Letter Health Consultation

KLAU AND BUENA VISTA MINE SITE

SAN LUIS OBISPO COUNTY, CALIFORNIA

Prepared by
California Department of Public Health

JULY 29, 2014

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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SAN LUIS OBISPO COUNTY, CALIFORNIA

Prepared By:

California Department of Public Health
Environmental Health Investigations Branch
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Agency for Toxic Substances and Disease Registry

State of California—Health and Human Services Agency
California Department of Public Health

Ron Chapman, MD, MPH
Director & State Health Officer

EDMUND G. BROWN JR.
Governor

July 29, 2014
Mr. Jim Sickles
Superfund Remedial Project Manager
U.S. Environmental Protection Agency, SFD-8-2
75 Hawthorne Street
San Francisco, CA 94612

Dear Mr. Sickles:

This Letter Health Consultation (LHC) follows up on a recommendation made in the Public Health Assessment (PHA) that the California Department of Public Health (CDPH) prepared in 2010 for the Klau and Buena Vista Mine Site, San Luis Obispo County, California. The PHA recommendation stated that exposure concerns related to mine waste in Las Tablas Creek should be evaluated, when this data becomes available. In June 2012 CDPH received this information from the United States Environmental Protection Agency (USEPA). CDPH Cooperative Agreement staff prepared this LHC in collaboration with USEPA and evaluated exposure to contaminants of concern (mercury, arsenic, thallium, and cadmium) in floodplain soils and creek sediments for this sparsely populated area along the Las Tablas Creek Watershed Area. Based on the available data, noncancer or cancer health effects are not expected from exposures to the resident/caretaker, seasonal hunter/hiker/rancher or a child from ingestion, skin contact, and dust inhalation of soils from the Las Tablas Creek Watershed Area. Limitations include sampling data that did not speciate between trivalent and hexavalent chromium and a lack of toxicity values for Thallium in the USEPA Integrated Risk Information System. On the basis of the evaluation of exposures to the contamination from the Klau and Buena Vista Mines, CDPH recommends the following:

1) Monitoring any changes in the population or in the use of land in order to address potentially exposed populations.
2) Restricting access to the creek and adjacent floodplains to help minimize potential exposures in the future.
3) Training and proper use of personal protective equipment (e.g., gloves, particulate respirator, etc.) for anyone engaging in activities in the Las Tablas Creek Watershed.
4) Recommending good housekeeping techniques to keep indoor dust levels low for the resident/caretaker.
5) Although no health effects from exposure to Las Tablas Creek soils or sediment are expected, CDPH is concerned that the exposed sediment along the Lake Nacimiento shoreline is impacted from KBV mine wastes. CDPH recommends reviewing potential exposures of hikers, fishermen, ATV riders/horse riders to sediment via dermal, incidental ingestion, and dust inhalation pathways, when these datasets become available.

Background

In April 2010, CDPH and the Agency of Toxic Substances and Disease Registry (ATSDR) published a Public Health Assessment (PHA) to address exposure concerns related to mine waste from the Klau and Buena Vista (KBV) Mine Site located in San Luis Obispo County, California. The KBV Mine Site is listed on the National Priority List (EPA #: CA1141190578). The PHA was written under a cooperative agreement between ATSDR and CDPH. The findings of the evaluation were made public in April 2010 (https://www.ehib.org/projects/KlauFinal.pdf). In the PHA, CDPH staff evaluated exposures of nearby residents or trespassers to on-site contamination.

Although exposures to on-site soil were evaluated in the PHA, potential exposures to creek sediment and floodplain soils were not evaluated due to lack of environmental sampling data for the Las Tablas Creek Watershed area (Figure 1). The PHA recommended the evaluation of these data if they became available. In June 2012, the USEPA completed a remedial investigation report for Operational Unit 2 (OU2), the Las Tablas Creek Watershed area, of the KBV Mine Site.[1] CDPH staff used these data to evaluate metals in floodplain soils and creek sediment to determine the potential health risks to nearby residents and trespassers. This letter presents CDPH's analysis, conclusions, and recommendations.

