Comments on the Draft UCD Remedial Investigation Report for the LEHR/SCDS Environmental Restoration Dated January 8, 2003

Comments Submitted by
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Presented below are my comments on the Draft UCD Remedial Investigation Report for the LEHR/SCDS Environmental Restoration, dated January 8, 2003.

Executive Summary, page x, first paragraph states that non-residential PRGs were used, since the current and future use was non-residential. This approach is dangerous. Ten, twenty or fifty years or more from now, a university administrator may decide that he/she wants to put a day school or some other facility in this area, and he/she will ignore the fact that there are still hazardous chemicals present in the soils and area. This is especially dangerous in light of the fact that the UCD administration refuses to properly label the site as a Superfund site.

Further, in the same paragraph it is stated that, *"Ten times (10 X) the California Title 22 Soluble Threshold Limit Concentration (STLC) criteria were used to evaluate hazardous wastes."* What is the justification for this? Ten times the STLC values can readily lead to adverse conditions.

How UCD estimated background concentrations needs to be critically reviewed to be sure that it is a proper, pre-pollution background for the area.

On page x, the second paragraph states that these are "conservative" screening levels. That is not necessarily the case.

On page x, under Landfill Unit No. 1, second paragraph, information should be provided on what were the exceedances of mercury, zinc and other pollutants at the site for the residential PRGs and the STLC values – not ten times the STLC values.

On page xi, the first paragraph states that according to a Dames & Moore (1999a) study, the vadose zone is not a continuing source of VOCs. As I recall that study, there was not a very definitive assessment. It was more speculative than definitive.

Page xi, under Landfill Unit No. 3, second paragraph should discuss what other constituents exceeded the residential PRG values and the STLC values.

Page xi, under Eastern Trenches mentions "pesticide compounds." What compounds? They should be listed. The same problem exists with respect to designating the constituents that were present above screening values for the Southern Trenches.

Page xii, in the second paragraph under Old Wastewater Treatment Plant, using two boreholes to investigate pollution of groundwaters by the old wastewater treatment plant is inadequate, based on how the sludge beds would have contributed to groundwater pollution through cracks in the beds. This would have produced narrow plumes, which could easily be missed by the investigation approach used.

Page xii, last paragraph, the approach for estimating potential impacts of stormwater runoff is not technically valid, where UCD has used the annual average flow of Putah Creek, versus the annual stormwater runoff volume. Those familiar with aquatic chemistry, toxicity and bioaccumulation know that one never attempts to characterize the potential for water quality problems associated with stormwater runoff based on annual average flows. This is more of the grossly inadequate aquatic chemistry, biology and toxicology that has chronically occurred associated with the UCD (and its contractors) investigations of the LEHR site problems. The true worst-case scenario should be evaluated for stormwater runoff to Putah Creek, to determine whether there is a potential for adverse impacts from constituents like chlordane, mercury, etc. UCD's approach is more of their chronic underestimation of the potential for stormwater runoff from the LEHR site to have an adverse impact on Putah Creek water quality.

Page xiii, first paragraph, the statement about the adequacy of the groundwater monitoring that has taken place at the LEHR site is inaccurate. Until UCD installs appropriately located upgradient and downgradient wells for each of the waste management units, UCD cannot claim that it has adequately investigated the potential for the waste management units to cause groundwater pollution.

Page xiii, second paragraph presents an unreliable assessment of the comparison to background concentrations. It has been known throughout the studies that there is still an inadequate characterization of the background groundwater quality at the LEHR site. Background has to be determined based on upgradient sampling of groundwaters for each of the waste management units.

Page xiv, in the first paragraph (Chloroform), there is need for additional information to substantiate the statements about how the IRA has *"... greatly reduced offsite migration of chloroform."* This appears to be more UCD propaganda, rather than based on a factual evaluation of this issue.

Page xiv, under Fate and Transport Evaluation, Soil to Groundwater, states in the first sentence that the *"... predicted rainwater infiltration rate of 2.06 ft/yr."* What does that mean? That a water molecule in rainfall would only move down in the water column 2 feet in a year? This is certainly a gross underestimation of the rate of transport that occurs in the vadose zone associated with a rainfall event.

