste Control Law, as set forth in CCR Title 22, including Sections 66264.147, 66265.143, 66265.145 and 66265.147. H&K anticipates that a trust fund, letter of credit or other appropriate financial assurance mechanism will be applicable. The OMA is to be discussed with DTSC after approval of the RAW.

6.3.7 Temporary Fencing and Posting

Fencing, posting and deed restriction are recommended for the on-site placement area if the pavement and buildings associated with the proposed commercial site development are not constructed over the waste placement area immediately after completion of the remedial activities. Recommendations for temporary fencing and posting are described below.

6.3.7.1 Fencing for On-Site Placement Area

The perimeter of the on-site placement area, as depicted on Sheet 1, is to be fenced. Fencing materials are to be 5-foot “no climb” field fence, supported by pressure-treated 4x4 wood posts at angle points and as needed to maintain tension, and by metal T-posts at other locations.

6.3.7.2 Signage for On-Site Placement Area

The perimeter fence is to be posted on each of the four sides, at locations that would be most likely visible to trespassers or other site visitors. The metal signs should include the following general language:

This area is subject to a deed restriction recorded in Nevada County on (insert recording date in month, day, year format) in Book (insert book number) and Page (insert page number). This Deed restriction was recorded because naturally occurring metals, such as arsenic, are present in mining waste in concentrations in this area that do not allow for unrestricted use. Human contact with the soil buried at this location should be avoided. For more information please contact the Department of Toxic Substances Control at (insert telephone number)."

6.4 SITE RESTORATION

After excavation, verification that RAOs have been achieved, and consultation with DTSC, minor grading will likely be performed to smooth the excavated areas at the former mine waste and affected soil locations. Backfilling will be performed only to approximate native contours, to promote positive drainage and to reduce the chance of surface water ponding. Where appropriate, site restoration activities will include broadcasting seed, fertilizer and straw within the excavation footprint for erosion control measures. Fiber wattles will be placed along the perimeter of the down slope sides of the disturbed areas as needed for erosion and sediment control. H&K

anticipates that these restoration activities will be performed as part of site grading for the commercial development, which is to take place immediately following site remediation.

6.4.1 Best Management Practices

Best Management Practices associated with erosion control and sediment retention are discussed below.

1. Straw with Jute Netting or Tackifiers: Jute netting or tackifiers should be placed and secured over the slopes to keep the straw from being washed or blown away. Tackifiers or binding agents may be used in lieu of jute netting.

2. Fiber Rolls: Fiber rolls (wattles) shall be installed on fill slopes. Fiber rolls shall be anchored with wood stakes placed 4 feet on center or closer. Fiber rolls placed on slopes should be trenched 2 to 4 inches into the soil. Additional wattles may be stored on-site during the rainy season in the event that the installed wattles are filled with sediment.

    a. Prior to fiber roll installation, the subgrade shall be prepared by removing local surface irregularities and larger rock or debris that would inhibit contact of the fiber roll with the subgrade. A contoured key trench shall be excavated 2 to 4 inches deep along the proposed installation route. Soil excavated from the key trench shall be placed on the up slope side of the fiber roll to reduce the chance of surface water undercutting the roll. When more than one fiber roll is placed in a row, the rolls shall be abutted securely to one another to provide a tight joint, not overlapped.

    b. Split, torn, unraveling or slumping fiber rolls shall be repaired or replaced. Fiber rolls shall be observed for damage when rain is forecasted, following rain events, and periodically as needed during prolonged rainfall.

    c. Fiber rolls typically do not require removal and can be abandoned in place, once permanent erosion control is established.

7 PUBLIC PARTICIPATION

H&K will work with DTSC to conduct the appropriate and necessary public participation activities prior to and during the proposed removal action. Appendix J presents a copy of the community profile report prepared by H&K.

8 REMEDIAL ACTION REPORTING

The results of the remedial activities will be presented in a post-remediation report. The purpose of the report is to describe remedial activities and to document compliance with this RAW. The report will present:

- a summary of remedial activities performed;
- a description and basis for deviations, if any, from this RAW;
- limits of excavation and volume of soil excavated;
- results of the verification soil sampling and laboratory analyses;
- as-built drawings of the on-site placement area;
- a summary of CQA performed during placement and compaction at the approved on-site burial location; and
- a summary of site restoration activities.

The post-remediation report will be presented to DTSC for review. Provided that the RAOs are achieved, the post remediation report will request a No Further Action decision from DTSC.

9 LIMITATIONS

The following limitations apply to the findings, conclusions and recommendations presented in this plan:

H&K's professional services were performed consistent with the generally accepted engineering principles and practices employed in northern California. No warranty is expressed or implied.

These services were performed per H&K's agreement with H&K's client. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of our services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan. This plan is solely for the use of our client unless noted otherwise. Any reliance on this plan by a third party is at the party's sole risk.

If changes are made to the nature or design of the project as described in this plan, then the conclusions and recommendations presented in this plan should be considered invalid by all parties. Only H&K can determine the validity of the conclusions and recommendations presented in this plan. Therefore, H&K should be retained to review all project changes and prepare written responses with regards to their impacts on H&K's conclusions and recommendations. However, H&K may require additional field work and laboratory testing to develop any modifications to the plan. Costs to review project changes and perform additional fieldwork and laboratory testing necessary to modify H&K's recommendations are beyond the scope of services presented in this plan. Additional work will require an approved scope of services, budget, and authorization to proceed.

H&K is not responsible for the health and safety of non-H&K personnel, on or off the project site.

The analyses, conclusions and recommendations presented in this plan are based on site conditions as they existed at the time H&K's investigations were performed. 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. In addition, changes in applicable or appropriate standards can occur, whether they result from legislation or the broadening of knowledge. Therefore, the recommendations presented in this plan may need to be revised based on site conditions or regulatory requirements.

10 REFERENCES

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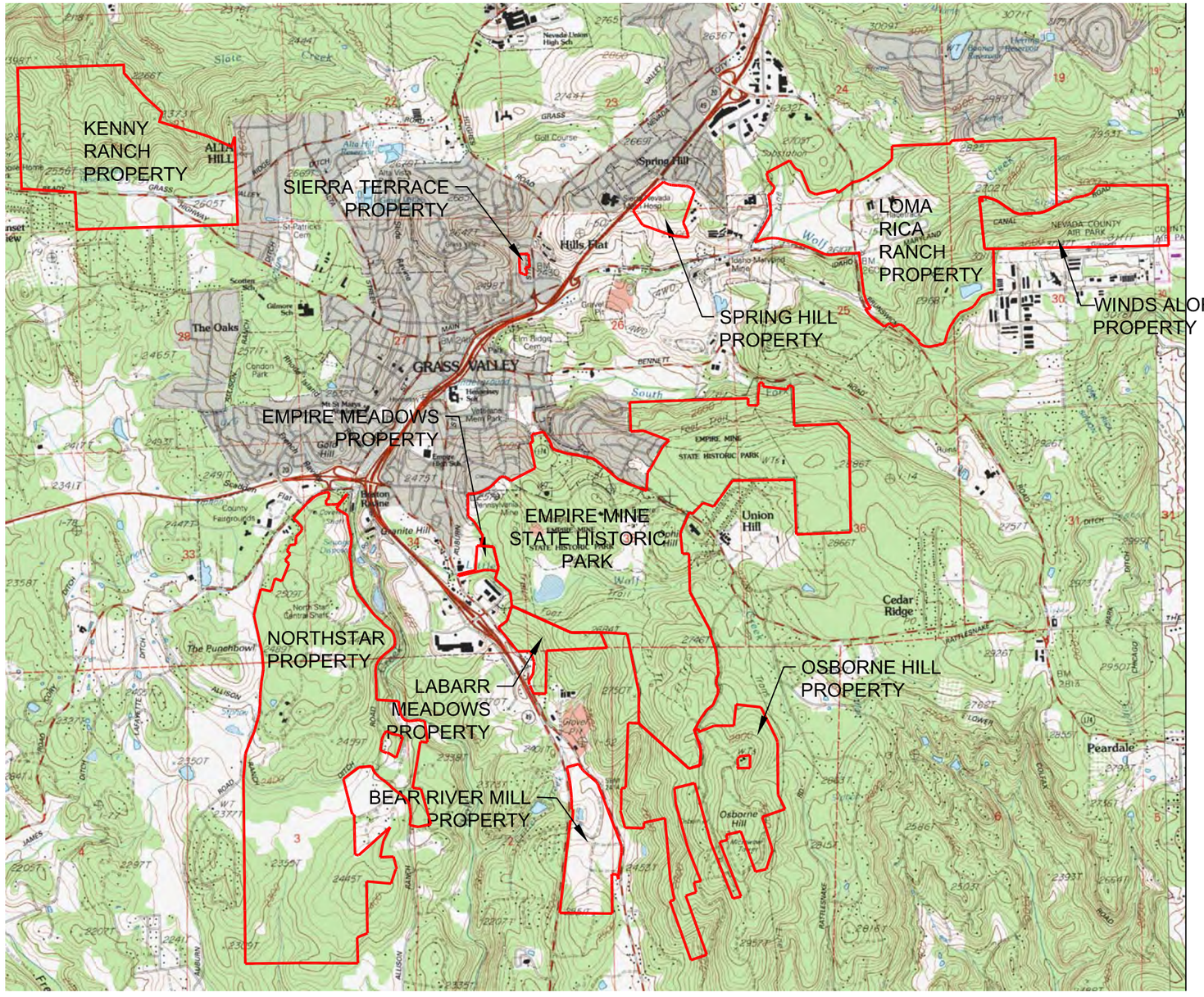
FIGURES



1500 0 1500 3000

SCALE:
1 INCH = 3000 METERS

LEGEND

APPROXIMATE PROPERTY BOUNDARY

SOURCE: USGS 7.5 minute topographic map, Grass Valley, California quadrangle, 1995.

3292-04-FIG1

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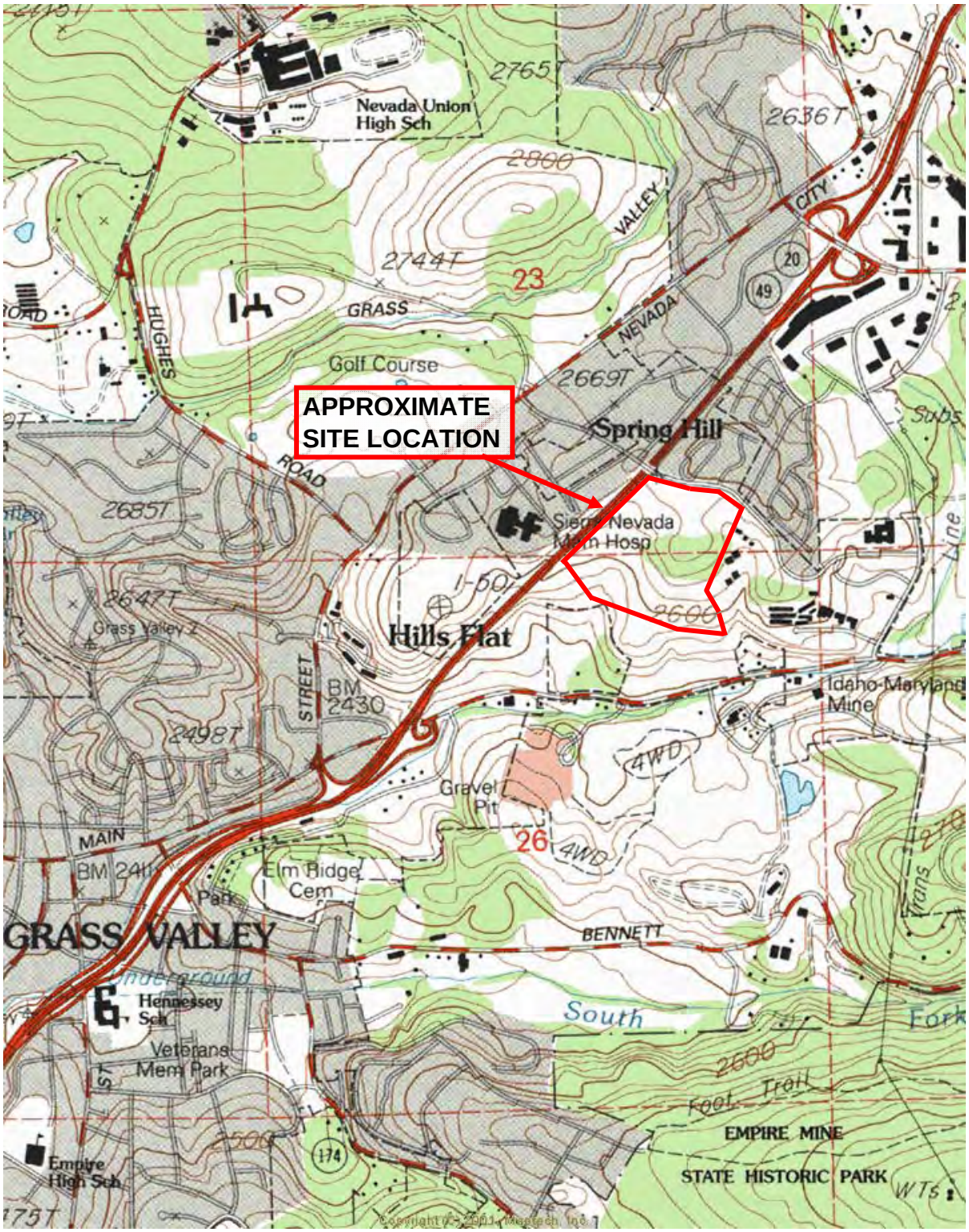
SITE VICINITY MAP SHOWING NEARBY PEA SITES
SPRING HILL PROPERTY
GRASS VALLEY, CALIFORNIA

DRAWN BY: DFD	CHECKED BY: CDR
PROJECT NO.: 3292-04	
DATE: AUGUST 2008	
FIGURE NO.: 1	



NO SCALE SOURCE: GRASS VALLEY QUADRANGLE MAP (USGS, PROVISIONAL EDITION 1995)

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SITE LOCATION MAP

SPRING HILL PROPERTY

GRASS VALLEY, CALIFORNIA

PROJECT NO. 3292-04

AUGUST 2008

FIGURE 2

75 0 75 150

APPROXIMATE SCALE
1 INCH = 150 FEET

FIGURE 3

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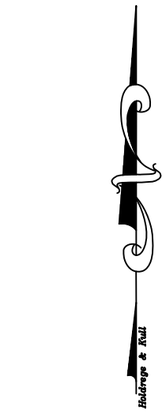
AERIAL PHOTOGRAPH

SPRING HILL PROPERTY

GRASS VALLEY, CALIFORNIA

NO.	REVISIONS	DATE

CHECKED BY:	CDR
DRAWN BY:	DFD
DATE:	AUGUST 2008
DRAWING NAME:	3292-04-FIG3
PROJECT NO.:	3292-04



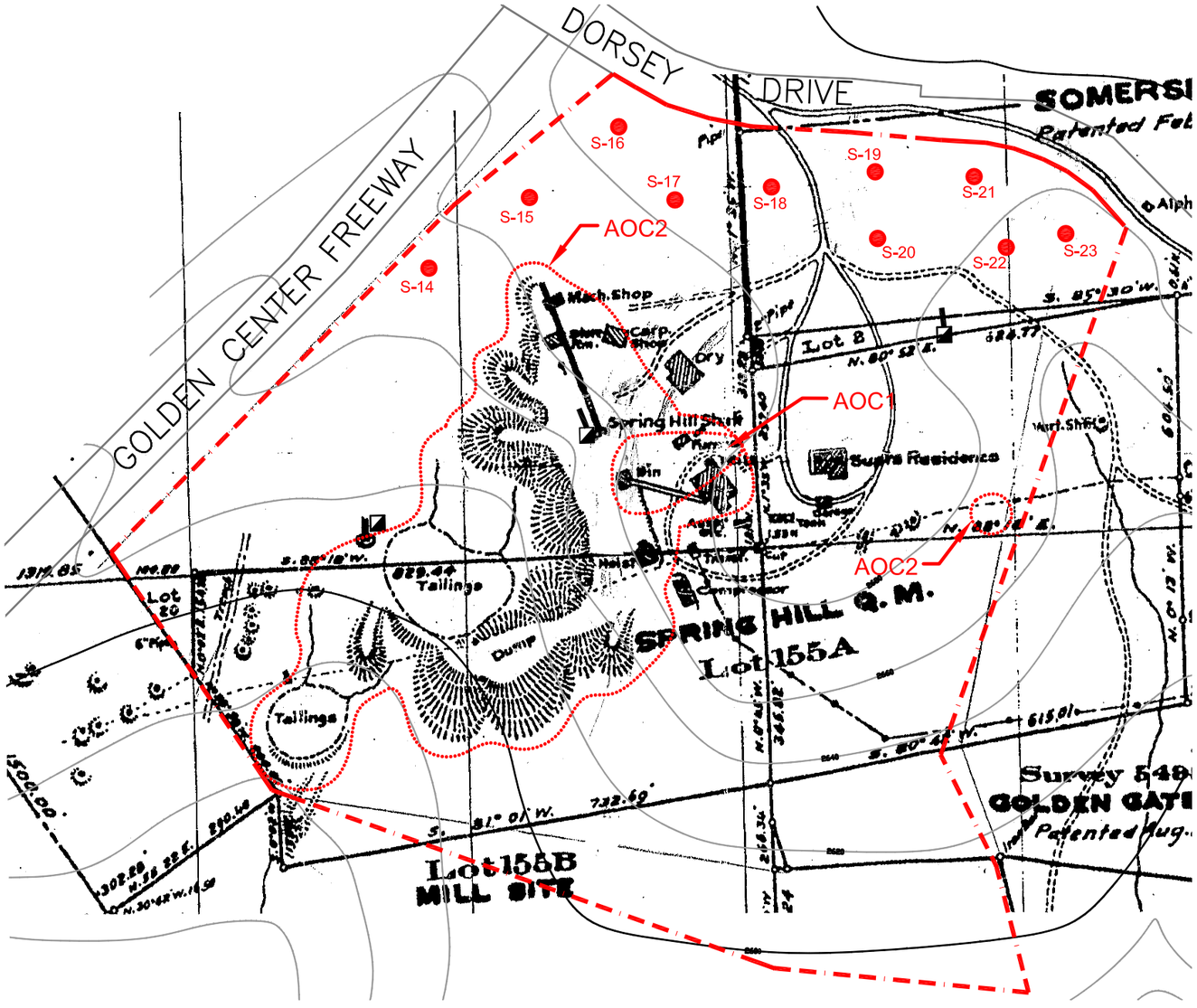
100 0 100 200

APPROXIMATE SCALE
1 INCH = 200 FEET

LEGEND

- SITE BOUNDARY
- AREA OF CONCERN (AOC) BOUNDARY
- APPROXIMATE RECORDED LOCATION OF MINE SHAFT
- S-14 APPROXIMATE LOCATION OF BACKGROUND SOIL SAMPLE

BASE MAP: MAP OF SPRING HILL MINING CO. (E. UREN, 1942)



3292-04-FIG4

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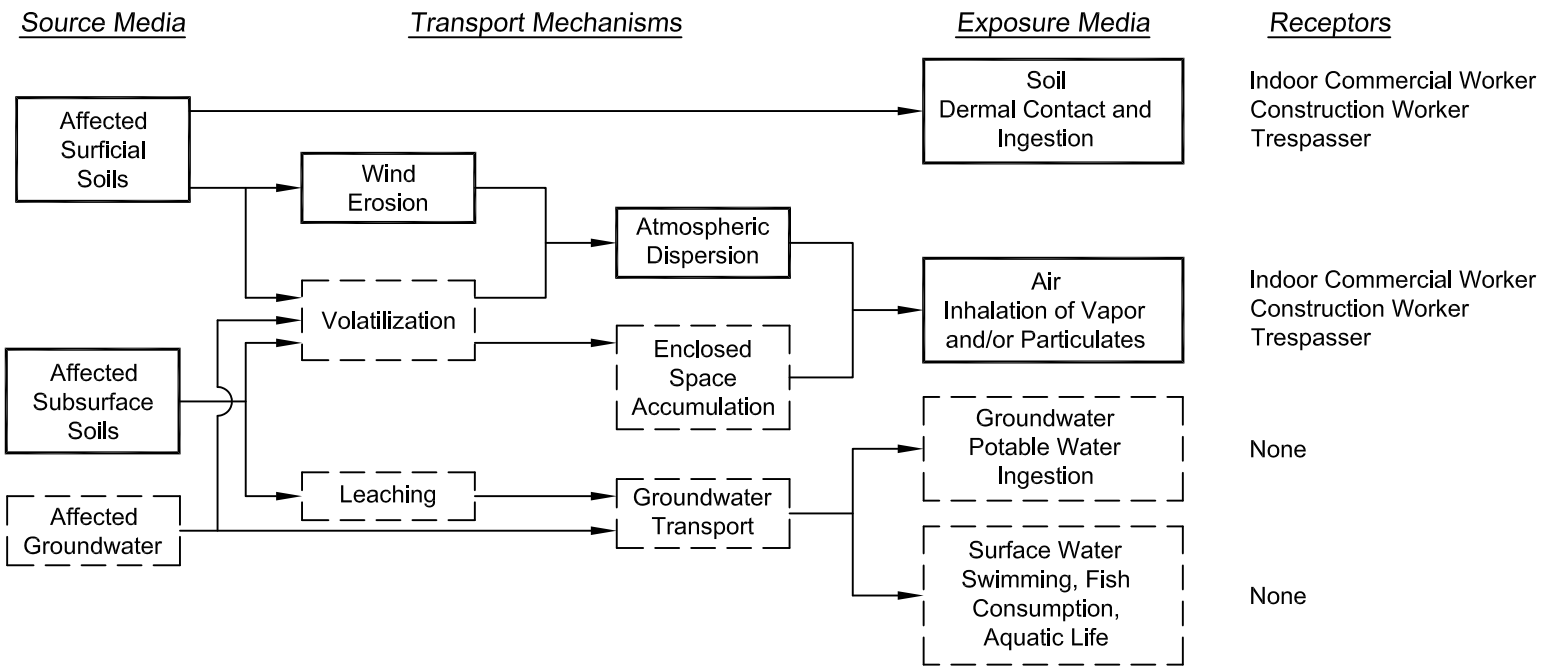
MINE WASTE ASSESSMENT AREAS
SPRING HILL PROPERTY
GRASS VALLEY, CALIFORNIA

DRAWN BY: DFD	CHECKED BY: JWM
PROJECT NO.: 3292-04	
DATE: AUGUST 2008	
FIGURE NO.: 4	



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SITE CONCEPTUAL MODEL DIAGRAM

SPRING HILL PROPERTY

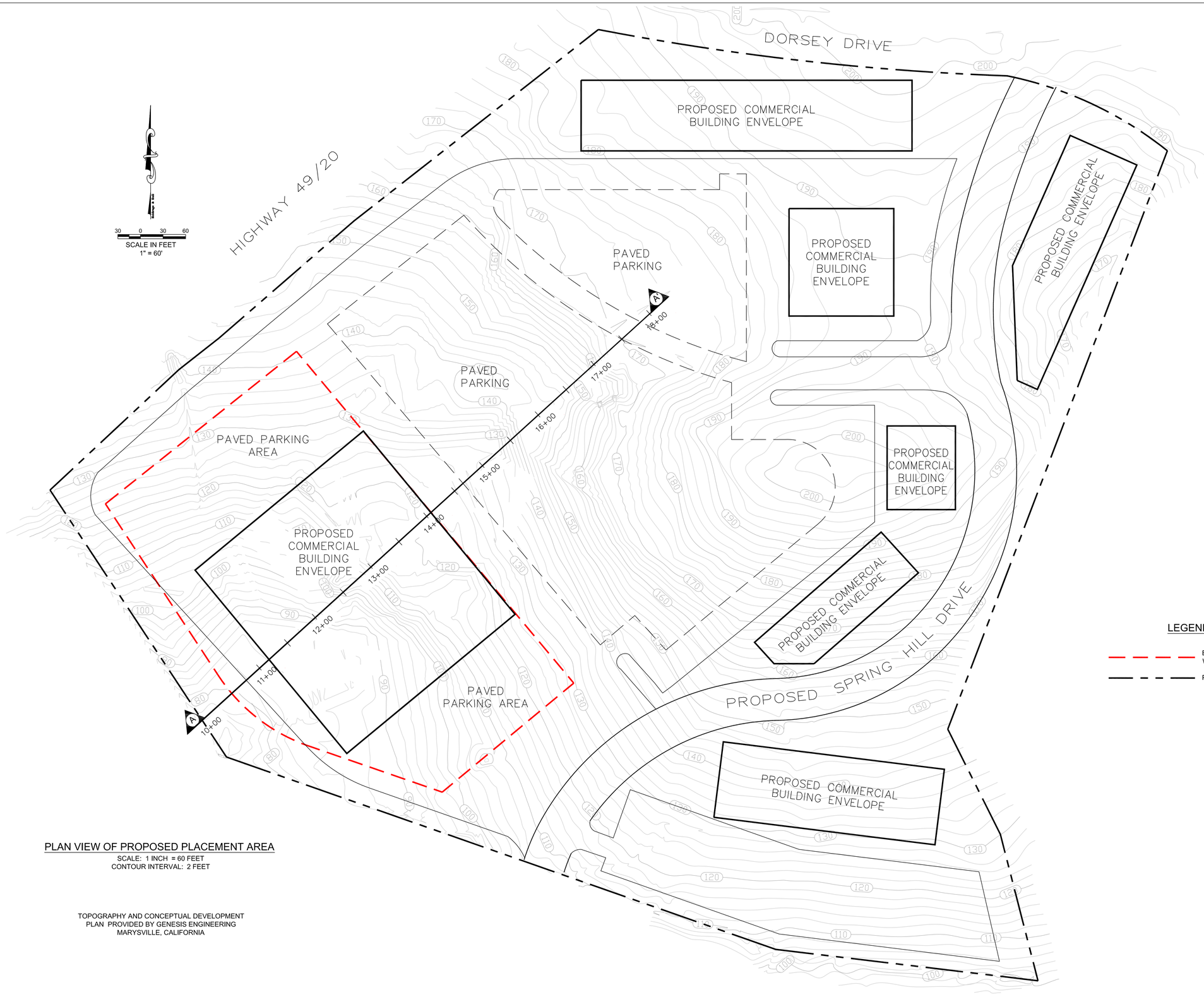
GRASS VALLEY, CALIFORNIA

DRAWN BY: DFD	CHECKED BY: JWM
PROJECT NO.: 3292-04	
DATE: AUGUST 2008	
FIGURE NO.: 5	

SHEETS

Sheet 1 Conceptual On-Site Placement Plan

Sheet 2 Conceptual Placement Area Section



PLAN VIEW OF PROPOSED PLACEMENT AREA
SCALE: 1 INCH = 60 FEET
CONTOUR INTERVAL: 2 FEET

TOPOGRAPHY AND CONCEPTUAL DEVELOPMENT PLAN PROVIDED BY GENESIS ENGINEERING MARYSVILLE, CALIFORNIA

LEGEND

- BOUNDARY OF PROPOSED WASTE PLACEMENT AREA
- PROPERTY BOUNDARY

NO.	REVISIONS	DATE

DESIGNED BY: JWM
DRAWN BY: SLD
DATE: AUGUST 2008
DRAWING NAME: 3292-04-SH1&2
PROJECT No.: 3292-04

CONCEPTUAL ON-SITE PLACEMENT PLAN
SPRING HILL PROPERTY
GRASS VALLEY, CALIFORNIA

HK HOLDREGE & KULL
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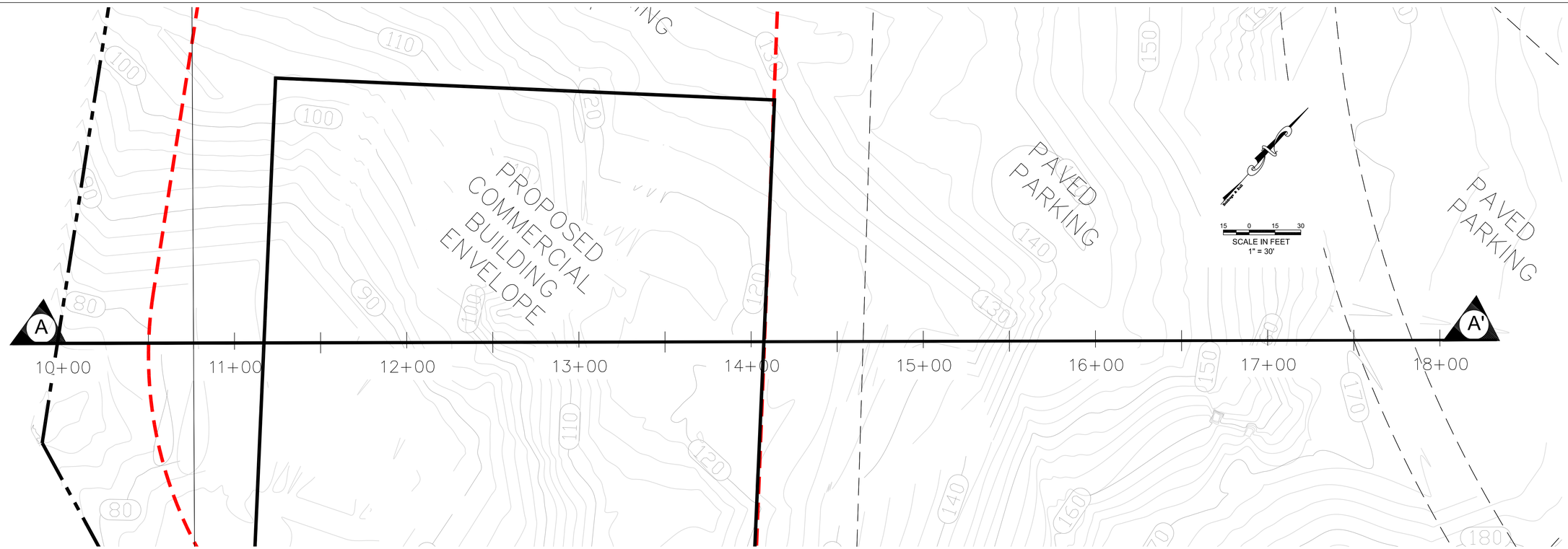
SHEET 1



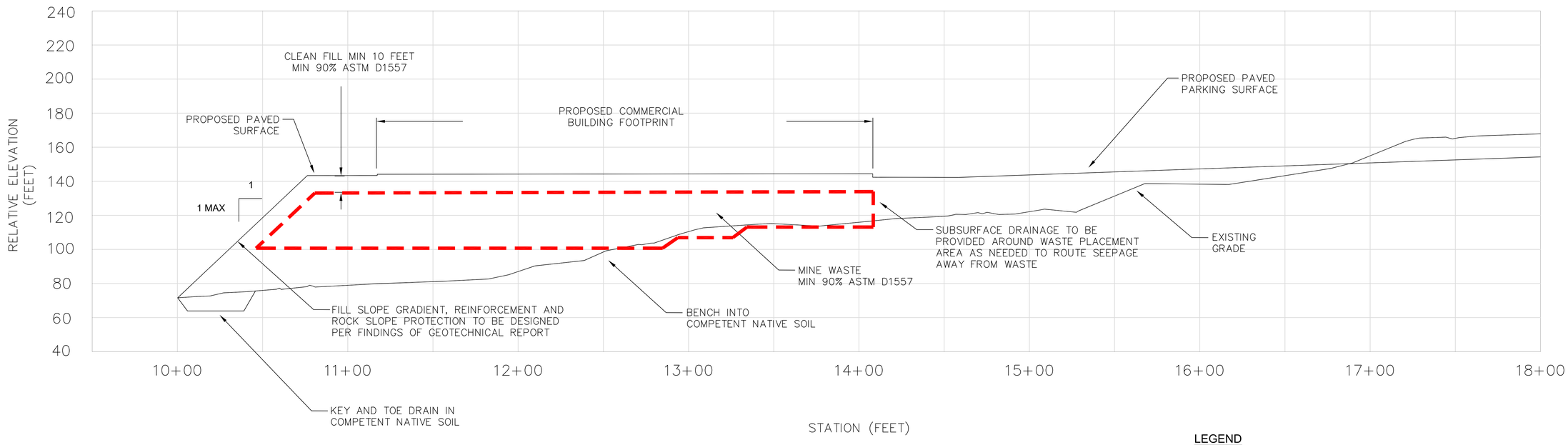
PLAN VIEW OF PROPOSED PLACEMENT AREA

SCALE: 1 INCH = 30 FEET
CONTOUR INTERVAL: 2 FEET

LEGEND

BOUNDARY OF PROPOSED WASTE PLACEMENT AREA

PROPERTY BOUNDARY



SECTION A-A'

HORIZONTAL SCALE: 1 INCH = 30 FEET
VERTICAL SCALE: 1 INCH = 30 FEET

LEGEND

BOUNDARY OF PROPOSED WASTE PLACEMENT AREA

TOPOGRAPHY AND CONCEPTUAL DEVELOPMENT PLAN PROVIDED BY GENESIS ENGINEERING MARYSVILLE, CALIFORNIA

NO.	REVISIONS	DATE

DESIGNED BY: JWM
DRAWN BY: SLD
DATE: AUGUST 2008
DRAWING NAME: 3292-04-SH1&2
PROJECT No.: 3292-04

CONCEPTUAL PLACEMENT AREA SECTION
SPRING HILL PROPERTY
GRASS VALLEY, CALIFORNIA

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SHEET 2

TABLES

Table 1 - Proposed Cleanup Goals
Spring Hill Property
Project No. 3292-04

Constituent	Maximum Detected Soil Concentration (mg/kg)		UCL Soil Concentration (mg/kg)		UCL Background Soil Concentration (mg/kg)	BTV Soil Concentration (mg/kg)	CHHSL for Residential Soil (mg/kg)	CHHSL for Commercial Soil (mg/kg)	COPC?	Proposed Cleanup Goals for Unrestricted Land Use		Proposed Cleanup Goals for Placement Beneath Commercial Development		Basis for Proposed Cleanup Goals	
	AOC 1	AOC 2	AOC 1	AOC 2						Total Concentration[1] (mg/kg)	Soluble Concentration[2] (µg/L)	Total Concentration[1] (mg/kg)	Soluble Concentration[2] (µg/L)	Protection of Human Health	Protection of Water Quality
Antimony	**12.4**	**12.2**	na	na	21.7	26.8	30	380	no	na	na	na	na	na	na
Arsenic	579	94.6	**348**	**21.9**	na	**17**	0.07	0.24	**yes**	**17**	**2**	**22**	**20**	**BTV/RBCL[3]**	**SDL**
Barium	**103**	**12.5**	na	na	na	na	5,200	63,000	no	na	na	na	na	na	na
Beryllium	ND<0.5	ND<0.5	na	na	na	na	150	1,700	no	na	na	na	na	na	na
Cadmium	**3.4**	**1.5**	na	na	12.2	13.8	1.7	7.5	no	na	na	na	na	na	na
Chromium	**962**	**60.4**	na	na	na	na	100,000	100,000	no	na	na	na	na	na	na
Cobalt	**79.4**	**56.3**	na	na	160	185	660	3,200	no	na	na	na	na	na	na
Copper	**467**	**94.2**	na	na	46.4	62	3,000	38,000	**yes**	**2,800**	na	**10,000**	na	**RBCL[4]**	na
Lead	810	341	**408**	**36.1**	13.7	na	80	320	**yes**	**80**	**2**	**260**	**20**	**RBCL[5]**	**SDL**
Mercury	19.5	1.29	**10.1**	**0.22**	na	na	18	180	**yes**	**18**	na	**82**	na	**RBCL[6]**	na
Molybdneum	**3.7**	ND<1	na	na	na	na	380	4,800	no	na	na	na	na	na	na
Nickel	1180	1290	**640**	**466**	na	na	1,600	16,000	no	na	na	na	na	na	na
Selenium	ND<2	ND<2	na	na	na	na	380	4,800	no	na	na	na	na	na	na
Silver	**21.8**	ND<2	na	na	na	na	380	4,800	no	na	na	na	na	na	na
Thallium	ND<2	ND<2	na	na	na	na	5	63	no	na	na	na	na	na	na
Vanadium	**948**	**54.6**	na	na	93.1	**117**	530	6,700	**yes[7]**	**117**	na	**260**	na	**BTV/RBCL[7]**	na
Zinc	**318**	**38.4**	na	na	na	na	23,000	100,000	no	na	na	na	na	na	na

Notes:
1 Total concentrations are based on USEPA Method 6010B/7471A.
2 Soluble concentrations are based on DI-WET and USEPA Method 6010B.
3 Arsenic cleanup goal for unrestricted land use is based on a BTV equal to the 95th percentile value for local background concentrations. Arsenic cleanup goal for commercial development is based on construction worker exposure.
4 Copper RBCL for unrestricted land use is based on the standard exposure scenario (Table 8), and copper RBCL for commercial development is based on construction worker exposure (Table 10).
5 Lead RBCLs are based on Lead Risk Assessment Spreadsheet Version 8 (DTSC). Results are presented in Tables 2 through 5. As indicated by lead levels in Table 5, dust suppression will be required to limit construction worker exposure.
6 Mercury RBCLs are derived in Tables 5 through 7.
7 Vanadium is considered a COPC for AOC 1 only. BTV is equal to 95% UPL for unrestricted land use. RBCL for commercial development is based on construction worker exposure (Table 12).
BTV = Background threshold value (95th percentile value for arsenic, 95% Upper Percentile Limit for other metals)
DI-WET = Title 22 Waste Extraction Test using deionized water as the extractant solution
mg/kg = milligrams per kilogram of soil
na = not applicable or not available
ND< = constituent not detected at concentration greater than the listed laboratory reporting limit
RBCL = risk-based cleanup level
SDL = soluble designated level based on Designated Level Methodology (see PEA report)
UCL = upper confidence limit (95%) on the arithmetic mean
µg/L = micrograms per liter of water

Table 2 - Derivation of Proposed Lead Cleanup Goal, Standard (Unrestricted) Exposure Scenario
Spring Hill Property
Project No. 3292-04

LEAD RISK ASSESSMENT SPREADSHEET 8
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	80.0
Respirable Dust (ug/m^3)	1.5

OUTPUT						
Percentile Estimate of Blood Pb (ug/dl)						PRG-90
	50th	90th	95th	98th	99th	(ug/g)
BLOOD Pb, CHILD	0.6	1.0	1.2	1.5	1.7	77
BLOOD Pb, PICA CHILD	1.1	2.1	2.4	3.0	3.4	39

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.00	1%		0.00	0%
Soil Ingestion	7.0E-3	0.56	99%	1.4E-2	1.13	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

Click here for REFERENCES

Table 3 - Derivation of Proposed Lead Cleanup Goal, Adult Exposure
Spring Hill Property
Project No. 3292-04

MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	260
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.4**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	0.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**5.2%**

PRG90 **318**

Click here for REFERENCES

Table 4 - Derivation of Proposed Lead Cleanup Goal, Construction Worker Exposure Scenario
Spring Hill Property
Project No. 3292-04

MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	260
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.330
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.8**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	5.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**94.4%**

PRG90 **48**

Click here for REFERENCES

Note: Becasuse benchmark level is exceeded, dust control will be necessary during construction.

