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MEMORANDUM

TO: Chris Parent, Project Manager
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FROM: Patty W. Wong-Yim, Ph.D.
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DATE: February 27, 2004

SUBJECT: Expanded Site Inspection - Draft Field Site Investigation Plan for the Benicia Arsenal, Benicia, California. Document Dated January 2400.

PCA: 14740 Site: 201114-47

BACKGROUND

Document Reviewed
In response to your request on January 20, 2004, the Human and Ecological Risk Division (HERD) has reviewed an Expanded Site Inspection (SI) Draft Field Site Investigation Plan (FSIP) for the Benicia Arsenal, Benicia, California. Document was prepared by Brown and Caldwell and dated January 2004.

Location and Setting: The Benicia Arsenal is a formerly used defense site (FUDS), located on 2,728 acre in Benicia, California. It functioned as an arsenal from 1849 to 1964. According to records of primary Department of Defense (DOD) land uses, the former Arsenal can be divided into five areas; Area W (Warehouse Area), Area I (Industrial/Manufacturing Area), Area R (Revetment/Explosives Holding Area), Area M (Motor Pool and Historical Ordnance Storage Area), and Area S (Magazine Storage Expansion Area).

Area I served as an industrial and manufacturing area for the former Arsenal. Several machine shops, manufacturing shops, and cleaning and painting shops were housed here, along with a blacksmith shop, a welding shop, numerous vehicle and artillery

repair shops, and a small arms shop. Photographic laboratories, a firehouse, a hospital, fuel storage and dispensing facilities, a locomotive house, boiler houses, storehouse and warehouse facilities, open storage facilities, landfills, and quarries were also located within the area. Among the 45 further action recommended (FAR) sites included in the Expanded SI, 32 are located in Area I.

Area M was primarily used to store ammunition, gunpowder, and ordnance. Eight sites in Area M, which were related to vehicle maintenance activities, will be inspected under the Expanded SI.

Area W was used to receive and store small arms, ammunition, and related supplies throughout World War II. Two sites in the area will be inspected under the Expanded SI.

Structures within Area S included a network of ammunition storage igloos for storage of artillery projectiles and aerial bombs. These igloos were later used for general storage. One site in Area S will be inspected under the Expanded SI.

Area R was mainly for temporary storage of explosives on flatbed railroad cars, artillery testing, demilitarization, and demolition of damaged and obsolete ammunition from military bases across the Pacific. Two sites in Area R, which were associated with demilitarization of damaged and obsolete ammunition, will be inspected under the Expanded SI.

Originally, 389 sites were evaluated in a Preliminary Assessment of the former Arsenal. Three hundred and twenty seven sites were considered as no DOD action indicated sites, whereas 62 sites were classified as FAR sites. Of the 62 FAR sites, 12 sites were potentially related to underground storage tanks and will not be included in the Expanded SI. Furthermore, as risk evaluation of several sites will be addressed in a remedial investigation, the draft FSIP only covered 45 FAR sites.

HERD's COMMENTS

1. **Scope of Review:** HERD has primarily confined its review of the document to those sections concerning risk assessment. We assume that regional personnel have evaluated the sampling method requirements, analytical methods summary, quality assurance project plan, investigation derived waste handling, and site safety and health plan. Any future changes or additions to the document should be clearly identified.

2. **Objective of Project:** In accordance with the FUDS program goals and US Army Corps of Engineers guidance, an expanded SI is planned to identify the presence of DOD-related chemicals that may have impacted the environment at the former Arsenal. The objective of the project is to characterize and, if necessary, remediate to an appropriate standard, land that was previously used by the DOD and that has no beneficial use history after the Arm ceased operations.

3. **Sampling Plan**: According to Table 5-4 of the draft FSIP, delineation limits were established for certain chemicals of interest (COIs) in groundwater, which are equivalent to their mobile laboratory reporting limits. Similarly, Table 5-5 shows the delineation limits for COIs in soil. As a result, volatile organic chemicals (VOCs) in groundwater will be delineated to their reporting limits, whereas inorganics in soil will be delineated to their 2000 USEPA Region IX Industrial Soil Preliminary Remediation Goals (PRGs) (USEPA, 2000).