Page xiv, last paragraph, the statement, *"Transport of constituents between HSU-2 and HSU-4 is no longer of concern ...,"* is inappropriate. This will always be of concern, so long as HSU-2 is polluted. In time, there will be migration through HSU-3 to HSU-4, if it has not already occurred.

Page xv, second paragraph is more of the propaganda, where UCD is attempting to portray that there is such massive dilution in Putah Creek that any stormwater runoff will not have an adverse impact on the Creek. The approach used by UCD is not an appropriate approach to assess this problem.

Page xv, under Recommendations, the statement is made in the first sentence that the existing data is adequate in quality and quantity to complete the UCD FS. Contrary to this statement, there are substantial database gaps that have to be addressed before a credible FS can be developed.

Page 9, last paragraph, second sentence discusses the *"... permanent flows of Putah Creek."* What will be the situation during severe drought, like that which occurred in the late 1980s and early 1990s? Will that same flow still be available? This issue needs to be discussed.

Page 15, first paragraph, with respect to the finalization of Dames & Moore's RI/FS workplan, UCD fails to mention that it was found that that workplan was significantly technically deficient.

Page 17, last paragraph, and elsewhere in this section, UCD is only presenting the favorable comments on the various investigations. It does not include the comments that were made by RPMs and DSCSOC on the inadequacies of the investigations conducted by Dames & Moore/UCD, such as Dames & Moore grossly underestimating the rate of movement of pollutants introduced into the groundwater underlying the LEHR site in its previous investigations. This error was corrected by PNNL when they were brought to the site by DOE. No mention is made in these results regarding the RPMs and DSCSOC's conclusions that the IRA was merely a stopgap interim approach that did not adequately address removal of pollutants derived from the LEHR site waste.

Page 18, last paragraph fails to mention, in connection with the ATSDR studies, that the 1996 studies, during low flow, showed that it was UCD's wastewater discharges which were creating anoxic conditions which led to methylation of mercury present in the stream, and were likely responsible for the elevated mercury in the fish taken near the LEHR site. Further, there still has not been adequate investigation of the potential for mercury from the LEHR site to be contributing to the mercury problem that occurs in fish taken from Putah Creek near the LEHR site.

UCD, in its discussion of the ATSDR studies, fails to mention that the US EPA, in conducting both the first and second round of ATSDR-sponsored studies, did not assess whether excessive bioaccumulation of chlordane and other chlorinated hydrocarbons present in stormwater runoff from the LEHR site was occurring. This issue is still unresolved, as a result of UCD's not conducting the studies that are needed to determine the role of chlordane in stormwater runoff from LEHR leading to excessive bioaccumulation in Putah Creek fish.

Page 19, in the paragraph devoted to the Old Wastewater Treatment Plant, one boring through the former drying bed is grossly inadequate to determine whether there has been pollution of soils and groundwaters underlying the drying bed.

Page 19, last paragraph under Hydropunch Investigations, no mention is made that Hydropunch is not a reliable approach for investigating the pollution of HSU-2 at offsite locations. As has been previously discussed by DSCSOC and a former RPM, Hydropunch only samples the surface layer of the aquifer, and does not penetrate sufficiently into the aquifer to properly characterize the water within the aquifer. The surface layer of an offsite location can readily contain low concentrations of pollutants compared to deeper waters within the aquifer, due to infiltration of clean water associated with rainfall over the area. This is a well known phenomenon that UCD continues to ignore when it claims that it has properly investigated offsite pollution of groundwaters by the LEHR site.

Another issue that DSCSOC has repeatedly discussed is that the concentrations in the upper layer of the offsite of HSU-2 aquifer will likely show a seasonal pattern associated with the infiltration of precipitation and irrigation water, which would dilute the upper layer of the aquifer. In order to properly characterize the full extent of offsite pollution by LEHR waste, a far more comprehensive offsite investigation needs to be done. Previously the RPMs have agreed that this should be done, and a former RPM (Duncan Austin) requested that UCD do this. As of yet, some half dozen years later, UCD has not properly investigated offsite pollution of HSU-2 by LEHR site waste.