Table 5 - Derivation of Proposed Total Mercury Cleanup Goal, Standard (Unrestricted) Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Mercury	Proposed Cleanup Goal	3.E-04	8.57E-05	NL	NL	0.01	18	1.37E-08	7.89E-01	1.02E-04	**7.89E-01**			0.00E+00
TOTAL									7.89E-01	1.02E-04	**8.E-01**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	6	n/a	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	350	350	days/yr	PEA Guidance Manual
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	PEA Guidance Manual
ED, exposure duration	6	24	yr	Human-Exposure-Based Screening Numbers
IRs, soil ingestion rate	200	100	mg/day	PEA Guidance Manual
IRa, inhalation rate	10	20	m^3/day	PEA Guidance Manual
BW, body weight	15	70	kg	PEA Guidance Manual
SA, exposed skin surface area	2,800	5,700	cm^2	Human-Exposure-Based Screening Numbers
AF, adherance factor	0.2	0.07	mg/cm^2	Human-Exposure-Based Screening Numbers
PEF, particulate emission factor	1.316E+09	1.316E+09	m^3/kg	Human-Exposure-Based Screening Numbers

Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)

Table 6 - Derivation of Proposed Total Mercury Cleanup Goal, Commercial Indoor Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Mercury	Proposed Cleanup Goal	3.E-04	8.57E-05	NL	NL	0.01	82	6.03E-08	1.51E-01	9.64E-05	1.51E-01			0.00E+00
TOTAL									1.51E-01	9.64E-05	**2.E-01**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	25	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	25	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	50	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	14	m^3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	3,300	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.2	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.36E+09	m^3/kg	US EPA Supplimental Guidance

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa).
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)

Table 7 - Derivation of Proposed Total Mercury Cleanup Goal, Construction Worker Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Mercury	Proposed Cleanup Goal	3.E-04	8.57E-05	NL	NL	0.01	82	6.21E-08	1.00E+00	1.42E-04	1.00E+00			0.00E+00
TOTAL									1.00E+00	1.42E-04	**1.E+00**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	1	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	1	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	330	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	20	m3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	5,700	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.8	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.32.E+09	m^3/kg	US EPA (2004)

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa): Linn W.S., Spier C.E., and J.D. Hackney. 1993. Activity Patterns in Ozone-exposed contstruction workers. J. Occ. Med.
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)
Threshold Limit Values and Biological Exposure Indices, American Converence of Governmental Industrial Hygenists (ACGIH 2004)

Table 8 - Derivation of Proposed Total Copper Cleanup Goal, Standard (Unrestricted) Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi [1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Copper	proposed cleanup goal	3.7E-02	3.7E-02	NL	NL	0.01	2800	2.13E-06	9.95E-01	3.68E-05	**9.95E-01**			0.00E+00
TOTAL									9.95E-01	3.68E-05	**1.E+00**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$ 5.00E-05
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	6	n/a	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	350	350	days/yr	PEA Guidance Manual
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	PEA Guidance Manual
ED, exposure duration	6	24	yr	Human-Exposure-Based Screening Numbers
IRs, soil ingestion rate	200	100	mg/day	PEA Guidance Manual
IRa, inhalation rate	10	20	m^3/day	PEA Guidance Manual
BW, body weight	15	70	kg	PEA Guidance Manual
SA, exposed skin surface area	2,800	5,700	cm^2	Human-Exposure-Based Screening Numbers
AF, adherance factor	0.2	0.07	mg/cm^2	Human-Exposure-Based Screening Numbers
PEF, particulate emission factor	1.316E+09	1.316E+09	m^3/kg	Human-Exposure-Based Screening Numbers

Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)

Table 9 - Derivation of Proposed Total Copper Cleanup Goal, Commercial Indoor Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Copper	proposed cleanup goal	3.7E-02	3.7E-02	NL	NL	0.01	38,000	2.79E-05	5.69E-01	1.03E-04	5.69E-01			0.00E+00
TOTAL									5.69E-01	1.03E-04	**6.E-01**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	25	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	25	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	50	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	14	m^3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	3,300	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.2	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.36E+09	m^3/kg	US EPA Supplimental Guidance

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa).
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)

Table 10 - Derivation of Proposed Total Copper Cleanup Goal, Construction Worker Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Copper	proposed cleanup goal	3.7E-02	3.7E-02	NL	NL	0.01	10,000	7.58E-06	9.93E-01	4.01E-05	9.93E-01			0.00E+00
TOTAL									9.93E-01	4.01E-05	**1.E+00**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	1	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	1	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	330	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	20	m3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	5,700	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.8	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.32.E+09	m^3/kg	US EPA (2004)

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa): Linn W.S., Spier C.E., and J.D. Hackney. 1993. Activity Patterns in Ozone-exposed contstruction workers. J. Occ. Med.
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)
Threshold Limit Values and Biological Exposure Indices, American Converence of Governmental Industrial Hygenists (ACGIH 2004)

Table 11 - Derivation of Proposed Total Vanadium Cleanup Goal, Commercial Indoor Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	1,800	1.32E-06	9.97E-01	1.81E-04	9.97E-01			0.00E+00
TOTAL									9.97E-01	1.81E-04	**1.E+00**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	25	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	25	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	50	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	14	m^3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	3,300	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.2	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.36E+09	m^3/kg	US EPA Supplimental Guidance

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa).
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)

Table 12 - Derivation of Proposed Total Vanadium Cleanup Goal, Construction Worker Exposure Scenario
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	260	1.97E-07	9.56E-01	3.85E-05	9.56E-01			0.00E+00
TOTAL									9.56E-01	3.85E-05	**1.E+00**	0.00E+00	0.00E+00	**0.E+00**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	1	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	1	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	330	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	20	m3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	5,700	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.8	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.32.E+09	m^3/kg	US EPA (2004)

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa): Linn W.S., Spier C.E., and J.D. Hackney. 1993. Activity Patterns in Ozone-exposed contstruction workers. J. Occ. Med.
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)
Threshold Limit Values and Biological Exposure Indices, American Converence of Governmental Industrial Hygenists (ACGIH 2004)

Table 13 - Total Metals in Background Soil

Spring Hill Property

Project No. 3292-04

Sample Number	Sample Depth (feet bgs)	Sample Date	Easting[1] (UTM)	Northing[1] (UTM)	Total Antimony (mg/kg)	Total Arsenic (mg/kg)	Total Cadmium (mg/kg)	Total Cobalt (mg/kg)	Total Copper (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)	Total Vanadium (mg/kg)
BG-1	0 - 0.5	5/20/03	na	na	na	ND<1.0	na	na	na	6.0	0.069	na	na
BG-2	0 - 0.5	5/20/03	na	na	na	ND<1.0	na	na	na	9.1	0.140	na	na
BG-3	0 - 0.5	5/20/03	na	na	na	17	na	na	na	13	0.066	na	na
BG-4	0 - 0.5	10/11/05	na	na	na	ND<1.0	na	na	na	20.4	na	na	na
BG-5	0 - 0.5	10/11/05	na	na	na	ND<1.0	na	na	na	6.8	na	na	na
BG-6	0 - 0.5	10/11/05	na	na	na	ND<1.0	na	na	na	15.0	na	na	na
S-12	0.25	4/18/07	na	na	na	ND<1.0	na	na	na	5.0	na	1,620	na
S-13	0.25	4/18/07	na	na	na	ND<1.0	na	na	na	3.1	na	1,680	na
S-14	0 - 0.5	6/27/08	608863	4343944	8.9	na	7.6	94.7	61.7	na	na	na	117
S-15	0 - 0.5	6/27/08	668907	4343975	17.1	na	9.7	128	55.9	na	na	na	92.7
S-16	0 - 0.5	6/27/08	668946	4344006	20.1	na	11.5	126	49.3	na	na	na	98.7
S-17	0 - 0.5	6/27/08	668971	4343974	21.1	na	12.7	177	39.6	na	na	na	91.6
S-18	0 - 0.5	6/27/08	669015	4343980	15.1	na	9.3	134	35.4	na	na	na	51.9
S-19	0 - 0.5	6/27/08	669061	4343986	16.1	na	10.8	122	19.7	na	na	na	67.9
S-20	0 - 0.5	6/27/08	669076	4343957	21.6	na	12.8	161	25.3	na	na	na	56.2
S-21	0 - 0.5	6/27/08	669105	4343984	25.2	na	12.9	185	34.3	na	na	na	75.5
S-22	0 - 0.5	6/27/08	669119	4343953	26.8	na	13.8	179	31.0	na	na	na	89.9
S-23	0 - 0.5	6/27/08	669145	4343959	13.9	na	7.4	86.4	35.3	na	na	na	72.5

Notes:

1 UTM coordinates are based on NAD (North American Datum) 83 and were obtained using a hand-held GPS device of resource-grade accuracy (typically less than 30 feet, as reported by the GPS unit.

bgs = below ground surface

mg/kg = milligrams per kilogram

ND< = not detected at or above the indicated laboratory reporting limit

na = not analyzed

Analysis for total metals performed by Excelchem Environmental Labs using U.S. EPA Test Method 6010B

Table 14 - Summary of Risk/Hazard Calculations for Background Soil, Standard Exposure Scenario (Unrestricted Land Use)
Spring Hill Property
Project No. 3292-04

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	UCL	4.E-04	4.E-04	NL	NL	0.01	21.7	1.65E-08	7.13E-01	2.64E-05	7.13E-01			0.00E+00
Arsenic	mean	3.E-04	8.57E-06	9.45	12.0	0.03	2.6	1.98E-09	1.20E-01	1.47E-04	1.20E-01	4.11E-05	3.53E-09	4.11E-05
Cadmium	UCL	5.E-04	5.7E-06	NL	6.3	0.001	12.2	9.27E-09	3.13E-01	1.04E-03	3.14E-01		8.69E-09	8.69E-09
Cobalt	UCL	2.E-02	5.7E-06	NL	9.8	0.01	160	1.22E-07	1.05E-01	1.36E-02	1.19E-01		1.77E-07	1.77E-07
Copper	UCL	3.7E-02	3.7E-02	NL	NL	0.01	46.4	3.53E-08	1.65E-02	6.09E-07	1.65E-02			0.00E+00
Mercury	mean	3.E-04	8.57E-05	NL	NL	0.01	0.09	6.84E-11	3.94E-03	5.10E-07	3.94E-03			0.00E+00
Vanadium	UCL	1.E-03	1.E-03	NL	NL	0.01	93.1	7.07E-08	1.22E+00	4.52E-05	1.22E+00			0.00E+00
TOTAL									2.50E+00	1.49E-02	**3.E+00**	4.11E-05	1.89E-07	**4.E-05**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	6	n/a	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	350	350	days/yr	PEA Guidance Manual
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	PEA Guidance Manual
ED, exposure duration	6	24	yr	Human-Exposure-Based Screening Numbers
IRs, soil ingestion rate	200	100	mg/day	PEA Guidance Manual
IRa, inhalation rate	10	20	m^3/day	PEA Guidance Manual
BW, body weight	15	70	kg	PEA Guidance Manual
SA, exposed skin surface area	2,800	5,700	cm^2	Human-Exposure-Based Screening Numbers
AF, adherance factor	0.2	0.07	mg/cm^2	Human-Exposure-Based Screening Numbers
PEF, particulate emission factor	1.316E+09	1.316E+09	m^3/kg	Human-Exposure-Based Screening Numbers

Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)

Table 15 - Cost Estimate for AOC 1 Excavation and On Site Placement
Spring Hill Property
Project No. 3292-04

Estimated Capital Costs[1]	**Estimated Quantity**[2]	**Unit**	**Unit Cost**	**Estimated Cost**
Excavation[2]	1,700	cubic yards	$5	$8,500
Import and Placement of Clean Fill[3]	0	cubic yards	$19	$0
On Site Transport and Placement[4]	1,700	cubic yards	$5	$8,500
Off Site Transport and Disposal[5]	0	tons	$100	$0
Erosion Control[6]	0	acres	$2,500	$0
Aggregate Base[7]	0	cubic yards	$19	$0
Asphalt Cap[7]	0	square feet	$3	$0
Management and Engineering[8]	1	% of direct costs	10%	$1,700
Contingency[9]	1	% of direct costs	15%	$1,530
Total Estimated Capital Cost				**$20,230**
Estimated Annual Cost (inspection and annual reporting to DTSC)				**$2,000**

Notes:
1 Estimate based on rates obtained from local contractors. Actual costs may vary significantly based on actual rates, material quantities and site conditions.
2 Excavation unit cost provided by Robinson Enterprises of Grass Valley, California.
3 Import of clean fill is not necessary for the On Site Placement alternative.
4 Transport and placement unit cost provided by Robinson Enterprises of Grass Valley, California.
5 Off site transport and disposal is not applicable to the On Site Placement alternative.
6 The remedial action is to be performed concurrently with site grading; thus, specific erosion control costs are not presented in this estimate.
7 The waste placement area includes a paved parking area (95,000 square feet) and a commercial building envelope (91,500 square feet). Costs for building construction, aggregate base and paving are not presented in this estimate.
8 Indirect manaagement and engineering costs are estimated as a percentage of direct costs.
9 A contingency is added as a percent of direct costs. Waste voumes have not been determined by survey. Waste volumes, waste characteristics and unit costs may vary.
AOC = Area of Concern

Table 16 - Cost Estimate for AOC 1 Excavation and Off Site Disposal
Spring Hill Property
Project No. 3292-04

Estimated Capital Costs[1]	**Estimated Quantity[2]**	**Unit**	**Unit Cost**	**Estimated Cost**
Excavation[2]	1,700	cubic yards	$5	$8,500
Import and Placement of Clean Fill[3]	0	cubic yards	$19	$0
On Site Transport and Placement[4]	0	cubic yards	$5	$0
Off Site Transport and Disposal[5]	2,300	tons	$100	$230,000
Erosion Control[6]	0	acres	$2,500	$0
Aggregate Base[6]	0	cubic yards	$19	$0
Asphalt Cap[7]	0	square feet	$3	$0
Management and Engineering[8]	1	% of direct costs	5%	$11,925
Contingency[9]	1	% of direct costs	10%	$24,193
Total Estimated Capital Cost				**$274,618**
Estimated Annual Cost				**$0**

Notes:
1 Estimate based on rates obtained from local contractors. Actual costs may vary significantly based on actual rates, material quantities and site conditions.
2 Excavation unit cost provided by Robinson Enterprises of Grass Valley, California.
3 Unit cost provided by Robinson Enterprises of Grass Valley, California. Cost will vary based on borrow source, which has not yet been determined.
4 Transport and placement unit cost provided by Robinson Enterprises of Grass Valley, California.
5 Unit cost assumes Class I non-RCRA disposal.
6 The remedial action is to be performed concurrently with site grading; thus, specific erosion control costs are not presented in this estimate.
7 Not applicable to the Off Site Disposal Alternative.
8 Indirect management and engineering costs are estimated as a percentage of direct costs.
9 A contingency is added as a percent of direct costs. Waste voumes have not been determined by survey. Waste volumes, waste characteristics and unit costs may vary.
AOC = Area of Concern

Table 17 - Cost Estimate for AOC 2 Excavation and On Site Placement
Spring Hill Property
Project No. 3292-04

Estimated Capital Costs[1]	**Estimated Quantity**[2]	**Unit**	**Unit Cost**	**Estimated Cost**
Excavation[2]	62,000	cubic yards	$5	$310,000
Import and Placement of Clean Fill[3]	0	cubic yards	$19	$0
On Site Transport and Placement[4]	62,000	cubic yards	$5	$310,000
Off Site Transport and Disposal[5]	0	tons	$40	$0
Erosion Control[6]	0	acres	$2,500	$0
Aggregate Base[7]	0	cubic yards	$19	$0
Asphalt Cap[7]	0	square feet	$3	$0
Management and Engineering[8]	1	% of direct costs	10%	$62,000
Contingency[9]	1	% of direct costs	10%	$37,200
Total Estimated Capital Cost				**$719,200**
Estimated Annual Cost (inspection and annual reporting to DTSC)				**$2,000**

Notes:
1 Estimate based on rates obtained from local contractors. Actual costs may vary significantly based on actual rates, material quantities and site conditions.
2 Excavation unit cost provided by Robinson Enterprises of Grass Valley, California.
3 Import of clean fill is not necessary for the On Site Placement alternative.
4 Transport and placement unit cost provided by Robinson Enterprises of Grass Valley, California.
5 Off site transport and disposal is not applicable to the On Site Placement alternative.
6 The remedial action is to be performed concurrently with site grading; thus, specific erosion control costs are not presented in this estimate.
7 The waste placement area includes a paved parking area (95,000 square feet) and a commercial building envelope (91,500 square feet). Costs for building construction, aggregate base and paving are not presented in this estimate.
8 Indirect manaagement and engineering costs are estimated as a percentage of direct costs.
9 A contingency is added as a percent of direct costs. Waste voumes have not been determined by survey. Waste volumes, waste characteristics and unit costs may vary.
AOC = Area of Concern

Table 18 - Cost Estimate for AOC 2 Excavation and Off Site Disposal
Spring Hill Property
Project No. 3292-04

Estimated Capital Costs[1]	**Estimated Quantity[2]**	**Unit**	**Unit Cost**	**Estimated Cost**
Excavation[2]	62,000	cubic yards	$5	$310,000
Import and Placement of Clean Fill[3]	62,000	cubic yards	$19	$1,178,000
On Site Transport and Placement[4]	0	cubic yards	$5	$0
Off Site Transport and Disposal[5]	83,700	tons	$40	$3,348,000
Erosion Control[6]	0	acres	$2,500	$0
Aggregate Base[6]	0	cubic yards	$19	$0
Asphalt Cap[7]	0	square feet	$3	$0
Management and Engineering[8]	1	% of direct costs	1%	$62,868
Contingency[9]	1	% of direct costs	10%	$458,887
Total Estimated Capital Cost				**$5,357,755**
Estimated Annual Cost				**$0**

Notes:
1 Estimate based on rates obtained from local contractors. Actual costs may vary significantly based on actual rates, material quantities and site conditions.
2 Excavation unit cost provided by Robinson Enterprises of Grass Valley, California.
3 Unit cost provided by Robinson Enterprises of Grass Valley, California. Cost will vary based on borrow source, which has not yet been determined.
4 Transport and placement unit cost provided by Robinson Enterprises of Grass Valley, California.
5 Unit cost assumes Class I non-RCRA disposal.
6 The remedial action is to be performed concurrently with site grading; thus, specific erosion control costs are not presented in this estimate.
7 Not applicable to the Off Site Disposal Alternative.
8 Indirect management and engineering costs are estimated as a percentage of direct costs.
9 A contingency is added as a percent of direct costs. Waste voumes have not been determined by survey. Waste volumes, waste characteristics and unit costs may vary.
AOC = Area of Concern

Table 19 - Cost Estimate Summary for Proposed Remedial Alternative
Spring Hill Property
Project No. 3292-04

Estimated Capital Costs	**Estimated Cost**
Excavation and Off Site Disposal for AOC 1 (see Table 16)	$274,618
Excavation and On Site Placement for AOC 2 (see Table 17)	$719,200
Total Estimated Capital Cost	**$993,818**
Estimated Annual Cost	**$2,000**

Notes:
See referenced tables for methodology and limitations.
AOC = Area of Concern

APPENDIX A

Administrative Record List and DTSC Comments

Table A1. Administrative Record List
Spring Hill Property
Updated June 14, 2012

Document Date	Document Author	Document Title
7/6/2007	H&K	Draft Preliminary Endangerment Assessment for Former Spring Hill Mine Property, APNs 35-260-62, 63 and 64 Grass Valley, California
7/17/2007	DTSC	Voluntary Cleanup Agreement, Docket No. HAS-VCA 07/08-008
8/27/2007	DTSC	Review of the Draft Preliminary Endangerment Assessment for the Former Spring Hill Mine Property In Grass Valley, California, Assessor's Parcel Numbers 35-260-62, 63, and 64
9/27/2007	DTSC	Preliminary Endangerment Assessment (PEA) Report for the Former Spring Hill Mine Property, Grass Valley, Nevada County
1/11/2008	H&K	Response to DTSC Comments on Draft Preliminary Endangerment Assessment, Former Spring Hill Property, Grass Valley, California
1/11/2008	H&K	Draft Final Preliminary Endangerment Assessment for Former Spring Hill Mine Property, APNs 35-260-62, 63 and 64 Grass Valley, California
2/5/2008	DTSC	Review of Draft Final Preliminary Endangerment Assessment for the Former Spring Hill Mine Property in Grass Valley, California, APNs 35-260-62, 63 and 64
8/22/2008	H&K	Draft Removal Action Work Plan for Spring Hill Property, APNs 35-260-62, 63 and 64 Grass Valley, California
10/2/2008	DTSC	Review of the Draft Removal Action Work Plan for Spring Hill Mine Property, Grass Valley, California, Assessor's Parcel Numbers 35-260-62, 63, and 64

Notes:
DTSC = California Enviornmental Protection Agency, Department of Toxic Substances Control
H&K = Holdrege & Kull Consulting Engineers and Geologists

Linda S. Adams
Secretary for
Environmental Protection

Department of Toxic Substances Control

Maureen F. Gorsen, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegger
Governor

October 2, 2008

Mr. Sean M. O'Niell
Genesis Engineering
1402 D Street
Marysville, California 95901

REVIEW OF THE DRAFT REMOVAL ACTION WORKPLAN FOR SPRING HILL MINE PROPERTY, GRASS VALLEY, CALIFORNIA, ASSESSOR'S PARCEL NUMBERS (APNs) 35-260-62, 63, AND 64

Dear Mr. O'Niell:

The Department of Toxic Substances Control (DTSC) reviewed the Draft Removal Action Workplan (RAW) received on August 26, 2008 for the Spring Hill Mine property located south of Dorsey Drive and south east of State Highway 49/20 in Grass Valley, California (Site).

The Site consists of approximately 26 acres and is identified by APNs 35-260-62, 35-260-63, and 35-260-64. The Site is currently being evaluated for commercial development. The Preliminary Endangerment Assessment (PEA) completed in January 2008 identified mine waste in soils on the property containing arsenic and lead concentrations ranging up to 579 milligrams per kilogram (mg/kg) and 418 mg/kg respectively.

The proposed RAW indicates that the contaminated soil that is not acceptable for unrestricted land use or the exposure scenarios for the developed site will be dig up and transported to an appropriate landfill. Soil with contaminant concentrations that are below the level that must be taken off site but above background will be placed under a cap to eliminate the possibility of any contact. The cap will be integrated into the construction of the future development which includes a building and parking lot. Deed restrictions and land use controls will also be employed as part of the remedy to ensure appropriate use of the site in the future.

The following comments on the draft RAW are provided to ensure an adequate final RAW is achieved:

- Section 4.2.1.3 indicates that approximately 150 truck loads will be necessary to haul off the AOC 1 waste material while Section 6.2.4

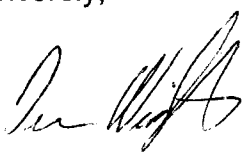
indicates that only 100 truck loads will be required for this task. This discrepancy should be rectified in the final RAW. The estimated number of truck loads should be consistent and as accurate as possible as this information will be used to support California Environmental Quality Act (CEQA) related documents for the project.

- Section 6.3 indicates that clean fill will be placed over the waste that will remain on site. It is recommended that the fill material be sampled as per the DTSC Information Advisory titled *Clean Imported Fill Material* (October, 2001) to ensure that it meets the cleanup standards established for the project.

Once the comments above are addressed DTSC will issue an approval of the RAW for public review. Prior to scheduling the thirty day public comment period, a Notice of Exemption (NOE) from CEQA and public participation tasks including a fact sheet on the proposed RAW and mail out of a public notice must be completed. DTSC will work with you and H&K to complete these items in a timely manner.

If you have any questions regarding this matter, please contact Mr. Dean Wright at (916) 255-6528.

Sincerely,



Dean Wright, P.G.
Engineering Geologist
Sacramento Office
Brownsfields and Environmental Restoration Program

cc: Mr. Sean Dunbar, P.G.
Holdrege & Kull
792 Searls Avenue
Nevada City, California 95959

APPENDIX B

PEA Data

Table 1 - Summary of DWR Well Completion Reports
Fomer Spring Hill Mine Property
APNs 35-260-62, 63 and 64
Grass Valley, California

No.	Reported Site Address[1]	Reported APN[1]	DWR Well Log No.	Estimated Elevation[2] (feet MSL)	Estimated Distance From Site[2] (feet)	Direction From Site[2] (feet)	Reported Depth to First Water[1] (feet)	Reported Depth of Static Water Level[1] (feet)	Reported Depth to Rock[1] (feet)	Reported Depth of Well[1] (feet)
1	Dorsey Drive	NR	111604	2680	200	W	NR	NR	25 - 55	130
2	Sutton Way	NR	208239	2600	1400	NE	152	30	24	625
3	Hughes Road	NR	81784	2560	2000	W	60	35	14	225
4	1040 East Main Street	NR	305758	2600	2000	NW	60	NR	40	180
5	1040 East Main Street	NR	305767	2600	2000	NW	60	NR	40	400

Notes:
1 Based on DWR Well Completion Report
2 Based on USGS 7.5' Quadrangle Map of Grass Valley CA (Provisional Edition, 1995)
APN = Nevada County assessors parcel number
DWR = State of California Department of Water Resources
MSL = mean sea level
NR = not reported on well completion report

Owner Name and Mailing Address[1]

No. 1 - Spring Hill Manor Convalescent Hospital

No. 2 - Francis Teut, 13240 North Day Rd, Grass Valley

No. 3 - Timberline Homes, 154 Hughes Rd, Grass Valley

No. 4 and 5 - Nevada County Country Club, 1040 E. Main St., Grass Valley

Table 2 - Total Metals and Inorganics Results for Soil Samples
Former Spring Hill Mine Site

APNs 35-260-62, 63 and 64

Grass Valley, California

Sample Number	Sample Location	Sample Type	Sample Depth (feet bgs)	Sample Date	Total Arsenic (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)	Total Cyanide (mg/kg)	Total Nitrate (mg/kg)
EXP-1	EXP-1	WR/SP	0.5	5/20/03	19	5.2	0.045	na	na	na
FND-1	FND-1	WR/SP	0.5	5/20/03	130	190	0.670	na	na	na
FND-2	FND-2	WR/SP	0.5	5/20/03	74	44	1.2	na	na	na
FND-S3	FND-S3	WR/SP	1.5	5/20/03	180	310	0.150	na	na	na
WR1-S1	WR1-S1	WR/SP	0.5	5/20/03	ND<1.0	4.8	0.310	na	na	na
WR1-S2	WR1-S2	WR/SP	1.0	5/20/03	28	37	0.200	na	na	na
WR1-S3	WR1-S3	WR/SP	1.0	5/20/03	ND<1.0	ND<1.0	0.220	na	na	na
WR-S1	WR-S1	WR/SP	0 - 0.5	10/11/05	1.1	6.3	0.189	na	na	na
WR-S2	WR-S2	WR/SP	1	10/11/05	2.5	3.6	0.180	na	na	na
WR-S3	WR-S3	WR/SP	0 - 0.5	10/11/05	ND<1.0	7.2	0.034	na	na	na
WR-S4	WR-S4	WR/SP	1.5	10/11/05	5.6	8.6	0.020	na	na	na
WR-S5	WR-S5	WR/SP	0 - 0.5	10/11/05	4.0	8.3	0.067	na	na	na
WR-S6	WR-S6	WR/SP	2	10/11/05	10.5	5.0	0.072	na	na	na
WR-S7	WR-S7	WR/SP	0.7	10/11/05	2.4	17.1	0.056	na	na	na
WR-S8	WR-S8	WR/SP	1	10/11/05	ND<1.0	9.5	0.019	na	na	na
WR-S9	WR-S9	WR/SP	0 - 0.5	10/11/05	1.0	11.3	0.029	na	na	na
WR-S10	WR-S10	WR/SP	0 - 0.5	10/11/05	1.2	8.8	0.081	na	na	na
WR-S11	WR-S11	WR/SP	1	10/11/05	3.9	19.8	0.306	na	na	na
WR-S12	WR-S12	WR/SP	0 - 0.5	10/11/05	5.3	47.6	0.048	na	na	na
WR-S13	WR-S13	WR/SP	0 - 0.5	10/11/05	11.2	11.9	0.122	na	na	na
WR-S14	WR-S14	WR/SP	0 - 0.5	10/11/05	ND<1.0	4.5	0.117	na	na	na
WR-S15	WR-S15	WR/SP	0 - 0.5	10/11/05	ND<1.0	44.9	0.219	na	na	na
WR-S16	WR-S16	WR/SP	0 - 0.5	10/11/05	3.6	9.8	0.106	na	na	na
WR-S17	WR-S17	WR/SP	0.5	10/11/05	22	52.9	0.126	na	na	na
WR-S18	WR-S18	WR/SP	2	10/11/05	2.7	10.9	0.208	na	na	na
WR-S19	WR-S19	WR/SP	0.5	10/11/05	4.1	11.7	0.239	na	na	na
WR-S20	WR-S20	WR/SP	1	10/11/05	5.7	4.4	0.136	na	na	na
WR-S21	WR-S21	WR/SP	1.5	10/11/05	6.9	3.9	0.193	na	na	na
SM-S1	SM-S1	T	0 - 0.5	10/11/05	ND<1.0	3.2	0.023	na	ND<0.25	na
SM-S2	SM-S2	T	0 - 0.5	10/11/05	ND<1.0	3.0	0.025	na	ND<0.25	na
SM-S3	SM-S3	T	2	10/11/05	2.6	3.0	0.051	na	ND<0.25	na
SM-S4	SM-S4	T	0 - 0.5	10/11/05	ND<1.0	2.9	0.028	na	ND<0.25	na
FND-S4	FND-S4	WR/SP	0.5	10/25/05	34	52.1	0.129	na	na	na
FND-S5	FND-S5	WR/SP	3	10/25/05	52.1	48	0.190	na	na	na
FND-S6	FND-S6	WR/SP	0-0.5	10/25/05	36.2	103	0.273	na	na	na
SND-S1	SND-S1	WR/SP	0-0.5	10/25/05	17.8	17.5	0.253	na	na	na
TP-2-6	Test Pit 2	WR/SP	6	3/13/07	6.9	ND<2.0	0.086	486	na	na
TP-2-10	Test Pit 2	WR/SP	10	3/13/07	ND<2.0	ND<2.0	0.014	548	na	na
TP-4-3	Test Pit 4	T	3	3/13/07	ND<2.0	ND<2.0	0.025	201	ND<1.0	ND<0.5
TP-4-6	Test Pit 4	T	6	3/13/07	ND<2.0	4.4	0.039	275	na	na
TP-5-10	Test Pit 5	T	10	3/13/07	20.2	5.1	0.186	403	ND<1.0	ND<0.5
TP-5-15	Test Pit 5	T	15	3/13/07	ND<2.0	3.1	0.092	212	ND<1.0	ND<0.5
TP-5-19	Test Pit 5	T	19	3/13/07	ND<2.0	5.6	0.055	295	ND<1.0	ND<0.5

Table 2 - Total Metals and Inorganics Results for Soil Samples
Former Spring Hill Mine Site

APNs 35-260-62, 63 and 64

Grass Valley, California

Sample Number	Sample Location	Sample Type	Sample Depth (feet bgs)	Sample Date	Total Arsenic (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)	Total Cyanide (mg/kg)	Total Nitrate (mg/kg)
TP-8-3	Test Pit 8	WR/SP	3	3/13/07	3.2	7.5	0.321	407	na	na
TP-8-6	Test Pit 8	WR/SP	6	3/13/07	6.2	5.0	0.243	296	na	na
TP-9-0.5	Test Pit 9	WR/SP	0.5	3/13/07	ND<2.0	16.8	0.139	1,290	na	na
TP-9-6	Test Pit 9	WR/SP	6	3/13/07	19.2	3.5	0.123	583	na	na
TP-10-8	Test Pit 10	WR/SP	8	3/13/07	2.1	2.2	0.283	585	na	na
TP-10-12	Test Pit 10	WR/SP	12	3/13/07	ND<2.0	70.2	0.127	940	na	na
TP-11-0.5	Test Pit 11	AS/NS	0.5	3/14/07	10.2	71.8	0.269	398	na	na
TP-12-0.5	Test Pit 12	AS/NS	0.5	3/14/07	8.2	15.3	0.432	421	na	na
TP-12-1.5	Test Pit 12	AS/NS	1.5	3/14/07	3.5	38.2	0.060	85.8	na	na
TP-13-2	Test Pit 13	WR/SP	2	3/14/07	ND<2.0	3.2	0.511	134	na	na
TP-13-4	Test Pit 13	WR/SP	4	3/14/07	ND<2.0	3.7	0.105	96.3	na	na
TP-14-0.5	Test Pit 14	WR/SP	0.5	3/14/07	ND<2.0	3.9	0.117	482	na	na
TP-14-2	Test Pit 14	WR/SP	2	3/14/07	4.2	4.9	0.065	206	na	na
TP-15-3	Test Pit 15	T	3	3/14/07	3.0	13.1	1.16	328	na	na
TP-15-5	Test Pit 15	T	5	3/14/07	2.0	4.2	0.030	238	na	na
TP-15-6	Test Pit 15	T	6	3/14/07	2.5	7.0	0.040	408	na	na
TP-16-0.5A	Test Pit 16	T	0.5	3/14/07	7.7	7.8	0.115	254	na	na
TP-16-1B	Test Pit 16	AS/NS	1	3/14/07	ND<2.0	4.1	0.054	709	na	na
TP-16-1C	Test Pit 16	WR/SP	1	3/14/07	ND<2.0	3.7	0.087	364	na	na
TP-17-4	Test Pit 17	T	4	3/14/07	6.4	5.7	0.070	197	ND<1.0	ND<0.5
TP-17-9	Test Pit 17	T	9	3/14/07	10.1	8.3	0.651	768	ND<1.0	ND<0.5
S-1	S-1	AS/NS	0.25	3/14/07	33.2	376	0.059	1,180	na	na
S-2	S-2	AS/NS	0.25	3/22/07	ND<1.0	65.9	0.166	121	na	ND<0.5
S-3	S-3	WR/SP	0.25	3/22/07	30.7	7.9	0.066	253	na	ND<0.5
S-4	S-4	WR/SP	0.25	3/22/07	ND<1.0	7.6	0.137	159	na	ND<0.5
S-5	S-5	WR/SP	0.5	3/22/07	ND<1.0	8.7	0.057	319	na	1.3
S-6	S-6	AS/NS	0.5	3/22/07	ND<1.0	50.0	0.105	796	na	1.6
S-7	S-7	WR/SP	0.5	3/22/07	ND<1.0	8.6	ND<0.010	142	na	0.5
S-8	S-8	AS/NS	0.5	3/23/07	25.5	341	0.507	685	ND<1.0	ND<0.5
S-9	S-9	AS/NS	0.25	3/23/07	50.2	76.6	1.29	111	ND<1.0	ND<0.5
S-10	S-10	AS/NS	0.25	3/23/07	579	418	8.69	400	ND<1.0	ND<0.5
TP-18-0.25	Test Pit 18	AS/NS	0.25	4/5/07	52.4	56.2	0.484	278	na	na
TP-18-1.0	Test Pit 18	AS/NS	1.0	4/5/07	18.3	12.3	0.108	182	na	na
TP-19-0.25	Test Pit 19	AS/NS	0.25	4/5/07	12.3	60.4	0.275	225	na	na
TP-19-0.75	Test Pit 19	AS/NS	0.75	4/5/07	ND<1.0	3.3	0.039	126	na	na
TP-20-0.25	Test Pit 20	AS/NS	0.25	4/5/07	ND<1.0	49.8	1.48	217	na	na
TP-20-1.0	Test Pit 20	AS/NS	1.0	4/5/07	4.6	18.4	8.38	174	na	na
TP-21-0.75	Test Pit 21	AS/NS	0.75	4/5/07	426	810	7.32	438	na	na
TP-21-1.5	Test Pit 21	AS/NS	1.5	4/5/07	ND<1.0	8.7	0.207	494	na	na
TP-22-0.25	Test Pit 22	AS/NS	0.25	4/5/07	52.3	196	3.76	239	na	na
TP-22-0.75	Test Pit 22	AS/NS	0.75	4/5/07	6.0	7.4	0.249	168	na	na
TP-23-0.25	Test Pit 23	AS/NS	0.25	4/5/07	271	69.5	0.964	104	na	na
TP-23-0.75	Test Pit 23	AS/NS	0.75	4/5/07	7.4	5.5	0.041	739	na	na