The KBV Mine Site consists of two abandoned mercury mines, active from 1868 to 1970, located on adjacent properties within the Lake Nacimiento watershed, on the ridge of the Santa Lucia Range, in San Luis Obispo County, California. The mines are approximately 12 miles west of Paso Robles. Surface water from the mines flows first into the Klau Branch of Las Tablas Creek, then into the Las Tablas Creek Ranch Reservoir, then back into Las Tablas Creek, and ultimately into Lake Nacimiento (approximately 8.5 miles downstream of the mines, see Figure 1).

Waste discharges originating from the Klau and Buena Vista Mines were first investigated by the California Regional Water Quality Control Board-Central Coast Region (RWQCB) in 1969. The waste includes acid mine discharges (AMD) consisting of a very low pH (~2-3) and elevated metals concentrations. Studies evaluating the water and sediment quality in the North and South Forks of Las Tablas Creek have confirmed that the KBV Mines are the primary source of contamination to the Las Tablas watershed and Lake Nacimiento. The land surrounding the site is mostly undeveloped space used for grazing and agricultural purposes. A year-round resort community is located along the south shore of Lake Nacimiento, with the population ranging from about 3,000 to 14,000 during busy holidays. In April 2006, the site was added to USEPA's National Priorities List (NPL), allowing the USEPA to use federal resources to conduct cleanup activities at the site.

The Las Tablas Creek Watershed is located in a sparsely populated area, which limits the possibility for exposure to the general population. On December 17, 2012, CDPH staff received information from USEPA regarding the potential populations that could be exposed to creek contaminants in sediment and floodplain soils: a caretaker for the mine (recently hired by the

[1] Innovative Technical Solutions, Inc. (ITSI). 2012. Remedial Investigation Report Klau and Buena Vista Mines Site Las Tablas Creek Watershed (OU2) San Luis Obispo County, California. (Document Control Number: 07163.0024.0057),
June.

mine owner and living on the site near the creek); ranchers and foremen (who move cattle from higher to lower grounds by the creek from early spring through summer); seasonal hunters and hikers (private land owners by Chimney Rock and Cypress Mountain Road allow hunters to cross their property and hunt deer for a fee during the legal hunting season); and a child residing at a local ranch (the property is within the floodplains adjacent to Las Tablas creek). Program staff investigated skin contact, incidental ingestion and dust inhalation as the potential exposure pathways.

CDPH staff provided a copy of the 2010 PHA to the new caretaker on February 6, 2013, and informed him in a letter of CDPH's evaluation, relative to his activities as resident caretaker of the mine property. CDPH staff also provided him with our contact information to convey comments or concerns. To date, the caretaker has not contacted CDPH staff for further information.

Discussion

In 2010, USEPA oversaw the collection of soil samples from selected floodplain areas adjacent to Las Tablas Creek, and sediment samples within the active channels of the creek and Harcourt Reservoir. These datasets were used to evaluate potential exposures to a resident/caretaker, seasonal hunter/ hiker/ rancher; and a child from skin contact, incidental ingestion, and soil dust inhalation. Las Tablas Creek is a dynamic stream with large surface flows during the winter (particularly during storm events), and flows within subsurface gravels during the late summer and fall. The creek meets the minimum definition for a perennial stream. Floodplain areas vary along the creek, including wide, flat areas, steep drop-offs, and relatively narrow, well-vegetated, gently sloping banks. Exposed floodplain areas in the summer and fall may be underwater during winter. Depending on the time of year, both soil and sediment have the potential to contribute to completed exposure pathways.

Therefore, CDPH staff compared both the concentration of contaminants detected in floodplain soil and sediment from Las Tablas Creek to media-specific noncancer and cancer comparison values. For the screening evaluation, CDPH looked at the maximum detected concentrations in lieu of the 95% upper confidence limits of mean (95% UCL) to allow for a more conservative assumption of exposure and ensure that potential health hazards from the chemicals are recognized. In this document the term "soil" refers to both data sets.

Based on the maximum detected concentrations, arsenic (21.4 mg/kg), cadmium (5.4 mg/kg), mercury (122 mg/kg), and thallium (8.10 mg/kg) exceeded soil-specific comparison values from ATSDR and the Office of Environmental Health Hazard Assessment (OEHHA). Of all of the contaminants detected, arsenic is the only chemical considered carcinogenic. These elements were evaluated further as contaminants of concern (COC) (see Table 1).

