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FEASIBILITY STUDY

SOUTH BAY ASBESTOS SITE

ALVISO, CALIFORNIA

FEBRUARY, 1989

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DRAFT FEASIBILITY STUDY
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1.0 INTRODUCTION

1.1 PURPOSE

The U.S. Environmental Protection Agency (EPA) has been concerned with the potential health hazards associated with exposure to asbestos since the early 1970s. The concern is based on medical evidence that exposure to airborne asbestos by asbestos workers and their families may cause various types of cancer as well as non-cancerous respiratory diseases (EPA, 1986a). More recently, the concern has expanded to include exposure outside the workplace because the use of asbestos-containing material is so widespread.

In 1983, asbestos was discovered in the community of Alviso, located in San Jose, California. Past disposal of asbestos waste, construction of a flood control levee ("ring levee") with asbestos-containing fill, and suspected placement of asbestos-containing fill throughout the community were identified as contributing to asbestos levels detected. Alviso was added to the National Priority List (NPL) of Superfund sites in 1984 with a score of 44.68, and EPA initiated a Remedial Investigation/Feasibility Study (RI/FS) in June 1986 for the Alviso area, identified as the South Bay Asbestos Superfund site. The flood control levee has been addressed in a separate Operable Unit Feasibility Study Report (EPA, 1988a).

This report, the Feasibility Study (FS), has been prepared as the conclusion of the RI/FS investigation. The purpose of the FS is to identify and evaluate various alternatives that will control the release of asbestos fibers into the ambient air from known sources. The FS is developed, in part, from the data presented in the RI report (EPA, 1988b). RI investigations were performed during 1987 and 1988, and included air, surface soil, subsurface soil, ground water, surface water, and sediment sampling and analysis as well as compilation of previous data. The RI has been issued concurrently with this document.

This FS has been prepared in accordance with the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. 960.1, et. seq.) and the National Contingency Plan

(NCP) (40 CFR 300 et. seq.). The U.S. EPA's documents Guidance on Feasibility Studies Under CERCLA (EPA, 1985b) and the Draft Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA, 1988c) have also been followed. References are provided in Appendix A.

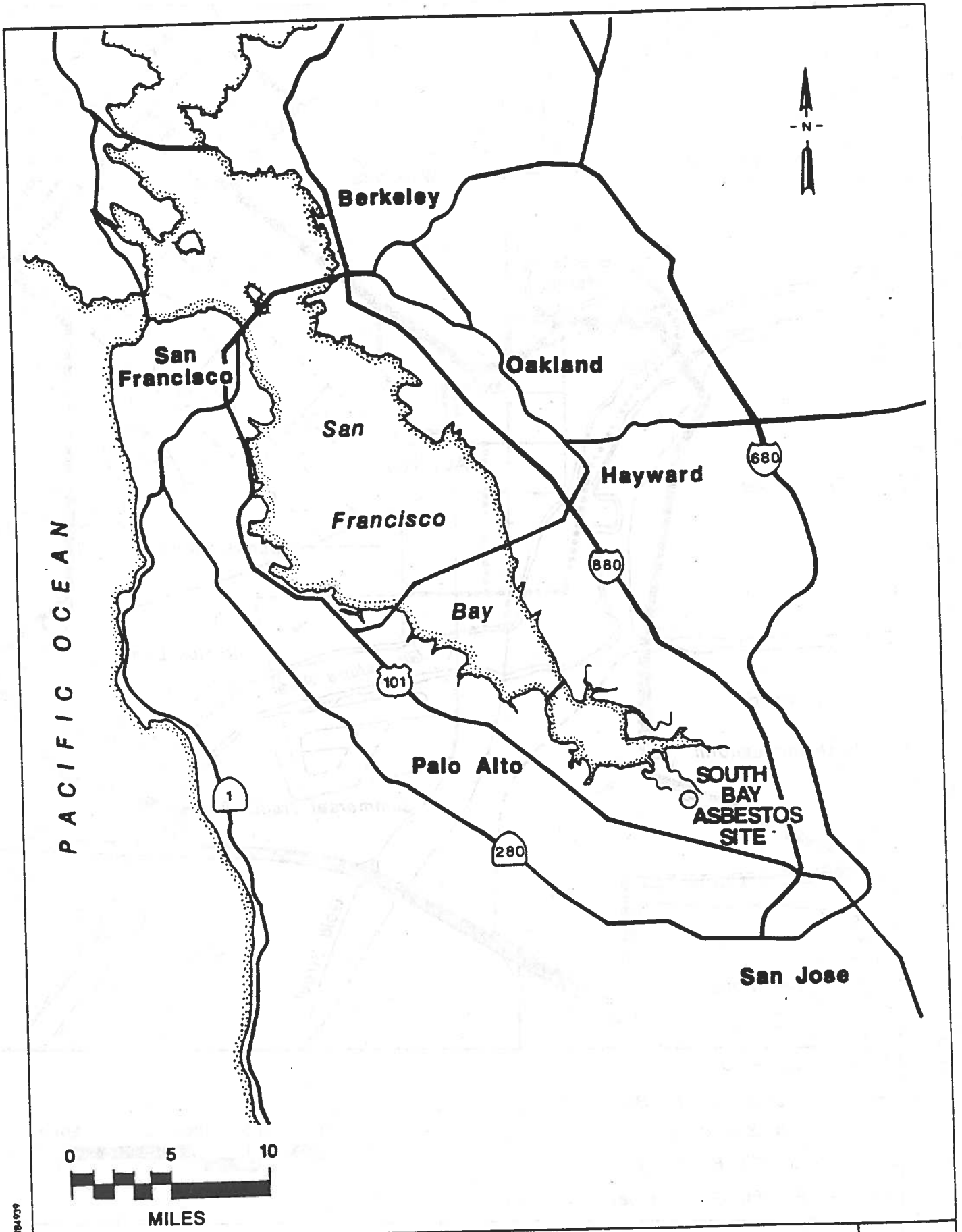
The public is encouraged to review this document and to submit comments to EPA. A glossary of terms has been included as Appendix B to assist the reader in interpreting this document. Based on the evaluation of the alternatives and public comments received, the EPA will select an alternative (or alternatives) to implement at the site. The alternative(s) selected will be protective of human health and the environment, will attain federal and state legal requirements, and will be cost-effective.

1.2 SITE BACKGROUND

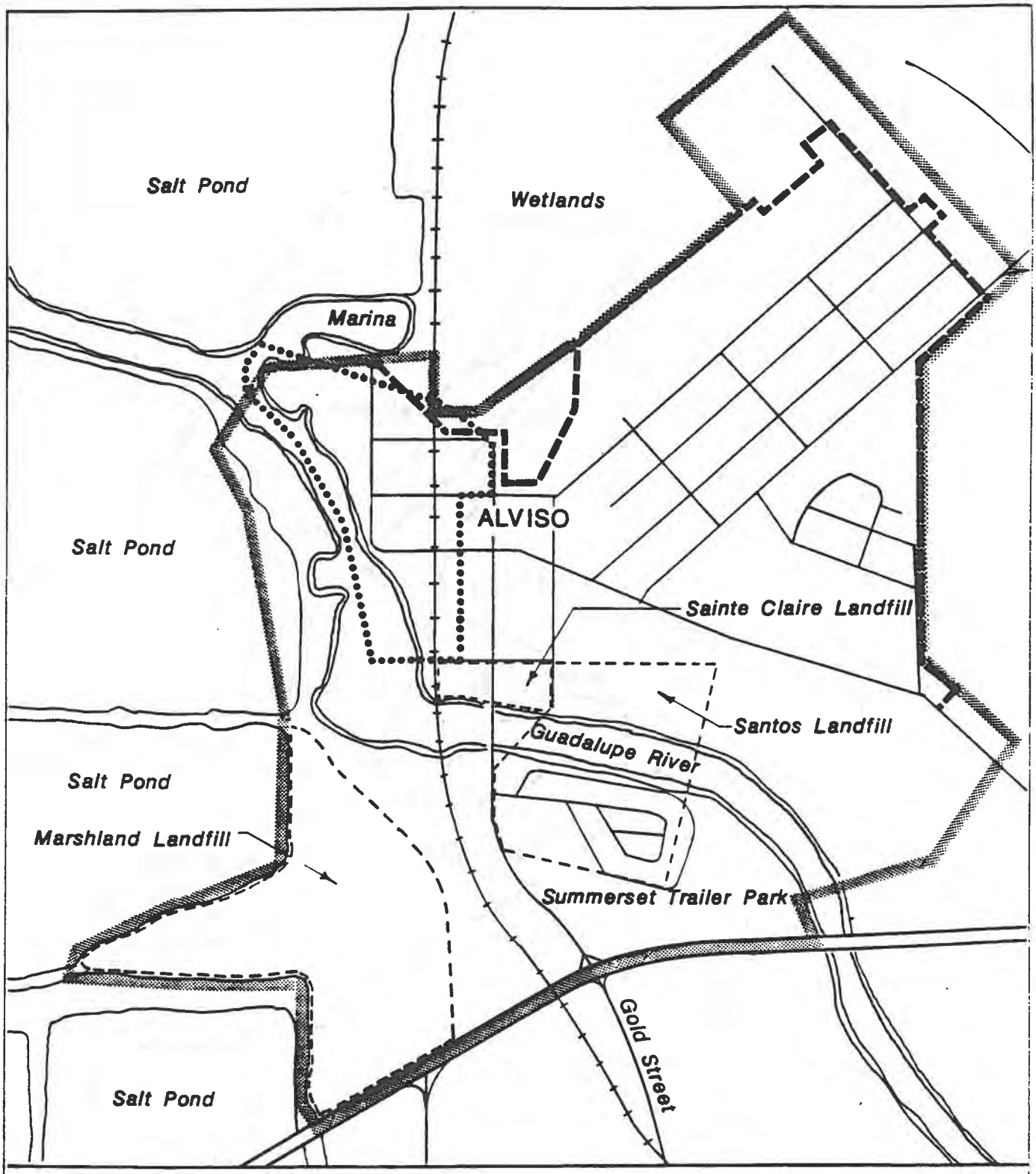
1.2.1 SITE LOCATION AND DESCRIPTION

The South Bay Asbestos site is located at the northern end of the Santa Clara Valley and at the southernmost extent of San Francisco Bay (Figure 1-1). The study area, which includes the community of Alviso, consists of a variety of residential, commercial, light industrial, and agricultural land uses, comprising an area of approximately 550 acres (Figure 1-2). Alviso is the northernmost community in the City of San Jose, with about 1,900 residents. The oldest section of the community, located west of Gold Street and north of the Guadalupe River, is a designated National Register Historic District. The community is located in a quiet section of the Silicon Valley between Highway 237 to the south, rapidly growing Santa Clara to the west and south, and expanding office development to the east and northeast.

The site is highly susceptible to flooding because of its proximity to the Bay and to the Guadalupe River and Coyote Creek. Flood-producing storms occur within the area every few years, as evidenced by historical records and newspaper accounts. Notable floods were reported in 1862, 1893, 1911, 1919, 1950, 1955, 1958, 1963, 1969, 1982 and 1983. Two major inflows to



Project No. 288-FS1	South Bay Asbestos Site Camp Dresser & McKee Inc.	REGIONAL LOCATION MAP	Figure 1-1



LEGEND

- Historic District Boundary
- Site Boundary
- Landfill Boundary
- Existing Ring Levee

0 500 1000 2000
FEET

Project No. 288-FS1	South Bay Asbestos Site Camp Dresser & McKee Inc.	SITE LOCATION MAP	Figure 1-2

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the Bay in the vicinity of the site are the Guadalupe River west and south of Alviso and Coyote Creek to the north and east. These rivers do not provide natural local drainage since they are leveed to prevent overbank flooding. The Guadalupe River was channelized in 1963 by the Santa Clara Valley Water District (SCVWD) to provide for greater flood flow capacity. The streams are under tidal influence and, therefore, discharge to the Bay is impeded during high tides. Numerous salt evaporation ponds are present between Alviso and the Bay, further impeding natural drainage into the Bay.

The development of agriculture in the region was facilitated by widespread ground water withdrawal from irrigation wells. Between 1934 and 1967, the ground surface of the Santa Clara Valley subsided four to six feet (EPA, 1988b and Aqua-Terra, 1986) to an elevation below sea level due to aquifer compaction, significantly increasing the potential for flooding. The subsidence is important to the site history since the land surface of most of Alviso has been artificially raised with soil and debris fill, some containing asbestos, to offset the effects of subsidence.

The community of Alviso is adjacent to some of the last remaining Bay wetlands. Over the last century, much of the tidal flats and marshlands which surrounded San Francisco Bay have been filled or altered (EPA, 1988b). Near Alviso, a fragment of the marshland survives as the New Chicago Marsh, a National Wildlife Refuge about 300 acres in size. The Refuge has an active public education program through its Environmental Education Center, located about a mile northeast of the community and administered by the U.S. Fish and Wildlife Service.

The wetlands adjacent to Alviso are a significant wildlife habitat because they provide an interface between fresh and salt water environments. The wetlands support several endangered or threatened species, including the Salt Marsh Harvest Mouse (Reithrodontomys raviventris), Golden Eagle (Aquila chrysaetos), and Peregrine Falcon (Falco peregrinus). The burrowing owl and California clapper rail are also protected species of special concern. Small mammals and a great number of birds and waterfowl species use the wetlands and surrounding "upland" habitats (i.e., land elevated above the water level of the marsh).

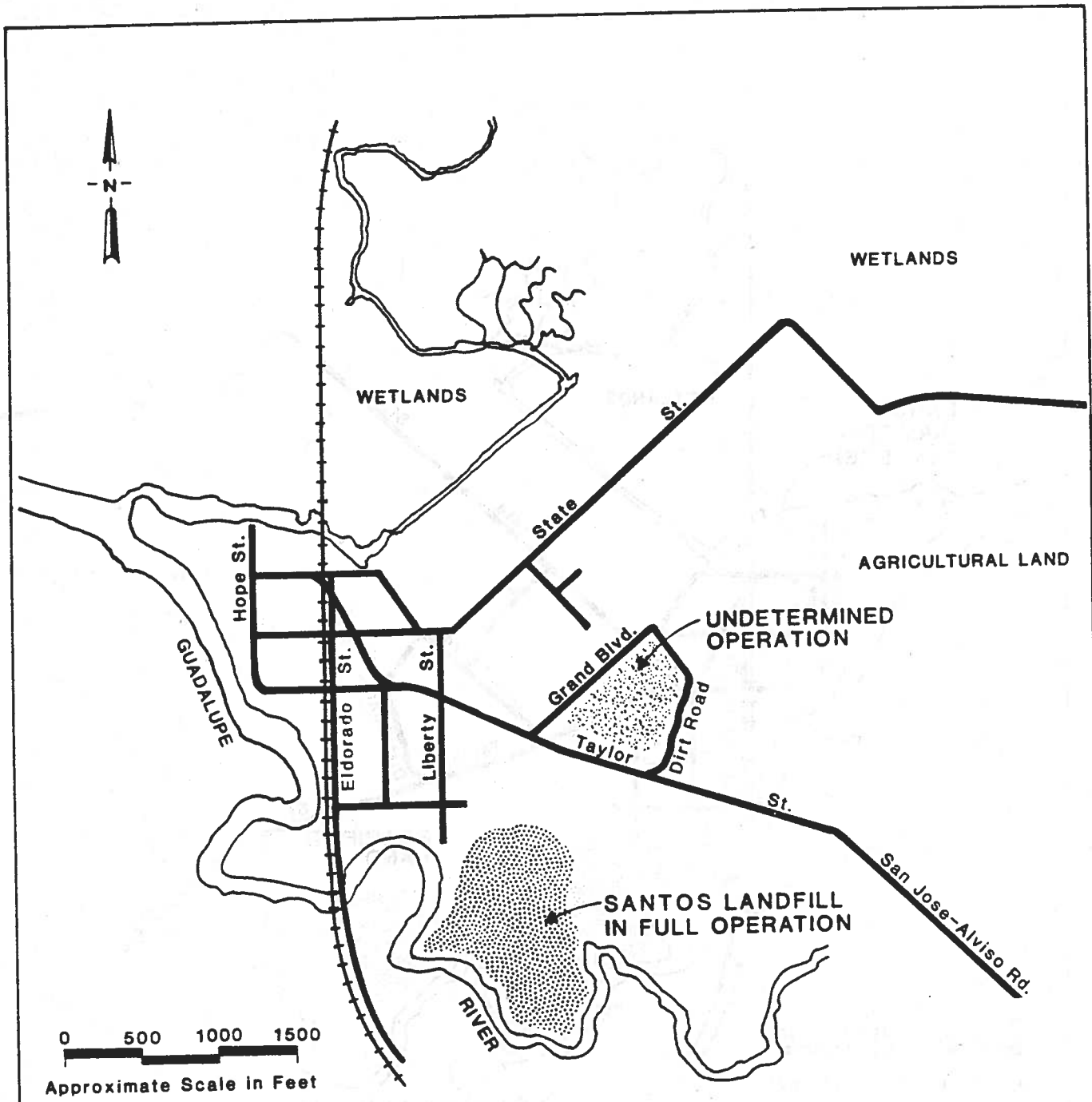
1.2.2 SITE HISTORY

Asbestos-related manufacturing began in the Alviso area in the early 1950s. The Keasby & Mattison Company operated an asbestos-cement pipe manufacturing plant about four miles south of the site at 2885 Lafayette Street, Santa Clara, from August 1953 through June 1962. CertainTeed Corporation purchased Keasby & Mattison Company on June 1, 1962 and manufactured asbestos-cement pressure and sewer pipe and fittings until June 9, 1982. Though not much is known of the Keasby & Mattison operation, several types of waste were produced at the CertainTeed plant, including broken asbestos-cement pipe, machining and processing waste, settling tank waste, and empty bags. It has been reported that numerous Alviso residents used the waste asbestos-cement pipe to drain excess water from their properties before curb and gutter were installed. According to company employees, two to three truckloads of scrap pipe, machining waste, and material from settling basins were transported to local landfills daily. Several landfills were located within the site boundaries, including the Santos Landfill, Marshland Development Corporation Landfill (also known as the Hoxie Landfill, the Edgewater Landfill, the Leslie Salt Landfill, or the "fill dump"), and the Sainte Claire Corporation Landfill. All three landfills may have received asbestos-containing wastes. These three landfills are discussed in detail in Appendix C. Historical aerial photographs were obtained and examined to document landfill history, as shown in Figures 1-3 through 1-11.

It is suspected that several areas within the Alviso site have been filled with asbestos-containing soils to improve flood protection as indicated in Figures 1-3 through 1-11. Some of this fill material may have been asbestos waste material.

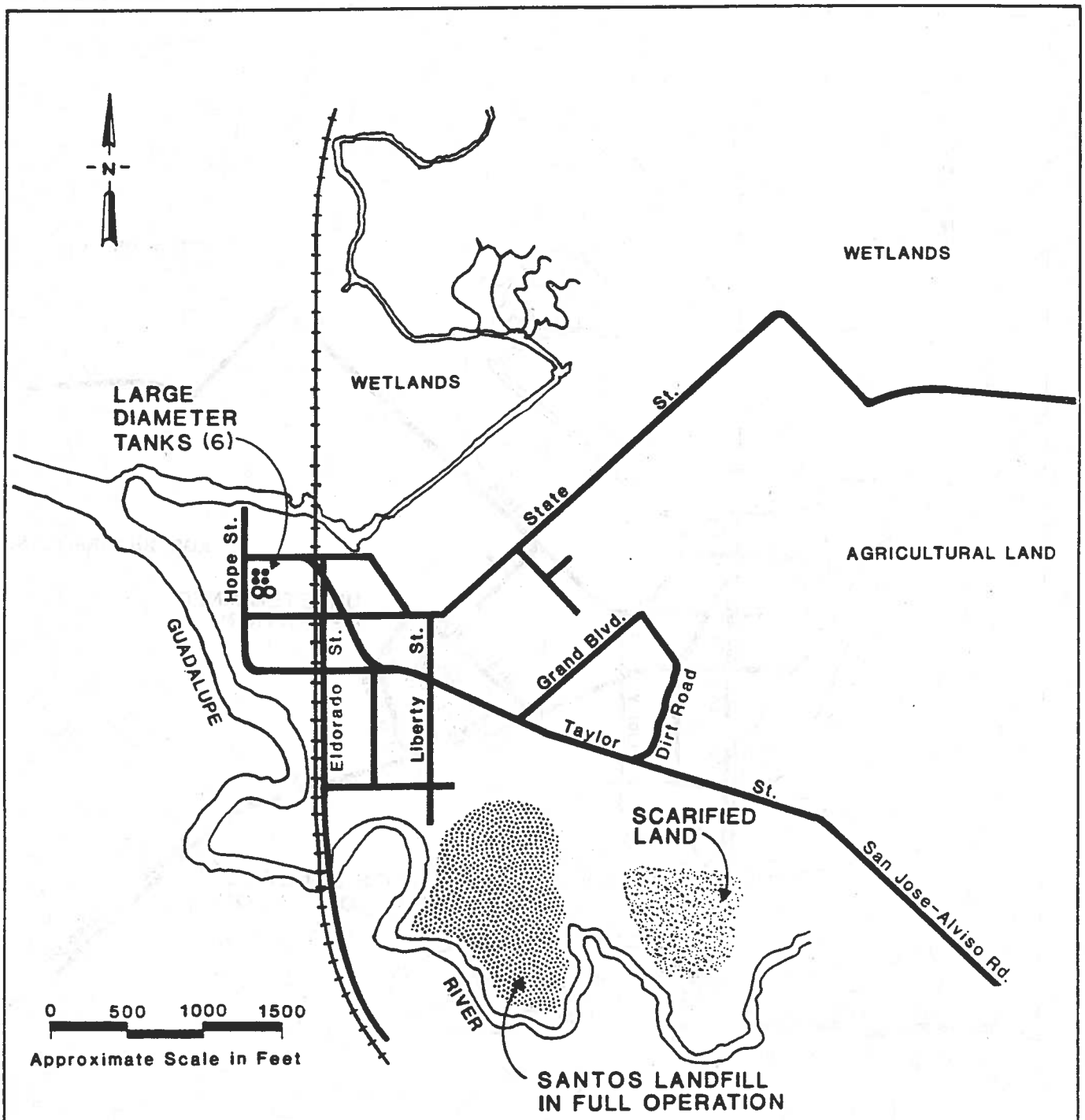
1.2.3 ASBESTOS DISCOVERY AND HAZARD RANKING

Asbestos was discovered on August 8, 1983 in the levee of the Guadalupe River adjacent to Moffat Street in of Alviso. The discovery of asbestos pipes and wastes occurred on property owned by the SCVWD and the City of



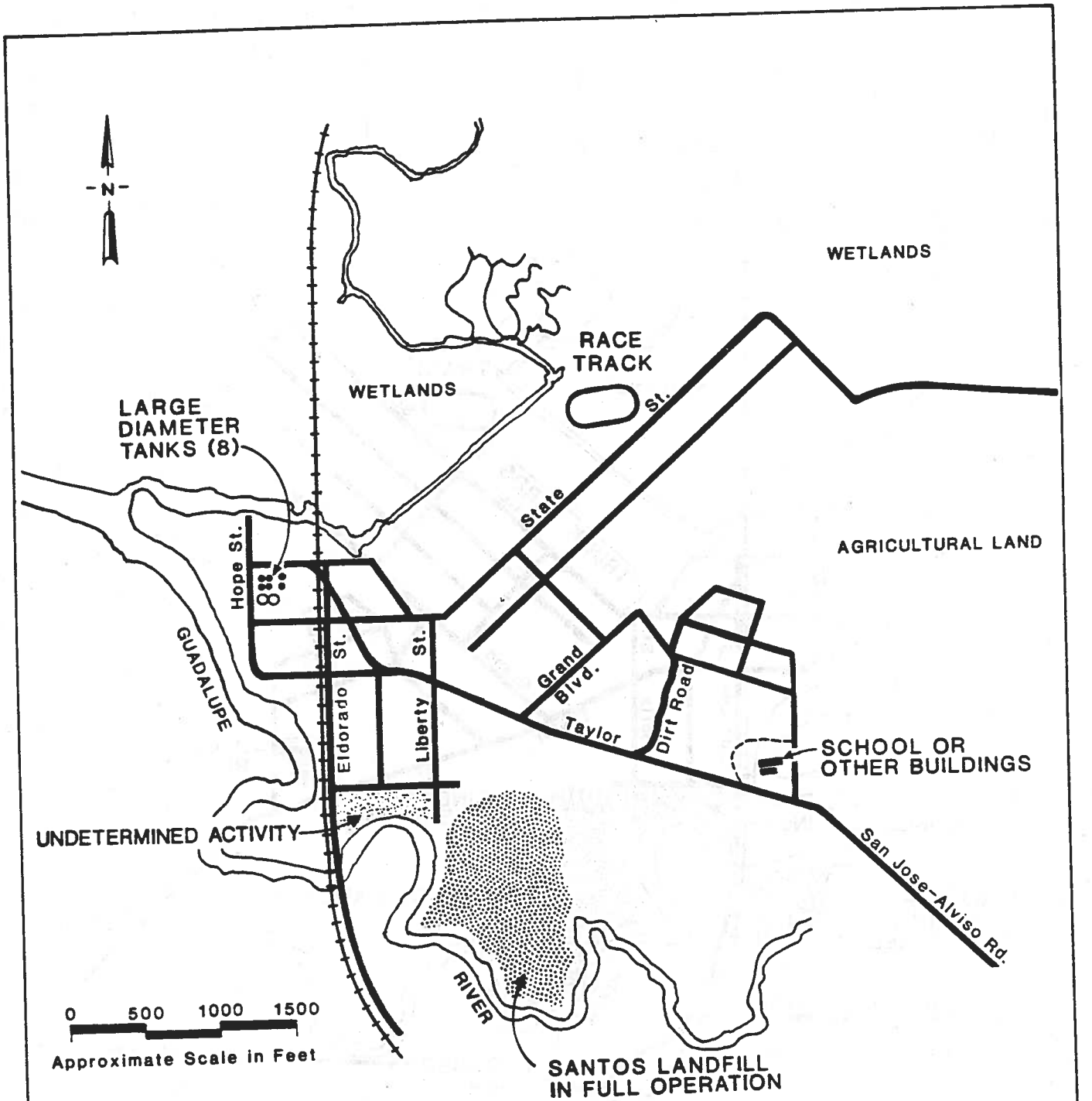
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	SEPTEMBER 26, 1948	1-3



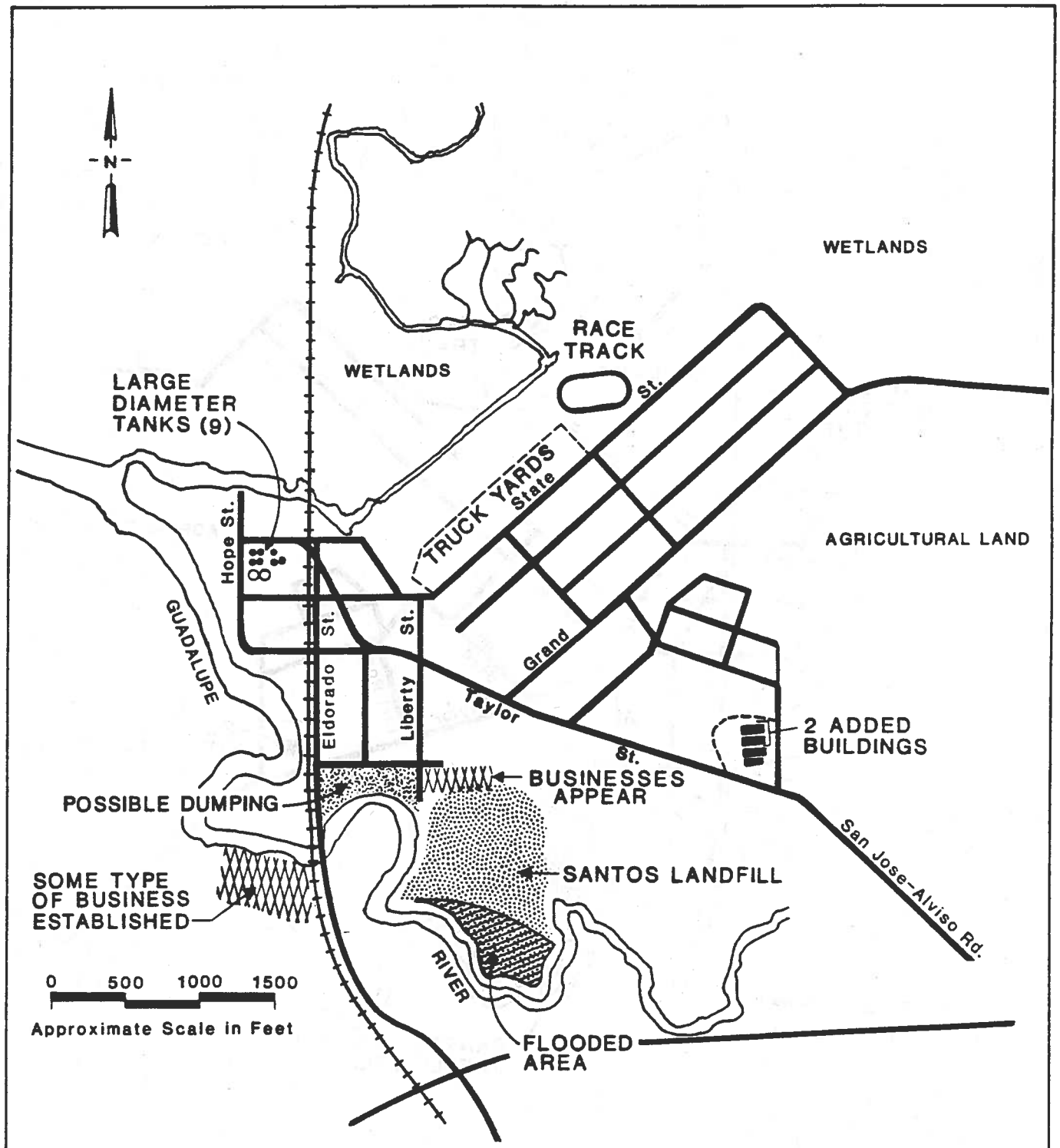
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	APRIL 1, 1950	1-4



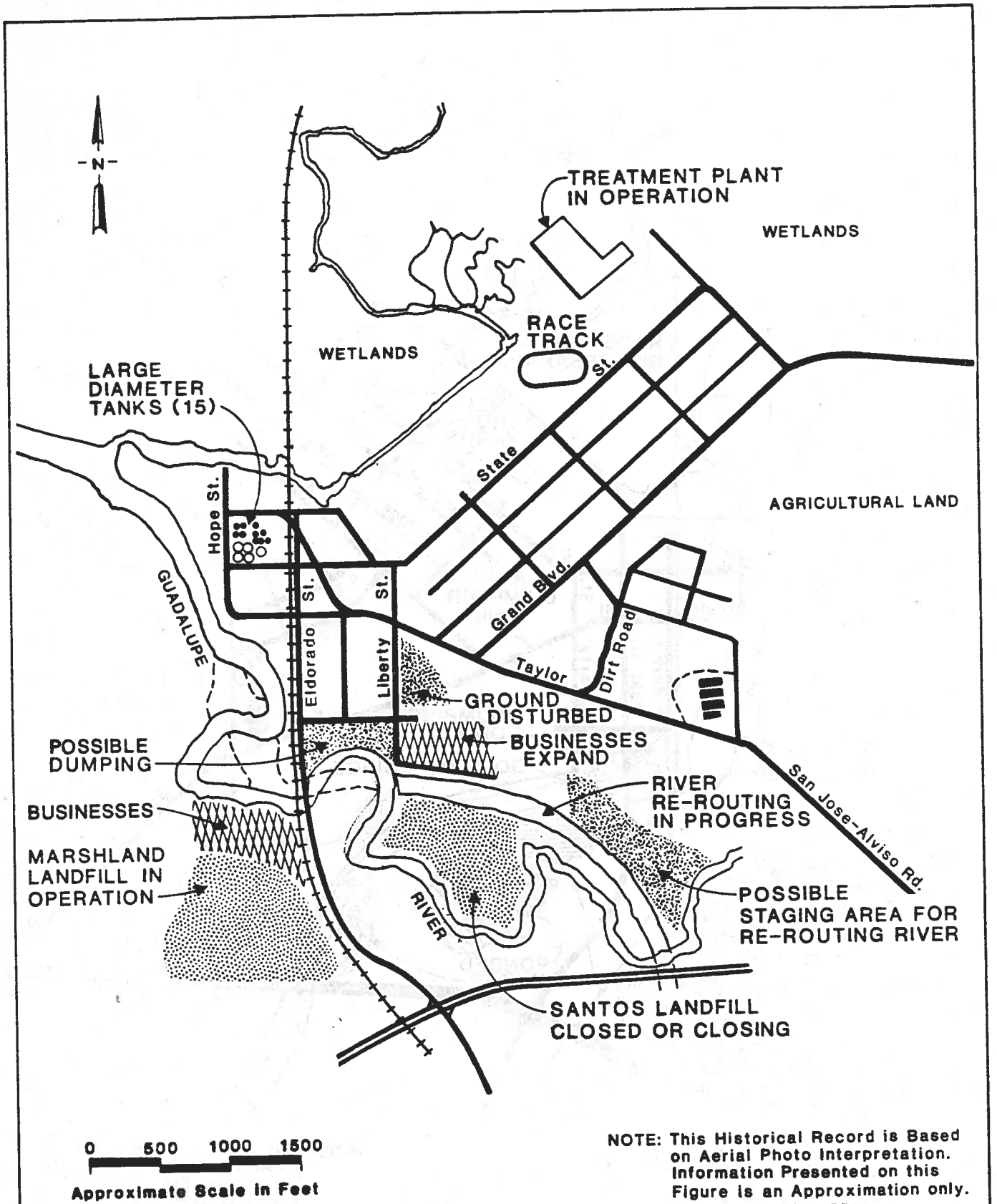
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	JUNE 9, 1956	1-5