Table 2 - Total Metals and Inorganics Results for Soil Samples
Former Spring Hill Mine Site

APNs 35-260-62, 63 and 64

Grass Valley, California

Sample Number	Sample Location	Sample Type	Sample Depth (feet bgs)	Sample Date	Total Arsenic (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)	Total Cyanide (mg/kg)	Total Nitrate (mg/kg)
TP-24-0.25	Test Pit 24	AS/NS	0.25	4/5/07	7.6	11.0	0.109	614	na	na
TP-25-0.75	Test Pit 25	AS/NS	0.75	4/5/07	2.5	1.6	0.171	314	na	na
TP-25-1.5	Test Pit 25	AS/NS	1.5	4/5/07	3.0	ND<1.0	0.105	274	na	na
TP-27-0.5	Test Pit 27	T	0.5	4/5/07	3.5	3.1	0.040	348	na	na
TP-27-2.0	Test Pit 27	T	2.0	4/5/07	2.6	2.6	0.039	211	na	na
S-11	S-11	T	0.25	4/5/07	35.0	20.8	19.5	488	na	na

Notes:

bgs- below ground surface

mg/kg - milligrams per kilogram

ND<1.0 - not detected at or above indicated laboratory reporting limit

na - not analyzed

WR/SP - waste rock and spoils pile

T - tailings

AS/NS - soil affected by mining or processing activities and native soil

Analysis for total arsenic, lead and nickel by U.S. EPA Test Method 6010B

Analysis for total mercury by U.S. EPA Test Method 7471A

Analysis for total cyanide by U.S. EPA Test Method 9014

Analysis for total nitrate by U.S. EPA Test Method 300.0

Table 3 - Total Metals Results for Background Soil Samples
Former Spring Hill Mine Site

APNs 35-260-62, 63 and 64

Grass Valley, California

Sample Number	Sample Location	Sample Depth (feet bgs)	Sample Date	Total Arsenic (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)
BG-1	BG-1	0 - 0.5	5/20/03	ND<1.0	6.0	0.069	na
BG-2	BG-2	0 - 0.5	5/20/03	ND<1.0	9.1	0.140	na
BG-3	BG-3	0 - 0.5	5/20/03	17	13	0.066	na
BG-4	BG-4	0 - 0.5	10/11/05	ND<1.0	20.4	na	na
BG-5	BG-5	0 - 0.5	10/11/05	ND<1.0	6.8	na	na
BG-6	BG-6	0 - 0.5	10/11/05	ND<1.0	15.0	na	na
S-12	S-12	0.25	4/18/07	ND<1.0	5.0	na	1,620
S-13	S-13	0.25	4/18/07	ND<1.0	3.1	na	1,680

Notes:

bgs- below ground surface

mg/kg - milligrams per kilogram

ND< - not detected at or above indicated laboratory reporting limit

na - not analyzed

Analysis for total arsenic, lead and nickel by U.S. EPA Test Method 6010B

Analysis for total mercury by U.S. EPA Test Method 7471A

Analysis for total cyanide by U.S. EPA Test Method 9014

Analysis for total nitrate by U.S. EPA Test Method 300.0

Table 4 - Title 22 Metals Results for Soil Samples
Former Spring Hill Mine Site
APNs 35-260-62, 63 and 64
Grass Valley, California

Analyte (mg/kg)	Sample Identification									*Laboratory Reporting Limit (mg/kg)*	*Residential CHHSL (mg/kg)*	*Industrial CHHSL (mg/kg)*	*TTLC (mg/kg)*	*STLC (mg/L)*
	FND-S5	WR-S13	WR-S17	TP-5-10	TP-9-0.5	TP-15-3	S-1	S-10	TP-21-0.75					
Antimony	10.2	12.2	6.9	5.0	7.0	6.2	4.3	9.9	12.4	*1.0*	*30*	*380*	*500*	*15*
Arsenic	22.3	20.2	45.8	94.6	ND	10.6	27.6	377	302	*1.0*	*0.07*	*0.24*	*500*	*5*
Barium	7.1	9.5	12.5	5.5	11.1	4.0	48.3	103	71.7	*2.0*	*5,200*	*63,000*	*10,000*	*100*
Beryllium	ND<0.3	ND<0.3	ND<0.3	ND	ND	ND	ND	ND	ND	*0.5*	*150*	*1,700*	*75*	*0.75*
Cadmium	0.8	1.1	0.7	1.2	1.5	1.0	2.3	2.6	3.4	*1.0*	*1.7*	*7.5*	*100*	*1.0*
Chromium	26	55.3	26.3	39.1	20.8	60.4	962	43.2	85.9	*1.0*	*100,000*	*100,000*	*2500*	*560*
Hex. Chromium	na	na	ND	na	na	na	na	na	na	*0.001*	*17*	*37*	*500*	*5*
Cobalt	49.5	41.3	47.3	19.1	56.3	13.1	41.3	21.4	79.4	*5.0*	*660*	*3,200*	*8000*	*80*
Copper	17.9	94.2	26.2	31.2	36.6	11.8	72.0	235	467	*2.0*	*3,000*	*38,000*	*2500*	*25*
Lead	21.6	12.2	37.1	12.3	6.9	18.4	300	348	615	*1.0*	*150*	*3,500*	*1000*	*5*
Mercury	0.276	0.189	0.129	0.193	0.215	1.08	0.231	22.5	10.8	*0.010*	*18*	*180*	*20*	*0.2*
Molybdenum	ND	ND	ND	ND	ND	ND	3.7	1.1	ND	*1.0*	*380*	*4,800*	*3500*	*350*
Nickel	677	464	680	285	1,050	278	977	303	471	*1.0*	*1,600*	*16,000*	*2000*	*20*
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	*2.0*	*380*	*4,800*	*100*	*1.0*
Silver	ND	ND	ND	ND	ND	ND	ND	16.7	21.8	*2.0*	*380*	*4,800*	*500*	*5*
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	*2.0*	*5.0*	*63*	*700*	*7.0*
Vanadium	23.5	48.1	20.4	29.0	16.6	54.6	948	47.4	79.4	*2.0*	*530*	*6,700*	*2400*	*24*
Zinc	38.4	31.9	29.8	20.9	17.7	21.4	129	165	318	*2.0*	*23,000*	*100,000*	*5000*	*250*

Notes:
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
ND = Not detected at or above the laboratory reporting limit
CHHSL = California Human Health Screening Level
TTLC = Total threshold limit concentration
STLC = Soluble threshold limit concentration
na = Not analyzed

The laboratory reporting limit for mercury in sample S-10 was 0.050 mg/kg.

Table 5 - DI-WET Solubility Analysis Results

Former Spring Hill Mine Site

APNs 35-260-62, 63 and 64

Grass Valley, California

Sample Number	Sample Date	DI-WET As (ug/L)	DI-WET Pb (ug/L)	DI-WET Hg (ug/L)	DI-WET Ni (ug/L)
WR-17	10/11/05	ND<10	ND<10	na	ND<10
FND-S5	10/25/05	ND<10	ND<10	na	ND<10
FND-S6	10/25/05	ND<10	ND<10	na	ND<10
TP-5-10	3/13/07	44.7	ND<6	ND<0.333	ND<10
TP-5-10*	3/13/07	ND<2.0	ND<1.2	na	32.7
TP-9-0.5	3/13/07	15.6	ND<6	ND<0.333	25.2
TP-15-3	3/14/07	15.1	ND<6	ND<0.333	ND<10
S-1	3/14/07	ND<10	ND<6	ND<0.333	48.1
S-10	3/23/07	26.1	9.3	ND<0.333	15.5
TP-21-0.75	4/5/07	26.5	11.6	ND<0.333	na
TP-2-6	3/13/07	11.3	1.4	na	4.5
TP-8-3	3/13/07	3.7	1.2	na	16.8
TP-8-6	3/13/07	6.3	ND<1.2	na	2.3
TP-9-6	3/13/07	24.7	ND<1.2	na	3.4
TP-13-2	3/14/07	3.4	1.4	na	10.9
TP-5-15	3/13/07	5.2	1.7	na	4.9
TP-15-5	3/14/07	ND<2.0	ND<1.2	na	6.2
TP-16-0.5A	3/14/07	ND<2.0	ND<1.2	na	10.5
TP-17-4	3/14/07	ND<2.0	ND<1.2	na	8.9
S-12**	4/18/07	ND<10.0	ND<6.0	na	58.5
S-13**	4/18/07	18.6	ND<6.0	na	26.2

Notes:

DI = Deionized water
WET = Waste Extraction Test
As = Arsenic
Pb = Lead
Hg = Mercury
Ni = Nickel
ug/L = micrograms per liter
ND< = Not detected above indicated laboratory reporting limit
na = Not analyzed
* = TP-5-10 was re-analyzed using lower reporting limits for As, Pb and Ni.
** = Background sample

The As, Pb and Ni analysis of the extract was conducted using EPA Test Method 6010B.
The mercury analysis of the extract was condcuted using EPA Test Method 7471.

Table 6 - Acid-Base Accounting Results
Spring Hill Property
APNs 35-260-62, 63 and 64
Grass Valley, California

Sample Number	Sample Date	AGP Sulfide	AGP Total	NP	NP/Total AGP	pH
FND-S5	10/25/2005	0.9	1.9	180	94.7	9.14
WR-S17	10/11/2005	1.9	2.5	150	60.0	9.54
TP-8-6	3/13/2007	11	13	250	19.2	9.42
TP-17-4	3/13/2007	ND<0.3	ND<0.3	320	1066.7	9.77

Notes:

mg/kg = Milligrams per kilogram

AGP = Acid generating potential (tons/1000 tons)

NP = Neutralizing potential (tons/1000 tons)

Reporting limit used for non-detectable results to calculate NP/AGP.

Table 7a - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Surface Water for Current Site Conditions

APNs 35-260-62, 63 and 64
Grass Valley, California

Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	10	2 µg/L
Lead	2.0 µg/L[3]	10	2 µg/L
Mercury	1.2 µg/L[4]	10	1.2 µg/L
Nickel	12 µg/L[5]	10	12 µg/L

Notes:

1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water

µg/L = micrograms per liter

Table 7b - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Surface Water Proposed On Site Placement

APNs 35-260-62, 63 and 64
Grass Valley, California

Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	100	20 µg/L
Lead	2.0 µg/L[3]	100	20 µg/L
Mercury	1.2 µg/L[4]	100	12 µg/L
Nickel	12 µg/L[5]	100	120 µg/L

Notes:

1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water

µg/L = micrograms per liter

Table 8a - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Groundwater for Current Site Conditions

APNs 35-260-62, 63 and 64
Grass Valley, California

Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	10	2 µg/L
Lead	2.0 µg/L[3]	10	2 µg/L
Mercury	1.2 µg/L[4]	10	1.2 µg/L
Nickel	12 µg/L[5]	10	12 µg/L

Notes:

1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water

µg/L = micrograms per liter

Table 8b - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Groundwater Proposed On Site Placement

APNs 35-260-62, 63 and 64
Grass Valley, California

Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	100	20 µg/L
Lead	2.0 µg/L[3]	100	20 µg/L
Mercury	1.2 µg/L[4]	100	12 µg/L
Nickel	12 µg/L[5]	100	120 µg/L

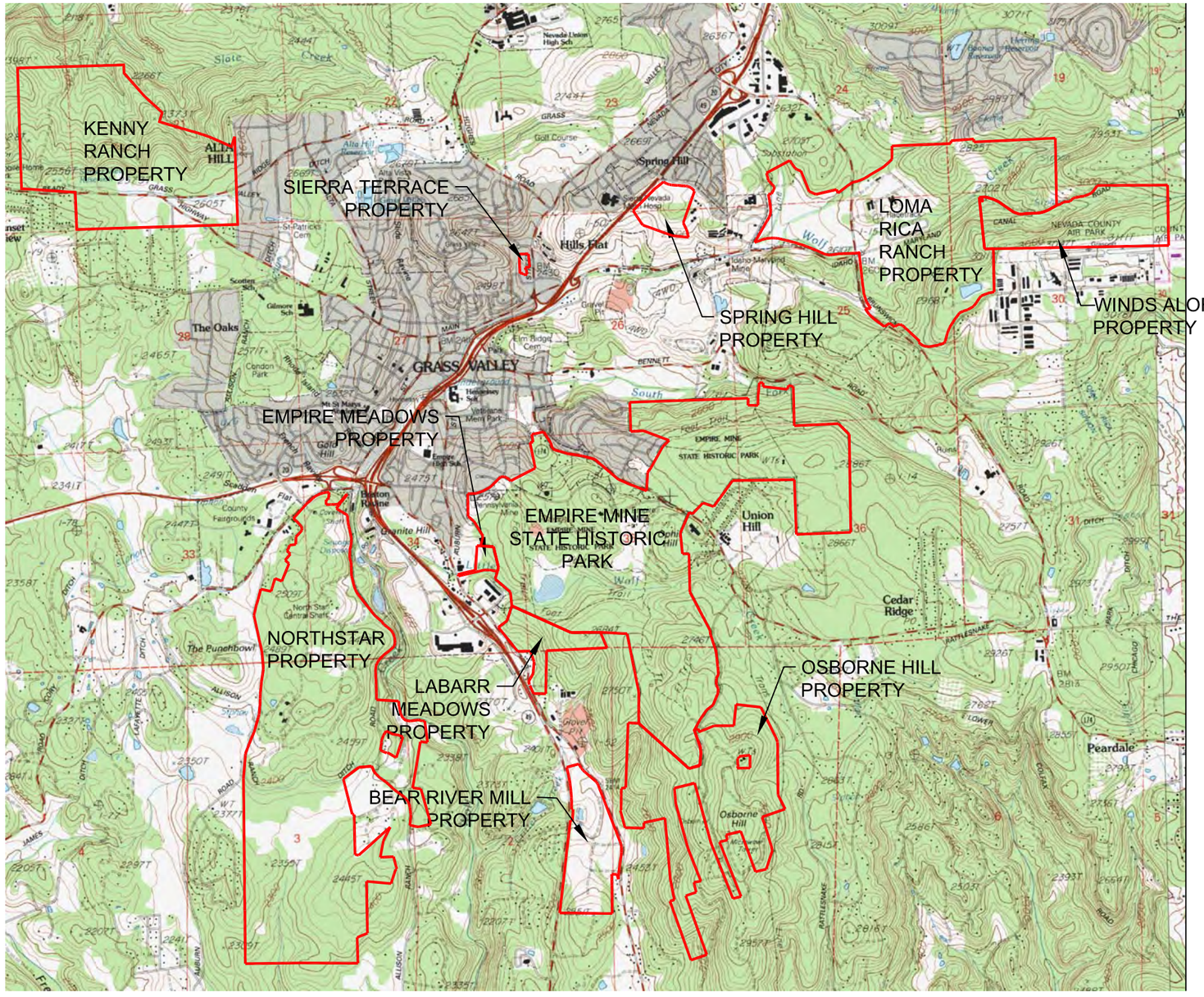
Notes:

1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water

µg/L = micrograms per liter

APPENDIX C

Background Soil Metals Data



SOURCE: USGS 7.5 minute topographic map, Grass Valley, California quadrangle, 1995.

3292–02–ARSENIC

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SITE VICINITY MAP SHOWING NEARBY PEA SITES
SPRING HILL MINE PROPERTY
GRASS VALLEY, CALIFORNIA

DRAWN BY: DFD	CHECKED BY: SLD
PROJECT NO.: 3292–02	
DATE: JANUARY 2008	
FIGURE NO.: A–1	

LEGEND

(FOR DETAILED GEOLOGIC DESCRIPTIONS SEE TABLE 4, APPENDIX A)

① FORMER SPRING HILL MINE
(ULTRAMAFIC ROCKS AND SERPENTINE)

② NORTH STAR
(DIABASE, QUARTZ DIORITE)

③ KENNY RANCH
(METASEDIMENTARY AND ULTRAMAFIC ROCKS)

④ OSBORNE HILL
(DIABASE, QUARTZ DIORITE)

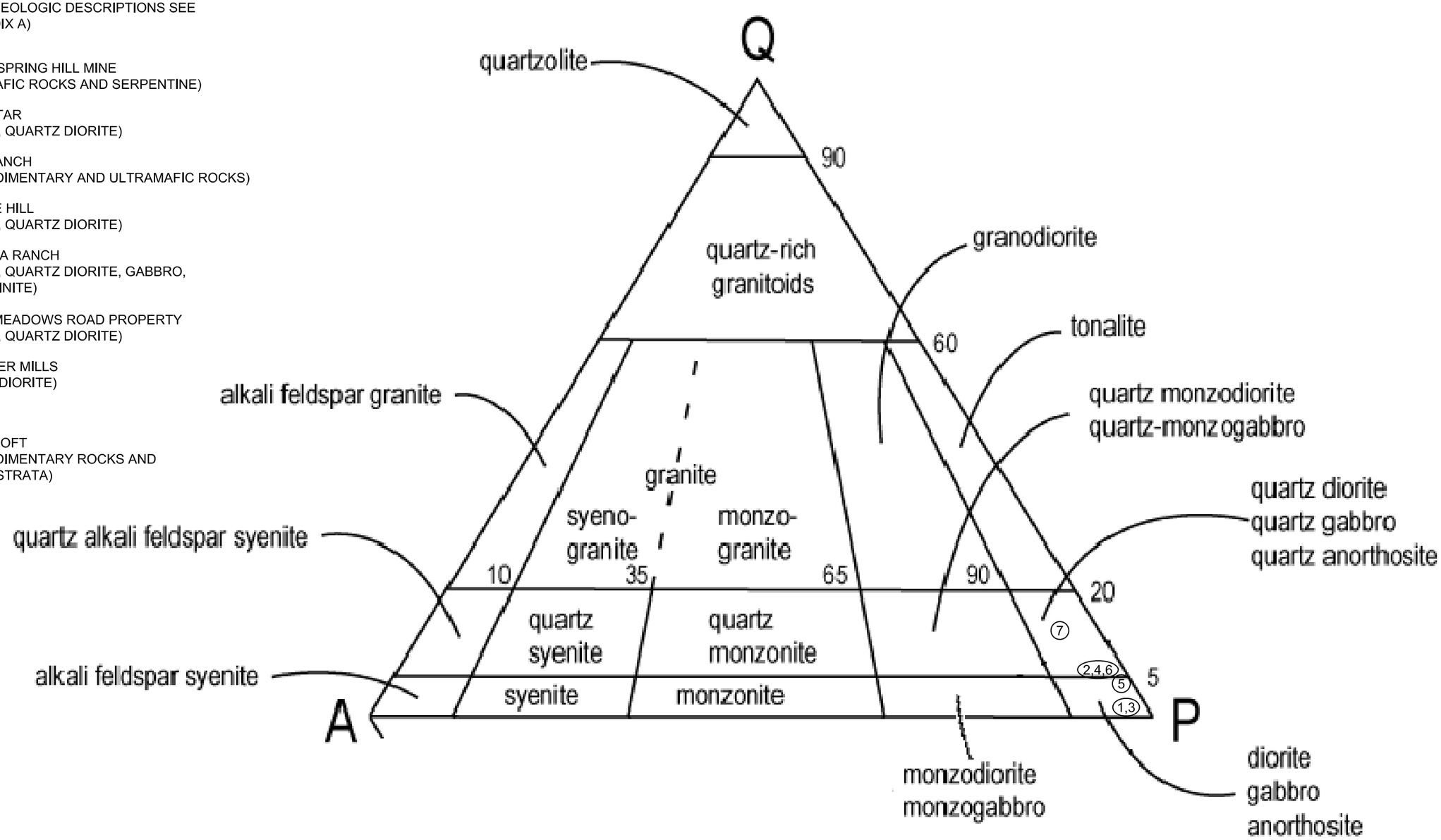
⑤ LOMA RICA RANCH
(DIABASE, QUARTZ DIORITE, GABBRO, SERPENTINITE)

⑥ LABARR MEADOWS ROAD PROPERTY
(DIABASE, QUARTZ DIORITE)

⑦ BEAR RIVER MILLS
(QUARTZ DIORITE)

NOT PLOTTED

⑧ WINDS ALOFT
(METASEDIMENTARY ROCKS AND CLASTIC STRATA)



3292–02–FIG–APP–A

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PREDOMINANT GEOLOGIC COMPOSITION OF ROCKS AT PEA SITES
IN THE VICINITY OF GRASS VALLEY, CA
FORMER SPRING HILL MINE PROPERTY
GRASS VALLEY, CALIFORNIA

DRAWN BY: DFD	CHECKED BY: SLD
PROJECT NO.: 3292–02	
DATE: JANUARY 2008	
FIGURE NO.: A–2	

Table 1
Total Arsenic in Background Soil Samples
Vicinity of Grass Valley, Nevada County, California

				EPA 6010B (mg/kg)
	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic
North Star Mine Property	BG-2	11/10/03	0 - 0.5	12
	BG-3	11/10/03	0 - 0.5	19
	BG-4	11/10/03	0 - 0.5	6.7
	BG-5	8/16/05	0 - 0.5	16.7
	BG-6	8/16/05	0 - 0.5	5.3
	BG-7	8/16/05	0 - 0.5	27.4
	BG-8	8/16/05	0 - 0.5	1.8
	BG-9	8/16/05	0 - 0.5	2.8
	BG-10	8/16/05	0 - 0.5	ND< 0.5
	BG-11	8/16/05	0 - 0.5	1.3
	BG-12	8/17/05	0 - 0.5	ND< 0.5
	BG-13	8/17/05	0 - 0.5	ND< 0.5
	BG-14	8/17/05	0 - 0.5	3.5
	BG-15	8/17/05	0 - 0.5	1.8
	BG-16	8/17/05	0 - 0.5	ND< 0.5
	BG-17	8/17/05	0 - 0.5	6.6
	BG-18	8/17/05	0 - 0.5	2.9
	BG-19	8/17/05	0 - 0.5	14.8
	BG-20	8/17/05	0 - 0.5	8.7
	BG-21	8/30/05	0 - 0.5	4.4
	BG-22	8/30/05	0 - 0.5	4.1
	BG-23	8/30/05	0 - 0.5	1.9
	BG-24	8/30/05	0 - 0.5	3.1
	BG-25	8/30/05	0 - 0.5	3.8
	BG-26	8/30/05	0 - 0.5	4.0
	BG-27	8/1/06	0 - 0.5	6.3
	BG-28	8/1/06	0 - 0.5	36.7
	BG-29	8/1/06	0 - 0.5	1.3
	BG-30	8/1/06	0 - 0.5	3.7
	BG-31	8/1/06	0 - 0.5	2.3
	BG-32	8/1/06	0 - 0.5	3.2
	BG-33	8/1/06	0 - 0.5	3.3
	BG-34	8/1/06	0 - 0.5	1.2
	BG-35	8/4/06	0 - 0.5	3.1
	BG-36	8/1/06	0 - 0.5	7.2
	BG-37	8/4/06	0 - 0.5	2.4
	BG-38	8/4/06	0 - 0.5	8.9
	BG-39	8/1/06	0 - 0.5	3.5
	BG-40	8/1/06	0 - 0.5	ND<1.0
	BG-41	8/3/06	0 - 0.5	2.7
	BG-42	8/3/06	0 - 0.5	ND<1.0
	BG-43	8/3/06	0 - 0.5	1.1
	BG-44	8/3/06	0 - 0.5	1.7
	BG-45	8/3/06	0 - 0.5	1.7
	BG-46	8/3/06	0 - 0.5	ND<1.0

Table 1
Total Arsenic in Background Soil Samples
Vicinity of Grass Valley, Nevada County, California

				EPA 6010B (mg/kg)
	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic
North Star Mine Property	BG-47	8/4/06	0 - 0.5	26.7
	BG-T1S1	9/28/05	0 - 0.5	6.1
	BG-T1S2	9/28/05	1.0	6.5
	BG-T1S3	9/28/05	2.0	10.1
	BG-T1S4	9/28/05	4.0	11.5
	BG-T2S1	9/28/05	0 - 0.5	13.9
	BG-T2S2	9/28/05	1.0	7.9
	BG-T2S3	9/28/05	2.0	14.8
	BG-T2S4	9/28/05	4.0	11.0
	BG-T2S5	9/28/05	6.0	7.8
	BG-T2S6	9/28/05	8.0	3.0
	BGT3-S1	10/5/05	0 - 0.5	13.7
	BGT3-S2	10/5/05	4.0	3.2
	BGT3-S3	10/5/05	8.0	ND<1.0
	BGT3-S3B	10/5/05	8.0	ND<1.0
	BGT4-S1	8/4/06	0 - 0.5	3.3
	BGT4@5'	8/4/06	5.0	ND<1.0
	BGT4@10'	8/4/06	10.0	1.5
	BGT5-S1	8/4/06	0 - 0.5	1.3
	BGT5@5'	8/4/06	5.0	3.8
	BGT5@10'	8/4/06	10.0	1.3
	BGT6-S1	8/4/06	0 - 0.5	3.2
	BGT6@5'	8/4/06	5.0	2.1
	BGT6@9.5'	8/4/06	9.5	2.5
	BGT7-S1	8/4/06	0 - 0.5	1.5
	BGT7@5'	8/4/06	5.0	5.3
	BGT7@10'	8/4/06	10.0	ND<1.0
	BGT8-S1	8/4/06	0 - 0.5	6.5
	BGT8@5'	8/4/06	5.0	ND<1.0
	BGT8@9'	8/4/06	9.0	ND<1.0
	BGT9-S1	8/4/06	0 - 0.5	10.1
	BGT9@5'	8/4/06	5.0	8.6
	BGT9@10'	8/4/06	10.0	6.3
	BGT10-S1	8/4/06	0 - 0.5	4.3
	BGT10@5'	8/4/06	5.0	6.4
	BGT10@10'	8/4/06	10.0	ND<1.0
	BGT11-S1	8/4/06	0 - 0.5	1.6
	BGT11@5'	8/4/06	5.0	ND<1.0
	BGT11@8'	8/4/06	8.0	1.0
	BGT12-S1	8/4/06	0 - 0.5	ND<1.0
	BGT12@4.5'	8/4/06	4.5	1.6
	BGT12@6.0'	8/4/06	6.0	ND<1.0
	BGT13-S1	8/4/06	0 - 0.5	3.0
	BGT13@5'	8/4/06	5.0	6.7
	BGT13@10'	8/4/06	10.0	10.3

Table 1
Total Arsenic in Background Soil Samples
Vicinity of Grass Valley, Nevada County, California

				EPA 6010B (mg/kg)
	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic
Kenny Ranch	BG-1A	11/13/01	0.5	8.0
	BG-2A	11/13/01	0.5	5.5
	BG-3A	11/13/01	0.5	6.0
	BG-4A	11/13/01	0.5	6.8
	BG-5	3/12/02	0.5	ND<0.3
	BG-6	3/12/02	0.5	ND<0.3
	BG-7	3/12/02	0.5	ND<0.3
	BG-8	3/12/02	0.5	ND<0.3
	BG-9	3/12/02	0.5	ND<0.3
	BG-10	3/12/02	0.5	ND<0.3
Winds Aloft Property	BG-1	8/12/04	0.5	2.3
	BG-2	8/12/04	0.5	ND<2.0
	BG-3	8/12/04	0.5	2.4
	BG-4	8/12/04	0.5	1.0
	BG-5	4/11/05	0.5	6.0
	BG-6	4/11/05	0.5	2.8
	BG-7	8/3/05	0.5	12.8
	BG-8	8/3/05	0.5	19.1
	BG-9	8/3/05	0.5	1.3
	BG-10	8/3/05	0.5	0.9
	BG-11	8/3/05	0.5	2.9
	BG-12	8/3/05	0.5	1.0
Osborne Hill Property	BG-1	4/5/2004	0.5	5.8
	BG-2	4/5/2004	0.5	7.6
	BG-3	4/2/2004	0.5	10
	BG-4	4/2/2004	0.5	6.5
	BG-5	4/2/2004	0.5	4.8
	BG-7	4/5/2004	0.5	3.6
	BG-9	4/5/2004	0.5	2.8
	OHE-1	4/13/2006	0.5	7.7
	OHE-2	4/13/2006	0.5	8.9
	OHE-3	4/13/2006	0.5	6.8
	OHE-4	4/13/2006	0.5	9.0
	OHE-5	4/13/2006	0.5	6.3
	OHE-6	4/13/2006	0.5	6.0
	OHE-6-2.0	4/18/2006	2.0	ND<1.0
	OHE-6-4.0	4/18/2006	4.0	ND<1.0
	OHE-6-6.0	4/18/2006	6.0	ND<1.0
	OHE-7	4/13/2006	0.5	4.4
	OHE-8	4/13/2006	0.5	5.3
	OHE-8-2.0	4/18/2006	2.0	ND<1.0
	OHE-8-4.0	4/18/2006	4.0	ND<1.0
	OHE-9	4/13/2006	0.5	9.2
	OHE-10	4/13/2006	0.5	2.5
	OHE-11	4/13/2006	0.5	ND<1.0
	OHE-12	4/13/2006	0.5	13.7

Table 1
Total Arsenic in Background Soil Samples
Vicinity of Grass Valley, Nevada County, California

				EPA 6010B (mg/kg)
	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic
Loma Rica Ranch	M1-BG1	11/26/2003	0.5	9.4
	M1-BG2	11/26/2003	0.5	14
	M2-BG1	12/4/2003	0.5	20
	M2-BG2	12/4/2003	0.5	5.6
	M3-BG1	11/26/2003	0.5	ND<2.0
	LR-BG1	10/25/2005	0.5	2.5
	LR-BG2	10/25/2005	0.5	7.3
	LR-BG3	10/25/2005	0.5	ND<1.0
	LR-BG4	10/25/2005	0.5	ND<1.0
	LR-BG5	10/25/2005	0.5	ND<1.0
	LR-BG6	10/25/2005	0.5	13.3
	LR-BG7	10/25/2005	0.5	2.1
	LR-BG8	10/25/2005	0.5	2.5
	LR-BG9	10/25/2005	0.5	1.0
	LR-BG10	10/25/2005	0.5	2.6
	LR-BG11	10/25/2005	0.5	2.8
	LR-BG12	10/25/2005	0.5	2.9
La Barr Meadows Property	LBM-4	9/11/2003	0.5	3.9
	BG-1	6/2/2005	0.5	4.0
	BG-2	5/25/2005	0.5	4.6
	BG-3	5/25/2005	0.5	4.5
	BG-4	5/25/2005	0.5	3.3
	BG-5	5/25/2005	0.5	7.4
	BG-6	6/2/2005	0.5	15.3
	BG-7	6/2/2005	0.5	4.4
	LBM-AMB1	8/10/2006	0.5	2.1
	LBM-AMB2	8/10/2006	0.5	7.7
	LBM-AMB3-0.5'	8/11/2006	0.5	1.2
	LBM-AMB3-5.0'	8/11/2006	5.0	3.4
	LBM-AMB3-10.0	8/11/2006	10.0	ND<1.0
	LBM-AMB4	8/10/2006	0.5	3.1
	LBM-AMB5	8/10/2006	0.5	2.5
	LBM-AMB6	8/10/2006	0.5	2.9
	LBM-AMB7	8/10/2006	0.5	3.1
	LBM-AMB8	8/10/2006	0.5	ND<1.0
	LBM-AMB9	8/10/2006	0.5	1.2
	LBM-AMB10-0.5'	8/11/2006	0.5	ND<1.0
	LBM-AMB10-5.0'	8/11/2006	5.0	1.3
	LBM-AMB10-10.0'	8/11/2006	10.0	ND<1.0
	LBM-AMB11	8/10/2006	0.5	4.1
	LBM-AMB-13	8/10/2006	0.5	5.1
	LBM-AMB-14	8/10/2006	0.5	1.0
	M2-SS5-5.0'	8/11/2006	5.0	2.7
	M5-SS1-5.0'	8/11/2006	5.0	2.0
	M8-SS7-5.0'	8/11/2006	5.0	ND<1.0
	Area1-SS2-0.5'	8/11/2006	0.5	ND<1.0

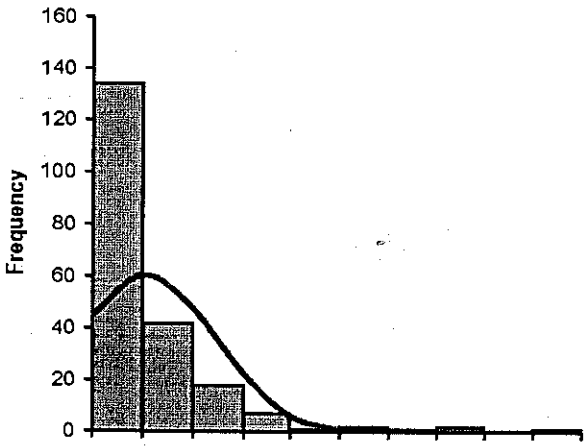
Table 1
Total Arsenic in Background Soil Samples
Vicinity of Grass Valley, Nevada County, California

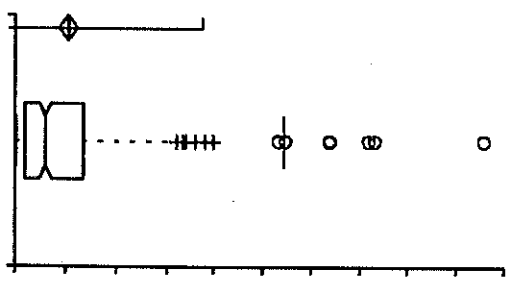
				EPA 6010B (mg/kg)
	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic
Bear River Mill Property	BG1A-6	--	0.5	11
	BG1B-6	--	0.5	4.4
	BG1C-6	--	0.5	9.6
	BG1A-10	--	10.0	6.7
	BG1B-10	--	10.0	18
	BG1C-8	--	10.0	9.1
	BG2A-6	--	0.5	36
	BG2B-6	--	0.5	14
	BG2C-6	--	0.5	13
	BG3A-6	--	0.5	32
	BG3B-6	--	0.5	ND<0.25
	BG3C-6	--	0.5	ND<0.25
	BG2A-7.5	--	7.5	48
	BG2B-7.5	--	7.5	0.85
	BG2C-7.5	--	7.5	1.2
	BG3A-7.5	--	7.5	16
	BG3B-7	--	7.5	ND<0.25
	BG3C-7.5	--	7.5	ND<0.25
Former Spring Hill Mine Property	BG-1	5/20/2003	0 - 0.5	ND<1.0
	BG-2	5/20/2003	0 - 0.5	ND<1.0
	BG-3	5/20/2003	0 - 0.5	17
	BG-4	10/11/2005	0 - 0.5	ND<1.0
	BG-5	10/11/2005	0 - 0.5	ND<1.0
	BG-6	10/11/2005	0 - 0.5	ND<1.0
	S-12	4/18/2007	0.25	ND<1.0
	S-13	4/18/2007	0.25	ND<1.0

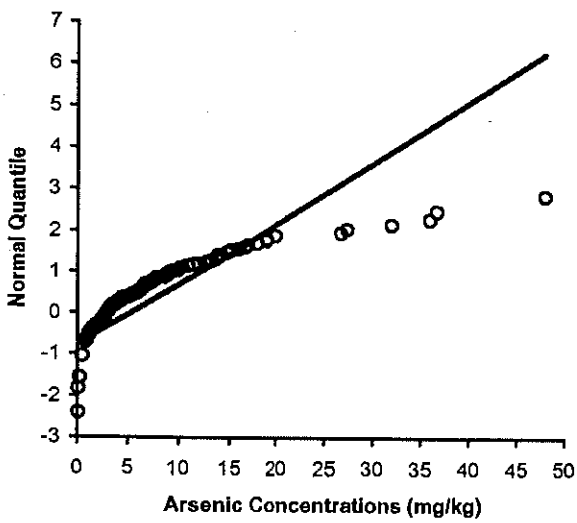
Notes

EPA = Environmental Protection Agency
mg/kg = milligrams per kilogram
RL = laboratory reporting limit
ND< = not detected at or above the referenced reporting limit.
na = not analyzed

Test	**Continuous summary descriptives**
Variable	Non-transformed Background Arsenic Concentrations (mg/kg), Spring Hill Mine Property
Performed by	Holdrege and Kull
Date	10 December 2007







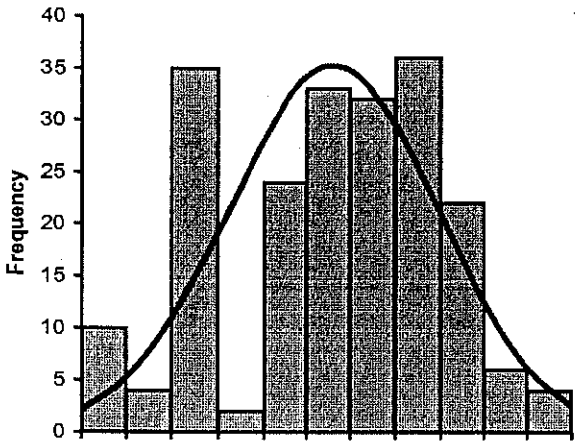
n	208
Mean	5.320
95% CI	4.383 to 6.257
Variance	47.0093
SD	6.8563
SE	0.4754
CV	129%

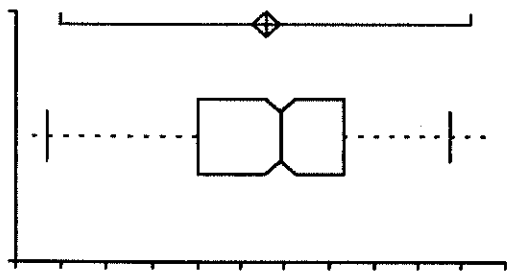
Median	3.050
95.6% CI	2.500 to 3.700
Range	47.875
IQR	5.775

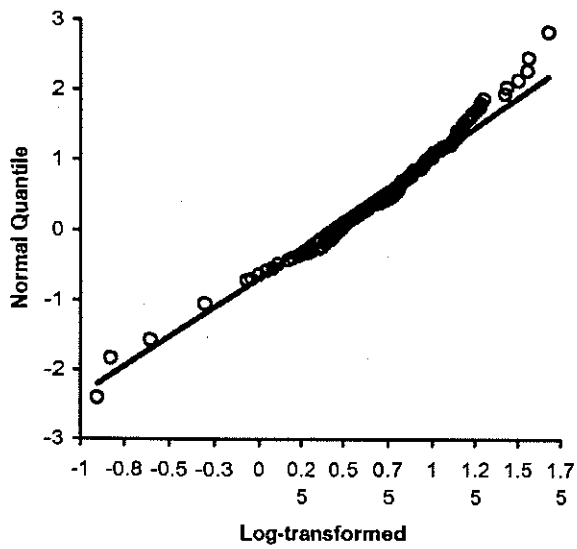
Percentile	
2.5th	0.150
25th	1.000
50th	3.050
75th	6.775
97.5th	27.243

	Coefficient	**p**
Shapiro-Wilk	0.6945	<0.0001
Skewness	2.9120	<0.0001
Kurtosis	11.4269	<0.0001

Test	**Continuous summary descriptives**
Variable	Log-transformed Arsenic Background Concentrations, Spring Hill Mine Property
Performed by	Holdrege and Kull
Date	10 December 2007







n	208
Mean	0.401
95% CI	0.321 to 0.481
Variance	0.3453
SD	0.5876
SE	0.0407
CV	147%

Median	0.484
95.6% CI	0.398 to 0.568
Range	2.584331224
IQR	0.830900385

Percentile	
2.5th	-0.824
25th	0.000
50th	0.484
75th	0.831
97.5th	1.435

	Coefficient	**p**
Shapiro-Wilk	0.9676	0.0001
Skewness	-0.3185	0.0597
Kurtosis	-0.6099	0.0126

Table 2 - Descriptive Statistics for Local Background Arsenic Data
Former Spring Hill Mine Property
Project No. 3292-01

Descriptive Statistic	Value
Sample size (n)	208
Frequency of Arsenic Detection	157/208 (75%)
Mean (μ)	5.320
Median	3.050
Standard Deviation	6.8563
Standard Error on the Mean	0.4754
Coefficent of Variation (CV)	1.29
Minimum Value[1]	0.13
Maxmium Value	48.00
Lower Quartile (Q1)	1.000
Upper Quartile (Q3)	6.775

Note:
1 Minimum value corresponds to samples BG3B-6, BG3C-6, BG3B-7 and BG3C-7.5 from the Bear River Mill Property, in which total arsenic was not detected above the laboratory reporting limit of 0.25 mg/kg. A value equal to half of the reporting limit was used for total arsenic concentration. See Table 1.