Table 1 - Maximum Concentration of Contaminants Detected in Las Tablas Creek Sediment and Floodplain Soil with Corresponding Media-Specific Comparison Values

Analyte	Maximum (mg/kg)	Comparison Value (mg/kg)	Media-Specific Comparison Value (Source)
Aluminum	23,600	50,000 chronic EMEG (child) 700,000 chronic EMEG (adult)	ATSDR
Antimony	15.5	20 RMEG (child) 280 RMEG (adult)	ATSDR
Arsenic	**21.4**	**15 chronic EMEG (child) 210 chronic EMEG (adult) 0.47 CREG**	**ATSDR**
Barium	323	10,000 chronic EMEG (child) 140,000 EMEG (adult)	ATSDR
Beryllium	2.20	100 chronic child EMEG (child) 1,400 EMEG (adult)	ATSDR
Boron	37.8	10,000 intermediate EMEG (child) 140,000 intermediate EMEG (adult)	ATSDR
Cadmium	**5.40**	**5 chronic EMEG (child) 70 chronic EMEG (adult)**	**ATSDR**
Chromium*	198	75,000 RMEG (child) 1,100,000 RMEG (adult)	ATSDR
Cobalt	110	500 intermediate EMEG (child) 7,000 intermediate EMEG (adult)	ATSDR
Copper	60.7	500 intermediate EMEG (child) 7,000 intermediate EMEG (adult)	ATSDR
Lead	16.1	150 - CHHSL	OEHHA

Table 1 - Maximum Concentration of Contaminants Detected in Las Tablas Creek Sediment and Floodplain Soil with Corresponding Media-Specific Comparison Values continued

Analyte	Maximum (mg/kg)	Comparison Value (mg/kg)	Media-Specific Comparison Value (Source)
Manganese	1,270	2,500 RMEG (child) 35,000 RMEG (adult)	ATSDR
Mercury**	**122**	**18 - CHHSL**	**OEHHA**
Methyl Mercury	0.0200	15 chronic EMEG (child) 210 chronic EMEG (adult)	ATSDR
Nickel	299	1,000 RMEG (child) 14,000 RMEG (adult)	ATSDR
Selenium	19.0	250 chronic EMEG (child) 3,500 chronic EMEG (adult)	ATSDR
Silver	2.78	250 RMEG (child) 3,500 RMEG (adult)	ATSDR
Thallium	**8.10**	**5 - CHHSL**	**OEHHA**
Vanadium	113	500 intermediate EMEG (child) 7,000 intermediate EMEG (adult)	ATSDR
Zinc	209	15,000 chronic EMEG (child) 210,000 chronic EMEG (adult)	ATSDR

Bolded detections meet or exceed media-specific comparison values (CV).
mg/kg: milligram per kilogram
ATSDR: Agency for Toxic Substances and Disease Registry
CHHSL: OEHHAs California Human Health Screening Levels for Residential Land Use OEHHA: Office of Environmental Health Hazard Assessment, California Environmental Protection Agency
EMEG: ATSDRs Environmental Media Evaluation Guide
RMEG: Reference Dose Media Evaluation Guide based Environmental Protection Agency's Reference Dose
CREG: ATSDRs Cancer Risk Evaluation Guide for 1 in 1,000,000 increased cancer risk
*The analyses did not speciate between trivalent and hexavalent chromium, but refer to "total chromium." No CV or CHHSLs are available for Total Chromium. However, per NIEHS's NTP for hexavalent chromium (http://ntp.niehs.nih.gov/ntp/roc/twelfth/profiles/ChromiumHexavalentCompounds.pdf)
"*Chromium (VI) compounds are strong oxidizing agents and are highly corrosive. In the environment, they generally are reduced to chromium (III) compounds*." For soil and sediment, CDPH staff therefore used the CV for trivalent chromium: RMEG, child (75,000 mg/kg).
**Data sets supplied from USEPA indicate total mercury. CDPH staff therefore used a screening level for total mercury (CHHSL).

