D R A F T

REMOVAL ACTION WORKPLAN (RAW)

Former University of California
Bay Area Research and Extension Center (BAREC)
90 North Winchester Boulevard
Santa Clara, California

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BAREC	Bay Area Research and Extension Center
bgs	below ground surface
Cal/EPA	California Environmental Protection Agency
CalTrans	California Department of Transportation
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
cm^2	Square centimeter
COPC	Chemical of Potential Concern
DEH	City of Santa Clara Department of Environmental Health
4,4'-DDD	4,4'-Dichorodiphenyldichloroethane
4,4'-DDE	4,4'-Dichorodiphenyldichloroethene
4,4'-DDT	4,4'-Dichorodiphenyltrichloroethane
DTSC	Department of Toxic Substances Control
EIR	Environmental Impact Report
kg	Kilogram
LBNL	Lawrence Berkeley National Laboratory
m^3/day	cubic meters per day
mg/cm^2	milligrams per square centimeter
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
mm of Hg	millimeters of mercury
MRL	Method Reporting Limit
MSL	Mean Sea Level
NA	Not Applicable
NCP	National Contingency Plan
ND	Not Detected
NR	Not Reported
PEA	Preliminary Endangerment Assessment
PRG	Preliminary Remediation Goal
RA	Removal Action
RAL	Recommended Action Level
RAOs	Removal Action Objectives
R&D	Research and Development
TBCs	To Be Considered
T&CVSC	Town and Country Village Shopping Center
UC	University of California
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

An environmental investigation was conducted at the former University of California (UC) Bay Area Research and Extension Center (BAREC) in Santa Clara, California (the site) to determine whether prior agricultural research operations had impacted soil. Residential development is planned for the site in the future. The State of California has closed the BAREC and plans to sell the property for development of single-family homes, open space and senior housing.

The results of the environmental investigation recommended that a removal action be performed to address elevated concentrations of arsenic in the eastern sector of Field 4, and the three "hot spots" in surface soil. A Removal Action Workplan ("RAW") was prepared to identify, evaluate, and recommend remediation alternatives for contaminated soils at the site. The primary objective of this RAW is to ensure the protection of human health and the environment.

Background

Since the 1920s, the BAREC was used as an agricultural research station. The primary research efforts at the BAREC have focused on improving crop production methods, irrigation systems, nutrition and variety characteristics of crops, and crop disease control. Part of this research has involved demonstrating the efficacy of a variety of research and development (R&D) pesticides. Monthly records of pesticide use were available from 1979 until the July 2002. These records indicated that small quantities of 90 different chemicals had been tested on crops at the site. Fourteen of these 90 chemicals were considered of potential concern because of their toxicity and persistence in the environment. The remaining chemicals were not of potential concern because of their lack of persistence and/or low toxicity.

Environmental Investigation

As a result of the application of pesticides to soil and the handling of pesticides on-site, over 50 samples of surface soil were collected to determine if surface soil in field plots and the greenhouses contained pesticide residues. These samples were analyzed for chemicals/pesticides that may persist in soil for many years following application. The chemicals analyzed included the 14 chemicals of potential concern, known to have been used at the site, and 60 pesticides that were commonly used prior to 1979. Subsurface soil samples were also collected and analyzed from a former sewer leach pit, the former evaporation pond, and former sediment trap to determine if deeper subsurface soil and potentially ground water beneath the site contained pesticide residues.

Investigation Results

Arsenic and dieldrin were the chemicals of potential concern that were found at concentrations above USEPA Region 9 Preliminary Remediation Goals (PRGs) in surface soil. Elevated concentrations of dieldrin were isolated and of limited horizontal and vertical extent. However, the dieldrin concentration in surface soil in Field 1 exceeded the PRG. As a result, it is recommended that this “hot spot” of dieldrin be addressed.

An area in the eastern portion of Field 4 had elevated concentrations of arsenic in surface soil relative to background levels and other areas at the site. These results suggest that the elevated concentrations of arsenic in Field 4 may be a result of prior use of arsenical pesticides. There were also two additional areas that had isolated, elevated concentrations of arsenic: 1) adjacent to the road in front of the former screen house, a less than five square foot area of distressed vegetation had an elevated concentration (37 mg/kg) of arsenic in surface soil; and 2) between Field 11 and 12, there is an elevated concentration (27 mg/kg) of arsenic in surface soil. Based on these results, a removal action was recommended to address the elevated concentrations of arsenic in the eastern sector of Field 4, and the three “hot” spots in surface soil.

Removal Action Alternatives

The removal action objectives (RAOs) for the site are:

- Minimize exposure of future site residents to surface soil containing arsenic above the 20 mg/kg level,
- Ensure the mean concentration of dieldrin in an individual field is below 30 ug/kg; and
- Leave the site in a physical condition that is compatible with single-family residential use.

Three removal action alternatives were evaluated based on their ability to meet RAOs, effectiveness, implementablility and cost. The three alternatives included: 1) No Action; 2) Capping and Implementation of Institutional Controls; and, 3) Excavation with Offsite Disposal..

The recommended alternative was excavation and offsite disposal of soil. Soil above cleanup goals would be excavated from the site and disposed of at a nearby nonhazardous, municipal landfill. The overall average arsenic concentration in shallow soil would be 12 mg/kg and the average dieldrin concentration in Field 1 less than 30 ug/kg following implementation of the recommended removal action alternative. Up to roughly 6000 cubic yards of soil are anticipated to be excavated over an approximately 2-week period from Field 4 and the three hot spots. Confirmation samples will be collected from the excavation areas prior to backfilling with clean import fill. Air monitoring and dust control measures will be implemented during removal action activities. The estimated cost of implementation of the removal action alternative is approximately $800,000. The anticipated time to implement the removal action at the site is 6 weeks.

1.0 INTRODUCTION

This Removal Action Workplan (RAW) was prepared by ENVIRON International Corporation (ENVIRON), an environmental consulting firm, on behalf of the State of California Department of General Services (DGS) to address the presence of contaminated soil at the former University of California (UC) Bay Area Research and Extension Center (BAREC) site ("the site"). The RAW has been prepared in a manner consistent with the National Contingency Plan (NCP) and in accordance with California Health and Safety Code, Section 25356.1. The RAW is also being prepared under a Voluntary Cleanup Agreement between the DGS and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) dated May 12, 2003. An Environmental Impact Report (EIR) is being prepared by the City of Santa Clara for the proposed development project and site clean-up to comply with the requirements of the California Environmental Quality Act (CEQA)

The purpose of this RAW is to identify, evaluate, and recommend remediation alternatives for contaminated soils at the site. Selection of one alternative is based upon an analysis of the effectiveness, implementability and cost of each alternative. The primary objective of this RAW is to ensure the protection of human health and the environment. Residential development is planned for the site in the future.

2.0 SITE CHARACTERIZATION

1.0. SITE DESCRIPTION AND BACKGROUND

The site is located at 90 North Winchester Boulevard in the City of Santa Clara, California. The location of the site is presented on Figure 1. The site is an approximately 17-acre, roughly rectangular-shaped property. As shown in Figure 2, 12 small buildings are located on the eastern portion of the site. The remainder of the property consists of agricultural fields, unpaved roadways and a paved parking area. The fields are identified by a number from one through twelve and cover a total of approximately eleven acres. Field 9 is enclosed by screens, which form a covered building over the field. Unpaved roadways provide access to the fields. The only paved area at the site is the northwest corner of the property, where buildings 100, 103, 104, 105, 201 and 204 are located. This paved area is used for parking.

1.0.0. Site History

According to facility personnel, the site was originally occupied by a veterans' widows home. Agricultural experimental field station operations at the site began in 1928. The home remained in operation until the 1960s, when it was demolished and replaced with more agricultural fields. According to historical topographical maps, the name of the facility used to be Holderman Sanitarium. Based on a review of historical titles and deeds, obtained from the DGS, four lots owned by Margaret Osborne were deeded to the State of California in 1921 and 1924. The four lots were incorporated into three lots, two of which were deeded by the State of California to the UC in 1952 and 1963. The third lot, located directly southwest of the site, remained property of the State of California, and is currently occupied by an office building, which is occupied by the Department of Veterans' Affairs.

The field station's initial purpose was to assist farmers in the surrounding area. Until 1990, deciduous fruit trees (such as apples, citrus, cherries, almonds and ornamental) were planted to conduct research on fertilizers, irrigation, variety characteristics of crops, and crop disease control. Part of this research has involved demonstrating the efficacy of a variety of research and development (R&D) pesticides. Monthly records of pesticide use were available from 1979 until July 2002. These records indicated that small quantities of 90 different chemicals had been tested on crops at the site. As the surrounding area changed and became urban, the trees were replaced with various crops, such as strawberries, corn, tomatoes, beans and flowers. Since about 1995, eighty percent of the research at BAREC has focused on crop improvement, whereas only twenty percent has involved pesticide use (UC, 2002). In early 2003, UC closed the BAREC. As part of closure, UC personnel removed all hazardous materials (i.e. fertilizers, pesticides, fuels, oils, cleaning solutions), portable tanks and trailers from the site. The buildings and related utilities remain in place at the site.

2.0.0. Geology

The site is located near the center of the South Bay hydrologic sub-basin of the San Francisco Bay hydrologic basin, which is located in the Coast Ranges geomorphic province. The Coast Ranges geomorphic unit is characterized by predominantly northwest trending mountains, valleys and faults. The South Bay unit is a broad alluvial valley sloping north toward San Francisco Bay. The site is underlain by Quaternary alluvium deposited by streams that merge near the center of the San Jose Alluvial Plain and flow north toward San Francisco Bay. The alluvium is composed of unconsolidated interbedded gravel, sand silt and clay. The alluvium becomes progressively finer-grained northward toward the Bay and contains a series of laterally extensive marine clay layers (Dames and Moore 1988).