Table 3 - Descriptive Statistics for Log-Transformed Local Background Arsenic Data
Former Spring Hill Mine Property
Project No. 3292-01

Descriptive Statistic	Value
Sample size (n)	208
Frequency of Arsenic Detection	157/208 (75%)
Mean (μ)	0.401
Median	0.484
Standard Deviation	0.5876
Standard Error on the Mean	0.0407
Coefficent of Variation (CV)	1.47
Minimum Value[1]	-0.903
Maxmium Value	1.681
Lower Quartile (Q1)	0.000
Upper Quartile (Q3)	0.831

Note:
1 Minimum value corresponds to samples BG3B-6, BG3C-6, BG3B-7 and BG3C-7.5 from the Bear River Mill Property, in which total arsenic was not detected above the laboratory reporting limit of 0.25 mg/kg. A value equal to half of the reporting limit was used for total arsenic concentration. See Table 1.

Table 4. Geologic Conditions at PEA Sites in the Vicinity of Grass Valley, California
Former Spring Hill Mine Property
Project No. 3292-02

PEA Site Location	Geologic Description
Former Spring Hill Mine Property	Based on the Geologic Map of the Grass Valley - Colfax Area (A. Tuminas, 1983)[1], the site is mapped as serpentine rocks of the Early Mesozoic aged Ultramafic- Mafic "Basement" Unit of the Lake Combie Complex. According to the Mineral Land Classification of Nevada County (Special Report 164, California Department of Conservation Division of Mines and Geology, 1990), the site geology is mapped as the ultramafic unit of the Jurassic-aged Lake Combie Complex.
North Star Mine Property	According to the Tuminas map[1], the northern approximately half of the subject site and a small area in the southwestern corner of the site are underlain by early Mesozoic massive diabase unit of the Lake Combie complex. Early Cretaceous La Barr Meadows quartz diorite is depicted in the southern third of the site and in areas to the east and northeast of the site. The middle portion of the site is underlain by Quaternary alluvium. A fault contact identified as the Wolf Creek Fracture Zone is depicted along and running parallel to the central and southern portions of the western property boundary. Areas to the east of the fracture zone, including a narrow strip of land along the western central property boundary are depicted as late Paleozoic to early Mesozoic aged, undifferentiated chert and shale of the Clipper Gap Unit.
Kenny Ranch Property	The Geologic Map of the Chico Quadrangle, California (Chico Quadrangle)[2] published by the California Department of Conservation Division of Mines and Geology in 1992 indicates that the northern portion of project site is underlain by Paleozoic and Mesozoic aged metasedimentary and ultramafic rock and that the southern portion of the site is underlain by Tertiary aged volcanic rock.
Winds Aloft Property	The Tuminas map[1] describes the geology underlying the majority of the site as Tertiary clastic strata. Metasedimentary rock is depicted on the northwestern portion of the site. The Tertiary clastic strata depicted on the site is likely underlain by metasedimentary rock, although the contact between the metasedimentary rock and the massive diabase and volcanic rocks associated with the adjacent Lake Combie Complex is obscured by the Tertiary clastic strata.
Osborne Hill Property	According to the Tuminas map[1], the subject site is underlain by early Mesozoic massive diabase associated with the Lake Combie complex. Intrusive, early Cretaceous La Barr Meadows quartz diorite is depicted near the westernmost property boundary, a short distance east of La Barr Meadows Road. Rocks associated with the Lake Combie complex are overlain by Tertiary clastic deposits northeast of the subject site.
Loma Rica Ranch Property	According to the Chico Quadrangle map[2], the subject site is underlain by Mesozoic to Paleozoic ultramafic rocks. According to the Tuminas map[1], four main rock units underlie the subject site. Oriented generally from west to east, these rock units are the early Mesozoic Lake Combie massive diabase, the undifferentiated Clipper Gap-Colfax transition zone, the early Mesozoic Lake Combie massive to undifferentiated gabbro to quartz diorite, and the Lake Combie serpentinite.
La Barr Meadows Road Property	According to the Chico Quadrangle map[2], the subject site is underlain by Mesozoic quartz diorite, intrusive rocks and massive diabase of the Lake Combie Complex.
Bear River Mill Property	According to the Tuminas map[1], the site is underlain by early Cretaceous, La Barr Meadows quartz diorite. The Chico Quadrangle map[2] indicates that the project site is underlain by Mesozoic plutonic rock, including quartz diorite, tonalite, trondhjemite, and quartz monzonite.

Notes:
1 Tuminas, A., 1983. Geologic Map of the Grass Valley - Colfax Area.
2 California Department of Conservation, Division of Mines and Geology, 1992, Geologic Map of the Chico Quadrangle.

EXCELCHEM
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ELAP Certificate No. : 2119

11 July 2008

Sean Dunbar

Holdrege & Kull-Nevada City

792 Searls Avenue

Nevada City, CA 95959

RE: Spring Hill RAW

Workorder number:0806211

Enclosed are the results of analyses for samples received by the laboratory on 06/30/08 10:05. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

_____

John Somers, Lab Director

Excelchem Environmental Labs

Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S-14	0806211-01	Soil	06/27/08 08:00	06/30/08 10:05
S-15	0806211-02	Soil	06/27/08 08:00	06/30/08 10:05
S-16	0806211-03	Soil	06/27/08 08:00	06/30/08 10:05
S-17	0806211-04	Soil	06/27/08 08:00	06/30/08 10:05
S-18	0806211-05	Soil	06/27/08 08:00	06/30/08 10:05
S-19	0806211-06	Soil	06/27/08 08:00	06/30/08 10:05
S-20	0806211-07	Soil	06/27/08 08:00	06/30/08 10:05
S-21	0806211-08	Soil	06/27/08 08:00	06/30/08 10:05
S-22	0806211-09	Soil	06/27/08 08:00	06/30/08 10:05
S-23	0806211-10	Soil	06/27/08 08:00	06/30/08 10:05

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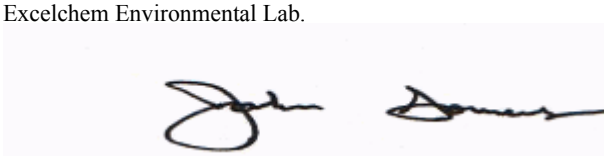

Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Environmental Labs

Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-14

0806211-01 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**8.9**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**7.6**	1.0	"	"	"	"	"	
Cobalt	**94.7**	5.0	"	"	"	"	"	
Copper	**61.7**	2.0	"	"	"	"	"	
Vanadium	**117**	2.0	"	"	"	"	"	

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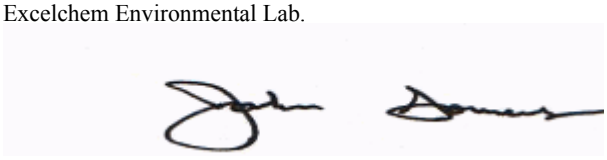

Laboratory Representative

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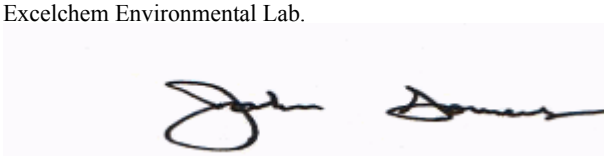
Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-15
0806211-02 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**17.1**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**9.7**	1.0	"	"	"	"	"	
Cobalt	**128**	5.0	"	"	"	"	"	
Copper	**55.9**	2.0	"	"	"	"	"	
Vanadium	**92.7**	2.0	"	"	"	"	"	

Excelchem Environmental Lab.



Laboratory Representative

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Excelchem Environmental Labs

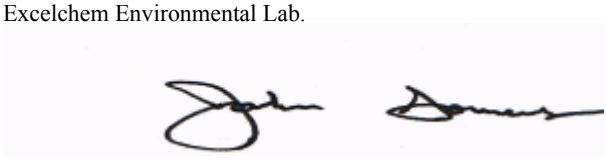
Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-16

0806211-03 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**20.1**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**11.5**	1.0	"	"	"	"	"	
Cobalt	**126**	5.0	"	"	"	"	"	
Copper	**49.3**	2.0	"	"	"	"	"	
Vanadium	**98.7**	2.0	"	"	"	"	"	

Excelchem Environmental Lab.



Laboratory Representative

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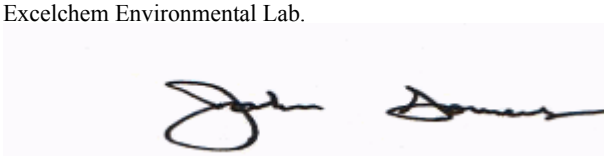
Excelchem Environmental Labs

Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-17
0806211-04 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**21.1**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**12.7**	1.0	"	"	"	"	"	
Cobalt	**177**	5.0	"	"	"	"	"	
Copper	**39.6**	2.0	"	"	"	"	"	
Vanadium	**91.6**	2.0	"	"	"	"	"	

Excelchem Environmental Lab.



Laboratory Representative

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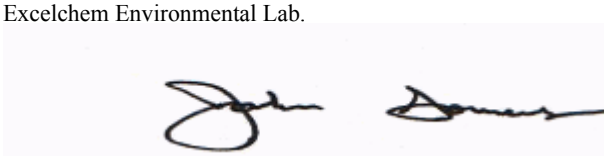
Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-18

0806211-05 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**15.1**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**9.3**	1.0	"	"	"	"	"	
Cobalt	**134**	5.0	"	"	"	"	"	
Copper	**35.4**	2.0	"	"	"	"	"	
Vanadium	**51.9**	2.0	"	"	"	"	"	

Excelchem Environmental Lab.



Laboratory Representative

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Excelchem Environmental Labs

Holdrege & Kull-Nevada City	Project:	Spring Hill RAW	
792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-19

0806211-06 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**16.1**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**10.8**	1.0	"	"	"	"	"	
Cobalt	**122**	5.0	"	"	"	"	"	
Copper	**19.7**	2.0	"	"	"	"	"	
Vanadium	**67.9**	2.0	"	"	"	"	"	

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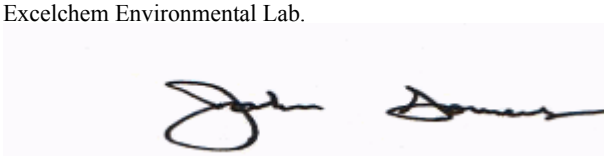

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Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-20

0806211-07 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**21.6**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**12.8**	1.0	"	"	"	"	"	
Cobalt	**161**	5.0	"	"	"	"	"	
Copper	**25.3**	2.0	"	"	"	"	"	
Vanadium	**56.2**	2.0	"	"	"	"	"	

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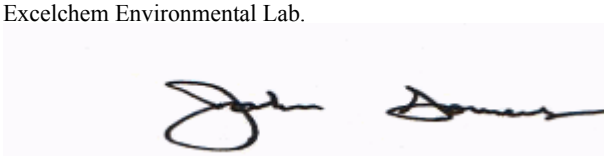

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Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-21

0806211-08 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**25.2**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**12.9**	1.0	"	"	"	"	"	
Cobalt	**185**	5.0	"	"	"	"	"	
Copper	**34.3**	2.0	"	"	"	"	"	
Vanadium	**75.5**	2.0	"	"	"	"	"	

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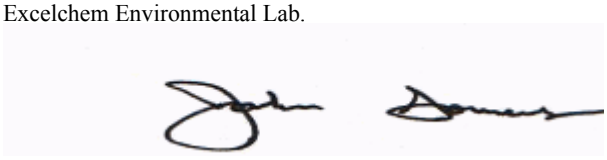

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Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-22

0806211-09 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**26.8**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**13.8**	1.0	"	"	"	"	"	
Cobalt	**179**	5.0	"	"	"	"	"	
Copper	**31.0**	2.0	"	"	"	"	"	
Vanadium	**89.9**	2.0	"	"	"	"	"	

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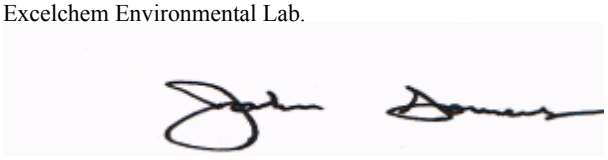

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Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

S-23

0806211-10 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
METALS BY 6000/7000 SERIES								
Antimony	**13.9**	1.0	mg/kg	ARG0055	07/09/08	07/09/08	EPA 6010B	
Cadmium	**7.4**	1.0	"	"	"	"	"	
Cobalt	**86.4**	5.0	"	"	"	"	"	
Copper	**35.3**	2.0	"	"	"	"	"	
Vanadium	**72.5**	2.0	"	"	"	"	"	

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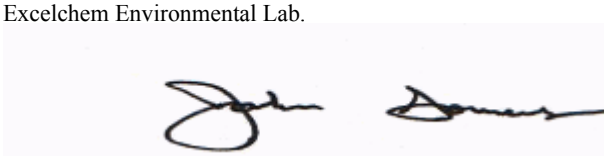

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METALS BY 6000/7000 SERIES - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ARG0055 - EPA 6010B										
Blank (ARG0055-BLK1)				Prepared & Analyzed: 07/09/08						
Antimony	ND	1.0	mg/kg							
Cadmium	ND	1.0	"							
Cobalt	ND	5.0	"							
Copper	ND	2.0	"							
Vanadium	ND	2.0	"							
LCS (ARG0055-BS1)				Prepared: 07/08/08 Analyzed: 07/09/08						
Antimony	93.7	1.0	mg/kg	100		93.7	75-125			
Cadmium	94.6	1.0	"	100		94.6	75-125			
Cobalt	98.1	5.0	"	100		98.1	75-125			
Copper	93.4	2.0	"	100		93.4	75-125			
Vanadium	94.5	2.0	"	100		94.5	75-125			
LCS Dup (ARG0055-BSD1)				Prepared: 07/08/08 Analyzed: 07/09/08						
Antimony	94.0	1.0	mg/kg	100		94.0	75-125	0.349	25	
Cadmium	93.9	1.0	"	100		93.9	75-125	0.788	25	
Cobalt	97.1	5.0	"	100		97.1	75-125	0.967	25	
Copper	93.1	2.0	"	100		93.1	75-125	0.367	25	
Vanadium	93.2	2.0	"	100		93.2	75-125	1.38	25	
Matrix Spike (ARG0055-MS1)	**Source: 0806203-01**			Prepared: 07/08/08 Analyzed: 07/09/08						
Antimony	93.3	1.0	mg/kg	100	5.96	87.4	75-125			
Cadmium	95.5	1.0	"	100	5.92	89.5	75-125			
Cobalt	101	5.0	"	100	8.48	93.0	75-125			
Copper	191	2.0	"	100	69.9	121	75-125			
Vanadium	224	2.0	"	100	112	112	75-125			
Matrix Spike Dup (ARG0055-MSD1)	**Source: 0806203-01**			Prepared: 07/08/08 Analyzed: 07/09/08						
Antimony	92.6	1.0	mg/kg	100	5.96	86.7	75-125	0.778	25	
Cadmium	93.5	1.0	"	100	5.92	87.6	75-125	2.04	25	
Cobalt	100	5.0	"	100	8.48	91.9	75-125	1.15	25	
Copper	167	2.0	"	100	69.9	96.7	75-125	13.5	25	
Vanadium	203	2.0	"	100	112	90.9	75-125	10.0	25	

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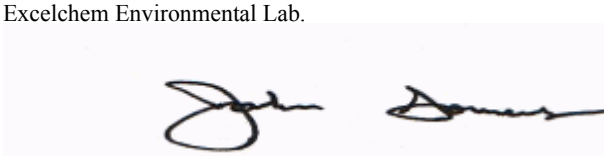

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Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

Notes and Definitions

ND - Analyte not detected at reporting limit.

NR - Not reported

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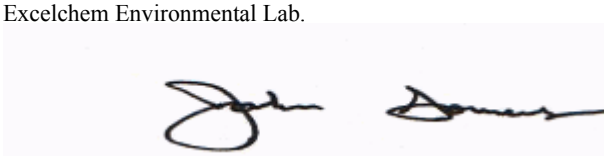

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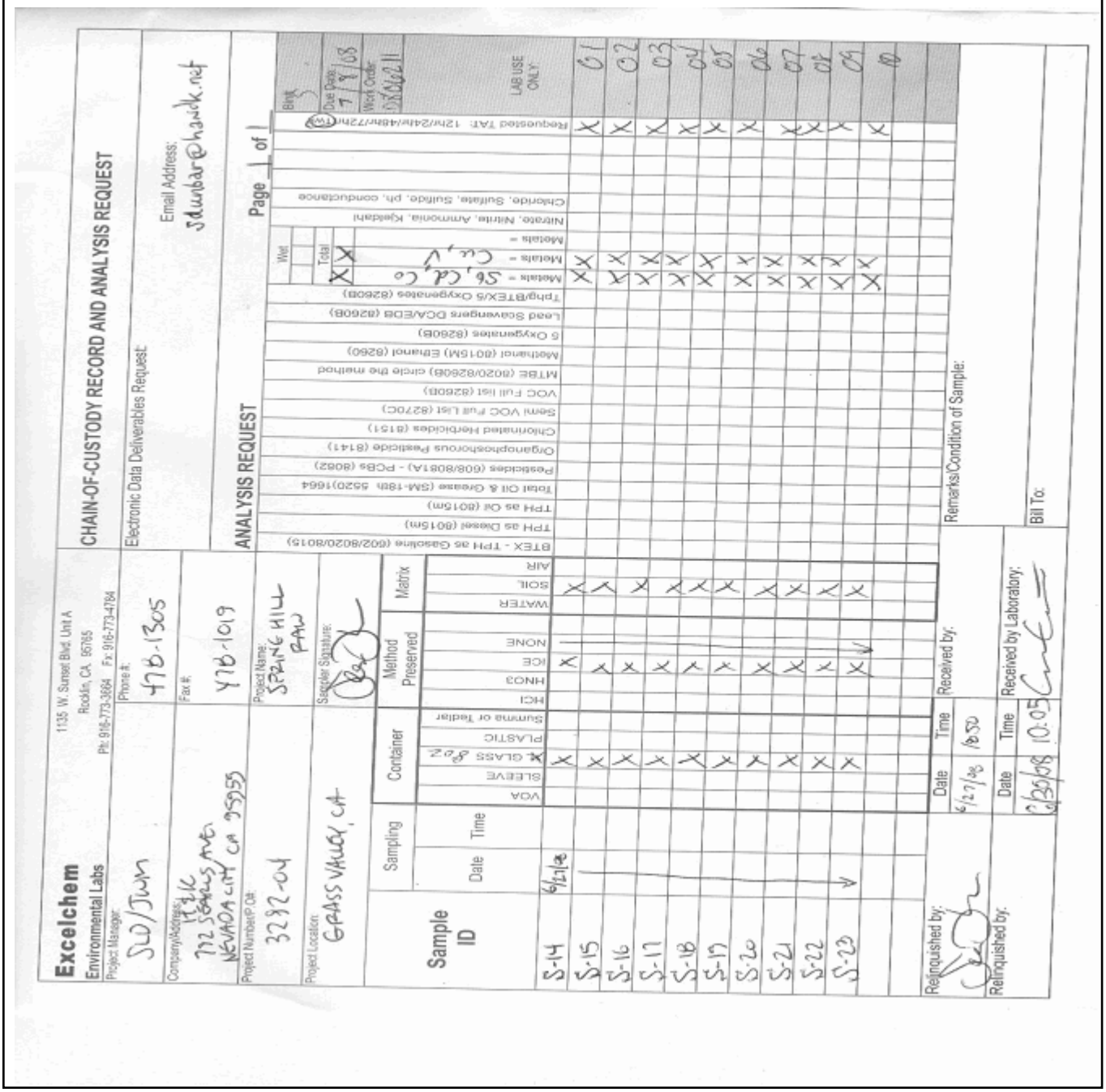

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792 Searls Avenue	Project Number:	3292-04	Date Reported:
Nevada City, CA 95959	Project Manager:	Sean Dunbar	07/11/08 11:24

APPENDIX D

HHSE Data

Risk and Hazard Calculation Spreadsheets

Table 1a - Summary of Statistics for Former Mill Area
Spring Hill Property
Project No. 3292-01

Constituent	As	Pb	Hg	Ni	Sb	Ba	Be	Cd	Cr	Co	Cu	Mo	Se	Ag	Tl	V	Z
Population	12	12	12	9	3	3	3	3	3	3	3	3	3	3	3	3	3
Minimum	ND<1	18.4	0.059	104	4.3	48.3	ND<0.5	2.3	43.2	21.4	72	1.1	ND<2	16.7	ND<2	47.4	129
Maximum	579	810	19.5	1180	**12.4**	**103**	ND<0.5	**3.4**	**962**	**79.4**	**467**	**3.7**	ND<2	**21.8**	ND<2	**948**	**318**
Mean	153	213	4	391	8.9	74.3	ND<0.5	2.8	364	47.4	258	2.4	ND<2	19.3	ND<2	358	204
Distribution	gamma	gamma	gamma	gamma	na	na	na	na	na	na	na	na	na	na	na	na	na
UCL method	App Gamma	App Gamma	App Gamma	App Gamma	na	na	na	na	na	na	na	na	na	na	na	na	na
UCL value	**348**	**408**	**10.1**	**640**	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 1b - Summary of Statistics for Mine Waste Rock and Tailings, Exclusive of Former Mill Area
Spring Hill Property
Project No. 3292-01

Constituent	As	Pb	Hg	Ni	Sb	Ba	Be	Cd	Cr	Co	Cu	Mo	Se	Ag	Tl	V	Z
Population	86	86	86	53	6	6	6	6	6	6	6	6	6	6	6	6	6
Minimum	ND<1	ND<1	ND<0.01	85.8	5	4	ND<0.5	0.7	20.8	13.1	11	ND<1	ND<2	ND<2	ND<2	16.1	17.7
Maximum	94.6	341	1.29	1290	**12.2**	**12.5**	ND<0.5	**1.5**	**60.4**	**56.3**	**94.2**	ND<1	ND<2	ND<2	ND<2	**54.6**	**38.4**
Mean	9.1	19.8	0.81	402	7.9	8.3	ND<0.5	1.1	38	37.8	36.3	ND<1	ND<2	ND<2	ND<2	32	27.6
Distribution	non-param	non-param	gamma	gamma	na	na	na	na	na	na	na	na	na	na	na	na	na
UCL method	97.5 Cheb	97.5 Cheb	App Gamma	App gamma	na	na	na	na	na	na	na	na	na	na	na	na	na
UCL value	**21.9**	**36.1**	**0.22**	**466**	na	na	na	na	na	na	na	na	na	na	na	na	na

Table 1c - Summary of Statistics for Background Soil
Spring Hill Property
Project No. 3292-01

Constituent	As	Pb	Hg	Ni	Sb	Ba	Be	Cd	Cr	Co	Cu	Mo	Se	Ag	Tl	V	Z
Population	8	8	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum	<1	3.1	0.066	1620	na	na	na	na	na	na	na	na	na	na	na	na	na
Maximum	17	20.4	0.14	1680	na	na	na	na	na	na	na	na	na	na	na	na	na
Mean	**2.6**	9.8	**0.09**	**1650**	na	na	na	na	na	na	na	na	na	na	na	na	na
Distribution	non-param	normal	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
UCL method	99 Cheb	Student's-t	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
UCL value	23.1	**13.7**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Notes:
Soil concentrations are shown in milligrams per kilograms (mg/kg)
Bold values are used as EPCs.
App Gamma = Approximate Gamma UCL
97.5 Cheb = 97.5% Chebyshev (Mean, Sd) UCL
99 Cheb = 99% Chebyshev (Mean, Sd) UCL
na = not applicable or not available
ND< = constituent not detected at concentration greater than the listed laboratory reporting limit
non-param = non-parametric

Table 2 - Toxicity Values[1]
Spring Hill Property
Project No. 3292-01

Analyte	RfDo (mg/kg-day)				RfDi (mg/kg-day)					Sfo (mg/kg-day)$^{-1}$		Sfi (mg/kg-day)$^{-1}$			ABS
	IRIS	PPRTV	HEAST	NCEA	IRIS	PPRTV	REL[2]	OEHHA[3]	HEAST	IRIS	OEHHA	IRIS	PPRTV	OEHHA	DTSC
Antimony	**4.E-04**	--	--	--	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01
Arsenic[4]	**3.E-04**	--	--	--	NL	--	0.03	**8.57E-06**	--	1.5	**9.45**	15.0	--	**12.0**	0.03
Barium	**2.E-01**	--	--	--	NL	--	NL	NL	**1.4E-04**	NL	NL	NL	--	NL	0.01
Cadmium[5]	**5.E-04**	--	--	--	NL	--	0.02	**5.71E-06**	--	**NL**	3.80E-01	**6.3**	--	15.0	0.001
Chromium III	**1.5**	--	--	--	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01
Cobalt	NL	**2.E-02**	6.0E-02	--	NL	**5.7E-06**	NL	NL	--	NL	NL	NL	**9.8**	NL	0.01
Copper	NL	--	**3.7E-02**	--	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01
Lead	NL	--	--	--	NL	--	NL	NL	--	NL	**8.50E-03**	NL	--	**4.20E-02**	0.01
Mercury[6]	**3.E-04**	--	--	--	**8.57.E-05**	--	0.09	2.57E-05	--	NL	NL	NL	--	NL	0.01
Molybdenum	**5.E-03**	--	5.0E-03	--	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01
Nickel	**2.E-02**	--	--	--	NL	--	0.05	**1.43E-05**	--	NL	NL	NL	--	**9.10E-01**	0.01
Silver	**5.E-03**	--	--	--	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01
Vanadium[7]	9.E-03	--	7.0E-03	**1.0E-03**	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01
Zinc	**3.E-01**	--	--	--	NL	--	NL	NL	--	NL	NL	NL	--	NL	0.01

Notes:
ABS = screening level dermal absorption fraction from soil (Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
HEAST = US EPA Office of Research and Development, Health Effects Assessment Summary Tables, July 1997 (cited in PRG Table)
IRIS = Integrated Risk Information System (http://www.epa.gov/iris/subst/index.html#z)
NL = not listed
OEHHA = Office of Environmental Health Hazard Assessment, California Cancer Potency Values, December 2001 (www.oehha.ca.gov/risk/chemicalDB/index.asp)
NCEA = US EPA National Center for Envrionmental Assessment (http://cfpub.epa.gov/ncea/)
PPRTV = Provisional Peer Reviewed Toxicity Values, US EPA OSWER Office of Superfund Remediation Technology Inovation (OSRTI) (cited in PRG Table)
PRG Table = US EPA Region 9 PRG Table (http://www.epa.gov/Region9/waste/sfund/prg/files/prgtable2004.xls)
REL = chronic reference exposure level
RfC = reference concentraton
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfi = cancer slope factor for inhalation exposure
Sfo = cancer slope factor for oral exposure
URF = unit risk factor

1 Toxicity values used for risk characterization are depicted in bold text.
2 RELs [ug/m^3] adopted by OEHHA as of December 2001 (http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html)
3 RfDi [mg/kg-day] = REL [ug/m^3] * (mg/10^{3}ug)(20m^3/day)(70 kg)$^{-1}$
4 Arsenic Sfi [(mg/kg-day)$^{-1}$] = IRIS inhalation unit risk (4.3E-3 per ug/m^3) * (10^{3}ug/mg)(70 kg)(20m3/day)$^{-1}$. Use of OEHHA Sfi for arsenic recommended by DTSC Human and Ecological Risk Division (HERD).
5 Cadmium Sfo not used, as HERD does not consider cadmium to be a carcinogen by the oral exposure route. Cadmium Sfi [(mg/kg-day)$^{-1}$] = 1.8E-3 per ug/m^3 * (1000 ug/mg)(70kg)(20 m^3/day)$^{-1}$.
6 Mercury RfDi [mg/kg-day] = RfC (3.4E-4 mg/m^3)*(20 m^3/day)(70 kg)$^{-1}$. Use of IRIS RfDi for Mercury recommended by HERD. Mercury RfDo listed by IRIS for mercuric chloride.
7 Use of NCEA RfDo for vanadium recommended by HERD. Value cited in PRG Table.