Noncancer health assessment

For this preliminary toxicological evaluation, CDPH assumed a 1-6-year-old child may play in the area one day a week for six years (52 days/year, 8 hours/day, for 6 years). For the resident/caretaker, exposure was assumed to occur 104 days per year (104 days/year, 8 hours/day, for 30 years). For seasonal hunter/hiker/ranchers, exposure was assumed to occur one day per week for three months of the year for nine years (24 days/year, 8 hours/day, for 9 years). Assumptions for potential exposure to these populations are based on a conference call with you regarding site characteristics, human activity, and exposure concerns on December 17, 2012. Since it is very unlikely that anyone would be exposed for a full day, using eight hours of exposure for each day provides a health-protective assumption for the calculated exposure doses.[2] In all three hypothetical scenarios, exposure was assumed to occur via dermal contact[3], incidental ingestion, and inhalation of dusts from soil.

Table 2 – Noncancer Dose Estimates from Exposures to Contaminants in Las Tablas Creek Sediment and Floodplain Soil with Corresponding Health Comparison Values

Contaminant	Estimated Child Dose (ug/kg/day)	Estimated Resident /Caretaker Dose (ug/kg/day)	Estimated Hunter/Hiker/Ranchers Dose (ug/kg/day)	Reference Dose (ug/kg/day)
Thallium	0.00505	0.00113	0.000261	0.02 (p-RfD)*
Arsenic	0.00857	0.00197	0.000455	0.30 (MRL)**
Mercury	0.0742	0.0170	0.00392	0.30 (MRL)***
Cadmium	0.00323	0.000170	0.000739	0.01 (MRL)****

Dose estimates include ingestion, dermal, and inhalation exposure.
ug/kg: microgram per kilogram; MRL: Agency for Toxic Substances and Disease Registry's Minimal Risk Level; p-RfD: 60% bioavailability assumed for arsenic ingestion.
USEPA's Provisional Reference Dose for Thallium and Compounds (http://hhpprtv.ornl.gov/issue_papers/ThalliumINitrate.pdf); *p-RfD for soluble thallium; **ATSDR's MRL for inorganic arsenic; *** ATSDR's MRL for methyl mercury; ****ATSDR's MRL for cadmium

[2] Estimated exposure doses were calculated using ATSDR Dose Calculator (equation and all default values were taken from ATSDR's Public Health Assessment Guidance Manual). Individual dose calculations for each exposure pathway are available upon request.

[3] Calculations for dermal exposure reflect skin surface measurements from: EPA. 1997 Exposure Factors Handbook. Volumes 1, 2, and 3. Available at: http://www.epa.gov/ncea/pdfs/efh/front.pdf
EPA. 2001. Risk assessment guidance for Superfund. Volume 1, 2, and 3. Available at: http://www.epa.gov/oswer/riskassessment/ragse/index.htm

Thallium

Although Thallium is identified as a COC, due to limitations in the available toxicological data, USEPA's Integrated Risk Information System (IRIS) does not provide toxicity values for thallium. When such a value is not available, a Provisional Peer-Reviewed Toxicity Value (PPRTV) is utilized as a chronic provisional reference dose (p-RfD). None of the calculated exposure doses for Thallium were found to exceed noncancer health comparison values derived from the PPRTV. Since exposure dose estimates for Thallium do not exceed the p-RfD, CDPH staff concludes that health effects from exposures to thallium are not likely for the resident caretaker, seasonal hunter/hiker/ranchers, or child (see Table 2).

Arsenic, cadmium, and mercury

None of the calculated exposure doses for arsenic, cadmium, and mercury were found to exceed noncancer health comparison values (see Table 2).

Conclusions: potential noncancer health effects

The data used in this evaluation (maximum detected concentrations), combined with health-protective exposure assumptions, indicate that noncancer health effects are not likely to be of concern. For this analysis program staff evaluated current and future exposure via skin contact, ingestion, or inhalation of airborne to soil for the resident/caretaker, seasonal hunter/hiker/ranchers, or a young child.

Cancer health assessment

Cancer health effects are evaluated in terms of a possible increased statistical risk of developing cancer. Arsenic is the only chemical considered to be a carcinogen. The maximum concentration of arsenic in soil (21.4 mg/kg) was found to exceed ATSDR's media-specific cancer risk evaluation guide (CREG) for a one in a million excess cancer risk (0.47 mg/kg) (see Table 1). CREGs are media-specific comparison values that serve as a screening tool for evaluating concentrations of carcinogens during an environmental guideline comparison and not as an indication that cancer is expected or predicted. The CREG assumes continuous exposure over a lifetime, which is not the case for the populations under consideration. To further evaluate the arsenic exposures, CDPH staff looked at the individual exposure pathways: inhalation, ingestion and dermal exposure for the subpopulations under consideration.

