



Linda S. Adams
Secretary for
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Department of Toxic Substances Control

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700 Heinz Avenue
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Arnold Schwarzenegger
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October 18, 2007

Mr. Greg Haet
Associate Director, Environmental Protection
Office of Environment, Health & Safety
University of California, Berkeley
317 University Hall #1150
Berkeley, California 94720-1150

OCT 20 2007

Dear Mr. Haet,

The Department of Toxic Substances Control (DTSC) received the Draft Current Conditions Report for the University of California Richmond Field Station Site located in Richmond, California. The report, dated April 2, 2007 was prepared by Tetra Tech EM, Inc. and Sea Engineering, Inc. for the Office of Environment, Health and Safety, University of California, Berkeley. The document describes the historical and current uses of the site, and summarizes past environmental investigations and remedial activities. The report also identifies data gaps. DTSC has reviewed the report and has the following comments as well as the enclosed comments prepared by DTSC's Human and Ecological Risk Division (HERD). DTSC has also incorporated as comments recommendations provided by the Community Advisory Group.

General Comments:

1. The CCR should include an up to date hydrogeological conceptual model that is supported by available site data including boring logs, cross sections, and maps illustrating geologic and hydrogeologic features. The distribution and extent of major contaminant types should be illustrated on maps and cross sections in addition to ground water elevation contours and flow directions in both the upper and lower horizons. Ground water occurrence, sample intervals and analytical results as well as surface features and potential source areas should be illustrated. These data and interpretations should be provided within the CCR or compiled as an appendix rather than as references. The same data will be needed to support the pending ground water monitoring program. If the data are not available to prepare the requested maps, cross sections, etc. the lack of information should be identified as a data gap.

2. The ground water flow direction and distribution/extent of contamination along the Zeneca boundary area should be determined and monitored in all contaminated intervals.
3. The former tram line used by the California Cap Company needs to be described in more detail. If the tram line was constructed and maintained similar to railroad lines, they will need to be investigated and should be identified as a data gap.
4. Additional investigation of the Bulb Area is needed as the previous samples were primarily analyzed for metals. As the Bulb Area was used as a landfill, additional sampling needs to be conducted for a wider range of chemicals.
5. Groundwater total dissolved solid (TDS) concentrations need to be collected from future groundwater monitoring wells.
6. As volatile organic compounds (VOCs) have been detected in groundwater, soil gas sampling needs to be conducted at the site. If additional VOC contamination is detected additional soil gas sampling will need to be conducted.
7. A test pit associated with the California Cap Company was identified on the figures. Further investigation of this area should be proposed to determine whether unexploded munitions or explosive residues are present. The text also needs to clarify the types of shells manufactured by the former California Cap Company.
8. Building 482 was identified as being used for asphalt testing. An investigation of semi-volatile organic compounds (SVOCs) and metals should be conducted at this building.
9. Building 470 was identified as containing the Forest Products Research furnace. The uses of the furnace should be further discussed.
10. The chemicals associated with the match head manufacturing should be discussed.
11. Building 197 was identified as an area of concern in the 1989 Environmental Assessment (Ensco Environmental Services, Inc.). An area south of a fuel pump island contained 40 55-gallon drums and 5-gallon containers of waste oil. This area as well as the fuel pump island and any underground piping should be identified and investigated.

12. The 1989 Environmental Assessment also states that improper storage of 55-gallon drums was observed outside of Buildings 118, 121 and 150. These areas need to be identified as a data gap and investigated.
13. An area of disturbed soil is located west of the U.S. EPA laboratory, but is not discussed in the CCR and does not appear to have been previously investigated. The lack of soil, soil gas, and grab ground water sampling should be identified as a data gap.

Specific Comments:

1. Page ES-1, Executive Summary and Page 1, Section 1.0 Introduction and Background: These sections should clarify that DTSC's Order did not include the "outboard" areas of the Richmond Field Station (RFS), and the acreage of the entire RFS and areas covered by the DTSC Order should be clarified.
2. Page ES-4, "The area of the former California Cap Company's mercury fulminate manufacturing plant, known as AOC 7, contains elevated concentrations of mercury in soil and groundwater." The text should state that in addition to mercury, arsenic, cadmium, copper, lead and zinc were identified at elevated concentrations at the former mercury fulminate facility.
3. Page ES-4, "Former FPL Wood Treatment Laboratory (WTL): A small localized area of soil containing elevated concentrations of arsenic was identified during removal of surface equipment associated with the former WTL." The text should be revised to state that in addition to arsenic, chromium, copper, and pentachlorophenol were identified at elevated concentrations at the former WTL.
4. Page ES-4, Please clarify that the pyrite cinders typically contain elevated concentrations of arsenic, cadmium, copper, lead, nickel and zinc.
5. Page ES-5, Biologically Active Permeable Barrier (BAPB): "The BAPB was installed between the ground surface and a depth of 20 feet to treat any residual dissolved metals in groundwater that may be migrating to the marsh." The text should clarify that ground water at depths greater than about 20 feet bgs will not be treated by the BAPB, and that metals contaminated ground water occurs at depths greater than 20 feet bgs on adjacent property and potentially on the field station. The CCR should identify as a data gap that the horizontal and vertical distribution of metals contaminated ground water has not been determined.
6. Page ES-5, "UC Berkeley has developed a groundwater monitoring program to monitor the effectiveness of the BAPB wall and to monitor the groundwater

quality in the Transition Area. The groundwater monitoring plan will be implemented in 2007." Implementation of the monitoring program should not begin until DTSC has reviewed and concurred with the proposal.

7. Page ES-5, The text states that "Elevated concentrations of several metals have been identified in the vicinity of this area." The specific metals that were identified at elevated concentrations should be added to the text.
8. Page 2, "Between the late 1800s and 1948, several companies, including the California Cap Company, manufactured explosives at the RFS." Pages 6 and 7 and Page 9 report the onsite manufacturing of "blasting caps, shells, and explosives". Page 10 of the CCR refers to several explosions that occurred during controlled burns at the field station. Although the text includes this information, it does not appear that sampling for explosive compounds has been completed at the field station. According to Table 7, Summary Statistics for Upland Area Soil, only three samples were analyzed for explosives.

An internet search located the following indications that munitions other than blasting caps were manufactured on the property.