The site is likely within or on the margin of the area underlain by extensive clay layers (Dames and Moore 1988). According to documentation provided by the UC for the irrigation well at the site, interbedded gravel, sand and clay was observed at the site to a depth of 39 feet. The gravel was underlain by layers of clay, sandy clay, gravelly clay and gravel to a depth of 360 feet. Blue clay was reported at depths of 70 to 75 feet, 105 to 119 feet, 239 to 244 feet, and 261 to 272 feet, which is consistent with the interpretation that the site is on the margin of the area underlain by extensive clay layers.

3.0.0. Hydrogeology

The alluvial deposits of the Santa Clara Valley basin are generally regarded as a complex series of coalescing alluvial fans. Sediments deposited by meandering stream channels on the fans resulted in a complex stratigraphic sequence, which trends northeast from the Santa Cruz Mountains toward San Francisco Bay and its estuarine areas. The alluvial deposits make up the primary water-yielding aquifers of the Santa Clara Valley, which are grouped into a shallow unconfined to semi-confined aquifer, and a deeper confined aquifer. The deeper confined aquifer is encountered beneath an extensive aquitard, at depths greater than 300 feet below ground surface (bgs) and is considered a viable drinking water source for this area. Recharge to the aquifers is from infiltration of surface waters to the deeper zones (IT Corporation, 1999). Most water wells in the Santa Clara Valley basin withdraw ground water from the Quaternary alluvium (Dames and Moore 1988). Four correlatable regional aquifers have been identified in the alluvial plain; the 60-foot, 250-foot, 350-foot, and 450-foot aquifers. Most major producing wells in the Santa Clara area withdraw water from a zone 150 to 250 feet below ground surface under confined or semi-confined conditions.

Former BAREC personnel indicate that one groundwater well is located on-site. It is located inside the pump house and was used for irrigation of the fields. The well at the site is screened from a depth of 200 to 250 feet bgs; the depth to groundwater in this well is 140 feet and approximately 3.7-million gallons were pumped annually when the BAREC was operating. A report by Environmental Data Resources, Inc. (EDR) identified nine additional active wells within a one-mile radius of the site. The wells are operated by O'Connor Hospital, the San Jose Water Company, the City of San Jose, and the City of Santa Clara. No additional information about these wells was found.

There is no site-specific information on shallow ground water at the site. ENVIRON reviewed a Soil and Ground Water Report prepared by McCulley, Frick & Gilman, Inc. for the Dunn-Edwards Corporation Facility located at 690 Winchester Boulevard, approximately 1/8 mile north of the site. The report indicated that shallow ground water was encountered between 20 and 30 feet bgs and that shallow ground water flowed towards the Bay to the east.

2.0. SOURCE, NATURE AND EXTENT OF IMPACTS

A series of environmental investigations have been conducted at the site. In 1993 and 1987, UC conducted two environmental investigations at the site. These investigations were related to removal of two underground fuel storage tanks and closure of an evaporation bed. In addition, as part of closure and redevelopment of the site, DGS conducted several environmental investigations between July 2002 and April 2003. The overall purpose of the DGS investigations was to determine whether current or past chemical use at the site had resulted in soil concentrations that might pose a threat to public health and the environment. A summary of the results of these investigations is presented below.

1.0.0. Underground Storage Tanks

Two 1,000-gallon fuel tanks were formerly located on-site. The date of installation of the tanks is unknown. A 1000-gallon gasoline UST was located next to Building 201, and a 1000-gallon diesel UST was located next to Building 207 (see Figure 2).

In 1993, UC personnel removed the USTs. The USTs were reportedly in good condition with no evidence of damage or leaks at the time of the removal. As part of removal activities, two samples were taken from approximately two feet below the bottom of the gasoline UST excavation, and one sample was taken from approximately two feet below the bottom of the diesel UST excavation. The soil samples were analyzed for gasoline, diesel, lead, benzene, toluene, ethylbenzene and xylenes. None of these constituents were detected. A letter dated October 7, 1993, from the City of Santa Clara Fire Department confirms that there was no sign of contamination, and that no further work was required.

2.0.0. Former Evaporation Bed

An evaporation bed was constructed in 1973 to dispose of diluted pesticide wastes. Rinsate from the washing of pesticide containers and application equipment was applied to the evaporation bed from 1973 to 1985. Use of the evaporation bed was discontinued in 1985 and inlets to the basin were sealed. In 1987, UC initiated an investigation to close the bed. Prior to its removal, the evaporation bed was sampled in July 1987 by UC staff. Details of the investigation can be found in the *Phase II – Site Characterization Report* (ENVIRON, 2003).

The UC, with the assistance of Dames & Moore, removed the evaporation bed in October 1987. All materials were excavated from inside of the liner and the liner was checked for integrity. After the liner was removed, the underlying two inches of soil were excavated from the bed to minimize possible residual contamination. Additional soil samples were collected by Dames & Moore. Based on the results of the sampling, Dames & Moore concluded that there was no indication that the operation of the former evaporation bed had a significant impact on the environment.

Additional samples were collected from the former pond by ENVIRON on behalf of DGS in April 1, 2003. In the center of the former evaporation pond, the soil samples, which were collected from depths of 2, 3.5, 6.5 and 7.8 feet bgs had arsenic concentrations of 20, 9.7, 2.8, and 2.9 mg/kg respectively. Soil samples collected at depths of 3.5 and 8.5 feet bgs from a soil boring adjacent to the sediment trap had arsenic concentrations of 3.5 and 3.2. Organochlorine pesticides were not detected in a sample of the liquid inside the sediment trap. Metals were detected at low concentrations in a sample of the sediment trap liquid. The results of this additional sampling confirmed Dames & Moore's conclusion that the operation of the former evaporation bed did not have a significant impact on the environment.

3.0.0. DGS Site Characterization Investigations 2002/2003

ENVIRON conducted a series of site characterization investigations on behalf of DGS in August and September 2002 and in April 2003. The primary focus of these investigations was to determine whether current or past pesticide use at the site had resulted in soil concentrations that might pose a threat to public health and the environment. Initially, over 50 samples of surface soil were collected to determine if surface soil in field plots and the greenhouses contained pesticide residues. These samples were analyzed for chemicals/pesticides that may persist in soil for many years following application. The chemicals analyzed included 14 chemicals of potential concern, known to have been used at the site, and 60 pesticides that were commonly used prior to 1979. In addition, subsurface soil samples were also collected and analyzed from a former sewer leach pit, the former evaporation pond and sediment trap to determine if deeper subsurface soil and potentially ground water beneath the site contained pesticide residues.

1.0.0.0. Surface Soil Results

Surface soil sampling results are discussed in detail in the *Phase II – Site Characterization Report* (ENVIRON, 2003). The results of analyses of soil samples from the field plots and greenhouses at the site indicate that only seven organochlorine pesticides, diquat and thirteen inorganic compounds were detected. Triazine pesticides, organophosphorous pesticides, chlorinated herbicides, paraquat, carbamate pesticides and urea pesticides were not detected in any of the samples analyzed. A statistical summary of the compounds detected is provided in Table 1.

Of the pesticides, 4,4'-DDT, 4-4'DDE and diquat were detected the most frequently at a rate of about 66 percent in the samples analyzed. Dieldrin was detected the next most frequently at a rate of about 25 percent while chlordane and endrin were detected at a frequency of less than 10 percent. Only one detection of heptachlor epoxide was reported in the 59 samples analyzed.

A comparison of the pesticide results with USEPA Region 9 PRGs[1] showed that only dieldrin exceeded the PRG for samples collected at 0.5 feet bgs. Exceedences of the PRGs occurred in one sample from Field 1 and two samples from Field 3. As a result, samples collected at 3 feet bgs from these locations (in addition to 3 more locations in Field 3 and one location in Field 7[2]) were analyzed for organochlorine pesticides. For samples from 3 feet bgs, dieldrin was detected in two of the samples from Field 3 at concentrations below the PRG. Dieldrin was not detected at 3 feet bgs in the other locations analyzed in Field 3 or, in Field 1 and Field 7. 4,4'-DDT and 4-4'-DDE were also detected in samples from Fields 3 and 7 at 3 feet bgs, but at concentrations well below the PRG. Diquat was detected in 8 of the 12 fields at concentrations well below the PRG. A summary of the results is shown on Figure 3.

Although dieldrin exceeded the PRG in three localized areas in shallow soil, the 95% upper confidence level (UCL) of the mean dieldrin concentration in shallow soil for the site was below the PRG of 30 ug/kg (Table 1). With the exception of Field 1, the mean concentration of dieldrin in shallow soil in each individual field is also below the PRG. However, the mean concentration of dieldrin in Field 1, which is where the maximum dieldrin concentration (240 ug/kg) is located, exceeds the PRG. There were three other samples collected from shallow soil in Field 1 and analyzed for dieldrin. Dieldrin was not detected in two of these samples and was detected at 11 ug/kg in the third sample. However, because the dieldrin concentration in the sample collected at F1-C is well above the PRG, the mean dieldrin concentration in Field 1 exceeds the PRG.

For the inorganic compounds, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, mercury, nickel, vanadium, and zinc were detected in samples from 0.5 feet bgs. Except for beryllium, cyanide and mercury, these inorganics were detected in all samples. This is expected since these compounds are naturally-occurring constituents of soil. Soil pH was also within the normal range for soil, i.e. between 6 and 8. Table 2 presents a comparison of the inorganic results from surface soil at the site to typical background ranges in soil in California and the western US. This comparison shows that the concentrations of inorganics detected at the site are within the typical background range for California/Western US.

Table 2 also presents background ranges for metals in soil in northern Santa Clara County and in the Bay Area. These background ranges were compiled in a report by Christina

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1 USEPA Region 9 PRGs were used for screening purposes only. The PRGs used for comparison are for residential soil from: October 1, 2002, *USEPA Region 9 Preliminary Remediation Goals (PRGs).*
2 These samples were analyzed because preliminary laboratory showed detection limits above the PRGs.

