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Pete Wilson, *Governor*

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DRAFT FINAL CORRECTIVE ACTION PLAN (CAP) UNDERGROUND STORAGE TANK (UST) SITES, NAVAL AUXILIARY LANDING FIELD (NALF) CROWS LANDING, STANISLAUS COUNTY.

We have reviewed the Draft Final Corrective Action Plan (Draft Final Action Plan) for Underground Storage Tank Sites UST Cluster 1, UST Cluster 2, UST 109 and UST 117) and the response to comments, submitted 2 March 1998. The Draft Final Plan has been revised to address most of our comments. We have reviewed the revisions and have the following comments on the recommended corrective action approach for groundwater and soil remediation.

Generally, we are concerned with the Navy's groundwater remedial approach for UST Cluster 1 and UST 117 which is to implement biosparging at these sites as the only remedial technology. We have comments on the evaluation of remedial alternatives for these site and the evaluation that was conducted to determine the feasibility of installing a pump and treat system. We believe that a pump and treat system is necessary to address groundwater remediation at two of the UST sites (UST Cluster 1 and UST 117), in addition to IRP Site 17, which has been identified as a source area for carbon tetrachloride contamination. With regard to the soil remedial approach, we believe that the soil remediation at UST Cluster 1 and UST 117 should be conducted concurrently with IRP site 17. Based on the information provided in this Report, we concur with the proposed remedial approach for soil (bioventing) and groundwater (biosparging) contamination at UST Cluster 2.

Groundwater Remediation

1. As discussed in our comments on the Draft Feasibility Study Report for Site 11 and 17, dated 9 April 1998, we are concerned that the Navy has not fully defined the extent of the carbon tetrachloride plume at Site 17. Without proper delineation of the carbon tetrachloride plume at Site 17, it is possible that implementation of biosparging at UST Cluster 1 and UST 117 could result in the spread of the carbon tetrachloride plume which appears to overlap groundwater contamination at these UST sites (plate 3). Biosparging involves the injection of air into the contaminated aquifer zones. Although this process may promote biodegradation of some petroleum hydrocarbons, the proximity of the carbon tetrachloride contamination, coupled with the uncertain air flow patterns generated by the biosparging wells (which is dependent on the

permeability of soils), could allow spreading of the carbon tetrachloride plume. Spreading of the carbon tetrachloride plume could prolong the groundwater cleanup time and add significant cost to the remediation effort.

2. The Navy should consider a groundwater remedial approach which would address IRP site 17, UST Cluster 1 and UST 117. However, it appears that the Navy's primary concern with installing a pump and treat system at these UST sites is that a majority of the hydrocarbon mass appears to be sorbed onto soil particles. The Navy estimates that the sorbed mass of contaminants is 1000 times greater than the dissolved phase. Although these estimates may be accurate, it appears that providing cleanup of the dissolved benzene plume should be the focus of the cleanup efforts, because of its greater mobility and lower aquifer cleanup level relative to the other constituents of concern (TPHg, TPHd and toluene, ethylbenzene and xylene).

3. The Navy has not provided any groundwater flow and contaminant transport modeling to evaluate the number of extraction wells that would be required to remediate groundwater at UST 117, UST Cluster 1 and UST Cluster 2 and to estimate remediation times. This type of evaluation is critical for comparing the technical and economic feasibility of this alternative with other alternatives. Predictions of remediation times for the hydrocarbon contamination associated with these UST sites (30 years for UST Cluster 1) and the number of extraction wells (30 extraction wells for UST Cluster 1) predicted necessary to remediate some of these sites requires supporting information. In order to provide a more meaningful comparisons of the remedial alternatives and to more accurately predict the number of extraction wells and corresponding remediation times, the Navy should provide groundwater flow and contaminant transport modeling which should incorporate capture of the benzene and carbon tetrachloride plumes that are associated with IRP site 17, UST Cluster 1 and UST 117.