"At Stege station the California Cap Company makes blasting caps, bombs, rockets, etc." (SOURCE: *A Memorial and Biographical History of Northern California* - Chicago, Lewis Publ. Co., 1891. Access at <http://www.calarchives4u.com/history/contracosta/1891.htm>); and,

"The California Cap Works, turning out caps and cartridges day and night, furnishes work for a large number of men and women. At this writing this industry is especially busy on account of the usual large demand for all kinds of munitions in the European war." (SOURCE: *The History of Contra Costa County, California* - published by The Elms Publishing Co., Inc., Berkeley, California, 1917. Access at <http://www.calarchieves4u.com/history/contracosta/1917-ch26.htm>)

- a) Based on the above information and lack of records, the University should identify the lack of soil and ground water sampling and analysis for explosives compounds and perchlorate as a data gap.
- b) Add the available names of companies known to have operated on the property.
- c) Clarify to the extent possible what types of explosives and ordnance were manufactured at the former facilities in addition to blasting caps. The CCR mentions the manufacturing of "shells" on site but the types of shells are not described.

- d) Amend the CCR as possible to include discussion and comment on site activities for the period leading up to World War II through plant closure and purchase by the University.
9. Pages 3 and 4, Geology and Hydrogeology. The CCR needs to be amended to include maps and cross sections demonstrating the current understanding of geological and hydrogeological conditions at the field station. The figures should illustrate the subsurface conceptual model and provide support for locations of completed or future sampling and analysis. Refer to general comment, above.
10. Page 4, Section 1.1.1.2, Geology and Hydrogeology:
- a) First paragraph: Please discuss whether the artificial fill is located in specific areas of the RFS or over the entire site.
 - b) Second paragraph: The 1950's wells should be identified as being used for research purposes and not for site characterization.
 - c) Fourth paragraph: Indicate which figure identifies the location of the temporary piezometers installed in 2002.
 - d) Last paragraph: Based on the information presented in this paragraph, it is unclear how groundwater flow direction was determined. Please discuss and provide the data that was used.
11. Page 7 and 8, Section 1.1.2.2:
- a) Please clarify whether Union Pacific Railroad or Santa Fe Railroad constructed the railroad spur that is now part of the Bay Trail. Section 1.1.1.4 previously identified Santa Fe Railroad as constructors of the rail spur.
 - b) This section states that fill material was placed to form the railroad spur. The appropriate railroad company should be contacted to determine if information regarding the source of the fill material is known.
 - c) It would be helpful to the reader if the location of the breakwater constructed prior to 1946 was specifically identified on one of the photographs provided in Appendix C. It may also be helpful to identify additional breakwater(s) that were constructed in the immediate area.
12. Page 10, Section 1.1.3, California Cap Company History, last paragraph: It is unclear from the description whether the Building 125 is referred to the original or current location.

13. Page 13, Section 1.1.4.1, Historical Academic Research and Teaching Activities: The locations of Buildings 300 and 480 could not be found on a figure. Include the buildings on the appropriate figures.
14. Page 16, Section 1.1.4.2, Engineering Geosciences Well Field: The lack of information regarding this well field should be identified as a data gap. Information should as boring logs, well construction details, pertinent hydrogeology information collected during the research studies, etc. should be provided.
15. Page 17, Section 1.1.4.3, Facilities Operations: This section identifies that a sewer line was routed from Building 490 to the former digester and oxidation ponds near Buildings 102 and 106. While the sewer line is no longer used, it is still in place. The line and backfill material should be evaluated to determine whether it may be a source or conduit for contamination.
16. Page 18, Section 1.1.4.3, Facility Maintenance:
 - a) This section needs to provide additional information regarding the types of equipment present and the activities that occurred at the facility. For example, are vehicle hydraulic lifts present, were solvents used to clean parts, were any oil/water separators present, etc.
 - b) Building 120 is described as the former location of an incinerator. The incinerator has been removed and the building is now called a solvent storage area. The solvent storage area is further discussed on Page 26. According to a 1989 environmental assessment by Ensco Environmental Services, Inc. 20 55-gallon drums containing thinner, kerosene, and other petroleum hydrocarbon products were inside the building and approximately 25 more 55-gallon drums were located outside the building. Spilled product and stained soil and concrete were noted in the report. Investigation of this area (soil, groundwater and soil gas) should be identified as a data gap.
17. Page 19, Section 1.1.4.3, Pyrite Cinders Management:
 - a) This section should state that the site-specific target levels (SSTLs) were developed while working with the San Francisco Bay Regional Water Quality Control Board. DTSC will be re-evaluating these values.
 - b) Clarify that the Interim Soils Management Plan is applicable to utility and road maintenance construction projects only.

18. Page 20, Section 1.1.4.4, Other Non-UC Tenants: This section states that releases from Stratacor are unlikely due to their small operation. If hazardous substances are used by this company, they should be identified along with the volumes used, storage methods, and method of disposal.
19. Page 23, Section 1.1.4.5, Laboratory Aboveground Storage Tanks and Drums:
 - a) Identify when the current aboveground storage tanks were installed and if they were replacement tanks. Also the condition of the tanks and the surrounding areas should be described (e.g., any staining, dead or stressed vegetation, etc.)
 - b) Drums of hydraulic oil, motor oil, kerosene and waste oil are identified as being stored in Building 280. The figures identify a Building 280A and 280B. Please clarify which building(s) are used to store drums.
20. Page 25, Aboveground Storage Tanks and Drums: The year the tanks were installed should be identified as well as the condition of the tanks and the surrounding area (e.g., staining, dead or stressed vegetation, etc.).
21. Page 26, PCB Transformers: This section identifies the removal for disposal or retrofitting, and stockpiling of PCB-bearing equipment. The text also states that capacitors were temporarily staged at Building 280, but does not identify the specific location where these activities occurred. These activities occurred during the late 1980's and early 1990's. No records indicate that spills occurred.
 - a) The stockpiling location should be identified and provided on a figure.
 - b) The lack of soil sampling and analysis for PCBs should be identified as a data gap at the stockpiling location.
 - c) The lack of soil sampling and analysis for PCBs should be identified as a data gap at the locations where transformers were retrofitted.
22. Page 26, Storage of Chemicals and Hazardous Materials: Buildings 106, 111, 114, 120, 125, 138, 160, 175, 280, 470, 474, and 478 were identified as being used for storage of chemicals and chemical waste. As these areas have not been previously investigated, they should be identified as a data gap.
23. Page 28, Additional Sampling for Radiological Materials: The report states that the data results were within expected background levels. The method used to identify background levels should be described as well as the actual background levels.
24. Page 33, Historical Releases in the Vicinity of the RFS: This section states that a pesticide release occurred near the front gate of the RFS. Additional information

should be included, such as the date of the spill, whether a cleanup occurred, sample results, the specific pesticide involved, etc.