Scott from various environmental investigations done within a 2-mile radius in northern Santa Clara County (Scott, 1991) and in a report by Lawrence Berkeley National Laboratory (LBNL) in the San Francisco Bay Area (LBNL, 2002). The former BAREC site is located in southern Santa Clara County between 5 and 10 miles south of where samples for northern Santa Clara County were collected in the Scott study. As discussed in Section 2, the site is underlain by Quaternary alluvium deposited by streams that merge near the center of the San Jose Alluvial Plain and flow north toward San Francisco Bay. The alluvium is composed of unconsolidated interbedded gravel, sand silt and clay and becomes progressively finer-grained northward toward the Bay. Based on this information, the alluvium in northern Santa Clara County may be finer-grained than in southern Santa Clara County suggesting that there may be some natural variations in the inorganic composition of soils between southern and northern Santa Clara County. A qualitative comparison between site data and the northern Santa Clara County data indicates that arsenic concentrations at the site are just outside the range of the northern Santa Clara County background values and the average arsenic concentration at the site is higher (11 mg/kg) than the northern Santa Clara County value (2.9 mg/kg). In addition, the average lead concentration at the site (23 mg/kg) is slightly above the northern Santa Clara County value (11.4 mg/kg). Copper and zinc average concentrations at the site are about the same as the northern Santa Clara County value while the average concentrations of beryllium, chromium, nickel and vanadium at the site are below the northern Santa Clara County study values.

With respect to the LBNL study, a qualitative comparison between site data and the roughly 1400 samples analyzed in LBNL study indicates that arsenic concentrations range from 1.8 to 37 mg/kg at the site and up to 42 mg/kg in the LBNL study. The average arsenic concentration at the site is higher (11 mg/kg) than the LBNL average (5.5 mg/kg). With respect to other metals, the average lead concentration at the site (23 mg/kg) is above the LBNL value (7.0 mg/kg). Barium and zinc average concentrations at the site are about the same as the LBNL average values while the average concentrations of beryllium, chromium, copper, nickel, and vanadium at the site are below the LBNL average values.

Table 2 also presents the results of the one background sample, BG-A, collected below pavement at 0.75 bgs at the site. This sample was taken outside of areas at the site known to have pesticide use. Typically, a minimum of 4 samples should be collected, if possible, to determine background concentrations; however, only one small area of the site, which was outside of buildings, was identified where there was no known pesticide/chemical use. Since the area surrounding the site is highly urbanized and previously used as agricultural land, there were also no offsite areas where representative background samples could be collected. As a result, comparison of the results to only one background sample is of limited statistical value. A qualitative comparison indicates that arsenic and lead were detected in many samples at concentrations above the concentrations detected at BG-A. Barium, however, was detected at concentrations below the concentration in BG-A. Except for arsenic, barium and lead, the other metals were detected at similar concentrations as BG-A.

A comparison of the inorganic results with USEPA Region 9 PRGs showed that arsenic exceeded the PRG for all samples including the background sample, BG-A. No other inorganic compound exceeded the PRGs. As noted in the preamble to the PRG table, the PRG for arsenic in residential soils is 0.39 mg/kg. This value is typically below background concentrations in a local area (especially in California), and as such, USEPA Region 9 has at times used the non-cancer PRG for arsenic of 22 mg/kg (USEPA, 2000).

Based on the above, an arsenic background concentration needs to be defined to determine areas at the site, which may have been impacted by arsenical pesticides. A discussion of the rationale for determining an arsenic background is presented below.

1.0.0.0.0. Arsenic Background

As discussed above, in the Scott study, the maximum arsenic concentration in background soil was 20 mg/kg. In the LBNL study, the proposed upper estimate of the background arsenic concentration was 42 mg/kg. In addition, a plot of the cumulative frequency of the shallow arsenic soil concentrations at the site, which is presented in Figure 7 of the *Phase II – Site Characterization Report* (ENVIRON, 2003), shows an inflection point at 20 mg/kg for the site. Based on these data, concentrations of arsenic above 20 mg/kg are considered to exceed background levels.

Furthermore, the arsenic background concentration and removal action objectives that were approved by DTSC for the residential portion of the Town and Country Village Shopping Center (T&CVSC) development at 360 Winchester Boulevard in San Jose, (which is in close proximity to the site), were also considered in determining an arsenic background concentration for the site. The mean background concentration for arsenic at the T&CVSC was 12 mg/kg. The residential removal action objectives for arsenic at the T&CVSC used a site-wide average concentration of 12 mg/kg and a maximum arsenic concentration of 20 mg/kg.

Table 3 presents summary statistics for arsenic in shallow and deeper soil at the site. Assuming the arsenic concentrations that are above 20 mg/kg are replaced with a concentration of 7 mg/kg, which is the average concentration in deep soils, the average, standard deviation and 95% UCL of the mean arsenic concentration in shallow soil becomes of similar magnitude to deeper soil. Furthermore, if the arsenic concentrations above 20 mg/kg are removed and the eastern portion of Field 4 is removed and replaced with soil with arsenic concentrations less than 7 mg/kg, then the average arsenic concentration in shallow soil at the former BAREC site is less than 12 mg/kg, which is the mean background concentration for arsenic that was used at the nearby T&CVSC site.

2.0.0.0.0. Nature and Extent of Arsenic above Natural Background Levels

Figures 4 and 5 illustrate the horizontal and vertical extent of arsenic in soil at the site. Elevated concentrations of arsenic above 20 mg/kg are located primarily in the eastern portion of Field 4, primarily at 0.5 feet bgs, in sample 1-GB collected from distressed vegetation next to the old screen house, and in sample F12-A in the dirt road between Fields 11 and 12 at 0.5 feet bgs. Sample F12-A, which has an arsenic concentration above 20 mg/kg, between Fields 11 and 12, however, appears to be of limited horizontal and vertical extent. Adjacent samples in Field 11 and 12 have arsenic concentrations of 10 and 5.3 mg/kg, respectively, and the sample at 3 feet bgs at F12-A has an arsenic concentration of 7.7 mg/kg. Sample 1-GB was collected from an obviously brown patch of grass in April 2003. The brown patch of grass was less than 2 feet in diameter surrounded by dark green grass.

With respect to the elevated concentrations of arsenic in Field 4, there are several samples in the southern half of Field 4 with arsenic above 20 mg/kg. At 0.5 feet depth, 6 samples exceeded 20 mg/kg at the following locations: F4-6, F4-A, F4-B, F4-C, F4-D, and F4-F; at 2 feet bgs, one sample exceeded 20 mg/kg at F4-7; and, at 3 feet bgs, two samples exceeded 20 mg/kg at the following locations: F4-7 and F4-C. Arsenic concentrations above 20 mg/kg are of limited vertical extent. All samples at 4 feet bgs collected from direct-push borings at F4-E/SB-1, F4-C/SB-2, and F4-F/SB-3 (near F4-7) had arsenic concentrations of 1.8, 7.7, and 2.6 mg/kg.

2.0.0.0. Subsurface Soil Sampling Results

With respect to samples collected from the former sanitary sewer leach pit, VOCs, SVOCs, organochlorine pesticides and TPH were not detected in soil samples collected from the bottom and 3 feet below the former sewer leach pit. Metals were detected at low concentrations in both samples.

With respect to the sampling results from the former evaporation pond, the soil samples, which were collected from depths of 2, 3.5, 6.5 and 7.8 feet bgs had arsenic concentrations of 20, 9.7, 2.8, and 2.9 mg/kg respectively. Soil samples collected at depths of 3.5 and 8.5 feet bgs from a soil boring adjacent to the sediment trap had arsenic concentrations of 3.5 and 3.2. Organochlorine pesticides were not detected in a sample of the liquid inside the sediment trap. Metals were detected at low concentrations in a sample of the sediment trap liquid.

These results show no evidence that subsurface soil and/or ground water had been adversely impacted as a result of operation of the former sewer leach pit, evaporation pond and/or sediment trap. No further investigation of subsurface soil and/or ground water was judged to be warranted based on these sampling results. The subsurface sampling results are detailed in the *Phase II – Site Characterization Report* (ENVIRON, 2003).

3.0.0.0. Comparison to Waste Classification Criteria

A comparison of the pesticide and inorganic results from the site with hazardous waste identification criteria in the California Code of Regulations (CCR) Title 22 Section 66261 showed that the average and 95% UCL concentrations were below the Total Threshold Limit Concentrations (TTLC) and 10 times the Soluble Threshold Limit Concentrations (STLC) for the relevant pesticides and inorganics. For the inorganics, no sample concentrations from the site exceeded the TTLC or 10 times the STLC. For the pesticides, there were only two samples, F3-D and F3-E, that exceeded the TTLC for DDT and DDE, but these samples are in areas where concentrations are below PRGs for pesticides and where arsenic concentrations are less than 20 mg/kg. Based on these results, soil in this area will remain in this location.

3.0 IDENTIFICATION OF REMEDIAL ACTION GOALS, OBJECTIVES, AND SCOPE

The results of the previous investigations have indicated the presence of arsenic in soil at levels above background in portions of the site and dieldrin above PRGs in an isolated location in surface soil. In addition, no sensitive fauna or flora have been identified at the site location and as a result, there are no apparent ecological or ground water risks associated with proposed remediation activities.

The purpose of this section is to identify the type and appropriateness of a remedial action, if warranted, and to identify the goals, objectives, and scope for such action to address the risks posed by arsenic and dieldrin in soil at the site. In addition, regulatory requirements are identified so that the remediation goals can be compared against the relevant regulatory standards.