Page 20, the second paragraph under Chemical and Aquatic Toxicity Monitoring, last sentence states that, *"Toxicity tests on stormwater samples taken in 1998 and 1999 by UC Davis found Site stormwater to be non-toxic."* It is not clear that the tests used were designed to determine low levels of toxicity, however.

Page 22, first full paragraph, the last sentence states that TDS is not being introduced into the groundwater through the land treatment system. That statement is likely to be incorrect. TDS will be conservative in the soil profile and, in fact, the land treatment system will probably increase the TDS, due to evaporation. There will be pollution of groundwaters underlying the land treatment system by the TDS that is discharged to the land surface and through evaporation that occurs of this wastewater discharge.

One of the issues that has not been addressed in any of this discussion is the presence of TOC in elevated concentrations downgradient from waste management units. TOC is an indicator of a variety of potential pollutants. This issue needs to be addressed in a credible discussion of these issues.

Page 24, the list of data gaps is far less than that which actually occur. These have been discussed herein and previously.

Pages 28 and 29 are an attempt by UCD to convince the RPMs that the average annual flow in Putah Creek should be used to estimate the potential impacts of stormwater-runoff-associated constituents from the LEHR site. As discussed above, this is a technically invalid approach that fails to consider the aqueous environmental chemistry of constituents of concern. Their chemistry will not necessarily obey a straight dilution relationship.

Page 30, under 2.2.1.8 Sediment and Benthic Organisms Sampling, previously we have been told by UCD that there were no organisms present in Putah Creek sediments. This time we are now finding that there are organisms present.

The statement is made in the third paragraph that, *"Site reconnaissance indicated that Putah Creek does not appear to support a large enough population of BMI for laboratory tissue analyses; therefore, sediment and benthic organisms sampling for laboratory chemical analyses was not performed.*" This is not a valid approach. If it is not possible to get enough organisms in a single sample, then additional samples will have to be taken. This is the standard procedure that should have been followed. It should be noted that the sampling locations chosen for this are not necessarily the locations where the greatest accumulation of materials discharged from LEHR would accumulate in downstream Putah Creek. A much more comprehensive sampling would have to be done to investigate this matter.

Page 32, first paragraph under 2.3.1.3 Analytical Methods and Detection Limits, mentions that routine US EPA and US DOE reference analytical methods were used. This has been a chronic problem at the LEHR site, where a number of the key analytical methods do not have adequate sensitivity. There is nothing in the US EPA regulations that indicates that methods adequate to detect concentrations of constituents at their potentially significant concentrations should be used. These methods have been available for some time, yet UCD has been reluctant to use them. The net result is that there still are not adequate data on a number of key parameters in stormwater runoff from the site.

Page 35, the bottom of the page indicates that UCD has screened the data for non-detectable constituents, constituents detected at or below background levels and common landfill constituents. Far more information needs to be presented to determine whether this screening is technically valid and appropriate.

Page 36, second paragraph indicates that industrial PRGs and ten times the STLC were used for screening criteria. As discussed above, this is a technically invalid approach and should not be allowed.

Page 36, mid-page, considerable additional information needs to be provided on the screening versus background, especially on the reliability of the background that has been used by UCD. The key issue that must be determined is what use will be made of the results of this screening of the soils in the waste management areas.

Page 47, for the constituents in stormwater, presents a complex and unreliable approach for assessing whether stormwater runoff is carrying constituents from the LEHR site that could have an adverse impact on the beneficial uses of Putah Creek. A comparison to background soils is not a valid approach. It is the absolute concentration of the constituent in the runoff relative to US EPA water quality criteria and state standards based on these criteria that is of interest. This section needs to be redone.

On 3.2.1 Constituents in Stormwater, I find this section very confusing. It needs further explanation. From the information provided, it appears to be an invalid approach for assessing

whether the site is contributing constituents in stormwater that are potentially adverse to the beneficial uses of Putah Creek. It is important to note that UCD's sampling of stormwater has been inadequate to properly characterize the impact of stormwater-runoff-associated constituents from the LEHR site.