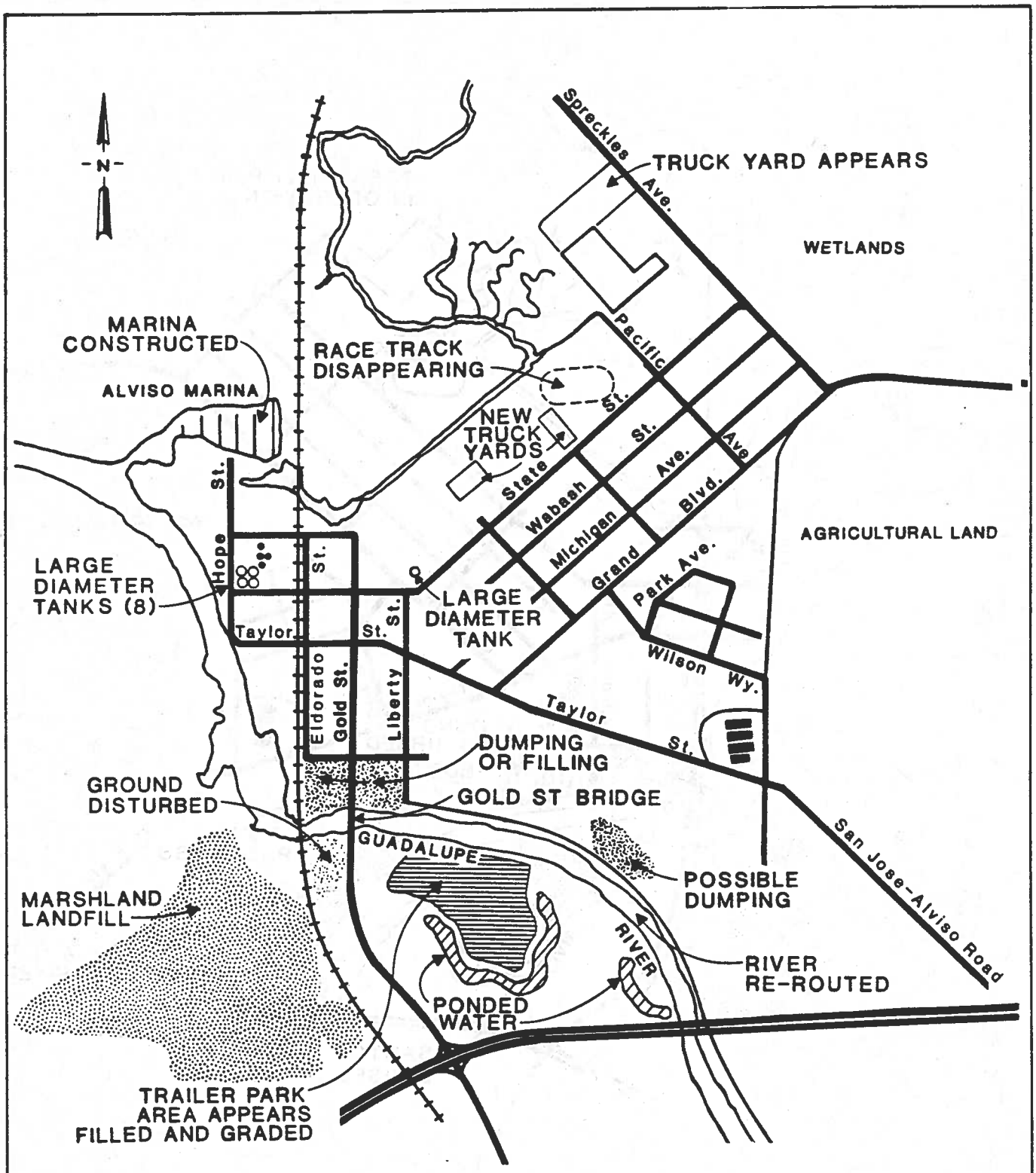
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	AUGUST 15, 1960	1-6



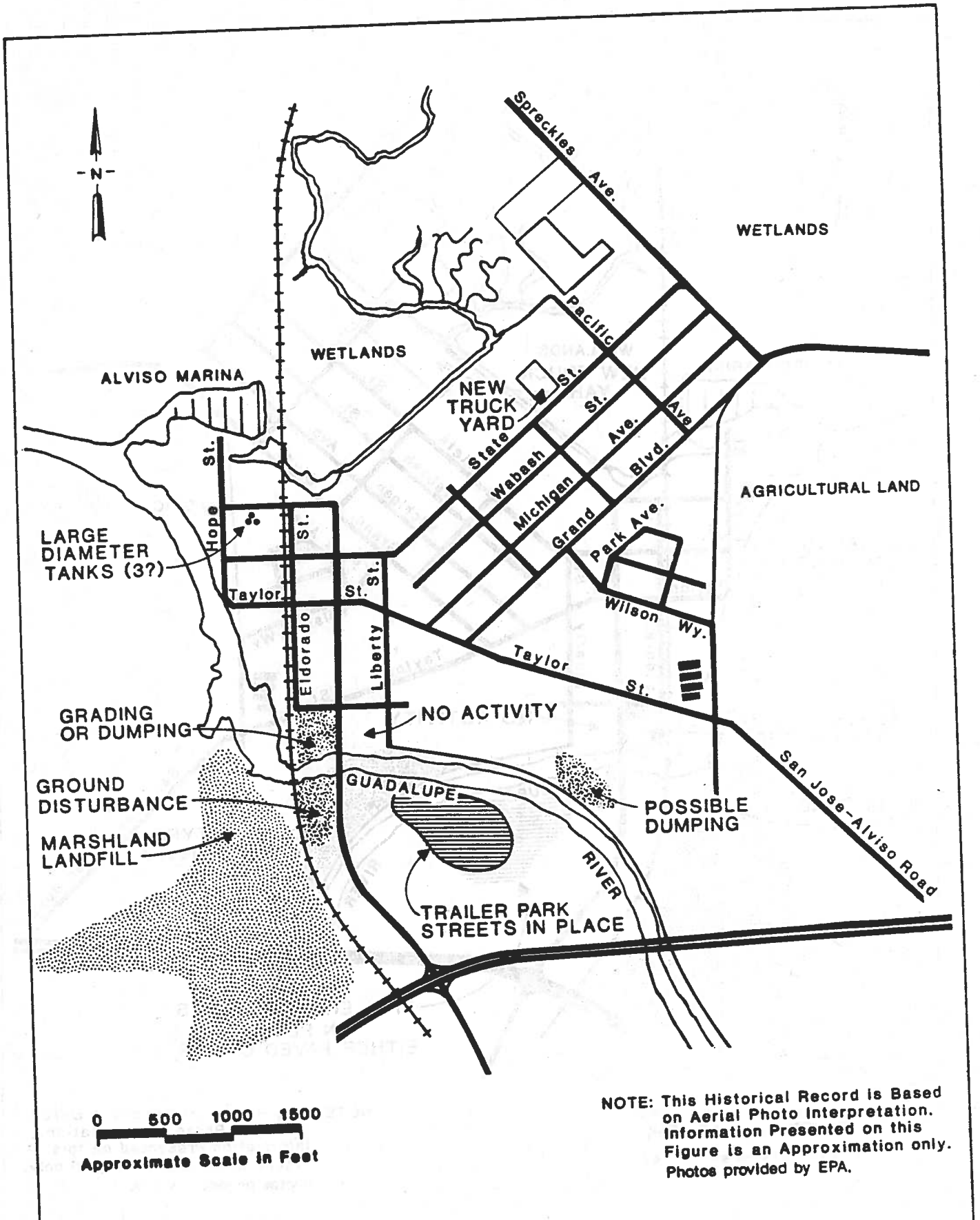
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	OCTOBER 13, 1963	1-7



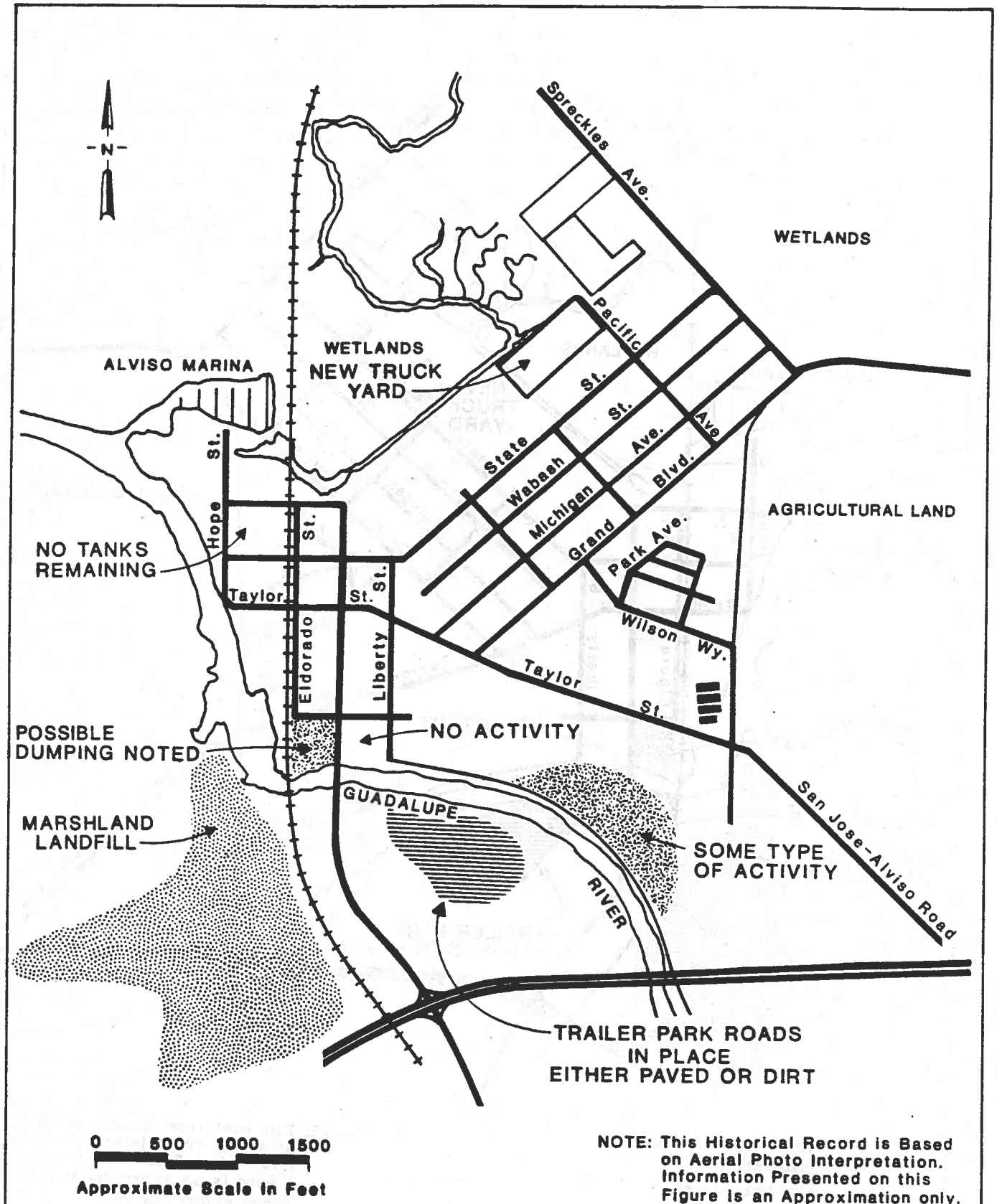
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No. 288-FS1	South Bay Asbestos	Historical Record JUNE 13, 1968	Figure 1-8
	Camp Dresser & McKee		



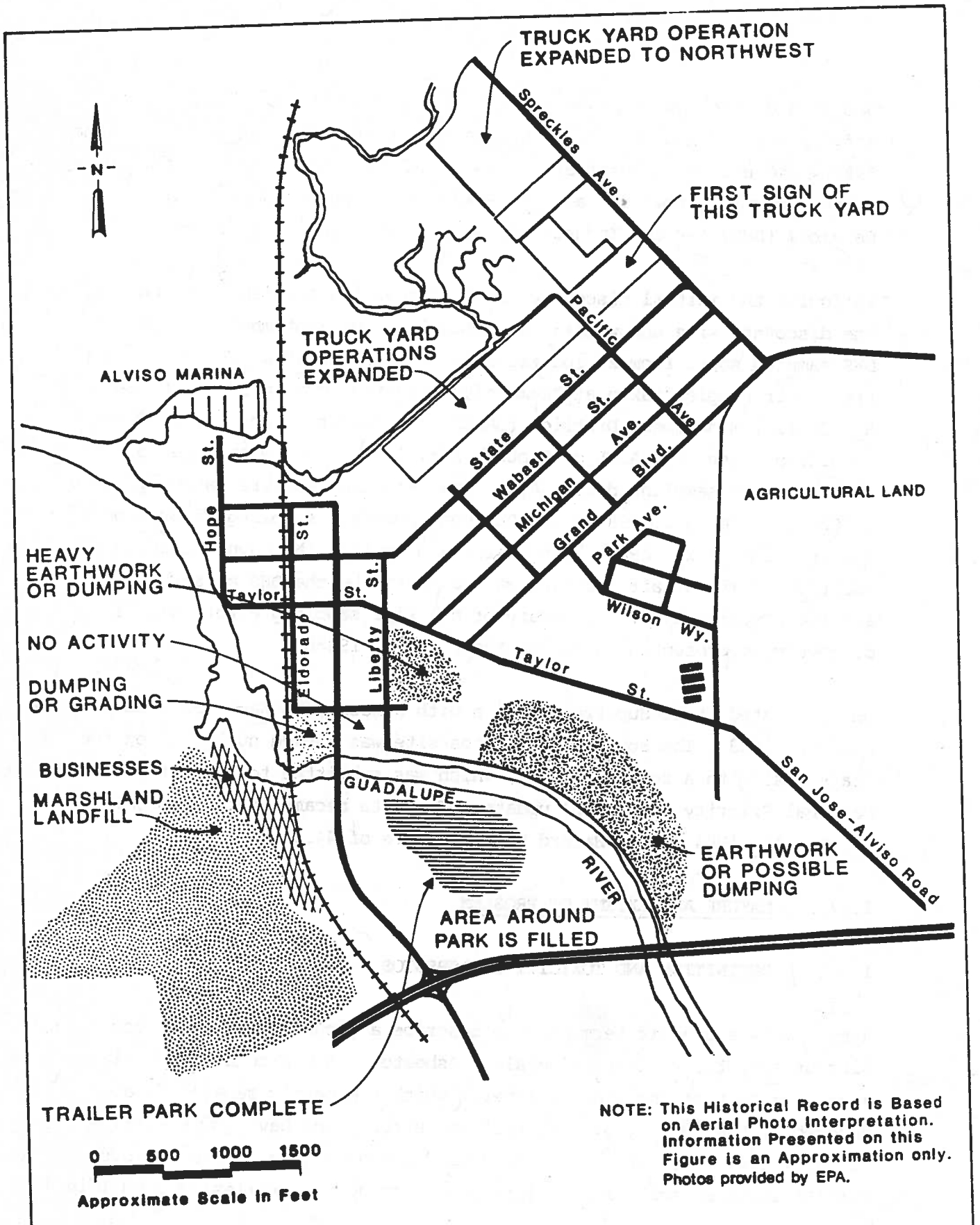
NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	FEBRUARY 22, 1974	1-9



NOTE: This Historical Record is Based on Aerial Photo Interpretation. Information Presented on this Figure is an Approximation only. Photos provided by EPA.

Project No. 288-FS1	South Bay Asbestos	Historical Record	Figure
	Camp Dresser & McKee	JULY 2, 1976	1-10



Project No.	South Bay Asbestos	Historical Record	Figure
288-FS1	Camp Dresser & McKee	MAY 28, 1982	1-11

San Jose during construction of a flood control outfall structure. A safety engineer and industrial hygienist from the California Occupational Safety and Health Administration (Cal-OSHA) found the asbestos during a routine permit inspection and notified the California Department of Health Services (DHS) Air and Industrial Hygiene Laboratory (AIHL).

Following the initial discovery, several agencies sampled soil and air at the discovery site and within the community. On September 12, 1983, the DHS sampled soils from 20 locations in residential areas throughout the area. Air samples taken at "community-oriented locations" by the Bay Area Air Quality Management District (BAAQMD) on August 22 and 23, 1983 were submitted to the DHS AIHL on September 6, 1983, along with meteorological data for each sampling date. Additional air samples were taken by the DHS on October 7 and 12, 1983. The DHS continued air sampling efforts on December 15 and 28, 1983, both inside and outside the Mayne School. Additional ambient air sampling was conducted by the DHS at several locations during 1984. A summary of all site sampling after initial discovery is presented in the RI Report (EPA, 1988b).

DHS initiated State Superfund action with a Hazardous Waste Site Ranking in December 1983. The South Bay Asbestos site was ranked number 17 on the State list with a score of 41.87, which was submitted to EPA for the 1984 National Priority List (NPL) update. The site became part of the NPL on October 15, 1984 with a Hazard Ranking score of 44.68.

1.3 NATURE AND EXTENT OF PROBLEM

1.3.1 DEFINITION AND TOXICITY OF ASBESTOS

Asbestos is a generic term used to describe a group of naturally occurring fibrous hydrated silicate minerals. Asbestos was a popular commercial substance because the mineral fibers, which are easily separated, are noncombustible, resistant to corrosion, strong, and have low electrical conductivity. The fibers have been used in insulation, brake linings, floor tile, plastics, cement pipe, paper products, textiles, and building products.

Asbestosis, which involves fibrosis of lung and pleural tissues, is another serious chronic disease, associated with exposure to high levels of asbestos (EPA, 1986a). A history of occupational exposure to asbestos is often a key feature of its diagnosis. Asbestosis can appear and progress decades after exposure to asbestos fibers. Because the high asbestos levels which cause asbestosis are not present at the South Bay Asbestos site, this disease is not a factor in this study.

Some evidence suggests adverse health effects from non-occupational asbestos exposure. Persons who lived in the households of asbestos workers have developed pleural mesothelioma and asbestos-related radiographic changes (EPA, 1986b). In another study, 35.9 percent of the contacts showed chest x-ray abnormalities as compared with 4.6 percent of control subjects drawn from the same community (Anderson, et al., 1976). A number of mesotheliomas have also been documented among populations whose only identified exposure was from living near asbestos mining areas, asbestos product factories, or shipyards where asbestos use had been very heavy (Anderson and Selikoff, 1979; Newhouse and Thomson, 1965; Wagner et al, 1960). An estimated 1,600 cases of mesothelioma occur yearly in the U.S. among various populations exposed to asbestos.

Exposure to asbestos is regulated in the workplace by the Occupational Health and Safety Administration (OSHA). The OSHA 8-hour time-weighted Permissible Exposure Limit (PEL) is 0.2 fibers per cubic centimeter of air. Fibers are defined under this standard as longer than 5 microns (or 5 millionths of a meter), with a diameter of 0.25 microns. Fibers this size are considered "long" fibers, since they are visible using an optical microscope. The laboratory techniques used to detect optically visible "long" fibers are Polarized Light Microscopy (PLM) for solids, and Phase Contrast Light Microscopy (PCLM) for air. The problem, however, is that these techniques cannot detect the thousands of "small" fibers, less than 5 microns, which are present in the environment for every "long" fiber. Although the health data base is founded on long fibers, some evidence suggests that short fibers may be important in causing cancer as well as

When the asbestos fibers in a solid material, such as soil or insulation, are released into the air and inhaled, the adverse human health effects can be extremely serious. Asbestos is a known human carcinogen and is also known to cause other lung diseases. Asbestos has been thoroughly examined in numerous epidemiology studies. The life-threatening diseases that have been repeatedly identified are asbestosis, lung cancer, and mesothelioma. Also associated with asbestos exposure in some studies are cancers of the larynx, pharynx, gastrointestinal tract, kidney, ovary, and respiratory diseases such as pneumonia. Major health effects from asbestos exposure are discussed in the Health Assessment Update (EPA, 1986a) and in detail in the Toxicology Profile presented in Appendix K of the RI Report (EPA, 1988b), and are summarized below.

Lung cancer is the major cause of of death from exposure to asbestos. It has been associated with exposure to all the principal commercial asbestos fiber types. Excess lung cancer has been documented in groups involved with the mining and milling of asbestos and the manufacture and use of asbestos products. Studies in which the extent of exposure can be approximated provide evidence that lung cancer increases linearly with both level and duration of exposure (Nicholson et al., 1979; Seidman, 1984; Selikoff et al; 1979). Cigarette smoking and asbestos have a strong synergistic interaction in development of lung cancer as shown in a study of 12,051 asbestos workers (Hammond et al., 1979). Consequently, when exposed to asbestos, the risk of lung cancer for smokers is much higher than that for nonsmokers exposed to asbestos.

Many human studies (Selikoff et al., 1979; Nicholson et al., 1982) have also shown that exposure to asbestos produces mesotheliomas, which are cancers that occur as thick diffuse masses in the serous membranes (mesothelia) that line body cavities. Epidemiology studies suggest that the incidence of mesothelioma is related to dose and time from first exposure. Association of mesothelioma with smoking is weak or nonexistent. Asbestos fibers appear, by far, to be the most common cause of mesotheliomas.

the longer, optically visible fibers (Schneiderman et al, 1981). The analytical technique which must be employed to measure short fibers is Transmission Electron Microscopy (TEM). TEM can measure all fiber sizes, but is very expensive to employ. Results are also difficult to duplicate. The difficulties of measuring and identifying asbestos with any technique can create extreme variations in analytical results.

Although the OSHA 0.2 fiber/cc workplace standard is the only promulgated health standard for asbestos, EPA is concerned about any asbestos exposure above a site-specific background level. The medical studies of asbestos disease have not yet defined a "safe" level of exposure, or a threshold below which there is no chance of disease. EPA recognizes that a certain background concentration of asbestos exists in the atmosphere, caused by asbestos product use and natural sources, which cannot be remedied. EPA is concerned that the potential for release from a recognized soil source may cause airborne levels above this background.

In conclusion, the adverse health effects of asbestos are well documented, with no known safe threshold of exposure.

1.3.2 EXTENT OF CONTAMINATION

Soil, air, surface water, sediments, and ground water have all been sampled at the site as part of the RI. The sampling results are presented in the RI report (EPA, 1988b). In summary, asbestos was detected throughout Alviso in soils in a random distribution. Table 1.1 summarizes the soil asbestos data from the RI and previous studies which were used in the exposure assessment. Table 1.2 is a summary of the air asbestos data used in the exposure assessment. The asbestos concentrations measured in the town (Stations 2,3, and 4) are nearly an order of magnitude higher than the upwind (Station 1 and downwind (Station 5) concentrations, measured during prevailing northwest winds. Data quality problems were encountered related to asbestos analytical methods, as discussed specifically in Sections 5.1, 5.2, and 5.3 of the RI report (EPA, 1988b). The majority of the Phase I asbestos air data were considered estimates due to high detection levels.

TABLE 1.1

SUMMARY OF ASBESTOS CONCENTRATIONS IN SURFACE SOIL
IN THE SOUTH BAY ASBESTOS SITE AREA(a)

Location	Frequency of Detection	Concentration (%)(b) Geometric Mean(c)	Maximum(d)
Residential Areas			
- Town of Alviso(e)	19/72	<1(f)	8
- Summerset Trailer Park(g)	13/26	<1	10
George Mayne School(h)	12/20	1.7	20
Environmental Education Center(i)	11/23	1.8	40
	0/3 (RI samples only)	<1	<1
Vacant Lots(j)	8/43	<1	10
Truckyards(k)	25/39	<1	19
Roads			
- Street Dust(l)	7/13	<1	3
- Streets(m)	69/196	<1	10

(a) Based on surface soil samples collected by Cal/OSHA (1983), DHS (1983), USEPA (1985), Ecology and Environment (1986), Woodward-Clyde Consultants (1986) and during the RI.
(b) Concentrations are reported in PLM area%.
(c) Geometric means were calculated using one half of the detection limit for non-detected samples. Detection limit for all samples except DHS samples is 1%; DHS detection limit is 0.01%.
(d) Maximum may no longer be indicative of on-site surface soil conditions because of emergency response actions.
(e) Includes samples collected from yards and vacant lots in the area bounded by Taylor Street and the Levee to Spreckles Avenue, and State Street to Gold Street. Geometric mean obtained using 12 samples from DHS, 50 samples from USEPA, and 10 samples from the RI.
(f) All values less than one percent will be reported as <1%.
(g) 15 samples from USEPA and 11 samples from DHS.
(h) 20 samples from USEPA; samples were collected prior to paving of schoolyard.
(i) 20 samples from USEPA and 3 samples from the RI.
(j) Includes all vacant lots in non-residential areas; 7 samples from DHS, 36 samples from USEPA, and 9 samples from the RI.
(k) Samples collected primarily from truckyards along State Street; 24 samples from E&E (TMA reanalysis), 11 samples from DHS, and 4 samples from the RI.
(l) 5 samples from the RI, and 8 samples from USEPA.
(m) 176 samples from USEPA, and 20 samples from DHS.

TABLE 1.2

SUMMARY OF PHASE II INDIRECT ASBESTOS REANALYSIS (a)

Date Sampled (Sample No.)	Concentration (PCMe structures/m3) (b)					
	Station 1	Station 2	Station 3	Station 4	Stations 2-4	Station 5
8/18/87 (009)	310	---	---	390	---	1,100
8/19/87 (010)E	---	430	---	---	---	---
8/30/87 (015)	90	980	---	600	---	40
9/11/87 (021)	---	8,500	---	710	---	---
9/17/87 (025)	860	1,200	---	510	---	---
9/20/87 (026)	50 U	650	---	140	---	---
9/25/87 (030)E	210	---	---	---	---	---
10/5/87 (035)E	---	---	1,300	3,300	---	---
10/7/87 (036)	---	---	4,500	---	---	---
10/14/87 (040)E	---	---	310	---	---	---
10/15/87 (041)E	80	---	---	---	---	---
10/17/87 (043)E	---	---	7,600	---	---	---
10/26/87 (047)	---	1,100	---	630	---	---
Summary Information						
No. of Samples Analyzed	6	6	4	7	17	2
Frequency of Detection	5/6	6/6	4/4	7/7	17/17	2/2
Geometric Mean Concentration (c)	147	1,206	1,927	589	1,003	210
Maximum Concentration	860	8,500	7,600	3,300	8,500	1,100

(a) Samples are from CDM's Phase II reanalysis of Phase I ambient air samples. Station 1 is located upwind, Stations 2-4 on site, and Station 5 off-site downwind. Dash indicates not annalyzed.

(b) PCMe structures are single asbestos fibers or fiber groups longer than 5 microns, wider than 0.25 microns, with an aspect ratio (length to width) greater than 3. Although detected by TEM, PCMe structures are considered equivalent to structures detected by the PCM method of analysis (EPA, 1988b).

(c) Geometric means were calculated using one-half of the reported detection limit for undetected samples.

U = Not detected. The listed value is the detection limit.

E = Episodic (4- to 12-hour average) sample. All others are 24-hour average samples.

Source: U.S. Environmental Protection Agency (USEPA). 1988. Memorandum from K. Kitchingham, Environmental Services Branch, to G. Baker, Remedial Branch TWPD. EPA Region IX. Subject: Review of Analytical Data for the South Bay Asbestos Site.

Risks from the pathways listed above were characterized by first comparing information on the presence and concentrations of asbestos in the sampled environmental media to Applicable or Relevant and Appropriate Requirements (ARARs) identified for the South Bay site. Because asbestos ARARs were not available for all of the sampled environmental media (see Section 2.0), a quantitative risk characterization was also conducted. In this evaluation, estimates of potential asbestos exposures through each pathway were combined with asbestos-specific toxicity values to predict potential risks associated with the site. For each pathway, an exposure scenario was developed based on assumptions about the environmental behavior and transport of asbestos, and the extent, frequency, and duration of exposures. These factors were used to predict potential exposures to asbestos to both average and a maximum plausible exposure case.

For chemical carcinogens such as asbestos, the excess upper bound lifetime cancer risk was estimated for each pathway; this risk is expressed as a probability. A risk of 1×10^{-6}, for example, represents the probability that, at a maximum, one individual out of a million will develop cancer as a result of exposure to a carcinogenic chemical over a 70-year lifetime.

Table 1.3 summarizes the results of the quantitative risk assessment for each exposure pathway and receptor group. For the inhalation of ambient air by Alviso and other nearby residents, excess lifetime cancer risks were estimated based on the Phase II indirect air data in Table 1.2. The average case risks for the on-site sampling stations (10^{-6} to 10^{-4}) were slightly higher than those at either the upwind (10^{-6} to 10^{-5}) or downwind (10^{-6} to 10^{-5}) sampling locations. There are, however, many significant uncertainties associated with these risk table estimates. For the maximum case scenarios, the use of a single maximum air measurement to calculate lifetime inhalation risks is extremely conservative and thus the maximum case risks are more representative of upper bound risks rather than maximum plausible risks. Another major uncertainty in the ambient inhalation risk estimates is associated with uncertainties in the asbestos dose-response data. Therefore, considering the potential impact of the combination of these and other uncertainties, these risk results should be interpreted as order of magnitude estimates.

These findings suggest that release of asbestos into the air and subsequent exposure results from traffic and/or soil disturbance in areas of exposed surficial soils containing asbestos.

1.3.4 RISK ASSESSMENT

The results of sampling efforts performed at the South Bay Asbestos site were summarized to identify chemicals to be evaluated in detail in the risk assessment (EPA 1988b). The primary chemical of concern with respect to potential effects on human health and the environment at the South Bay site is asbestos, which was detected in all sampled environmental media.

The following exposure pathways were selected for detailed evaluation in the risk assessment:

- Lifetime exposure of residents by inhalation of ambient air;
- Lifetime exposure of residents by inhalation of airborne asbestos generated by trucks in unpaved truckyards;
- Exposure of children by direct contact with and subsequent incidental ingestion of asbestos-contaminated soil in non-residential areas (i.e., vacant lots); and
- Lifetime exposure of residents by incidental ingestion of asbestos-contaminated soil during outdoor activities.

These pathways were selected for their likelihood and frequency of occurrence, and for their potential to generate asbestos levels in air that may be of concern to human health.

The potentially exposed population includes the approximately 1,870 individuals who reside in Alviso and workers who may be employed in the town. The Alviso population is highly mobile; among those residing in Alviso in 1980, only 38% were living in Alviso in 1975. Approximately 10% of the Alviso population is under five years of age (187) and 4.5% over 65 years of age (84). Thirty-two percent of the population in 1980 was between five and 20 years of age (600).

Risks from the pathways listed above were characterized by first comparing information on the presence and concentrations of asbestos in the sampled environmental media to Applicable or Relevant and Appropriate Requirements (ARARs) identified for the South Bay site. Because asbestos ARARs were not available for all of the sampled environmental media (see Section 2.0), a quantitative risk characterization was also conducted. In this evaluation, estimates of potential asbestos exposures through each pathway were combined with asbestos-specific toxicity values to predict potential risks associated with the site. For each pathway, an exposure scenario was developed based on assumptions about the environmental behavior and transport of asbestos, and the extent, frequency, and duration of exposures. These factors were used to predict potential exposures to asbestos to both average and a maximum plausible exposure case.

For chemical carcinogens such as asbestos, the excess upper bound lifetime cancer risk was estimated for each pathway; this risk is expressed as a probability. A risk of 1×10^{-6}, for example, represents the probability that, at a maximum, one individual out of a million will develop cancer as a result of exposure to a carcinogenic chemical over a 70-year lifetime.

Table 1.3 summarizes the results of the quantitative risk assessment for each exposure pathway and receptor group. For the inhalation of ambient air by Alviso and other nearby residents, excess lifetime cancer risks were estimated based on the Phase II indirect air data in Table 1.2. The average case risks for the on-site sampling stations (10^{-6} to 10^{-4}) were slightly higher than those at either the upwind (10^{-6} to 10^{-5}) or downwind (10^{-6} to 10^{-5}) sampling locations. There are, however, many significant uncertainties associated with these risk table estimates. For the maximum case scenarios, the use of a single maximum air measurement to calculate lifetime inhalation risks is extremely conservative and thus the maximum case risks are more representative of upper bound risks rather than maximum plausible risks. Another major uncertainty in the ambient inhalation risk estimates is associated with uncertainties in the asbestos dose-response data. Therefore, considering the potential impact of the combination of these and other uncertainties, these risk results should be interpreted as order of magnitude estimates.