1.0. CHEMICALS OF POTENTIAL CONCERN

As stated in Section 2, arsenic and dieldrin were the chemicals of potential concern that were found at concentrations above PRGs in surface soils. Only three out of 60 sample had concentrations of dieldrin above its PRG. The dieldrin concentrations were of limited horizontal and vertical extent, and the 95% UCL of the mean diedrin concentration for the entire site was below the PRG of 30 ug/kg. However, the mean dieldrin concentration in Field 1 exceeded the PRG primarily because of an isolated detection of dieldrin at a concentration of 240 ug/kg in surface soil. Two other samples, F3-A and F3-B, detected dieldrin at 42 and 37 ppm, respectively, which is just above the PRG. However, the average concentration of these two samples plus the other four samples from Field 3 are below PRG. As a result, it is recommended that only the “hot spot” of dieldrin in Field 1 be addressed such that the mean concentration in Field 1 will be below the PRG of 30 ug/kg.

Arsenic, a naturally occurring inorganic chemical found in soil as well as in certain pesticides, was detected at concentrations above natural, background levels for Santa Clara in a portion of the site. Figures 4 and 5 illustrate the horizontal and vertical extent of arsenic in soil at the site. Elevated concentrations of arsenic above 20 mg/kg are located primarily in the eastern portion of Field 4, primarily at 0.5 feet bgs, in sample 1-GB collected from distressed vegetation next to the old screen house, and in sample F12-A in the dirt road between Fields 11 and 12 at 0.5 feet bgs.

2.0. REMOVAL ACTION OBJECTIVES

To assist in development and evaluation of remedial alternatives for addressing chemicals of potential concern that have been detected in site soils, remedial action objectives (RAOs) have been developed for the site. The RAOs for the site are as follows:

- Minimize exposure of future site residents to surface soil containing arsenic above the 20 mg/kg level,
- Ensure the mean concentration of dieldrin in an individual field is below 30 ug/kg; and
- Leave the site in a physical condition that is compatible with single-family residential use.

Since it is not feasible to remediate arsenic to levels below natural background, the removal action objectives are based on the natural background concentration range for arsenic in soils in this area of Santa Clara. The proposed cleanup goal of 20 mg/kg is within the acceptable health risk range.

3.0. STATUTORY LIMITS ON REMOVAL ACTION

Sections 25323.1 and 25356.1(h) of the California Health and Safety Code (H&SC) state that a site is exempted from the requirement for a remedial action plan if DTSC approves a non-emergency removal action at a site and the estimated cost of the removal action is less than $1,000,000. The removal action alternatives for the former BAREC site are estimated to cost less than this limit and therefore, this removal action workplan (RAW) has been prepared.

4.0. POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Remedial actions under the CERCLA (as amended by the Superfund Amendments and Reauthorization Act) must comply with the substantive provisions of federal and state Applicable or Relevant and Appropriate requirements (ARARs) [CERCLA Section 121(d)]**.** Applicable requirements are those federal and state cleanup standards, standards of control and other environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. If a requirement is not applicable, it still may be relevant and appropriate. A relevant and appropriate requirement addresses problems or situations that are substantially similar to those encountered at the CERCLA site. Under USEPA ARAR guidance[3], a requirement must be both relevant and appropriate to be an ARAR.

It is not unusual that multiple federal and/or state requirements are initially identified as being relevant, even though the requirements address similar issues or circumstances. USEPA ARAR guidance provides for further screening of the "relevant" requirements to determine which requirements are "appropriate" and hence, an ARAR. "Relevant" requirements would not be considered "appropriate" when:

> *"...another requirement is available that more fully matches the circumstances at the site"*, or

> *"...another requirement is available that has been designed to apply to that specific situation, reflecting an explicit decision about the requirements appropriate to that situation."*

For a state requirement to qualify as an ARAR, it must be promulgated, legally enforceable, more stringent than any corresponding federal requirements, consistently applied, and identified in a timely manner.

ARARs fall into one of three identified categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are health or risk-based numerical limitations or standards that apply to site-specific conditions. Location-specific ARARs are restraints placed on activities conducted in a specific location. Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous waste or site remediation activities. Table 4 provides a summary of federal, state and local ARARs and TBCs for the arsenic-contaminated soil at the site.

With respect to chemical-specific ARARs, there are no promulgated State or Federal standards for arsenic-contaminated soil. There are also no location-specific ARARs for arsenic contaminated soil at the site. A potential action-specific ARAR for arsenic-contaminated soil relates to regulations promulgated under the Federal Resource Conservation and Recovery Act (RCRA) and State Hazardous Waste Regulations, which govern characterization, disposal, storage, treatment and transportation of waste.

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3 See CERCLA Compliance with Other Laws Manual: Interim Final, August, 1988.

Compliance with RCRA regulations would apply to the site if arsenic-contaminated soil is excavated and disposed of offsite. Other potential action-specific ARARs are the Clean Air Act and California Ambient Air Standards, which regulate emissions of chemical vapors and dust, and the City of Santa Clara Ordinance related to soil movement or grading. Compliance with these regulations would apply if soil were excavated. Other action-specific standards are the Federal and State Occupational Safety and Health Administration Regulations (OSHA), which establish standards for workers.

In addition to chemical-, location-, and action-specific ARARs, advisories, criteria, and guidance developed by USEPA or other federal or state agencies may, as appropriate, be considered in developing the CERCLA remedy. These criteria are referred to as “to-be-considered” (TBC) criteria.

With respect to TBCs, the USEPA has developed Risk Assessment Guidance for contaminated sites (Risk Assessment Guidance for Superfund, 1989) and Soil Screening Guidance (Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, July 1996) as a tool to evaluate and cleanup sites on the National Priorities List. These guidances provide methodology for developing risk-based, site-specific screening levels (SSLs) for contaminants in soil. For example, the SSL presented in the guidance for arsenic is 0.4 mg/kg for residential land use. According to USEPA, SSLs are not cleanup levels and on their own do not trigger the need for a response action. If chemicals equal or exceed their SSL, further study or investigation, but not necessarily clean up, is warranted.

Similar to the SSLs, USEPA Region 9 has developed Preliminary Remediation Goals (PRGs) as risk-based tools for evaluating cleanup of contaminated sites. As previously stated in Section 2, the PRG for arsenic is 0.39 mg/kg and 30 ug/kg for dieldrin for a residential site. For arsenic, this value is typically below background concentrations in a local area (especially in California), and as such, USEPA Region 9 has at times used the non-cancer PRG for arsenic of 22 mg/kg (USEPA, 2000). Further evaluation may include additional sampling, considering background or ambient levels, and re-evaluating exposure and toxicity assumptions.

These guidances are considered TBCs, which are non-promulgated advisories or guidances that are generally not enforceable. Where no specific potential ARARs exist for a chemical or situation, or where such potential ARARs are not sufficient to be protective, guidance documents or advisories may be considered in determining the necessary level of cleanup for the protection of human health or the environment.

There are no chemical-specific ARARs for arsenic and dieldrin in soil. As previously stated, PRGs, which are considered TBCs, exist for arsenic and dieldrin. For dieldrin, the threshold cleanup level at the site for unrestricted residential land use is the PRG of 30 ug/kg. For arsenic, since TBCs do not consider relatively high naturally occurring background levels in California soil, remedial actions and alternatives are evaluated considering the estimated background concentration range for arsenic. A discussion of arsenic background concentrations was presented in Section 2.2.3.1. The cleanup levels for arsenic and dieldrin for unrestricted residential land use at the site are as follows:

- The maximum concentration of arsenic may not exceed 20 mg/kg;
- The average concentration of arsenic in soil shall not exceed 12 mg/kg; and,
- The mean concentration of dieldrin in each individual field shall not exceed 30 ug/kg.

The cleanup levels for arsenic are the same as the residential removal action objectives for arsenic for unrestricted land use at the T&CVSC development at 360 Winchester Boulevard. Although these cleanup goals are protective of health, additional precaution may be employed to further reduce any potential exposure to contaminated soil. Based on these factors, the TBCs for the site and subsequent evaluation of remedial alternatives will focus, not only on numerical cleanup standards for soils but also on different strategies for preventing exposure to contaminated soil.

4.0 IDENTIFICATION AND EVALUATION OF REMOVAL ACTION ALTERNATIVES

The remedial alternative evaluation, as presented below, consists of development of three remedial alternatives, evaluation of the alternatives against NCP and USEPA guidelines, and the selection of an appropriate remedial alternative for the site.

1.0. REMOVAL ACTION ALTERNATIVES

The response actions for soil at the site include excavation and off-site disposal, capping, and institutional controls. These response actions have been assembled into candidate remedial alternatives for the site.

The three alternatives that have been developed for the site are:

Alternative 1 No Action

Alternative 2 Capping and Institutional Controls;

Alternative 3 Excavation with Off-Site Disposal;

A description and details regarding implementation of each alternative are presented below.

1.0.0. Alternative 1 – No Action

Alternative 1 is the No Action Alternative. In this alternative, it is assumed that no removal action occurs. This alternative also forms the basis of comparison for all other alternatives. If no action were taken at the site, maintenance of a fence and land use restrictions would be required.

1.1.1. Alternative 2 – Capping and Implementation of Institutional Controls

Alternative 2 consists of placing a soil cap over the eastern portion of Field 4, excavating the three small hot spots at F1-C, 1-GB and F12-A, and establishing institutional controls for the site. Figure 6 shows the excavation and capping areas. The two hots spots at 1-GB and F-12A would be excavated until confirmation samples collected from the excavation perimeter showed arsenic concentrations below 20 mg/kg. For the hot spot at F1-C, soil would be excavated until the mean concentration of dieldrin in Field 1 was less than 30 ug/kg. It is estimated up to a total of 500 cubic yards would be excavated from these three hot spots. Excavated soil would be transported offsite for disposal or re-use. Analytical data collected to date indicates that excavated soil from the site will likely be nonhazardous. Additional waste characterization samples will be collected from the excavated soils prior to offsite disposal as part of implementation of Alternative 2. Assuming these samples confirm that the soil is indeed nonhazardous, then the soil will be transported offsite to a municipal landfill for disposal.[4]

With regards to capping, a minimum thickness of 24 inches of soil will be placed over the eastern portion of Field 4 to prevent direct contact with native soil that has arsenic concentrations greater than 20 mg/kg. Appropriate compaction of capped soil would be conducted. Drainage netting would be placed underneath the capping. After completion of the capping, the drainage netting would serve as a "marker" for assistance in maintaining adequate cover over the potentially arsenic-impacted soil. If netting were observed in the future, either during excavation activities or as a result of erosion, remedial activities or placement of additional soil would be implemented to prevent exposure to the soils below the "marker" netting.