25. Page 38, Section 1.1.5.4, Liquid Gold: The Richmond Sanitary District should be contacted to verify the statements contained in this section with regards to the sanitary and storm drain lines.
26. Page 45, Section 1.2.1.5, Human Health and Ecological Tiered Risk Evaluation: This section states that for upland AOCs 1 through 6, the previous risk assessment recommended surface excavation or capping to eliminate potential exposure pathways. Please clarify whether capping was implemented as a remedy for any of the AOCs identified.
27. Page 64, Section 1.3.4.1, Metals, first paragraph: This paragraph states that the mechanism responsible for the elevated levels of metals in the eastern portion of the marsh is not fully understood and needs further investigation. The need for the investigation should be identified as a data gap.
28. Page 71, Section 1.3.7.1, Extent of Chemicals in Shallow-Zone Groundwater, last paragraph: The groundwater sample locations identified in this paragraph are not identified on Figure 46. Please revise the figure or reference.
29. Page 75, Pesticides and PCBs in Shallow-Zone Groundwater: Please specify whether the samples were filtered or unfiltered.
30. Page 77, Section 2.1.1, Potential Sources: The Richmond Sanitary District should be contacted to verify the historical descriptions provided regarding the sewer lines.
31. Page 82, Section 2.2.1, Metals, This section includes a discussion of the effects of acidic pH levels on metals in sediments. The discussion should also include the impact of elevated pH levels on metals, in particular arsenic.
32. Page 83, Section 2.2.1.1, Mercury: Please state whether the mercury fulminate present at AOC 7 is an explosive hazard if subject to shock, impact, friction, spark or flame.
33. Page 86, Section 2.2.1.4, Lead: This section identifies potential sources of lead at the site, which includes manufacturing of shells and blasting caps and leaded paint. It does not appear that all manufacturing areas were evaluated to determine if elevated levels of lead are present in these areas. These areas should be identified as a data gap.

Mr. Greg Haet
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34. Page 92, Section 2.4.1, Human Receptors and Exposure Pathways: It is unclear whether workers who are non-UC employers were considered as receptors.

Please provide responses to these comments to DTSC within 60 days of receipt of this letter. If you have any questions regarding this letter, please contact Lynn Nakashima of my staff at (510) 540-3839.

Sincerely,



Barbara J. Cook, P.E., Chief
Northern California – Coastal Cleanup
Operations Branch

Enclosure

cc: Mr. Mark Vest
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Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Lynn Nakashima
Site Mitigation and Brownfields Reuse Program
700 Heinz Avenue, Suite 200
Berkeley, CA 90630

FROM: J. Michael Eichelberger, Ph.D. *Kimiko Klein for.*
Staff Toxicologist
Human and Ecological Risk Division (HERD)

Kimiko Klein, Ph.D. *Kimiko Klein*
Staff Toxicologist
Human and Ecological Risk Division (HERD)

DATE: October 12, 2007

SUBJECT: Draft Current Conditions Report
UNIVERSITY OF CALIFORNIA, BERKELEY, RICHMOND FIELD STATION
PCA 11050 Site Code: 201605-00

Background

The University of California Richmond Field Station is located on 90-acres of former industrial land and 60-acres of off shore areas consisting of West Stege Marsh (13-acres) north of the East Bay Regional Parks District's Bay Trail with the remainder of the property located south of the trail and consisting of additional marshland, mudflats and open water. Industrial use of the uplands, particularly the manufacture of blasting caps containing mercury fulminate, has been documented as early as the 1870's and continued until 1950, when the University of California purchased the property for use as a research facility. Documented releases of chemicals of potential ecological concern (COPECs) including metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) have been reported. Several site investigations have occurred at the property between 1981 and 2006, and a human health and ecological risk evaluation of the uplands and West Stege Marsh were completed in 2001. Several remedial measures have been implemented

since 2002, and include, but are not limited to, treatment and transport to the adjacent Zeneca property of mercury contaminated soils, installation of a biologically active permeable barrier and excavation and removal of contaminated sediments from a portion of West Stege Marsh, and backfilling with clean fill to restore California clapper rail habitat. The Human and Ecological Risk Division (HERD) has been requested to provide technical support for this site.

Document Reviewed

The HERD reviewed a document entitled "Draft Current Conditions Report, University of California, Berkeley, Richmond Field Station, Richmond, California", dated April 2, 2007, and prepared by Tetra Tech EM Inc. and Sea Engineering, Inc. for the Office of Environment, Health and Safety, University of California, Berkeley. The HERD received this document on April 9, 2007.

General Comments

This report describes the history of uses of the site, past investigations and remedial activities that have taken place on-site, and summarizes all environmental data representing current conditions of the site. The HERD read the entire document but focused its review on those areas and issues that may affect an assessment of risk posed by contaminants currently present on-site.

General Comment A. The report notes that both a human health and ecological risk assessment was performed for the site in 2001. Hazard to ecological receptors was assessed for both West Stege Marsh and the uplands of the site. Unfortunately, the report discusses the ecological risk assessment only in general terms and does not describe which of the uplands were included in the ecological risk assessment. The locations of documented and suspected releases of chemicals of potential ecological concern (COPECs) are not uniform across the site, and this is reflected in the soil and sediment sampling locations shown on Figure 18. The HERD does not believe it can adequately assess the risk to ecological receptors in the uplands, because the extent and location of habitat is not specified.

General Comment B. The HERD recommends the addition of a section under previous investigations or history describing any past significant re-grading efforts that may have changed the final grade in the upland area that will need to be considered in determining future soil sample depths to characterize releases from past activities.