TABLE 1.3

SUMMARY OF EXCESS INDIVIDUAL LIFETIME CANCER RISKS FOR EXPOSURE TO ASBESTOS AT THE SOUTH BAY SITE

Exposure Pathway*	Average Case	Maximum Case
Inhalation - Ambient Air		
Station 1 (off-site/upwind)	$1 \times 10^{-6} - 3 \times 10^{-5}$	$7 \times 10^{-6} - 2 \times 10^{-4}$
Stations 2-4 (on-site)	$8 \times 10^{-6} - 2 \times 10^{-4}$	$6 \times 10^{-5} - 2 \times 10^{-3}$
Station 5 (off-site/downwind)	$1 \times 10^{-6} - 5 \times 10^{-5}$	$9 \times 10^{-6} - 3 \times 10^{-4}$
Inhalation - Activity Generated Airborne Asbestos		
Truck Traffic on Unpaved Surfaces		
Residents Inhaling:		
Dust from Truckyards	NC	$>3 \times 10^{-3}$
Dust from Unpaved Roadways	NC	$>3 \times 10^{-3}$
Street Dust from Paved Roadways	NC	$>3 \times 10^{-3}$
Ingestion of Soil		
Children Playing on Non-Residential Areas (i.e., vacant lots)	NC	3×10^{-5}
Lifetime Exposure from:		
Alviso Yards	NC	5×10^{-5}
Trailer Park Yards	NC	6×10^{-5}

NC = Not calculated because geometric mean soil level was below the detection limit.

* The potential size of the populations exposed are estimated to be: <560-1,870 for inhalation of asbestos in ambient air and ingestion exposure to asbestos in soil; <150-600 for children/teenager exposure pathways; <100-1,000 for adult gardening scenarios; <560-1,870 for inhalation of vehicle-generated dusts by residents. The potential size of the worker population is not known.

Lifetime inhalation risks associated with exposure to airborne asbestos at various locations in California have also been estimated in a different study (SAI, 1983). The excess lifetime cancer risks were predicted to be in the 10^{-6} to 10^{-4} range. There are important uncertainties associated with these risk estimates as well, and thus they too should be interpreted with caution. For example, the conversion factor between analytical techniques is uncertain as is the use of only four sample measurements per location (all collected on the same day) to characterize average and maximum case long-term exposure point concentrations.

The DHS activity experiment data (EPA, 1988b) were used to evaluate risks associated with inhalation of vehicle-generated dusts. Only a few experimental sample data values were available and these were unvalidated. Thus there are significant uncertainties associated with these pathways of exposure. Based on the DHS data, the excess lifetime cancer risks for maximum case scenarios of exposure were all estimated to exceed 3×10^{-3}. This risk level is the highest value presented in EPA's Health Risk Table (Appendix K, EPA, 1988b) from which the vehicle-generated inhalation risks were estimated.

Ingestion risks were predicted for children playing in soil and residents contacting soil in yards. The ingestion risk was 3×10^{-5} for children, and in the 10^{-5} range for adult residents.

It should be recognized that Table 1.3 does not capture all aspects of uncertainty associated with this risk assessment. The risks presented in this assessment are not precise, and are presented solely to guide the decision of whether to take remedial action at the South Bay Asbestos site.

1.3.5 EXTENT OF REMEDIATION

In order to determine the areas to be remediated and aid in the development of alternatives, aerial photographs and several site visits were used to delineate the area's physical characteristics and types of activity. Seven subunits were identified as follows:

- Ring Levee
- Truck Yards
- Streets
- Vacant Lots
- Landfills
- Marina
- Yards, Gardens, and Businesses

Each of these subunits have been described in detail in Appendix C. The Ring Levee has been addressed under a separate feasibility study (EPA, 1988a) and will, therefore, not be considered in this feasibility study. In addition, the Marina is under the jurisdiction of the Department of Interior and will not be considered in this feasibility study. As discussed in Appendix C, the Marshland Landfill is presently undergoing closure in accordance with State landfill regulations, and these activities are consistent with the remedial alternatives in this report. The businesses located to the east of the Marshland Landfill will be addressed as part of the Yards, Gardens, and Businesses subunit. The remaining five subunits have been sampled extensively and sample analyses indicate asbestos contamination of up to three percent (PLM) for the Streets subunit (detected in the street dust) and up to a maximum of 19 percent (PLM) for the Truck Yards subunit. Table 1.4 presents the five subunits under consideration and their physical characteristics.

The alternatives to be developed in Section 2.0 will address the specific requirements of each of the subunits. For example, a soil cover would not be considered for the Streets subunit since they are paved, but rather an alternative appropriate for paved streets would be developed such as street sweeping.

TABLE 1.4

SUBUNIT CHARACTERISTICS

Subunit	Number of Subareas	Total Area (acres)	Type of Activity
Truck Yards	11	27	Truck activity ranging from pallet storage to sand and gravel hauling.
Streets	17	45	Heavy vehicle traffic as well as bicycle and pedestrian traffic. Heaviest truck traffic generally along perimeter streets.
Vacant Lots	42	91	Low activity. On going filling occuring (i.e., Taylor Street) on some lots. Most lots barren with no sign of activity.
Landfills	3	35	Marshland under closure, Santos occupied primarily by a trailer park, and Sainte Claire used primarily for fill dump and occasional equipment/tractor trailer parking.
Yards, Gardens and Businesses	350	113	Typical residential activities

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1.4 FEASIBILITY STUDY PROCESS

The objective of this FS is to develop a range of remedial alternatives which protect human health and the environment by minimizing the potential release of asbestos fibers from known or suspected source areas. The FS provides sufficient information to allow EPA decision-makers and the public to select the most appropriate remedial action or actions. The Feasibility Study is conducted in three phases in accordance with the Draft Guidance for Remedial Investigation and Feasibility Studies under CERCLA, March 1988 (EPA, 1988c).

- Phase I: Identification of technologies and development of remedial action alternatives.
- Phase II: Refinement of the alternatives and the selection of alternatives for detailed analysis.
- Phase III: Detailed analysis of the remedial alternatives.

1.4.1 PHASE I

Under Phase I, remedial action objectives are established which will be achieved by the proposed remedial action alternatives. These objectives are typically defined in terms of a contaminant of concern in a specific medium, an exposure route and receptor, and an acceptable contaminant level for the exposure route and receptor (i.e. cleanup goal). Where possible, acceptable contaminant levels are determined by the Risk Assessment, and/or the Applicable or Relevant and Appropriate Requirements (ARARs). General response actions are then developed to satisfy the remedial action objectives. Some examples of general response actions include treatment, containment, and disposal.

The next step of Phase I involves the identification and screening of technology types, a subcategory of general response actions. Chemical, thermal, and biological treatment are all examples of technology types under the treatment general response action. Technology types are screened on the basis of their applicability to the waste type and form. Process options, a subcategory of technology types, are then identified for the

technology types that remain after screening. For the thermal treatment technology type, examples of process options are rotary kiln incineration, advanced electric reactor, and vitrification. The process options are screened on the basis of effectiveness, implementability, and cost relative to other process options within the same technology type. The goal of this level of screening is to arrive at one to two representative process options for each technology type.

The final step in Phase I is the development of alternatives. This step is accomplished by combining process options that, together, meet the remedial action objectives. For the South Bay Asbestos site, alternatives will be developed that range from no action, to remediation of the subunits of greatest concern to remediation of all subunits. Phase I is documented in Section 2.0 of this FS.

1.4.2 PHASE II

The purpose of Phase II is to select remedial action alternatives to be analyzed in greater detail from those developed under Phase I. This is accomplished by refining the Phase I alternatives and then evaluating the alternative as a whole on the basis of effectiveness, implementability, and cost. Screening of the alternatives then occurs by comparing the results of the evaluations. Remedial alternatives with the most favorable overall evaluations are retained to undergo detailed analysis. The screening procedure should attempt to maintain representatives from the full range of treatment and containment technologies developed in Phase I. The screening procedure is provided in Chapter 3.0 of the report.

1.4.3 PHASE III

Phase III provides the basis for determining which remedy to implement. It consists of the same steps as those taken in Phase II, but since fewer remedial alternatives remain to be evaluated, the analysis is undertaken in greater detail. Nine criteria are evaluated for each alternative:

- Protection of human health and the environment

- Compliance with ARARs
- Reduction of mobility, toxicity, or volume
- Short-term effectiveness
- Long-term effectiveness
- Implementability
- Cost
- Community acceptance
- State and local agency acceptance

The results of the Phase III assessment are presented in Chapter 4.0 of the FS report.

Section 5.0 presents the preferred alternative or alternatives based on the feasibility sutdy documented in this report. A public comment period will take place allowing interested parties an opportunity to comment on this report. The EPA will issue a Record of Decision (ROD) in which the preferred Remedial Action is selected based on the comments received from the public and regulatory agencies.

2

2.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES (PHASE I)

2.1 CRITERIA FOR DEVELOPING REMEDIAL ACTION ALTERNATIVES

This section provides the methodology and rationale used to develop the site remedial action alternatives. The development and evaluation of alternatives followed the guidelines set forth in the following references:

- National Contingency Plan (NCP), in particular, 40 CFR, Section 300.68
- U.S. EPA (1986c). Interim Guidance on Superfund Selection of Remedy, December 24, 1986, Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.0-19
- U.S. EPA (1987a). Additional Interim Guidance for Fiscal Year 1987 Record of Decision, July 24, 1987, OSWER Directive No. 9355.0-21
- U.S. EPA (1988c). Draft Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, March 1988

CERCLA provides for selecting a remedial action that is protective of human health and the environment, that is cost-effective, and that attains Federal and State requirements that are applicable or relevant and appropriate (ARARs). In addition, the remedial action should utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, EPA is required to give preference to treatment remedies which permanently and significantly reduce the mobility, toxicity, or volume of hazardous substances.

Section 2.2 identifies all ARARs which, in part, are used to develop the remedial action objectives presented in Section 2.3. Appropriate general response actions are identified in Section 2.4 which meet the remedial action objectives. Corresponding technology types and process options are identified in Sections 2.5 and 2.6, respectively. Remedial action alternatives are assembled in Section 2.7 from the appropriate process options.

2.2 APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE REQUIREMENTS

2.2.1 INTRODUCTION

Under Section 121(d)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as reauthorized in 1986, remedial actions must attain a degree of cleanup which assures protection of human health and the environment. Additionally, CERCLA remedial actions that leave any hazardous substance, pollutant, or contaminant on-site must meet, upon completion of the remedial action, a level or standard of control that at least attains standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate" under the circumstances of the release. These requirements, known as "ARARs," may be waived only in certain instances specified in Section 121(d)(4) of CERCLA.

ARARs are derived from both Federal and State laws. Under Section 121(d)(2), the Federal ARARs for a site could include requirements under any of the Federal environmental laws (e.g., the Clean Air Act, the Clean Water Act, and the Safe Drinking Water Act). State ARARs include promulgated requirements under the State environmental or facility siting laws that are more stringent than Federal ARARs and have been identified to EPA by the State in a timely manner. Subparagraph 121(d)(2)(c) of CERCLA limits the applicability of State requirements or siting laws which could effectively result in the statewide prohibition of land disposal of hazardous substances, pollutants, or contaminants unless certain conditions are met.

Subsection 121(d) of CERCLA requires that Federal and State substantive requirements that qualify as ARARs be complied with by remedies (in the absence of a waiver). State requirements can by waived if a State has not consistently applied or demonstrated the intent to consistently apply a requirement in similar circumstances at other remedial actions within the State (Subparagraph 121(d)(4)(E) of CERCLA). Federal, State, or local permits do not need to be obtained for removal or remedial actions

implemented on-site (Subsection 121(e) of CERCLA). "On-site" is interpreted by EPA to include the areal extent of contamination and all suitable areas in reasonable proximity to the contamination necessary for implementation of the response action.

The definition of "applicable" and "relevant or appropriate" requirements is derived from the National Contingency Plan, 40 CFR § 300.6 (1986) ("NCP"). However, until the new revision of the NCP is promulgated to codify Section 121 of CERCLA, the definition of the July 9, 1987, EPA memorandum on ARARs (EPA, 1987b) will be used:

Applicable requirements means those cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements means cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. For example, requirements may be relevant and appropriate if they would be "applicable" but for jurisdictional restrictions associated with the requirement.

The determination of which requirements are "relevant and appropriate" is somewhat flexible. EPA and the State may look to the type of remedial actions contemplated, the hazardous substances present, the waste characteristics, the physical characteristics of the site, and other appropriate factors. It is possible for only part of a requirement to be considered relevant and appropriate. Additionally, only substantive requirements need be followed (50 Fed. Reg. 47,946 [1985]), preamble to the NCP.

There are three types of ARARs. The first type includes contaminant-specific requirements. These ARARs set limits on concentrations of specific hazardous substances, pollutants, and contaminants in the environment. Examples of this type of ARAR are ambient water quality criteria and drinking water standards. A second type of ARAR includes location-specific requirements which set restrictions on certain types of activities based on site characteristics. These include restrictions on activities in wetlands, floodplains, and historic sites. The third type of ARAR includes action-specific requirements. These are technology-based restrictions which are triggered by the type of action under consideration. Examples of action-specific ARARs are Resource Conservation and Recovery Act (RCRA) regulations for waste treatment, storage, and disposal. These specific ARARs are discussed in greater detail in Sections 2.2.3 through 2.2.5.

2.2.2 ARAR IDENTIFICATION PROCESS

ARARs must be identified on a site-specific basis from information about specific chemicals at the site, specific features of the site location, and actions that are being considered as remedies. If no ARAR covers a particular situation, or if an ARAR is not sufficient to protect public health or the environment, then non-promulgated standards, criteria, guidance, and advisories must be used to provide a protective remedy.

EPA and the State of California reviewed, respectively, Federal and State laws, standards, requirements, criteria, and limitations for possible application to the South Bay Asbestos site. Tables D.1 and D.2 in Appendix D contain a listing of the potential ARARs screened by EPA (Table D.1) and the State (Table D.2). These tables identify each potential ARAR and whether or not it is "applicable" or "relevant and appropriate." The remainder of this analysis describes the three types of ARARs in greater detail.

2.2.3 CONTAMINANT-SPECIFIC ARARs

The FS is designed to address the threats to human health and the environment as previously described in Section 1.0. The source of concern is asbestos-contaminated soil located throughout the site. The local human population and, to a lesser degree, wetland species constitute the potential receptors from exposure to the asbestos contamination. The two routes of exposure are inhalation and ingestion. The ARARs identified for the South Bay Asbestos site address emission of asbestos fibers from contaminated soils, inhalation/ingestion of asbestos fibers, and disposal of contaminated soils.

The contaminant-specific ARARs for asbestos are described below.

1. Occupational Safety and Health Administration (OSHA)

   OSHA has set a permissible exposure limit (PEL) for all asbestos fibers at 0.2 fiber per cc for occupationally exposed workers. The action level is 0.1 fiber per cc. This is the only promulgated asbestos exposure level. It is not protective for ambient exposure but must be used as an upper bound.

2. Toxic Substances Control Act (AHERA)

   The AHERA final rules apply to asbestos abatement in schools. However, the monitoring procedures described in the rules for determining absence of contamination may be applicable to determining acceptable ambient levels. Local education agencies must consider an area to contain asbestos if asbestos fibers are present in any sample at greater than one percent analyzed for the PLM method. Appropriate response actions are then required.

3. Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAPS)

   Asbestos is identified as a hazardous air contaminant. NESHAPS regulations for inactive asbestos disposal sites require "no visible emissions" or specified types of containment cover to eliminate emissions.

4. California Bay Area Air Quality Management District Regulations

   Similar to NESHAPS, this regulation (Reg. 11, Rule 2) requires "no visible emissions" and provides cover requirements and handling procedures for asbestos material.

5. California Air Resources Act, CAC Title 17, Part 3, Chapter 1

Asbestos is identified as a toxic air contaminant, although no specific exposure guidelines are promulgated. The EPA considers its risk assessment process equivalent to the state's for determining health risks.

2.2.4 LOCATION-SPECIFIC ARARs

Physical characteristics of the site influence the type and location of remedial responses considered. The location-specific ARARs identified for the site in Tables D.1 and D.2 establish consultation procedures with Federal and State agencies and may impose constraints on the location of remedial measures or require mitigation measures.

The location-specific ARARs relate to fish and wildlife, wetlands, floodplains, and activities in navigable waters. The location-specific ARARs influence the type and location of remedial alternative developed for the site.

1. National Historic Preservation Act, 40 C.F.R S6.301(b) and 36 C.F.R Part 800.

   The law requires that the EPA consider the effects of any undertaking, i.e., remedial alternative, on any structures included in The National Register of Historic Places. This is considered an ARAR at Alviso because the older section of town is a designated Historic District.

2. McAteer-Petris Act, Title 7.2, Sec. 66600, Title 14, Dov. 5, Section 10110 et seq.

   The law requires that planned alternatives be consistent with the San Francisco Bay Plan, which designates land use for bayside areas. Coordination with the Bay Conservation and Development Commission will occur as stipulated.

2.2.5 ACTION-SPECIFIC ARARs

The action-specific ARARs for the South Bay Asbestos site deal with requirements for worker safety and waste handling.

1. Occupational Safety and Health Act, 29 U.S.C. §651-678

   Federal OSHA requirements for worker safety and medical monitoring would be required during remedial activities.

2. Bay Area Air Quality Management District Regulation 11, Rule 2, 305.3.1

   Controls emissions of asbestos to the atmosphere and provides appropriate waste disposal and cover procedures. Also controls dust generation emissions during excavation and construction activities.

2.3 REMEDIAL ACTION OBJECTIVES AND CLEANUP GOALS

2.3.1 OBJECTIVES

The risk assessment (Section 1.3.4) concluded that a site-specific risk may be caused by inhalation of asbestos fibers liberated during soil disturbance. A lesser risk to human health is through incidental soil ingestion. However, the risk assessment was inconclusive because of the large uncertainties involved. No cleanup goal or action level for soil was developed because no precise relationship between soil concentration and air asbestos levels was observed. As described above, there are no ARARs specific to ambient asbestos which directly apply to the site. Thus, to protect human health and the environment, the following general remediation objectives were developed for the South Bay Asbestos Site:

- Reduction of asbestos emissions to the ambient air due to soil disturbance.
- Minimization of direct human contact with asbestos-contaminated soil.
- A long-term cost effective solution for the asbestos risk at the site.

The following rationale describes the development of specific remedial action criteria and cleanup goals for this site.

2.3.2 CLEANUP RATIONALE

The RI report (EPA, 1988b) concluded that asbestos contamination is located throughout the site in a random distribution. That is, none of the subunit areas (with the exception of the ring levee) can be called source areas with consistent high asbestos soil levels. Results of the risk assessment (Section 1.3.4) indicate that average case risks associated with ambient air at the site are within the range of 10^{-6} to 10^{-4}. The ambient air sampling upwind and downwind of the site indicated risks roughly an order of magnitude less, or 10^{-7} to 10^{-5}. The risk assessment further determined that activity such as the truck yard operations and vehicle traffic along dusty (asbestos-contaminated) streets may increase the inhalation risk considerably. The greatest risk ($>3x10^{-3}$ maximum case) is attributed to truck yard vehicle operations. Previous sampling results indicate that asbestos is present at the truck yards from 1-19 percent (PLM) and along dusty streets from 1-2 percent (PLM).

Based on these conclusions, it appears that site risk is created by disturbance of asbestos containing soils and liberation of the fibers into the air, where they can be inhaled. The greatest potential for disturbance appears to be vehicle traffic. Less effective disturbance mechanisms would be digging/excavating of the soil, followed by bicycle traffic and lastly, foot traffic. Table 2.1 is a matrix showing the site subunits ranked by soil disturbance potential, presence of nearby receptors, and estimated risk, if unremediated. The matrix indicates that the logical approach to site cleanup is to remediate the areas of greatest disturbance to achieve the greatest risk reduction. Continued remediation of areas with lower disturbance potential would presumably achieve smaller reductions in potential site risk.

Table 2.1

Qualitative Site
Remediation Ranking Matrix

Subunit	Soil Disturbance Factor[1]	Proximity to Residents[2]	Estimated Risk Ranking
Truckyards	5	5	High
Streets	5	5	High
Yards, Gardens Businesses	2-3	5	Medium
Vacant Lots	1	4	Medium-Low
Landfills	2	1	Low

NOTES:

1) 5 - corresponds to heaviest traffic/disturbance such as heavy vehicles
   1 - corresponds to no soil disturbing activity or very light sporadic pedestrian traffic

2) 5 - Corresponds to residents living in very close proximity to subunit
   1 - Corresponds to no nearby residents

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2.3.3 CLEANUP GOAL

The cleanup goal will be to remediate those subunit areas with the greatest potential for soil disturbance, in close proximity to site residents, which have detectable asbestos in soil. The presence of asbestos will be determined by on-site pre-remediation soil sampling. The pre-remediation sampling approach proposed is described in Appendix E. As discussed in the RI, precision in asbestos analysis is affected by several factors, including the physical properties of asbestos (i.e. size and shape of fibers), difficulty in obtaining a homogeneous sample, and laboratory variations such as microscope operator interpretation. The two most appropriate methods presently available, PLM and TEM, have different detection and precision levels. For PLM, the detection limit is one percent (based on field of view estimates) with an order of magnitude variance in precision. For TEM, the detection limit is much lower because of detailed fiber counting but analytical variance can be high.

From a practical standpoint, the use of PLM is recommended because the analysis can be conducted in an on-site trailer with a short turnaround time and is considerably less costly than TEM (~$50/sample vs. ~$500/sample). This cleanup goal is consistent with emergency remedial actions that have been previously conducted at the site.

2.4 GENERAL RESPONSE ACTIONS

General response actions (GRAs) are defined as those measures which will satisfy the remedial action objectives and cleanup goal described in Section 2.3. General response actions include no action, institutional actions, containment, treatment, disposal, collection. Information presented in the Interim Ring Levee OUFS (EPA, 1988a) and additional research performed during the preparation of this FS indicate that no action, containment, disposal, and institutional actions are the appropriate GRAs. Treatment response actions for asbestos are in an extremely limited state of development and are therefore inappropriate as discussed in the OUFS (EPA, 1988a). Collection response actions (i.e., pipelines, wells, etc.) are inappropriate for obvious reasons.

2.4.1 NO ACTION

SARA requires that "no action" be carried through the entire feasibility study for the purpose of providing a baseline for comparison of the "action" alternatives. Under "no action," the current status of the site would not change. Access to and disturbance of contaminated soils would still be possible and the potential for inhalation or ingestion of the asbestos would remain unchanged.

2.4.2 INSTITUTIONAL ACTIONS

Institutional response actions are legally enforceable actions developed to protect human health and the environment. Most institutional actions are in the form of deed or access restrictions, but may include simple actions such as warning signs to severe actions such as property condemnation and relocation. Institutional response actions are rarely successfully implemented, and cannot preclude continued exposure to site contaminants.

2.4.3 CONTAINMENT

Containment response actions provide a means by which contaminant migration is reduced, minimized, or eliminated by the use of a physical barrier. Containment response actions can be implemented both in-situ and above ground. "In-situ" containment generally refers to a cover system and "above ground" generally refers to removing the media and placing in a contained system such as drums, tanks, or storage bins for storage either on- of off-site. Storage implies a temporary situation.

2.4.4 DISPOSAL

Disposal response actions involve the removal of the contaminated media, containerization (optional), and placement into a secured enclosure. For CERCLA site soils, the most common disposal method is transport to a RCRA landfill. However, since site soils are not classified as hazardous under RCRA or State regulations, disposal of asbestos soils could occur at any

landfill facility. Disposal can be implemented both on- and off-site as long as all requirements are adhered to. Off-site disposal has the advantage over on-site disposal in that the risk is completely removed from the site. The off-site advantage is offset, in part, by the potential for higher risks during implementation, particularly during removal and transport.

2.5 IDENTIFICATION OF REMEDIAL ACTION TECHNOLOGY TYPES

Remedial action technology types or technologies (RATs) are defined as a subcategory of general response actions encompassing a number of remedial action process options (described in Section 2.6).

The technologies that have been identified for the South Bay Asbestos site are categorized below by general response actions and are discussed in the following subsections:

No Action	Institutional Actions
No Action	Institutional Controls
Containment	Disposal
On-Site Containment Off-Site Containment	On-Site Disposal Off-Site Disposal

2.5.1 NO ACTION

No Action, as previously discussed in Section 2.4.1, means that no remedial activities will be conducted to reduce or eliminate the hazards at the site. Periodic site monitoring may be required to evaluate risk.

2.5.2 INSTITUTIONAL CONTROLS

Institutional control technologies are intended to protect human health and the environment by limiting contact with the contaminated media through the use of legally binding restrictions. Process options associated with the institutional control technologies may include deed restrictions, access

restrictions, fencing, and warning signs. Generally speaking, implementation of institutional controls are relatively inexpensive but may be time-consuming and difficult to implement. Enforcement of the institutional controls is difficult and labor-intensive. Institutional control process options will be evaluated in Section 2.6. For the purpose of the initial screening in Section 3.0 and detailed analysis in Section 4.0, however, the process options will be grouped together and evaluated as "institutional controls" to avoid unnecessary complication of the screening process. Actual institutional controls, if any, will be determined during the design or remediation phase.

2.5.3 ON-SITE CONTAINMENT

Containment technologies are remedies that employ a physical barrier to limit the mobility of the contaminated media, thereby reducing or eliminating the mobility of the contaminant. Examples of on-site physical barriers are slurry walls, soil covers, drum storage areas, and vaults. On-site containment process options show potential for all subunits of concern and will be identified and evaluated in Section 2.6.

2.5.4 OFF-SITE CONTAINMENT

Off-site containment technologies include various storage facilities where contaminated media would be containerized and temporarily stored. Temporary storage may be necessary where no suitable alternatives are available to treat the wastes at the present time, but are foreseen in the near future. Off-site containment is generally more costly and has associated risk during implementation because of handling and transport.

For these reasons, and because temporary storage of the contaminated soil does not provide any benefit, off-site containment technologies are inappropriate for the site and will no longer be considered.

2.5.5 ON-SITE DISPOSAL

On-site disposal technologies are similar to on-site containment technologies in that they reduce the mobility of contaminants. On-site disposal, however, refers to complete and permanent encapsulation of the waste which provides a greater reduction in mobility. Landfills, complete with a liner and cap, are examples of on-site disposal technologies. On-site disposal may be a feasible technology and process options will be identified and evaluated in Section 2.6.

2.5.6 OFF-SITE DISPOSAL

Off-site disposal technologies involve the transfer of on-site waste to a secure off-site disposal facility or landfill. Off-site disposal process options include sanitary and RCRA landfills. Off-site disposal is commonly selected for many sites because it is, many times, the only technology that results in complete and permanent removal of all risk from a site. Off-site disposal process options will be evaluated in Section 2.6.

2.6 IDENTIFICATION AND SCREENING OF PROCESS OPTIONS

Process options are defined as specific processes, systems, or actions that may be used to clean up or mitigate site hazards. Process options are frequently combined to form the remedial action alternatives. In some cases, a process option by itself may be considered an alternative if it can clean up or mitigate site hazards, which is often the case at sites where only one contaminant and/or media is present. For the South Bay Asbestos site, it is possible that a process option can address a particular subunit, but highly unlikely that the same process option can address all subunits.

2.6.1 UNIVERSAL SCREENING

Table 2.2 presents a screening of all known process options for the technology types discussed in Section 2.5. The process options in this table are screened on three criteria: effectiveness, implementability, and cost. Effectiveness refers to the ability of the process option to meet the remedial action objectives, in whole or part. As an example, hydraulic barriers are only appropriate for ground water and would not provide any control of asbestos emissions or minimize potential for ingestion of asbestos contaminated soil. Therefore, hydraulic barriers are eliminated as a feasible process option. The second criterion, implementability, refers to the physical ability to construct or perform the process option. For example, an on-site landfill is highly effective at containing asbestos, but because the site is located in a flood plain, the landfill could not be soundly designed or permitted. As a result, the on-site landfill is screened out based on the inability to implement. The third and final criterion, cost, is a relative measure used to discriminate between process options within the same technology type. The two components of this criterion are capital and O&M. The ratings of low, medium, and high are used to define the relative cost. Medium refers to an average cost and low and high refer to an order of magnitude lower and an order of magnitude higher, respectively.

2.6.2 PROCESS OPTIONS

The universal screening presented in Table 2.2 identified 21 process options from which 10 have been identified as potentially feasible. These 10 process options are listed in Table 2.3 and defined in this section.

2.6.3 NO ACTION

As previously stated, No Action will be carried through the feasibility study as required by CERCLA primarily as a baseline for comparison. No action at the site does not attain ARARs and is not protective of human health and the environment.

TABLE 2.2

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
No Action					
No Action	Will not result in any risk reduction. Site would remain unchanged.	Easy to implement. Minimal administrative services required. Continuous air monitoring would be recommended.	Low	Low	Further consider in accordance with SARA.
Institutional Controls					
Warning Signs	Previous warning signs have been destroyed. More visible warning signs may last longer, and should be augmented by an effective community awareness program. Signs may reduce asbestos emissions and potential for direct human contact.	Signs would be easy to manufacture and install. Periodic replacement would be required. Continuous inspection and air monitoring would be required.	Low	Low	To be further evaluated during the design phase.
Fencing	Would reduce potential for direct human contact and may result in reduced asbestos emissions.	Fencing would be easy to install. Periodic repair/replacement would be necessary. Some areas, because of location, would not be aesthetically suitable for fencing.	Low to Medium	Low to Medium	To be further evaluated during the design phase.

TABLE 2.2 (cont.)

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
Access Restrictions	Does not physically restrict soil disturbance. If enforceable, however, access restrictions would reduce the potential for direct human contact and may result in reduced asbestos emissions.	Access restrictions would require negotiations with property owners and some minimal administrative services. Enforcement strategy would have to be determined at a later time.	Low	Low	To be further evaluated during the design phase.
Deed Restrictions	Does not physically restrict soil disturbance. More enforceable than access restrictions. If enforceable, deed restrictions would reduce the potential for direct human contact by controlling land use.	Deed restrictions would require negotiations with property owners and some more intensive administrative services such as legal counsel and enforcement support.	Low to Medium	Low	To be further evaluated during the design phase.
Property Buy-Out	Random locations throughout the site have been found to be contaminated and selective buy outs would not control or reduce potential for asbestos emissions. Total buy out would ultimately reduce risk by eliminating human contact with the site.	Difficult to implement. Potentially intensive legal activity would be required.	Low to Very High	Low	Eliminate.

TABLE 2.2 (cont.)

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
On-Site Containment					
Slurry Walls	For ground water and subsurface contaminant containment only.	N.A.	N.A.	N.A.	Eliminate.
Sheet Piling	N.A. N.A. N.A.	N.A. Eliminate.			
Grout Curtains	N.A. N.A. N.A.	N.A. Eliminate.			
Hydraulic Barriers	N.A. N.A. N.A.	N.A. Eliminate.			
Soil Cover	A commonly selected process option in containing asbestos. Highly effective at reducing emissions and potential for direct human contact by the use of a low permeability physical barrier. More effective in low activity (i.e. non-vehicular) areas. Not recommended for truck yards and other businesses.	Implementation in some areas may be difficult because of limited work space and steep slopes. In most areas, an equivalent volume of contaminated soil would have to be removed to allow for soil cover placement. Conventional equipment would be used to implement.	Medium	Medium to High	To be further evaluated.

TABLE 2.2 (cont.)

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
Asphalt Cover	Effectiveness in controlling asbestos emissions is estimated to be high. Asphalt is less permeable and more durable than soil, and, therefore better suited for areas such as the truck yards and other business.	Conventional construction methods would be used to place asphalt. Area to be asphalted would require rough grading. Manual placement may be required in confined spaces and on steep slopes.	High	Medium to High	To be further evaluated.
Concrete Cover	Effectiveness in controlling asbestos emissions is estimated to be high and comparable with the asphalt cover. Like the asphalt cover, the concrete cover is better suited for areas such as the truck yards and other businesses. Generally speaking, concrete is more durable than asphalt, but when subject to flooding and seismic activity is virtually equivalent.	Concrete is much more labor intensive to place than asphalt. Concrete placement would be performed using conventional methods. Area to be concreted would require rough grading. Manual placement may be required in confined spaces and on steep slopes. Routine maintenance is likely to be less frequent than that required for asphalt, but more costly.	High to Very High	Medium to high	Eliminate. More costly than the asphalt cover with no additional benefit.

TABLE 2.2 (cont.)