Soil Remediation

4. Soil cleanup activities for UST sites 117 and UST Cluster 1 could also be incorporated with remedial action for IRP site 17. SVE Pilot testing conducted at UST 117, suggests significant mass removal of petroleum hydrocarbons from this site. Pilot test operations should be expanded to include remediation of Site 17 and UST Cluster 1.

5. Based on our experience at similar sites, it is common that sites contaminated with chlorinated VOCs or fuel hydrocarbons are initially remediated by SVE and that these systems are later converted to bioventing systems, to remediate the non-volatile components. However, if the Navy must carefully evaluate such an approach at UST Cluster 1 and UST 117. We have provided the following SVE/bioventing implementation criteria which was developed for SVE/bioventing sites at Mather AFB. We believe the decision criteria used at Mather AFB could be applied at Crows Landing. The approach involves vadose zone modeling at various stages of the remedial action to evaluate if the remaining mass of contaminants could threaten groundwater quality. The approach also uses a wellhead vapor concentration criteria (greater than 2500 ppmv Total Volatile Hydrocarbons) and is not applicable until the carbon tetrachloride contamination at Site 17 is remediated , as discussed in our comments on the *Draft Feasibility Study Report for Sites 11 and 17*, dated 8 April 1998 (please see narrative cleanup

standards language for VOCs provided with our comment letter). Further, the decision to switch the SVE system to bioventing must also be based on soil gas monitoring data, to evaluate residual soil gas concentrations, and estimated mass of contaminants remaining in the vadose zone. Also, costs associated with optimizing the SVE system should be considered prior to converting the system to bioventing.

6. The decision to convert an SVE system to bioventing must also be evaluated based on which approach is used to remediate the adjacent carbon tetrachloride plume. The groundwater contaminant plume (carbon tetrachloride) for IRP site 17 overlaps the petroleum hydrocarbon plume for UST 117 and UST Cluster 1, suggesting the possibility that the vadose zone contamination for these three sites may also overlap. An overlap of contaminants may allow spreading of chlorinated VOCs in the vadose zone at IRP site 17, if bioventing is implemented at the adjacent UST sites Therefore, the Navy may not want to remediate UST 117 or UST Cluster 1 by bioventing until the vadose contamination at IRP site 17 is remediated by SVE to the extent technically and economically feasible (see narrative cleanup standard provided with the FS Report comment letter, dated 8 April 1998).

If you have any questions in this matter, please call me at (916) 255-3050.