Institutional controls would be placed to reduce or eliminate exposure to potentially arsenic-impacted soils at the site. Institutional controls would consist of development and implementation of a site management plan and deed restrictions. The site management plan would, at minimum, outline the procedures for inspection and maintenance of the site to ensure that ground covering such as pavement, grass, landscaping or mulch is maintained in all soil areas; risk management measures to be implemented during subsurface work; limitations on residents activities that potentially disturb the landscape cover over the site; and, actions to be taken were the site redeveloped. The deed restrictions would prevent development of single-family homes, schools, day care facilities, etc. over the capped area of the site. All institutional controls would require approval by the City of Santa Clara Department of Environmental Health (DEH) and DTSC. Annual inspections would be performed to ensure compliance with the site management plan and deed restrictions.

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[4] It is possible that the soil could be re-used by the California Department of Transportation (CalTrans) in a future, nearby roadway project depending on the timing of implementation of the removal action and the roadway project. If a CalTrans project were identified, specific approval would need to be obtained from DTSC and as such, DTSC would be contacted.

3.0.0. Alternative 3 – Excavation with Off-Site Disposal

Alternative 3 consists of excavating and removal of soil from the three hot spots and from the eastern half of Field 4. Soil would be excavated from 1-GB, F12-A and the eastern half of Field 4 until arsenic concentrations are below the cleanup goals (i.e., below 20 mg/kg and site average of 12 mg/kg). For the hot spot at F1-C, soil would be excavated until the mean concentration of dieldrin in Field 1 was less than 30 ug/kg. All excavated soil would be disposed of offsite. Figure 7 shows the estimated extent of the excavation areas under Alternative 3. It is estimated that up to 6000 cubic yards of soil would be excavated and disposed of offsite. During excavation, appropriate dust suppression would be applied at all times to ensure atmospheric dust levels would not exceed the acceptable levels. Dust levels would be monitored during implementation of this alternative.

After excavation, samples of soil at the edges and base of each excavation would be collected and analyzed for chemicals of potential concern to demonstrate that in-place concentrations are below the cleanup goals. If needed, additional soil excavation and confirmatory sampling would continue until in-place concentrations are below the remedial goals. The excavations would be backfilled with clean soil imported from off-site and appropriate compaction of backfilled soil would be conducted.

As with Alternative 2, excavated soil would be transported offsite for disposal[5]. It is anticipated that excavated soil will be nonhazardous, and as such, it is assumed for cost estimating purposes that the excavated soil will be transported to and disposed of at a municipal landfill.

2.0. EVALUATION CRITERIA

The three alternatives described above are subjected to detailed evaluation in Section 4.3. Each alternative is evaluated on the basis of three criteria: effectiveness, implementability and cost.

1.0.0. Effectiveness

In the effectiveness evaluation, the following factors are considered:

[5] It is possible that the soil could be re-used by the California Department of Transportation (CalTrans) in a future, nearby roadway project depending on the timing of implementation of the removal action and the roadway project. If a CalTrans project were identified, specific approval would need to be obtained from DTSC and as such, DTSC would be contacted.

- *Overall Protection of Human Health and the Environment*. For the site, this factor considers the ability of each alternative to meet RAO's. As discussed in Section 3.3, the RAO's for the site are: 1) minimize exposure of future site residents to surface soil containing arsenic above the 20 mg/kg level, 2) ensure the mean concentration of dieldrin in an individual field is below 30 ug/kg; and 3) leave the site in a physical condition that is compatible with single-family residential use;

- *Compliance with ARARs/TBCs.* As discussed in Section 3.5, the cleanup goals for soil at the site are: 1) the mean concentration of dieldrin in an individual field is below 30 ug/kg; 2) the maximum concentration of arsenic may not exceed 20 mg/kg; and 3) the average concentration of arsenic in shallow soil shall not exceed 12 mg/kg;

- *Reduction of Mobility, Toxicity, or Volume.* For the site, this factor evaluates whether the mobility and/or volume of arsenic[6] in soil is reduced as a result of implementation of the alternative. A reduction in toxicity of arsenic/dieldrin is not considered since none of the removal action alternatives consider treatment of arsenic/dieldrin-impacted soil;

- *Long-Term Effectiveness and Permanence.* For the site, this factor considers whether the RAOs and cleanup goals will continue to be met in the future under each alternative; and

- *Short-Term Effectiveness*. This factor evaluates the protection of public health during implementation of each alternative for the site.

2.0.0. Implementability

This criterion examines the technical and administrative feasibility of implementing the alternative. Evaluation includes the availability of various services and materials required during implementation of the action, institutional or social concerns that could preclude the action, and State concerns that could impact implementation. In the implementability evaluation, the following factors are considered:

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[6] Reduction in mobility or volume of dieldrin is not considered under this criterion because the volume of dieldrin-impacted soil is small relative to the volume of arsenic-impacted soil.

- Technical feasibility: the ease or difficulty of implementing the alternatives and the reliability of the technology.

- Administrative feasibility: those activities needed to coordinate with other offices and agencies, such as waivers or permits.

- State Acceptance; and

- Community Acceptance.

3.0.0. Cost

This criterion evaluates the estimated capital cost, and, if appropriate, the estimated operation and maintenance (O&M) costs assuming a 7% interest rate.

3.0. ALTERNATIVES EVALUATION

This section presents the detailed evaluation of the three alternatives.

1.0.0. Alternative 1 – No Action

Effectiveness

Because no removal action would be implemented as part of Alternative 1, RAOs and cleanup goals would not be met, arsenic mobility and volume would not be reduced, and therefore, this alternative would not be effective at protecting human health in the short- or long-term.

Implementability

Since there is no action under this alternative, the technical and administrative feasibility of this alternative is easy. However, state and community acceptance of this alternative is unlikely.

Cost

There are no costs associated with implementation of this alternative.

2.0.0. Alternative 2 – Capping and Implementation of Institutional Controls

Effectiveness

Through capping and hot spot excavation, Alternative 2 minimizes exposure of future site residents to arsenic above 20 mg/kg and leaves the site in a physical condition that is compatible with single-family residential use. However, Alternative 2 does leave arsenic in soil in Field 4 above 20 mg/kg and does not lower the site-wide average arsenic concentration to below 12 mg/kg, and as such, Alternative 2 does not comply with cleanup goals. Alternative 2 does reduce the mobility of arsenic/dieldrin at the site as a result of capping and excavation, and the volume of arsenic/dieldrin at the site is reduced somewhat as a result of the hot spot excavation. The long-term effectiveness of Alternative 2 is uncertain because it is dependent on the ability of the cap to be maintained through implementation of a site management plan and enforcement of deed restrictions over the capped area. Since implementation of Alternative 2 involves only excavation of roughly 500 cubic yards of soil with elevated arsenic/dieldrin and the time to implement Alternative 2 is only a few weeks, exposure of construction workers and nearby residents to contaminants during implementation of Alternative 2 is minimal. As a result, the short-term effectiveness of Alternative 2 is acceptable.

Implementability

The techniques used to excavate and cap the impacted soil are well-established and the equipment, materials, and labor are readily available. There would be no technical restrictions to implementation.

Permits would be required for excavation and grading, and deed restrictions (i.e. institutional controls) would also be required, but there are no known administrative restraints to the implementation of this alternative. However, there may be difficulties in enforcing the site management plan and deed restrictions for development over the capped area. As a result, community and state acceptance of this alternative is uncertain.

Cost

An estimate of the costs of implementing Alternative 2 is presented in Table 5. The estimated capital cost to implement Alternative 2 is $ 406,000. The O&M costs associated with this alternative include maintenance of the cap. It is assumed that O&M of the cap would be the responsibility of a property owner's association in the capped area. Annual O&M costs are estimated to be $7,000. The present value of O&M costs over a 30-year period assuming a 7% interest rate is $ 74,500. The total estimated cost for Alternative 2 is, therefore, estimated to be $480,500.

3.0.0. Alternative 3 – Excavation with Offsite Disposal

Effectiveness

Through excavation, Alternative 3 minimizes exposure of future site residents to arsenic above 20 mg/kg and leaves the site in a physical condition that is compatible with single-family residential use. Alternative 3 removes arsenic in soil in Field 4 above 20 mg/kg and lowers the site-wide average arsenic concentration to below 12 mg/kg, and as such, Alternative 3 complies with cleanup goals. Alternative 3 also reduces the mobility and volume of arsenic/dieldrin at the site as a result of excavation and offsite disposal. The long-term effectiveness of Alternative 3 is acceptable because soil with chemicals of potential concern above the cleanup goals will be removed from the site. Since implementation of Alternative 3 involves excavation of roughly 6000 cubic yards of soil, exposure of construction workers and nearby residents to contaminants during implementation of Alternative 3 may occur. However, the time to implement Alternative 3 is only a few weeks and dust control measures would be implemented during excavation activities, thus minimizing nearby residents overall exposure to site contaminants. As a result, the short-term effectiveness of Alternative 3 is acceptable.

Implementability

The techniques used to excavate the impacted soil are well-established and the equipment, materials, and labor are readily available. There would be no technical restrictions to implementation.