Table 3 shows the estimated concentrations of arsenic in air for the maximum concentration in soil and for the highest 95% upper confidence limit of the mean (95% UCL) concentration in soil. Data provided in the "*Remedial Investigation Report for the Las Tablas Creek watershed area, OU2*" were used in the 95% UCL calculations (soil and sediment, wet and dry seasons). 95% UCL results were provided to you via email in a Technical Assistance on March 6, 2012.[4]

[4] Project staff used ProUCL 4.1 to calculate 95% upper confidence limits of the mean

Table 3 – Estimated Arsenic Concentration in Air from Airborne Sediment and Soil, PEF, and Cancer Health Screening Level

Arsenic Concentration in soil (mg/kg)	PEF (m^3/kg)	Estimated Arsenic Concentration in air from sediment or soil (µg/m^3)	ATSDR $CREG_A$ (µg/m^3)
21.4 (maximum detected)	1,316,000,000	0.00001626	0.00023
7.97 (highest 95% UCL)	1,316,000,000	0.00000605623	0.00023

PEF – default Particulate Emission Factor from the California Department of Toxic Substances Control Office of Human and Ecological Risk (HERO, http://www.dtsc.ca.gov/AssessingRisk/upload/HHRA_Note1.pdf)
$CREG_A$ – Cancer Risk Evaluation Guide in Air, was obtained from ATSDR's PHAGM (http://www.atsdr.cdc.gov/hac/PHAManual/appf.html#3.3)
µg/m^3= micrograms per cubic meter
mg/kg= milligrams per kilogram

The estimated concentrations of arsenic in air from airborne soil were not found to exceed the CREG (2.3E-04 µg/m^3). In order to evaluate the cumulative cancer risk from arsenic, CDPH staff included all exposure pathways in the calculation: dust inhalation, incidental ingestion and dermal exposure. There is no information available on mutagenic mode of action for arsenic, or chemical-specific evaluation recommendations, therefore CDPH staff followed OEHHA's recommendation for assessing cancer risk for children by assuming that the average daily dose for short-term exposure for children is assumed to last a minimum of nine years.[5] Exposure duration was 30 years for the resident/caretaker, nine years for the child, and nine years for hunter/hiker/ranchers. Note that these exposure assumptions are very conservative since no 8-hour continuous exposure is likely.[6]

CDPH estimated the total excess cancer risk for each exposed population by adding the potential individual risks resulting from each exposure pathway. The total estimated excess cancer risks for seasonal hunter/hiker/ranchers from dermal exposure, ingestion, and inhalation of arsenic in soil does not exceed the point of departure risk of one in a million. However, the total estimated excess cancer risks for the resident/caretaker and child slightly exceeded the point of departure risk of one in a million (see Table 4).

[5] Office of Environmental Health Hazards Assessment. Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. 2003 Aug. p. 111 (http://www.oehha.ca.gov/air/hot_spots/pdf/HRAguidefinal.pdf)
[6] Estimated cancer risk calculated using ATSDR Dose Calculator (Equation and all default values taken from ATSDR's Public Health Assessment Guidance Manual. Individual calculations for each exposure pathway are available upon request.

Table 4 – Potential Total Cancer Risk from All Exposure Pathways Using the Maximum Detected Concentration of Arsenic (21.4 mg/kg)

Population	Potential Cancer Risks Using Maximum Detected Concentration of Arsenic			
	Dermal	Ingestion*	Inhalation	Total
Child	1.83E-07	1.47E-06	4.27E-10	1.65E-06
Resident /Caretaker	1.47E-07	1.12E-06	2.85E-09	1.27E-06
Seasonal Hunter/Hiker/ Ranchers	1.02E-08	7.75E-08	1.97E-10	8.79E-08

*60% bioavailability assumed for arsenic ingestion

CDPH further evaluated the resident/caretaker and child cancer risks from exposure to arsenic using the highest 95% UCL (7.97 mg/kg). The 95% UCL provides a better estimate for the central tendency of the exposure point concentration, compared to the maximum concentration. The total estimated excess cancer risks for the resident/caretaker and child from dermal exposure, ingestion, and inhalation of arsenic in soil using the 95% UCL concentration of arsenic do not exceed the point of departure risk of one in a million (Table 5).