Table 3 - Summary of Risk/Hazard Calculations for Former Mill Area, Standard Exposure Scenario (Unrestricted Land Use)
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	maximum	4.E-04	4.E-04	NL	NL	0.01	12.4	9.42E-09	4.07E-01	1.51E-05	4.07E-01			0.00E+00
Arsenic	Approximate Gamma UCL	3.E-04	8.57E-06	9.45	12.0	0.03	348	2.64E-07	1.61E+01	1.97E-02	1.61E+01	5.50E-03	4.72E-07	5.50E-03
Barium	maximum	2.E-01	1.4E-04	NL	NL	0.01	103	7.83E-08	6.77E-03	3.57E-04	7.13E-03			0.00E+00
Cadmium	maximum	5.E-04	5.7E-06	NL	6.3	0.001	3.4	2.58E-09	8.72E-02	2.89E-04	8.75E-02		2.42E-09	2.42E-09
Chromium III	maximum	1.5	1.5	NL	NL	0.01	962	7.31E-07	8.43E-03	3.12E-07	8.43E-03			0.00E+00
Cobalt	maximum	2.E-02	5.7E-06	NL	9.8	0.01	79.4	6.03E-08	5.22E-02	6.77E-03	5.89E-02		8.79E-08	8.79E-08
Copper	maximum	3.7E-02	3.7E-02	NL	NL	0.01	467	3.55E-07	1.66E-01	6.13E-06	1.66E-01			0.00E+00
Mercury	Approximate Gamma UCL	3.E-04	8.57E-05	NL	NL	0.01	10.1	7.67E-09	4.42E-01	5.72E-05	4.43E-01			0.00E+00
Molybdenum	maximum	5.E-03	5.E-03	NL	NL	0.01	3.7	2.81E-09	9.73E-03	3.59E-07	9.73E-03			0.00E+00
Silver	maximum	5.E-03	5.E-03	NL	NL	0.01	21.8	1.66E-08	5.73E-02	2.12E-06	5.73E-02			0.00E+00
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	948	7.20E-07	1.25E+01	4.61E-04	1.25E+01			0.00E+00
Zinc	maximum	3.E-01	3.E-01	NL	NL	0.01	318	2.42E-07	1.39E-02	5.15E-07	1.39E-02			0.00E+00
TOTAL									2.98E+01	2.77E-02	**3.E+01**	5.50E-03	5.62E-07	**6.E-03**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	6	n/a	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	350	350	days/yr	PEA Guidance Manual
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	PEA Guidance Manual
ED, exposure duration	6	24	yr	Human-Exposure-Based Screening Numbers
IRs, soil ingestion rate	200	100	mg/day	PEA Guidance Manual
IRa, inhalation rate	10	20	m^3/day	PEA Guidance Manual
BW, body weight	15	70	kg	PEA Guidance Manual
SA, exposed skin surface area	2,800	5,700	cm^2	Human-Exposure-Based Screening Numbers
AF, adherance factor	0.2	0.07	mg/cm^2	Human-Exposure-Based Screening Numbers
PEF, particulate emission factor	1.316E+09	1.316E+09	m^3/kg	Human-Exposure-Based Screening Numbers

Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)

Table 4 - Summary of Risk/Hazard Calculations for Mine Waste Rock and Tailings (excluding Former Mill Area), Standard Exposure Scenario (Unrestricted Land Use)
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Antimony	maximum	4.E-04	4.E-04	NL	NL	0.01	12.2	9.27E-09	4.01E-01	1.48E-05	4.01E-01			0.00E+00
Arsenic	97.5% Chebyshev UCL	3.E-04	8.57E-06	9.45	12.0	0.03	21.9	1.66E-08	1.01E+00	1.24E-03	1.01E+00	3.46E-04	2.97E-08	3.46E-04
Barium	maximum	2.E-01	1.4E-04	NL	NL	0.01	12.5	9.50E-09	8.21E-04	4.34E-05	8.65E-04			0.00E+00
Cadmium	maximum	5.E-04	5.7E-06	NL	6.3	0.001	1.5	1.14E-09	3.85E-02	1.28E-04	3.86E-02		1.07E-09	1.07E-09
Chromium III	maximum	1.5	1.5	NL	NL	0.01	60.4	4.59E-08	5.29E-04	1.96E-08	5.29E-04			0.00E+00
Cobalt	maximum	2.E-02	5.7E-06	NL	9.8	0.01	56.3	4.28E-08	3.70E-02	4.80E-03	4.18E-02		6.24E-08	6.24E-08
Copper	maximum	3.7E-02	3.7E-02	NL	NL	0.01	94.2	7.16E-08	3.35E-02	1.24E-06	3.35E-02			0.00E+00
Mercury	Approximate Gamma UCL	3.E-04	8.57E-05	NL	NL	0.01	0.22	1.67E-10	9.64E-03	1.25E-06	9.64E-03			0.00E+00
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	54.6	4.15E-08	7.18E-01	2.65E-05	7.18E-01			0.00E+00
Zinc	maximum	3.E-01	3.E-01	NL	NL	0.01	38.4	2.92E-08	1.68E-03	6.22E-08	1.68E-03			0.00E+00
TOTAL									2.25E+00	6.25E-03	**2.E+00**	3.46E-04	9.31E-08	**3.E-04**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	6	n/a	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	350	350	days/yr	PEA Guidance Manual
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	PEA Guidance Manual
ED, exposure duration	6	24	yr	Human-Exposure-Based Screening Numbers
IRs, soil ingestion rate	200	100	mg/day	PEA Guidance Manual
IRa, inhalation rate	10	20	m^3/day	PEA Guidance Manual
BW, body weight	15	70	kg	PEA Guidance Manual
SA, exposed skin surface area	2,800	5,700	cm^2	Human-Exposure-Based Screening Numbers
AF, adherance factor	0.2	0.07	mg/cm^2	Human-Exposure-Based Screening Numbers
PEF, particulate emission factor	1.316E+09	1.316E+09	m^3/kg	Human-Exposure-Based Screening Numbers

Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)

Table 5 - Summary of Risk/Hazard Calculations for Background Soil, Standard Exposure Scenario (Unrestricted Land Use)
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi [1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Arsenic	mean	3.E-04	8.57E-06	9.45	12.0	0.03	2.6	1.98E-09	1.20E-01	1.47E-04	1.20E-01	4.11E-05	3.53E-09	4.11E-05
Mercury	mean	3.E-04	8.57E-05	NL	NL	0.01	0.09	6.84E-11	3.94E-03	5.10E-07	3.94E-03			0.00E+00
TOTAL									1.24E-01	1.48E-04	**1.E-01**	4.11E-05	3.53E-09	**4.E-05**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	6	n/a	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	350	350	days/yr	PEA Guidance Manual
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	PEA Guidance Manual
ED, exposure duration	6	24	yr	Human-Exposure-Based Screening Numbers
IRs, soil ingestion rate	200	100	mg/day	PEA Guidance Manual
IRa, inhalation rate	10	20	m^3/day	PEA Guidance Manual
BW, body weight	15	70	kg	PEA Guidance Manual
SA, exposed skin surface area	2,800	5,700	cm^2	Human-Exposure-Based Screening Numbers
AF, adherance factor	0.2	0.07	mg/cm^2	Human-Exposure-Based Screening Numbers
PEF, particulate emission factor	1.316E+09	1.316E+09	m^3/kg	Human-Exposure-Based Screening Numbers

Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)

Table 6 - Summary of Risk/Hazard Calculations for Former Mill Area, Commercial Indoor Exposure Scenario
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	maximum	4.E-04	4.E-04	NL	NL	0.01	12.4	9.12E-09	1.72E-02	3.12E-06	1.72E-02			0.00E+00
Arsenic	Approximate Gamma UCL	3.E-04	8.57E-06	9.45	12.0	0.03	348	2.56E-07	7.92E-01	4.09E-03	7.96E-01	8.02E-04	1.50E-07	8.02E-04
Barium	maximum	2.E-01	1.4E-04	NL	NL	0.01	103	7.57E-08	2.85E-04	7.41E-05	3.59E-04			0.00E+00
Cadmium	maximum	5.E-04	5.7E-06	NL	6.3	0.001	3.4	2.50E-09	3.37E-03	5.99E-05	3.43E-03		7.71E-10	7.71E-10
Chromium III	maximum	1.5	1.5	NL	NL	0.01	962	7.07E-07	3.55E-04	6.46E-08	3.55E-04			0.00E+00
Cobalt	maximum	2.E-02	5.7E-06	NL	9.8	0.01	79.4	5.84E-08	2.20E-03	1.40E-03	3.60E-03		2.80E-08	2.80E-08
Copper	maximum	3.7E-02	3.7E-02	NL	NL	0.01	467	3.43E-07	6.99E-03	1.27E-06	6.99E-03			0.00E+00
Mercury	Approximate Gamma UCL	3.E-04	8.57E-05	NL	NL	0.01	10.1	7.43E-09	1.86E-02	1.19E-05	1.87E-02			0.00E+00
Molybdenum	maximum	5.E-03	5.E-03	NL	NL	0.01	3.7	2.72E-09	4.10E-04	7.45E-08	4.10E-04			0.00E+00
Silver	maximum	5.E-03	5.E-03	NL	NL	0.01	21.8	1.60E-08	2.41E-03	4.39E-07	2.42E-03			0.00E+00
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	948	6.97E-07	5.25E-01	9.55E-05	5.25E-01			0.00E+00
Zinc	maximum	3.E-01	3.E-01	NL	NL	0.01	318	2.34E-07	5.87E-04	1.07E-07	5.87E-04			0.00E+00
TOTAL									1.37E+00	5.74E-03	**1.E+00**	8.02E-04	1.79E-07	**8.E-04**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	25	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	25	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	50	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	14	m^3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	3,300	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.2	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.36E+09	m^3/kg	US EPA Supplimental Guidance

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa).
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)

Table 7 - Summary of Risk/Hazard Calculations for Waste Rock and Tailings (excluding Former Mill Area), Commercial Indoor Exposure Scenario
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	maximum	4.E-04	4.E-04	NL	NL	0.01	12.2	8.97E-09	1.69E-02	3.07E-06	1.69E-02			0.00E+00
Arsenic	97.5% Chebyshev UCL	3.E-04	8.57E-06	9.45	12.0	0.03	21.9	1.61E-08	4.99E-02	2.57E-04	5.01E-02	5.05E-05	9.45E-09	5.05E-05
Barium	maximum	2.E-01	1.4E-04	NL	NL	0.01	12.5	9.19E-09	3.46E-05	8.99E-06	4.36E-05			0.00E+00
Cadmium	maximum	5.E-04	5.7E-06	NL	6.3	0.001	1.5	1.10E-09	1.49E-03	2.64E-05	1.51E-03		3.40E-10	3.40E-10
Chromium III	maximum	1.5	1.5	NL	NL	0.01	60.4	4.44E-08	2.23E-05	4.06E-09	2.23E-05			0.00E+00
Cobalt	maximum	2.E-02	5.7E-06	NL	9.8	0.01	56.3	4.14E-08	1.56E-03	9.95E-04	2.55E-03		1.98E-08	1.98E-08
Copper	maximum	3.7E-02	3.7E-02	NL	NL	0.01	94.2	6.93E-08	1.41E-03	2.56E-07	1.41E-03			0.00E+00
Mercury	Approximate Gamma UCL	3.E-04	8.57E-05	NL	NL	0.01	0.22	1.62E-10	4.06E-04	2.59E-07	4.06E-04			0.00E+00
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	54.6	4.01E-08	3.02E-02	5.50E-06	3.02E-02			0.00E+00
Zinc	maximum	3.E-01	3.E-01	NL	NL	0.01	38.4	2.82E-08	7.09E-05	1.29E-08	7.09E-05			0.00E+00
TOTAL									1.02E-01	1.30E-03	**1.E-01**	5.05E-05	2.96E-08	**5.E-05**

Notes:

1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	25	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	25	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	50	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	14	m^3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	3,300	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.2	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.36E+09	m^3/kg	US EPA Supplimental Guidance

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa).
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)

Table 8 - Summary of Risk/Hazard Calculations for Former Mill Area, Construction Worker Exposure Scenario
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	maximum	4.E-04	4.E-04	NL	NL	0.01	12.4	9.39E-09	1.14E-01	4.60E-06	1.14E-01			0.00E+00
Arsenic	Approximate Gamma UCL	3.E-04	8.57E-06	9.45	12.0	0.03	348	2.64E-07	5.30E+00	6.02E-03	5.30E+00	2.15E-04	8.84E-09	2.15E-04
Barium	maximum	2.E-01	1.4E-04	NL	NL	0.01	103	7.80E-08	1.89E-03	1.09E-04	2.00E-03			0.00E+00
Cadmium	maximum	5.E-04	5.7E-06	NL	6.3	0.001	3.4	2.58E-09	2.23E-02	8.82E-05	2.23E-02		4.54E-11	4.54E-11
Chromium	maximum	1.5	1.5	NL	NL	0.01	962	7.29E-07	2.36E-03	9.51E-08	2.36E-03			0.00E+00
Cobalt	maximum	2.E-02	5.7E-06	NL	9.8	0.01	79.4	6.02E-08	1.46E-02	2.07E-03	1.67E-02		1.65E-09	1.65E-09
Copper	maximum	3.7E-02	3.7E-02	NL	NL	0.01	467	3.54E-07	4.64E-02	1.87E-06	4.64E-02			0.00E+00
Mercury	Approximate Gamma UCL	3.E-04	8.57E-05	NL	NL	0.01	10.1	7.65E-09	1.24E-01	1.75E-05	1.24E-01			0.00E+00
Molybdenum	maximum	5.E-03	5.E-03	NL	NL	0.01	3.7	2.80E-09	2.72E-03	1.10E-07	2.72E-03			0.00E+00
Silver	maximum	5.E-03	5.E-03	NL	NL	0.01	21.8	1.65E-08	1.60E-02	6.46E-07	1.60E-02			0.00E+00
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	948	7.18E-07	3.48E+00	1.41E-04	3.48E+00			0.00E+00
Zinc	maximum	3.E-01	3.E-01	NL	NL	0.01	318	2.41E-07	3.90E-03	1.57E-07	3.90E-03			0.00E+00
TOTAL									9.13E+00	8.45E-03	**9.E+00**	2.15E-04	1.05E-08	**2.E-04**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	1	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	1	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	330	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	20	m3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	5,700	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.8	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.32.E+09	m^3/kg	US EPA (2004)

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa): Linn W.S., Spier C.E., and J.D. Hackney. 1993. Activity Patterns in Ozone-exposed contstruction workers. J. Occ. Med.
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)
Threshold Limit Values and Biological Exposure Indices, American Converence of Governmental Industrial Hygenists (ACGIH 2004)

Table 9 - Summary of Risk/Hazard Calculations for Waste Rock and Tailings (excluding Former Mill Area), Construction Worker Exposure Scenario
Spring Hill Property
Project No. 3292-01

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	maximum	4.E-04	4.E-04	NL	NL	0.01	12.2	9.24E-09	1.12E-01	4.52E-06	1.12E-01			0.00E+00
Arsenic	97.5% Chebyshev UCL	3.E-04	8.57E-06	9.45	12.0	0.03	21.9	1.66E-08	3.33E-01	3.79E-04	3.34E-01	1.35E-05	5.57E-10	1.35E-05
Barium	maximum	2.E-01	1.4E-04	NL	NL	0.01	12.5	9.47E-09	2.30E-04	1.32E-05	2.43E-04			0.00E+00
Cadmium	maximum	5.E-04	5.7E-06	NL	6.3	0.001	1.5	1.14E-09	9.82E-03	3.89E-05	9.86E-03		2.00E-11	2.00E-11
Chromium	maximum	1.5	1.5	NL	NL	0.01	60.4	4.58E-08	1.48E-04	5.97E-09	1.48E-04			0.00E+00
Cobalt	maximum	2.E-02	5.7E-06	NL	9.8	0.01	56.3	4.27E-08	1.03E-02	1.46E-03	1.18E-02		1.17E-09	1.17E-09
Copper	maximum	3.7E-02	3.7E-02	NL	NL	0.01	94.2	7.14E-08	9.36E-03	3.77E-07	9.36E-03			0.00E+00
Mercury	Approximate Gamma UCL	3.E-04	8.57E-05	NL	NL	0.01	0.22	1.67E-10	2.70E-03	3.81E-07	2.70E-03			0.00E+00
Vanadium	maximum	1.E-03	1.E-03	NL	NL	0.01	54.6	4.14E-08	2.01E-01	8.09E-06	2.01E-01			0.00E+00
Zinc	maximum	3.E-01	3.E-01	NL	NL	0.01	38.4	2.91E-08	4.70E-04	1.90E-08	4.70E-04			0.00E+00
TOTAL									6.79E-01	1.91E-03	**7.E-01**	1.35E-05	1.75E-09	**1.E-05**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value	Units	Reference
ATc, averaging time (carcinogen)	70	yr	AT = lifetime for carcinogens
ATnc, averaging time (non-carcinogen)	1	yr	AT = ED for non-carcinogens
EFs, exposure frequency (ingestion)	250	days/yr	US EPA Supplimental Guidance
EFd, exposure frequency (dermal)	250	days/yr	US EPA Supplimental Guidance
EFi, exposure frequency (inhalation)	250	days/yr	US EPA Supplimental Guidance
ED, exposure duration	1	yr	US EPA Supplimental Guidance
IRs, soil ingestion rate	330	mg/day	US EPA Supplimental Guidance
IRa, inhalation rate	20	m3/day	US EPA Exposure Factors Handbook
BW, body weight	70	kg	US EPA Supplimental Guidance
SA, exposed skin surface area	5,700	cm^2	US EPA Risk Assessment Guidance
AF, adherance factor	0.8	mg/cm^2	US EPA Risk Assessment Guidance
PEF, particulate emission factor	1.32.E+09	m^3/kg	US EPA (2004)

US EPA Exposure Factors Handbook (EPA/600/P-95/002Fa): Linn W.S., Spier C.E., and J.D. Hackney. 1993. Activity Patterns in Ozone-exposed contstruction workers. J. Occ. Med.
US EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24) December 2002.
US EPA Risk Assessment Guidance for Superfund (RAGS), Part E, Chapter 3 and Appendix C (2004)
Threshold Limit Values and Biological Exposure Indices, American Converence of Governmental Industrial Hygenists (ACGIH 2004)

Table 10 - Summary of Human Health Screening Evaluation
Spring Hill Property
Project No. 3292-01

Assessment Area	Exposure Scenario					
	Standard (Unrestricted Land Use)		Commercial Indoor Worker		Construction Worker	
	Hazard	Risk	Hazard	Risk	Hazard	Risk
Former Mill Area	3.E+01	6.E-03	1.E+00	8.E-04	9.E+00	2.E-04
Waste Rock and Tailings (excluding Former Mill Area)	2.E+00	3.E-04	1.E-01	5.E-05	7.E-01	1.E-05
Background Soil	1.E-01	4.E-05	na	na	na	na

Hazard = Chronic health hazard index
Risk = Excess lifetime cancer risk

Table 11 - Summary of Lead Hazard Assessment, Standard Exposure Scenario
Spring Hill Property
Project No. 3292-05

Assessment Area	Exposure Point Concentration (EPC, mg/kg)	EPC Source	90th Percentile Estimate of Blood Lead (ug/dl)	
			Non-Pica Child	Adult Worker
Former Mill Area	408	Approximate Gamma UCL	5.3	0.7
Waste Rock and Tailings (excluding Former Mill Area)	36	97.5 Cheb	0.5	0.1
Background Soil	14	Student's-t UCL	0.2	0.0

Hazard = Chronic health hazard index
UCL = Upper Confidence Limit on the arithmetic mean
App Gamma = Approximate Gamma UCL
97.5 Cheb = 97.5% Chebyshev (Mean, Sd) UCL

Summary of Statistical Calculations

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\RA\stats\M	Variable:	Mill As

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	12
Minimum	0.5
Maximum	579
Mean	153.1667
Median	63.2
Standard Deviation	183.7101
Variance	33749.4
Coefficient of Variation	1.199413
Skewness	1.520397

Gamma Statistics	
k hat	0.607216
k star (bias corrected)	0.510968
Theta hat	252.2441
Theta star	299.7581
nu hat	14.57318
nu star	12.26322
Approx.Chi Square Value (.05)	5.399878
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	4.723129

Log-transformed Statistics	
Minimum of log data	-0.693147
Maximum of log data	6.361302
Mean of log data	4.015761
Standard Deviation of log data	1.982268
Variance of log data	3.929385

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.7956
Shapiro-Wilk 5% Critical Value	0.859
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	248.407

Gamma Distribution Test	
A-D Test Statistic	0.193329
A-D 5% Critical Value	0.776646
K-S Test Statistic	0.144125
K-S 5% Critical Value	0.25702
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	347.8443
Adjusted Gamma UCL	397.6848

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.893617
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	7502.217
95% Chebyshev (MVUE) UCL	1026.481
97.5% Chebyshev (MVUE) UCL	1350.723
99% Chebyshev (MVUE) UCL	1987.633

95% Non-parametric UCLs	
CLT UCL	240.3974
Adj-CLT UCL (Adjusted for skewness)	265.2682
Mod-t UCL (Adjusted for skewness)	252.2863
Jackknife UCL	248.407
Standard Bootstrap UCL	236.5253
Bootstrap-t UCL	332.6275
Hall's Bootstrap UCL	323.9538
Percentile Bootstrap UCL	244.0583
BCA Bootstrap UCL	261.3167
95% Chebyshev (Mean, Sd) UCL	384.3301
97.5% Chebyshev (Mean, Sd) UCL	484.3547
99% Chebyshev (Mean, Sd) UCL	680.8337

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\RA\stats\M	Variable:	Mill Pb

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	12
Minimum	18.4
Maximum	810
Mean	213.225
Median	129.75
Standard Deviation	235.5676
Variance	55492.1
Coefficient of Variation	1.104784
Skewness	1.633614

Gamma Statistics	
k hat	0.929816
k star (bias corrected)	0.752918
Theta hat	229.3195
Theta star	283.1983
nu hat	22.31559
nu star	18.07002
Approx.Chi Square Value (.05)	9.440109
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	8.503256

Log-transformed Statistics	
Minimum of log data	2.912351
Maximum of log data	6.697034
Mean of log data	4.736131
Standard Deviation of log data	1.245741
Variance of log data	1.55187

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.805487
Shapiro-Wilk 5% Critical Value	0.859
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	335.3497

Gamma Distribution Test	
A-D Test Statistic	0.385768
A-D 5% Critical Value	0.759227
K-S Test Statistic	0.205968
K-S 5% Critical Value	0.253041
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	408.15
Adjusted Gamma UCL	453.1183

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.941496
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	881.6684
95% Chebyshev (MVUE) UCL	606.125
97.5% Chebyshev (MVUE) UCL	771.3653
99% Chebyshev (MVUE) UCL	1095.948

95% Non-parametric UCLs	
CLT UCL	325.0792
Adj-CLT UCL (Adjusted for skewness)	359.3452
Mod-t UCL (Adjusted for skewness)	340.6945
Jackknife UCL	335.3497
Standard Bootstrap UCL	320.5682
Bootstrap-t UCL	404.7719
Hall's Bootstrap UCL	409.1273
Percentile Bootstrap UCL	329.15
BCA Bootstrap UCL	360.7667
95% Chebyshev (Mean, Sd) UCL	509.6411
97.5% Chebyshev (Mean, Sd) UCL	637.9006
99% Chebyshev (Mean, Sd) UCL	889.8415

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\RA\stats\M	Variable:	Mill Hg

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	12
Minimum	0.059
Maximum	19.5
Mean	4.388083
Median	1.34
Standard Deviation	5.783331
Variance	33.44691
Coefficient of Variation	1.317963
Skewness	1.835147

Gamma Statistics	
k hat	0.594492
k star (bias corrected)	0.501424
Theta hat	7.381237
Theta star	8.751238
nu hat	14.2678
nu star	12.03418
Approx.Chi Square Value (.05)	5.248543
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	4.583115

Log-transformed Statistics	
Minimum of log data	-2.830218
Maximum of log data	2.970414
Mean of log data	0.43814
Standard Deviation of log data	1.755901
Variance of log data	3.083187

RECOMMENDATION
Data follow gamma distribution (0.05)
Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.754187
Shapiro-Wilk 5% Critical Value	0.859
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	7.386319

Gamma Distribution Test	
A-D Test Statistic	0.297856
A-D 5% Critical Value	0.77763
K-S Test Statistic	0.182808
K-S 5% Critical Value	0.257217
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	10.06127
Adjusted Gamma UCL	11.52208

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.959961
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	75.75532
95% Chebyshev (MVUE) UCL	19.21666
97.5% Chebyshev (MVUE) UCL	25.09812
99% Chebyshev (MVUE) UCL	36.65112

95% Non-parametric UCLs	
CLT UCL	7.134173
Adj-CLT UCL (Adjusted for skewness)	8.079208
Mod-t UCL (Adjusted for skewness)	7.533726
Jackknife UCL	7.386319
Standard Bootstrap UCL	6.985879
Bootstrap-t UCL	8.999414
Hall's Bootstrap UCL	8.958826
Percentile Bootstrap UCL	7.281583
BCA Bootstrap UCL	7.944333
95% Chebyshev (Mean, Sd) UCL	11.66528
97.5% Chebyshev (Mean, Sd) UCL	14.81413
99% Chebyshev (Mean, Sd) UCL	20.99944

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\RA\stats\M	Variable:	Mill Ni

Raw Statistics	
Number of Valid Samples	9
Number of Unique Samples	9
Minimum	104
Maximum	1180
Mean	390.8889
Median	278
Standard Deviation	322.0689
Variance	103728.4
Coefficient of Variation	0.82394
Skewness	2.157031

Gamma Statistics	
k hat	2.304867
k star (bias corrected)	1.610652
Theta hat	169.5928
Theta star	242.6898
nu hat	41.48761
nu star	28.99174
Approx.Chi Square Value (.05)	17.7001
Adjusted Level of Significance	0.02308
Adjusted Chi Square Value	15.86679

Log-transformed Statistics	
Minimum of log data	4.644391
Maximum of log data	7.07327
Mean of log data	5.736077
Standard Deviation of log data	0.699126
Variance of log data	0.488777

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.760345
Shapiro-Wilk 5% Critical Value	0.829
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	590.5231

Gamma Distribution Test	
A-D Test Statistic	0.343726
A-D 5% Critical Value	0.728865
K-S Test Statistic	0.174195
K-S 5% Critical Value	0.282132
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	640.2533
Adjusted Gamma UCL	714.2309

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.974663
Shapiro-Wilk 5% Critical Value	0.829
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	762.4589
95% Chebyshev (MVUE) UCL	782.0436
97.5% Chebyshev (MVUE) UCL	954.582
99% Chebyshev (MVUE) UCL	1293.5

95% Non-parametric UCLs	
CLT UCL	567.4743
Adj-CLT UCL (Adjusted for skewness)	649.9532
Mod-t UCL (Adjusted for skewness)	603.3881
Jackknife UCL	590.5231
Standard Bootstrap UCL	559.4828
Bootstrap-t UCL	815.7225
Hall's Bootstrap UCL	1284.173
Percentile Bootstrap UCL	573.3333
BCA Bootstrap UCL	630.7778
95% Chebyshev (Mean, Sd) UCL	858.8441
97.5% Chebyshev (Mean, Sd) UCL	1061.329
99% Chebyshev (Mean, Sd) UCL	1459.071

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	AOC As

Raw Statistics	
Number of Valid Samples	86
Number of Unique Samples	51
Minimum	0.5
Maximum	94.6
Mean	9.1
Median	3.1
Standard Deviation	14.806
Variance	219.2176
Coefficient of Variation	1.627033
Skewness	3.21853

Gamma Statistics	
k hat	0.612123
k star (bias corrected)	0.598522
Theta hat	14.86628
Theta star	15.20411
nu hat	105.2852
nu star	102.9458
Approx.Chi Square Value (.05)	80.53005
Adjusted Level of Significance	0.047209
Adjusted Chi Square Value	80.19357

Log-transformed Statistics	
Minimum of log data	-0.693147
Maximum of log data	4.549657
Mean of log data	1.201842
Standard Deviation of log data	1.458164
Variance of log data	2.126242

RECOMMENDATION
Data are Non-parametric (0.05)
Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.280672
Lilliefors 5% Critical Value	0.09554
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	11.75506

Gamma Distribution Test	
A-D Test Statistic	2.829239
A-D 5% Critical Value	0.807313
K-S Test Statistic	0.140066
K-S 5% Critical Value	0.101191
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	11.63301
Adjusted Gamma UCL	11.68182

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.143929
Lilliefors 5% Critical Value	0.09554
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	14.75977
95% Chebyshev (MVUE) UCL	18.15734
97.5% Chebyshev (MVUE) UCL	21.94834
99% Chebyshev (MVUE) UCL	29.39504

95% Non-parametric UCLs	
CLT UCL	11.72613
Adj-CLT UCL (Adjusted for skewness)	12.3182
Mod-t UCL (Adjusted for skewness)	11.84742
Jackknife UCL	11.75506
Standard Bootstrap UCL	11.79148
Bootstrap-t UCL	12.76613
Hall's Bootstrap UCL	12.96954
Percentile Bootstrap UCL	11.95116
BCA Bootstrap UCL	12.54186
95% Chebyshev (Mean, Sd) UCL	16.0593
97.5% Chebyshev (Mean, Sd) UCL	19.07059
99% Chebyshev (Mean, Sd) UCL	24.98569

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	AOC Pb

Raw Statistics	
Number of Valid Samples	86
Number of Unique Samples	72
Minimum	0.5
Maximum	341
Mean	19.77558
Median	7.7
Standard Deviation	40.7691
Variance	1662.12
Coefficient of Variation	2.061588
Skewness	6.100453

Gamma Statistics	
k hat	0.727764
k star (bias corrected)	0.710129
Theta hat	27.17306
Theta star	27.84787
nu hat	125.1754
nu star	122.1422
Approx.Chi Square Value (.05)	97.61516
Adjusted Level of Significance	0.047209
Adjusted Chi Square Value	97.24326

Log-transformed Statistics	
Minimum of log data	-0.693147
Maximum of log data	5.831882
Mean of log data	2.158496
Standard Deviation of log data	1.211399
Variance of log data	1.467487

RECOMMENDATION
Data are Non-parametric (0.05)
Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.318178
Lilliefors 5% Critical Value	0.09554
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	27.08644

Gamma Distribution Test	
A-D Test Statistic	4.269476
A-D 5% Critical Value	0.79563
K-S Test Statistic	0.208594
K-S 5% Critical Value	0.100393
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	24.74444
Adjusted Gamma UCL	24.83908

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.106902
Lilliefors 5% Critical Value	0.09554
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	24.8282
95% Chebyshev (MVUE) UCL	30.62355
97.5% Chebyshev (MVUE) UCL	36.18315
99% Chebyshev (MVUE) UCL	47.1039

95% Non-parametric UCLs	
CLT UCL	27.00676
Adj-CLT UCL (Adjusted for skewness)	30.09688
Mod-t UCL (Adjusted for skewness)	27.56844
Jackknife UCL	27.08644
Standard Bootstrap UCL	26.81301
Bootstrap-t UCL	33.97972
Hall's Bootstrap UCL	56.81939
Percentile Bootstrap UCL	27.9814
BCA Bootstrap UCL	31.95465
95% Chebyshev (Mean, Sd) UCL	38.93837
97.5% Chebyshev (Mean, Sd) UCL	47.23012
99% Chebyshev (Mean, Sd) UCL	63.51767

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	AOC Hg

Raw Statistics	
Number of Valid Samples	86
Number of Unique Samples	76
Minimum	0.005
Maximum	1.29
Mean	0.181523
Median	0.1195
Standard Deviation	0.225217
Variance	0.050723
Coefficient of Variation	1.240707
Skewness	3.302299

Gamma Statistics	
k hat	1.149958
k star (bias corrected)	1.117595
Theta hat	0.157852
Theta star	0.162423
nu hat	197.7927
nu star	192.2263
Approx.Chi Square Value (.05)	161.1451
Adjusted Level of Significance	0.047209
Adjusted Chi Square Value	160.6631

Log-transformed Statistics	
Minimum of log data	-5.298317
Maximum of log data	0.254642
Mean of log data	-2.20048
Standard Deviation of log data	1.012759
Variance of log data	1.025681

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.216862
Lilliefors 5% Critical Value	0.09554
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.22191
Gamma Distribution Test	
A-D Test Statistic	1.187321
A-D 5% Critical Value	0.779043
K-S Test Statistic	0.090511
K-S 5% Critical Value	0.098954
Data follow approximate gamma distibution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.216535
Adjusted Gamma UCL	0.217185
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.083659
Lilliefors 5% Critical Value	0.09554
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.23648
95% Chebyshev (MVUE) UCL	0.288007
97.5% Chebyshev (MVUE) UCL	0.333304
99% Chebyshev (MVUE) UCL	0.422282
95% Non-parametric UCLs	
CLT UCL	0.22147
Adj-CLT UCL (Adjusted for skewness)	0.23071
Mod-t UCL (Adjusted for skewness)	0.223351
Jackknife UCL	0.22191
Standard Bootstrap UCL	0.22082
Bootstrap-t UCL	0.237717
Hall's Bootstrap UCL	0.239132
Percentile Bootstrap UCL	0.223663
BCA Bootstrap UCL	0.229395
95% Chebyshev (Mean, Sd) UCL	0.287383
97.5% Chebyshev (Mean, Sd) UCL	0.333188
99% Chebyshev (Mean, Sd) UCL	0.423164

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	AOC Ni

Raw Statistics	
Number of Valid Samples	53
Number of Unique Samples	53
Minimum	85.8
Maximum	1290
Mean	402.3604
Median	319
Standard Deviation	260.3981
Variance	67807.17
Coefficient of Variation	0.647176
Skewness	1.27242

Gamma Statistics	
k hat	2.684995
k star (bias corrected)	2.545592
Theta hat	149.8552
Theta star	158.0616
nu hat	284.6094
nu star	269.8328
Approx.Chi Square Value (.05)	232.7845
Adjusted Level of Significance	0.045472
Adjusted Chi Square Value	231.8262

Log-transformed Statistics	
Minimum of log data	4.452019
Maximum of log data	7.162397
Mean of log data	5.79972
Standard Deviation of log data	0.645704
Variance of log data	0.416934

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.140696
Lilliefors 5% Critical Value	0.121701
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	462.2614

Gamma Distribution Test	
A-D Test Statistic	0.299934
A-D 5% Critical Value	0.75903
K-S Test Statistic	0.077736
K-S 5% Critical Value	0.123214
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	466.3971
Adjusted Gamma UCL	468.3252

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.055957
Lilliefors 5% Critical Value	0.121701
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	485.5312
95% Chebyshev (MVUE) UCL	574.2317
97.5% Chebyshev (MVUE) UCL	647.5287
99% Chebyshev (MVUE) UCL	791.5065

95% Non-parametric UCLs	
CLT UCL	461.1942
Adj-CLT UCL (Adjusted for skewness)	467.8742
Mod-t UCL (Adjusted for skewness)	463.3033
Jackknife UCL	462.2614
Standard Bootstrap UCL	460.1116
Bootstrap-t UCL	472.7596
Hall's Bootstrap UCL	468.3802
Percentile Bootstrap UCL	463.3925
BCA Bootstrap UCL	470.8264
95% Chebyshev (Mean, Sd) UCL	558.2714
97.5% Chebyshev (Mean, Sd) UCL	625.7342
99% Chebyshev (Mean, Sd) UCL	758.2518

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	BKG As

Raw Statistics	
Number of Valid Samples	8
Number of Unique Samples	2
Minimum	0.5
Maximum	17
Mean	2.5625
Median	0.5
Standard Deviation	5.833631
Variance	34.03125
Coefficient of Variation	2.276539
Skewness	2.828427

Gamma Statistics	
k hat	0.527847
k star (bias corrected)	0.413237
Theta hat	4.85463
Theta star	6.201035
nu hat	8.445546
nu star	6.6118
Approx.Chi Square Value (.05)	1.959539
Adjusted Level of Significance	0.01946
Adjusted Chi Square Value	1.385164

Log-transformed Statistics	
Minimum of log data	-0.693147
Maximum of log data	2.833213
Mean of log data	-0.252352
Standard Deviation of log data	1.246757
Variance of log data	1.554402

RECOMMENDATION
Data are Non-parametric (0.05)
Use 99% Chebyshev (Mean, Sd) UCL

Recommended UCL exceeds the maximum observation

Consider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.418591
Shapiro-Wilk 5% Critical Value	0.818
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.470068

Gamma Distribution Test	
A-D Test Statistic	2.566482
A-D 5% Critical Value	0.76045
K-S Test Statistic	0.547263
K-S 5% Critical Value	0.308441
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	8.646289
Adjusted Gamma UCL	12.23158

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.418591
Shapiro-Wilk 5% Critical Value	0.818
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	11.97343
95% Chebyshev (MVUE) UCL	4.336951
97.5% Chebyshev (MVUE) UCL	5.578688
99% Chebyshev (MVUE) UCL	8.017841

95% Non-parametric UCLs	
CLT UCL	5.955011
Adj-CLT UCL (Adjusted for skewness)	8.158822
Mod-t UCL (Adjusted for skewness)	6.813818
Jackknife UCL	6.470068
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/A
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	11.55273
97.5% Chebyshev (Mean, Sd) UCL	15.44281
99% Chebyshev (Mean, Sd) UCL	23.08412

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	BKG Pb

Raw Statistics	
Number of Valid Samples	8
Number of Unique Samples	8
Minimum	3.1
Maximum	20.4
Mean	9.8
Median	7.95
Standard Deviation	5.87367
Variance	34.5
Coefficient of Variation	0.599354
Skewness	0.818543

Gamma Statistics	
k hat	3.20411
k star (bias corrected)	2.085902
Theta hat	3.058572
Theta star	4.698207
nu hat	51.26576
nu star	33.37443
Approx.Chi Square Value (.05)	21.16284
Adjusted Level of Significance	0.01946
Adjusted Chi Square Value	18.74236

Log-transformed Statistics	
Minimum of log data	1.131402
Maximum of log data	3.015535
Mean of log data	2.118291
Standard Deviation of log data	0.625701
Variance of log data	0.391502

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.929578
Shapiro-Wilk 5% Critical Value	0.818
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	13.73439

Gamma Distribution Test	
A-D Test Statistic	0.191148
A-D 5% Critical Value	0.720878
K-S Test Statistic	0.16429
K-S 5% Critical Value	0.296102
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15.45489
Adjusted Gamma UCL	17.45081

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.980212
Shapiro-Wilk 5% Critical Value	0.818
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	18.80949
95% Chebyshev (MVUE) UCL	19.46108
97.5% Chebyshev (MVUE) UCL	23.62419
99% Chebyshev (MVUE) UCL	31.8018

95% Non-parametric UCLs	
CLT UCL	13.2158
Adj-CLT UCL (Adjusted for skewness)	13.85795
Mod-t UCL (Adjusted for skewness)	13.83455
Jackknife UCL	13.73439
Standard Bootstrap UCL	13.04788
Bootstrap-t UCL	15.40713
Hall's Bootstrap UCL	13.8457
Percentile Bootstrap UCL	13.175
BCA Bootstrap UCL	13.525
95% Chebyshev (Mean, Sd) UCL	18.85193
97.5% Chebyshev (Mean, Sd) UCL	22.76871
99% Chebyshev (Mean, Sd) UCL	30.46247

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	As WET

Raw Statistics	
Number of Valid Samples	19
Number of Unique Samples	13
Minimum	1
Maximum	44.7
Mean	10.87368
Median	5
Standard Deviation	11.87943
Variance	141.1209
Coefficient of Variation	1.092494
Skewness	1.59814

Gamma Statistics	
k hat	0.962296
k star (bias corrected)	0.845442
Theta hat	11.29973
Theta star	12.86154
nu hat	36.56724
nu star	32.1268
Approx.Chi Square Value (.05)	20.17052
Adjusted Level of Significance	0.03687
Adjusted Chi Square Value	19.34345

Log-transformed Statistics	
Minimum of log data	0
Maximum of log data	3.799974
Mean of log data	1.783773
Standard Deviation of log data	1.204647
Variance of log data	1.451174

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.78604
Shapiro-Wilk 5% Critical Value	0.901
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	15.59958

Gamma Distribution Test	
A-D Test Statistic	0.611317
A-D 5% Critical Value	0.77067
K-S Test Statistic	0.191489
K-S 5% Critical Value	0.204587
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	17.31917
Adjusted Gamma UCL	18.05968

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.919907
Shapiro-Wilk 5% Critical Value	0.901
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	28.26448
95% Chebyshev (MVUE) UCL	27.5844
97.5% Chebyshev (MVUE) UCL	34.5093
99% Chebyshev (MVUE) UCL	48.11192

95% Non-parametric UCLs	
CLT UCL	15.35645
Adj-CLT UCL (Adjusted for skewness)	16.42412
Mod-t UCL (Adjusted for skewness)	15.76611
Jackknife UCL	15.59958
Standard Bootstrap UCL	15.23266
Bootstrap-t UCL	17.30398
Hall's Bootstrap UCL	16.64203
Percentile Bootstrap UCL	15.47368
BCA Bootstrap UCL	16.11579
95% Chebyshev (Mean, Sd) UCL	22.75312
97.5% Chebyshev (Mean, Sd) UCL	27.89336
99% Chebyshev (Mean, Sd) UCL	37.99036