Permits would be required for excavation and grading, but there are no known administrative restraints to the implementation of this alternative. Alternative 3 should be acceptable to the community and state.

Cost

An estimate of the costs of implementing Alternative 3 is presented in Table 6. The estimated capital cost to implement Alternative 3 is $874,000.

4.0. COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The three remedial alternatives described above are subjected to comparative evaluation below. As part of the comparative analysis, each alternative is also rated relative to each other. Rating points are then assigned based on each alternative's ability to meet the evaluation criteria. Table 7 summarizes the results of the comparative analysis.

1.0.0. Effectiveness

Alternative 1 - No Action: This alternative, rated the lowest in effectiveness, is presented as a baseline case. No points are assigned under this criterion because Alternative 1 does not satisfy any of the five factors under the effectiveness criterion.

Alternative 2 – Capping and Implementation of Institutional Controls: Alternative 2 is rated higher in effectiveness than Alternative 1, but not as effective as Alternative 3. Alternative 2 addresses RAOs, but does not meet site cleanup goals. Alternative 2 reduces the mobility and volume of arsenic/dieldrin in site soils through capping and limited excavation, but does not reduce the mobility or volume nearly to the extent as Alternative 3. Because of the uncertainty regarding future maintenance of the cap, the long-term effectiveness and permanence of Alternative 2 is uncertain. The short-term effectiveness of Alternative 2, however, is acceptable. Alternative 2 was assigned a total of 2.5 points under the effectiveness criterion.

Alternative 3 - Excavation with Offsite Disposal: Alternative 3 is rated higher in effectiveness than Alternative 1 or Alternative 2. Alternative 3 addresses RAOs and will meet cleanup goals through excavation and offsite disposal. Alternative 3 also reduces the mobility and volume of arsenic/dieldrin in soil in comparison to the other two alternatives. Alternative 3 is a permanent solution so there are no risks of human exposure to elevated concentrations of chemicals of potential concern in soil in the future. As with Alternative 2, the short-term effectiveness of Alternative 3 is acceptable. Alternative 3 is assigned 5 points because it satisfies all of the sub-criteria under effectiveness.

2.0.0. Implementability

With exception of Alternative 2, there are no technical feasibility concerns with the implementation of the alternatives. A site management plan and deed restrictions, which would be prepared as part of Alternative 2, would require approval from the regulatory agencies and long-term enforcement of the site management plan and deed restrictions is uncertain. The technical/administrative feasibility of Alternatives 1 and 3 is easier than Alternative 2.

Alternatives 2 and 3 involve excavation, which can easily be conducted at the site. Alternatives 2 and 3 involve importing materials, which are readily available in the site vicinity. Alternatives 2 and 3 are also easy to construct, and the goods and service are easily available.

Because of uncertainties regarding long-term enforcement of institutional controls, Alternative 2 may have difficulty with regards to state and community acceptance. However, Alternative 1, which does nothing to prevent/minimize contact with arsenic/dieldrin impacted soil, is the least likely alternative to be accepted by the state and community. Alternative 3 is likely the most acceptable alternative to the state and community.

3.0.0. Cost

In Table 7, 5 points are assigned if the cost is less than $100,000 to implement the alternative; three points are assigned if the cost to implement the alternative is between $100,000 and $500,000; one point is assigned if the cost to implement the alternative is between $500,000 and $1,000,000; and, no points are assigned if the cost to implement the alternative exceeds $1,000,000.

There are no costs associated with Alternative 1 since no action is proposed. Alternative 2 is less expensive than Alternative 3 and less than $500,000. Alternative 3 was the most expensive at roughly $800,000.

4.0.0. Rating Summary

As shown in Table 7, the sum of the ratings, shows that Alternative 3, Excavation with Offsite Disposal, as the highest rated alternative. Although the most expensive alternative, Alternative 3 is the most protective of human health, removes all contamination above cleanup goals and is relatively easy to implement. As a result, Alternative 3 is the recommended alternative for the former BAREC site.

5.0 REMOVAL ACTION IMPLEMENTATION

This Section details the steps that will be taken to implement Alternative 3 at the former BAREC site. Removal activities will be performed by a California certified contractor (the "Contractor") including supervision by a California registered geologist or professional civil engineer (the "Engineer"). All removal, transportation and disposal will be performed in accordance with all applicable federal, state, and local laws, regulations, and ordinances.

1.0. SITE PREPARATION

Prior to equipment mobilization for the proposed removal action, the preparation activities detailed in the following sections will be implemented.

1.0.0. Building Demolition

Prior to implementation of RAW activities, the site buildings/structures and their foundations that are not planned for reuse will be demolished. Demolition activities will be conducted in accordance with all applicable regulations especially regulations pertaining to the handling, management and disposal of asbestos containing materials and lead-based paint. All building debris, which is not to be reused during future re-development, will be removed from the site. The irrigation well located at Building 203 will be closed and abandoned according to the Santa Clara Valley Water District requirements prior to site redevelopment.

A minimum of one sample shall be collected from soil up to 6 inches beneath each of the building foundations following building/foundation removal. No samples will be collected from the greenhouses, which were already sampled in prior environmental investigations. Samples will be analyzed for asbestos, lead, arsenic, organochlorine pesticides and petroleum hydrocarbons. Additional samples may be collected and additional analyses performed if the Engineer observes evidence of possible releases of contaminants to soils beneath the former building/structure.

2.0.0. Site Stripping

Following building demolition, the site will be stripped of all vegetation and loose soils in preparation for redevelopment. It is important that prior to stripping/rough grading, the locations of Field 4, the hot spots at F1-C, 1-GB and F12-A be marked and their coordinates recorded.

3.0.0. Utility Clearance

No invasive activities will begin without notification of local "Underground Services Alert (USA)" and identification of utilities in and around the excavation area at least 48 hours prior to beginning of work. In addition, a private utility locator will be retained to conduct a utility survey prior to beginning of the excavation, to ensure that all underground utilities in the proposed work areas have been identified.

4.0.0. Delineation of Excavation Areas

Following stripping/rough grading, the locations of the hot spots (F1-C, 1-GB, and F12-A) and excavation area in Field 4 will be marked. An excavation grid will be established at Field 4 to facilitate pre-and post excavation sampling. At Field 4, the grid will be 50 feet by 50 feet. The boundary of the excavation area will be the north, south, and eastern boundaries of Field 4 and the western extent of the excavation will extend 250 feet west of the eastern boundary of Field 4. At the hot spots, the excavation boundary will extend from the hot spot to 5 feet in all directions.

5.0.0. Security Measures

Appropriate barriers and/or privacy fencing will be installed prior to beginning the excavation process to ensure that all work areas are secure and safe. To ensure trespassers or unauthorized personnel are not allowed near work areas, security measures may include, but are not limited to:

- Posting notices directing visitors to the Site Manager and limiting access to work areas. The Site Manager will be the person in charge of supervising all activities at the site.

- Maintaining a visitor and personnel's log. Visitors must have prior approval from the Site Manager to enter the site. Visitors shall not be permitted to enter the site without first receiving site-specific health and safety training from the Site Health and Safety Officer(s). The Site Health and Safety Officer(s) will be in charge of ensuring compliance with the health and safety plan (HASP), and of providing a point of contact for employees working at the site who have questions regarding the HASP.

- Installing chain-link barrier fencing around the perimeter of the work area, which will be locked during non-work hours to restrict access to the excavation and nearby areas.

- Requiring that all personnel, before leaving the site, sign out in the visitor and personnel's log.
- Maintaining a safe and secure work area, including areas where equipment is stored or placed, at the close of each workday.

Persons requesting site access will be required to demonstrate a valid purpose for access and provide appropriate documentation to demonstrate they have received proper training required by the site-specific HASP (discussed below).

6.0.0. Permits

It is anticipated that a grading permit from the City of Santa Clara will be necessary to complete the removal action.

7.0.0. Waste Management

Based on the results of prior site investigations, it is anticipated that soil excavated from the site will be nonhazardous. Analytical results were compared to the California hazardous waste identification criteria in the California Code of Regulations (CCR) Title 22 § 66261. These results indicate that the waste is classified as a nonhazardous waste and could be disposed of at local municipal landfill.

8.0.0. Bay Area Air Quality Management District (BAAQMD)

Potentially applicable BAAQMD regulations include those addressing particulate matter emissions (Regulation 6). BAAQMD Regulation 6 addresses particulate matter and visible emissions mostly pertaining to discrete point sources. However, Regulation 6-305 states:

> "**Visible Particles:** A person shall not emit particles from any operation in sufficient number to cause annoyance to any other person, which particles are large enough to be visible as individual particles at the emission point or of such size and nature as to be visible individually as incandescent particles. This Section 6-305 shall only apply if such particles fall on real property other than that of the person responsible for the emission."

The air monitoring network described below and the dust control measures will be implemented such that the project remains in compliance with this regulation.

9.0.0. Health And Safety Plan (HASP)

All contractors will be responsible for operating in accordance with the most current Occupational Safety and Health Administration (OSHA) regulations including 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and 29 CFR 1926, Construction Industry Standards, as well as other applicable federal, state and local laws and regulations. A HASP will be prepared and submitted to DTSC prior to implementation of the RAW.

10.0.0. Soil Sampling and Analysis Plan

Appendix B contains soil sampling and quality assurance guidelines for the sampling that is to be performed following building demolition, site stripping and excavation activities.

2.0. FIELD DOCUMENTATION

The Engineer will be responsible for maintaining a field logbook during the removal action activities. The field logbook will serve to document observations, personnel on-site, equipment arrival and departure times, and other vital project information.