Table 5 – Potential Total Child and Resident/Caretaker Cancer Risk from All Exposure Pathways Using the 95% UCL of Arsenic in Soil/Sediment (7.97 mg/kg)

Population	Potential Cancer Risks Using the 95% UCL of Arsenic			
	Dermal	Ingestion	Inhalation	Total
Child	6.81E-08	5.47E-07	1.59E-10	6.15E-07
Resident/Caretaker	5.47E-08	4.17E-07	1.06E-09	4.73E-07

Conclusions: potential cancer health effects

Using conservative exposure assumptions (maximum detected concentration of arsenic and 8-hour continuous exposure), no significant cancer risk is associated with the current and future exposures of seasonal hunter/hiker/ranchers from skin contact, incidental ingestion, and inhalation of soil. The total estimated potential cancer risk for the resident caretaker and child slightly exceeded the point of departure risk of one in a million from all exposure pathways. Further evaluation of the potential resident/caretaker and child cancer risk using an estimated exposure point concentration that better represents the central tendency of the datasets (95% UCL), showed that the estimated cancer risk for child and resident/caretaker did not exceed the point of departure risk of one in a million. Therefore, CDPH staff concludes that the potential cancer risks for a resident/caretaker and child are not likely to be significant with current and future exposures from skin contact, incidental ingestion, and inhalation of soil.

Summary and recommendations

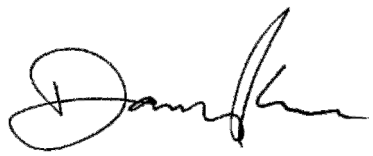
Based on the available data, noncancer or cancer health effects are not expected from exposures to the resident/caretaker, seasonal hunter/hiker/rancher or a child from ingestion, skin contact, and dust inhalation of soils from the Las Tablas Creek Watershed Area.

Although current and future exposure to creek sediment and floodplain soils would not be expected to increase the risk of cancer or have noncancer health effects, it is still possible that adverse health effects may occur due to changes in exposure patterns. As a precaution, CDPH recommends the following:

6) Monitoring any changes in the population or in the use of land in order to address potentially exposed populations.
7) Restricting access to the creek and adjacent floodplains to help minimize potential exposures in the future.
8) Training and proper use of personal protective equipment (e.g., gloves, particulate respirator, etc.) for anyone engaging in activities in the Las Tablas Creek Watershed.
9) Recommending good housekeeping techniques to keep indoor dust levels low for the resident/caretaker.
10) Although no health effects from exposure to Las Tablas Creek soils or sediment are expected, CDPH is concerned that the exposed sediment along the Lake Nacimiento shoreline is impacted from KBV mine wastes. CDPH recommends reviewing potential exposures of hikers, fishermen, ATV riders/horse riders to sediment via dermal, incidental ingestion, and dust inhalation pathways, when these datasets become available.

Please do not hesitate to contact me if you have any questions.

Sincerely,



Danny Kwon, MPH, REHS
Staff Research Scientist
Environmental Health Investigations Branch
California Department of Public Health
850 Marina Bay Parkway, Building P3
Richmond, CA 94804
Telephone (510) 620-3670
Fax (510) 620-3720
Email Danny.Kwon@cdph.ca.gov

cc:

Gabriele Windgasse, DrPH
Chief, Site Assessment Section
Environmental Health Investigations Branch
California Department of Public Health
850 Marina Bay Parkway
Richmond, CA 94804