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	Pb WET

Raw Statistics	
Number of Valid Samples	19
Number of Unique Samples	8
Minimum	0.6
Maximum	11.6
Mean	3.010526
Median	1.7
Standard Deviation	3.075512
Variance	9.458772
Coefficient of Variation	1.021586
Skewness	1.719407

Gamma Statistics	
k hat	1.22994
k star (bias corrected)	1.070826
Theta hat	2.447703
Theta star	2.811405
nu hat	46.73771
nu star	40.6914
Approx.Chi Square Value (.05)	27.07104
Adjusted Level of Significance	0.03687
Adjusted Chi Square Value	26.10066

Log-transformed Statistics	
Minimum of log data	-0.510826
Maximum of log data	2.451005
Mean of log data	0.643406
Standard Deviation of log data	0.995001
Variance of log data	0.990027

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.773346
Shapiro-Wilk 5% Critical Value	0.901
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.234031

Gamma Distribution Test	
A-D Test Statistic	0.754431
A-D 5% Critical Value	0.763578
K-S Test Statistic	0.177119
K-S 5% Critical Value	0.203281
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	4.525225
Adjusted Gamma UCL	4.693464

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.896532
Shapiro-Wilk 5% Critical Value	0.901
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	5.766877
95% Chebyshev (MVUE) UCL	6.345554
97.5% Chebyshev (MVUE) UCL	7.788835
99% Chebyshev (MVUE) UCL	10.62388

95% Non-parametric UCLs	
CLT UCL	4.171087
Adj-CLT UCL (Adjusted for skewness)	4.468475
Mod-t UCL (Adjusted for skewness)	4.280417
Jackknife UCL	4.234031
Standard Bootstrap UCL	4.124625
Bootstrap-t UCL	4.800707
Hall's Bootstrap UCL	5.534954
Percentile Bootstrap UCL	4.194737
BCA Bootstrap UCL	4.4
95% Chebyshev (Mean, Sd) UCL	6.086038
97.5% Chebyshev (Mean, Sd) UCL	7.416814
99% Chebyshev (Mean, Sd) UCL	10.03087

General Statistics

Data File	F:\1 Projects\3292 Spring Hill Mine\TBLs\stats	Variable:	Ni WET

Raw Statistics	
Number of Valid Samples	18
Number of Unique Samples	14
Minimum	2.3
Maximum	48.1
Mean	11.93889
Median	5.6
Standard Deviation	12.14516
Variance	147.5049
Coefficient of Variation	1.017277
Skewness	2.015273

Gamma Statistics	
k hat	1.521625
k star (bias corrected)	1.305058
Theta hat	7.846143
Theta star	9.148167
nu hat	54.7785
nu star	46.98209
Approx.Chi Square Value (.05)	32.25012
Adjusted Level of Significance	0.03574
Adjusted Chi Square Value	31.07959

Log-transformed Statistics	
Minimum of log data	0.832909
Maximum of log data	3.873282
Mean of log data	2.116536
Standard Deviation of log data	0.829162
Variance of log data	0.687509

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.725475
Shapiro-Wilk 5% Critical Value	0.897
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	16.91876

Gamma Distribution Test	
A-D Test Statistic	1.062925
A-D 5% Critical Value	0.756093
K-S Test Statistic	0.242344
K-S 5% Critical Value	0.207191
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	17.39261
Adjusted Gamma UCL	18.04766

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.91965
Shapiro-Wilk 5% Critical Value	0.897
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	19.02332
95% Chebyshev (MVUE) UCL	21.96363
97.5% Chebyshev (MVUE) UCL	26.52342
99% Chebyshev (MVUE) UCL	35.48023

95% Non-parametric UCLs	
CLT UCL	16.64751
Adj-CLT UCL (Adjusted for skewness)	18.10045
Mod-t UCL (Adjusted for skewness)	17.14539
Jackknife UCL	16.91876
Standard Bootstrap UCL	16.54964
Bootstrap-t UCL	20.35379
Hall's Bootstrap UCL	20.75763
Percentile Bootstrap UCL	17.07222
BCA Bootstrap UCL	18.46667
95% Chebyshev (Mean, Sd) UCL	24.41685
97.5% Chebyshev (Mean, Sd) UCL	29.81608
99% Chebyshev (Mean, Sd) UCL	40.42181

Lead Risk Assessment Spreadsheets

LEAD RISK ASSESSMENT SPREADSHEET 8
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	408.0
Respirable Dust (ug/m^3)	1.5

OUTPUT						
Percentile Estimate of Blood Pb (ug/dl)						PRG-90
	50th	90th	95th	98th	99th	(ug/g)
BLOOD Pb, CHILD	2.9	5.3	6.3	7.6	8.7	77
BLOOD Pb, PICA CHILD	5.8	10.5	12.5	15.2	17.2	39

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.02	1%		0.02	0%
Soil Ingestion	7.0E-3	2.87	99%	1.4E-2	5.74	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

Click here for REFERENCES

Spring Hill Property, Former Mill Area, Approximate Gamma UCL, Standard Exposure Scenario

LEAD RISK ASSESSMENT SPREADSHEET 8
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	36.0
Respirable Dust (ug/m^3)	1.5

OUTPUT						
Percentile Estimate of Blood Pb (ug/dl)						PRG-90
	50th	90th	95th	98th	99th	(ug/g)
BLOOD Pb, CHILD	0.3	0.5	0.6	0.7	0.8	77
BLOOD Pb, PICA CHILD	0.5	0.9	1.1	1.3	1.5	39

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.00	1%		0.00	0%
Soil Ingestion	7.0E-3	0.25	99%	1.4E-2	0.51	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

Click here for REFERENCES

Spring Hill Property, Waste Rock and Tailings (Excluding Former Mill Area), 97.5 Chebyshev UCL (Mean, Sd), Standard Exposure Scenario

LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	14.0
Respirable Dust (ug/m^3)	1.5

OUTPUT						
Percentile Estimate of Blood Pb (ug/dl)						PRG-90
	50th	90th	95th	98th	99th	(ug/g)
BLOOD Pb, CHILD	0.1	0.2	0.2	0.3	0.3	77
BLOOD Pb, PICA CHILD	0.2	0.4	0.4	0.5	0.6	39

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.00	1%		0.00	0%
Soil Ingestion	7.0E-3	0.10	99%	1.4E-2	0.20	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

Click here for REFERENCES

Spring Hill Property, Background Soil, Student's-t UCL, Standard Exposure Scenario

MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	408
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.7**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	1.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**19.5%**

PRG90 **318**

Click here for REFERENCES

Spring Hill Property, Former Mill Area, Approximate Gamma UCL, Adult Exposure

MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	36
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.1**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	0.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.0%**

PRG90 **318**

Click here for REFERENCES

Spring Hill Property, Former Mill Area, Approximate Gamma UCL, Adult Exposure

MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	14
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.0**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	0.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.0%**

PRG90 **318**

Click here for REFERENCES

Spring Hill Property, Former Mill Area, Approximate Gamma UCL, Adult Exposure

APPENDIX E

Dust Mitigation Plan

DUST MITIGATION PLAN
for
REMEDIAL ACTION
at
SPRING HILL PROPERTY
Grass Valley, California

Prepared by:
Holdrege & Kull
792 Searls Avenue
Nevada City, CA 95959

Project No. 3292-04
August 22, 2008

TABLE OF CONTENTS

1 INTRODUCTION

This Dust Mitigation Plan (DMP) describes material handling protocols to reduce the release of metals into the atmosphere during remediation activities and wastewater disposal system installation. The DMP is an element of the Removal Action Workplan (RAW) for soil remediation of mine waste stockpiles within the Spring Hill Property (site) located immediately south of Dorsey Drive and southeast of Highway 49/20 in Grass Valley, Nevada County, California. The assessor's parcel numbers (APNs) for the property are 35-260-62, 35-260-63 and 35-260-64. The RAW describes procedures for excavation and on-site placement of soil that contains elevated concentrations of arsenic and other metals. Approximately 1,700 cubic yards of mine waste and affected soil from a former mill area (Area of Concern (AOC) 1) is to be excavated, transported off-site, and disposed at an appropriate solid waste facility. Approximately 62,300 cubic yards of mine waste and tailings identified at other locations on the site are to be excavated, transported within the site, and buried on-site in a deed-restricted location.

2 PURPOSE

The purpose of this DMP is to:

1. Outline engineering controls to be implemented during remediation activities, including fugitive dust prevention, track-out prevention, surface and stockpile protection, ingress/egress development, vehicle movement, and implementation of best management practices (BMPs).

2. Outline protocol for confirming that engineering controls, as designed, are implemented during mechanical soil disturbance, including site clearing, site grading, underground utility work, transportation, and disposal activities.

3. Outline post-remediation stabilization controls to be implemented after excavation and removal of mine waste and affected soil, and burial of other site mine waste in a deed-restricted location.

3 NOTIFICATION OF COMMENCEMENT OF GRADING

The Nevada County Department of Environmental Health (NCDEH) shall be notified at least ten days in advance of commencement of grading. Contact information is provided below:

Department of Environmental Health
Nevada County Community Development Agency
950 Maidu Avenue
Nevada City, CA 95959
Phone: 530-265-1222
Fax: 530-265-9853
Email: Env.Health@co.nevada.ca.us

4 ENGINEERING CONTROLS

Engineering controls and dust control measures apply to all mechanical soil disturbances in affected soil areas on the site, including mine waste stockpiles, mine waste placement areas, and naturally mineralized areas. Construction activities are defined in this document as any mechanical soil disturbance in the affected soil areas. Mechanical soil disturbance may result from activities such as clearing, grading, excavation, fill placement, compaction, and movement of equipment over unprotected surfaces.

4.1 SUMMARY OF GENERAL CONTROLS

The engineering controls described below shall be implemented during any mechanical soil disturbance associated with the proposed remediation activities. Alternate engineering controls proposed by the contractor that are not included in this DMP must be approved by the California Department of Toxic Substances Control (DTSC) prior to commencement of any soil disturbance.

4.1.1 Area of Disturbance

The areas of disturbance should be delineated by staking or marking prior to commencement of construction activity, including vertical extent of excavation and fill placement.

4.1.2 Track Out Prevention

No soil is allowed to leave the work areas through vehicle track-out or any other means. Track-out controls shall be implemented as follows:

- The ingress and egress route is to be developed prior to construction. If more than one ingress/egress route is used, track-out prevention protocol shall be maintained at each location.

- Vehicles and equipment shall be visually inspected for soil or mud accumulation, and shall be washed or brushed down as necessary at the ingress/egress location before leaving the property.

- A gravel pad or metal screen may be used to clean tires at the ingress/egress locations. The gravel pad should be composed of gravel at least 1-inch or larger, with a silt content of less than 5 percent. The gravel pad, if used, is to be maintained in good condition, and repaired as necessary to maintain the integrity of the pad.

- BMPs shall be implemented at the ingress/egress location. BMPs shall be adhered to during road wetting and rinsing of vehicles.

4.1.3 Soil Stockpiles

Soil stockpiles shall be protected by sufficient wetting with water spray, application of chemical dust suppressant, or by tarp or plastic covering.

- Active stockpiles are to be adequately wetted or covered with tarps.

- Inactive stockpiles (stockpiles that will remain inactive for more than seven days) shall be protected by (1) keeping the surface adequately wetted; (2) applying chemical dust suppressants or stabilizers according to manufacturer's directions; or (3) covering with tarps.

4.1.4 Traffic Control

Proposed travel routes, parking areas, and staging areas must be established prior to commencement of grading.

- Maximum vehicle speed for any vehicle or equipment on the site shall be 15 miles per hour. Slower vehicle speeds may be necessary to reduce soil disturbance or dust generation.

- Vehicular and equipment travel should be limited to designated areas.

- Only vehicles and equipment directly involved with site grading and utility work, including refueling and maintenance vehicles, should be allowed in the designated work area during excavation and grading activities. All other vehicles and equipment shall remain parked in a designated clean area on-site.

- Access routes within the site must be stabilized by watering or applying chemical dust suppressants, according to manufacturer's directions, as necessary to control fugitive dust emissions.

- The remediation contractor is responsible for traffic control on-site and on public roadways.

4.1.5 Earthmoving Activities

Dust mitigation measures shall be initiated prior to commencement of remediation activities, and should continue until confirmation that waste and affected soil has been removed from the site. Recommendations to be implemented during site grading are provided below.

- Prior to and during any ground disturbance, water shall be sprayed to sufficiently wet areas of disturbance and stockpiled soil. The contractor shall supply a water truck of adequate size and capacity for this purpose. Wetting should fully extend to the anticipated depths of the excavation. All soil/rock material shall be adequately wetted such that no visible dust emissions occur. Sufficient moisture may be determined by the field test described below.

- Grading operations shall be suspended when, despite application of dust mitigation measures, wind speeds are high enough to result in fugitive dust emissions.

- BMPs shall be implemented during construction activities. All water that could potentially contain affected soil shall be retained on-site. All sediment collected shall be retained on-site.

4.1.6 Field Determination of Moisture

Field testing for determination of sufficient moisture content will be conducted as follows:

1. A one-quart soil sample shall be taken from the top 3 inches of the disturbed area or stockpile;

2. The sample shall be poured from a height of 4 feet above a clean hard surface; and

3. The material will be considered adequately wetted if no observable dust is emitted when the material is dropped.

4.1.7 On-Site Trucking

Hauled material must be adequately wetted to prevent dust from blowing out of the trucks. Additionally, the loads must be contained within cargo compartments that are covered with tarps, or loaded so that the material does not touch the front, back, or sides of the cargo compartment at any point less than 6 inches from the top of the compartment.

4.1.8 Air Monitoring

At this time, air monitoring will not be required for the project unless visible dust emissions are observed. The lead agency or local enforcement agency may require air monitoring at any time during the project. If conditions arise such that air monitoring is required, air monitoring shall be conducted in accordance with this DMP. All results of air monitoring shall be reported to NCDEH and DTSC within 48 hours of their collection during the first two weeks of sampling, and within 72 hours of collection for subsequent weeks.

4.2 ENGINEERING CONTROLS BY TASK

The engineering controls noted below are provided to assist in task planning. Engineering controls shall be modified, if necessary, based on observation of fugitive dust emission or air sampling results.

4.2.1 Site Preparation

Prior to commencement of any mechanical disturbance at the site, the following engineering controls should be in place.

- Proposed areas of disturbance, including the vertical extent of excavation and fill placement, should be clearly delineated.

- Ingress/egress and wheel-wash areas should be constructed prior to commencement of grading. The ingress/egress and wheel-wash areas are to be maintained throughout all phases of the project.

- BMP features such as jute mats, fiber rolls, basins, or silt traps should be installed.

- Parking areas should be clearly defined outside the area of disturbance.

4.2.2 Clearing and Grubbing

The following engineering controls shall be implemented prior to and during clearing and grubbing.

- Prior to commencement of clearing and grubbing activities, vegetation and soil surfaces within the areas to be cleared should be sufficiently pre-wetted to prevent generation of fugitive dust from clearing activities. A sufficient amount of water should be used and allowed to soak into the subsurface. No soil disturbance, including removal of vegetation, may occur in any area that has not been sufficiently pre-wetted. Note that pre-wetting may need to occur over a period of days during dry weather, and that pre-wetting may also be necessary during or following periods of rainy weather.

- Water application should continue throughout clearing operations. Water spraying should be fanned over the site, and directed at specific activities,

as appropriate. Proposed routes of site access should be sprayed with an amount of water sufficient to prevent generation of visible dust from equipment travel.

4.2.3 Grading

Prior to any soil disturbance, the area of proposed disturbance must be sufficiently and repeatedly wetted, so that no fugitive dust is generated by the activities.

- No soil disturbance may occur in any area that has not been sufficiently pre-wetted. Areas to be excavated should be sufficiently wetted to the depths of the excavation, so that no dust is generated by the excavation.

- Any soil disturbance that results in generation of dust must cease immediately until the area has been sufficiently wetted to a depth necessary to prevent generation of fugitive dust.

- Disturbed areas are to be maintained in accordance with this DMP.

4.2.4 Fill Placement

The following engineering controls shall be implemented prior to and during fill placement.

- Fill material and areas where fill is to be placed should be adequately wetted so that no fugitive dust is generated during fill placement.

- Affected soil and rock is to be placed in a designated fill area within the site. The soil shall be sufficiently wetted prior to placement and throughout the work day, as necessary. At the end of each work day, the material should be wetted to enable crusting of the surface, or covered with plastic sheeting.

5 ADMINISTRATIVE CONTROLS

5.1 OCCUPATIONAL SAFETY & HEALTH ACT

The contractor and crew shall maintain current OSHA certification. Personal air monitoring equipment may be required by the lead agency.

5.2 DMP COMPLIANCE MONITORING

DMP compliance monitoring is to be conducted during any mechanical soil disturbance activity. The contractor shall provide adequate advance notice and information to the lead agency, local enforcement agency, and H&K about site activities so that they may perform the following tasks:

- Confirm implementation of engineering controls such as ingress/egress areas, wheel wash areas, and parking areas outside the area of construction.

- Confirm that sufficient water is available and applied so that no visual evidence of fugitive dust is observed beyond the site boundaries.

- Confirm on-site travel and wheel-wash protocols are regularly implemented.

- Coordinate air sampling with the air monitoring contractor, if air monitoring and/or sampling is required.

- Confirm that proper transportation protocol is observed by the contractor.

- Confirm that affected soil is contained on-site and stockpiled according to the DMP specifications.

- Confirm construction activities are in compliance with the guidelines of the DMP.

5.3 AIR MONITORING PROTOCOL

At this time, air monitoring is not required at the site. However, air monitoring may be required by NCDEH or DTSC at any time. If required, air monitoring and sampling is to be performed in accordance with protocol described below.

- Ambient air sampling should be conducted to establish base line values for ambient airborne PM10 concentrations upwind and downwind of the project site.

- Air sampling and monitoring should be conducted according to a schedule determined by NCDEH or DTSC.

- Air sampling results shall be submitted to NCDEH/DTSC within 48 hours of their collection during the first two weeks of sampling, and within 72 hours of collection for subsequent weeks. Engineering controls shall be modified, if necessary, based on the air sampling results.

- Air sampling should continue until monitoring results indicate that the environmental controls are sufficient to ensure that OSHA Permissible Exposure Levels are not exceeded, or until the termination of site activities.

APPENDIX F

Site Safety Plan

SITE SAFETY PLAN
for
REMEDIAL ACTION
At
SPRING HILL PROPERTY
Grass Valley, California

Prepared by:
Holdrege & Kull
792 Searls Avenue
Nevada City, CA 95959

Project No. 3292-05
June 14, 2012

TABLE OF CONTENTS

1 INTRODUCTION

Holdrege & Kull (H&K) prepared this task specific Site Safety Plan (SSP) for services to be performed by H&K in the vicinity of mine waste and other impacted soil associated with historical mining activities at the proposed Spring Hill Property (site) located in Grass Valley, California. The SSP was prepared in accordance with guidelines set forth in the California Hazardous Waste Operations Standard, Section 5192 of Title 8 of the Code of California Regulations (8 CCR 5192); the Hazardous Communications Standard, 8 CCR 5194; OSHA's Safety and Health Standard of Title 29 of the Code of Federal Regulations (29 CFR 1910.120, 29 CFR 1926).

The purpose of this SSP is to establish safe procedures and practices for H&K employees engaged in field activities associated with excavation and sampling activities at the site. This SSP is for employees of H&K. However, it will be read and signed by site visitors and subcontractors prior to work associated with site remediation and sampling.

The health and safety guidelines and requirements presented herein are based on a review of available information and an evaluation of potential hazards. The plan describes the health and safety procedures and equipment required for excavation and soil sampling in order to minimize the potential for exposures to field personnel. Should circumstances during the course of field work be extraordinarily different than anticipated, field work shall be temporarily stopped, so that potential hazards can be evaluated and appropriate health and safety precautions implemented.

It is not possible in advance to discover, evaluate and protect against all possible hazards which may be encountered. Adherence to the requirements of this SSP will significantly reduce, but not eliminate, the potential for occupational injury and illness at the project site.

The provisions of this SSP will be implemented by H&K personnel. All contractors, subcontractors and other visitors are responsible for their own health and safety. However, all H&K subcontractors are to comply with the requirements of this SSP at a minimum. Subcontractors are to develop their own SSP which addresses all anticipated hazards associated with their scope of work.

Section 2 of this SSP describes the site location and field activities. Section 3 presents the key personnel for this task. Section 4 provides a description of the known site hazards and procedures for protecting workers. Section 5 specifies

routine and special training for this task. Section 6 discusses the levels of personal protection. Section 7 discusses medical surveillance requirements. Section 8 discusses the delineation of work areas and site access control. Section 9 contains the decontamination procedures. Section 10 presents references.

2 BACKGROUND AND SETTING

Relic features associated with historical mining activity were identified as part of a preliminary endangerment assessment of the site. Identified abandoned mine features are associated primarily with hard rock gold mining. Remedial activities have been proposed for mine waste and other impacted soil at the site.

2.1 FIELD ACTIVITIES

The proposed work includes observation of excavation activities and collection of confirmation soil samples. Excavation activity will include the use heavy equipment and sampling will be performed using hand-tools and hand operated sampling devices as described in the Removal Action Workplan (RAW) and Verification Sampling and Analysis Plan (VSAP).

3 KEY PERSONNEL AND RESPONSIBILITY

3.1 H&K CHAIN OF COMMAND

Jason W. Muir, PE, is the Project Manager. Pam Raynak, or another qualified H&K employee who is designated prior to the start of the remedial action, will perform confirmation sampling and act as site safety officer (SSO). Other H&K staff may also perform sampling and observation. The SSO has the authority to monitor and correct health and safety problems as noticed on site. The project field staff have completed 40 hours of comprehensive health and safety training which meets the requirements of 8 CCR 5192 and 29 CFR 1910.120. The SSO will make this SSP available to each member of the H&K field team, subcontractors and site visitors.

The project staff is responsible for ensuring that all data acquisition is performed in accordance with the project workplan and SSP, and that deviations from the plans are based upon field conditions encountered and are well documented in the field notes. The field team's health and safety responsibilities include:

1. Following the SSP;

2. Reporting any unsafe conditions or practices to the SSO;

3. Reporting all facts pertaining to incidents which result in injury or exposure to toxic materials to the SSO;

4. Reporting equipment malfunctions or deficiencies to the SSO.

The SSO has on-site responsibility for ensuring that all field team members, including H&K personnel, comply with the SSP. It is the SSO's responsibility to inform the subcontractors and other field personnel when chemical and physical hazards arise. Additional SSO responsibilities include:

1. Providing site safety briefing for team members;

2. Updating equipment or procedures to be used on site based on new information gathered during the site investigation;

3. Inspecting all personal protective equipment to be used by H&K or subcontractors to H&K;

4. Assisting the Project Manager by documenting compliance with the SSP by completing employee and subcontractor SSP acknowledgment forms (Appendix A);

5. Evaluating the effectiveness of field decontamination procedures for personnel, protective equipment, sampling equipment and containers, and heavy equipment and vehicles;

6. Discussing with H&K personnel the location and route to the nearest medical facility and arranging for emergency transportation to the nearest medical facility;

7. Discussing with H&K personnel the telephone numbers of local public emergency services (e.g., police and fire);

8. Reporting injuries and/or illnesses using the accident report form (Appendix B); and

9. Stopping operations that threaten the health and safety of the field team and/or surrounding populace.

3.2 SUBCONTRACTOR PERSONNEL RESPONSIBILITIES

All subcontractors are responsible for their own SSP. A written SSP must be available for County of Nevada review if requested.

3.3 VISITORS

Visitors to the work areas are responsible for their own health and safety, but will be provided with a copy of this SSP to read and sign. Following is a list of project contacts.

Jason W. Muir, PE (H&K) Project Manager	Office: 530-478-1305 Mobile: 530-362-2776
Pam Raynak, PG (H&K) Project Geologist/SSO	Office: 530-478-1305 Mobile: 530-362-0032
Wesley Nicks, Director Nevada County Department of Environmental Health Local Enforcement Agency (LEA) representative	Office: 530-265-1464
Dean Wright, PE California Department of Toxic Substances Control Lead Agency representative	Office: 916-255-6528

4 HAZARD EVALUATION

The potential hazards to personnel working at this site have been identified as chemical and physical. Each potential hazard relative to the potential for exposure is described below.

4.1 CHEMICAL HAZARDS

The soil to be excavated contains elevated concentrations of metals. Exposure to metals in the mine waste and affected soil may occur through the following exposure routes: ingestion of soil or soil dust, inhalation of soil dust, and dermal contact with soil. Application of water to the affected soil is essential to control fugitive dust emissions. Exposure may be reduced by the use of PPE such as boots, long-sleeved clothing, gloves and dust mask or respirator. Proper decontamination is important to remove contaminants prior to leaving the affected areas and to limit exposure. Table 4-1 presents general information for potential chemical hazards that could possibly be encountered during excavation and sampling. The information includes exposure limit recommendations, routes of exposure, and typical signs and systems of exposure. Contaminants other than those listed in Table 4-1 may be encountered.

4.2 PHYSICAL HAZARDS

Physical hazards associated with this project include working near heavy equipment (e.g., excavator and loader), heavy lifting, physical strain associated with sampling activities, pinching/cutting/crushing associated with use of mechanical sampling devices and hand tools, slip/trip/fall due to uneven ground surface or mine excavation, potential soil instability near steep excavations, weather conditions, venomous insects, poison oak and noise.

4.2.1 General

Uneven ground surface and/or debris may increase risk of injuries. Personnel shall wear appropriate footwear while on site. Personnel shall wear hard hats, brightly colored (orange/yellow) vest or equivalent, and shall be aware of equipment activities at all times. Keep within view of operators and out of the vicinity of heavy equipment unless required for a specific task. On-site personnel need to be aware of the position and movement of heavy equipment at all times. Adequate clearance from the equipment will be maintained at all times. Eye contact will be maintained by personnel with the equipment operator prior to passing in front of the equipment.

Based on the site characterization results, the limited number of days anticipated for site excavation (ten working days), and required application of water for dust suppression during soil excavation, airborne levels of metals are expected to be low. During excavation no respiratory protection is required and operations will be performed wearing normal work uniforms with disposable gloves and coveralls (modified Level D personal protection), and dust masks. During the remedial activities, soil moisture content will be maintained to reduce the potential for dust generation.

If, during the excavation or screening process, the site safety officer or any site worker observes fugitive dust emissions from the excavation or stockpiled material, water will be applied to the soil. If sufficient soil moisture cannot be maintained, the site safety officer will stop work and evaluate the appropriateness of additional personal protection measures (Level C), or resumption of work under more favorable conditions.

4.2.2 Noise

Noise levels around heavy equipment can exceed a comfortable range; ear plugs are recommended. Use of hearing protective devices (HPDs) is required whenever

the noise level equals or exceeds 85 dBA. In the absence of noise monitoring equipment, an elevated noise level will be defined as a situation where a person cannot be heard above equipment noise while speaking in a normal voice from a distance of two feet. If this condition occurs, the SSO will require that personnel affected by the noise hazard use HPDs.

4.2.3 Equipment Safety

Standard operating safety procedures will be followed by H&K and its subcontractors working around mechanical equipment. Equipment shall be in good operating condition and used in accordance with manufacturer's specifications. Rags, towels or other absorbent materials will be available to clean up any incidental spills that may occur. No hazardous materials in excess of reportable quantities will be brought on-site by H&K personnel.

4.2.4 Sunburn

Working outdoors on sunny days for extended periods of time can cause sunburn to the skin. Excessive exposure to sunlight is associated with the development of skin cancer. Field personnel should take precautions to minimize the risk of sunburn by using sun-screen lotion of at least 15 SPF and/ or wearing hats and long-sleeved garments.

4.2.5 Venomous Insects, Arachnids and Snakes

The project site provides potential habitat for rattlesnakes, and venomous insects and arachnids. Field personnel will wear boots and long pants to reduce potential bite exposure areas. Care should be taken in approaching and accessing areas where snakes and insects may be hidden. Personnel should periodically check clothing, hair and skin during the workday for the presence of ticks.

4.2.6 Poison Oak

The project site provides potential habitat for poison oak, which commonly causes itching skin lesions when contacted. All field personnel should be able to identify poison oak and avoid contact with it during site work. In addition, personnel will wear long pants to minimize incidental contact with poison oak plants. If contact is unavoidable, additional protective clothing such as disposable coveralls should be worn to reduce potential transfer of plant oils to clothing and skin.

4.2.7 Hazards Associated with Soil Sampling Activities

The level of personal protection required for soil sampling is modified Level D, provided that fugitive dust emissions are controlled during on-site activities by application of water to affected mine waste and soil. Soil samples may be obtained using a backhoe, slide-actuated hand sampler, or other hand tools. If working near a backhoe, personnel should follow the guidelines for working near heavy equipment as described in the sections above. If using mechanical samplers or hand tools, personnel should maintain awareness for pinching, crushing, or cutting potential from moving parts or sharp edges. OSHA guidelines should be followed for entry into open excavations.

5 TRAINING REQUIREMENTS

All H&K personnel working on-site have completed training in hazard recognition and basic health and safety issues as required by OSHA regulations contained in 8 CCR 5192 and 29 CFR 1910.120 (e). In addition, each H&K employee working on site and each subcontractor will be familiar with the requirements of this task-specific SSP, and will participate in site activity and safety briefings. The SSO will document site safety activities and implementation of this plan. Prior to new field activities, H&K and subcontractor personnel will conduct a tailgate safety briefing in the field.

6 PERSONAL PROTECTIVE EQUIPMENT

Based on the chemical information and hazard analysis, Level D protection will be initially required for excavation activities and sampling activities. If excessive dust is generated during excavation, dust masks will be required.

Level D protection consists of steel-toed boots, long pants, hard hat, hearing protection, safety glasses or goggles, and gloves if in contact with mine waste and/or contaminated soil.

7 MEDICAL SURVEILLANCE REQUIREMENTS

Medical surveillance of H&K employees is to be conducted meets the requirements of 8 CCR 5192 and 29 CFR 1910.120 (f). There are no identified additional medical surveillance requirements associated with this project.

8 SITE CONTROL MEASURES

The potential chemical and physical hazards have been identified in this SSP; however, should site specific or unexpected conditions arise, the SSO will stop all work at the site and the Project Manager will be notified. Work will not be completed until the SSP has been revised or re-evaluated accordingly.

Break or eating areas shall be located away from the work zone and upwind. In the instance where work is continued to the next day, the work site shall be secured prior to leaving the site. Communication between field team members will consist of verbal communication and hand signals if necessary.

8.1 DAILY START-UP AND SHUTDOWN PROCEDURES

The following protocol will be followed prior to daily start-up and shutdown during field activities:

1. The SSO will review site conditions with respect to modification of work and the task specific SSP;

2. Field personnel will be briefed and updated on safety procedures;

3. The SSO will ensure that first aid equipment is readily available;

4. At the shutdown of daily operations, and in between individual field events, all reusable equipment will be decontaminated and secured.

8.2 WORK ZONES FOR EXCAVATION ACTIVITIES

Designated work zones will be established as appropriate for exclusionary work areas, contamination reduction, and support. The primary means of maintaining site control and reducing the potential for migration of hazardous materials into uncontaminated areas during sampling activities will be by the use of disposable sampling equipment and decontamination of reusable equipment between each sampling event.

8.3 TRAFFIC CONTROL

Based on the volume of soil to be removed, we anticipate that approximately 100 truck loads will be removed from the site. We anticipate that removal of the mine waste and affected soil will take ten working days and that between approximately

10 and 15 truckloads per day will be removed. The trucks will exit the site via Spring Hill Drive, a double lane public roadway. The trucks will turn right onto Idaho Maryland Road (a public road) and continue to State Highway 49 to haul soil to the landfill for disposal.

Safe work practices and traffic control measures are to be employed during the project. We propose to post signs on Spring Hill Drive near the property boundary and on Idaho-Maryland Road near the intersection with Spring Hill Drive to alert motorists of truck traffic. The contractor will use radio or cell phone communication on Spring Hill Drive to direct traffic. When trucks are ready to enter Idaho Maryland Road, a flagman will be informed so they can stop residential traffic until the road is clear of trucks. During truck hauling of equipment and soil, contractors are to use reasonable precautions to avoid damaging the road. Precautions such as operating trucks at a speed of 15 miles per hour or less while traveling on Spring Hill Drive, staying on the pavement and avoiding tire contact on the pavement edge, and avoiding hard braking are to be used.

A Start Work Notification will be distributed to residents within a quarter mile of the job site. Project contact information will be provided in the Start Work Notification.

8.4 WORK PRACTICES

Safe work practices for this project are listed below:

1. Set-up, assemble, and check all equipment for integrity and proper function before starting work activities.

2. Do not use faulty or suspect equipment.

3. Use only new and intact protective clothing. Change gloves, etc., if they tear.

4. Do not use hands to wipe sweat away from face. Use a clean towel or paper towels.

5. Practice contamination avoidance at all times.

6. Do not smoke, eat, or drink within the excavation and sampling areas.

7. Wash hands, face and arms at all breaks and prior to leaving the site at the end of the work day.

8. Perform decontamination procedures completely as required.

9. Notify the Project Manager immediately if there is an accident that causes an injury or illness.

8.5 EMERGENCY MEDICAL TREATMENT

In the event of a medical emergency, local rescue agencies should be contacted by calling 911.

In the event that non-emergency medical treatment is necessary, the nearest medical facility is Sierra Nevada Memorial Hospital at 155 Glasson Way in Grass Valley, California. The hospital phone number is 530-274-6000.

Directions to the hospital are as follows:
From the site go northwest on Dorsey Drive towards East Main Street.
Turn left on Catherine Lane.
Turn left on Glasson Way. The hospital is on the right.

9 DECONTAMINATION

Decontamination procedures associated with excavation and soil sampling activities will take place prior to leaving all work areas and sample locations and/or prior to reusing equipment at a new sampling location, as set forth in the scope of work.

10 REFERENCES

10.1 FEDERAL HEALTH AND SAFETY REQUIREMENTS

EPA Order 1440.1- Respiratory Protection

EPA Order 1440.3- Health and Safety

NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. June 1994.

OSHA Safety and Health Standards 29 CFR 1910 (General Industry), U.S. Department of Labor, Occupational Safety and Health Administration.

OSHA 29 CFR 1910.120 Hazardous waste Operations and Emergency Response, Final Rule, U.S. Department of Labor, Occupational Safety and Health Administration.

OSHA Safety and Health Standards 29 CFR 1926 (Construction Industry), U.S. Department of Labor, Occupational Safety and Health Administration.

Standard Operating Safety Guidelines, USEPA, Environmental Response Branch, Hazardous Response Support Division, Office of Emergency Response.

10.2 STATE HEALTH AND SAFETY REQUIREMENTS

California Code of Regulations, Title 8, Chapter 4, Subchapter 4, Construction Safety Orders.

California Code of Regulations, Title 8, Chapter 4, Subchapter 5, Electrical Safety Orders.

California Code of Regulations, Title 8, Chapter 4, Subchapter 7, commencing with Section 3200, CAL/ OSHA General Industry Safety Orders.

California Code of Regulations, Title 22, Division 4, Chapter 30, commencing with Section 66000, California Department of Health Services, Toxic Substances Control Program.

Table 4-1 – Potential Chemical Hazards
Spring Hill Property RAW

Chemical Name	NIOSH Recommended Exposure Limit (REL)	OSHA Permissible Exposure Limit (PEL)	IDLH Level	Routes of Exposure	Symptoms of Exposure	Ionization Potential/ Flammable Limits
Asbestos	0.1 fiber/cm^3	8-hour time weighted average (TWA) airborne concentration of 0.1 fiber/cm^3 (averaged over a sampling period of 30 minutes)	Not determined	Inhalation, ingestion, contact	Asbestosis (chronic exposure): dyspnea (breathing difficulty), interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation eyes; [potential occupational carcinogen]	n/a
Arsenic (organic)	none	0.5 mg/m^3 TWA	Not determined	Inhalation, ingestion, contact	In animals: irritation skin, possible dermatitis; respiratory distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage	n/a
Lead	0.050 mg/m^3 TWA	0.050 mg/m^3 TWA	100 mg/m^3 (as Pb)	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	n/a
Mercury (colloidal or metallic)	0.05 mg/m^3 TWA	0.1 mg/m^3 TWA	10 mg/m^3	Inhalation, skin and eye contact, absorption, ingestion	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	n/a
Title 22 Metals	Varies depending on specific metal—see NIOSH guide for specific REL	Varies depending on specific metal—see NIOSH guide for specific PEL	Varies depending on specific metal	Inhalation, skin absorption and contact, ingestion	Varies depending on specific metal	n/a

APPENDIX

Health and Safety Plan Acknowledgment Form

Accident Report Form

Hospital Route Map

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT FORM

The undersigned acknowledges that he/she has received a copy of the Task Specific Health and Safety Plan for the Spring Hill Property RAW and that he/she has read and understands the contents of the plan.