Why only the last two years of data? With such infrequent sampling, the last five years of stormwater data should be examined.

Page 51 fails to mention TOC as an indicator of a variety of potential hazardous chemicals that could be present in waste at the LEHR site that become groundwater pollutants. This should be discussed.

Page 54, in section 4.1 Constituents in Soil and Waste, again mentions the unreliable approach of using industrial PRGs and hazardous waste criteria which are ten times STLCs.

Page 56, top of the page presents a *"...simple equation that estimates the soil retardation factors for each particular constituent (R_C) as the constituents migrate towards groundwater."* As I have repeatedly discussed over the years, this approach is not valid when dealing with complex mixtures of wastes for those constituents whose aqueous environmental chemistry is such that they are not in a simple ionic or molecular form that was used to establish the K_d value. As a result of complexation, colloid formation or other processes, the rate of transport using K_d values based on pure, simple systems is not reliable and can either under- or over-estimate the actual transport. Some of the areas' groundwaters are polluted by TOC. This TOC is going to affect transport, K_d, etc.

Page 57, top of the page presents information on average infiltration rates. The average infiltration rate is not the key issue in estimating the rates of pollutant transport from the surface through the soil column to the groundwater table. Migration through the vadose zone occurs primarily associated with wetted front transport. This is not an average situation, but an actual situation that occurs over a short period of time.

Page 57, Table 4-2, the velocity in ft/yr for the chemicals presented in this table is likely to be in significant error because of the unreliability of the approach used. To indicate that nitrate would take 50 years to reach groundwater, as is done in Table 4-3, should have been a clue that there is something drastically wrong with these calculations. Anyone familiar with groundwater pollution by nitrate in the Central Valley knows that it is a much more rapid process than described herein.

Page 60, vertical gradient, in the discussion of Transport from HSU-2 to HSU-4, the statement that there will be no transport could readily be in error. Without proper investigation, it must be considered as unreliable.

Page 63, section 4.4.3.3 is labeled "Natural Oxidation of Hexavalent Chromium in Soils," which is nonsense. There is no "natural oxidation of hexavalent chromium in soils." Hexavalent chromium is already in the maximum oxidation state.

Page 64, the discussion of the environmental chemistry of chromium does not discuss the fact that waste-derived constituents could influence the rate at which naturally-occurring chromium-3 is oxidized to chromium-6, and therefore the disposal of wastes by UCD is an indirect but real source of chromium for the groundwaters that must be investigated and, most importantly, controlled.

Page 65, second paragraph, "IRM" should be "IRA."

Page 66, last paragraph, the statement, *"Based on the fate and transport evaluation in Section 4.2, tritium is much more mobile than C-14,"* reflects a lack of understanding of basic chemistry. Tritium, like C-14, exists in a variety of chemical compounds. Tritium is not necessarily tritiated water, as is assumed here. Hydrogen-3 can be in many different forms. I have suggested repeatedly that there is need to understand the specific forms of tritium that are being found as pollutants. Is it tritiated water, or is it tritiated organics? Without this information there can be no meaningful discussion of transport rates of tritium.

The bottom of page 67 is more of the unreliable approach for estimating potential impacts of stormwater-runoff-associated constituents.

Page 68, in section 4.5.2, the issue is not constituents above background, but constituents in the surface soils that can be transported in excess of water quality standards or affect beneficial uses.

The discussion on page 68 is unreliable and should be redone by someone who understands the issues.

The summary presented on pages 69 through 71 contains a number of the same kinds of erroneous statements that are discussed above, based on the previous presentations in the text.

Page 71, second bullet repeats the issue about the constituents being strongly sorbed and not reaching groundwater for 100 to 1000 years. Even if these predictions were reliable, transport in 100 to 1000 years would be of concern since the eventual pollution of groundwaters could be detrimental to the people who would want to use this water at that time. Many of these conclusions suffer from the same errors and misrepresentation of issues as discussed above, and are therefore not reliable.