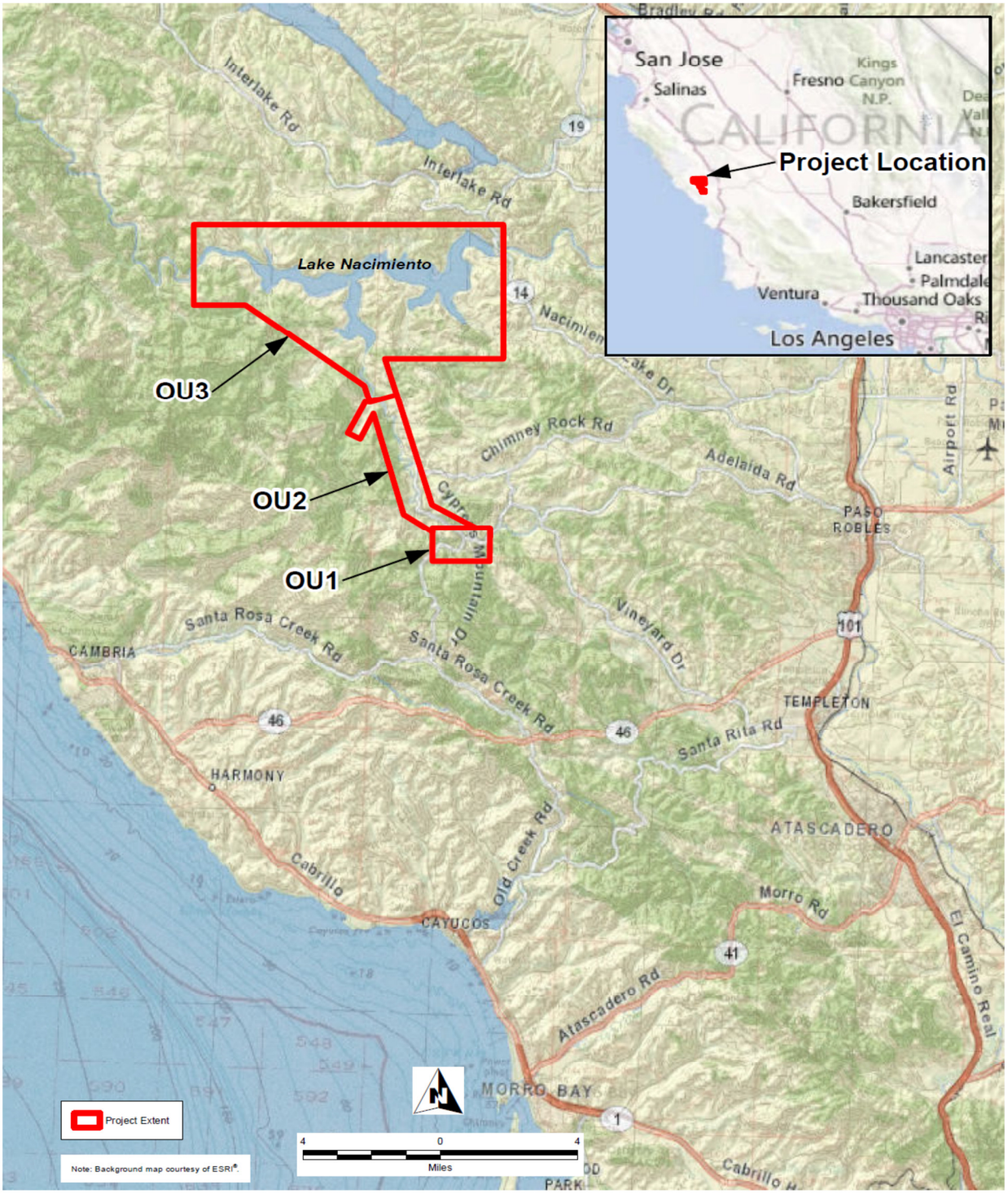
Paul B. English, PhD, MPH
Branch Science Advisor
Environmental Health Investigations Branch
California Department of Public Health
850 Marina Bay Parkway
Richmond, CA 94804

Rick Kreutzer, MD, Chief
Division of Environmental and Occupational Disease Control
California Department of Public Health
850 Marina Bay Parkway, Building P, 3rd Floor
Richmond, CA 94804

Charisse J. Walcott
Environmental Health Scientist
Western Branch
Division of Community Health Investigations CDC/ATSDR
1600 Clifton Road, Mailstop F-59
Atlanta, GA 30333

CAPT Robert Knowles, MS, REHS
Regional Director
Agency for Toxic Substances & Disease Registry, Region 9
75 Hawthorne Street, Suite 100, HHS-1
San Francisco, CA 94105

Figure 1 - Klau and Buena Vista Mines Superfund Site, San Luis Obispo County, California



Source: CDM Smith. Conceptual SAP for SEDA and Contaminant Loading Evaluation. 2012 November 16