_____

Name Company

_____

Signature Date

_____

Name Company

_____

Signature Date

_____

Name Company

_____

Signature Date

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Name Company

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Signature Date

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Name Company

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Name Company

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Signature Date

ACCIDENT REPORT FORM

This form should be completed in the event of an accident on-site which involves H&K, subcontractor, LEA or client personnel resulting in illness or injury.

H&K Project No._____ Date_____

Project Name _____

Project Location_____

Accident Location_____

Personnel Involved _____
_____

Description of Incident _____
_____
_____
_____
_____

Action Taken _____
_____
_____
_____

Results _____
_____

SSO notified? Yes_____ No_____

If not, why? _____

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HOSPITAL ROUTE MAP

SPRING HILL PROPERTY

Dorsey Drive

Grass Valley, California

PROJECT NO. 3765-05

JUNE 2012

APPENDIX G

Verification Sampling and Analysis Plan

VERIFICATION SAMPLING AND ANALYSIS PLAN for REMOVAL ACTION at SPRING HILL PROPERTY Grass Valley, California

Prepared By:
Holdrege & Kull
792 Searls Avenue
Nevada City, California 95959

Project No. 3292-04
August 22, 2008 (Updated June 14, 2012)

TABLE OF CONTENTS

1 INTRODUCTION

This Verification Sampling and Analysis Plan (VSAP) is an element of the Removal Action Workplan (RAW) for soil remediation of mine waste and affected soil within the Spring Hill Property (site) located off of Dorsey Drive in Grass Valley, California. The site comprises assessor's parcel numbers (APNs) 35-260-62,63 and 64. The RAW describes procedures for excavation and on-site placement of soil that contains elevated concentrations of arsenic and other metals. In addition, approximately 1,700 cubic yards of mine waste (mill tailings and affected soil) are to be removed from Area of Concern (AOC) 1 and transported to appropriate solid waste disposal facilities. Approximately 62,000 cubic yards of mine waste (mill tailings and waste rock) are to be excavated from AOC 2 and relocated on-site in a deed-restricted location. The objective of verification sampling is to confirm the removal of soil that contains total and soluble metals concentrations which exceed the remediation goals.

2 PERFORMANCE STANDARDS AND GUIDANCE

Sampling and analysis will be performed in accordance with applicable guidance and requirements set forth pursuant to the Comprehensive Environmental Response Compensation Liability Act (CERCLA) as amended by the Superfund Amendment and Reauthorization Act (SARA); the National Contingency Plan (NCP); and local, state, and federal practices in effect at the time of performance of the work.

3 DESIGN AND PLACEMENT OF SAMPLING GRID

Systematic verification will be performed within the soil removal areas to distribute sample locations uniformly over the areas of excavated soil. Systematic sampling will be implemented by establishing a sample grid over portions of the excavation areas located outside of the proposed on-site waste placement area.

The areas of concern (AOC 1 and AOC 2) comprise approximately 280,000 square feet (6.4 acres). Of this, approximately 99,000 square feet (2.3 acres) are located within the on-site placement area. Verification sampling and analysis is to be performed in the portions of AOC 1 and AOC 2 outside of the waste placement area, which comprises approximately 181,000 square feet (4.1 acres).

The minimum sample frequency is one sample per 2,500 square feet of footprint area (50 feet by 50 feet), resulting in an estimated 72 verification soil samples. In addition, samples will be obtained from the perimeter of the excavation areas (outside of the placement area boundary) at a maximum spacing of one sample per 100 feet, resulting in an estimated 15 samples for 1,430 feet of excavation perimeter.

In total, an estimated 87 verification soil samples will be obtained from the base and perimeter of the excavation areas. An additional nine samples (at least 10 percent of the total number of samples) will be obtained as field duplicates.

The samples will be analyzed for total arsenic, lead, mercury, and copper, which are considered constituents of potential concern (COPCs) for both AOC 1 and AOC 2. In addition, samples obtained from AOC 1 will be analyzed for total vanadium, which is considered a COPC for only AOC 1. COPC evaluation and remediation goals are summarized in Table 1 of the RAW.

Soluble metals concentrations were characterized as part of the PEA. Soluble arsenic and lead concentrations detected in AOC 1 are not suitable for on-site placement and may require further characterization prior to landfill disposal. The soluble arsenic and lead concentrations detected in AOC 2 have been deemed suitable for on-site placement and do not require further characterization.

Provided that the results of verification soil sample analysis for total metals meet the remediation goals, verification soil sample analysis for soluble metals is not anticipated to be necessary. However, if the results of total metals analysis suggest that soluble metals concentrations may exceed the remediation goals, the associated verification soil samples will be analyzed for the corresponding soluble metals.

The lateral and vertical extent of the proposed excavations shall be increased locally to facilitate removal of soil that contains metals concentrations which exceed the target cleanup levels. If the initial results of verification soil sampling indicate that further excavation is warranted, additional verification soil sampling will be required to confirm the effectiveness of the additional excavation. If the excavation is enlarged, additional samples will be obtained as needed to achieve the minimum sample frequency.

4 SAMPLING PROCEDURES

Following soil removal activities, grid cell locations will be identified using a graduated tape measure and a fixed site feature as the control point to reference the grid. Grid node locations will be identified by wood stakes placed on north-south and east-west axes of the perimeter of the excavation. Each grid cell will be identified with a sequential alphanumeric numbering system (A-1, A-2, B-1, etc.).

One verification soil sample will be collected from each cell. Samples will be collected from cells that are completely within the removal area or that overlay the removal area by 50 percent or more (i.e., cells along borders). Sample locations and the number of samples may be adjusted in the field if necessary.

The following is a summary of equipment that may be used during verification soil sampling activities:

- Hand trowel;
- Disposable scoops;
- Hand-held impact sampler;
- Measuring tape;
- 8-ounce pre-cleaned, laboratory-supplied, glass sample jars;
- Stainless steel sample tubes;
- Zip-lock plastic bags;
- Paper towels;
- Personal protective equipment;
- Pre-moistened towelettes;
- Insulated transport/storage container and appropriate packing supplies;
- Buckets, brushes and laboratory-grade soap for equipment decontamination;
- Sample labels;
- Chain-of-custody forms; and
- Sample collection log, sub-area field map, water-resistant ink pen, and daily field report forms.

Verification sampling will be conducted according to the procedures described below. A pre-cleaned trowel or hand-held impact sampler will be used to collect approximately

four ounces of soil from each sampling point within the excavation. The soil will be placed directly into clean 4-ounce glass containers provided by the laboratory. Sample containers will be sealed with Teflon™-lined lids and will be labeled and placed in a refrigerated container for shipment to the laboratory.

5 DECONTAMINATION AND SAMPLE HANDLING PROCEDURES

The sample collection equipment, if not pre-cleaned, will be cleaned with a laboratory grade soap and distilled water solution and rinsed with distilled water between sample locations, or by using pre-moistened towelettes if only metals are to be analyzed. Used sampling materials and personal protective equipment (i.e., spent decontamination towelettes, gloves, paper towels, etc.) will be properly disposed off-site.

Sample jars will be sealed with Teflon™-lined lids. Sample containers will be labeled and placed in a refrigerated container for transport to the project analytical laboratory under chain-of-custody protocol.

The samples will be identified using a numbering system which will consist of the cell identification and the date the sample was collected. Samples will be identified with a label affixed to the sample jar. The following information will be specified on each label:

- Project name;
- Project number;
- Date and time of sample collection; and
- Sample identification number.

Samples will be transported to the laboratory by courier and will be accompanied by three-copy, pressure sensitive chain-of-custody forms. The form will accompany every sample shipment to the analytical laboratory to document sample possession from the time of collection. The form will contain the following information:

- Sample identification number;
- Signature of collector;

- Date and time of collection;
- Site name and project number;
- Sample matrix;
- Sample container description;
- Analyses requested;
- Special analytical procedures requested (if applicable);
- Remarks (expected interferences, hazards, unusual events at the time of sampling), if applicable;
- Preservatives added (if any);
- Special sample preparation (if applicable);
- Destination of samples (laboratory name);
- Signature of persons involved in chain of possession (relinquished by and received by); and
- Date and time of sample receipt at laboratory.

The two top sheets of the chain-of-custody form will be placed in a water-tight plastic bag which will be taped to or placed in the cooler for transport.

When transferring samples, the individuals relinquishing and receiving the samples will sign, date, and record the time on the chain-of-custody form. A separate chain-of-custody form will accompany each sample shipment. The method of shipment and courier name(s) will be entered on the chain-of-custody form.

Daily field activities will be recorded on daily field report forms that indicate the date and time of field observations made by field personnel. All field forms will be signed by field personnel.

Information pertinent to soil sampling will be recorded in water-resistant ink on daily field logs. Entries in the field log will include the following information:

- Location of sampling site (cell coordinates);
- Names and affiliations of all sampling team members;
- Surface lithology;
- Date and time of sample collection;
- Description of deviations from sampling plan (if any);

- Sample destination (e.g., name of laboratory); and
- Signature of personnel responsible for sampling.

Original data recorded in field logs, chain-of-custody forms, and on other forms will be written in water-resistant ink. Original record documents (field logs and chain-of-custody forms) will not be destroyed or discarded, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on a document assigned to one individual, that individual will make corrections by drawing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information should not be obliterated. If possible, any subsequent error(s) discovered on a document will be corrected by the person who made the entry.

6 LABORATORY PROCEDURES

Samples will be analyzed by a laboratory that is certified by the California Department of Health Services for performing the analyses requested. The verification soil samples will be analyzed for total metal COPCs using U.S. EPA Test Method 6010B/7471A. The laboratory reporting limits for arsenic, copper, lead, mercury and vanadium will be less than half of value of the corresponding cleanup goal.

The following table summarizes the analyses to be performed on verification samples from each remediation area.

Verification Soil Sample Analyses		
Remediation Area	Constituent	Analysis Method
AOC 1	Arsenic, Copper, Lead, Vanadium	EPA 6010B
AOC 1	Mercury	EPA 7471A
AOC 2	Arsenic, Copper, Lead	EPA 6010B
AOC 2	Mercury	EPA 7471A

Sample handling procedures used by the laboratory may vary from the procedures specified herein as long as they fulfill the objective of maintaining sample integrity and traceability.

6.1 Chain-of-Custody Procedures

The sample custodian at the laboratory will accept custody of delivered samples and verifies the following information:

1. All samples are present;
2. All samples are in good condition;
3. All samples are accompanied by a properly completed chain-of-custody form;
4. The sample identification is complete and corresponds to the chain-of-custody form; and
5. The condition of custody seals and temperature of the ice chest interior.

If sample integrity is questionable, the sample custodian will notify the laboratory's project administrator, who in turn will notify the H&K project manager. Arrangements can then be made for sample replacements to be shipped to the laboratory. The sample custodian will document the sample condition on the sample custody log and sign the chain-of-custody form.

6.2 Logging of Laboratory Samples

After chain-of-custody procedures are complete and acceptable, the sample custodian will assign laboratory identification numbers to the samples. Laboratory sample identification numbers may be written on the chain-of-custody form for tracing purposes. The custodian will transfer the samples to the proper analyst(s) or store the samples in an appropriate secure area.

Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted. Data sheets and laboratory records are retained as part of the permanent documentation for at least three years.

6.3 Sample Preparation and Analysis

Samples collected from each grid will be thoroughly homogenized to ensure sample uniformity. Homogenization will be performed by thoroughly mixing the sample prior to obtaining a portion for digestion. Homogenization will be verified by the laboratory by analysis of duplicate samples. Duplicate samples will be obtained at a frequency of 10% of the total number of samples.

6.4 Sample Storage

Samples and extracts are retained by the analytical laboratory for up to 30 days after the data are reported by the laboratory. Unless notified by the program managers, excess or unused samples will be disposed by the laboratory in a manner consistent with appropriate government regulations.

6.5 Alternate Field Analysis by XRF

On-site field analyses for metals in soil may be conducted using portable X-ray fluorescence (XRF) equipment in accordance with USEPA Method 6200 in lieu of laboratory analysis. Initial and continuing calibration should be conducted in accordance with the manufacturer's instructions.

XRF operators should possess a Radioactive Materials License issued by the California Department of Health Services, and should be trained to operate the specific equipment used.

Provided that samples are well-homogenized, sieving and grinding for sample preparation are optional. Moisture content above 20% may interfere with analysis, and samples should be sufficiently dried to obtain an acceptable correlation coefficient as described below.

For data validation, laboratory analysis will be performed on a minimum of ten percent (not less than five) of the samples field-analyzed by XRF. Confirmatory soil samples should be split from the well-homogenized sample material. Confirmatory soil samples should be selected from the lower, middle and upper ranges measured using XRF. Results of least-squares regression of field and laboratory data must demonstrate a correlation coefficient (r^2) value of at least 0.8 for the XRF data to be considered valid.

7 REMEDIAL MEASURES CRITERIA

The goal of the remediation is to reduce the potential human health risk associated with metals in mine waste and affected soil. Target cleanup concentrations for COPCs are summarized below and in Table 1 of the RAW.

Proposed Cleanup Goals for Unrestricted Land Use

- Arsenic: 17 mg/kg, a background threshold value (BTV) estimated as the 95th percentile value for local background soil arsenic concentrations (see Appendix C of the RAW).
- Copper: 2,800 mg/kg, a risk-based cleanup level (RBCL) derived in Table 8 of the RAW.
- Lead: 80 mg/kg, a RBCL derived in Table 2 of the RAW.
- Mercury: 18 mg/kg, a RBCL derived in Table 5 of the RAW.
- Vanadium: 117 mg/kg, a BTV value estimated as the 95% Upper Percentile Limit (UPL) for site background soil vanadium concentrations (statistical output is presented in Appendix C of the RAW).

Proposed Cleanup Goals for On-Site Placement and Deed Restriction

- Arsenic: 22 mg/kg based on construction worker exposure.
- Copper: 10,000 mg/kg, a RBCL derived in Tables 9 and 10 of the RAW.
- Lead: 260 mg/kg, a RBCL derived in Tables 3 through 5 of the RAW.
- Mercury: 82 mg/kg, a RBCL derived in Tables 6 and 7 of the RAW.
- Vanadium: 260 mg/kg, a RBCL derived in Tables 11 and 12 of the RAW.

8 QUALITY ASSURANCE

The purpose of the following quality assurance plan is to specify procedures to be followed to maintain consistent quality of field and laboratory data.

8.1 Data Quality Objectives

H&K developed data quality objectives (DQOs) to address the level of uncertainty in data that will be used to address the study question and support the decision. The DQOs are to be used as measurement performance criteria for new data and as acceptance criteria for the inclusion of existing data. Laboratory quality control procedures address data quality indicators (DQIs) such as precision, bias and accuracy. DQIs such as representativeness and comparability are addressed in the *Quality Control* section below. Completeness will be assessed based on comparison of the number of valid measurements completed with the minimum frequencies set forth in the VSAP. Sensitivity is governed by the laboratory practical quantitation limits (PQLs), as discussed below.

PQLs, or laboratory reporting limits (RLs), for arsenic and lead in soil are to be no higher than 2 mg/kg. The DQOs are based on laboratory PQLs, which are lower than the corresponding remediation goals. H&K anticipate that the PQLs will be appropriate for the purposes of the VSAP.

8.2 Special Training/Certifications

Personnel working on the project site shall be certified under OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910). Analytical laboratories will be certified by the State of California.

8.3 Documentation and Records

The project manager will distribute the VSAP to the project staff. Project staff is to review the pertinent sections of the RAW and VSAP prior to performing the relevant tasks.

Global Positioning System (GPS) data, chain-of-custody documentation, field maps and photographs will be maintained at H&K's Nevada City office for a period of five years following the investigation.

Sample location maps, sample collection methodology and quality control procedures, laboratory reports and chain of custody documentation will be included in the closure report. Approved documents, including the PEA Report, RAW, and closure report, are to be retained at DTSC's Sacramento office.

8.4 Quality Control

The following quality control procedures will be employed:

- Duplicate soil samples will be obtained at a frequency of 10% of the total number of samples to assess comparability, precision and representativeness.

- The laboratory will perform laboratory quality control procedures such as method blanks and matrix spike samples to assess accuracy and bias.

- Laboratory analysis of samples analyzed in the field by XRF will be performed at a frequency of 10% of field-analyzed samples to validate the XRF results.

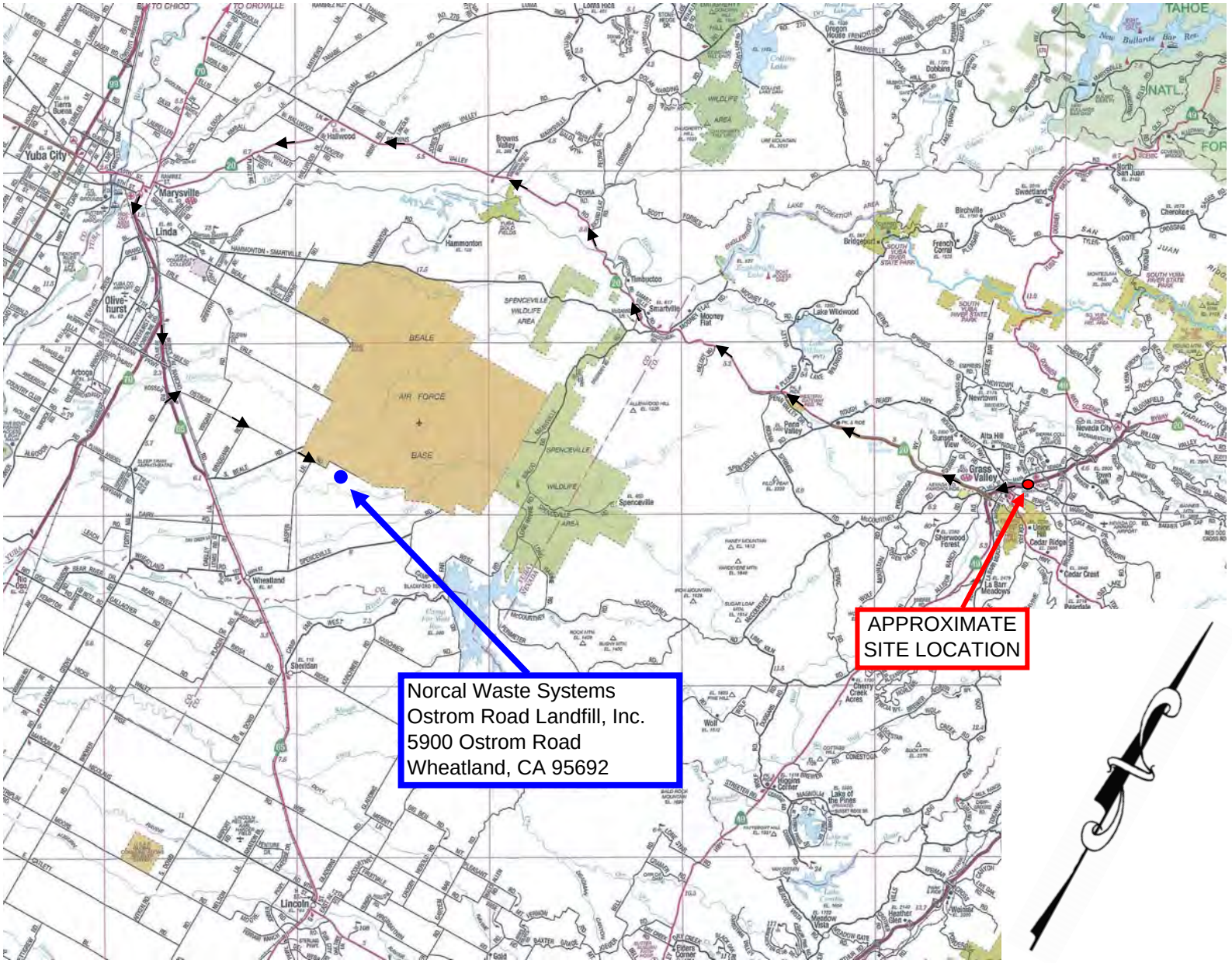
8.5 Data Validation

Data will be validated based on an estimate of the potential cumulative error from field, laboratory, and data manipulation. Data will be evaluated with regard to the DQIs (precision, bias, accuracy, representativeness, comparability, completeness, and sensitivity). Based on the evaluation results, data will be accepted, accepted with qualification, or rejected.

Data review will be performed to assess the accuracy of data recording, processing and transmittal. Field and laboratory quality control data will be reviewed for completeness. Sample preservation and holding times will be verified.

APPENDIX H

Transportation Route Maps



HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
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(530) 478-1305 • FAX (530) 478-1019

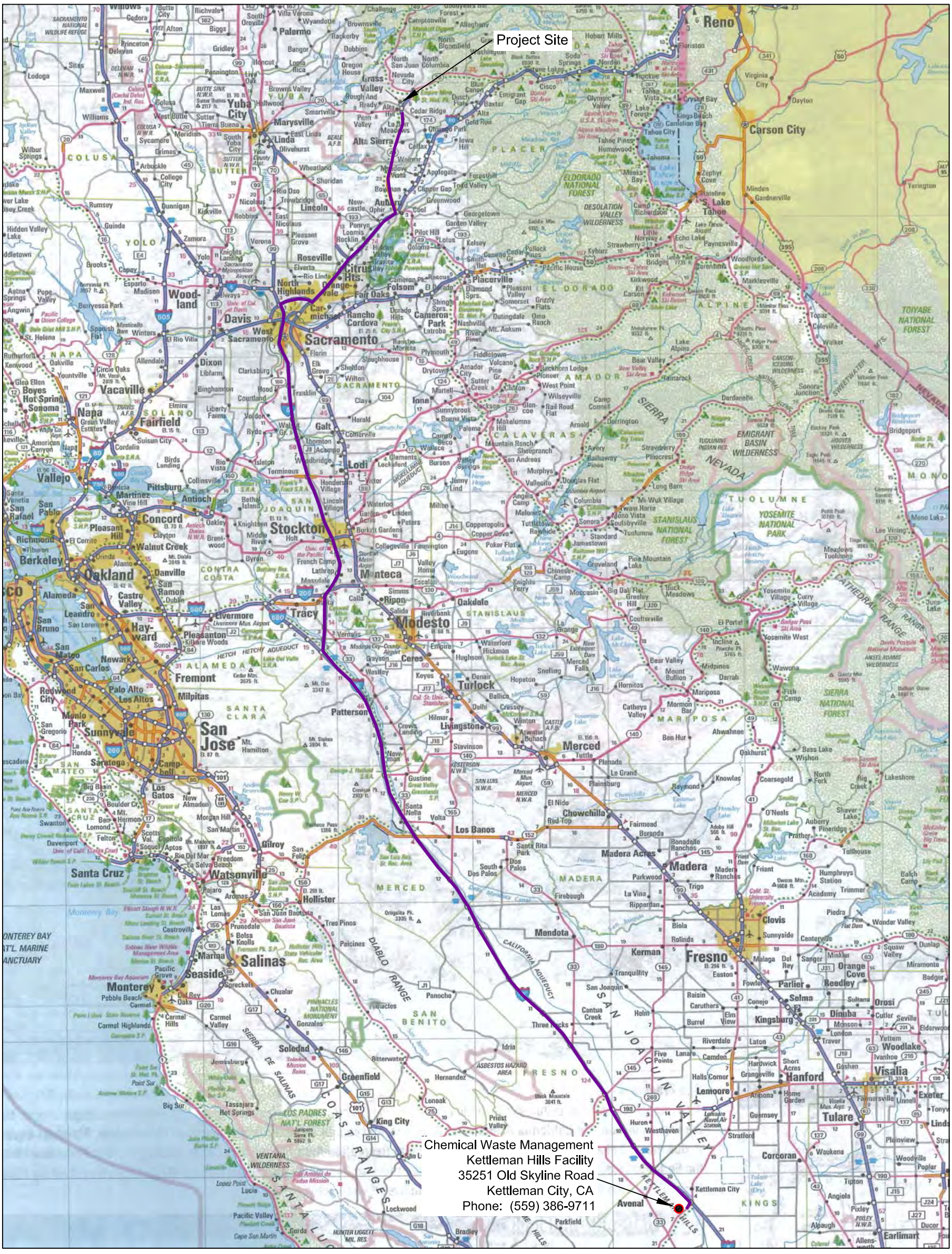
TRANSPORTATION ROUTE MAP

SPRING HILL PROPERTY

TO OSTROM ROAD LANDFILL, WHEATLAND, CA

PROJECT NO. 3292-04

AUGUST 2008



KETTLEMAN HILLS FACILITY, CALIFORNIA

TRUCK ROUTE MAP

FOR NON–RCRA OR RCRA HAZARDOUS SOLID WASTE

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DRAWN BY: DFD	***CHECKED BY:*** LLW
PROJECT NO.: 3292–04	
DATE: AUGUST 2008	

APPENDIX I

Soil Management Plan

SOIL MANAGEMENT PLAN
for
WASTE PLACEMENT AREA
at
SPRING HILL PROPERTY
Grass Valley, California

Prepared by:
Holdrege & Kull
792 Searls Avenue
Nevada City, California 95959

Project No. 3292-04
August 22, 2008

TABLE OF CONTENTS

1 INTRODUCTION

The Soil Management Plan is an element of the Removal Action Workplan (RAW) for remedial action at the Spring Hill Property (site) located in Grass Valley, California. The assessor's parcel numbers (APNs) for the site are 35-260-62, 63 and 64. The RAW describes procedures for excavation and on-site placement of soil that contains elevated concentrations of metals. Approximately 62,000 cubic yards of soil and rock are to be excavated from area of concern (AOC) 2 and reused as engineered fill at a deed-restricted placement location. A commercial development, including buildings and pavement, is to be consructed over the engineered fill. This Soil Management Plan provides recommendations for soil management in the event that the reused mine waste requires future excavation and/or handling. Protocol for reducing dust emissions during excavation and/or handling is presented in the Dust Mitigation Plan, which is also appended to the RAW.

1.1 PURPOSE

The mine waste to be used as engineered fill contains concentrations of metals, notably arsenic, which are elevated above background concentrations. Although the arsenic is naturally occurring in mineralized, gold bearing veins, past mining activity resulted in deposition of the mineralized soil and rock at the ground surface. Exposure to the soil (ingestion, dermal contact or inhalation of soil dust) presents a cancer risk and chronic health hazard. Thus, the soil is to be buried to limit exposure. In the event that the soil is excavated in the future, specific soil management procedures such as dust control are recommended to reduce the chance of human exposure to the metals concentrations.

2 DESCRIPTION OF WASTE PLACEMENT AREA

An estimated 62,000 cubic yards of mine waste are to be placed and compacted in an area designated to support a future commercial building and paved parking area located in the western portion of the site. Sheet 1 of the RAW depicts the location of the proposed on-site placement area.

The 4.3-acre placement area measures approximately 330 feet by 570 feet. The mine waste fill will be up to approximately 30 feet deep. The waste is to be located centrally within the fill prism to reduce the likelihood of surface water infiltration or subsurface

seepage through the waste. Clean fill is to be placed above the waste so that excavation can be performed for utilities without disturbing the waste.

The placement area will require a land use covenant (LUC) agreement and operation and maintenance plan (OMA). The LUC agreement is intended to protect public health and the environment by: 1) preventing inappropriate land use, 2) increasing the probability that the public will have information about residual contamination, 3) disclosing information for real estate transactions about residual contamination, 4) ensuring that long-term mitigation measures are carried out by protecting the engineering controls and remedy; and 5) ensuring that subsequent owners assume responsibility for preventing exposure to contamination.

3 RECOMMENDED SOIL MANAGEMENT PROCEDURES

In the event of future disturbance of the placement area below the designated utility zone, the following soil management practices should be followed. Prior to any disturbance, the details and procedures must be submitted to DTSC for review, and approved by DTSC.

1. Soil Handling Procedures

    a. Per the Dust Mitigation Plan, maintain moisture content in soil to prevent the generation of visible dust during preparation, placement and compaction.

    b. Avoid contact with soil.

    c. Place and compact soil back in the designated placement area from which it was excavated. No soil is to be removed from the site or transported within the site.

    d. Segregate clean soil in the utility zone from mine waste (below the utility zone). The materials should be stockpiled separately. Mine waste must be placed and compacted below the utility zone.

2. Erosion Controls

   a. Permanent surface coverings (such as pavement) must be restored after replacement and recompaction of the mine waste and cover soil in the excavation.

3. Best Management Practices

   a. Best management practices shall be implemented to reduce the chance of potential sediment discharges from excavated areas or stockpiled soil prior to backfill and reinstallation of permanent surface coverings. Best management practice types are described below.

   b. Straw with Jute Netting or Tackifiers: Jute netting or tackifiers should be placed and secured over the slopes to keep the straw from being washed or blown away. Tackifiers or binding agents may be used in lieu of jute netting.

   c. Fiber Rolls: Fiber rolls (wattles) shall be installed on fill slopes. Fiber rolls shall be anchored with wood stakes placed 4 feet on center or closer. Fiber rolls placed on slopes should be trenched 2 to 4 inches into the soil. Additional wattles may be stored on-site during the rainy season in the event that the installed wattles are filled with sediment. Prior to fiber roll installation, the subgrade shall be prepared by removing local surface irregularities and larger rock or debris that would inhibit contact of the fiber roll with the subgrade. A contoured key trench shall be excavated 2 to 4 inches deep along the proposed installation route. Soil excavated from the key trench shall be placed on the up slope side of the fiber roll to reduce the chance of surface water undercutting the roll. When more than one fiber roll is placed in a row, the rolls shall be abutted securely to one another to provide a tight joint, not overlapped. Split, torn, unraveling or slumping fiber rolls shall be repaired or replaced. Fiber rolls shall be observed for damage when rain is forecasted, following rain events, and periodically as needed during prolonged rainfall. Fiber rolls typically do not require removal and can be abandoned in place, once permanent erosion control is established.

3.1 HEALTH AND SAFETY

The mine waste located below the utility zone contains elevated concentrations of metals, particularly arsenic. Exposure to metals in the soil may occur through exposure routes such as ingestion of soil or soil dust, inhalation of soil dust, and dermal contact with soil or soil dust.

Application of water to the affected soil is essential to control fugitive dust emissions. Exposure may be reduced by the use of personal protective equipment such as boots, long-sleeved clothing, gloves and dust mask or respirator. Proper decontamination is important to remove contaminants prior to leaving the affected areas and to limit exposure.

APPENDIX J

Community Profile

COMMUNITY PROFILE
SPRING HILL PROPERTY
Grass Valley, California

Site Location and Size

The approximately 26-acre site is located to the south of Dorsey Drive and to the southeast of State Highway 49/20 in Grass Valley, Nevada County, California. The subject site is comprised of three contiguous parcels, an eastern parcel (Assessor's Parcel Number (APN) 35-260-64, 11.37 acres), a northern parcel (APN 35-260-62, 1.7 acres) and a western parcel (APN 35-260-63, 13.67 acres).

The subject site is located in the southern half of the southeast quarter of Section 23 and the northern half of the northeastern quarter of Section 26, Township 16 North, Range 8 East of the Grass Valley Quadrangle topographic map (United States Geological Survey (USGS), 1995 provisional edition). Site elevations range from approximately 2550 feet above mean sea level (MSL) to approximately 2690 feet above MSL.

Figures 1 and 2 of the Preliminary Endangerment Assessment (PEA) report show the site and surrounding area. Figure 1 shows the approximate site location and property boundaries. Figure 2 is an aerial photograph of the site and immediate vicinity.

Description of Property

The subject site is situated in the Sierra Nevada physiographic province. Physiographic conditions consist of gently to moderately rolling terrain. Typical vegetation includes ponderosa and gray pines, black oak, manzanita, and ceanothus. Site vegetation is generally characterized by mixed conifer forest, oak woodland, manzanita, and other shrubs.

Surface topography at the site generally slopes toward the south and southwest from a relatively flat-lying area in the northern portion of the site and a knoll in the northern central portion of the site. The northern portion of the eastern edge of the site slopes toward the southeast.

The nearest perennial surface water to the site is Wolf Creek, located approximately 500 feet south of the site at an approximate elevation of 2480 feet MSL. Wolf Creek flows to the south and southwest through downtown Grass Valley. Seasonal stormwater flow is likely to cross the southern portion of the property.

At the time of Holdrege & Kull's (H&K's) investigations, the site was generally undeveloped other than the historic mining relics.

Description of Surrounding Land Uses

The subject property is bordered by State Highway 49/20 to the northwest, by commercial property to the south, and by an apartment complex to the east. Dorsey Drive borders the site to the north; an apartment complex is located beyond Dorsey Drive to the north.

Visibility of the Site to Neighbors

The mine features on the site are generally not visible from neighboring properties.

PROJECT DESCRIPTION

Proposed Site Improvements

As of the date of this community profile, no proposed project plans have been prepared for the site.

Potential Environmental Concerns

Historical research indicated the Spring Hill Mine operated at the site intermittently from the late 1800s to the early 1940s. At least three mine shafts, several structures including a mill, and mine waste including waste rock dumps and mill tailings are depicted on the historic maps and identified in the documents that were reviewed. An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of mine tailings may be present at the site. These volume estimates are based on limited subsurface data and were not calculated using survey methods.

To date, approximately 100 samples of background soil, mine waste rock and mine tailings have been collected from the site for chemical analysis. Total arsenic, lead and mercury concentrations were detected in samples of mine waste rock and tailings at concentrations exceeding site background values. Arsenic was detected at concentrations exceeding the California Human Health Screening Level (CHHSL) for industrial soil.

Elevated soil metals concentrations present a potential human health risk resulting from exposure pathways including incidental soil ingestion, dust inhalation, and dermal contact. Metals of potential concern include arsenic, lead and mercury.

Status of Environmental Investigation

The community profile was initially prepared for California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) review as part of a Preliminary Endangerment Assessment (PEA) equivalent report pursuant to a signed Voluntary Cleanup Agreement between the site owner and DTSC. Site investigations to date have included excavation of shallow exploratory trenches, and sampling of mine waste and native soil. DTSC approved the PEA report in a letter dated February 5, 2008. The community profile was updated for inclusion in the Removal Action Workplan (RAW).

Location of Nearby CalEPA and U.S. EPA Projects

H&K is currently involved with several PEA projects being performed or recently completed on nearby properties. The approximate locations of these and other projects in the Grass Valley area are shown on Figure 1 of the RAW.

LOCAL AWARENESS AND INTEREST

Community Demographics

The site is located within the Grass Valley city limits in Nevada County, California. To our knowledge, there are no specific language considerations for the subject site vicinity. The population is primarily white middle/working class. Demographic information listed on the U.S. Census Bureau website for the 2000 census is attached to this community profile.

Community Contact

To H&K's knowledge, no community members or groups have expressed interest in the subject property.

Community Interaction

To H&K's knowledge, no public meetings have taken place regarding the subject property.

A variety of public awareness groups in the Grass Valley area maintain web sites to discuss local environmental issues, schedule public meetings, and discuss local developments. These groups include Grass Valley Neighbors, Rural Quality Coalition, and Wolf Creek Community Alliance. These organizations could be contacted by phone or e-mail in the event that community outreach activities become necessary as a part of the PEA process. Their contact information is included in the Key Contact List presented below.

Media Coverage

To H&K's knowledge, no recent media coverage of the subject property has occurred.

Government Involvement

DTSC is the agency involved with the project at this time. Grass Valley and Nevada County agencies are likely to be involved with the project in the future, including Nevada County Department of Environmental Health (NCDEH) and City of Grass Community Development Department. Government contacts are included in the Key Contact List below.

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Lisa Swarthout, Council Member
Yolanda Cookson, Council Member
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Katherine Medeiros, President and CEO
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KEY ISSUES AND CONCERNS

Historical research and field investigation has identified the potential for site impact resulting from past mining activity at the site. Based on the results of H&K's sampling to date, the metals of concern identified in onsite soil occur at concentrations lower than California hazardous levels in all but a few limited areas of the site. A possible exposure pathway to nearby residents would be dust raised during excavation and grading activities. We anticipate that dust generation will be minimal due to the ambient soil moisture content. Water will be used to wet soil and limit dust generation during excavation and grading activities if excessively dry soil conditions are encountered.

We are not aware of special interest groups expressing concern regarding environmental conditions. We anticipate that concern from local neighbors and interest groups regarding the proposed site development may focus on:

- Traffic and congestion;
- Growth of the community;
- Increase in population;
- Wildlife preservation; and
- Proposed land use.

We anticipate that community and interest groups can be informed of issues regarding the subject site via postal mail or e-mail.

RECOMMENDED PUBLIC PARTICIPATION

Appropriate community outreach activities will be performed for each phase of the project as determined by DTSC. Community outreach should be performed prior to site mitigation as part of RAW preparation.