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
Soil Suppressant	Soil suppressants are temporary measures only and therefore, as a long-term solution would require frequent reapplication. Actual effectiveness of suppressants is unknown, but there is some reduction in emissions achieved. Suppressants are highly susceptible to breakdown and are not recommended for areas which encounter vehicular traffic.	Most suppressants are applied through sprays which make application very easy. Frequent reapplication would be required because of heavy activity, precipitation, seismic activity, and potential flooding. Frequent reapplication would result in high maintenance cost.	Low to Medium	High to Very High	Eliminate. Not consistent with SARA in providing a long-term, permanent solution.
Containerization	Would involve removal and placement of asbestos contaminated soil in drums or storage bins. Effectiveness of this process option is high once containerized, however, excavation and containerization could result in increased emissions during implementation.	Implementation of this process is not practical because of the large volume of soil to be containerized and stored on site. Since no treatment is available, storage of soil future treatment does not appear viable.	High	High	Eliminate. Not consistent with SARA in providing a long-term permanent solution.

TABLE 2.2

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
Vacuum Sweeping	Relatively innovative process developed from indoor asbestos abatement which utilizes a HEPA filtered vacuum apparatus. This process option has been employed in emergency response situations resulting in a high effectiveness rating. It is ideally suited for the removal of asbestos-contaminated dust/dirt located in paved areas such as the streets.	Implementation requires special, low dust generation equipment presently available from only a few vendors. This is the only process option available for the streets subunit.	High	High	To be further evaluated.
<u>On-Site Disposal</u>					
Landfill (Class I - Class III)	Could be effective with careful management and maintenance. Potential for site risk would remain. Potential for asbestos emissions during construction would be high.	High ground water levels at the site do not permit the construction of a Class III landfill. Implementation would be difficult because of inconsistency with current land use and difficulty in obtaining required approvals and community acceptance.	High	High	Eliminate.

TABLE 2.2

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
Off-Site Disposal					
Class I (RCRA) Landfill	Off-site RCRA landfills would encapsulate asbestos-contaminated soil. With this process option, all contaminated soil would be completely removed from the site, thereby eliminating future risks. Like containerization, would be a potential for asbestos emissions during implementation.	This process option can be implemented with conventional, readily available construction equipment. Depending on the quantity or volume to be disposed of, more than one RCRA landfill may be required.	Very High	None	To be further evaluated.
Class III Solid Waste Landfill	With respect to asbestos, Class III landfills provide an equivalent level of effectiveness as RCRA landfills.	Implementation of this process option may be more difficult than the off-site RCRA landfill because of the reluctance of individual Class III landfills to accept the soil. Of all landfills contacted locally only one expressed interest in accepting the waste.	High	None	To be further evaluated.

TABLE 2.2

UNIVERSAL SCREENING OF PROCESS OPTIONS

Process Option	Effectiveness	Implementability	Cost		Result of Screening
			Capital	O&M	
Deep Well Injection	For ground water only	N.A.	N.A.	N.A.	Eliminate.

TABLE 2.3

POST-UNIVERSAL SCREENING OF PROCESS OPTIONS

NO ACTION
No Action
ON-SITE CONTAINMENT
Soil Cover Asphalt Cover Vacuum Sweeping
INSTITUTIONAL CONTROLS
Warning Signs Fencing Access Restrictions Deed Restrictions
OFF-SITE DISPOSAL
Landfill Facility (Class I - Class III)

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2.6.4 INSTITUTIONAL CONTROLS

The four process options (warning signs, fencing, access restrictions, and deed restrictions) will be discussed as a single group referred to as institutional controls. Actual institutional controls will be decided upon during either the design phase or remediation phase, based on soil disturbance potential and the pre-remediation sampling results.

Warning signs and fencing are self-explanatory. Access restrictions are verbal or written agreements made between an agency and property owner to limit access by pedestrian and vehicular traffic across a contaminated area in the event no action or a less durable (i.e., thin versus thick soil cover) alternative was to be implemented. A deed restriction is a written and recorded document kept on file in the County Assessor's office. A deed restriction may contain a number of restrictions related to activity on a particular property.

2.6.5 SOIL COVER

The Soil Cover process option consists of placing a minimum of six inches of clean soil over the asbestos-contaminated soil and revegetating. If revegetation is not desirable, the cover thickness must be increased to a minimum of 18 inches. These minimum cover requirements are consistent with NESHAPs regulations. A soil cover system will prevent direct human contact and significantly reduce the potential for asbestos emissions.

The Soil Cover process option by itself may be a feasible alternative for the Landfills, Vacant Lots, and Yards, Gardens, and Businesses subunits. A soil cover is not feasible for the Truck Yards subunit because of the high use at the truck yards. The Streets subunit consists of paved streets with dust piles located along the edges, therefore, a soil cover is not applicable in these areas.

2.6.6 ASPHALT COVER

The Asphalt Cover process option involves the placement of an asphalt cover over contaminated areas to prevent direct human contact and minimize the potential for asbestos emissions. The thickness of the asphalt cover will be designed in accordance with engineering specifications based on use at the particular subunit.

Since asphalt has a higher wearability rating than soil, it may be feasible for the Truck Yards subunit in addition to the Landfills, Vacant Lots, and Yards, Gardens, and Businesses subunits. An asphalt cover is not appropriate for the Streets subunit since the streets are already paved and in good condition. For the truck yards, the asphalt cover will be an engineering design that may require a sub-base material such as gravel and a prepared subgrade such as sand or sandy soil. Asphalt thickness design is discussed in Sections 3.0 and 4.0.

2.6.7 VACUUM SWEEPING

Vacuum Sweeping is a process option which involves a vacuum system to remove dust and debris. Several vacuum systems are available from conventional street sweepers to innovative filtered, low dust generation asbestos vacuums. The vacuum systems are available as truck mounted, self-contained units or trailer-mounted units which utilize hoses and wands similar to household vacuums.

Because of the nature of asbestos fibers, a trailer mounted unit or low dust generation, self-contained unit is recommended. The unit should be equipped with a filter system capable of trapping asbestos fibers. The Vacuum Sweeping process option is only necessary along paved streets and will not be considered for any of the other subunits.

2.6.8 OFF-SITE LANDFILL

The Off-Site Landfill process option consists of excavating contaminated soil and transporting to a disposal facility. The contaminated soil would be transported via truck using plastic or tarps to prevent dust emissions. The excavated area would be restored to original grade and revegetated or resurfaced. Although any landfill can accept the soil under State of California regulations, RCRA (Class I) landfills may be the only available disposal sites. Nearly all Class II and Class III landfills contacted within 75 miles of the site refused to accept the material.

2.7 DEVELOPMENT OF ALTERNATIVES

Table 2.4 presents the six feasible process options defined in Section 2.6 and their application to the five subunits of concern. With the exception of No Action, none of the process options can function solely as a sitewide alternative (i.e. a single process option is not applicable for all subunits). The next step in the development of remedial action alternatives is to combine process options to provide complete site remediation, consistent with the objectives and cleanup goals in Section 2.3. No action will be carried through the evaluation as a basis for comparison as Alternative No. 1.

The matrix presented in Section 2.3 (Table 2.1) indicates the subunit areas ranked by estimated risk. The alternatives to be evaluated have been developed in order of increasing effectiveness or risk reduction. The degree of effectiveness (protectiveness) ranges from Alternative No. 2 which addresses the Truck Yards and Streets subunits, estimated to be those areas with the highest risk (1×10^{-3}), to Alternative No. 5 which removes all potential risk. The alternatives have been developed as follows:

Alternative No. 1 - No Action

Alternative No. 2 - Asphalt Cover on Truck Yards/Vacuum Sweeping of Streets/Offsite Disposal of Waste Material as Required/ Institutional Controls

TABLE 2.4

FEASIBLE PROCESS OPTIONS

Process Option	Landfills	Truck Yards	Streets	Vacant Lots	Yards, Gardens, and Businesses
No Action	X	X	X	X	X
Institutional Controls	X	X		X	X
Soil Cover	X			X	X
Asphalt Cover	X	X			X
Vacuum Sweeping			X		
Off-Site Landfill	X	X		X	X

288.15:10

Alternative No. 2 is a combination of an asphalt cover for the truck yards and vacuum sweeping for the streets. In order to place asphalt in most truck yards in accordance with proper engineering design and drainage grading would occur. Some existing soil may have to be excavated and disposed of either on or off-site to avoid mounding which would result in structural instability and potential runoff into the adjacent wetlands. Furthermore, in order to ensure that the integrity of the asphalt cover is maintained for the design life, institutional controls in the form of deed restrictions and maintenance agreements would be employed. This alternative also includes deed restrictions at the landfills and inspection and verification that the landfills subunit has sufficient cover to meet NESHAPs regulations. Also, any asbestos source material such as pipes, like the material found at the O'Neill Tract (EPA, 1988b) would be collected and disposed of off-site.

Alternative No. 3 - Asphalt Cover on Truck Yards, Sainte Claire Landfill, and 50 Percent of Businesses/Soil Cover on 50 Percent of Remaining Contaminated Areas/Vacuum Sweeping of Streets/Offsite Disposal of Waste Material As Required/ Institutional Controls

The third alternative addresses approximately half of the areas of medium to low risk identified in Table 2.1, in addition to the truckyards and streets. These areas would include parking lots of businesses subjected to occasional vehicle traffic, the Sante Claire Landfill used occasionally for vehicle parking, and yards/lots used by children. For these areas or subunits, a soil cover is the most feasible process option, with the exception of the Sainte Claire Landfill and business parking lots, where an asphalt cover is better because of the relatively higher use. Deed restrictions would be implemented, particularly for the landfills, to control potential exposure.

Alternative No. 4 - Asphalt Cover on Truck Yards, Sainte Claire Landfill, and 100 Percent of Businesses/Soil Cover on 100 percent of Remaining Contaminated Areas/Vacuum Sweeping of Streets/Offsite Disposal of Waste Material As Required/ Institutional Controls

The fourth alternative is similar to Alternative No. 3 except that 100 percent of the site with detectable asbestos would be remediated including those areas with very low chance for soil disturbance. Alternative No. 4 would therefore address risk levels down to or below background risk levels.

Alternative No. 5 - Off-Site Landfill of All Contaminated Soil Above 1 Percent (PLM)/Vacuum Sweeping of Streets

The fifth and final alternative involves the excavation and off-site disposal of all contaminated soil above the PLM detection limit of one percent (PLM). The excavated areas would be restored to pre-remediation condition (i.e. no improvements such as asphalt covers or vegetation would be included). This alternative would remove all potential risk at the site and there would be no need for institutional controls or maintenance.

The five alternatives developed will be screened in Section 3.0 on the basis of effectiveness, implementability, and cost. The alternatives passing the initial screening of Section 3.0 will be evaluated in detail in Section 4.0 on the basis of the following criteria:

- Protection of human health and the environment;
- Compliance with legally applicable or relevant and appropriate requirements (ARARs);
- Reduction of toxicity, mobility, or volume;
- Short-term effectiveness;
- Long-term effectiveness and performance;
- Implementability;

- Cost;
- Community acceptance; and
- State and Local agency acceptance.

The alternatives passing the detailed evaluation will proceed through a public and agency comment period and be refined based on comments received.

3.0 INITIAL SCREENING OF REMEDIAL ACTION ALTERNATIVES

3.1 GENERAL

This Section provides an initial screening of the five alternatives identified in Section 2.7 as potentially feasible, based on a preliminary screening of process options. This screening is based on an evaluation of effectiveness, implementability and cost like the process option screening, but this screening is used to evaluate alternatives that provide sitewide remediation. The five alternatives, listed below, were developed in accordance with the requirements of the National Oil and Hazardous Substance Contingency Plan (NCP) (40 CFR 300,68) and CERCLA.

Alternative No. 1 - No Action.

Alternative No. 2 - Asphalt Cover on Truck Yards/Vacuum Sweeping of Streets/Off-Site Disposal of Waste Material as Required/Institutional Controls.

Alternative No. 3 - Asphalt Cover on Truck Yards, Sainte Claire Landfill, and 50 Percent of Businesses/Soil Cover on 50 Percent of Remaining Contaminated Areas/Vacuum Sweeping of Streets/Off-Site Disposal of Waste Material as Required/Institutional Controls.

Alternative No. 4 - Asphalt Cover on Truck Yards, Sainte Claire Landfill, and 100 Percent of Businesses/Soil Cover on 100 Percent of Remaining Contaminated Areas/Vacuum Sweeping of Streets/Off-Site Disposal of Waste Material as Required/Institutional Controls.

Alternative No. 5 - Off-Site Landfill of All Contaminated Soil Above 1 Percent (PLM)/Vacuum Sweeping of Streets.

The RI/FS Guidance (EPA, 1988c) states that for source control actions the following types of alternatives should be developed to the extent practicable:

- A number of treatment alternatives ranging from one that would eliminate, or minimize to the extent feasible, the need for long-term management (including monitoring) at a site, to one that would use treatment as a primary component of an alternative to address the principal at threats at the site.

- One or more alternatives that involve containment of waste with little or no treatment but protect human health and the environment by preventing potential exposure and/or by reducing the mobility.

- A No Action alternative.

As indicated in Section 2.4, treatment technologies/process options for asbestos are in a very limited state of development and, therefore, no treatment alternatives have been developed. Alternative No. 5, however, does meet the treatment alternative requirement of eliminating or minimizing the need for long-term management at the site.

3.2 CRITERIA FOR INITIAL SCREENING

Each alternative will be screened on the basis of three evaluation criteria: effectiveness, implementability, and cost. These evaluation criteria are defined as follows:

1. Effectiveness

   Effectiveness is defined as the ability to meet the remedial action objective(s) for both short-term and long-term durations. Short-term refers to the construction/implementation period and long-term refers to the period after the remedial action is complete through the intended design life (30 years).

   In specific terms, effectiveness is the measure of protectiveness to human health and the environment. Protectiveness is achieved through the reduction of toxicity, mobility, or volume. The measure of protectiveness is the level to which toxicity, mobility, or volume can be reduced. Since containment alternatives have been determined to be the only potentially feasible alternatives at this stage in the FS process, reductions in toxicity or volume are not anticipated.

   Effectiveness for this FS is, therefore, defined as the reduction in mobility (or level of containment) of asbestos in order to minimize the potential for inhalation (i.e., airborne asbestos) and direct human contact (i.e., exposed asbestos).

2. Implementability

Implementability is defined as the technical and administrative feasibility of constructing/implementing, maintaining, and operating a remedial action alternative. Technical feasibility refers to the availability of technologies/process options, materials, equipment, skilled personnel, etc. that each alternative would employ. Administrative feasibility refers to the ability to obtain permits for offsite actions and support from other offices and agencies to implement, operate, and maintain the alternatives.

3. Cost

The cost estimates prepared at this level of evaluation are intended to provide an order-of-magnitude level of accuracy which is defined by the American Association of Cost Engineers to be +100/-50 percent. Appendix F provides the preliminary cost analysis for each alternative. Capital and operation and maintenance (O&M) cost have been estimated and used to determine the present worth costs. For the purposes of this FS, the total capital cost includes mobilization at 25 percent of the subtotal capital cost and a 20 percent contingency in addition to 15 percent for engineering and construction management services. The mobilization cost includes all health and safety requirements in addition to the typical mobilization costs.

3.3 INITIAL SCREENING

3.3.1 ALTERNATIVE NO. 1 - NO ACTION

Description

Under this alternative, no remedial action would occur at the site or subunits to minimize the threat to human health and the environment. Periodic monitoring would be the only activity that would occur at the site. As a minimum, air monitoring would occur every five years as part of the required Public Health Evaluation (PHE) which is conducted to assess ongoing risks to human health and the environment (42 U.S.C. Section 9621(c).

Effectiveness

The No Action alternative serves as a baseline for comparison of other remedial alternatives. The risk at the South Bay Asbestos site is associated with inhalation of airborne asbestos generated from the disturbance of asbestos-contaminated soils, with possible ingestion of the asbestos-contaminated soils. The No Action alternative would not reduce this risk of exposure, nor would it meet the remedial action objective to control emissions and minimize human contact.

Implementability

Since monitoring is the only activity that would be conducted, implementability would be straightforward. It is anticipated that an air monitoring/sampling plan would be developed which would identify the number, location, and sampling frequency necessary to adequately conduct the 5-year PHE. Soil sampling may also be included in order to assess risks from direct human contact.

At this stage, it is not known whether State or local agencies would accept the No Action alternative. Agency participation would be required to determine responsibilities for site monitoring, quality assurance/quality control procedures, and funding.

Cost

The present worth cost of the No Action alternative is estimated to be $49,000. Capital costs would consist of miscellaneous administrative costs that are, for all practical purposes, negligible. Costs include 5-year interval air sampling and analysis, and reevaluation of the existing risk assessment (PHE). Costs are presented in Appendix F.

3.3.2 ALTERNATIVE NO. 2 - ASPHALT COVER ON TRUCK YARDS/VACUUM SWEEPING OF STREETS/OFF-SITE DISPOSAL OF WASTE MATERIAL AS REQUIRED/INSTITUTIONAL CONTROLS

Description

Alternative No. 2 targets the control of asbestos emissions in the highest activity areas. The alternative consists of placing an asphalt pavement of 8 to 14 inches in thickness over all the unpaved, asbestos-contaminated truck yards (i.e. greater than or equal to 1 percent (PLM)) and vacuum sweeping of at least the designated truck route streets. In order to assure proper grade and drainage within the truck yards, a small volume of the contaminated soil may be excavated as required and disposed of either on- or off-site. The dust and debris collected from vacuum sweeping would be disposed of in an off-site landfill, as well as obvious asbestos sources such as pipes. Institutional controls would be implemented at the truck yards to ensure long-term performance of the asphalt through routine maintenance. Landfill areas would be inspected to assure compliance with NESHAPS regulations, and additional cover would be added as required. Deed restrictions would be implemented to assure no future disturbance of the landfill areas.

Vacuum sweeping consists of sweeping dusty, paved roadways with a filtered, low dust generation vacuum unit or HEPA (High Efficiency Purifying Apparatus) vacuum system. HEPA systems are presently available as trailer-mounted units similar to a canister vacuum with a hose and wand attachment similar to a household vacuum. The actual sweeping would be conducted manually with the trailer following close behind. Truck-mounted HEPA units could also be fabricated which would increase productivity, however, manual assistance would be necessary to remove large pieces of debris and to access confined areas.

Effectiveness

Paving of the truckyards would address the areas with the highest potential for soil disturbance, and subsequent inhalation exposure. The asphalt cover would provide an impermeable cover that would eliminate asbestos emissions and prevent direct human contact for an indefinite period with regular maintenance, thus providing long-term effectiveness and protectiveness. Regular maintenance would be critical to the effectiveness of this alternative because asphalt is susceptible to rapid deterioration resulting from photodegradation (UV light) and moisture (i.e. precipitation and flooding), in addition to normal wear by traffic. Vacuum sweeping would be conducted as a one-time operation to remove dust and debris from the streets, completely eliminating exposure associated with disturbance of soils in the Streets subunit. Some asbestos emissions to the air would occur during implementation of the alternative, but dust suppression methods would be employed to minimize emissions during the short term.

Alternative No. 2 would reduce the mobility of asbestos at the site, but would not decrease asbestos toxicity or volume. This alternative meets the remedial action objectives to reduce asbestos emissions to the ambient air, minimize potential for direct human contact and provide a long-term cost-effective solution.

Implementability

Implementation of Alternative No. 2 would commence with the removal of dust and debris from the streets along the designated truck routes, followed by asphalt paving of the truck yards, followed by vacuuming of all streets to remove any dust deposited during remedial actions. Obvious asbestos sources such as pipe debris would be identified and removed. It is estimated that this alternative could be completed within one year.

There are no anticipated problems with respect to technical and administrative feasibility. Two of five street sweeping equipment manufacturers contacted manufacture "asbestos-specific" vacuum systems

(i.e. HEPA vacuums) and there are at least three remedial action contractors in the area with experience in operating these systems. During the design phase, it is recommended that the available vacuum systems should be evaluated and that performance specifications should be developed. Asphalt paving would be implemented utilizing conventional construction methods. Several asphalt paving contractors are located in the vicinity.

Disposal of the small amount of asbestos material and excess soils anticipated would be permitted at Class III municipal landfills by the California Department of Health Services, and the California Waste Management Board, since the material is non-friable waste. However, municipal landfills contacted regarding disposal of the contaminated soil declined to accept the material, presumably because it is a Superfund waste. The nearest RCRA-approved landfill (Class I), Chemical Waste Management-Kettleman Hills, will accept the contaminated soil in double-lined containers. Class I disposal has been assumed, because of the apparent unavailability of Class III disposal sites. However, during design a closer and less expensive municipal landfill or other suitable disposal site may be found.

Routine maintenance of the asphalt would consist of filling cracks and potholes and periodic resurfacing. The responsibility for regular maintenance would have to be established and the frequency of maintenance would be dependent upon truck yard activity.

Cost

The total present worth cost of Alternative No. 2 is estimated to be $9,957,000. Capital costs are estimated to be $7,353,000 and include the cost of fabricating a HEPA mobile vacuum unit. O&M costs are estimated to be $145,000/year (over 30 years) and include the cost of routine pavement repair (see Appendix F).

3.3.3 ALTERNATIVE NO. 3 - ASPHALT COVER ON TRUCK YARDS, SAINTE CLAIRE LANDFILL, AND 50 PERCENT OF BUSINESS/SOIL COVER ON 50 PERCENT OF REMAINING CONTAMINATED AREAS/VACUUM SWEEPING OF STREETS/OFF-SITE DISPOSAL OF WASTE MATERIAL AS REQUIRED/INSTITUTIONAL CONTROLS

Description

Alternative No. 3 consists of covering/containing both the highest activity areas (Alternative No. 2, above) and a portion of the lower activity areas. Specifically, all asbestos-contaminated truck yards, the Sainte Claire Landfill, and 50 percent of the asbestos-contaminated businesses would be paved with asphalt of varying thickness, depending on the level of activity. Asphalt paving of the Sainte Claire Landfill was selected because of the trucking and heavy equipment activity observed on both parcels. Fifty percent of the vacant lots, yards, and gardens would be covered with a minimum of 6-inches of soil. Fifty percent of the asbestos-contaminated areas with the YG&B and vacant lots subunit represents approximately 30 percent of the total site area within the subunits, based on previous sampling data and data collected during the RI. The streets would be remediated by vacuum sweeping. All excavated asbestos-contaminated soil would be transported and disposed of in an off-site landfill. Institutional controls would be implemented to ensure routine maintenance and prevent unmonitored activity, particularly in the YG&B and vacant lots subunits. Deed restrictions would be implemented at the landfills, as in Alternative No. 2.

Effectiveness

Alternative No. 3 provides an elevated level of effectiveness over Alternative No. 2 because more areas would be covered, thereby reducing the potential for asbestos emissions and subsequent inhalation of fibers or direct human contact. Increased asbestos exposure could occur during implementation since remediation would take place within the residential areas (i.e. front- and backyards, gardens, etc.). Dust control measures would be used to minimize any increase. The long-term effectiveness would be heavily dependent upon the ability to enforce the institutional controls that would ensure maintenance and prevent unmonitored soil-disturbing

activity. This alternative would reduce the mobility of asbestos over roughly half of the community.

Implementability

Implementation of Alternative No. 3 would commence with the removal of dust and debris from the streets along the designated truck routes; followed by asphalt paving of the truck yards, Sainte Claire Landfill, and 50 percent of the businesses; followed by removal of asbestos sources; followed by placing a soil cover over 50 percent of the asbestos-contaminated yards, gardens, and vacant lots; followed by vacuuming of all streets to remove any dust deposited during remedial actions. It is estimated that this alternative would require approximately three years to implement.

The only foreseen difficulty with this alternative would be the ability to access yards and gardens because of spatial and logistical constraints. It may be necessary to construct soil covers in these areas with small-scale power equipment or by hand. The result would be reduced productivity but additional labor would be readily available and more crews could be established if necessary.

Asphalt paving, vacuum sweeping, and asbestos-contaminated soil transport and disposal would be performed as discussed for Alternative No. 2 in Section 3.3.2. The soil cover would be constructed utilizing conventional equipment and readily available materials. The cover thickness would vary depending on activity and property owner preference. In accordance with National Emissions Standards for Hazardous Air Pollutants (NESHAP) the cover thickness would either be 6-inches of soil with vegetation or 24-inches of soil without vegetation. These cover thicknesses have been used consistently at other asbestos contamination sites. In order to place the soil cover, a volume of contaminated soil would be removed as required and disposed of to avoid mounding and provide an aesthetically acceptable remediation.

Routine maintenance for the asphalt would consist of filling cracks and potholes, and periodic resurfacing. The soil cover would require yearly inspections, and maintenance would consist of additional fill in the event of settlement, revegetation, and temporary irrigation. Oversight would be required for any remediated areas in which subsurface activity was to be conducted (i.e. tree planting, construction, etc.).

Cost

The total present worth cost of Alternative No. 3 is estimated to be $39,153,000. Capital costs are estimated to be $34,400,000 and O&M costs are estimated to be $267,000/year. Capital cost would include all materials, labor, and equipment to place the covers and vacuum sweep. O&M cost would include the cost of all maintenance items discussed above (see Appendix F).

3.3.4 ALTERNATIVE NO. 4 - ASPHALT COVER ON TRUCK YARDS, SAINTE CLAIRE LANDFILL, AND 100 PERCENT OF BUSINESS/SOIL COVER ON 100 PERCENT OF REMAINING CONTAMINATED AREAS/VACUUM SWEEPING OF STREETS/OFF-SITE DISPOSAL OF WASTE MATERIAL AS REQUIRED/INSTITUTIONAL CONTROLS

Description

Alternative No. 4 is identical to Alternative No. 3 except that Alternative No. 4 serves to remediate all asbestos-contaminated areas. One hundred percent of the asbestos-contaminated areas represents approximately 60 percent of the total site area based on previous sampling data and data collected during the RI.

Effectiveness

Alternative No. 4 provides an elevated level of effectiveness over Alternative No. 3 since all potential asbestos emission sources would be contained. With routine maintenance, Alternative No. 4 would provide a long-term and permanent solution by minimizing asbestos emissions and potential for direct human contact.

Implementability

Implementability for Alternative No. 4 is as discussed for Alternative Nos. 2 and 3. The time required to implement this alternative is estimated to be 6 years.

Cost

The total present worth cost of Alternative No. 4 is estimated to be $67,825,000. Capital costs are estimated to be $61,133,000 and O&M costs are estimated to be $337,000/year (see Appendix F).

3.3.5 ALTERNATIVE NO. 5 - OFF-SITE LANDFILL OF ALL CONTAMINATED SOIL ABOVE ONE PERCENT (PLM)/VACUUM SWEEPING OF STREETS

Description

Alternative No. 5 was developed to provide the highest level of protection through removal of all asbestos-contaminated soil from the site, thereby eliminating all risk once completed. Asbestos has been detected in the ground water which rises to within approximately five feet of the surface on the average. The risk assessment (EPA, 1988b) concluded that the risk from the asbestos in ground water was negligible since an exposure pathway does not exist. It has, therefore, been assumed that removal of the asbestos-contaminated soil below the high water level would not be necessary. The areal extent of removal has been assumed to be 100 percent of the contaminated area or approximately 230 acres to a depth of 5 feet, for a total volume of approximately 1.9 million cubic yards.

The areas of highest activity (i.e. truck yards and businesses) would be remediated first, followed by the less active areas. This alternative would consist of excavation, transport, and disposal of all asbestos-contaminated soil in an off-site landfill, and restoration of the excavated areas to pre-remediation conditions. Vacuum sweeping would be utilized to remediate the paved roadways.

Effectiveness

Alternative No. 5 is the most protective long-term remedy for the site. With all asbestos-contaminated soil removed from the site, no risks would remain. No institutional controls would be required unless excavation below 5 feet would be necessary. In general, most utilities and building foundations would not exceed five feet in depth.

The greatest concern associated with this alternative is the short-term effectiveness. Since 1.9 million cubic yards would be excavated, the risks associated with inhalation and direct human contact during implementation would be increased considerably. Dust control and fencing would reduce the potential risks, but they would still be greater than those associated with the other alternatives, primarily because of the volume and increased time required for implementation (approximately eight years).

Implementability

Alternative No. 5 would be implemented utilizing conventional construction techniques, material, and equipment. Potential problems associated with this alternative are: (1) the availability of landfill capacity, (2) the availability of transporters, and (3) the excavation of soil around buildings and other structures.

The first two concerns are dependent upon the actual volume and the schedule for implementation. Presently, Kettleman Hills was the only landfill contacted willing to accept the soil with the capacity to accept the full 1.9 million cubic yards. To complete remediation within eight years, approximately 100 - 15 cubic yard capacity trucks would be required daily, five days per week. This would result in a considerable inflow/outflow of traffic at the site and would require 50 trucks to make two round trips daily, assuming disposal at Kettleman Hills. If the soil would have to go out of state because of limited capacity at Kettleman Hills, the number of trucks in the fleet could be as high as 500. Implementation time could be increased to reduce this number, however, cost would increase significantly.

Excavation around buildings and structures poses potential problems since most foundations are located above the 5-foot excavation depth. Many of the buildings are sitting on piers or were built on slabs. Geotechnical and structural engineering services would be required on a building-by-building basis to assess the integrity of each building or structure. Underground utilities would also have to be supported during excavation.

Cost

The total present worth cost of Alternative No. 5 is estimated to be $543,534,000. The capital cost includes the cost of engineering services for assessing the integrity of the buildings and structures and the cost for supporting the buildings, structures, and utilities. O&M cost is estimated to be negligible since all asbestos material would be removed from the site (see Appendix F).

3.4 SUMMARY

Table 3-1 presents a summary of the initial screening of the five alternatives identified as potentially feasible. Generally speaking, all the alternatives, excluding No Action, are feasible at the South Bay Asbestos site. Alternative Nos. 4 and 5 provide the greatest level of protection, with No. 5 being greater than No. 4. Because the cost of No. 5 is nearly an order of magnitude higher than No. 4 with similar levels of effectiveness, Alternative No. 5 will no longer be considered. The remaining four alternatives will be evaluated in detail in Section 4.0.

TABLE 3-1

INITIAL SCREENING SUMMARY

Alternative	Effectiveness	Implementability	Cost			Result of Screening
			Present Worth	Capital	O&M	
No. 1	Does not meet Remedial Action Objectives (RAOs) and it is not protective.	Easily implemented	$49,000	---------	----------	Consider further in accordance with SARA.
No. 2	Highly effective at controlling asbestos emissions from highest activity areas. Meets the remedial action objectives.	Easiest to implement of the action alternatives. No problems anticipated.	$9,957,000	$7,353,000	$145,000/yr	Consider further
No. 3	More effective than Alternative No. 2 because more areas would be covered. Increased, but controllable, risk would be incurred because of increased soil disturbance and proximity to residences.	Access to confined areas would require small-scale equipment or hand work. Reduced productivity would result.	$39,153,000	$34,400,000	$267,000/yr	Consider further.
No. 4	More effective than Alternative no. 3 because 100 percent of the asbestos-contaminated soil would be covered. With routine maintenance and enforcement of institutional controls, Alternative No. 4 would provide a level of effectiveness equivalent to Alternative No. 5.	Access to confined areas would require small-scale equipment or hand work. Reduced productivity would result.	$67,825,000	$61,133,000	$377,000/yr	Consider further
No. 5	Overall, Alternative No. 5 is the most effective alternative. During implementation, Alternative No. 5 would pose the highest risk because of the volume of soil that would be handled. However, all potential risk would be removed from the site and there would be no need for institutional controls.	Capacity of the receiving landfill and availability of trucks directly affects the implementation of this alternative. Excavation around buildings land structures would be very difficult and costly.	$543,534,000	$543,534,000	----------	Cost is an order of magnitude greater than Alternative No. 4 which offers an equivalent level of protectiveness. Therefore, delete from further consideration in accordance with RI/FS guidance.

4

4.0 DETAILED ANALYSIS OF SELECTED REMEDIAL ACTION ALTERNATIVES

4.1 GENERAL

Section 3.0 provided an initial screening of the following alternatives based on general responses to effectiveness, implementability, and cost:

- Alternative No. 1 - No Action
- Alternative No. 2 - Asphalt Cover on Truck Yards/Vacuum Sweeping of Streets/Off-Site Disposal of Waste Material As Required/Institutional Controls
- Alternative No. 3 - Asphalt Cover on Truck Yards, Sainte Claire Landfill, and 50 Percent of Businesses/Soil Cover on 50 Percent of Remaining Contaminated Areas/Vacuum Sweeping of Streets/Off-Site Disposal of Waste Material As Required/Institutional Controls
- Alternative No. 4 - Asphalt Cover on Truck Yards, Sainte Claire Landfill, and 100 Percent of Businesses/Soil Cover on 100 Percent of Remaining Contaminated Areas/Vacuum Sweeping of Streets/Off-Site Disposal of Waste Material As Required/Institutional Controls
- Alternative No. 5 - Off-Site Landfill of All Contaminated Soil Above 1 Percent (PLM)/Vacuum Sweeping of Streets

Alternative No. 5 was screened out on the basis of cost.

The final phase in the FS process is the detailed analysis of alternatives passing the initial screening. The detailed analysis provides decision makers with sufficient information to use as a basis for selecting alternatives that are protective of human health and the environment and meet the objectives of the EPA, state, and local agencies, and the community, to the maximum extent practicable.