General Comment C. The following specific comments are divided into two parts. The first set of specific comments addresses ecological concerns of the HERD as they relate to the current conditions report. The second set addresses human health concerns associated with the current site characterization dataset.

Ecological Health Specific Comments

1. Page 2, Section 1.1.1, Site Description, third paragraph. The total acreage for the site would seem to be 111.5 acres (i.e., 96-acres of upland, 6.5-acres identified as the transitional area, and 9-acres consisting of West Stege Marsh). However, Appendix E (Technical Report: Summary of PCB Results, Richmond Field Station, University of California, Berkeley, Richmond, California) describes the total area as being 150-acres. The discrepancy is apparently accounted for by the inclusion of 60-acres of tidal mud flats, marsh and open water located south of the East Bay Regional Parks District's (EBRPD) Bay Trail. Aside from the reference contained in Appendix E, HERD did not find any other references to that portion of the property south of the bay trail in the Current Conditions Report. The report should include a description of this portion of the site and include a statement about past or current investigations in this area, even if the statement is to say that there have been no investigations.
2. Page 9, Section 1.1.3, California Cap Company History, first paragraph. It would help the readability of the report greatly if the location of buildings and associated structures would be referenced to a figure the first time they are mentioned in the text. For example, both the California Cap Company and the U.S. Briquette Company are mentioned but are not referenced to a figure. This is a global comment that should be applied throughout the report.
3. Page 17, Section 1.1.4.3, Facilities Operations, Utilities, paragraph at top of page. The report should reference the former tile sewer line that runs under the California Cap Company facility and discharged to the San Francisco Bay to a figure in the report. The sewer line could have served as a preferential pathway for site related contaminants.
4. Page 43, Section 1.2.1.2, Field Sampling and Analysis Plan and Tiered Risk Evaluation, fifth paragraph. The HERD does not agree with a 10 times dilution of groundwater samples when comparing them to ambient water quality criteria. Groundwater entering the bay or the marsh through marine sediments is considered to be undiluted until it enters the surface water. Therefore, benthic organisms living in the sediments are assumed to be exposed to the measured concentration. The dilution is not allowed in order to protect the benthic invertebrate community.
5. Page 43, Section 1.2.1.2, Field Sampling and Analysis Plan and Tiered Risk Evaluation, sixth paragraph. Please indicate if the additional site characterization for PCBs at the western storm drain was completed, and, if so, present the results.
6. Page 45, Section 1.2.1.5, Human Health and Ecological Tiered Risk Evaluation. This section requires clarification.

- a. The discussion concerning areas of concern (AOCs) in the text for both the West Stege Marsh and the upland areas of the field station should be referenced to a figure. As far as the HERD could discern, there are no illustrations of the West Stege Marsh AOCs on any figure contained in the report. There are many figures showing Phase I and Phase II excavations of sediment from the marsh, but the locations of the AOCs relative to these excavations is lacking and needs to be rectified. The human health and ecological site-specific target levels (H-SSTLs and E-SSTLs) developed in the 2001 *Human Health and Ecological Tiered Risk Assessment* prepared by URS (Oakland, California) and were used to determine the location and extent of the remedial excavations should be presented in the report. The HERD has reviewed the E-SSTLs and believes that these values need to be reassessed in regards to their use in future risk assessments. Please see specific comment 13 below.
 - b. The ecological risk assessment limited its evaluation of upland environment to herbivorous mammals and carnivorous birds. Plants and invertebrates were not evaluated and neither were other vertebrate guilds that could have been evaluated quantitatively, including the larval stage of amphibians, herbivorous birds, invertivorous birds, invertivorous mammals or carnivorous mammals. The risk assessment notes that many of these receptors would not occur in managed (landscape) environments, but the Current Conditions Report clearly states that upland habitats consisting of terrestrial grassland, including rare native grassland, coastal scrub, meadows, and seeps (seasonal wetlands not dominated by grasses) exist on site. Therefore, a complete understanding of hazard to ecological receptors at the UC Field Station is not completely understood.
7. Page 46, Section 1.2.1.6, Additional Soil and Groundwater Investigations, Upland Areas, final paragraph of section. In the first two sentences, it is not clear if the report is referring to soil or groundwater. Since the HERD was not involved in the approval of the SSTLs, the HERD believes a discussion about the appropriateness of the SSTLs is warranted, especially if they are being used for site characterization purposes and delineation of the boundaries of the AOCs.
 8. Page 55, Section 1.3, Summary of Existing Environmental Data, final paragraph of page. Sediment concentrations should be compared not only to the effects range-median (ER-M), but also to the effects range low (ER-L).
 9. Page 95, Section 2.4.2, Ecological Receptors and Exposure Pathways, second paragraph.
 - a. The report acknowledges that "*In the marsh area, several metals (such as arsenic, copper, and mercury) and PCBs remain in surface sediments at*

concentrations exceeding criteria protective of sediment-dwelling biota." The report does not offer information concerning remediation of these additional areas of the marsh. The report qualifies the impact to the benthic invertebrates by stating "*However current concentrations of most constituents detected in sediments do not exceed the Tier 2 E-SSTL protective of the endangered California clapper rail, except for copper, mercury, and PCBs in localized areas.*" It is important to understand that benthic invertebrates are an essential component of the food-web and without a healthy invertebrate population, the goal of establishing a long-term, viable, productive habitat, for the California clapper rail, may be unattainable.

- b. The HERD does not believe the methodology for choosing E-SSTLs designed to be protective of the California clapper rail is correct and has doubts that the E-SSTLs are indeed health protective. Page 4-2 of the 2001 West Stege Marsh Ecological Risk Assessment indicates the E-SSTLs are based on "*LOAEL-based TRVs.*" A LOAEL is an acronym for lowest observed adverse effect level. The HERD believes that for clean-up purposes it is appropriate to back calculate clean-up numbers (i.e., identified as Tier E-SSTLs in this report), but the values should be appropriate for the ecological receptors that the remediation is designed to protect. Impacts to endangered and threatened species, such as the California clapper rail (and the salt marsh harvest mouse), should be reduced to the no-effect level and not to the LOAEL. LOAEL-based toxicity reference values (TRVs) may be based on mid-range effects which may be a point on the dose-response curve where the loss of sensitive individuals of the population may occur. Also, at the lowest observable effect level, sensitive individuals may have reduced vigor and be susceptible to environmental stressors (or predators) that may lead to death. Doses below a LOAEL-based TRVs may be appropriate for protecting populations of non-special status species, where a loss of a few sensitive individuals may not significantly impact the population as a whole. On the other hand, the loss of a single individual from an endangered or threatened species may deleteriously impact that population. Areas of the marsh that have been cleaned up to a LOAEL-based TRV may not be providing sufficient protection for the California clapper rail, or the salt-marsh harvest mouse. Further assessment of those portions of the Marsh that have not been remediated may be indicated to ensure protection of these species.