3.1. Sampling Size and Locations: We recommend consulting a geologist from DTSC for comments on proposed groundwater sampling locations and groundwater flow directions shown in the draft FSIP. We understand that one of the main objectives of the project is to provide preliminary data to support future funding request for site investigation and remediation at the former Arsenal under the FUDS program. Although we believe that the FSIP may be adequate for this purpose, we do not expect the results to be sufficient for site characterization or site screening purposes. Since the Army is proposing only an extremely small number of groundwater samples, a handful of soil samples collected from limited areas, and a very short list of COIs in the draft FSIP, the Expanded SI will be insufficient for screening out sites from further investigations, especially since most of the sites will lack a soil investigation. Therefore, we recommend additional groundwater and soil samples be collected during the Expanded SI.

3.2. Soil Investigation: Based on results from previous investigations and an assumption that most of the soil contaminations should have been migrated to groundwater, the Expanded SI will be mainly focused on VOC investigations in groundwater. Additional soil sampling is necessary because some chemicals, including but not limited to, polychlorinated biphenyls (PCBs), dioxins, and polyaromatic hydrocarbons (PAHs) are very resistant to environmental degradation and tightly adsorbed to soil usually have limited migration from the source locations. Please amend the soil sampling plan to include additional surface and subsurface soil sample collections.

3.3. Chemical of Interest: The draft FSIP states that VOCs in groundwater, total petroleum hydrocarbons in groundwater, and inorganics in soil will be investigated in the Expanded SI. Considering a long site history and variety of DOD activities supported by the former Arsenal, we cannot agree with limited COIs included in the FSIP. Inorganics (metals) and toxic chemicals like PAHs (associated with fuels and motor oils, and generated during burning activities), PCBs (commonly used in transformers since 1920s, found in contaminated heating oils which might be used in boiler houses, presence in missiles which were serviced and stored at the former Arsenal), dioxins (found as contaminants in pesticides commonly used in the Vietnam War, and generated during incineration of solid wastes and burning waste solvents), pesticides, asbestos (commonly used in construction materials before 1960s), perchlorate (used as fuel in missiles), and explosives (in munitions) should also be included in the groundwater and soil sample analyses. Please include these chemicals as the COIs for the Expanded SI.

3.4. Groundwater Sample Analyses: According to the FSIP, groundwater at the former Arsenal is currently not for municipal use. Therefore potential exposure to contaminants in groundwater for current industrial workers onsite is mainly through vapor intrusion into indoor air. Based on this assumption, the Expanded SI will be mainly focused on VOC investigations in groundwater. Please provide a certification from the Regional Water Quality Control Board to support the statement. In the absence of the supporting document, groundwater at the former Arsenal should be considered for all beneficial uses. Moreover, considering shallow groundwater is present in certain areas of the former Arsenal (5-10 feet below ground surface), potential exposure to groundwater during construction and excavation activities by constructor workers should be considered as a complete pathway. Additionally, groundwater may leach into ecologically sensitive areas such as Suisun Bay. As a result, COIs in groundwater should not be limited to VOCs. Please include inorganic, semi-volatile organic chemicals (SVOCs) analyses for groundwater samples in the FSIP.

4. **Delineation Limit:**
4.1. Volatile Organic Chemicals in Groundwater: To facilitate high flexibility of the sampling plan and fast turn over of sample analyses, a mobile laboratory will be stationed onsite for rapid sample analyses. Volatile organic chemical contaminations in groundwater will be delineated to their mobile laboratory reporting limits. However, some of these reporting limits, and hence their delineation limits, are above the USEPA Region IX Tap Water PRGs or other relevant toxicity criteria for some VOCs. Sites with groundwater contamination concentrations below the reporting limits may be overlooked. Consequently, sites contaminated with chemical(s) at unacceptable concentrations may be screened out during the Expanded SI phase. We recommend split samples be collected and sent to standard laboratory for detailed analyses with appropriate detection limits.