The detailed analysis consists of the following components:

- Development of additional information for each alternative with respect to the volumes or areas of contaminated media to be addressed, the technologies to be used, and any performance requirements associated with those technologies.

- An assessment and a summary of each alternative against the nine evaluation criteria, with respect to each subunit, discussed in the following section.
- A comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criterion.

4.2 CRITERIA FOR DETAILED ANALYSIS

The detailed analysis includes an analysis of the nine criteria presented below which encompass technical, cost, and institutional considerations; compliance with specific statutory requirements; and state/local agency and community acceptance.

- Short-term effectiveness
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume
- Implementability
- Cost
- Compliance with ARARs
- Overall protectiveness
- State and local agency acceptance
- Community acceptance

Evaluation of the nine criteria is consistent with the latest EPA guidance under CERCLA, including the revised Preliminary Review Draft NCP (10/14/87), OSWER Directives 9355.0-19 (Interim Guidance on Superfund Selection of Remedy, 12/24/86) and 9355.0-21 (Additional Interim Guidance for FY '87 Records of Decision, 7/24/87).

Each criterion is described in the following subsections.

4.2.1 SHORT-TERM EFFECTIVENESS

The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation period until response objectives have been met. In particular, this criterion examines the remedial activities associated with each alternative that may result in increased risks from ingestion or inhalation of asbestos. This evaluation is limited to a qualitative analysis based on assumed activities. Worker safety is also considered.

4.2.2 LONG-TERM EFFECTIVENESS AND PERMANENCE

The assessment of alternatives against this criterion evaluates the long-term effectiveness of alternatives in protecting human health and the environment from the time the response objectives have been met until the end of the design life and beyond. The adequacy and reliability of long-term maintenance and controls are considered. The assessment of the magnitude of remaining risk is limited in this study to a qualitative analysis.

4.2.3 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME (TMV)

Reduction of TMV is achieved through treatment of wastes. Since treatment is not feasible for the asbestos-contaminated soil, only reduction in mobility will be evaluated. Reduction of mobility is defined as the containment of asbestos in order to reduce, minimize, or eliminate the potential for airborne asbestos (i.e., inhalation pathway) and direct human contact (i.e., ingestion pathway).

4.2.4 IMPLEMENTABILITY

This criterion evaluates the technical and administrative feasibility of constructing and operating the alternative. In particular, this criterion evaluates administrative feasibility, technical feasibility including physical ability to implement and construction methods, and availability of services and materials, including experienced personnel.

4.2.5 COST

This criterion evaluates the capital, operations and maintenance (O&M), and present worth costs of each alternative. Capital costs include direct (construction) and indirect (nonconstruction and overhead) costs. Direct capital costs would include cost of materials, labor, equipment, land and site development, buildings, services, utilities, transport and disposal. Indirect capital costs may include engineering design, startup and shakedown costs, contingency allowances, legal fees and administrative costs. O&M are the yearly costs to ensure the continued effectiveness of a remedial action. These may include maintenance, labor, services, and periodic site reviews. Present worth costs are presented, by discounting all future costs to the current, or base, year. The costs represent an accuracy of -30/+50 percent based on available information. Detailed costs are presented in Appendix G.

4.2.6 COMPLIANCE WITH ARARs

The assessment against this criterion describes how the alternative complies with ARARs, or if a waiver is required and how it is justified. The assessment includes information from advisories, criteria, and guidance that the lead and support agencies have agreed is necessary and appropriate.

4.2.7 OVERALL PROTECTION

This criterion evaluates the ability of the alternative to protect and maintain protection of human health and the environment. The analysis indicates how each source of contamination is eliminated, reduced, or controlled for each alternative. This criterion is, in effect, a summary of the first three criteria.

4.2.8 STATE AND LOCAL AGENCY ACCEPTANCE

This criterion evaluates potential comments or concerns from state and local agencies. Since actual comments or concerns will be unknown until after the public comment period, this criterion will be addressed in general terms only. Comments/concerns received during the public comment period will be responded to in the Responsiveness Summary.

4.2.9 COMMUNITY ACCEPTANCE

This criterion evaluates the community's comments or concerns. Like the preceding criterion, however, actual community comments/concerns will not be known until after the public comment period, so the discussion will be presented in general terms. Comments/concerns received from the community during the public comment period will be responded to in the Responsiveness Summary.

4.3 DETAILED ANALYSIS OF ALTERNATIVES

4.3.1 ALTERNATIVE NO. 1 - NO ACTION

Description

This alternative would not involve remedial action. No Action means that the site would remain in its current condition. Risks from inhalation of asbestos would remain at the levels described in Section 1.3.4, Risk Assessment. Order of magnitude risks of 1×10^{-3} were estimated in the

proximity of the truckyards where soil-disturbing activities occur regularly. Risk in the rest of the community ranged from 2×10^{-4} to 8×10^{-6} for the average case. The only site activities which would occur under No Action include site monitoring every 5 years as part of the site revisit and Public Health Evaluation (PHE) required under CERCLA (42 U.S.C Section 9621(c)), since wastes are left on site.

Short-Term Effectiveness

Since no remedial activity would occur under No Action, no short-term effectiveness or reduction in risk would be achieved.

Long-Term Effectiveness and Permanence

The No Action alternative is included as a baseline for comparison of other remedial alternatives. Under No Action, the existing site risks would not be reduced and would remain as discussed in Section 1.3.4. No long-term effectiveness or permanence would be achieved since no actions would be taken. The remedial action objectives discussed in Section 2.3 would not be met.

Reduction of Toxicity, Mobility or Volume

No Action would not reduce toxicity, mobility or volume.

Implementability

Since no actions would be undertaken, implementability does not apply. Site sampling every five years would be implemented similar to sampling for the RI investigation.

Cost

The cost of the No Action alternative is estimated to be $49,000. These costs assume sampling every five years, for 30 years, along with re-evaluation of the existing risk assessment. The costs are presented in

Appendix G, and include an estimated 10 air samples, collected over a 3-day period by two on-site investigators, required equipment, and risk assessment evaluation.

Compliance with ARARs

The No Action alternative would not attain ARARs.

Overall Protectiveness

The No Action alternative would provide no protectiveness or risk reduction. Risks would remain similar to the levels estimated in the Risk Assessment, or 1×10^{-3} at the truckyards and 2×10^{-4} to 8×10^{-6} in the community.

State & Local Agency Acceptance

Although State and local agency acceptance will not be known until after the public comment period, No Action will probably not be acceptable, given the level of concern about potential site health risks.

Community Acceptance

No Action would not be acceptable to the community as a whole, based on the information and comments received from previous community meetings.

4.3.2 ALTERNATIVE NO. 2 - ASPHALT COVER ON TRUCK YARDS/VACUUM SWEEPING OF STREETS/OFF-SITE DISPOSAL OF WASTE MATERIAL AS REQUIRED/INSTITUTIONAL CONTROLS

Description

Alternative No. 2 involves asphalt paving of asbestos-contaminated truck yards comprising an estimated area of approximately 128,500 square yards (SY), vacuum sweeping of 10,300 lineal feet (LF) of streets adjacent to the truck yards initially, followed by vacuum sweeping of all paved streets, or approximately 35,000 LF, location and removal of obvious asbestos sources

such as pipe with disposal in an off-site landfill, deed restrictions on the landfills subunit after verification of NESHAPs cover thickness, and institutional controls to ensure maintenance of the remediation.

For the purposes of this feasibility study, an asphalt pavement composite thickness ranging from 8 to 14 inches was estimated based on observed use and the guidelines of the American Association of State Highway and Transportation Officials (AASHTO, 1978) and the Seelye Design Manual (Seelye, 1960). The pavement would be composed of 4 inches of asphalt (includes wearing and binder courses), 4 inches of base course (crushed aggregate), and subbase as required (sands and gravels with silt and/or clay). Each truckyard will be graded as required to assure proper drainage and prevent pavement buildup from disrupting existing building and loading dock access. If excess soil must be removed, it would be used on site or disposed of offsite in an appropriate disposal site.

Vacuum sweeping would be conducted as a one-time operation, but in two phases. The first phase would be to remove dust and debris from the streets located adjacent to the truck yards and along truck routes prior to remediating the truck yards. The purpose of the first phase is to reduce the risk associated with resuspension of the asbestos-contaminated dust caused primarily by vehicle traffic. The second phase would be conducted after the truck yards have been remediated. This phase would entail vacuum sweeping of all paved streets to eliminate the risk from any potential asbestos-contaminated dust and debris deposited during or after remediation. The vacuum unit would employ a HEPA filter system to prevent dust generation.

The contaminated street dust, asbestos debris, and any soil would be loaded onto plastic-lined tractor trailers and hauled to a landfill for disposal. The only landfill contacted which would accept the material is the Kettleman Hills Landfill in Kettleman City, California, approximately 180 miles from the site. The material could potentially be disposed of in a closer, Class III municipal landfill if one is willing and permitted to accept it, since the material is not friable and therefore not defined as hazardous waste under California regulations.

Institutional controls would be implemented, including deed restrictions on the landfill parcels to prevent future disturbance, and long-term O&M agreements to maintain the truckyard pavements to prevent future breakdown.

Short-Term Effectiveness

Although this alternative addresses the truckyard area with the highest activity levels and potential risk, in the short term Alternative No. 2 would be likely to generate some visible dust during paving activities. Precautionary measures such as vacuum sweeping of the streets and the use of dust suppressants during soil disturbing activities, however, would control dust emissions and reduce the associated risk. This alternative would have little or no impact on the environment in the short term. The alternative could be implemented over a period of 12 months; construction could occur at each truckyard individually to control dust emissions.

Construction workers involved in the remediation would be protected by complying with current OSHA regulations. These include area air monitoring, use of respirators, ongoing medical monitoring and use of dust suppressants to control emisions.

With respect to vacuum sweeping, the vacuum units have been designed specifically for the removal of asbestos and, therefore, offer a high level of short-term effectiveness (i.e., no increase in dust generation during implementation). Risk resulting from disturbed street dust would actually be lower than present conditions during the implementation of vacuum sweeping because all vehicular traffic would be re-routed during the remediation.

Overall, the short-term effectiveness for Alternative No. 2 would be high.

Long-Term Effectiveness and Permanence

An asphalt cover is an impermeable cover that would effectively control asbestos emissions from the truck yards. Coupled with the removal of asbestos-contaminated street dust and debris, Alternative No. 2 would provide a high level of long-term protection at these two high activity/highest risk subunits. Sitewide, visible dust emissions would be reduced, presumably resulting in reduced asbestos levels in the ambient air. Asphalt will prevent infiltration of precipitation, and may increase runoff levels from the site.

Long-term effectiveness and permanence would be heavily dependent upon maintenance of the asphalt covers. Asphalt would be subject to cracking and settlement and would require maintenance on a yearly basis. The asphalt would provide a high level of resistance against flooding and would contain the asbestos. Institutional controls involving maintenance agreements would be required to ensure consistent repair practices to maintain effectiveness. Costs for long-term maintenance have been included in the cost section.

The streets subunit is an impacted area rather than a source area and, therefore, long-term effectiveness and permanence of vacuum sweeping would be dependent on the influence of unremediated areas or subunits. Redeposition of asbestos-containing dust in the streets could require future vacuum sweeping. This would be determined during yearly inspections or during the five-year Public Health Evaluation (PHE).

Although the risk remaining at the site cannot be quantified, some potential risk will be present after remediation since several subunit areas will not undergo remediation. However, the likelihood of extensive soil disturbance in these areas is low, which reduces the potential for asbestos exposure.

Reduction of Toxicity, Mobility or Volume

The asbestos-contaminated soil at the truckyards would be contained by the pavement, thereby reducing the mobility of the asbestos. No reduction in toxicity or volume would be anticipated since no treatment to change the physical structure would occur.

Implementability

Paving under Alternative No. 2 would be implemented utilizing conventional construction techniques and equipment with special provisions to control dust during grading. Several vendors and contractors have indicated that they have vacuum sweeping units available, however, retrofitting or complete fabrication may be required to meet the needs at the South Bay Asbestos site. The cost of fabricating a site-specific vacuum unit has been included in the total project cost since the vacuum sweeper is a limited, speciality piece of equipment.

Implementation would commence with the vacuum sweeping of State, Spreckles, Liberty, Gold, and Taylor Streets which account for an estimated 10,300 LF of paved roadways adjacent to truck yards or designated as truck routes. It has been estimated that it would take 9 to 10 working days to remediate these streets and that asbestos dust would be collected at a rate of 1/2 CY per 100 LF for a total of 52 CY. Location and removal of asbestos source material and landfill inspection could occur during this time.

Remediation of the truck yards would commence following the vacuum sweeping. Truck yards would be remediated one at a time unless more than one crew were available. Composite soil samples would be taken from each truck yard surface to determine asbestos content as discussed in Appendix E. If the soil shows no detectable asbestos (greater than or equal to 1% PLM), then no action would be taken. If asbestos is detected, then each truck yard would be cleared of all equipment and portable facilities. The equipment and other miscellaneous items would be stored on an adjacent truck yard where possible. It has been assumed that all 11 identified unpaved truck yards would be remediated. The asphalt pavement would be

placed over the top of the graded and prepared areas and allowed to cure. It has been estimated that each truck yard would be remediated within 10 to 15 working days for a total of approximately 110 to 165 working days.

After all truck yards have been paved, the streets with visible dust and debris would be vacuum swept. Site observations have indicated that this would include nearly all streets or approximately 35,000 LF. The rate of dust collection has been estimated at 1/4 CY per 100 LF or 83 CY of dust. Remediation time for the streets has been estimated at 30 working days.

In total, Alternative No. 2 would require approximately 235 working days or 12 months to implement, of which two months would be required for mobilization and one month for demobilization. Materials and labor would be readily available for the asphalt cover and sweeping. Workers would be given adequate saftey training under OSHA regulations, and would undergo medical monitoring. Only conventional construction permits would be required for this alternative. Coordination would be maintained with OSHA (to ensure correct worker safety practices) and the City of San Jose to ensure compliance with construction codes. Institutional controls would be implemented to assure that routine maintenance would be performed and that soil disturbing activity would be monitored. Upon completion of all planned remedial actions, EPA would notify the City of San Jose that conventional street sweeping operations would recommence.

Cost

The present worth cost of Alternative No. 2 is estimated to be $7,561,000 or an equivalent unit cost of $18/sy for remediation of 128,500 sy of truck yards and 302,000 sy of paved roadways. Capital cost is estimated to be $5,135,000. Yearly maintenance cost is estimated to be $134,900 and includes a yearly inspection and repair/replacement of 5 percent of the asphalt. The required 5-year PHE (since wastes are left on site) is estimated to cost $15,000 each for a total of 6 during the 30-year design life. This cost is based on the collection of 10 air samples by a 2-men crew over 3 days, sample analysis, equipment cost, and a re-evaluation of the existing or previous public health evaluation. Costs are presented in Appendix G.

Compliance with ARARs

The ARARs pertaining to this alternative are NESHAP's "no visible emissions", OSHA's "worker health and safety", the McAteer-Petris Act regulating activities in the Bay, and BAAQMD Reg. 11, Rule 2, 305.3.1 for controlling emissions to the atmosphere in the Bay Area. With stringent dust control and responsible construction practices, all ARARs would be attained by Alternative No. 2.

Overall Protectiveness

The Truck Yards and Streets subunits represent approximately 31 percent (72 acres) of the total contaminated area but, because of the level of activity, present the greatest risk to human health through inhalation of airborne asbestos (Table 2.1). Alternative No. 2 would eliminate asbestos emissions from the truck yards and remove the asbestos dust from the streets, assuming the truck yards would be maintained and redeposition onto the streets would not occur, Alternative No. 2 would reduce site-wide risk and provide a considerable measure of overall protection. Since asbestos-contaminated soil would still remain uncovered in other areas of the site, and the potential for inhalation and ingestion at these areas would remain unchanged. The potential for asbestos exposure and associated risk still remains if these areas are disturbed.

The EPA has, as an emergency action, asphalt-paved previously unpaved streets in the community determined to be high risk areas from previous investigations. The level of protectiveness achieved by these actions is difficult to estimate, but it has resulted in decreased dust generation at the remediated locations.

State and Local Agency Acceptance

State and local agency acceptance of this alternative will not be known until after the public comment period. Comments and concerns received during that period will be incorporated in the Responsiveness Summary.

Community Acceptance

Past community concerns have included the generation of dust from the truck yards and the dirty streets. Based on these concerns, it is anticipated that Alternative No. 2 would be acceptable to the community. Actual community acceptance would not be known until after the public comment period.

4.3.3 ALTERNATIVE NO. 3 - ASPHALT COVER ON TRUCK YARDS, SAINTE CLAIRE LANDFILL, AND 50 PERCENT OF BUSINESSES/SOIL COVER ON 50 PERCENT OF REMAINING CONTAMINATED AREAS/VACUUM SWEEPING OF STREETS/OFF-SITE DISPOSAL OF WASTE MATERIALS AS REQUIRED/INSTITUTIONAL CONTROLS

Description

Alternative No. 3 was developed to address part of the low to medium risk areas (Table 2.1) within the vacant lots, landfills, and YG&B subunits, in addition to the higher risk truck yards and streets subunits. As such, this alternative is a combination of Alternative No. 2 and additional cover in other subunits. Areas with a potential for soil disturbance within the landfills subunit include the Sainte Claire Landfill at which heavy equipment and tractor trailer parking has been observed. For the YG&B subunit, high activity areas include parking lots, driveways, and unpaved roadways. Detectable levels of asbestos (equal to or greater than 1 percent PLM) were found in approximately 60 percent of the samples taken in the vacant lots, landfills, and YG&B subunits (RI report, EPA 1988b). This alternative assumes that 50 percent of the asbestos-contaminated areas, or 30 percent of the total area within the three subunits (50% of 60%) would be remediated.

Alternative No. 3 consists of asphalt paving, source removal, vacuum sweeping, and deed restrictions/institutional controls as discussed for Alternative No. 2. In addition, Alternative No. 3 consists of paving 50 percent of asbestos-contaminated parking lots, driveways, the unpaved

roadways located between the Marshland Landfill and Gold Street, and the Sainte Claire Landfill. 50 percent of the vacant lots, yards, gardens, and the Santos Landfill would be covered with a vegetated soil cover. Institutional controls such as long-term maintenance agreements would be implemented to ensure the long-term integrity of the asphalt and soil covers.

The asphalt cover for the parking lots, driveways, and unpaved roadways would not be as extensive as the one for the truck yards because static and dynamic loads would be considerably less. A 1-1/2 inch thick asphalt cover would be placed in these areas. In most cases, minimal surface preparation would be required because these areas are well graded as is. Approximately 11,000 SY of asphalt paving would be required in these areas. An additional 4,600 SY of asphalt designed for the truck yards would be used at the Sainte Claire Landfill.

The soil cover would be constructed to meet NESHAPs requirements of 6 inches of compacted soil with vegetation or 24 inches of compacted soil without vegetation. This FS has assumed that a 6-inch vegetated cover would be used for two reasons. First, the vegetated cover would be aesthetically acceptable. Second, a vegetated cover would provide greater resistance from the impacts of flooding and minimize erosion. In order to place the soil cover to avoid mounding and drainage problems, a volume of asbestos-contaminated soil would be removed where required. It has been assumed that a total volume of 82,800 CY would be removed over an area of approximately 331,000 SY. This would account for placing 6 inches of compacted soil, 1-1/2 inches of topsoil and 1-1/2 inches of sod or other vegetation. The excavated material would be transported off site and disposed of in an appropriate location. As a worst case, a Class I, RCRA-approved landfill has been assumed for costing, since this is the only type of landfill that could be located to accept the material.

Short-Term Effectiveness

Implementation of Alternative No. 3 would disturb a considerable area and could produce dust since several presently undisturbed areas would be excavated. Precautionary measures such as vacuum sweeping of the streets and the use of dust suppressants during soil disturbing activities would control dust generation. However, risk associated with inhalation could be increased for the 36 month implementation period. This would be particularly true during the remediation of yards, gardens, and vacant lots located within the residential community. Construction workers would be required to comply with OSHA asbestos workplace standards, which control asbestos exposure. Area air monitoring would occur during implementation.

The short-term effectiveness for Alternative No. 3 would be moderate because of the potential for airborne asbestos. This alternative also has the potential to impact surface water runoff levels, since runoff will be increased due to the placement of asphalt and changes in site drainage.

Long-Term Effectiveness and Permanence

Once implemented, Alternative No. 3 would be highly effective at eliminating asbestos emissions from the truck yards, streets, and other areas of high to moderate activity. Adjacent unremediated areas could potentially still contribute to airborne emissions, but sitewide ambient air asbestos levels and associated risk would be substantially reduced since all high and medium activity areas would be contained. The remaining risk cannot be quantified, but can be assumed to be low, since the potential for extensive soil disturbance in remaining uncovered areas is low.

As discussed for Alternative No. 2, long-term effectiveness and permanence would be heavily dependent upon maintenance of the asphalt and soil covers. Like the asphalt cover, the soil cover would be subject to cracking and settlement, but would require maintenance more frequently. Deed restrictions and maintenance agreements for watering, mowing and weed control would have to be developed with the property owners. Periodic

inspections by the governing agency (City of San Jose) would be required to ensure maintenance was conducted. Costs for long-term maintenance have been included in the cost estimate for this alternative. However, it is very difficult to assess the reliability of such long-term O&M agreements.

Changes in runoff and drainage from the site may increase surface water levels, but should have no long-term adverse impact on the environment.

Reduction of Toxicity, Mobility or Volume

Mobility of the asbestos within the remediated areas would be reduced considerably. No reduction in toxicity or volume would be anticipated since no treatment would occur to change the physical structure.

Implementability

Implementation of Alternative No. 3 would be achieved through conventional construction methods, excluding the vacuum sweeping portion which was previously discussed for Alternative No. 2. Some difficulty would be anticipated when remediating confined areas such as yards and gardens. Implementation in these areas would require either smaller equipment or manual labor. Working in and around the residential community would require stringent scheduling and adequate public notification. Implementation would commence with the vacuum sweeping of State, Spreckles, Liberty, Gold, and Taylor Streets which account for an estimated 10,300 LF and would require 9 to 10 working days to complete. Removal of asbestos sources and landfill inspection would occur concurrently. Remediation of the truck yards would commence and proceed as discussed for Alternative No. 2. Remediation of the truck yards would take approximately 110 to 165 working days. Because of the occasional truck activity observed at the Sainte Claire Landfill, it would be remediated after the truck yards and in a similar manner. Since the Sainte Claire Landfill is presently being filled at the western parcel and well graded with gravel at the eastern parcel, no excavation and minimal grading would be anticipated. Approximately 4,600 SY of asphalt (truck yard design) would be required and remediation would take approximately 10 working days.

The next areas to be targeted for remediation would be the parking lots, driveways, and unpaved roadways within the businesses located between the Marshland Landfill and Gold Street. Preremediation sampling would occur (Appendix E) as described for Alternative No. 2 to pinpoint those areas with asbestos. Minimal preparational work would be anticipated since these areas are already cleared and well graded. The asphalt would be placed with conventional asphalt paving equipment to a thickness of 1-1/2 inches. It has been assumed that contaminated areas cover approximately 11,000 SY and would require 30 working days to remediate.

After all asphalt paving has been completed, soil cover remediation would commence. Each subarea within the three subunits would be sampled as discussed in Appendix E to determine which subareas require remediation. The areas to be remediated would be cleared of all debris and excavated to a depth of 9 inches. The excavated soil would be transported to and disposed of at an off-site landfill. Because of the widespread distribution of the subareas, all staging would be done at each subarea (i.e., contaminated soil would be excavated and loaded directly onto waiting trucks and fill material would be delivered directly to each subarea). The exposed surface would be backfilled with 6 inches of compacted fill, fine graded, and topped with 1-1/2 inches of topsoil and sod or seed. Garden areas would be excavated to 2 feet deep and backfilled with 2 feet of "garden" fill. Manual labor would most likely be required to hand excavate in garden areas and some yards. Soil cover thickness at the Santos Landfill may vary because of existing topography, but would not be less than 6 inches. No excavation would occur in the vicinity of the Santos Landfill because of the potential for asbestos release. Approximately 82,800 CY of asbestos-contaminated soil would be excavated from these subunits and replaced with a 9-inch thick soil cover extending over 331,000 SY. Implementation of the soil cover would require approximately 5 working days for each residence, 7 working days for each vacant lot, and 30 working days for the Santos Landfill. The total time required to implement would be 600 working days for the remediation of 96 yards, 13 vacant lots, and the Santos Landfill.

The final step in the remediation of Alternative No. 3 would be the vacuum sweeping of all paved streets, excluding the newly paved roadways, with visible dust accumulations. Site observations have indicated that this would include nearly all streets or approximately 35,000 LF. Remediation time for the streets has been estimated at 30 working days.

Alternative No. 3 would require a total of 895 working days or approximately 3-1/2 years to implement. Two months have been included for mobilization and 1 month for demobilization. Materials and labor would be readily available for the asphalt and soil covers, and sweeping. Workers would be given adequate safety training under OSHA regulations, and would undergo medical monitoring. Only conventional construction permits would be required for this alternative. Coordination would be maintained with OSHA (to ensure proper worker safety) and the City of San Jose to ensure compliance with construction codes.

Institutional controls in the form of maintenance agreements and/or deed restrictions would be implemented to assure that routine maintenance would be performed and that subsurface activity would be monitored.

Cost

The present worth cost of Alternative No. 3 is estimated to be $30,789,000 or an equivalent unit cost of $44/sy for remediation of 128,500 sy of truck yards, 4,600 sy of the Sainte Claire landfill, 302,000 sy of paved roadways, and 342,000 sy of the YG&B, vacant lots, and landfills subunits. Capital cost is estimated to be $26,635,100. Fifty-one percent of this cost or approximately $13,500,000 is attributed to transport and disposal at an off-site landfill. Yearly maintenence is estimated to be $233,000 and includes a yearly inspection, repair/replacement of 5 percent of the asphalt, repair/revegetation of 10 percent of the soil cover, and associated site monitoring cost during maintenance. The required 5-year PHE is estimated to cost $15,000 each for a total of 6 during the 30-year design life. This cost is based on the collection of 10 air samples by a 2-person crew over 3 days, sample analysis, equipment cost, and a re-evaluation of the existing or previous public health evaluation.

Compliance with ARARs

The ARARs pertaining to this alternative are NESHAPs "no visible emissions", OSHA's worker health and safety, the McAteer-Petris Act regulating activities in the Bay, and BAAQMD Reg. 11, Rule 2, 305.3.1 for controlling emissions to the atmosphere in the Bay Area. With stringent dust control, all ARARs would be attained.

Overall Protectiveness

Alternative No. 3 would remediate about half (154 acres) of the total site area (311 acres). Significant reductions in risk from inhalation and ingestion would be achieved resulting in a high overall protectiveness rating. Asbestos emissions would be eliminated from all high and medium activity areas with detectable asbestos within a relatively short time period of 3-1/2 years. Risk would still be present at the unremediated areas, but because of the low activity/low concentration in these areas the risk would be low and would not significantly impact the sitewide risk.

State and Local Agency Acceptance

State and local agency acceptance of this alternative will not be known until after the public comment period. Comments and concerns received during that period will be incorporated in the Responsiveness Summary.

Community Acceptance

Actual community acceptance would not be known until after the public comment period. Comments and concerns received will be incorporated into the Responsiveness Summary.

4.3.4 ALTERNATIVE NO. 4 - ASPHALT COVER ON TRUCK YARDS, SAINTE CLAIRE LANDFILL, AND 100 PERCENT OF BUSINESSES/SOIL COVER ON 100 PERCENT OF REMAINING CONTAMINATED AREAS/VACUUM SWEEPING OF STREETS/OFF-SITE DISPOSAL OF WASTE MATERIALS AS REQUIRED/INSTITUTIONAL CONTROLS

Description

Alternative No. 4 is identical to Alternative No. 3 except that Alternative No. 4 would remediate 100 percent of all areas with detectable asbestos. Alternative No. 4 would include placing a soil cover over 662,000 sy and a 1-1/2-inch thick asphalt cover over 21,900 sy in addition to the truck yard paving and vacuum sweeping discussed previously. Since the discussion for each of the nine criteria evaluated is similar, only the key differences will be pointed out.

Short-Term Effectiveness

The short-term effectiveness of Alternative No. 4 is rated as low to moderate because implementation would take nearly 6 years to complete, most of which would involve soil disturbing activities (i.e., excavation, grading, hauling, etc.) of presently undisturbed soil.

Long-Term Effectiveness and Permanence

Alternative No. 4 provides the highest degree of long-term effectiveness of all the alternatives evaluated in the detailed analysis. Asbestos emissions would be eliminated from all source areas and the potential for direct human contact would be greatly reduced.

Long-term effectiveness and permanence would be heavily dependent upon routine maintenance as discussed for Alternative Nos. 2 and 3.

Reduction of Toxicity, Mobility or Volume

No reductions in toxicity or volume would occur since no treatment would take place. The mobility of the asbestos-contaminated soil remaining on-site would be contained indefinitely with maintenance.

Implementability

Implementation would be as discussed for Alternative No. 3.

Approximately 1500 working days or nearly 6 years would be required to implement. In particular, it would take approximately 960 working days to remediate the yards and gardens, and 182 working days to remediate the vacant lots.

Cost

The present worth cost of Alternative No. 4 is estimated to be $53,563,000 or an equivalent unit cost of $48/sy for remediation of 128,500 sy of truck yards, 4600 sy of the Sainte Claire landfill, 302,000 sy of paved roadways, and 673,000 sy of the YG&B, vacant lots, and landfills subunits. Capital cost is estimated to be $47,940,800. Fifty-five percent of this cost or approximately $26,500,000 is attributed to transport and disposal at an off-site landfill. Yearly maintenance is estimated to be $316,300 and includes a yearly inspection, repair/replacement of 5 percent of the asphalt, repair/vegetation of 10 percent of the soil cover, and associated site monitoring cost during maintenance. The required 5-year PHE is estimated to cost $15,000 each for a total of 6 during the 30-year design life. This cost is based on the collection of 10 air samples by a 2-person crew over 3 days, sample analysis, equipment cost, and a re-evaluation of the existing or previous public health evaluation.

Compliance with ARARs

Same as Alternative No. 3.

Overall Protectiveness

Alternative No. 4 would remediate 100 percent of the site area with detectable asbestos. Significant reductions in risk from inhalation and ingestion, presumably to acceptable levels, would be achieved resulting in

the highest overall protectiveness. Asbestos emissions would be eliminated from all asbestos-contaminated areas on-site. If asbestos were to be detected in the ambient air after remediation, off-site sources would have to be investigated. The only potential for exposure would be via subsurface activity (i.e., excavation), or breakdown of the remediated areas.

State and Local Agency Acceptance

State and local agency acceptance of this alternative will not be known until after the public comment period. Comments and concerns received during that period will be incorporated in the Responsiveness Summary.

Community Acceptance

Same as Alternative No. 3.

The four alternatives will be compared in the following section.

5

5.0 SUMMARY OF ALTERNATIVES

This section provides a summary of the detailed evaluation presented in Section 4.0. Table 5.1 summarizes each of the evaluation criteria with respect to each alternative and is presented such that a direct comparison of alternatives can be made.

As discussed in the table, Alternative No. 1 (No Action) is the least protective and least costly, and Alternative No. 4 is the most protective and most costly. Alternatives No. 2 and No. 3 fall in between with Alternative No. 3 being more protective and more costly than No. 2.

Alternative No. 2 addresses the highest activity areas and thus achieves a large reduction of asbestos exposure and risk. However, Alternative No. 2 does not address low levels of asbestos in soil in other areas of the site, which have a potential for disturbance. Alternatives 3 and 4, although they offer greater long-term protectiveness by covering a larger part of the site, would increase risk in the short term more than Alternative No. 2 by disturbing many areas with construction. Alternative Nos. 3 & 4 would require much longer time periods to implement than Alternative No. 2. All alternatives are possible to implement, but both Alternatives Nos. 3 and 4 would require intensive small-scale construction techniques to address individual lots. Alternative No. 4 offers the greatest amount of overall protection, yet with the highest cost and least short-term effectiveness. Alternative No. 2 offers improved overall protectiveness over No Action, and has the highest short-term effectiveness, at the lowest cost.