1.0.0. Field Logbooks

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or other terminology, which might prove inappropriate. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

Entries in the field logbook will include at a minimum the following for each fieldwork date:

- Site name and address
- Recorder's name

- Team members and their responsibilities
- Time of site arrival/entry on-site and time of site departure
- Other personnel on-site
- A summary of any on-site meetings
- Field observations of soil (e.g., heavy rains, odors, colors, etc.)
- Quantity of soil excavated
- Quantity of soil temporarily stored on-site
- Quantity of excavated soil in truckloads transported off-site
- Names of waste transporters and proposed disposal facilities
- Copies or numbers of manifests or other shipping documents (such as bill of landing) for waste shipments
- Quantity of import fill material in truckloads
- Deviations from this RAW and/or HASP
- Changes in personnel and responsibilities as well as reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

2.0.0. Photographs

Photographs will be taken at every excavation area, and in other areas of interest on-site. Photographs will also be taken prior to the commencement of site re-development and construction activities. They will serve to verify information entered in the field logbook. When a photograph is taken, the following information will be written in the logbook or will be recorded in a separate field photography log:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed

- Name of person taking the photograph

3.0. EXCAVATION

1.0.0. Excavation Plan

The estimated extent of the excavation area is shown in Figure 7 (although the actual lateral extent of removal would be determined based on sample results during implementation of the alternative). The estimated volume of soil to be excavated is approximately 6000 cubic yards. Depending on weight of the soil, between 300 and 350 truckloads of soil will be transported offsite over roughly a 2-week period. The excavation will be conducted in phases.

Field 4 Excavation

For Field 4, the excavation will be conducted in one-foot lifts. Prior to excavating each one-foot lift, samples of surface soil will be collected in each of the grid nodes and analyzed for arsenic on a 24-hour turnaround time (TAT). Samples will be collected prior to excavation because stripping the site may result in as much as 8 inches of soil being removed from portions of the site. The samples collected during DGS site characterization activities were from approximately 6 inches bgs. Since samples at 3 feet bgs were below the cleanup goals except at F4-7 and F4-C, re-sampling is necessary to determine if arsenic concentrations after stripping remain above the cleanup goals. The excavation area will be determined based on the results of the samples. The Engineer will delineate the grid areas that require excavation to a one-foot depth considering the cleanup goals for the site, i.e. no arsenic concentrations above 20 mg/kg and a site-wide arsenic concentration of 12 mg/kg. Soil in the delineated areas will be excavated to a one-foot depth and then samples collected from the grid nodes in the delineated areas to determine if the cleanup goals have been met. The excavation will continue in one-foot depth increments until the Engineer determines the cleanup goals have been met or specific site conditions require the Engineer to revise the excavation plan or sampling sequence. Confirmation samples will be collected at the grid nodes at the base of the excavation, i.e., approximately every fifty feet.

Hot Spot Excavation

After stripping and prior to excavation, a sample will be collected from each of the three hot spots. Samples will be collected prior to excavation because stripping the site may result in as much as 8 inches of soil being removed from portions of the site. The hot spot samples collected during DGS site characterization activities were from approximately 6 inches bgs. Since samples at 3 feet bgs at the hot spots were below the cleanup goals, re-sampling is necessary to determine if arsenic/dieldrin concentrations after stripping remain above the cleanup goals.

The sample from hot spot F1-C will be analyzed for dieldrin, and the hot spots from 1-GB and F12-A will be analyzed for arsenic. Excavation activities will be initiated at F1-C if the dieldrin concentration is greater than 30 ug/kg, and at 1-GB and F12-A if the arsenic concentration is greater than 20 mg/kg. If excavation is required, a five-foot radius around the hot spot will be excavated to a depth of two feet. A sample will be collected and analyzed for arsenic (at 1-GB or F12-A) or dieldrin (at F1-C) from the bottom of each excavated area. If the results indicate that arsenic is less than 20 mg/kg at 1-GB or F12-A or that dieldrin is less than 30 ug/kg at F1-C, the excavation will cease and be prepared for backfilling. For 1-GB and F12-A, if the results indicate that arsenic exceeds 20 mg/kg, the excavation will continue at one-foot depth increments and five-foot step-outs until the arsenic concentration is less than 20 mg/kg. For F1-A, if the results indicate that dieldrin exceeds 30 ug/kg, the excavation will continue at one-foot depth increments and five- foot step-outs until the mean dieldrin concentration in Field 1 is less than 30 ug/kg. Additional bottom samples shall be collected once the excavation area exceeds 2500 square feet.

Properly equipped workers, required to be trained according to 29 CFR 1910.120, will complete all fieldwork. Soil containing elevated concentrations of arsenic will be excavated using a hydraulic backhoe or other types of earth moving equipment, as necessary. Excavation areas will be controlled to avoid dust generation with physical barriers (such as perimeter fencing with tarps) and wetting. The site will be controlled and no excavation will be conducted in times of high wind conditions. Storm water drains will be covered with plastic sheeting during all excavation activities, to prevent sediment or excavation runoff from entering the drains.

2.0.0. Temporary Storage Operations

As soil is excavated, it may be temporarily stored at staging areas on-site before off-site transportation and disposal. At the staging areas, excavated soil will be placed on an impermeable barrier and covered with tarps to prevent any run-on and/or dust generation, and bermed to contain any run-off. Stockpiles shall be no higher than 6 feet. Each excavation area will be secured and water will be used to control any fugitive dust from blowing onto other properties.

Direct loading may take place concurrently with excavation operations, in which case, stockpiles may be uncovered while loading. To minimize fugitive dust emissions during loading, drop heights should be minimized and water should be used. It is anticipated that soil to be disposed of offsite will be temporarily stockpiled at Field 1 (excavation from dieldrin hot spot), Fields 8, 9, 10 and 11. Soil that is to be used for backfilling the excavation (i.e., import soil) will be temporarily stockpiled on Field 2. Stockpiles of soil, either import soil or soil to be exported, shall remain no longer than 30 days.

3.0.0. Decontamination Procedures

Entry to the excavation areas should be limited to avoid unnecessary exposure and related transfer of arsenic-impacted soil. In unavoidable circumstances, equipment or trucks should be decontaminated in a designated decontamination area before leaving the site. Decontamination will occur prior to and after the removal activity has been completed using dry brush, hand washing, or steam cleaning methods. Equipment will be decontaminated in a pre-designated area on pallets or plastic sheeting. Clean bulky equipment will be stored on plastic sheeting. Cleaned small equipment will be stored in plastic bags.

1.0. AIR AND METEOROLOGICAL MONITORING

This section details the air and meteorological monitoring strategy and methodologies that will be used during the removal action. The strategy and methodologies are designed to achieve several goals:

- Measure the particulate matter generated during the excavation and decontamination activities to assign the appropriate personal protective equipment (PPE) for on-site workers;

- Measure particulate matter and meteorological variables to assist the Contractor for the implementation of dust control measures;

- Measure particulate matter to determine potential off-site impacts during excavation and decontamination activities.

Air and meteorological monitoring will be conducted during excavation activities. The monitoring network will consist of two separate networks to monitor for dust or particulate matter with an aerodynamic diameter less than 10 micrometers (PM_{10}). One network will consist of real time dust monitors to be used by on-site health and safety personnel and the Contractor. The second network will consist of real-time PM_{10} monitors to be used for fenceline measurements.

1.1.2. On-site Monitoring Network

Monitor locations for the on-site dust monitors will be based on the on-site health and safety officer's and the Contractor's needs. The locations will be representative of worker exposure and general site conditions. This dust monitoring network will consist of monitors such as the Personal DataRam or PDM-3 Miniram particulate monitor manufactured by MIE, or equivalent. Implementation of PPE will be based on the interpretation of the collected data in comparison to action levels established by the on-site health and safety officer.

1.1.3. Regulatory Standards and Recommended Action Levels

In Section 5.1.8, potentially applicable BAAQMD regulations included those addressing particulate matter emissions (Regulation 6). The fenceline air monitoring network described below and the dust control measures will be implemented to help insure that the project remains in compliance with this regulation.

Federal and state air regulations limit the concentration of PM_{10} in the ambient air through the National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (California AAQS). The NAAQS specify that the concentration of PM_{10} must not exceed 150 $\mu g/m^3$ for a 24-hour period and an annual arithmetic mean of 50 $\mu g/m^3$. California AAQS specify that the concentration of PM_{10} must not exceed 50 $\mu g/m^3$ for a 24-hour period and an annual arithmetic mean of 20 $\mu g/m^3$. The more stringent state limits were used to determine the Recommended Action Level (RAL) for this monitoring program for shorter averaging periods, which are more relevant to the removal activities. Action levels for eight hour averaging periods were developed using averaging time conversion factors of 1.75.[7] The RAL for PM_{10} for this air-monitoring program is an eight-hour average concentration of 87.5 $\mu g/m^3$.

1.1.4. Fenceline Monitoring Network

Monitor locations for the fenceline PM_{10} monitors will consist of one location, upwind of the site based on the primary wind direction, and multiple locations along the fenceline in

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7 United States Environmental Protection Agency (USEPA). 1992. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised.* EPA-454/R-92-019. October.

the direction of sensitive off-site locations. The monitors will be real-time PM_{10} monitors. The on-site meteorological station will be located in an area representative of wind patterns for the site, as described in published guidance.[8, 9] On-site meteorological data collected will include wind speed and direction, temperature, and relative humidity. During excavation, fenceline monitoring and meteorological data will be collected on a hourly basis. If during excavation PM_{10} levels exceed 50 ug/m^3 between upwind and downwind monitors, then additional dust control measures will be implemented.

1.2. DUST CONTROL PLAN

This section details potential dust control measures that the Contractor will implement, if required, to minimize dust emissions during the removal action. Dust emissions may result from activities during removal action and from wind erosion. These sources are most effectively controlled using wet suppression. A high wind threshold will also be established to minimize wind erosion during extreme meteorological conditions and low visibility/permeability wind fencing will be installed around the excavation area(s). Stockpiles will be covered unless being loaded, water will be sprayed on areas which have already been excavated and are subject to wind erosion.