Population

Chart #1

Total Population Nevada County and California

	Population	Annual percent change	California	Annual Percent Change
1990	77,500	3.9%	29,558,000	n/a
2000	91,642	1.2%	33,721,583	1.8%
2005	98,172	0.9%	36,675,346	1.3%
2006	98,798	0.6%	37,114,598	1.2%
2007	99,026	0.2%	37,559,440	1.2%
2008	99,186	0.2%	38,049,462	1.3%

Source: CA Department of Finance, Demographic Research

Chart #2

City of Grass Valley Population

	Population	Annual Percent Change
1990	8,850	n/a
2000	10,040	0.5%
2005	12,905	5.6%
2006	12,868	-0.3%
2007	12,915	0.4%
2008	12,929	0.1%

Source: CA Department of Finance, Demographic Research

Chart #3

Town of Truckee Population

	Population	Annual Percent Change
1994	11,143	n/a
2000	13,778	3.6%
2005	15,532	2.1%
2006	15,710	1.1%
2007	15,901	1.2%
2008	16,165	1.7%

Source: CA Department of Finance, Demographic Research

Chart #4

City of Nevada City

	Population	Annual Percent Change
1990	2,860	n/a
2000	2,975	0.6%
2005	3,028	-0.1%
2006	3,049	0.7%
2007	3,057	0.3%
2008	3,074	0.6%

Source: CA Department of Finance, Demographic Research

Chart #5

Population Density Nevada County

Year	Population	Density per sq. Mile
1990	77,500	80.9
2000	91,642	95.7
2005	98,172	102.5
2006	98,798	103.2
2007	99,026	103.4
2008	99,186	103.6

Source: CA Department of Water Resources

Population of Nevada County

Chart #6

Population by Age Distribution

Year	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+
1990	10,962	9,634	7,148	13,290	12,345	7,431	9,414	6,348	2,431
2000	10,002	13,431	7,008	10,753	16,483	13,976	8,993	7,744	4,284
2005	8,839	14,486	8,085	9,611	16,603	17,683	11,672	7,652	4,815
2006	8,519	14,173	8,921	9,038	16,180	18,004	12,179	7,652	4,768
2007	8,374	13,857	9,619	8,699	15,932	18,187	13,038	7,698	4,815
2008	8,311	13,473	10,416	8,299	15,613	18,399	13,772	7,912	4,817

California Department of Finance

Chart #7

Population by Race/Ethnicity

Year	Total	White	Hispanic	Asian	Black	Native Am	Other
1990	79,003	74,122	3,316	627	173	765	0
2000	92,532	83,928	5,225	740	254	698	1,687
2005	99,303	89,666	5,964	761	257	710	1,945
2006	99,434	89,634	6,089	771	259	714	1,967
2007	100,219	90,250	6,221	780	261	718	1,989
2008	101,012	90,874	6,353	788	263	722	2,012

California Department of Finance

Population by Educational Attainment

Chart #8

Population 18 and Over, 1990

City	Less than 9th grade	9th to 12th no diploma	High school graduate	Some college	Associate's degree	Bachelors degree	Graduate degree	Total
Grass Valley	441	1,210	2,292	1,855	387	521	288	6,994
Nevada City	67	202	473	618	187	384	269	2,200
Nevada County	1,867	7,052	16,384	17,023	5,014	8,660	3,630	59,630
California	2,352,017	3,114,969	5,080,909	5,246,699	1,649,596	3,052,702	1,523,650	22,020,542

Source: U.S. Department of Commerce, Bureau of the Census

Population 18 and Over, 2000

City	Less than 9th grade	9th to 12th no diploma	High school graduate	Some college	Associate's degree	Bachelors degree	Graduate degree	Total
Grass Valley	234	980	2,835	2,623	524	927	382	8,505
Nevada City	16	232	446	705	193	405	328	2,325
Nevada County	1,180	6,838	17,201	22,082	6,385	11,496	5,743	70,925
California	2,687,841	3,235,504	5,192,997	5,981,132	1,657,058	3,847,654	2,047,999	24,650,185

Source: U.S. Department of Commerce, Bureau of the Census

Educational Attainment by Gender, Population 18 and Over, 2000

	Less than 9th grade	9th to 12th no diploma	High school graduate	Some college	Associate's degree	Bachelors degree	Graduate degree	Total
Nevada County								
Male	674	3,604	8,206	9,970	2,947	5,863	3,125	34,389
Female	506	3,234	8,995	12,112	3,438	5,633	2,618	36,536
California								
Male	1,315,431	1,664,851	2,486,048	2,820,371	758,112	1,901,008	1,161,751	12,107,572
Female	1,372,410	1,570,653	2,706,949	3,160,761	898,946	1,946,646	886,248	12,542,613
United States								
Male	7,338,038	13,942,950	28,211,869	22,272,543	5,539,281	14,846,954	8,757,637	100,909,272
Female	7,497,115	13,772,149	31,694,883	25,363,950	7,069,245	15,434,947	7,537,588	108,369,877
Total	14,835,153	27,715,099	59,906,752	47,636,493	12,608,526	30,281,901	16,295,149	209,279,149

Source: U.S. Department of Commerce, Bureau of the Census

Migration

Chart #9

Net Migration

	Migrants
1996	528
1997	541
1998	288
1999	677
2000	553
2001	464
2002	234
2003	274
2004	278
2005	-54

Source: Internal Revenue Service 2003

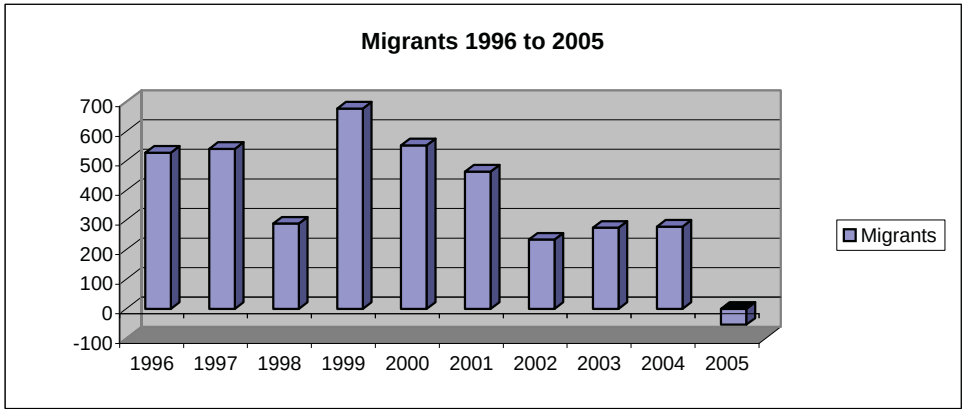


Chart #10

Top 5 In Migration and Median Income by County

	2005	2005	2006	2006
County	**Median Income**	**Number**	**Med Income**	**Percent**
Placer	$32,584	427	$488,448	1.18%
Sacramento	$34,562	220	$48,841	0.61%
Santa Clara	$62,829	145	$160,234	0.40%
Contra Costa	$47,446	105	Source: www.city/Nevada-City	
Alameda	$27,038	97		

Source: Internal Revenue Service 2003

Chart #11

Top 5 Out Migration and Median Income by County

	2005	2005	2006	2006
County	**Median Income**	**Number**	**Med Income**	**Percent**
Placer	$29,486	490	$56,388	1.35%
Washoe, NV	$37,304	222	$490,441	0.61%
Sacramento	$26,203	197	$38,934	0.54%
San Diego	$17,076	69	Source: www.city/Nevada-City	
Butte	$18,071	62		

Source: Internal Revenue Service 2003

Chart #12

Components of Population Change

Year	Change	Births	Deaths	Natural increase	Net Migration
1990	3700	950	719	231	3469
1995	1263	803	753	50	1213
2000	1533	772	843	-71	1604
2001	1909	800	914	-114	2023
2002	1092	790	912	-122	1214
2003	1450	884	989	-105	1555
2004	964	773	988	-215	1179
2005	710	827	1093	-266	976
2006	742	832	978	-146	888
2007	339	773	982	-209	548

Source: California Dep. of Finance

Unemployment

Chart #13

Unemployment Amounts Nevada County Cities

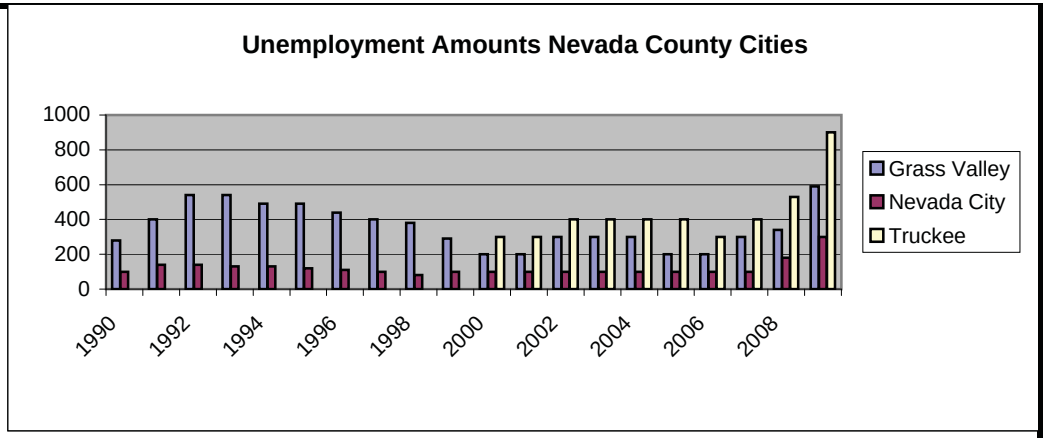
	Grass Valley	Nevada City	Truckee
1990	280	100	n/a
1991	400	140	n/a
1992	540	140	n/a
1993	540	130	n/a
1994	490	130	n/a
1995	490	120	n/a
1996	440	110	n/a
1997	400	100	n/a
1998	380	80	n/a
1999	290	100	n/a
2000	200	100	300
2001	200	100	300
2002	300	100	400
2003	300	100	400
2004	300	100	400
2005	200	100	400
2006	200	100	300
2007	300	100	400
2008	340	180	530
2009 Nov.	590	300	900

Source: California Employment Development Department

Unemployment Rate in California

November-09	12.3%

Source: California Employment Development Department



Source: California Employment Development Department

Chart #14

Nevada County

Average Monthly Labor Statistics, 5/2008-7/2009

Month	Labor force	Employed	Unempl.	Unempl. Rate
May	50,340	47,240	3,100	6.2%
June	51,670	48360	3,320	6.4%
July	52,110	48,680	3,430	6.6%
Aug.	52,540	49,170	3,370	6.4%
Sept.	51,300	48,010	3,280	6.4%
Oct.	50,730	47,180	3,550	7.0%
Nov.	50,600	46,700	3,890	7.7%
Dec.	50,810	46,500	4,310	8.5%
January	51,770	46,670	5,110	9.9%
Februar	51,520	46,160	5,360	10.4%
March	51,390	45,640	5,750	11.2%
April	50,250	44,820	5,420	10.8%
May	49,350	43,830	5,530	11.2%
June	50,630	44,820	5,810	11.5%
July	50,550	44,820	5,730	11.3%
Nov.	49,630	43,910	5,720	11.5%

Source: California Employment Development Department

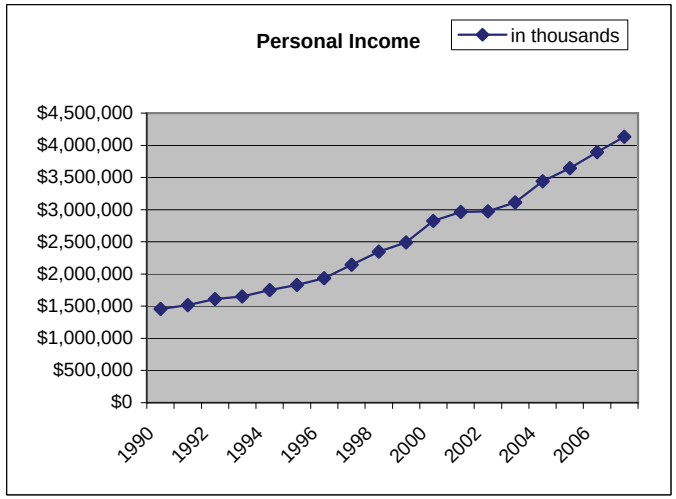
Personal Income

Chart #15

Total Personal Income Nevada County

	in thousands	Annual % Change
1990	$1,456,413	6.3
1991	$1,518,348	4.3%
1992	$1,608,635	5.9%
1993	$1,648,490	2.5%
1994	$1,751,140	6.2%
1995	$1,830,469	4.5%
1996	$1,934,551	5.7%
1997	$2,144,440	10.8%
1998	$2,348,951	9.5%
1999	$2,491,475	6.1%
2000	$2,826,443	13.4%
2001	$2,965,263	4.9%
2002	$2,975,115	0.3%
2003	$3,111,879	4.6%
2004	$3,440,613	10.6%
2005	$3,646,004	6.0%
2006	$3,892,500	5.0%
2007	$4,132,773	4.0%

Source: U.S. Department of Commerce



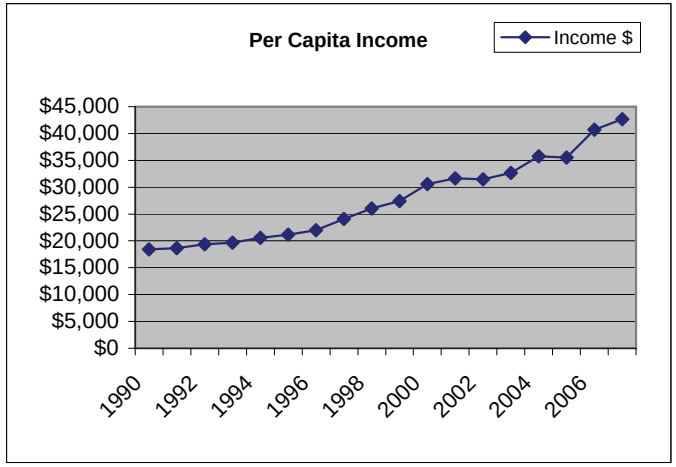


Chart #16

Per Capita Income Nevada County

	Income $	% Change
1990	$18,396	1.0%
1991	$18,679	1.5%
1992	$19,400	3.9%
1993	$19,651	1.3%
1994	$20,557	4.6%
1995	$21,156	2.9%
1996	$22,018	4.1%
1997	$24,058	9.3%
1998	$26,050	8.3%
1999	$27,409	5.2%
2000	$30,553	11.5%
2001	$31,676	3.7%
2002	$31,496	-0.6%
2003	$32,666	3.7%
2004	$35,787	9.6%
2005	$35,507	4.8%
2006	$40,736	7.9%
2007	$42,671	3.7%

Source: U.S. Department of Commerce

Median Household Income

Chart #17

Median Household Income by County (Nominal)

	Nevada County	California
2000	$46,777	$46,836
2001	$46,171	$47,064
2002	$47,478	$47,323
2003	$47,626	$48,440
2004	$49,811	$49,894
2005	$51,582	$53,627
2006	Not Avail	Not Avail
2007	$56,344	$58,361
2008	$56,890	$61,154

Source: U.S. Department of Commerce, Bureau of the Census

Chart #18

Median Household Income (Nominal)

	1989	1999	% Change
Grass Valley	$20,966	$28,182	34.4%
Nevada City	$25,061	$36,667	46.3%
Nevada County	$32,200	$45,864	42.4%
California	$35,798	$47,493	32.7%

Source: U.S. Department of Commerce

Chart #19

Per Capita Income by City or Town

	1989	**1989 adjusted for inflation**	**1999**
City of Grass Valley	$12,078	$16,227	$16,877
Nevada City	$15,412	$20,707	$22,399
Town of Truckee	$15,689	$21,079	$26,786

Chart #20

Poverty Rates

	1989	**1999**	**2007**
City of Grass Valley	13.8%	14.9%	13.0%
Nevada City	10.8%	7.9%	7.9%
Truckee	n/a	n/a	4.6%
Nevada County	7.7%	8.1%	(2006) 7.9%
California	12.5%	14.2%	12.4%

Source: U.S.DoC

Source: www.citydata.com

Chart #21

Number of Physicians

	Nevada County	California
1990	152	74,437
1995	181	78,169
2000	241	84,675
2005	274	94,546
2006	266	96,299

Source: Medical Board of California

Job Growth by Industry Sector

Employment by Industry

Chart #22

	Ag. & Mining	Construct.	Manuf.	Transp. & pub. utilities	Wholesale trade	Retail trade	Finance, insurance real est.	Services	Gov. & public admin.	Tourism
1990	1,095	4,247	3,468	752	739	6,699	2,876	10,702	4,201	n/a
1991	1,064	3,965	3,568	790	880	6,996	2,951	11,314	4,446	n/a
1992	1,101	3,644	3,308	847	996	7,027	3,278	11,404	4,562	n/a
1993	1,169	3,640	3,172	893	981	7,267	3,356	11,910	4,535	n/a
1994	1,301	3,803	3,162	925	1,080	7,587	3,849	12,606	4,590	n/a
1995	1,398	3,701	3,322	967	786	7,796	3,250	13,305	4,657	n/a
1996	482	3,772	3,488	997	816	8,128	3,229	12,480	4,704	n/a
1997	1,422	3,960	3,543	1,017	865	8,087	3,810	13,082	5,024	n/a
1998	1,415	4,820	3,467	1,027	981	8,640	4,766	15,943	4,990	n/a
1999	1,405	5,381	3,338	1,013	1,101	8,917	5,082	16,788	5,039	n/a
2000	1,315	5,825	3,298	1,064	1,163	9,150	5,619	17,700	5,185	n/a
2001	1,267	6,431	2,527	838	990	6,480	6,032	17,077	5,318	5,311
2002	1,253	6,431	2,099	D	921	6,464	6,093	17,488	5,521	5,775
2003	1,159	6,218	2,125	D	849	6,406	6,474	18,243	5,871	5,732
2004	1,129	6,665	2,328	D	D	6,349	6,847	18,572	5,769	5,976
2005	1,144	7,382	2,308	D	928	6,395	7,165	19,189	5,714	6,030

Source: U.S. Department of Commerce Some data which may disclose confidential information is not included (D)

2008 May	n/a	n/a	2,010	520	410	4,130	n/a	11,690	5,600	n/a
2009 May	n/a	n/a	1,790	470	410	3,710	n/a	10,880	5,180	n/a

Source: Employment Development Department

Business by Employment Size and Industry, October to December 2008

Chart #23

Number of Employees	Mining	Construct.	Manuf.	Transp. & pub. utilities	Wholesale trade	Retail trade	Finance, insurance real est.	Services	Gov. & public admin.	Ag., Forestry fishing	Total businesses by number employees
Unknown	2	2	13	2	2	71	6	48	22	0	168
1 to 4	5	912	315	150	216	633	355	2,571	15	233	5,405
5 to 9	1	91	40	19	26	130	46	243	11	18	625
10 to19	1	37	23	5	12	89	24	109	9	11	320
20 to 49	0	17	13	7	6	47	13	55	7	2	167
50 to 99	1	1	6	7	0	13	1	16	6	1	52
100 to 249	0	1	2	1	0	2	1	10	1	0	18
250 to 499	0	0	1	0	0	0	1	2	1	0	5
500 to 999	0	0	0	0	0	0	0	0	1	0	1
1,000 or mor	0	0	0	0	0	0	0	0	0	0	0
Total Bus. by Industry	8	1,061	413	191	262	985	447	3,054	73	265	6,759

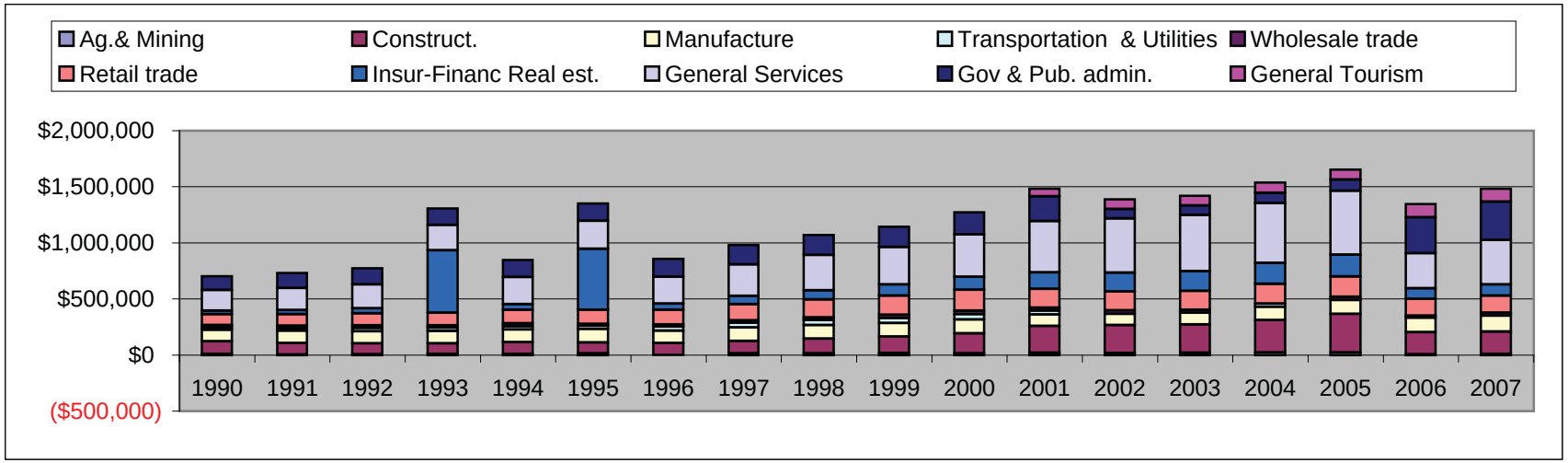
Source: Dun & Bradstreet

Earnings by Industry

Chart #24

	Ag.& Mining	Construct.	Manufacture	Transportation & Utilities	Wholesale trade	Retail trade	Insur-Financ Real est.	General Services	Gov & Pub. admin.	General Tourism
1990	$9,158	$112,084	$104,574	$22,458	$19,690	$95,449	$31,980	$185,022	$121,320	n/a
1991	$5,290	$100,761	$110,964	$23,494	$21,120	$103,003	$37,262	$196,473	$131,950	n/a
1992	$6,199	$99,059	$107,404	$26,831	$23,844	$107,899	$44,767	$214,469	$142,825	n/a
1993	$8,222	$96,384	$108,889	$28,692	$22,566	$112,644	$555,585	$226,504	$146,511	n/a
1994	$10,028	$103,617	$115,018	$28,330	$25,658	$119,456	$52,360	$239,376	$154,541	n/a
1995	$14,168	$97,489	$120,131	$31,048	$15,527	$123,913	$544,713	$249,428	$156,221	n/a
1996	($1,907)	$106,819	$110,828	$34,903	$19,586	$130,638	$56,332	$239,623	$159,469	n/a
1997	$15,675	$110,240	$119,663	$43,340	$21,057	$142,178	$73,373	$281,021	$173,676	n/a
1998	$14,202	$131,951	$121,911	$44,407	$23,791	$160,168	$79,840	$314,515	$179,087	n/a
1999	$16,384	$148,756	$121,125	$43,860	$27,731	$171,735	$99,686	$332,935	$180,524	n/a
2000	$15,589	$178,293	$124,052	$45,619	$31,458	$188,088	$114,701	$377,141	$197,393	n/a
2001	$18,827	$239,922	$103,078	$32,604	$27,678	$167,698	$146,702	$457,458	$219,955	$67,741
2002	$17,815	$248,894	$99,714	D	$30,424	$168,815	$169,333	$483,409	$84,235	$84,235
2003	$20,391	$250,664	$106,875	D	$26,476	$167,731	$176,330	$499,660	$86,137	$85,163
2004	$22,979	$289,723	$115,783	$30,428	D	$174,691	$186,223	$533,505	$93,040	$91,919
2005	$22,979	$343,930	$123,678	D	$27,257	$182,450	$193,162	$571,054	$99,857	$89,857
2006	$7,801	$195,898	$129,676	$16,520	D	$150,900	$94,101	$312,737	$319,034	$120,423
2007	$9,318	$199,793	$142,007	D	$26,825	$151,152	$100,981	$395,979	$339,863	$116,466

Source: U.S., Department of Commerce, Bureau of Economic Analysis



Agriculture

Chart #25

Historical Top Crops Harvested Acreage

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Crops												
Wine grapes	201	201	201	201	201	303	348	404	356	349	350	358
Pasture, Range	95,000	95,000	95,000	95,000	95,000	95,000	94,000	93,500	91,500	93,000	95,000	95,000
Pasture, Irrigated	7180	7180	7180	7180	7180	7180	7180	7000	7180	7300	14000	10000

Chart #26

Historical Top Crops by Value (Thousands $)

Cattle	n/a	n/a	n/a	n/a	$1,692	$1,930	$1,975	$2,845	$2,579	$2,737	$2,815	$2,790
Wine Grapes	$504	$914	$1,168	$603	$930	$1,186	$1,243	$1,717	$1,722	$1,713	$1,848	$1,500
Pasture Irrigated	$1,622	$1,622	$1,527	$1,622	$1,658	$1,753	$1,744	$1,717	$1,722	$1,713	$1,848	$1,500

Chart #27

Historical Wine Grapes Production (Tons)

Wine Grapes	495	856	1063	546	902	1082	1043	1746	1307	1434	1302	1329

Chart #28

Total Harvested Acreage

Acres	102,381	102,381	102,381	102,381	102,381	102,483	101,528	100,904	99,036	100,649	109,350	95,716
% of all Land	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.6%	16.5%	16.2%	16.4%	17.8%	15.6%

Chart #29

Agricultural and Timber Production (Thousands)

Agricultural	$5,746	$6,515	$7,018	$6,020	$5,024	$7,144	$7,254	$8,190	$8,041	$8,663	$9,313	$8,938
Timber	$16,979	$20,258	$22,390	$19,037	$13,601	$15,169	$11,776	$11,538	$8,987	$9,397	$8,808	$7,322
Timber as %	74.7%	75.7%	76.1%	76.0%	73.0%	68.0%	61.9%	58.5%	52.8%	52.0%	48.6%	45.0%
Total	22,725	26,773	29,408	25,057	18,625	22,313	19,030	19,728	17,028	18,060	18,121	16,260

All above, Source: California Agricultural Statistics Service

Chart#30

Nevada County Value of New Construction (Thousands) Total valuation

	$99,216	$85,508	$115,663	$130,076	$161,532	$169,550	$156,294	$181,838	$182,674	$211,046	$212,988	$199,079

Source: California Construction Industry Research Board

Chart#31

Total Annual Travel Expenditure in Nevada County (Millions)

	$159.6	$170.7	$182.4	$182.3	$198.6	$217.0	$221.8	$225.5	$230.7	$239.1	$254.2	$267.7

Source: California Travel and Tourism Commission, Dean Runyan Associates

Service Industry

Chart #32

Service Industry Employment

Year	Information	Professional Scientific & Technical	Management of Companies & Enterprise	Administrative & Waste services	Educational services	Health Care & Social Assistance	Other Services	Total
2001	639	4,319	76	2,838	724	4,744	3,737	17,077
2002	618	4,179	81	3,085	740	4,844	3,941	17,488
2003	670	4,330	71	3,143	888	5,151	3,990	18,243
2004	711	4,616	122	2,900	935	5,179	4,109	18,572
2005	785	4,906	123	3,036	806	5,316	4,217	19,189

Source: U.S. Department of Commerce, Bureau of Economic Analysis

Service Industry Earnings (Thousands)

Year	Information	Professional Scientific & Technical	Management of Companies & Enterprise	Administrative & Waste services	Educational services	Health Care & Social Assistance	Other Services	Total
2001	$18,417	$145,869	$3,392	$55,531	$8,864	$163,980	$61,405	$457,458
2002	$20,930	$133,485	$3,374	$67,690	$10,312	$179,534	$68,084	$483,409
2003	$20,720	$133,939	$3,567	$68,222	$12,812	$188,822	$71,578	$499,660
2004	$24,368	$147,980	$5,287	$61,835	$13,616	$204,947	$75,472	$533,505
2005	$26,685	$164,400	$5,587	$64,424	$12,551	$217,317	$80,090	$571,054

Source: U.S. Department of Commerce, Bureau of Economic Analysis

Housing in Nevada County

Chart #33

Nevada County Total Housing Units

	Single Family units	Multiple-Family units	Mobile Homes	Total housing units	Annual percent change
1990	30,560	3,299	3,493	37,352	n/a
1995	34,734	3,621	3,771	42,126	2.2%
2000	37,198	3,699	3,385	44,282	-0.7%
2001	37,716	3,727	3,441	44,884	1.4%
2002	38,395	3,819	3,525	45,739	1.9%
2003	39,001	3,862	3,621	46,484	1.6%
2004	39,659	4,010	3,725	47,394	2.0%
2005	40,374	4,267	3,752	48,393	2.1%
2006	40,882	4,318	3,801	49,001	1.3%
2007	41,453	4,370	3,848	49,671	1.4%

Source: California Department of Finance, Demographic Research Unit

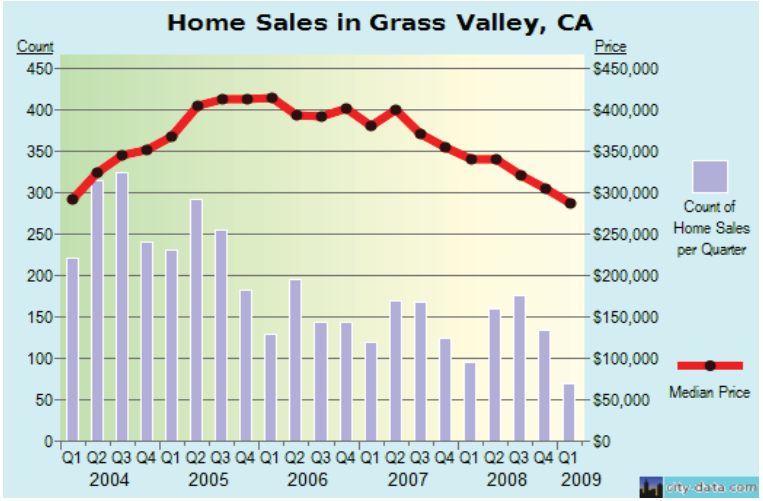
Chart #34

City of Grass Valley Total Housing Units

	Single Family units	Multiple-Family units	Mobile Homes	Total housing units	Annual percent change
1990	2,350	1,782	253	4,385	n/a
1995	2,537	1,844	253	4,634	1.1%
2000	2,706	2,060	500	5,266	5.7%
2001	2,799	2,182	692	5,673	7.7%
2002	2,856	2,182	692	5,730	1.0%
2003	2,916	2,182	692	5,790	1.0%
2004	3,035	2,182	692	5,909	2.1%
2005	3,219	2,404	695	6,318	6.9%
2006	3,240	2,404	695	6,339	0.3%
2007	3,266	2,404	692	6,365	0.4%

Source: California Department of Finance, Demographic Research Unit

Chart #35



Source: Onboard Informatics<city-data.com

Housing in Nevada County--Towns

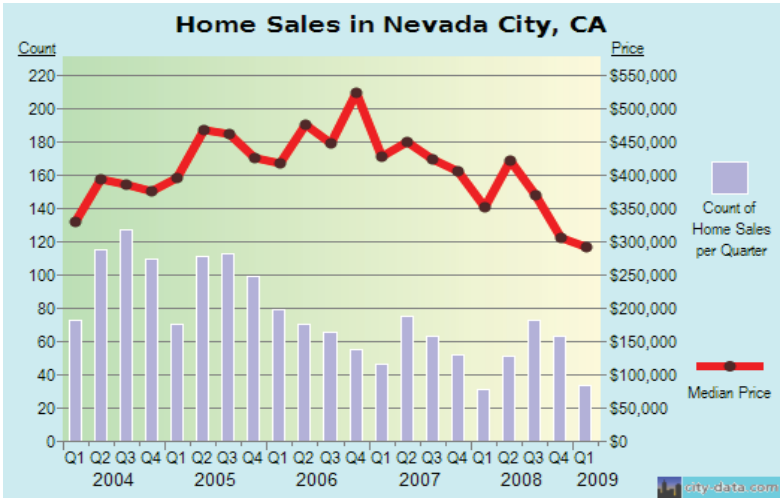
Chart #36

City of Nevada City Total Housing Units

	Single Family units	Multiple-Family units	Mobile Homes	Total housing units	Annual percent change
1990	1,038	322	39	1,399	n/a
1995	1,080	324	39	1,443	1.2%
2000	1,147	195	72	1,414	-5.2%
2001	1,159	195	72	1,426	0.8%
2002	1,164	195	72	1,431	0.4%
2003	1,169	195	74	1,438	0.5%
2004	1,175	195	74	1,444	0.4%
2005	1,188	195	74	1,457	0.9%
2006	1,190	213	74	1,477	1.4%
2007	1,195	229	74	1,498	1.4%

Source: California Department of Finance, Demographic Research Unit

Chart #37



Source: Onboard Informatics-<city-data.com>

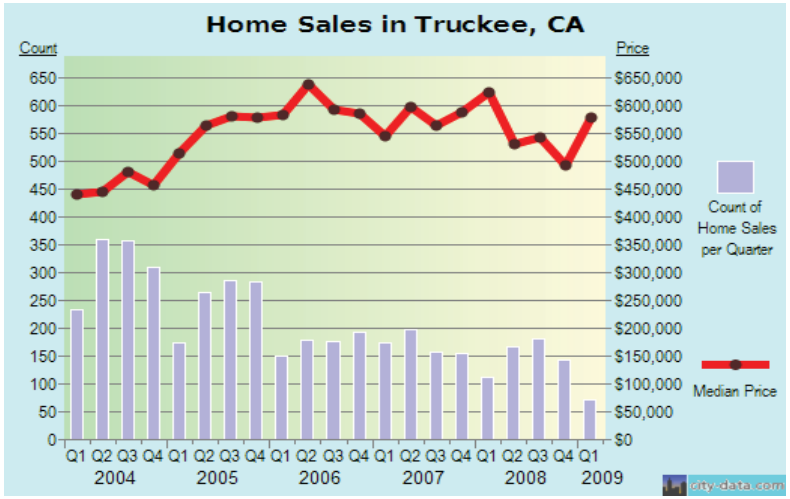
Chart #38

Town of Truckee Total Housing Units

	Single Family units	Multiple-Family units	Mobile Homes	Total housing units	Annual percent change
1994	7,477	949	286	8,712	n/a
1995	7,800	953	286	9,039	1.1%
2000	8,561	899	899	9,757	5.7%
2001	8,767	927	927	9,992	7.7%
2002	9,031	1,019	1,019	10,330	1.0%
2003	9,156	1,049	1,049	10,503	1.0%
2004	9,313	1,185	1,185	10,796	2.1%
2005	9,535	1,307	1,307	11,140	6.9%
2006	9,701	1,340	1,340	11,339	0.3%
2007	9,934	1,376	1,376	11,608	0.4%

Source: California Department of Finance, Demographic Research Unit

Chart #39



Source: Onboard Informatics-<city-data.com>

Taxable Sales

Chart #37

Taxable Sales by City and County

	Grass Valley		Nevada City		Truckee		Nevada County (Thousands)	
	Taxable retail sales	Total Taxable sales	Taxable retail sales	Total Taxable sales	Taxable retail sales	Total Taxable sales	Taxable retail sales	Total taxable sales
1990	$140,548	$169,168	$34,512	$46,480	n/a	n/a	$404,576	$584,996
1991	$132,835	$161,399	$35,588	$47,071	n/a	n/a		
1992	$147,915	$184,377	$35,572	$47,147	n/a	n/a		
1993	$146,817	$180,032	$35,600	$47,158	$74,222	$94,996		
1994	$154,753	$185,409	$35,406	$51,037	$98,026	$126,163		
1995	$159,501	$188,939	$35,904	$51,502	$102,174	$134,061	$469,001	$663,479
1996	$168,146	$201,182	$35,551	$48,442	$110,869	$143,486	$496,325	$705,378
1997	$171,548	$214,098	$38,596	$70,604	$123,561	$154,894	$519,355	$761,122
1998	$180,602	$223,689	$43,124	$64,065	$124,470	$157,848	$536,041	$778,139
1999	$208,885	$257,907	$49,379	$82,558	$141,821	$179,841	$618,867	$911,768
2000	$218,111	$269,147	$56,072	$94,402	$148,900	$201,645	$662,224	$997,050
2001	$239,076	$292,334	$53,539	$78,301	$150,200	$199,069	$697,305	$1,019,922
2002	$264,210	$312,393	$49,477	$83,979	$152,457	$200,100	$701,019	$1,039,617
2003	$278,661	$324,478	$46,698	$91,891	$153,472	$205,685	$712,764	$1,064,456
2004	$322,962	$373,124	$48,542	$112,822	$174,989	$230,973	$783,850	$1,170,443
2005	$398,945	$469,018	$46,678	$97,502	$182,146	$253,303	$846,860	$1,273,632
2006	$424,151	$500,094	$45,664	$108,721	$203,473	$286,339	$877,506	$1,354,634
2007	$441,544	$519,801	$47,183	$91,280	$222,280	$290,036	$883,818	$1,327,500
2008*	$194,798	$236,589	$22,337	$45,623	$99,063	$119,588	$393,611	$586,027

*1st & 2nd Quarter

CA Board of Equalization