TABLE 5.1
SUMMARY OF ALTERNATIVES

Criterion	Alternative No. 1 - No Action	Alternative No. 2 - Remediation of Streets and Truck Yards	Alternative No. 3 - Remediation of 50% of Contaminated Areas	Alternative No. 4 - Remediation of 100% of Contaminated Areas
Short-term effectiveness	This criterion is not applicable to the no action alternative since implementation would involve no on-site activity.	Slightly increased risk from inhalation would be anticipated during implementation, but would be minimized by the use of dust suppressants. Removal of street dust would result in an immediate decrease in risk from the streets subunit.	See discussion for Alternative No. 2. In addition, elevated risk from inhalation would be anticipated during the remediation of YG&B, vacant lots, and landfills subunits. Highest risk increase would be encountered during the remediation of the yards and gardens. Stringent dust control would be implemented.	See discussion for Alternative No. 3. Overall, short-term effectiveness would be the least for Alternative No. 4 since the largest area would be disturbed during remediation.
Long-Term Effectiveness and Permanence	No action provides for long-term protectiveness or effectiveness.	With maintenance, asbestos emissions from the high activity truck yards subunit would be eliminated resulting in reduced street dust deposition. The overall effect would be a reduction in sitewide airborne asbestos levels. Some areas would remain unremediated. Alternative No. 2 would serve as a permanent solution at the highest activity/highest risk areas.	See discussion for Alternative No. 2. Alternative No. 3 would further reduce the overall site risk contributed by the YG&B, vacant lots, and landfills subunits. A smaller area would remain unremediated under Alternative No. 3 than under Alternative No. 2. The soil and asphalt covers in these areas would serve as permanent solutions.	Remediation of all contaminated areas along with routine maintenance would provide the highest level of effectiveness and permanance. All asbestos exposure resulting from the site would be reduced. Asbestos emissions would be eliminated, assuming regular maintenance.
Reduction of Toxicity, Mobility, or Volume	No reduction in toxicity, mobility, or volume would be anticipated. Natural attenuation may result in some "unquantifiable" reduction.	Mobility of the asbestos at the high activity subunits would be reduced by eliminating emissions, assuming routine maintnenance. No reductions in toxicity or volume would be anticipated.	Containment of 50 percent of the contaminated area by either a soil cover, asphalt cover, or vacuum sweeping would reduce the mobility of the corresponding volume of asbestos. No reductions in toxicity or volume would be anticipated.	Containment of 100 percent of the contaminated area would reduce the mobility of the corresponding volume of asbestos. No reductions in toxicity or volume would be anticipated.

TABLE 5.1, continued
SUMMARY OF ALTERNATIVES

Criterion	Alternative No. 1 - No Action	Alternative No. 2 - Remediation of Streets and Truck Yards	Alternative No. 3 - Remediation of 50% of Contaminated Areas	Alternative No. 4 - Remediation of 100% of Contaminated Areas
Implementability	Alternative No. 1 would be the easiest to implement. Only administrative measures would be taken.	Implementation of Alternative No. 2 would be straight forward. Conventional equipment and readily available materials and labor would be employed to remediate each truck yard in 15 working days. Approximately 40 days would be required to remediate the streets. An asbestos abatement contractor would most likely be required to implement this phase. In total, 1 year would be required for implementation.	See discussion for Alternative No. 2. In addition, the lower activity areas (YG&B, vacant lots, and landfills subunits) would be remediated utilizing conventional equipment. Small-scale equipment or manual laobr may be required in confined areas such as certain backyards and gardens. Approximately 30 working days would be required to remediate the parking lots, driveways, and unpaved roadways. Each residence would require 5 working days, each vacant lot would require 7 working days, and the Santos Landfill would require 30 working days to remediate. Approximately 3 1/2 years would be required to implement Alternative No. 3.	Same as discussion for Alternative No. 3. Alternative No. 4 would require nearly 6 years to implement because of larger area involved.
Cost				
- Capital	$0	$5,135,000	$26,635,100	$47,940,800
- Annual Maintenance	$0	$134,900	$233,000	$316,300
- Present Worth	$49,000 (5 year PHE only)	$7,561,000	$30,789,000	$53,563,000
- Equivalent Unit Cost	Not applicable	$18/SY	$44/SY	$48/SY
Compliance with ARARs	Does not meet NESHAP requirements of "no visible emissions", BAAQMD regulations, and may exceed OSHA PEL certain activities at the truck yards.	Would attain ARARs.	Would attain ARARs.	Would attain ARARs.

TABLE 5.1, continued
SUMMARY OF ALTERNATIVES

Criterion	Alternative No. 1 - No Action	Alternative No. 2 - Remediation of Streets and Truck Yards	Alternative No. 3 - Remediation of 50% of Contaminated Areas	Alternative No. 4 - Remediation of 100% of Contaminated Areas
Overall Protectiveness	Does not offer any protection to human health and the environment.	Alternative No. 2 would remediate approximately 31 percent of the total contaminated area. This area, however, presents the greatest risk to human health via inhalation because it is the highest activity area. Remediation of the truck yards and streets subunit would have the greatest impact on risk reduction. Sitewide, however, contaminated areas would still remain uncontrolled. Alternative No. 2 would provide a moderate level of protection relative to the other alternatives.	Alternative No. 3 would remediate approximately 67 percent of the total contaminated area. Significant reductions in sitewide risk would be achieved by controlling emissions from the high activity areas (i.e., truck yards and streets) and the high concentration areas within the lower activity areas. Overall protectiveness of Alternative No. 3 is rated as high.	Alternative No. 4 would remediate 100 percent of the total contaminated area. Sitewide reductions in risk would be anticipated, resulting in the highest overall protectiveness rating.
State and Local Agency Acceptance	Not acceptable. The site has been acknowledged as hazardous by the California Department of Health Services.	Unknown.	Unknown.	Unknown.
Community Acceptance	Community has expressed concern over dust generated from the truck yards and the accumulation of dust in the streets. It has, therefore, been assumed that the community would not accept this alternative. Actual acceptance would not be known until after the public comment period.	Alternative No. 2 addresses the community concerns discussed for Alternative No. 1. It is assumed that Alternative No. 2 would be acceptable to the community. Actual acceptance would not be known until after the public comment period.	See discussion for Alternative No. 2. Actual acceptance would not be known until after the public comment period.	Same as discussion for Alternative No. 3.

APPENDIX A

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APPENDIX B

GLOSSARY

GLOSSARY

ARAR - Applicable or Relevant and Appropriate Requirements.

AHERA - Asbestos Hazard Emergency Response Act.

AIHL - Air and Industrial Hygiene Laboratory of the California Department of Health Services.

ATSDR - Agency for Toxic Substance and Disease Registry: A branch of the Center for Disease Control that is responsible for preparing health assessments at sites.

Asbestos - Mineral fibers which can be separated and used for a variety of industrial applications including refractory filters.

BAAQMD - Bay Area Air Quality Management District.

BCDC - Bay Conservation and Development Commission.

Bench Scale - Treatability tests performed on a small scale, usually in a laboratory, to better define parameters of a treatment technology.

CAA - Clean Air Act.

Cal-Osha - California Occupational Health and Safety Administration.

CEQA - California Environmental Quality Act.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA).

CFR - Code of Federal Regulations.

CLP - Contract Laboratory Program.

COE - United States Army Corps of Engineers.

CWA - Clean Water Act.

Chrysotile - A serpentine mineral commonly displaying a fibrous habit with a chemical composition of $(M_3Fe)_3\ Si_2O_5(OH)_4$.

DHS - California Department of Health and Safety.

DQO - Data Quality Objectives: Statements that specify the data needed to support decisions regarding remedial response activities.

EECA - Engineering Evaluation and Cost Analysis: Prepared by EPA to justify cost of Expedited Remedial Actions (ERAs).

EIS - Environmental Impact Statement.

ERA - Expedited Response Action.

Excess lifetime cancer risk - The potential for carcinogenic effects from exposure to one or more chemicals.

FS - Feasibility Study.

FSP - Field Sampling Plan: Defines in detail the sampling and data gathering activities to be used at a site (see SAP).

General response action - General types of actions, such as containment, that may be taken to achieve exposure limits specified by remedial action objectives.

Health assessment - Assessment of existing risk to human health posed by NPL sites, prepared by the ATSDR.

HEP - Habitat Evaluation Procedures - a habitat-based evaluation methodology used to determine impacts on wetlands and identify mitigation goals.

ISV - In-situ vitrification.

Innovative technologies - Technologies that are fully developed but lack sufficient cost or performance data for routine use at CERCLA sites.

Lead agency - The agency, either the EPA, Federal agency, or appropriate State agency having primary responsibility and authority for planning and executing the remediation at a site.

MCL - Maximum Contaminant Level: Established under the Safe Drinking Water Act.

MCLG - Maximum Contaminant Level Goal.

NAAQS - National Ambient Air Quality Standards.

NCP - National Oil and Hazardous Substances Contingency Plan.

NEPA - National Environmental Policy Act.

NESHAPS - National Emission Standards for Hazardous Air Pollutants, as promulgated under Clean Air Act.

NIOSH - National Institute for Occupational Safety and Health.

NPDES - National Pollutant Discharge Elimination System.

NPL - National Priorities List: A list of sites identified for remediation under CERCLA.

O&M - Operation and maintenance.

OSHA - Occupational Safety and Health Administration.

OSWER - Office of Solid Waste and Emergency Response.

Operable Unit - A discrete part of a remedial action that can function independently as a unit and contributes to preventing or minimizing a release or threat of release.

PCLM - Phase Contrast Light Microscopy - used to analyze air samples.

PEL - Permissible Exposure Limit.

PLM - Polarized Light Microscopy - typically used to analyze bulk asbestos material or soil.

PRP - Potentially Responsible Party.

Pilot Scale - Treatability tests performed on a large scale to simulate the physical, as well as chemical, parameters of a process.

Present Worth Analysis - A summary of costs to be incurred over a period of time, discounted to the present.

q_1^* - Cancer Potency Factor: The lifetime cancer risk for each additional mg/kg of body weight per day of exposure.

QA/QC - Quality assurance/quality control.

RCRA - Resource Conservation and Recovery Act.

RI/FS - Remedial Investigation/Feasibility Study.

RMCL - Recommended Maximum Contaminant Level: Developed under Safe Drinking Water Act.

ROD - Record of Decision: Documents selection of cost-effective Superfund-financed remedy.

Reference Dose (RfD) - For noncarcinogenic effects, the amount of a chemical that can be taken into the body each day over a lifetime without causing adverse effects.

Remedial Action Alternative - A potential approach to preventing or mitigating site-specific contamination problems, defined in terms of a remedial action technology option or combination of options and the volumes or areas of media to which the option or options will be applied.

Remedial Action Objective - A description of remedial goals for each medium of concern at a site; expressed in terms of the contamination of concern exposure route(s) and receptor(s), and maximum acceptable exposure level(s).

Remedial Action Technology Type (or technology type) - A general category encompassing a number of remedial action technology options that address a similar problem (e.g., capping, containment barriers, chemical treatment).

Remedial Action Technology Process Option (or process option) - A specific process, system, or action that may be used to clean up or mitigate contaminant problems (e.g., clay cap, slurry wall, neutralization).

SARA - Superfund Amendments and Reauthorization Act of 1986 (see CERCLA).

SCVWD - Santa Clara Valley Water District.

SDWA - Safe Drinking Water Act.

SITE - Superfund Innovative Technology Evaluation.

STLC - Soluble Threshold Limit Concentration.

SWDA - Solid Waste Disposal Act.

Sensitivity Analysis - A test of a procedure to determine the overall changes that will result from any small change in one or more procedural elements.

Serpentine - A group of hydrous magnesium-rich phyllosilicate minerals typically found in low grade metamorphic environments.

Serpentinite - A rock composition dominated by serpentine.

Support Agency - The agency, either the Federal EPA or the State agency, responsible for review and concurrence in developing and selecting a remedy at a CERCLA site.

TEM - Transmission Electron Microscopy.

TSD - Treatment, Storage, and Disposal.

TSCA - Toxic Substances Control Act.

TTLC - Total Threshold Limit Concentration.

Technology Process Option - See remedial action technology process.

Technology Type - See remedial action technology type.

Treatability Studies - Studies, usually performed after the FS Phase II, to better define the physical and chemical parameters of technology process options being evaluated for use at CERCLA sites.

USC - United States Code.

USFWS - United States Fish and Wildlife Service.

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APPENDIX C

DESCRIPTION OF SUBUNITS

Results of soil and air sampling and EPA guidance led to the development of subunits (smaller areas characterized by activity, contamination levels or location). The intent of the subunit development process was to compile more effective and feasible sitewide alternatives. Aerial photographs and several site visits were used to delineate these areas based on physical characteristics and type of activity. A list of proposed subunits was presented to EPA. Taking into account community concerns among other factors, EPA revised the list of subunits to the following:

- Ring Levee
- Truck Yards
- Streets
- Vacant Lots
- Landfills
- Marina
- Yards, Gardens and Businesses

Division of a site as large and diverse as the South Bay Asbestos site into subunits is consistent with FS guidance and practical. Each subunit represents an area with similar conditions that can be remediated as a whole (i.e., similar construction equipment and techniques).

RING LEVEE

The ring levee is the only subunit that has been designated as an Operable Unit (OU) for the purpose of expediting a remedial action. Inhalation of airborne asbestos from disturbance of the heavily used levee, particularly by children, prompted the EPA to take accelerated action. As a result, the ring levee has been addressed under separate cover in an OUFS (EPA 1988a) and will only be discussed briefly herein.

The ring levee is approximately five to 12 feet in height with a rounded trapezoidal shape, two miles in length, and extends around the community of Alviso on the east, north, and northwest (Figure C-1). The side slopes vary, but are generally steeper than 2:1 (horizontal:vertical). The levee consumes approximately eight acres in surface area. The levee is

moderately to heavily vegetated over approximately 50 percent with the heavy vegetation located generally in areas removed from public access. The less vegetated or unvegetated areas, on the other hand, are generally located where public use is heavy or where the polymer dust suppressant has been applied. A small, approximately 1- to 3-foot wide, well-worn walking path exists along the crest.

The ring levee immediately adjoins School Street, the homes on the eastern side of Alviso (the O'Neill Tract), and the street along Grand and Spreckles Avenues (Figure C-1). The levee is removed from public streets along the northwest, where it borders the commercial trucking operations along State Street. The steep outboard or bayward side of the levee abuts wetlands areas along Spreckles Avenue and along the truckyard/commercial operations. During high water conditions in winter and spring in the marsh, the outboard toe of the levee is submerged under water in these reaches. At its western end, the levee borders two private properties. One property owner has fenced the levee to prevent foot traffic. The levee terminates at the boat launching marina at the northwestern end of town.

The levee immediately adjacent to streets and homes is used heavily as a pedestrian walkway. Residents, and particularly children, have been seen walking and jogging along the levee, playing on the slopes, and picnicking or riding bicycles on or adjacent to the levee. The levee in these areas is barren of vegetation. In addition, it appears that motor vehicles may also drive over the levee.

A polymer dust suppressant has been applied to the levee (May 1986, July 1987, and July 1988) as an intermediate response action. The polymer was applied only on the barren areas adjacent to homes and streets. Observations of the sprayed levee segments indicated that the polymer tends to break up under heavy use and soil sloughing on the steep side slopes. While the polymer dust suppressant was believed to be an acceptable interim measure, unknown effectiveness and significantly high re-application cost limited its potential as a long-term alternative.

The OUFS provided the EPA with four alternatives, three of which were action alternatives and the fourth being No Action. The three action alternatives were: (1) Soil Cover, (2) Gunite Cover, and (3) Soil/Gunite Cover. Following the public comment period on the OUFS, the EPA prepared a Record of Decision (ROD) with the preferred alternative being a Soil Cover.

TRUCK YARDS

Truck yards have been classified as a subunit primarily because of community concern over the visible dust clouds generated as trucks enter, exit, and maneuver around the yards. Thirteen truck yards have been identified within the site boundaries (Table C.1). Eleven of the 13 truck yards are either unpaved or partially paved. Figure C-1 identifies these 13 truck yards and the respective owners/operators. Mattos Trucking (Truck Yard F) is partially asphalt paved and L&S Stake (Truck Yard L) is chip sealed. The assumption has been made that these two truck yards will require no action.

Truck yard operations range from pallet construction and storage to sand and gravel hauling to unidentified operations. Truck sizes range from 10- to 18-wheelers with some operations utilizing 4-wheel pick-ups and 6-wheel flatbeds. Figure C-2 shows a typical truck yard. A traffic study conducted by the City of San Jose, Department of Traffic Operations concluded that up to 200 trucks per day pass through Alviso (City of San Jose, 1986). Visual observations during several field visits noted that most of the truck traffic generally occurred between 6 a.m. to 9 a.m. and between 3 p.m. and 6 p.m. Monday through Friday.

STREETS

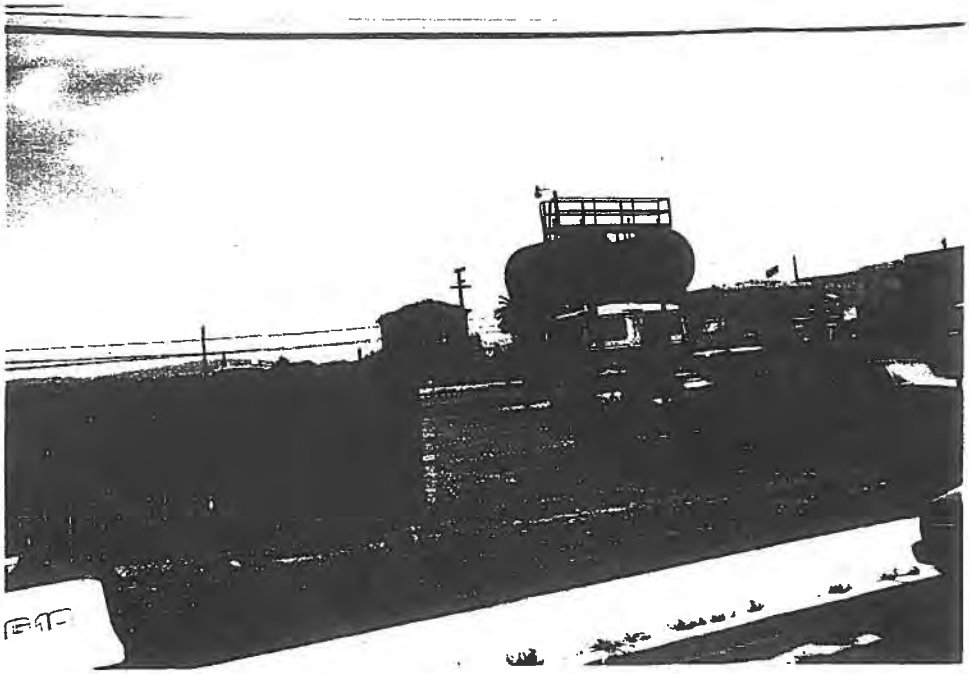
The streets, like the truck yards, have been classified as a subunit primarily because of community concern over the visible dust clouds and standing dust piles collecting in the gutters. As much as 4 inches of dust

TABLE C.1
TRUCK YARDS SURVEY

Truck Yard No.	Location	Owner	E&E Sampling Results	Area (SY)	Comments
A	Near intersection of State St. and Liberty St.	Maciel	1 @ ND/TR 2 @ 1-2%	9,000	
B	Near intersection of State St. Archer St.	Thompson & Uslar	7 @ ND/TR	28,000	
C	Adjacent to truck yard no. B off Essex Ave.	Pellicoti		15,000	
D	At intersection of State St. and Essex Ave.	Revels	4 @ ND/TR 1 @ 1-2%	5,000	
E	State St. between Essex Ave. and Pacific Ave.	Bennett	2 @ ND/TR 2 @ 1 % 1 @ >10%	4,000	
F	On State St. between Essex Ave. and Pacific Ave.	Mattos	2 @ ND/TR 1 @ 1-2%		Not included - paved.
G	Near intersection of State St. and Pacific Ave.	Pelligrini			Not included - as truck yard subunit; now vacant lot #2.
H	Northwest of truck yard no. 6 off Pacific Ave.	Gibbons		10,000	
I	At intersection of Pacific Ave. and Wabash St.	Escalante	4 @ ND/TR	2,000	
J	Off Grand Blvd. and Wilson Wy.	Ryan and Ricker Industries	1 @ ND/TR 3 @ 1-2%	—	Not included; limited part of yards, gardens, and business subunit.
K	At intersection of State St. and Pacific Ave.	Pelligrini		4,500	

TABLE C.1 (cont.)
TRUCK YARDS SURVEY

Truck Yard No.	Location	Owner	E&E Sampling Results	Area (SY)	Comments
L	On Spreckles Ave., northwest of State St.	L&M Stake	4 @ ND/TR 2 @ 1-2%	—	Not included, chip sealed.
M	North of Water Treatment Plant on Spreckles Ave.	Smith	7 @ ND/TR	35,000	
N	At intersection of Hope St. and Catherine St.	Pelligrini	2 @ ND/TR 2 @ 1-2%	9,000	
O	At intersection of Gold St. and Moffat St.	Pelligrini	2 @ ND/TR 2 @ 1-2%	7,000	

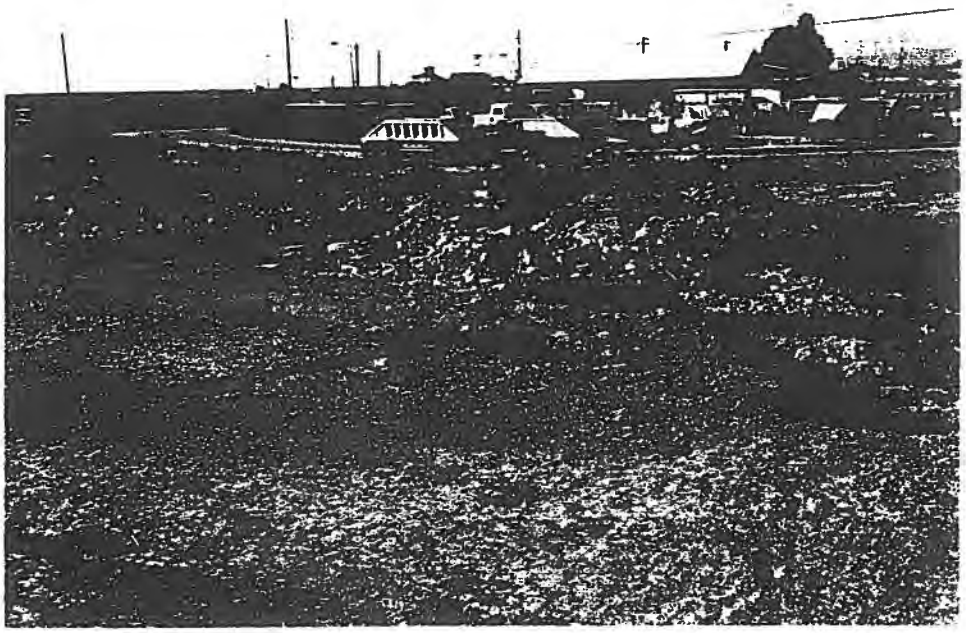


UNPAVED TRUCKYARD, CATHERINE AND HOPE STREETS.

REPRESENTATIVE AREA INCLUDED WITHIN THE YARDS, GARDENS AND BUSINESSES SUBUNIT.

NOTE: Photographs taken 3/30/88 by CDM during site visit.

Project No.	South Bay Asbestos	REPRESENTATIVE PHOTOGRAPHS OF SUBUNITS	Figure
288-FS1	Camp Dresser & McKee Inc.		C-2



WEST SIDE OF ST. CLAIRE LANDFILL, LOOKING NORTH. PHOTOGRAPH TAKEN FROM GOLD STREET BRIDGE.

REPRESENTATIVE VACANT LOT. NOTE DIRT IN GUTTER AT BASE OF CURB.

NOTE: Photographs taken 3/30/88 by CDM during site visit.

Project No.	South Bay Asbestos	REPRESENTATIVE PHOTOGRAPHS OF SUBUNITS	Figure
288-FS1	Camp Dresser & McKee Inc		C-3

has been observed in gutters along the curb extending 4 to 5 feet out into the street, along State Street. Sampling results of the street dust along State Street during the RI (EDA, 1988b) indicate asbestos levels at 1 to 2 percent (PLM). Sampling results of the unpaved streets in the O'Neill Tract (Figure C-1) showed no measurable level of asbestos. The only other unpaved streets within the site boundaries are located in the commercial area west of Gold Street and south of the Guadalupe River and east of Liberty Street along Moffat Street. These areas, however, are considered as part of the Landfills and Yards, Gardens, and Businesses subunits, respectively. As a result of the asbestos analyses, the unpaved streets in the O'Neill Tract will be excluded from any further analysis and remedial action. All other paved streets will be considered as part of the streets subunit. The streets are listed in Table C.2 and shown in Figure C-1.

VACANT LOTS

A field investigation was conducted in order to characterize vacant lots. It was observed that nearly all vacant lots showed signs of minimal use, unlike other subunits. Because of the correlation between use and potential asbestos emissions, the vacant lots have been classified as an individual subunit.

During the field investigation, 44 vacant lots were identified. Each vacant lot was photographed and recorded with respect to use, type of ground cover, thickness and extent of vegetative cover, type and quantity of debris, and existence of fencing. Other characteristics were also noted including dimensions, access, and whether or not sampling data was available. Table C.3 contains the summary of the field investigation. Each vacant lot has been identified in Figure C-1 and a photograph of a typical vacant lot is presented in Figure C-3.

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TABLE C.2

STREETS SURVEY[1]

Street	CDM Sampling Results	EPA/Cal-Osha Sampling Results	Length (LF)	Width (FT)	Area (SF)
State St.	2 @ 1%	5 @ TR/ND	3,600	60	216,000
Wabash St.	1 @ 2%		3,600	60	216,000
Michigan St.	1 @ ND		3,800	60	228,000
Grand Blvd.	1 @ 1%				
Spreckles Ave.			3,600	60	216,000
Pacific Ave.			1,800	60	108,000
Essex Ave.			1,100	60	66,000
Archer St.			1,000	60	60,000
Hope St.			1,100	60	66,000
El Dorado St.			1,600	60	96,000
Gold St.			1,800	60	108,000
Liberty St.			1,800	60	108,000
Moffat St.			1,700	60	102,000
Taylor St.			1,200	60	72,000
Catherine St.			1,400	60	84,000
Elizabeth St.			1,500	60	90,000
Wilson Wy.			1,000	60	60,000
			1,400	60	84,000
		Total:	32,900 LF		1,974,000 SF

(1) Extensive sampling of unpaved portion of Spreckles Avenue in 1985 not included since street has been paved. Samples of unpaved streets in the O'Neill Tract also not included, since no asbestos detected.

TABLE C.3

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
1	1-34	Spreckles Ave. & State St.	Rectangular lot, 85% heavily vegetated. Tractor trailer storage on S.W. portion of site. Construction waste, trash, and junked cars on N.E. portion of site. Most of lot is depressed an average of 1 foot below roadway.	Three CDM soil samples taken: #43 - <1 TR #44 - <1 TR #45 - <1-2%	Easy access from State and Speckles	770	280	215,600
2	2-1	State St. between pacific Ave. and Essex Ave.	Truck yard					
3	No photo	1/2 block N.W. of State St. on Pacific Avenue	Truck Yard					
4	1-32	State St. between Speckles Ave. and Pacific Ave.	Residential lot presently for sale. Previously fenced, only poles remaining. Flat and street level. Sparse vegetation over 30%. Small quantity of trash.	No samples	Easy access from state street	200	130	26,000
5	1-35	On Wabash St. near corner of Wabash St. and Pacific Ave.	Residential lot fully enclosed with 6-foot chainlink fence. Flat lot 1 foot above street level. Less than 30% vegetated. Clean lot.	One CDM soil sample: #57 - 1-2%	Easy access from Wabash St.	130	80	10,400
6	1-17	N.E. corner of Gold St. and Catherine St.	Oblong lot near pump station, less than 10% vegetated. Some construction waste. Several large boulders located on lot.	One CDM sample: #114 - 2-3% One EPA sample: <1%	Easy access from Gold St. and Catherine St.	-	-	16,800

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
7	1-36	Midway between Pacific Ave. and Essex Ave. on Wabash St.	Rectangular residential lot bounded on three sides by 6-foot wood privacy fence. Street side is open. Lot is barren with construction waste, tires, and trash. Lot is flat and level with street.	No known samples	Easy access from Wabash St.	120	80	9,600
8	1-31	Between Essex Ave. and Pacific Ave. on State St.	Narrow, rectangular, residential lot. Used as parking area for several cars. Some trash in the form of tires, metal, and wood. Lot is flat, barren, and stree level.	CDM sample: #66 - 1-2%	Easy access from State St.	120	50	6,000
9	2-19	Midway between Pacific Ave. and Spreckles Ave. on Michigan Ave.	Rectangular, residential lot. Fully enclosed with part wooden privacy and part chain link fence. Lot is moderately vegetated, approximately 50%. Some trash. Car storage. Lot is flat and street level.	One EPA sample <1%	Easy access from Michigan Ave.	120	80	9,600
10	No photo	Corner of Spreckles Ave. and Michigan Ave.	Rectangular, residential corner lot. Six foot privacy fence on two sides. Used for vehicle storage and some junk. 80% moderately vegetated. Lot is relatively flat and 1 foot above street level.	4 CDM samples 1 @ ND 3 @ 1-2% EPA samples 2 @ 1-5%	Easy access from Michigan Ave.	120	50	6,000

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
11	2-18	Corner of Michigan Ave. and Pacific Ave.	Lot apparently has two owners. Half of lot is 85% densely vegetated, fenced, and elevated 4 to 5 feet above street. Fence is 6-foot chain link. Other half of lot is moderately vegetated over 75%. Lot is flat and street level. Both halves are clean (no trash).	No known samples	Easily accessible from Michigan Ave. and Pacific Ave.	120	80	9,600
12	2-17	W/SW of lot 11 on Michigan Ave.	Large residential lot with no vegetation. Construction waste and residential waste covers 30% of lot. Lot is flat and street level.	CDM sample #56 - 1-2% EPA sample 1 @ <1%	Easy access from Michigan Ave.	230	120	27,600
13	2-20	Corner of Grand Blvd. and Essex Ave.	Residential corner lot with heavy vegetation over 90%. Lot is elevated 2-3 feet above street level. Lot has minimal trash.	No known samples	Easy access from Grand Blvd. and Exoex Ave.	120	80	9,600
14	2-7	Corner of Essex Ave. and Wabash St.	Large residential corner lot sparsely vegetated over 30%. Lot is flat and street level. Minimal trash.	CDM sample #200 - <1%TR EPA samples: #224 - <1%TR 2 @ <1%	Easy access from Essex Ave. and Wabash St.	170	120	20,400
15	1-30	Between Essex Ave. and Archer St. on State St.	Residential lot. Flat and street level with less than 25% sparse vegetation. 5-foot high chain link fence divides lot into two portions. Fence is damaged. One portion of lot is gravelled.	No known samples	Easy access from State St.	120	120	14,400

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
16	2-9	Adjacent to Lot 15 on Wabash St. between Essex Ave. and Archer St.	Resident lot is sparsely vegetated (<20%). Lot is flat and street level with minimal trash.	CDM sample #201 - <1% ND 1 EPA sample @ <1%	Easy access from Wabash St.	120	120	14,400
17	2-10	On Wabash St. near Archer St.	Large residential lot that is heavily vegetated over 90%. Lot is flat and at street level. A well established foot path bisects the lot diagonally. A junk car and minimal trash is on the lot.	CDM sample #202 - 1-2% EPA sample 1 @ 1-5%	Easy access from Wabash St.	120	120	14,400
18	1-29	Adjacent to Lot 17 on State St. near Archer St.	Narrow residential lot with no vegetation. Lot is flat and street level. Footpath (continuation of Lot 17) bisects lot. New construction to west has forced footpath completely through Lot 18.	CDM sample #212 - <1%ND EPA sample 1 @ 1%	Access from State St.	120	50	6,000
19	2-11	Corner of Wabash St. and Archer St.	4-foot high wood and wire fenced residential lot. Light vegetation over 85%. Lot is flat, street level, and well maintained.	No known samples	Easy access from Wabash St. and Archer St.	120	50	6,000
20	1-28	Located midway between Archer St. and intersection of State St., Catherine St., and Liberty St. on State St.	Appears to be a construction related storage lot. Lot is dirt/gravel, flat, and street level. Most of lot is enclosed with a 6-foot high chain link fence.	No known samples	Easy access from State St.	120	120	14,400

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
21	2-12	Located near dead end on Wabash St.	Large residential/commercial lot sparsely vegetated with less than 10% vegetation. Lot is relatively flat and elevated approximately 1 foot above street, 6-foot wood privacy fence on two sides.	CDM sample #205 - <1%TR	Easy access from Wabash St.	120	100	12,000
22	1-16	Corner lot at intersection of State St., Catherine St., and Liberty St.	Irregular shaped residential lot. Moderately vegetated on 40%. Wire and post fence on one side, white picket fence on another side. Lot is flat and street level.	3 CDM samples at or near Lot 22: #126 - <1%TR #115 - 1-2% #? - 2-3% 2 EPA samples: 1 @ <1% 1 @ 1-5%	Easy access from Liberty St.	-	-	10,200
23	2-13	At dead end on Wabash St.	Commercial lot located between vehicle storage yard and auto salvage yard. Lot is barren with tree stumps and miscellaneous trash over 10%. Lot is flat with some mounds. Lot is 6-inches to 1-foot above street level. Lot is bounded on two sides by 6-foot high security chainlink fences.	No known samples	Access from Wabash St.	130	80	10,400
24	1-4	Adjacent to Lot 23 on Michigan Ave.	Large commercial lot with sparse vegetation over 50%. Some construction debris. Lot is flat and street level. Some vehicle traffic is apparent.	CDM sample #80 - <1%TR EPA sample 1 @ <1%	Easy access along Michigan Ave.	380	120	45,600