10. Page 96, Section 2.4.2, Ecological Receptors and Exposure Pathways, first paragraph. Although the report describes the occurrence of upland areas consisting of "*terrestrial grassland, including coastal scrub, native grassland, meadows, and seeps (seasonal wetlands not dominated by grasses,*" the HERD could not locate any figure in the report that identified the features mentioned in Section 2.4.2. Upland habitat such as the coastal terrace prairie located between Buildings 280 and 300 should be discussed in the text and referenced to a figure that shows their

location at the site. The report offers little insight concerning possible contamination of these habitat areas. Without visual reference, sampling activities for specific COPECs associated with historical operations cannot be related to the upland habitats. This is an ecological risk assessment data gap.

11. Page 100, Section 2.4.2.3, Ecological Receptors, Upland Receptors, second paragraph. The 2001 ecological risk assessment evaluated the California ground squirrel as a representative mammalian receptor. The risk assessment would have benefited from the inclusion of an invertivorous mammal, i.e., a shrew. As a feeding guild, shrews are often the most sensitive vertebrate receptor to environmental contaminants. Future risk assessments of upland habitats should include additional feeding guilds and, in particular, a shrew as a receptor of concern.
12. Page 103, Section 3.0, Data Gaps for Richmond Field Station, second paragraph. The HERD did not see any evaluation of VOC exposure of burrowing animals. Evaluation of VOCs should not be limited to human health issues. The HERD has mammalian TRVs available for several VOCs that could be used for comparison to soil gas in burrows.
13. Figure 23, Copper Analytical Results in Soil and Sediment. The HERD forward calculated a dose, based on a soil concentration of 429,123 mg/kg, the clean-up level (or as the HERD will identify it, the safe soil concentration) for the California ground squirrel. At this soil concentration, the average daily dose from copper in the soil (taking into account food web transfer) when divided by the TRV should equal one. The calculation, the results, and the references for the input parameters for estimating the average daily dose are shown below.

Body Weight, California Ground Squirrel ¹	584g
Ingestion rate (adult) taken from Nagy ²	$y=a(\text{grams body mass})^b$ $a=0.859$ $b=0.628$ Ingestion rate = 0.047kg/day 5% of total food intake
Incidental soil ingestion (IR) ³	
Assume diet is 100% plants	
Assume site use factor = 1	
Plant tissue concentration; Literature Derived Bioaccumulation Factor ⁴	

$$\text{LN}(C_p)=0.394*\text{LN}(C_s)+0.668$$

C_p = concentration of copper in plant

C_s = concentration of copper in soil (429,123 mg/kg)

= mg Cu/kg plant tissue

Average Daily dose (ADD) of Copper to the California ground squirrel =

$$\frac{(\text{Plant [Cu] mg/kg} * \text{Squirrel Ingestion Rate}) + (\text{Soil [Cu]} * \% \text{ soil in diet} * \text{IR})}{\text{Squirrel Body Weight}}$$

When the appropriate values are substituted into the ADD equation for the California ground squirrel the results = **1715 mg/kg Cu BW Day⁻¹**

¹CRC Handbook of Mammalian Body Masses (1995)

²Nagy (2001) herbivorous mammal dry matter intake

³Beyer et al. (1994) estimate

⁴US EPA 2007 Soil copper to plant uptake factor

Dividing the ADD by the US EPA Region 9 BTAG (2002) mammalian TRV_{high} of 632 gives a hazard quotient of 2.71, a value slightly higher than the predicted quotient of 1. However, if the ADD is calculated for a shrew with appropriate input parameters from the same literature sources given for the ground squirrel, at the same soil concentration of 429,123 mg/kg soil (E-SSTL), the shrew ADD is calculated to be 47,614 mg/kg Cu day⁻¹. When this ADD is divided by the TRV_{high} the hazard quotient is 181. Therefore the copper E-SSTL developed for the ground squirrel is not protective for the shrew.

The HERD believes it is unlikely that plants or invertebrates could survive in a soil containing 429,123 mg/kg copper. The Oak Ridge National Laboratory (ORNL, 1997) soil benchmark for effects of copper on plants is 100 mg/kg based on a lowest observed effect concentration. The US EPA ecological soil screening level (Eco-SSL) is 70 mg/kg and is calculated as the geometric mean of the maximum acceptable toxicant concentration (MATC) and 10% effective concentration (EC₁₀). It is likely that a concentration of copper in the soil at the E-SSTL would not be able to support plant life. The Eco-SSL of copper for invertebrates is 80 mg/kg. It is also likely that invertebrates could also not inhabit the soil at the E-SSTL concentration. Under these conditions there would be no habitat or food for either the shrew or the ground squirrel.

Limiting the ecological evaluation to a few ecological receptors and not considering more sensitive guilds underestimates the hazard to ecological receptors. The HERD believes the uncertainty regarding the protectiveness of the E-SSTLs extends to all of the COPECs.

Human Health Specific Comments

1. Table 1: Historical and Current Uses of Buildings; Figure 5 Location of current and former Facilities in the Central Portion of RFS; and Figure 18 Soil and Sediment

Sampling Locations and Analytical Groups. Although Table 1 is a very informative table, it appears to be incomplete.