Page 74, in section 5.3 Recommendations, the first sentence is in error when it claims that there are adequate data of sufficient quality to begin the UCD FS and SWRA. The FS and SWRA should continue, but there is need to now organize the studies that DSCSOC has been calling for for over five years to properly characterize stormwater runoff from the LEHR site with respect to its impacts on Putah Creek, as well as defining the pollution of groundwaters by each of the waste management units and the extent of offsite pollution of groundwaters by LEHR site waste.

ATSDR references on page 75 are listed in two different ways. They should be consistent.

A number of the references are not properly listed, like on page 79 the reference to Spaulding. A proper reference for a PhD dissertation (at least, that is what I assume it is) must include the location at which the study was done. The references need to be redone with sufficient detail so that someone else can use them to locate the documents that are being referenced.

Page 78 includes the Pacific Eco-Risk (2002) Benthic Community Bioassessment. We have not seen this report. This report should have been made available to the RPMs and DSCSOC.

Table 3-1 must be expanded to include the US EPA Region 9 PRGs for residential properties.

Table 3-9 shows a number of non-detects for constituents for which there are analytical methods to measure the concentrations in surface waters. This is a direct reflection of the inadequate analytical methods that have been used.

Table 4-1 presents retardation factors which almost certainly have little or no relationship to the real world rate of transport for many of the constituents listed.

Table 4-4 has a number of non-detects, where the detection limits, which are not shown, are above concentrations which are known to be adverse to aquatic life. This is true for chromium, mercury, and possibly for cadmium.

Table 4-5 is not relevant to how constituents in stormwater runoff could affect water quality. No one knowledgeable in this area would ever use average concentrations and flows to predict impacts. That is not how chemicals impact aquatic life or other beneficial uses.

Do the wells with high chromium also have high levels of other waste-derived constituents?

I need further information on what UCD means by "paired well analysis." It is my recommendation that an RPM meeting be held, where UCD and its consultants should go through this report in detail to explain what they have done and answer questions on it.

With respect to the Putah Creek water quality discussions, it is unfortunate that UCD allowed its consultant to spend so much time on these calculations of relative runoff volume, versus that of the creek. It should have been obvious that that approach would never be accepted as reliable for predicting water quality impacts.

Supplemental Discussion on the Inappropriateness of Using the Dilution Model to Predict Impacts of Stormwater Runoff

Chemical constituents impact the beneficial uses of water through toxicity and bioaccumulation. Toxicity impacts have to be analyzed in terms of a concentration duration of

exposure relationship for the organisms of concern. With respect to organisms, there are three environments:

- those near the point of discharge where organisms with sufficient swimming ability can maintain their position and be exposed to an adverse concentration for sufficient time to be harmed during the runoff event
- planktonic organisms, for which the dilution model probably works, since the constituents and the organisms move together downstream
- the benthic environment, where organisms on the bottom or within the sediments are exposed to constituents as the constituents pass by.

Another issue to consider is not whether the concentrations of the constituent in runoff from the LEHR site causes an exceedance of a water quality standard, but whether it contributes to water quality problems that may exist due to upstream sources. This is of particular importance with respect to mercury and the pesticides. Further, for particulate-associated constituents, there may be areas where the particulates of a certain type accumulate to cause problems to organisms at those locations. These may not necessarily be close to the LEHR site. They could be at considerable distances downstream. Again, it is not a situation where the particulates derived from LEHR cause the problem. The issue is whether the LEHR site particulate-associated pollutants contribute to other problems.

These potential exposure scenarios cannot be evaluated by the grossly over-simplified dilution modeling approach that UCD has used.

Another issue that has not been adequately addressed is that of translocation of materials below the soil surface wastes to the surface through vegetation, which in turn would have localized areas near the vegetation where the leaves and flowers on the vegetation will drop to the ground or be carried by wind to other areas, and then eventually reach Putah Creek through stormwater runoff.

There are also food web accumulation issues that must be considered, such as benthic organisms taking up the pollutants at relatively low concentrations – even below detection limits for good analytical methods – which then lead to elevated concentrations in higher-trophic-level organisms.