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
25	1-5 2-15	Lot bounded by MichiganAve., Archer St., Grand Blvd., and Taylor St.	Large commercial lot presently being diked up to minimize dumping. Lot is sparsely vegetated over 30%. Appliances, tires, construction waste is randomly dumped along lot. Lot is street level to 1 foot lower than street. Lot is relatively flat.	5 CDM samples: #78 - 2-3% #84 - 1-2% #83 - 1-2% #82 - 2-3% #79 - 1-2% EPA samples: 5 @ 1-5% 3 @ <1%	Easy access from all four bordering streets	800	250	200,000
26	2-21	On Grand Blvd at intersection of Wilson Way and Grand Blvd.	Residential lot with sparse vegetation over 90%. Used for semi-truck and trailer parking. 6 foot high chainlink fence. Lot is flat, street level, and well maintained.	CDM sample #72 - 1-2% EPA sample 1 @ 1-5%	Access from Grand Blvd.	250	80	20,000
27	No photo	Lot at corner of Grand Blvd. and Taylor St.	Large farm lot. Moderate vegetation over 90%. Lot is relatively flat and at street level. Lot is fenced with post and barb wire.	2 CDM samples: #85 - <1%TR #86 - <1%TR 2 EPA samples: 1 @ <1% 1 @ <1%	Easy access from Taylor St. and Grand Blvd.	420	260	109,200
28	No photo	Adjacent to Lot 27 on Taylor St.	Large unclassified use lot. Relatively flat and moderately vegetated over 70%. Partially fenced.	No known samples	Access from Taylor St.	450	380	171,000

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
29	1-11	Corner of Wilson Way and Park Place.	Lot has been filled to 12 to 15 feet and is used by children as a bike jump. Lot is moderately vegetated over 70%.	EPA sample 1 @ <1%	Easy access from Wilson Way and Park Place	120	80	9,600
30	1-13	Across street from Lot 29 at intersection of Wilson Way and Park Place continuing around Grand Blvd.	Irregular shape residential lot that parallels Wilson Way. Lot is flat and moderately vegetated over 80%. Well worn walking paths were observed and used by children on their way to and from school. Lot is well maintained with some dumping along Grand Blvd.	No known samples	Access from Wilson Way and Grand Blvd.	-	-	72,400
31	2-22	Located within trailer park at intersection of Park Place and Roosevelt Way.	Moderately vegetated lot over 85%. Relatively flat and street level. Misc. metal waste disposed of on lot.	EPA samples indicate less than 1%	Access from park Place and Roosevelt Way.	120	100	12,000
32 & 33	2-24	Across from the school on Taylor Street	Unclassified use of lot. Mostly fenced with moderate vegetation over 50%.	EPA samples indicate less than 1%	Access from Taylor St.	1,100	600	660,000
34	No photo	Adjacent to lot 33 on Taylor St.	Large unclassified lot which borders the Guadalupe River. Lot elevation and slope varies greatly. The lot is presently being filled near the river. Some depressions (ponding) were observed. Vegetation is sparse.	EPA samples indicate less than 1%	Access from Taylor St.	-	-	1,105,000

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
35	1-26	On Taylor St. at intersections of Grand Blvd. and Taylor St. and Michigan Ave. and Taylor St.	Large unclassified lot with moderate vegetation over 80%. large quantities of waste material. Lot is mostly flat and street level.	19 EPA samples indicate less than 1%. 2 samples indicate 1-5%	Access from Taylor St. and Liberty St.	-	-	600,000
36	1-25	On Hope St. between Gold St. and Liberty St.	Used as a parking lot. Lot is flat and street level. Lot is dirt/gravel with no vegetation.	CDM sample #130 - <1% TR EPA samples 2 @ <1% 1 @ 1-5%	Access from Hope St., Gold St. and Liberty St.	330	180	59,400
37	1-18	Corner of Gold St. and Elizabeth St.	Residential/commercial corner lot. Lot is well graded dirt with no vegetation. Lot is approximately street level.	One EPA sample @ 1-5%	Access through Gold St. and Elizabeth St.	180	120	21,600
38	1-24	Corner of El Dorado St. and Catherine St.	Commercial corner lot. Lot is used as a parking lot and for steel scrap disposal. Lot is flat and street level. Lot is mostly dirt with some vegetation on 25%.	CDM sample #R 120 - <1% ND	Access along El Dorado St. and Catherine St.	160	160	25,600

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
39	1-22	Corner of El Dorado St. and Taylor St.	Irregular shaped commercial lot used as a parking lot and heavy equipment storage. Heavy vegetation over 50%. Lot has varying slope.	3 CDM samples: R103 - <1%ND 416 - <1%TR 139 - <1%TR 7 EPA samples: 6 @ <1% 1 @ 1-5%	Access along Taylor St. and El Dorado St.	-	-	120,000
40	1-23	Corner of El Dorado St. and Catherine St.	Residential/Commercial lot with heavy vegetation over 70%. Lot is depressed 203 below El Dorado St. level.	No known samples	Access along El Dorado St. and Catherine St.	180	120	21,600
41	1-19	Corner of Hope St. and Elizabeth St.	Large commercial, heavily vegetated lot. Well maintained and partially fenced. Lot is relatively flat.	One CDM sample taken at Roadway edge near El Dorado St.: #? - 2-3% 1 EPA sample: 1 @ <1%	Access along Elizabeth St.	330	280	92,400
42	1-20	Corner of Hope St. and Mill St.	Commercial lot moderately vegetated over 70%. Fill piles are located on the lot. Lot is depressed from Roadway 3-4 ft. Lot is fenced with 4 ft. high wire fence.	1 EPA sample @ <1%	Access from Mill St. and Hope St.	-	-	52,500

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
43	1-21	At end of Mill St.	Irregular shape commercial lot with light to moderate vegetation over 75%. Lit is flat and subject to restricted use due to location.	6 CDM samples: #400 - <1%ND 401 - <1%ND 402 - <1%ND 403 - <1%ND 404 - 10-20% 405 - <1%TR 4 EPA samples @ <1%	Access through marina parking lot on top of levee	-	-	60,000
44	2-8	On Wabash St. between Archer St. and Essex St.	Residential lot with 6' high privacy fence. Lot is flat and sparsely vegetated. Some various trash over 10%. Lot is street level.	No known samples	Access from Wabash St.	120	60	7,200
45	Error	No Lot 45						
46	2-16	On Michigan Ave. near the intersectionof Essex St. and Michigan Ave.	Narrow residential lot moderately vegetated over 90%. Lot is mounded up 4-5 feet above street level.	1 EPA sample @ <1%	Access from Michigan Ave.	120	60	7,200
47	3-19	N.E. corner of Gold St. and Moffat St.	Corner lot located near the Alviso Community Health Center. Lot is street level and mostly barren. Miscellaneous filling is obvious by different soil types present. Concrete waste located on a portion of lot.	1 CDM sample @ 1-2% 4 EPA samples: 3 @ <1% 1 @ 1-5%	Access from Gold St. and Moffat St.	180	180	32,400

TABLE C.3 (cont.)

VACANT LOT SURVEY

Lot No.	Photo No.	Location	Description	Soil Sampling Result (PLM)	Access	Length (FT)	Width (FT)	Area (SF)
48	3-27	Elizabeth St. between El Dorado St. and Gold St.	Well graded, clean lot presently for sale. Lot is barren and fenced with a 6-foot chainlink and 3 barb wire fences. Lot is approximately 2 feet lower than street elevation and over half is used for junk car storage.	No known samples.	Access from Elizabeth St.	180	100	18,000

LANDFILLS

Three landfills within the site boundary were identified as having accepted or suspected of having accepted asbestos-containing waste. These landfills are the Santos Landfill, the Hoxie Landfill (also known as Leslie Landfill, Marshland Development, or as the "Fill Dump"), and the Sainte Claire Corporation Landfill. From a practical standpoint, these landfills have been classified as a subunit. It has been assumed that waste handling characteristics and closure procedures for the landfills were similar with respect to types of waste accepted, waste placement, and cover thickness. Figure C-1 shows the location of each landfill and Table C.4 presents a description of each landfill, the sampling results, and approximate area. Figure C-3 presents a photograph of the Santos Landfill.

Santos Landfill

Of the three landfills, the Santos Landfill is the oldest, having started operations in 1947 and continuing through to 1964. The Santos Landfill is located at the southern end of Alviso, just east of Gold Street (Figure C-1). Most of the landfill site is presently occupied by the Summerset Mobile Home Trailer Park and the large levees adjacent to the Guadalupe River.

In 1963 and 1964, the Guadalupe River was realigned to decrease the potential flood hazard to Alviso. The river was rerouted through the Santos Landfill, dividing it into two areas. Details are sketchy, however, it is believed that the asbestos first detected during the construction of the outfall structure in 1983 was either the Santos Landfill (residuals from the Guadalupe rerouting) or the Sainte Claire Corporation Landfill described below. Figures 1-3 through 1-11 in Section 1.0 present an historical account of the landfilling operations for all three landfills. The information presented on the figures was extracted from available aerial photographs compiled at different scales and, therefore, accuracy and limits shown are approximate only. The Santos Landfill is not recognizable today as landfill, since the majority of the former site has been covered and a trailer park constructed. The busineses located north

TABLE C.4

LANDFILLS SURVEY

Landfill	Location	Description	CDM Sampling Results	EPA/CAL-OSHA Sampling Results	Approximate Area
Santos Landfill	Located at the southern end of Alviso, just east of Gold Street.	The Santos landfill operated from 1947 through 1964 and accepted residential and commercial waste. The Summerset Mobile Home trailer park presently occupies a portion of the Santos landfill. The trailer park contains approximately 117 trailers, all of which are well maintained and landscaped. The remainder of the landfill is partially vegetated or occupied by businesses.	No samples	23 @ TR/ND 9 @ 1-2% 1 @ 2-3% 1 @ 7-10%	30 Acres
Sainte Claire Landfill	Located at the southern end of Alviso at the intersection of Gold Street and Moffat Street.	The Sainte Claire landfill is divided into two parcels. The first parcel (west parcel) is bounded on the north by Moffat Street, on the south by the Guadalupe River, on the west by the railroad tracks, and on the east by Gold Street. The second parcel (East Parcel) is bounded on the north by Moffat Street, on the south by the Guadalupe River, on the west by Gold Street, and on the east by liberty Street. The landfill was never actually a designated landfill. Historical records indicate the landfill accepted commercial waste/fill for the purpose of elevating the land. The western parcel is presently being filled with "visually" clean material and the eastern parcel has been covered with a gravel layer.	1 @ 1%	10 @ TR/ND 1 @ 1-2% 4 @ 3-5% 2 @ 5-10%	4.5 Acres
Marshland Landfill	Located in the extreme southwest portion of the site, just west of Gold Street and south of the Guadalupe River.	The Marshland landfill is presently closed. The landfill began accepting household waste in in 1960 and continued to 1981 or 1982. A final cover is being constructed at the landfill and will presumably be revegetated. Several businesses, and reportedly some residences, occupy the area east of the Marshland landfill. The businesses were in operation for some time before the Marshland landfill commenced operation. The area is barren of vegetation with dirt roadways.	No surface samples	No surface samples	50 Acres
Area adjacent to Sainte Claire Landfill	East of Liberty north of Guadalupe River.	Area is narrow strip north of the Guadalupe River and east of the Sainte Claire landfill.	No samples	12 @ TR/ND 3 @ 3-5% 4 @ 5-10%	10 Acres

of the river and south of Moffat Street (Figure C-1) may be situated on the old landfill area. The flood control levees adjacent to the river are located in the center of the old landfill area.

Sainte Claire Corporation Landfill

The Sainte Claire Corporation Landfill (Sainte Claire Landfill) was never actually a designated landfill. Historical records indicate that the landfill accepted commercial fill for the purpose of elevating the land to increase the property value and make it suitable for construction. Whether or not asbestos waste was accepted is uncertain. The Sainte Claire Landfill is divided into two parcels or properties. Both parcels are located in the southern portion of the community, just to the north and east of the Santos Landfill (Figure C-1). The first parcel (west parcel) is bounded on the north by Moffat Street, on the south by the Guadalupe River, on the west by the railroad tracks, and on the east by Gold Street. The second parcel (east parcel) is bounded on the north by Moffat Street, on the south by the Guadalupe River, on the west by Gold Street, and on the east by Liberty Street.

Fill has been disposed of on both parcels during the last 40 years. The western parcel continues to be filled with "visually" clean fill. The eastern parcel served as the staging area for the SCVWD during the Gold Street bridge elevating project which was completed in 1987. As part of the project mobilization process, the eastern parcel was graded and covered with a gravel cover of unspecified thickness. Presently, the western parcel does not appear to be used and the eastern parcel is used for parking heavy equipment including semi trucks.

Marshland Landfill

The Marshland Landfill is the largest and most recent of the three landfills. The landfill occupies a 50-acre parcel of land in the extreme southwest portion of the site, just west of Gold Street and south of the Guadalupe River (Figure C-1). The property is owned by the Leslie Salt Company and has been leased to several entities over the years. The

landfill began accepting household waste in 1960 under a sublease and continued to accept waste until 1981 or 1982 when the landfill closed. Whether or not the Marshland Landfill accepted asbestos-containing waste is unclear. Limited soil and groundwater sampling was conducted by CDM at the Marshland Landfill under an agreement with Leslie Salt during the RI (EPA, 1988b).

Leslie Salt recently submitted a Solid Waste Assessment Test (SWAT) report in accordance with State of California regulations. Several businesses are located at the eastern edge of the Marshland Landfill, west of Gold Street, and south of the Guadalupe River. Most of the businesses appear to be vehicle and boat salvage yards or restoration and repair shops. It has also been reported that some residents are located within this area. Historical records, however, indicate that the area where these businesses are located was never used as a landfilling area. The businesses were in operation for some time before the Marshland Landfill commenced operation. Some of the businesses have large older boats and equipment stored on their properties which appeared to be in existence several years prior to the landfill operation. No soil sampling was conducted in this area.

Since the Marshland Landfill is presently placing a final cover, consistent with the remedial alternatives under Superfund, it is not included in any of the proposed site alternatives. The businesses located east of the landfill will be addressed in this FS, but will require sampling during remedial action to determine the extent of contamination.

MARINA

The Alviso Marina is located in the extreme northwest corner of the site and serves as a boat dock and recreation area (Figure C-1). The marina has been classified as an individual subunit based on institutional considerations because the area in which asbestos contamination was detected (designated on Figure C-1 as Lot 43) is owned by the Department of Interior (DOI) and maintained by the U.S. Fish and Wildlife Service. The

extent of contamination at Lot 43 is confined to the flood control levee which encompasses the lot, based on available data. Other areas within the Marina subunit have been sampled and show no detectable asbestos levels.

Since the contamination is isolated to the levee and the property is under DOI jurisdiction, this subunit will not be subject to further consideration in this FS. DOI has been notified of the situation and will take appropriate action.

YARDS, GARDENS, AND BUSINESSES

The Yards, Gardens, and Businesses (YG&B) subunit has been established to include all areas not covered by the other subunits to assure that all areas within the site have been addressed. Figure C-3 provides a photograph of a typical yard. In addition to the obvious yards and gardens, this subunit includes driveways, grocery stores and non-trucking businesses parking lots, the library parking lot, and any other unpaved areas within the site. In general, these areas are all similar in that they represent small, unsampled areas with moderate to high use. Most of these areas were not sampled during the RI phase for both budgeting and access constraints. The areas within this subunit will be sampled as the first step in the Remedial Design (RD) or Remedial Action (RA) phase.

SUMMARY

Of the seven subunits identified initially, five will be considered during the preparation of the FS (the levee has been considered in a separate document). The Marina subunit falls under the jurisdiction of the DOI and is, therefore, excluded from the site. Remedial action to be taken at this subunit will be at the discretion of the DOI.

APPENDIX D

ARARs

TABLE D.1

FEDERAL ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
Contaminant-Specific				
Safe Drinking Water Act	40 U.S.C. § 300g			
National Primary Drinking Water Standards	40 C.F.R. Part 141	Establishes health-based standards for public water systems (maximum contaminant levels)	No/No	No MCL has been promulgated for asbestos; waters in site vicinity are not used for drinking. Any site discharges during remedial actions will not enter drinking water sources.
National Secondary Drinking Water Standards	40 C.F.R. Part 143	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels)	No/No	Secondary MCLs are not relevant and appropriate.
Maximum Contaminant Level Goals	Pub. L. No. 99-339, 100 Stat. 642 (1986)	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety	No/No	To be considered only; MCLG not to be used as ARAR as per CERCLA.
Clean Water Act	33 U.S.C. §§ 1251-1376			
Water Quality Criteria	40 C.F.R. Part 131 Quality Criteria for Water, 1976, 1980, 1986	Sets criteria for water quality based on toxicity to aquatic organisms and human health	Yes/No	Remedial actions may have a de minimus affect on water quality of adjacent wetland.
Occupational Safety and Health Act (OSHA)	29 U.S.C. §§651-678	Sets permissible exposure limits (PELs) for worker safety.	Yes/No	Only existing promulgated asbestos exposure level. Not protective enough for ambient exposure but must be used as an upper bound.

TABLE D.1 (cont.)

FEDERAL ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
Clean Air Act	42 U.S.C. § 7401 et seq			
National Emissions Standards for Hazardous Air Pollutants for Asbestos	40 C.F.R. Parts 61, 140-161, 156	Specifies control requirements for asbestos handling and work practices to control emissions.	Yes/No	Specifies "no visible emissions. Does not specify a threshold contaminant level. Specifies soil cover requirements.
Toxic Substances Control Act (TSCA)	15 USC §§ 2601 et seq.			
Asbestos Hazard Emergency Response Act (AHERA)	40 C.F.R. Part 763	Establishes final roles regarding asbestos in schools.	Yes/No	Although the rule concerns asbestos in schools, it does establish procedures by which the presence of asbestos is judged against ambient levels. These procedures may be relevant and appropriate during remedial action and afterward.
Action-Specific				
Clean Water Act	33 U.S.C. §§ 1251-1376			
National Pollutant Discharge Elimination System	40 C.F.R. Parts 122, 125	Requires permits for the discharge of pollutants from any point source into waters of the United States	No/No	Water treatment or discharge is not a part of this RI/FS.

TABLE D.1 (cont.)

FEDERAL ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
Solid Waste Disposal Act ("SWDA")	42 U.S.C. §§ 6901-6987			
Criteria for Classification of Solid Waste Disposal Facilities and Practices	40. C.F.R. Part 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.	No/No	Applicability of this law will be based on if the site is a treatment, storage, disposal (TSD) facility.
Guidelines for the Land Disposal of Solid Wastes	40 C.F.R. Part 241	Establishes requirements and procedures for land disposal of solid wastes	No/No	Applicability of this law will be based on if the site is a treatment, storage, disposal (TSD) facility.
Hazardous Waste Management Systems General	40 C.F.R. Part 260	Establishes procedures and criteria for modification or revocation of any provision in 40 C.F.R. Part 260-265	No/No	Applicability of this law will be based on if the site is a treatment, storage, disposal (TSD) facility.
Resource Conservation and Recovery Act of 1976	42 U.S.C. §§ 6901-6987	Establishes criteria for proper handling and disposal of hazardous waste, and establishes definitions of what constitutes a hazardous waste.	No/No	Asbestos is not a hazardous waste under RCRA.

TABLE D.1 (cont.)

FEDERAL ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
Location-Specific				
National Historic Preservation Act	16 U.S.C. § 470 40 C.F.R. § 6.301(b) 36 C.F.R. Part 800	Requires Federal agencies to take into account the effect of any Federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.	Yes/No	The older portion of Alviso is a designated National Register Historic District. Each remedy will have to be assessed to determine the impact to the district and associated structures. May trigger 106 consultation process with National Historic Preservation Council and State Historic Society.
Archeological and Historic Preservation Act	16 U.S.C. § 469 40 C.F.R. § 6301(c)	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally licensed activity or program.	No/No	The remedy does not affect historical or archeological data.
Historic Sites, Buildings and Antiquities Act	16 U.S.C. §§ 461-467 40 C.F.R.§ 6.301(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	No/No	The remedy does not affect any Natural Landmark.
Fish and Wildlife Coordination Act, Fish and Wildlife Act, Watershed Protection and Flood Prevention Act	16 U.S.C. §§ 661-666 40 C.F.R. § 6.302(g)	Requires consultation when Federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	No/No	Alternatives developed will not modify the adjacent New Chicago Marsh area.

TABLE D.1 (cont.)

FEDERAL ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
Endangered Species Act	16 U.S.C. 1531 50 C.F.R. Part 200 50 C.F.R. Part 402, 424	Requires action to conserve endangered species within critical habitats upon which endangered species depend. Includes consultation with Dept. of Interior and U.S. Fish and Wildlife.	No/No	An endangered species, the Salt Marsh Harvest Mouse, has been identified near the site. Alternatives will not impact the critical habitat.
Clean Water Act				
Dredge or Fill Requirements (Section 404)	33 U.S.C. §§ 1251-1376 40 C.F.R. Parts 230, 231 33 C.F.R. Part 323	Prohibits discharge of dredged or fill material into aquatic ecosystems unless no adverse impacts can be demonstrated. Land mitigation is triggered if impacts are unavoidable.	No/No	Alternatives developed will not involve discharge of dredged or fill material into aquatic wetland system.
Rivers and Harbors Act of 1899	33 U.S.C § 403			
Section 10 Permit	33 C.F.R. Parts 320-330	Requires permit for structures or work in or affecting navigable waters.	No/No	Alternatives developed will not involve structures or work in or affecting navigable waters.
National Environmental Policy Act (NEPA)	42 U.S.C. §§ 4332-4370a	Similar to CEQA under California law; requires environmental review of various alternatives.	No/Yes	A requirement for an environmental impact statement will be satisfied by the RI/FS document.

TABLE D.1 (cont.)

FEDERAL ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
U.S. Fish and Wildlife Mitigation Policy	F.R. 7644-7663, Vol. 46, No. 15	Establishes mitigation goals for each of 4 habitat resource categories, to avoid critical habitat loss.	No/No	Requires no net loss of habitat; substantive requirements will be met by RI/FS. Alternativew will not affect habitat.
Executive Order on Protection of Wetlands	Exec. Order No. 11988 (Floodplain Management) Exec. Order No. 11990 (Protection of Wetlands) 40 C.F.R. § 6.302(a) & Appendix A	Requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists.	No/No	Alternatives developed will not affect the adjacent wetland.
Wilderness Act	16 U.S.C. 1131	Administer federally owned wilderness area to leave it unimpacted	No/No	No wilderness area on site or adjacent to site.
National Wildlife Refuge	16 U.S.C. 668 50 C.F.R. 27	Restricts activities within a National Wildlife Refuge	No/No	A wildlife refuge is adjacent to site. Alternative will not affect refuge.
Coastal Zone Management Act	16 U.S.C. 1451	Conduct activities in accordance with State-approved management program.	No/No	As per Table D.2, site does not come under jurisdiction of state program.

TABLE D.2 CALIFORNIA ARARs

Applicable/ Standard, Requirement Criteria or Limitation	Citation	Description	Applicable/ Relevant & Appropriate	Comments
Contaminant Specific				
Air Resources Act	Health & Safety Code Div. 26, Section 39000 Title 17, Cal. Admin Code (CAC), Part 3, Chapter 1	Regulates Air Quality (Air Resources Board)	Yes/No	Asbestos is identified as a toxic air contaminant. Regulations do not establish a state-wide ambient standard. The EPA risk determination is equivalent to state's risk assessment process for identifying health risks.
California Safe Drinking Water Act	Health & Safety Code, Div. 7, Part 1 contaminant levels (MCLs) Title 22, CAC Div. 4 Chap.	Regulates Drinking Water Standards, maximum (Department of Health Services)	No/No	Asbestos is not an MCL. Surface/ground-water in site vicinity is not used for drinking.
Safe Drinking Water and Toxics Enforcement Act (Proposition 65)	Health & Safety Code, Div. 20, Chap. 6.6	Sets reproductive toxin levels, regulates reporting of hazardous materials releases to local government (Department of Health Services)	Yes/No	Although asbestos is on the list of recognized toxins, water in site vicinity not used for drinking, so does not apply (within tidal zone).
Hazardous Waste Control Laws	Health & Safety Code, Div. 20, Chap. 6.5 Title 22, CAC, Div. 4, Chap. 30	Provides minimum standards for management of hazardous wastes (Department of Health Services, Regional Water Quality Board)	Yes/No	Asbestos is identified as a toxic hazardous waste, in Article 9. No STLC or TTLC values are provided to identify health risks.
Hazardous Substance Account Act	Health & Safety Code, Div. 20, Chap. 6.8	Requirements governing expenditure of state Superfund dollars on abandoned sites & emergency response. (Dept. of Health Services)	No/No	Although the site at one time was a State Superfund site, since now on NPL under Federal action, State shall not duplicate Federal action (§ 25350).

TABLE D.2 CALIFORNIA ARARs, continued

Applicable/ Standard, Requirement Criteria or Limitation	Citation	Description	Applicable/ Relevant & Appropriate	Comments
Hazardous Substances Act	Health & Safety Code, Div. 22, Chap 13, Sec. 28740 et seq	Defines hazardous substances (Dept. of Health Services)	Yes/No	Asbestos considered toxic; "Hazardous substance" and "toxic" broadly defined.
Location Specific				
McAteer-Petris Act	Government Code, Title 7.2, Sec. 66600 et seq. Title 14 CAC, Div. 5 Sec. 10110 et seq	Establishes the San Francisco Bay Conservation and Development Comm. Regulates activities in and adjacent to the Bay through the Bay Plan document. (BCDC)	Yes/No	The planned alternatives are consistent with the Bay Plan; review requirements of BCDC will be complied with.
California Coastal Act	Public Resources Code, Div. 20, Sec. 30000 et seq.	Regulates activities in coastal zone	No/No	Bay site does not come under jurisdiction of law.
Action Specific				
California Environmental Quality Act	Public Resources Code, Div. 13, Sec. 21000 et seq. Title 14 CAC, Div. 6, Chapter 3; Sec. 15000 et seq.	Provides for environmental review of project impacts, analysis of alternatives, with an environmental impact statement (Resources Agency)	No/No	Based on the assumption that a categorical exemption from CEQA provisions will be provided by a regulatory agency. The RI/FS will meet the applicable provisions and will be functionally equivalent under Sec. 21080.5, so that separate EIR may not be required.
Porter-Cologne Water Quality Act	Water Code, Div. 7, CAC Section 13000 et seq. Title 23, CAC, Chap. 3 Subchap. 15	Establishes duties and authorities of the state and Regional Water Quality Control Boards; Title 23 describes standards for hazardous waste discharge and disposal as it may effect waters of the state. (Regional Water Quality Control Board).	Yes/No	This law applicable as per remedial alternatives involving potential discharge/release of asbestos into waters of State. Also discusses closure of hazardous waste facilities.

TABLE D.2 CALIFORNIA ARARs, continued

Applicable/ Standard, Requirement Criteria or Limitation	Citation	Description	Applicable/ Relevant & Appropriate	Comments
Occupational Health & Safety Act	Labor Code, Div. 5 Section 6300 et seq	Worker safety, responsibilities and duties of employer (Cal-OSHA)	No/No	Applies to all response activities.
Fish and Game Laws	Fish and Game Code, Div. 6, Part 1	Water Pollution Prohibition	No/Yes	Applies to response activities as they affect aquatic habitat. Remedial actions will not affect habitat.
Regional Water Quality Control Board Non-Degradation Policy	Resolution No. 68-16	Waters of the State will not be degraded unless in the interest of the State	No/Yes	Strict interpretation of this law has been consistently applied regarding acceptable discharge levels; however, remedial actions do not involve water discharge.
Bay Area Air Quality Management	BAAQMD Reg. 11, Rule 2, 305.3.1	Controls emissions of asbestos to the atmosphere and provides for an appropriate waste disposal procedure and cover requirements.	Yes/No	Applicable to all remedial activities.

APPENDIX E

PROPOSED PRE-REMEDIATION SAMPLING APPROACH

APPENDIX E
PROPOSED PRE-REMEDIATION SAMPLING APPROACH

The objective of sampling during the remedial action is to assess, on a parcel by parcel basis, which areas require remediation. To cost-effectively determine those areas, a flexible, interactive on-site sampling and analysis process has been developed. The asbestos concentration which triggers remediation is an average of 1 percent as measured by PLM. If the average asbestos concentration exceeds 1 percent, then the entire lot or yard will be remediated. Partial remediation of an individual parcel will not be considered due to practical constraints.

A composite sampling program is proposed. Individual grab samples will be collected from a number of unbiased locations throughout the parcel. The soil from the grab samples will be combined and a single composite sample from the soil mixture will be analyzed. If this composite sample contains no detectable asbestos, no remedial action will be required; however, if the sample contains detectable asbestos, the entire parcel will be remediated. The advantages of this proposed method are rapid remedial decision making, rapid sample collection, low analytical cost as compared to analyzing individual grab samples, and representative sampling of the parcels.

Sampling will be comprised of the following steps:

1. Division of the parcel into units
2. Division of each unit into quadrants
3. Collection of randomized grab samples from each quadrant
4. Compositing of grab samples to form a unit composite
5. Compositing of the unit composites to form a parcel composite

1. <u>Division of the parcel into units</u>. The size of the individual land parcels (vacant lots and yards) is variable. To ensure consistent sample density, a standardized unit will be determined. Each parcel will then be divided into the standard units and four random samples will be composited from each unit. The selected unit is the average size of a residential yard. Thus, a composite of four samples will be collected from each yard.

If a vacant lot is three times as large as the average yard, then the lot will be divided into three units and a composite of four samples will be collected from each unit.

2. Division of each unit into quadrants. The sampling team will stake the four corners and center of each unit, thus dividing the unit into quadrants. To ensure that a representative sample is obtained, a stratified random sample location procedure will be followed, as described below.

3. Collection of randomized samples. To ensure that the sample locations within each quadrant are not biased, a random location procedure will be utilized. The sampler will visually locate the center of the sampling quadrant. Random numbers will then be used to direct the sampler to move away from the center of the quadrant. It is proposed that a series of three digit random numbers be used. The first digit of the random number will range from 1 to 4 and will determine the direction of movement (north, east, south, or west). The second and third digits will range from 1 to 15 and will determine the distance in feet to be traveled. The sampler will make two random movements before collecting a sample. The sample will be collected from near-surface soil using the circular template method described in the Remedial Investigation Sampling and Analysis Plan.

4. Compositing of samples. The samples collected from the four quadrants will be combined and mixed in a stainless steel bowl. An 8 ounce sample will be collected from the mixture. If the parcel is composed of only one sampling unit (i.e. it is a residential yard), then the 8 ounce unit composite sample will be analyzed on site. If the parcel is composed of more than one unit, then step 5 is performed.

5. Compositing of unit composites. If the parcel is comprised of more than one sampling unit, an 8 ounce unit composite will be obtained from each of the units. These composites will be combined in a stainless steel bowl and a single 8 ounce sample will be collected from the mixture. This parcel composite will then be analyzed on-site.

Samples will be analyzed in an on-site temporary laboratory by a trained technician. The analytical method will be EPA's Interim Method for bulk asbestos using PLM. Costs have been assumed to be $50 per analysis, and approximately $50 per sample for collection and handling.

APPENDIX F

PRELIMINARY COST ESTIMATES

PRELIMINARY COST ESTIMATES

The cost presented in Section 3.0 of this document were developed from the following worksheets. The overall accuracy of these costs are within minus 50 percent and plus 100 percent of the anticipated actual construction cost. This level of estimate, as defined by the American Association of Cost Engineers, represents an order-of-magnitude accuracy. Unit costs were obtained from cost estimating reference books, previous cost estimates, phone quotes, and "best approximations" where no data was available.

Present worth costs were calculated assuming an inflation rate of 4 percent, a discount rate of 8 percent, and a 30-year design life. The End-of-Year method was utilized.

Mobilization has been estimated at 25 percent of the subtotal capital cost. Mobilization includes all contractor overhead items such as offices and equipment mobilization/demobilization, site security, health and safety training medical monitoring, decontamination facilities, utility connect/disconnects, permits, contractor reports, and surveying costs.