ROBERT REEVES
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RR:rrr

attachment

cc: Mr. Ray Leclerc, Department of Toxic Substances Control, Sacramento
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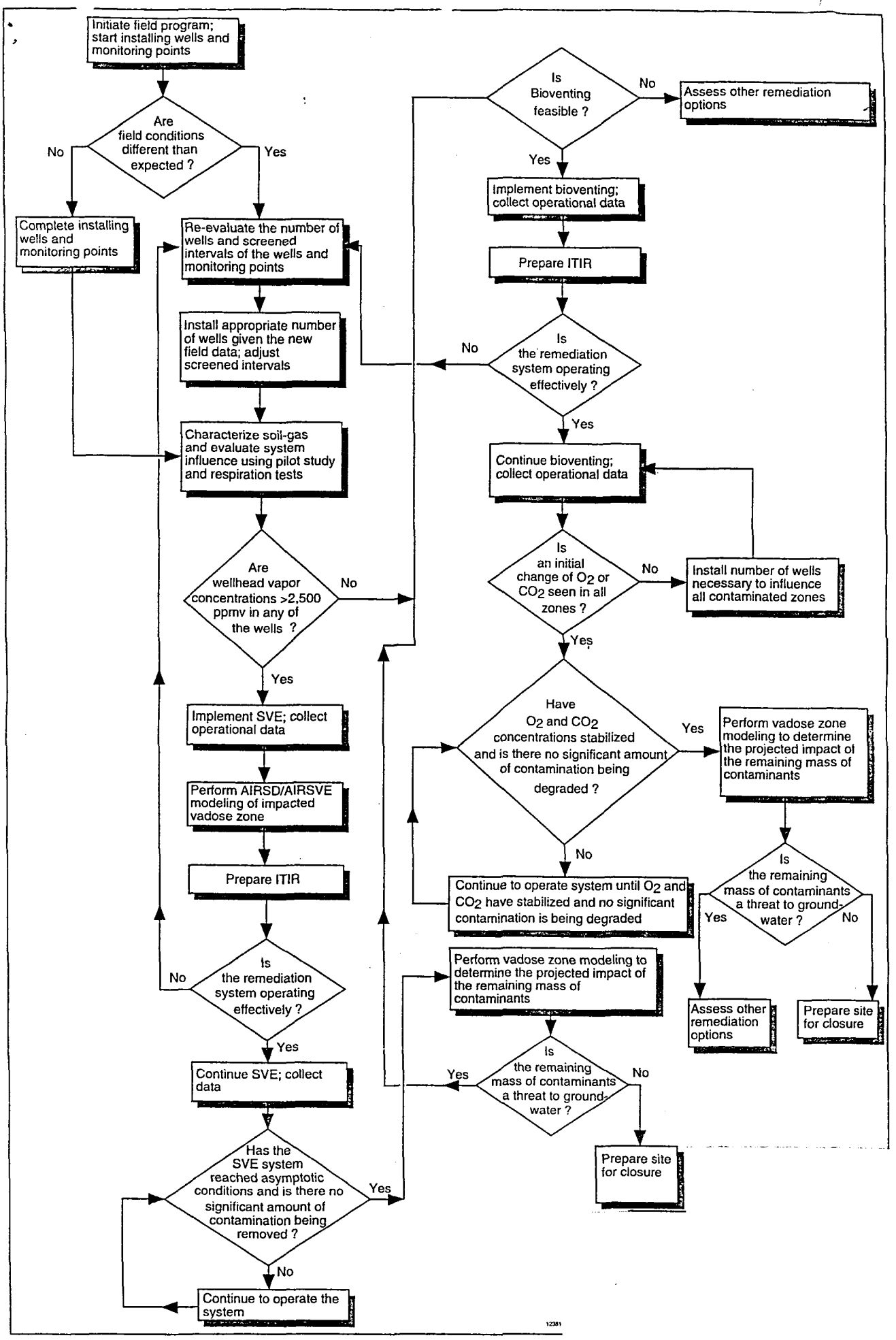
Initiate field program; start installing wells and monitoring points
Are field conditions different than expected ?
No
Yes
Complete installing wells and monitoring points
Re-evaluate the number of wells and screened intervals of the wells and monitoring points
Install appropriate number of wells given the new field data; adjust screened intervals
Characterize soil-gas and evaluate system influence using pilot study and respiration tests
Are wellhead vapor concentrations >2,500 ppmv in any of the wells ?
No
Yes
Implement SVE; collect operational data
Perform AIRSD/AIRSVE modeling of impacted vadose zone
Prepare ITIR
Is the remediation system operating effectively ?
No
Yes
Continue SVE; collect data
Has the SVE system reached asymptotic conditions and is there no significant amount of contamination being removed ?
Yes
No
Continue to operate the system
Is Bioventing feasible ?
No
Assess other remediation options
Yes
Implement bioventing; collect operational data
Prepare ITIR
Is the remediation system operating effectively ?
No
Yes
Continue bioventing; collect operational data
Is an initial change of O2 or CO2 seen in all zones ?
No
Install number of wells necessary to influence all contaminated zones
Yes
Have O2 and CO2 concentrations stabilized and is there no significant amount of contamination being degraded ?
Yes
Perform vadose zone modeling to determine the projected impact of the remaining mass of contaminants
Is the remaining mass of contaminants a threat to ground-water ?
Yes
No
Assess other remediation options
Prepare site for closure
No
Continue to operate system until O2 and CO2 have stabilized and no significant contamination is being degraded
Perform vadose zone modeling to determine the projected impact of the remaining mass of contaminants
Is the remaining mass of contaminants a threat to ground-water ?
Yes
No
Prepare site for closure
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