- a. Figure 5 shows many historical buildings that are not identified in the table. The table should be revised to include the identification and historic use of all former buildings. Several of these historical buildings may have had releases of chemicals to the environment that could pose a potential hazard or risk to receptors.
 - b. Figure 5 should also be revised to show the location of the former U.S. Briquette Company in the southeastern corner of the site.
 - c. The text states that several buildings have been moved over time. The past and current locations of such buildings should be placed on Figures 5 and 18.
 - d. There are current buildings shown on Figure 18 that have not been identified. Please revise the figure and the table to identify all buildings currently on-site, as necessary.
2. Figures 5 and 6 Location of Current and Former Facilities ..., and Figure 18 Soil and Sediment Sampling Locations and Analytical Groups. The locations of the former facilities, shown in Figures 5 and 6, should be added to Figure 18. Figure 18 superimposes currently existing sample locations and analytical groups tested for over current building locations. The revised figure will show that portions of the site have not at all been characterized with respect to past historical manufacturing activities, such as the former blasting cap and former explosive storage area. In addition, the revised figure will show that analytical groups that may be relevant to these historic activities have not been tested for in all the appropriate locations. Potential data gaps will be visually revealed by revising the figure in this manner.
 3. Page 9 Section 1.1.3 California Cap Company History. This section summarizes the manufacturing activities that took place at the site during the period before the University purchased the property. This section should be expanded to include a listing of the materials and chemicals used to manufacture blasting caps and shells and the waste that could have been generated during those processes. This section should also list the chemicals that could have been released at the explosive storage and test pit areas.
 4. Page 10 Section 1.1.3 California Cap Company History. A figure should be created that shows the locations of the past explosions described in the text, the sites where debris was dumped over the former seawall, and the areas where cinders were deposited for different purposes. These locations should be superimposed on Figures 5 and 6 – Locations of Current and Former Facilities and/or on the proposed revised Figure 18 - Soil and Sediment Sampling Locations and Analytical Groups.

5. Page 13 Section 1.1.4.1 Historical Academic Research and Teaching Activities. The research activities listed in several of the bullet items, such as transportation research, soils and concrete research, and forest products research, may have resulted in the release of chemicals of potential concern to the environment. Therefore, soils around the buildings where hazardous chemicals may have been used in research should be analyzed for these chemicals.
6. Page 14 Section 1.1.4.1 Historical Academic Research and Teaching Activities – Groundwater transport research. The locations of the injection and observation wells are shown on Figure 8 –Site Features Map. This figure should be referenced in the text. If surface deposition from pumping groundwater to the surface could have occurred during the period when these wells were operating, soil samples should be taken in the area for possible contaminants from such releases.
7. Page 15 Section 1.1.4.2 Current Academic Research and Teaching Activities – Earthquake Resource Center. Hydraulic oil is needed to operate the earthquake shaker table. Used hydraulic oil may contain hazardous chemicals and metals. If there are records or evidence of spills or the potential for releases to the environment, soils around this center should be collected and analyzed for common contaminants in and for oil.
8. Page 16 Section 1.1.4.2 Current Academic Research and Teaching Activities – Engineering Geosciences Well Field; Figure 8 Site Features Map; and, Figure 18 Soil and Sediment Sampling Locations and Analytical Groups.
 - a. Figure 8, showing the locations of the wells in the well field, should be cited in this section. Records should be examined to determine what, if any, chemicals may have been injected into these wells as part of research efforts. The results of this examination should be included in this report.
 - b. All features shown on Figure 8 should also be placed on Figure 18. This will show the location of features for which no environmental data exist.
9. Page 16 Section 1.1.4.3 Facilities Operations – Utilities, and Figure 5 Location of Current and Former Facilities in the Central Portion of RFS. See also Sections 1.1.5.1 Former Zeneca Site –Historical Releases in the Vicinity of the RFS and Section 1.1.5.5 Other Potential Off-Site Sources – Western Storm Drain Line for discussion on contaminants originating off-site flowing on-site through sewer and storm drains. Soil sampling should be performed along and beneath the wastewater and sewage lines and storm water drainage flow lines targeting locations where hazardous chemicals from past or current activities could have leaked into the surrounding soil. This comment also refers to any fuel, oil, and gas lines associated

with the former California Cap Company, as shown on Figure 5. The lack of sample results along these utility lines represents a data gap.

10. Page 16 Section 1.1.4.3 Facilities Operations – Utilities, and Figure 8 Site Features Map. Figure 8 shows the location of several polychlorinated biphenyl (PCB)-containing transformers. Soils around these transformer locations should be sampled for PCBs.
11. Page 18 Section 1.1.4.3 Facilities Operations – Utilities. The soil around and downwind from Building 120 where a former incinerator was located should be sampled for dioxins/furans.
12. Page 19 Section 1.1.4.3 Facilities Operations – Pyrite Cinders Management; Figure 9 Known or Suspected Pyrite Cinder Locations in Upland and Transition Areas; and Figure 18 Soil and Sediment Sampling Locations and Analytical Groups. Known or suspected pyrite cinder locations that may still exist on-site should be shown on Figure 18 as a tool to identify data gaps in metals sampling.
13. Page 23 Section 1.1.4.5 RFS Chemical and Radioactive Materials Use – Chemical Use – Academic Research and Teaching Activities – Laboratory Aboveground Storage Tanks and Drums, and Figure 8 Site Features Map. Soil beneath above ground storage tanks should be sampled for the chemicals that have been stored in those tanks.
14. Page 24 Section 1.1.4.5 RFS Chemical and Radioactive Materials Use – Chemical Use – Academic Research and Teaching Activities – Former Forest Products Laboratory Wood Treatment Laboratory. Please clarify if pentachlorophenol was analyzed for in any soil samples taken around the wood treatment laboratory facilities. If no such data exist, soil samples around the wood treatment laboratory facilities should be collected and tested for the toxic components of wood preservatives, including dioxins. Also, the approximate boundary of the proposed excavation area for the removal of soil containing elevated arsenic should be added to Figure 18.
15. Page 25 Section 1.1.4.5 RFS Chemical and Radioactive Materials Use – Chemical Use – Hazardous Materials Use – RFS Facilities' Support Activities – Underground Storage Tanks, and Figure 18 Soil and Sediment Sampling Locations. According to the text, soil samples were collected at the time that these underground storage tanks were removed. These sample locations should be placed on Figure 18, if these sample results represent soil still in place.
16. Page 26 Section 1.1.4.5 RFS Chemical and Radioactive Materials Use – Chemical Use – Hazardous Materials Use – RFS Facilities' Support Activities – PCB Transformers. According to the text, polychlorinated biphenyls (PCB)-containing

electrical equipment was stored in Building 280. Therefore, PCBs should be tested for in the soil around Buildings 280A and 280B.