1.2.1. Wet Suppression

The main mechanism for the control of fugitive dust emissions from construction activities and wind erosion is by watering, which leads to the formation of a surface crust to reduce the available reservoir of dust. In addition to water, a wide variety of chemical dust suppressants are available to enhance the formation of a surface crust.

The effectiveness of wet suppression is dependent on the type of activities occurring, the frequency of watering, and the meteorological conditions. The watering schedule will be determined by an evaluation of the air monitoring and meteorological data, site conditions, and site activities.

1.2.2. High Wind Warnings

High wind conditions can lead to higher dust emissions. Thus, based on the information collected by the on-site meteorological station, work will be stopped during high wind

8 Bay Area Air Quality Management District (BAAQMD). 1996. “Meteorological Monitoring Guidance.” *Manual of Procedures*. Volume IV. Appendix A. May 8.
9 United States Environmental Protection Agency (USEPA). 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications.* EPA-454/R-99-005. February.

conditions. There are no wind speed restrictions stated in local or federal regulations. However, an initial self imposed action level for work stoppage will be set at a sustained wind speed of 25 mph. This action level is subject to revision based on actual site conditions.

1.2.3. Wind Fences

Wind fences will be used as a dust control measure in conjunction with other dust control measures discussed above. The fence reduces the wind speed at a specific location. The fence dimensions necessary to achieve optimum effectiveness will vary depending on the geography of the dust source. Typically, a fence material with 50% porosity is generally considered optimum for most applications. Low visibility/permeability windscreens will be installed around the perimeters of the excavation area(s) during the removal activities.

1.3. TRANSPORTATION PLAN FOR OFF-SITE DISPOSAL

The waste material will be profiled and approval will be received before any excavation activities commence. Final determination of the disposal site will be based on approval from the disposal site. Once the disposal facility is selected, copies of waste profile reports used to secure disposal permission from the landfill will be provided to DTSC. A Transportation Plan is included in Appendix A.

1.4. SITE RESTORATION

Clean import fill will be brought to the site to backfill all excavated areas. The imported soil be placed in 6-inch lifts and compacted to the standards specified in the City-approved construction plans for site re-development.

1.4.1. Borrow Source Evaluation

Evaluation of the imported fill soil for the presence of contaminants must be concluded prior to their consideration for use as replacement fill at the site. Only fill materials that meet DTSC criteria will be transported to the site. A reasonable approach to confirming the absence of chemical contaminants for any potential fill sources is to follow DTSC's Information Advisory on Clean Imported Fill Material. Following this guideline, it is anticipated that four samples for every 1,000 cubic yards plus one sample per each additional 500 cubic yards of imported soil will be taken. The samples will be analyzed for heavy metals (by USEPA methods 6010B and 7471A), asbestos (by polarized light microscopy), total petroleum hydrocarbons (by USEPA Method 3550) and pH (by USEPA Method 9040/9045).

1.4.2. Load Checking

All loads of imported fill will be checked by Organic Vapor Analyzer for each truckload entering the site and by visual screening for fuel/hydraulic oil leaks (or other staining) in soil placed for filling the site excavation.

1.4.3. Diversion of Unacceptable Borrow

Imported base material will be visually checked for unacceptable materials at the working face. If loads containing unacceptable materials (exhibit staining or detectable VOCs) are dumped, transporters of the unacceptable loads will be stopped before leaving the site.

Equipment operators will watch for evidence of contaminated imported fill in loads being dumped at the working face. If contaminated materials are found or suspected, the imported material is to be isolated. The hauler of the prohibited materials will be identified and the Engineer will be contacted to determine what appropriate actions will be taken.

Segregated, improper materials will be removed from the working face immediately. These materials will be reloaded to the transporter's vehicle when possible or stockpiled in an appropriate area for later removal by a properly licensed waste hauler.

1.4.4. Documentation of Rejected Loads

All loads, which enter the site and are subsequently rejected, will be recorded. Data compiled will include when the incident occurred, who the hauler was, why the load was rejected, whether the load was dumped prior to rejection, and what steps were taken to remove the rejected material. Additional data may be recorded as deemed necessary for the particular situation.

A separate area will always be maintained for the storage of unacceptable materials, pending removal by the original transporter or a properly licensed waste hauler.

1.5. PROJECT SCHEDULE AND REPORT OF COMPLETION

Implementation of removal activities will begin after receiving approval of the RAW. The removal activities will be performed in conjunction with site redevelopment activities and will occur during the dry season (between April and October 2004). Table 8 summarizes the anticipated number of days for removal action implementation tasks.

A Report of Completion, documenting all activities conducted pursuant to an approved RAW and certifying that all activities have been conducted consistent with this RAW, will be prepared as expeditiously as possible upon completion of the removal action and submitted to DTSC for review and approval.

2.0 REFERENCES

Bay Area Air Quality Management District (BAAQMD). 1996. "Meteorological Monitoring Guidance." _Manual of Procedures_. Volume IV. Appendix A. May.

Dames & Moore. 1988. _Report of Closure: Former Evaporation Bed Deciduous Fruit Field Station, Santa Clara California_, Job No. 234-193-43, April 8.

ENVIRON International Corporation. 2003. Phase II - _Site Characterization Report University of California Former Bay Area Research and Extension Center (BAREC), 90 North Winchester Boulevard, Santa Clara_, California. July 2003.

IT Corporation. 1999. _Final Removal Action Work Plan_. Town and Country Village Shopping Center / Winchester Parcel. San Jose, California. November.

Lawrence Berkeley National Laboratory 2002. _Analysis of Background Distributions of Metals in Soil at Lawrence Berkeley National Laboratory_. June.

United States Environmental Protection Agency (USEPA). 1992. _Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised_. EPA-454/R-92-019. October.

USEPA. 1996. _Soil Screening Guidance: Technical Background Document_, EPA/540/R-95/128, July.

USEPA. 2000. _Meteorological Monitoring Guidance for Regulatory Modeling Applications_. EPA-454/R-99-005. February.

TABLES

Table 8
Anticipated Number of Days for Project Implementation and Reporting

Schedule of Tasks			
Task	**Days[10] to Complete**	**Cumulative Days**	**Notes**
Building Demolition	14	14	Not part of RAW, but must be completed prior to RAW implementation
Site Preparation	7	21	
Excavation Activities	14	35	Assumes minimal weather delays
Site Restoration	7	42	
Reporting	28	70	

10 Calendar days

FIGURES

APPENDICES

APPENDIX A
TRANSPORTATION PLAN

APPENDIX B

SOIL SAMPLING AND ANALYSIS PLAN

APPENDIX C
ADMINISTRATIVE RECORD

ADMINISTRATIVE RECORD

Agency for Toxic Substances and Disease Registry (ATSDR). .Toxicological profile for 1,3-Dichloropropene. U.S Department of Health and Human Services. February 1991.

American Association of Cost Engineers (AACE), 1993, Recommended Practices and Standards.

Bay Area Air Quality Management District (BAAQMD). 1996. "Meteorological Monitoring Guidance." *Manual of Procedures*. Volume IV. Appendix A. May.

California Code of Regulations, Title 22, Division 4.5 Environmental Health Standards for the Management of Hazardous Waste

California Code of Regulations, Title 8, Section 1532.1

California Environmental Quality Act (CEQA), Public Resources Code, Division 13, Section 21000, et seq

California Hazardous Waste Control Law, California Health and Safety Code, Division 20, Chapters 6.5 and 6.8.

California Occupational Health and Safety Act, Labor Code, Division 5, Section 6300, et. seq

California Environmental Protection Agency – Department of Toxics Substances Control (DTSC), Interim Guidance for Sampling Agricultural Soils for School Sites (Second Revision), August 26, 2002.

DTSC, Public Participation Policy and Guidance Manual EO-94-002-PP.

DTSC, Remedial Action Plan (RAP) Policy, EO-95-007-PP, December 5, 1995

DTSC, Removal Action Work Plans (RAWP), Memorandum, Barbara Coler, Statewide Cleanup Operations Division, March 14, 1995.

DTSC, Transportation Plan Preparation Guidance for Site Remediation, May 1994

DTSC, Voluntary Cleanup Agreement, California Department of General Services. Department of Toxic Substances Control, May 2003.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986

ENVIRON International Corporation. Phase II - Site Characterization Report University of California Former Bay Area Research and Extension Center (BAREC), 90 North Winchester Boulevard, Santa Clara, California. October 2003.

Jenkins, Sanders & Associates. Background Metal Concentrations in the San Francisco Bay Sediments. 1994.

Lawrence Berkeley National Laboratory. Analysis of Background Distributions of Metals in Soil at Lawrence Berkeley National Laboratory. June 2002.

IT Corporation. Final Removal Action Work Plan. Town and Country Village Shopping Center / Winchester Parcel. San Jose, California. November 1999.

Porter-Cologne Water Quality Control Act

Scott, Christina. *Background Metal Concentrations in Soils in Northern Santa Clara County California*. University of San Francisco, Masters Thesis 1991

U.S. Code of Federal Regulations, Title 40, Protection of the Environment, Part 300 National Contingency Plan

.

U.S. Environmental Protection Agency, *USEPA Region 9 Preliminary Remediation Goals (PRGs).* October 1, 2002.

U.S. Environmental Protection Agency. 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications.* EPA-454/R-99-005. February.

U.S. Environmental Protection Agency, *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA*, EPA/540-R-93-057, 1993.

U.S. Environmental Protection Agency, *Remediation Technologies Screening Matrix and Reference Guide*. EPA 542-B-93-005, 1993.

U.S. Environmental Protection Agency. 1992. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised.* EPA-454/R-92-019. October.

U.S. Environmental Protection Agency, *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002,* December, 1989.

U.S. Environmental Protection Agency. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October, 1988.

U.S. Environmental Protection Agency, EPA Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, SW-846.