4.2. Maximum Contamination Limit and Tap Water Preliminary Remediation Goal: Groundwater contaminations will be delineated to detection limits of COIs in water. For chemicals with USEPA Region IX Tap Water PRGs below their detection limits, contaminations with unacceptable concentrations may not be detected. We recommend including the USEPA Region IX Tap Water PRGs for all COIs in Table 5-4 for comparison purposes.

4.3. Inorganics in Soil: Quantitation limits for antimony, cadmium, molybdenum, selenium, silver, and thallium are above their corresponding ambient concentrations listed in Table 5-6. Therefore, concentrations of inorganics above their representative ambient levels may be overlooked in soil samples. To avoid underestimating chemical contaminations introduced by past DOD activities, we recommend collecting split soil samples for inorganic analysis with acceptable quantitation limits for these metals. In addition, please provide the source of ambient concentrations used in the draft FSIP.

5. **Expanded Site Inspection Report and Benicia Screening Level:** Benicia screening levels (BSLs) listed in Table 5-6 are equal to the USEPA Region IX PRGs

(USEPA, 2000). Please specify uses of BSLs in the Expanded SI and future investigations. The report contains no information on potential uses of results generated under the FSIP, criteria for site screening in the Expanded SI, and format of the Expanded SI report, which are essential for the draft FSIP. In the absence of this information, it is hard to justify whether the proposed sampling plans and delineation limits in the FSIP will be sufficient for the Expanded SI purpose. Please amend the draft FSIP to include the information.

6. **Site Ranking for Further Delineation:** Section 4 lists a hierarchy for determining sites for further delineation. However, no rationale on design of the hierarchy was provided in the FSIP. Considering most of the sites are currently occupied with industrial buildings and actively in use, major exposure pathway for current industrial workers is inhalation of VOCs through vapor intrusion into indoor air. Since shallow groundwater is present in certain areas of the former Arsenal, we recommend sites with groundwater impacted by VOCs, especially carcinogens, be of the highest priority for future delineation. Overall, we recommend sites be ranked as below:

- Site with soil, soil gas, or groundwater data suggesting potential impacts to indoor air, especially if children are present onsite (residential area, child care centers, and schools);
- Sites with groundwater impacted by VOCs
- Sites with possible human exposure by direct contact (e.g. exposed soil)
- Sites with subsurface soil that have no cap
- Site with impacted subsurface covered by impermeable material

In addition, scientific judgment should also be used under exception site conditions.

7. **Ecological Risk:** The FSIP does not describe whether ecological receptors will be considered in the investigation. Ecological receptors were not considered in ranking sites for further delineation. All of the delineation limit for inorganics were established based on the USEPA Region IX 2000 Industrial PRGs and VOCs in groundwater will be delineated to reporting limits, which were compared to available maximum contaminations levels for drinking water. Please include in the FSIP considerations of potential exposure of ecological receptors at the former Arsenal.

8. **Data Quality for Risk Assessment:** We understand that risk assessment will not be performed in the Expanded SI. However, we recommend the Army to ensure data generated for the Expanded SI will fulfill the QA/QC requirement for risk assessment purposes. As a result, data generated in the Expanded SI can be combined other investigation data in future, for risk assessment purposes. Besides, these data may be used to support No Further Action decision during site closure. Therefore, we urge the Army to ensure that data collected will fulfill the QA/QC requirement for risk assessment.

DISCUSSION and CONCLUSIONS

HERD comments regarding revisions and additions to the draft FSIP are noted. As stated above, significant deficiencies are present in the draft FSIP such that we cannot concur with the draft work plan at this time. We recommend the Army to include our suggestions and revise the draft FSIP accordingly. We look forward to review the revised draft FSIP.

If you have any questions or concerns, please contact me at (916) 255-6438.

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REFERENCES

US EPA, Region XI Preliminary Remediation Goals. (2000) Memo from Stanford Smucker, Ph.D., Regional Toxicologist.