17. Page 26 Section 1.1.4.5 RFS Chemical and Radioactive Materials Use – Chemical Use – Hazardous Materials Use – RFS Facilities' Support Activities – Storage of Chemicals and Hazardous Materials. Although the text states that transformers formerly stored in Building 120 did not contain PCBs, soil around this building should be collected and analyzed for PCBs.
18. Page 27 through 29 Section 1.1.4.5 RFS Chemical and Radioactive Materials Use – Radiological Materials Use – Academic Research and Teaching Activities; Figure 10 Radiological Sampling Locations; and Appendix G Radiological Survey. This section describes the use of and sampling for radiological materials, and the figure purportedly shows the locations of radiological sampling. However, Figure 10 shows only the locations of observation and recharge wells used for one experiment and does not show any of the locations of historic use of radioisotopes described in the text. A figure should be included in the main body of the text showing all soil areas that have been subjected to radiological testing and/or surveys superimposed on the locations of all former and current buildings and/or areas at the RFS where radiological materials have been used. This single figure should incorporate the information shown in Figure 10 as well as the information shown in the figures presented in Appendix G.
19. Pages 32 and 33 Section 1.1.5 Surrounding Off-Site Use History – Historical Releases in the Vicinity of the RFS. Storm water originating from the former Stauffer operations have reportedly flowed onto the RFS property. This release should be further investigated along with the sampling recommended in Specific Comment 9 above. The description in the text of infiltration of contaminated groundwater from the former Stauffer site into sewer lines provides further evidence that the paths of historic and current sewer lines should be investigated.
20. Page 43 Section 1.2.1.2 Field Sampling and Analysis Plan and Tiered Risk Evaluation. A) It would be informative to include a list of the chemicals analyzed for in soil samples collected in the upland area as part of the field sampling and analysis event performed in 1999. Similarly, a list of the target chemicals analyzed for in groundwater and sediment samples should be included. B) If any of the sample results from this event represent current conditions, this should be stated in the text.
21. Page 45 Section 1.2.1.5 Human Health and Ecological Tiered Risk Evaluation.
 - a. This section should be revised to discuss the risk assessment criteria used to identify the upland and marsh Areas of Concern (AOCs).

- b. A statement should be included in this section that relates the marsh AOCs 1 through 6 to the areas marked on the various figures in this report as Area 1, Area 2, M3, M1 and storm drain excavation. A figure providing this information should be included in this report.
 - c. Site-specific target levels (SSTLs) for human and ecological receptors were developed in the risk evaluation performed by URS in 2001. Since these SSTLs are used as comparators in the summary tables depicting the concentrations of chemicals of potential concern, a brief description of how these SSTLs were developed should be included in this section or as an appendix to this report. A table listing the SSTLs and an accompanying table listing exposure scenarios, exposure parameters, and target risk and/or hazard index upon which the various SSTLs are based should also be included in this report.
22. Page 49 Section 1.2.2.2 Phase 2. If chemicals of potential concern have been analyzed for on the asphalt treatment pads and the concrete-lined treatment pad after their utilization in the treatment and storage of affected sediments, the results should be discussed in this section. If these treatment pads have not been so characterized, this represents a data gap.
23. Page 51 Section 1.2.2.5 Western Stege Marsh Restoration Project Monitoring. This monitoring plan will assess the restoration efforts at the marsh. The HERD recommends that this plan be reviewed and coordinated with the monitoring plan for East Stege Marsh and revisions made, if necessary, to put in place a marsh-wide monitoring plan that would effectively assess its overall ecological health.
24. Page 57 Section 1.3.1.2 Pesticides. One surface soil sample for pesticide analysis in the upland area exists in the current conditions dataset. The text states that this is sufficient based on past activities on the site and data obtained in prior investigations. However, upland areas where pesticides may have been extensively used, stored, and/or studied (such as the former forests products laboratory) have not been identified or characterized. This represents a potential data gap.
25. Page 57 Section 1.3.1.3 Polychlorinated Biphenyls; Figure 8 Site Features Map; and Figures 32 – 34 PCB Analytical Results in Soil and Sediment. As noted in comments above, PCB sampling of upland surface soil should take place in the areas around Buildings 280A, 280B, and 120 because of past use of these buildings as storage areas for electrical equipment. Currently existing PCB sample locations should be matched against the locations of former electrical transformers, as shown in Figure 8, in order to identify additional areas of investigation for this class of chemicals.

26. Page 58 Section 1.3.1.4 Semivolatile Organic Compounds (SVOCs), and Figure 35 SVOC and PAH Analytical Results in Soil and Sediment. The site has limited soils data for polycyclic aromatic hydrocarbons (PAHs), despite the fact that there are on-site areas where explosives may have been tested and where explosions were known to have occurred. These areas should be tested for the presence of explosives and PAHs.
27. Page 58 Section 1.3.1.5 Volatile Organic Compounds (VOCs). Only two soil matrix samples for VOCs exist in the upland soils database. Building 120 was used for solvent storage, Building 117 was used as a maintenance shop, and Building 197 was used for drum storage. Any of these uses could have involved releases of VOCs to the environment and provide support for further investigation by performing soil gas sampling in those areas. Other past or current storage areas or maintenance shops should be identified for possible soil gas sampling as well.
28. Page 59 Section 1.3.2 Extent of Chemicals in Soil and Sediment in RFS Transition Area, and Table 11 Comparison of Chemicals to Criteria for Transition Area Soil and Sediment Data. The western portion of the transition area, the area between the marsh and the upland area, has not been remediated.
 - a. Although there are 96 data points for metals in the transition area, there are only two data points for pesticides, and 10 samples for PCBs, suggesting that the transition area may not be completely characterized with respect to the presence of pesticides or to the extent of PCB contamination in the old outfall area. The historical record should be examined to determine if the upland fill material used to create this transition zone could have contained hazardous chemicals, in addition to metals, that should be the subject of further investigation.
 - b. Table 11 presents soil criteria for ecological and human receptors. As stated in a previous specific comment, an appendix should be added to the document describing how the ecological soil screening criteria were determined.
 - c. Whereas the current and future use of the upland and marsh area are clear, the HERD requests a discussion to be included in the report addressing the likely future use of the transition area. This would provide context for the appropriate application of human and ecological evaluation in risk management decisions for this area.
29. Page 61 Section 1.3.3.1 Off-Site Property North Area. This section summarizes off-site PCB analysis. Figure 32 PCB Analytical Results in Soil and Sediment, 0 to 1 Feet BGS should be cited in this section. The soil samples taken in this area should be further defined as surface or near-surface soil samples.

30. Page 61 Section 1.3.3.2 Off-Site Property East Area. Eight soil and sediment samples represent current conditions at the boundary between the RFS and the former Zeneca site. However, Figure 19 appears incomplete, as only three of the sample locations are shown. The figure should be corrected to show all the sample locations discussed. Although the concentrations of metals measured in this area are compared to human-health risk criteria in the text, the concentrations measured in marsh sediments should be compared to the appropriate ecological-health risk criteria in the text as well (as depicted in Figures 20 to 27).
31. Page 62 Section 1.3.4 Extent of Chemicals in Sediment in Western Stege Marsh. The results of the extensive sampling indicate that the unremediated part of the marsh to the west remains contaminated with metals, PCBs and pesticides, particularly in the vicinity of Meeker Slough.
- a. Sediment and biological samples were collected in 2004. The results of these analyses should be included in this report to serve as a measure for assessing the general health of this area of the marsh.
 - b. An assessment of the risks and benefits of remediation prior to restoration is needed for Meeker Slough.
32. Page 67 Section 1.3.5.3 Fill Sources and Analysis by Phase. The text states that Phase 3 of the remediation activities included the removal of sediment containing mercury in the central portion of the marsh. However, this area is not identified in any figure. The figures should be revised to identify this remediation area.
33. Page 69 Section 1.3.5.3 Fill Sources and Analysis by Phase – Existing Stockpiles Soils. Any existing soil stockpiles that have not been tested and future candidate soil fill sources should be evaluated according to the current DTSC *Clean Imported Fill Material Information Advisory*, dated October 2001.
34. Page 74 Section 1.3.7.1 Extent of Chemicals in Shallow-Zone Groundwater – Volatile Organic Compounds in Shallow-Zone Groundwater, and Figure 47 Volatile Organic Compounds in Groundwater. The nineteen shallow groundwater samples taken on-site are all at or near the boundary between the UCRFS and the former Zeneca site. 1,2-Dichloroethane, carbon tetrachloride, tetrachloroethylene (PCE), and trichloroethylene (TCE) were detected at levels above their respective Maximum Contaminant Levels (MCLs). The VOC plumes in groundwater must be delineated, as the shallow-most aquifer contaminated with VOCs can serve as a source of VOCs that could intrude indoors with subsequent potential exposure. As mentioned in a previous specific comment, there are other potential on-site sources of VOCs which must be investigated as well for the same reason.

35. Page 75 Section 1.3.7.2 Extent of Chemical in Intermediate-Zone Groundwater. The HERD is concerned whether it is possible to adequately characterize the intermediate zone at this site with only four groundwater samples.
36. Page 76 Section 1.3.7.3 Extent of Chemicals in Deeper-Zone Groundwater. The locations of the wells used to collect deeper-zone groundwater samples should be included on Figure 45 – Groundwater Sampling Locations and Analytical Groups. The target analytes for this groundwater sampling event should be listed.
37. Page 80 Section 2.1.2 Migration Pathways. The discussion of migration of chemicals from soil to the atmosphere should be revised.
- a. The statement that VOCs have not been detected in soil at RFS should be deleted, since only two soil samples have been analyzed for VOCs in the upland area.
 - b. It should be stated that, if VOCs are present in soil and groundwater, they may migrate through the soil and into indoor air. This could represent a significant potential exposure pathway for current and future indoor workers.
38. Page 86 Section 2.2.1.5 Bioavailability of Metals. Numerous metals have been detected in shallow groundwater. The shallow groundwater dataset should be examined to identify the filtered groundwater samples. If there are filtered groundwater samples in which metals were detected, this would suggest that at least a fraction of metals on-site may be bioavailable, that is, soluble in water.
39. Table 7 Summary Statistics for Upland Area Soil. For those chemicals that have never been detected, the detection limit or range of detection limits should be added for each target analyte. In addition, it would be informative to include the depth below ground surface at which the maximum concentrations were measured. This specific comment applies to all the tables of summary statistics.

Conclusions

The ecological cleanup numbers (ESSTLs) do not appear to be protective of ecological receptors. It is apparent the risk assessment did not consider the potentially most sensitive receptors and there is no indication in the report what portions of the uplands were evaluated. The distribution and concentration of contaminants varies greatly across the site, and since the locations of habitat are not provided in the report, HERD cannot tell if the areas of contamination and habitat are co-located. The Current Conditions Report needs to identify areas of upland habitat on a figure and the figure should be attached as an addendum to the report. The text should discuss the future uses of the present habitat and, in particular, that of the Coastal prairie. Presently, HERD cannot comment on whether the results from the ecological risk assessment

posted in the report are protective of upland ecological receptors. After the location of the upland habitat areas are identified, the adequacy of the risk assessment for these areas should be reassessed. The ecological clean up levels for both the uplands and marsh habitats (E-SSTLs) were developed utilizing LOAEL based toxicity reference values. Protection of the California Clapper rail requires cleanup levels to the no effect level; therefore HERD does not believe the E-SSTLs for West Stege Marsh are protective for the rail. HERD believes that the ecological risk assessment for the remaining portions of West Stege Marsh should be reassessed and should include additional feeding guilds, as well as plants and invertebrates.

This report on current conditions reveals many more data and information gaps than those identified in the document. The data gaps include the identification and characterization of potential VOC sources in soil vapor and shallow groundwater and a large fraction of the upland area that has not been characterized with respect to the potential past and current releases of hazardous chemicals to the environment.

If you have further questions on ecological health risk issues, please contact Dr. Eichelberger at JEichelb@dtsc.ca.gov or by telephone at 916 255 6688. If you have questions on human health risk issues, please contact Dr. Klein at Kklein@dtsc.ca.gov or by telephone at 916 255 6643 or 510 540 3762.

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