The following abbreviations have been used in the costing worksheets:

CY - cubic yard
EA - each
LF - linear or lineal foot
LS - lump sum
PHE - Public Health Evaluation
SY - square yard
YR - year

288.15A:2

CDM COST ESTIMATE

PROJECT: South Bay Asbestos DATE: 24-Jan-89
PROJ. NO.:7777-288
EST LEVEL:PRELIMINARY (-50/+100%)
ALTERN.: NO. 1 NO ACTION TIME TO COMPLETE: 0 MONTHS

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST
1.0	CAPITAL COST				
1.1	INITIAL VACUUM SWEEPING	0	LF	$30	$0
1.2	TRUCK YARD PAVING(8-14IN)	0	SY	$19	$0
1.3	ST. CLAIRE PAVING(8-14IN)	0	SY	$19	$0
1.4	MISC. PAVING (1-1/2-IN)	0	SY	$12	$0
1.5	SOIL COVER (9-INCH THICK)	0	SY	$7	$0
1.6	SOIL EXCAVATION	0	CY	$7	$0
1.7	SOIL HANDLING	0	CY	$6	$0
1.8	TRANSPORT	0	CY	$60	$0
1.9	DISPOSAL	0	CY	$100	$0
1.10	BACKFILL/RESTORATION	0	CY	$5	$0
1.11	FINAL VACUUM SWEEPING	0	LF	$30	$0
1.12	INSTITUTIONAL CONTROLS	0	LS	$10,000	$0
1.13	SOIL SAMPLE/ANALYSIS	0	EA	$100	$0
1.14	SUBTOTAL CAPITAL COST				$0
1.15	MOBILIZATION @ 25%				$0
1.16	CONTINGENCY @ 20%				$0
1.17	ENGINEERING & DESIGN (5%)				$0
1.18	CONSTRUCTION MANAGEMENT (10%)				$0
1.19	TOTAL CAPITAL COST				$0
2.0	YEARLY MAINTENANCE				
2.1	YEARLY INSPECTION	0	EA	$2,500	$0
2.2	REPAIR 5% ASPHALT				
	8-14" ASPHALT	0	SY	$20	$0
	-1-1/2"ASPHALT	0	SY	$15	$0
2.3	REVEGETATE 10%	0	SY	$3	$0
2.4	SUBTOTAL MAINTENANCE				$0
2.5	CONTINGENCY @ 10%				$0
2.6	TOTAL MAINTENANCE COST				$0
3.0	5-YEAR PHE				
3.1	5-YEAR PHE	6	EA	$15,000	$90,000

4.0	PRESENT WORTH COST			
4.1	PRESENT WORTH CAPITAL	1 LS	$543,534,000	$543,534,000
4.2	PRESENT WORTH MAINTENANCE	30 YR	$0	$0
4.3	PRESENT WORTH 5-YEAR PHE	0 EA	$0	$0
4.4	TOTAL PRESENT WORTH			$543,534,000

CDM COST ESTIMATE

PROJECT: South Bay Asbestos DATE: 24-Jan-89
PROJ. NO.:7777-288
EST LEVEL:PRELIMINARY (-50/+100%)
ALTERN.: NO.2 TIME TO COMPLETE: 12 MONTHS

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST
1.0	CAPITAL COST				
1.1	INITIAL VACUUM SWEEPING	10300	LF	$30	$309,000
1.2	TRUCK YARD PAVING(8-14IN)	128500	SY	$19	$2,442,000
1.3	ST.CLAIRE PAVING (8-14IN)	0	SY	$19	$0
1.4	MISC. PAVING (1-1/2-IN)	0	SY	$12	$0
1.5	SOIL COVER (9-INCH THICK)	0	SY	$7	$0
1.6	SOIL EXCAVATION	4500	CY	$7	$32,000
1.7	SOIL HANDLING	4500	CY	$6	$27,000
1.8	TRANSPORT	4500	CY	$60	$270,000
1.9	DISPOSAL	4500	CY	$100	$450,000
1.10	BACKFILL/RESTORATION	0	CY	$5	$0
1.11	FINAL VACUUM SWEEPING	35000	LF	$30	$1,050,000
1.12	INSTITUTIONAL CONTROLS	1	LS	$10,000	$10,000
1.13	SOIL SAMPLE/ANALYSIS	50	EA	$100	$5,000
1.14	SUBTOTAL CAPITAL COST				$4,595,000
1.15	MOBILIZATION @ 25%				$1,149,000
1.16	CONTINGENCY @ 20%				$919,000
1.17	ENGINEERING & DESIGN (5%)				$230,000
1.18	CONSTRUCTION MANAGEMENT (10%)				$460,000
1.19	TOTAL CAPITAL COST				$7,353,000
2.0	YEARLY MAINTENANCE				
2.1	YEARLY INSPECTION	1	EA	$2,500	$3,000
2.2	REPAIR 5% ASPHALT				
	8-14" ASPHALT	6425	SY	$20	$129,000
	-1-1/2"ASPHALT	0	SY	$15	$0
2.3	REVEGETATE 10%	0	SY	$3	$0
2.4	SUBTOTAL MAINTENANCE				$132,000
2.5	CONTINGENCY @ 10%				$13,000
2.6	TOTAL MAINTENANCE COST				$145,000
3.0	5-YEAR PHE				
3.1	5-YEAR PHE	6	EA	$15,000	$90,000

4.0	PRESENT WORTH COST			
4.1	PRESENT WORTH CAPITAL	1 LS	$0	$0
4.2	PRESENT WORTH MAINTENANCE	30 YR	$0	$0
4.3	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000
4.4	TOTAL PRESENT WORTH			$49,000

CDM COST ESTIMATE

PROJECT: South Bay Asbestos DATE: 24-Jan-89
PROJ. NO.:7777-288
EST LEVEL:PRELIMINARY (-50/+100%)
ALTERN.: NO.3 TIME TO COMPLETE: 36 MONTHS

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST
1.0	CAPITAL COST				
1.1	INITIAL VACUUM SWEEPING	10300	LF	$30	$309,000
1.2	TRUCK YARD PAVING(8-14IN)	128500	SY	$19	$2,442,000
1.3	ST. CLAIRE PAVING(8-14IN)	4600	SY	$19	$87,000
1.4	MISC. PAVING (1-1/2-IN)	11000	SY	$12	$132,000
1.5	SOIL COVER (9-INCH THICK)	331000	SY	$7	$2,317,000
1.6	SOIL EXCAVATION	87300	CY	$7	$611,000
1.7	SOIL HANDLING	87300	CY	$6	$524,000
1.8	TRANSPORT	87300	CY	$60	$5,238,000
1.9	DISPOSAL	87300	CY	$100	$8,730,000
1.10	BACKFILL/RESTORATION	0	CY	$5	$0
1.11	FINAL VACUUM SWEEPING	35000	LF	$30	$1,050,000
1.12	INSTITUTIONAL CONTROLS	1	LS	$10,000	$10,000
1.13	SOIL SAMPLE/ANALYSIS	500	EA	$100	$50,000
1.14	SUBTOTAL CAPITAL COST				$21,500,000
1.15	MOBILIZATION @ 25%				$5,375,000
1.16	CONTINGENCY @ 20%				$4,300,000
1.17	ENGINEERING & DESIGN (5%)				$1,075,000
1.18	CONSTRUCTION MANAGEMENT (10%)				$2,150,000
1.19	TOTAL CAPITAL COST				$34,400,000
2.0	YEARLY MAINTENANCE				
2.1	YEARLY INSPECTION	1	EA	$2,500	$3,000
2.2	REPAIR 5% ASPHALT				
	8-14" ASPHALT	6655	SY	$20	$133,000
	-1-1/2"ASPHALT	550	SY	$15	$8,000
2.3	REVEGETATE 10%	33100	SY	$3	$99,000
2.4	SUBTOTAL MAINTENANCE				$243,000
2.5	CONTINGENCY @ 10%				$24,000
2.6	TOTAL MAINTENANCE COST				$267,000
3.0	5-YEAR PHE				
3.1	5-YEAR PHE	6	EA	$15,000	$90,000

4.0	PRESENT WORTH COST			
4.1	PRESENT WORTH CAPITAL	1 LS	$7,353,000	$7,353,000
4.2	PRESENT WORTH MAINTENANCE	30 YR	$145,000	$2,555,000
4.3	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000
4.4	TOTAL PRESENT WORTH			$9,957,000

CDM COST ESTIMATE

PROJECT: South Bay Asbestos DATE: 24-Jan-89
PROJ. NO.:7777-288
EST LEVEL:PRELIMINARY (-50/+100%)
ALTERN.: NO. 4 TIME TO COMPLETE: 72 MONTHS

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST
1.0	CAPITAL COST				
1.1	INITIAL VACUUM SWEEPING	10300	LF	$30	$309,000
1.2	TRUCK YARD PAVING(8-14IN)	128500	SY	$19	$2,442,000
1.3	ST. CLAIRE PAVING(8-14IN)	4600	SY	$19	$87,000
1.4	MISC. PAVING (1-1/2-IN)	11000	SY	$12	$132,000
1.5	SOIL COVER (9-INCH THICK)	662000	SY	$7	$4,634,000
1.6	SOIL EXCAVATION	170200	CY	$7	$1,191,000
1.7	SOIL HANDLING	170200	CY	$6	$1,021,000
1.8	TRANSPORT	170200	CY	$60	$10,212,000
1.9	DISPOSAL	170200	CY	$100	$17,020,000
1.10	BACKFILL/RESTORATION	0	CY	$5	$0
1.11	FINAL VACUUM SWEEPING	35000	LF	$30	$1,050,000
1.12	INSTITUTIONAL CONTROLS	1	LS	$10,000	$10,000
1.13	SOIL SAMPLE/ANALYSIS	1000	EA	$100	$100,000
1.14	SUBTOTAL CAPITAL COST				$38,208,000
1.15	MOBILIZATION @ 25%				$9,552,000
1.16	CONTINGENCY @ 20%				$7,642,000
1.17	ENGINEERING & DESIGN (5%)				$1,910,000
1.18	CONSTRUCTION MANAGEMENT (10%)				$3,821,000
1.19	TOTAL CAPITAL COST				$61,133,000
2.0	YEARLY MAINTENANCE				
2.1	YEARLY INSPECTION	1	EA	$2,500	$3,000
2.2	REPAIR 5% ASPHALT				
	8-14" ASPHALT	6655	SY	$20	$133,000
	-1-1/2"ASPHALT	550	SY	$15	$8,000
2.3	REVEGETATE 10%	66200	SY	$3	$199,000
2.4	SUBTOTAL MAINTENANCE				$343,000
2.5	CONTINGENCY @ 10%				$34,000
2.6	TOTAL MAINTENANCE COST				$377,000
3.0	5-YEAR PHE				
3.1	5-YEAR PHE	6	EA	$15,000	$90,000

4.0	PRESENT WORTH COST			
4.1	PRESENT WORTH CAPITAL	1 LS	$34,400,000	$34,400,000
4.2	PRESENT WORTH MAINTENANCE	30 YR	$267,000	$4,704,000
4.3	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000
4.4	TOTAL PRESENT WORTH			$39,153,000

CDM COST ESTIMATE

PROJECT: South Bay Asbestos DATE: 24-Jan-89
PROJ. NO.:7777-288
EST LEVEL:PRELIMINARY (-50/+100%)
ALTERN.: NO. 5 TIME TO COMPLETE: 96 MONTHS

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST
1.0	CAPITAL COST				
1.1	INITIAL VACUUM SWEEPING	10300	LF	$30	$309,000
1.2	TRUCK YARD PAVING(8-14IN)	0	SY	$19	$0
1.3	ST. CLAIRE PAVING(8-14IN)	0	SY	$19	$0
1.4	MISC. PAVING (1-1/2-IN)	0	SY	$12	$0
1.5	SOIL COVER (9-INCH THICK)	0	SY	$7	$0
1.6	SOIL EXCAVATION	1900000	CY	$7	$13,300,000
1.7	SOIL HANDLING	1900000	CY	$6	$11,400,000
1.8	TRANSPORT	1900000	CY	$60	$114,000,000
1.9	DISPOSAL	1900000	CY	$100	$190,000,000
1.10	BACKFILL/RESTORATION	1900000	CY	$5	$9,500,000
1.11	FINAL VACUUM SWEEPING	35000	LF	$30	$1,050,000
1.12	INSTITUTIONAL CONTROLS	0	LS	$10,000	$0
1.13	SOIL SAMPLE/ANALYSIS	1500	EA	$100	$150,000
1.14	SUBTOTAL CAPITAL COST				$339,709,000
1.15	MOBILIZATION @ 25%				$84,927,000
1.16	CONTINGENCY @ 20%				$67,942,000
1.17	ENGINEERING & DESIGN (5%)				$16,985,000
1.18	CONSTRUCTION MANAGEMENT (10%)				$33,971,000
1.19	TOTAL CAPITAL COST				$543,534,000
2.0	YEARLY MAINTENANCE				
2.1	YEARLY INSPECTION	0	EA	$2,500	$0
2.2	REPAIR 5% ASPHALT				
	8-14" ASPHALT	0	SY	$20	$0
	-1-1/2"ASPHALT	0	SY	$15	$0
2.3	REVEGETATE 10%	0	SY	$3	$0
2.4	SUBTOTAL MAINTENANCE				$0
2.5	CONTINGENCY @ 10%				$0
2.6	TOTAL MAINTENANCE COST				$0
3.0	5-YEAR PHE				
3.1	5-YEAR PHE	0	EA	$15,000	$0

4.0	PRESENT WORTH COST			
4.1	PRESENT WORTH CAPITAL	1 LS	$61,133,000	$61,133,000
4.2	PRESENT WORTH MAINTENANCE	30 YR	$377,000	$6,643,000
4.3	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000
4.4	TOTAL PRESENT WORTH			$67,825,000

APPENDIX G

DETAILED COST ESTIMATES

DETAILED COST ESTIMATES

The costs presented in Section 4.0 of this document were developed from the following worksheets. The overall accuracy of these costs are within minus 30 percent and plus 50 percent of the anticipated actual construction cost. Unit costs were obtained from cost estimating reference books, previous cost estimates, phone quotes, and "best approximations" in the case of the easement costs.

Present worth costs were calculated assuming an inflation rate of 4 percent, a discount rate of 8 percent, and a 30-year design life. The End-of-Year method was utilized.

The following abbreviations have been used in the costing worksheets:

MO - month
EA - each
LS - lump sum
SF - square foot
CY - cubic yard
LF - lineal or linear foot
SY - square yard
WK - week
YR - year
PHE - Public Health Evaluation

288.15A.2

CDM DENVER COST ESTIMATE DATE: 24-Jan-89

PROJECT: SOUTH BAY ASBESTOS OU2FS ALTERNATIVE:NO. 1
PROJ. NO.: 7777-288
EST LEVEL: -30/+50 %

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST	REFERENCE
1.0 -	MOBILIZATION/DEMOBILIZATION					
	FLAT RATE ITEMS:					
	VEHICLE/EQUIP. DECON SET-UP		LS	$20,000	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. SET-UP		LS	$1,000	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	CONTRACTOR REPORTS		LS	$12,000	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	UTILITIES(CONNECT/DISCONNECT)		LS	$15,000	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERMITS		LS	$40,000	$0	R.S. MEANS SITE WORK COST DATA 1988, P.4
	MISCELLANEOUS SURVEYING		LS	$20,000	$0	CDM/ SOUTH BAY ASBESTOS, 1988
	VARIABLE RATE ITEMS:					
	HEAVY EQUIPMENT		EA	$1,000	$0	R.S. MEANS SITE WORK COST DATA 1988, P.36
	VEHICLE/EQUIP. DECON OPER.		MO	$2,000	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. OPER.		MO	$2,600	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	IND. HYG./SAFETY OFFICER		MO	$6,000	$0	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
2.0	SITE MONITORING/CHAR.					
	AIR MONITORING					
	-BASELINE		MO	$4,000	$0	CDM/ATL/KENNEDY GENERATING STATION,1987
	-INTERIM		MO	$4,000	$0	CDM/ATL/KENNEDY GENERATING STATION,1987
	-POST REMEDIATION		MO	$4,000	$0	CDM/ATL/KENNEDY GENERATING STATION,1987
	TITLE SEARCH		PARCELS	$400	$0	KIER & WRIGHT,1988
	MAINTENANCE EASEMENTS		SF	$3	$0	CDM/SOUTH BAY ASBESTOS/VARIOUS REF.,1988
3.0	REMEDIATION -					
	WARNING SIGNS		EA	$15	$0	CDM/SOUTH BAY ASBESTOS,1988
	FENCING		LF	$15	$0	R.S.MEANS SITE WORK COST DATA 1988
	SOIL SAMPLING(COLL. & ANAL.)		EA	$100	$0	EMS LABORATORIES, 1988
	CLEARING AND GRUBBING		SY	$1	$0	LSI CURRENT CONSTRUSTION COSTS, 1988
	GRADING		SY	$1	$0	LSI CURRENT CONSTRUSTION COSTS, 1988
	COMPACTED SOIL (M/P)		CY	$15	$0	CDM/MGM BRAKES, 1988
	TOPSOIL (M/P)		CY	$24	$0	CDM/MGM BRAKES, 1988
	REVEGETATION		SY	$2	$0	LSI CURRENT CONSTRUSTION COSTS, 1988, P. 41
	IRRIGATION		WK	$400	$0	CDM/SOUTH BAY ASBESTOS,1988
	1-1/2" ASPHALT (M/P)					
	-GREATER THAN 50,000 SY		SY	$10	$0	RENEW SEALER ASHALT QOUTE,1987
	-LESS THAN 50,000 SY		SY	$12	$0	RENEW SEALER ASHALT QOUTE,1987
	14" ASPHALT COMPOSITE(M/P)					
	-GREATER THAN 50,000 SY		SY	$16	$0	CALIFORNIA PAVEMENT QOUTE,1988
	-LESS THAN 50,000 SY		SY	$19	$0	CALIFORNIA PAVEMENT QOUTE,1988

	VACUUM SWEEPING	LF	$29	$0	SOS INTERNATIONAL QOUTE, 1988
	EXCAVATION	CY	$7	$0	CDM/MGM BRAKES, 1988
	STOCKPILING/HANDLING	CY	$6	$0	
	TRANSPORT	CY	$60	$0	CHEMICAL WASTE MGMT. QUOTE, 1989
	DISPOSAL	CY	$96	$0	CHEMICAL WASTE MGMT. QUOTE, 1989
	BACKFILL/COMP. (M/P)	CY	$3	$0	R.S. MEANS SITE WORK COST DATA 1988, P. 225
			CAPITAL COST SUBTOTAL =	$0	
			ENGINEERING & DESIGN (8%) =	$0	
			CONSTRUCTION MGMT (7%) =	$0	
			CONTINGENCY (10%) =	$0	
			TOTAL CAPITAL COST =	$0	
4.0	OPERATIONS AND MAINTENANCE				
	YEARLY INSPECTION	0 EA	$2,500	$0	CDM/SOUTH BAY ASBESTOS,1988
	REPLACE 25% WARNING SIGNS	0 EA	$15	$0	
	REPLACE 5% OF FENCE	0 LF	$15	$0	
	REVEGETATE OVER 10%	0 SY	$2	$0	
	TEMPORARY IRRIGATION	WK	$400	$0	
	REPAIR/REPLACE 15% OF ASPHALT				
	- 1-1/2" ASPHALT	0 SY	$12	$0	
	- 14" ASPHALT COMPOSITE	0 SY	$19	$0	
			SUBTOTAL YEARLY O&M COST =	$0	
			CONTINGENCY (5%) =	$0	
			TOTAL YEARLY O&M COST =	$0	
5.0	5 YEAR SITE ASSESSMENT	6 EA	$15,000	$90,000	
6.0	PRESENT WORTH COST				
	PRESENT WORTH CAPITAL	1 LS	$0	$0	
	PRESENT WORTH O&M	30 YR	$0	$0	
	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000	
	TOTAL PRESENT WORTH COST			$49,000	

CDM DENVER COST ESTIMATE DATE: 24-Jan-89

PROJECT: SOUTH BAY ASBESTOS OU2FS ALTERNATIVE:NO. 2
PROJ. NO.: 7777-288
EST LEVEL: -30/+50 %

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST	REFERENCE
1.0	MOBILIZATION/DEMOBILIZATION					
	FLAT RATE ITEMS:					
	VEHICLE/EQUIP. DECON SET-UP	1	LS	$20,000	$20,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. SET-UP	1	LS	$1,000	$1,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	CONTRACTOR REPORTS	1	LS	$12,000	$12,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	UTILITIES(CONNECT/DISCONNECT)	1	LS	$15,000	$15,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERMITS	1	LS	$40,000	$40,000	R.S. MEANS SITE WORK COST DATA 1988, P.4
	MISCELLANEOUS SURVEYING	1	LS	$20,000	$20,000	CDM/ SOUTH BAY ASBESTOS, 1988
	VARIABLE RATE ITEMS:					
	HEAVY EQUIPMENT	12	EA	$1,000	$12,000	R.S. MEANS SITE WORK COST DATA 1988, P.3
	VEHICLE/EQUIP. DECON OPER.	9	MO	$2,000	$18,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. OPER.	9	MO	$2,600	$23,400	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	IND. HYG./SAFETY OFFICER	3	MO	$6,000	$18,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
2.0	SITE MONITORING/CHAR.					
	AIR MONITORING					
	-BASELINE	2	MO	$4,000	$8,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	-INTERIM	9	MO	$4,000	$36,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	-POST REMEDIATION	1	MO	$4,000	$4,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	TITLE SEARCH	15	PARCELS	$400	$6,000	KIER & WRIGHT,1988
	MAINTENANCE EASEMENTS	10000	SF	$3	$30,000	CDM/SOUTH BAY ASBESTOS/VARIOUS REF.,1988
3.0	REMEDIATION -					
	WARNING SIGNS	50	EA	$15	$800	CDM/SOUTH BAY ASBESTOS,1988
	FENCING	5000	LF	$15	$75,000	R.S.MEANS SITE WORK COST DATA 1988
	SOIL SAMPLING(COLL. & ANAL.)	50	EA	$100	$5,000	EMS LABORATORIES, 1988
	CLEARING AND GRUBBING		SY	$1	$0	LSI CURRENT CONSTRUCTION COSTS, 1988
	GRADING	128500	SY	$1	$128,500	LSI CURRENT CONSTRUCTION COSTS, 1988
	COMPACTED SOIL (M/P)		CY	$15	$0	CDM/MGM BRAKES, 1988
	TOPSOIL (M/P)		CY	$24	$0	CDM/MGM BRAKES, 1988
	REVEGETATION		SY	$2	$0	LSI CURRENT CONSTRUCTION COSTS, 1988, P.
	IRRIGATION		WK	$400	$0	CDM/SOUTH BAY ASBESTOS,1988
	14" ASPHALT COMPOSITE (M/P)					
	-GREATER THAN 50,000 SY	64250	SY	$16	$1,028,000	LSI CURRENT CONSTRUCTION COSTS, 1988, P.
	-LESS THAN 50,000 SY		SY	$19	$0	RENEW SEALER ASPHALT QOUTE,1987
	8" ASPHALT COMPOSITE(M/P)					
	-GREATER THAN 50,000 SY	64250	SY	$9	$578,300	LSI CURRENT CONSTRUCTION COSTS, 1988, P.
	-LESS THAN 50,000 SY		SY	$19	$0	CALIFORNIA PAVEMENT QOUTE,1988

	VACUUM SWEEPING	45300 LF	$29	$1,313,700	SOS INTERNATIONAL QOUTE, 1988
	EXCAVATION	4500 CY	$7	$31,500	CDM/MGM BRAKES, 1988
	STOCKPILING/HANDLING	4500 CY	$6	$27,000	
	TRANSPORT	4500 CY	$60	$270,000	CHEMICAL WASTE MGMT. QUOTE, 1989
	DISPOSAL	4500 CY	$96	$432,000	CHEMICAL WASTE MGMT. QUOTE, 1989
	BACKFILL/COMP. (M/P)	CY	$3	$0	R.S. MEANS SITE WORK COST DATA 1988,
		CAPITAL COST SUBTOTAL =		$4,153,200	
		ENGINEERING & DESIGN (8%) =		$276,100	
		CONSTRUCTION MGMT (7%) =		$290,700	
		CONTINGENCY (10%) =		$415,300	
		TOTAL CAPITAL COST =		$5,135,300	
4.0	OPERATIONS AND MAINTENANCE				
	YEARLY INSPECTION	1 EA	$2,500	$2,500	CDM/SOUTH BAY ASBESTOS,1988
	REPLACE 25% WARNING SIGNS	13 EA	$15	$200	
	REPLACE 5% OF FENCE	250 LF	$15	$3,800	
	REVEGETATE OVER 10%	0 SY	$2	$0	
	TEMPORARY IRRIGATION	WK	$400	$0	
	REPAIR/REPLACE 5% OF ASPHALT				
	- 14" ASPHALT COMPOSITE	3213 SY	$19	$61,000	
	- 8" ASPHALT COMPOSITE	3213 SY	$19	$61,000	LSI CURRENT CONSTRUCTION COSTS, 1988,
		SUBTOTAL YEARLY O&M COST =		$128,500	
		CONTINGENCY (5%) =		$6,400	
		TOTAL YEARLY O&M COST =		$134,900	
5.0	5 YEAR SITE ASSESSMENT	6 EA	$15,000	$90,000	
6.0	PRESENT WORTH COST				
	PRESENT WORTH CAPITAL	1 LS	$5,135,300	$5,135,000	
	PRESENT WORTH O&M	30 YR	$134,900	$2,377,000	
	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000	
	TOTAL PRESENT WORTH COST			$7,561,000	
	EQUIVALENT UNIT COST =	$18 /SY			

PROJECT: SOUTH BAY ASBESTOS OU2FS ALTERNATIVE:NO.3
PROJ. NO.: 7777-288
EST LEVEL: -30/+50 %

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST	REFERENCE
1.0	MOBILIZATION/DEMOBILIZATION					
	FLAT RATE ITEMS:					
	VEHICLE/EQUIP. DECON SET-UP	1	LS	$20,000	$20,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. SET-UP	1	LS	$1,000	$1,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	CONTRACTOR REPORTS	1	LS	$12,000	$12,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	UTILITIES(CONNECT/DISCONNECT)	1	LS	$15,000	$15,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERMITS	1	LS	$40,000	$40,000	R.S. MEANS SITE WORK COST DATA 1988, P.4
	MISCELLANEOUS SURVEYING	1	LS	$20,000	$20,000	CDM/ SOUTH BAY ASBESTOS, 1988
	VARIABLE RATE ITEMS:					
	HEAVY EQUIPMENT	18	EA	$1,000	$18,000	R.S. MEANS SITE WORK COST DATA 1988, P.3
	VEHICLE/EQUIP. DECON OPER.	39	MO	$2,000	$78,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. OPER.	39	MO	$2,600	$101,400	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	IND. HYG./SAFETY OFFICER	12	MO	$6,000	$72,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
2.0	SITE MONITORING/CHAR.					
	AIR MONITORING					
	-BASELINE	2	MO	$4,000	$8,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	-INTERIM	39	MO	$4,000	$156,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	-POST REMEDIATION	1	MO	$4,000	$4,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	TITLE SEARCH	120	PARCELS	$400	$48,000	KIER & WRIGHT,1988
	MAINTENANCE EASEMENTS	10000	SF	$3	$30,000	CDM/SOUTH BAY ASBESTOS/VARIOUS REF.,1988
3.0	REMEDIATION -					
	WARNING SIGNS	100	EA	$15	$1,500	CDM/SOUTH BAY ASBESTOS,1988
	FENCING	20000	LF	$15	$300,000	R.S.MEANS SITE WORK COST DATA 1988
	SOIL SAMPLING(COLL. & ANAL.)	200	EA	$100	$20,000	EMS LABORATORIES, 1988
	CLEARING AND GRUBBING	331000	SY	$1	$331,000	LSI CURRENT CONSTRUSTION COSTS, 1988
	GRADING	331000	SY	$1	$331,000	LSI CURRENT CONSTRUSTION COSTS, 1988
	COMPACTED SOIL (M/P)	55200	CY	$15	$828,000	CDM/MGM BRAKES, 1988
	TOPSOIL (M/P)	14300	CY	$24	$343,200	CDM/MGM BRAKES, 1988
	REVEGETATION	331000	SY	$2	$662,000	LSI CURRENT CONSTRUSTION COSTS, 1988, P.
	IRRIGATION	12	WK	$400	$4,800	CDM/SOUTH BAY ASBESTOS,1988
	1-1/2" ASPHALT (M/P)					
	-GREATER THAN 50,000 SY		SY	$10	$0	RENEW SEALER ASHALT QOUTE,1987
	-LESS THAN 50,000 SY	11000	SY	$12	$132,000	RENEW SEALER ASHALT QOUTE,1987
	14" ASPHALT COMPOSITE(M/P)					
	-GREATER THAN 50,000 SY	66550	SY	$16	$1,064,800	CALIFORNIA PAVEMENT QOUTE,1988
	-LESS THAN 50,000 SY		SY	$19	$0	CALIFORNIA PAVEMENT QOUTE,1988
	8" ASPHALT COMPOSITE(M/P)					
	-GREATER THAN 50,000 SY	66550	SY	$9	$599,000	CALIFORNIA PAVEMENT QOUTE,1988
	-LESS THAN 50,000 SY		SY	$19	$0	CALIFORNIA PAVEMENT QOUTE,1988

	VACUUM SWEEPING	45300 LF	$29	$1,313,700	SOS INTERNATIONAL QOUTE, 1988
	EXCAVATION	87300 CY	$7	$611,100	CDM/MGM BRAKES, 1988
	STOCKPILING/HANDLING	87300 CY	$6	$523,800	
	TRANSPORT	87300 CY	$60	$5,238,000	CHEMICAL WASTE MGMT. QUOTE, 1989
	DISPOSAL	87300 CY	$96	$8,380,800	CHEMICAL WASTE MGMT. QUOTE, 1989
	BACKFILL/COMP. (M/P)	CY	$3	$0	R.S. MEANS SITE WORK COST DATA 1988, P.
		CAPITAL COST SUBTOTAL =		$21,308,100	
		ENGINEERING & DESIGN (8%) =		$1,704,600	
		CONSTRUCTION MGMT (7%) =		$1,491,600	
		CONTINGENCY (10%) =		$2,130,800	
		TOTAL CAPITAL COST =		$26,635,100	
4.0	OPERATIONS AND MAINTENANCE				
	YEARLY INSPECTION	1 EA	$2,500	$2,500	CDM/SOUTH BAY ASBESTOS,1988
	REPLACE 25% WARNING SIGNS	25 EA	$15	$400	
	REPLACE 5% OF FENCE	1000 LF	$15	$15,000	
	REVEGETATE OVER 10%	33100 SY	$2	$66,200	
	TEMPORARY IRRIGATION	12 WK	$400	$4,800	
	REPAIR/REPLACE 5% OF ASPHALT				
	- 1-1/2" ASPHALT	550 SY	$12	$6,600	
	- 14" ASPHALT COMPOSITE	3328 SY	$19	$63,200	
	- 8" ASPHALT COMPOSITE	3328 SY	$19	$63,200	
		SUBTOTAL YEARLY O&M COST =		$221,900	
		CONTINGENCY (5%) =		$11,100	
		TOTAL YEARLY O&M COST =		$233,000	
5.0	5 YEAR SITE ASSESSMENT	6 EA	$15,000	$90,000	
6.0	PRESENT WORTH COST				
	PRESENT WORTH CAPITAL	1 LS	$26,635,100	$26,635,100	
	PRESENT WORTH O&M	30 YR	$233,000	$4,105,000	
	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000	
	TOTAL PRESENT WORTH COST			$30,789,000	
	EQUIVALENT UNIT COST =	$44 /SY			

CDM DENVER COST ESTIMATE DATE: 24-Jan-89

PROJECT: SOUTH BAY ASBESTOS OU2FS ALTERNATIVE:NO. 4
PROJ. NO.: 7777-288
EST LEVEL: -30/+50 %

ITEM NO.	DESCRIPTION	QUANTITY OR MEASURE	UNIT OF MEASURE	UNIT COST	ITEM COST	REFERENCE
1.0	MOBILIZATION/DEMOBILIZATION					
	FLAT RATE ITEMS:					
	VEHICLE/EQUIP. DECON SET-UP	1	LS	$20,000	$20,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. SET-UP	1	LS	$1,000	$1,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	CONTRACTOR REPORTS	1	LS	$12,000	$12,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	UTILITIES(CONNECT/DISCONNECT)	1	LS	$15,000	$15,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERMITS	1	LS	$40,000	$40,000	R.S. MEANS SITE WORK COST DATA 1988, P.4
	MISCELLANEOUS SURVEYING	1	LS	$20,000	$20,000	CDM/ SOUTH BAY ASBESTOS, 1988
	VARIABLE RATE ITEMS:					
	HEAVY EQUIPMENT	24	EA	$1,000	$24,000	R.S. MEANS SITE WORK COST DATA 1988, P.3
	VEHICLE/EQUIP. DECON OPER.	69	MO	$2,000	$138,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	PERSONNEL DECON TRLR. OPER.	69	MO	$2,600	$179,400	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
	IND. HYG./SAFETY OFFICER	18	MO	$6,000	$108,000	CDM/WOODBURY CHEMICAL COST ESTIMATE,1987
2.0	SITE MONITORING/CHAR.					
	AIR MONITORING					
	-BASELINE	2	MO	$4,000	$8,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	-INTERIM	69	MO	$4,000	$276,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	-POST REMEDIATION	1	MO	$4,000	$4,000	CDM/ATL/KENNEDY GENERATING STATION,1987
	TITLE SEARCH	220	PARCELS	$400	$88,000	KIER & WRIGHT,1988
	MAINTENANCE EASEMENTS	10000	SF	$3	$30,000	CDM/SOUTH BAY ASBESTOS/VARIOUS REF.,1988
3.0	REMEDIATION -					
	WARNING SIGNS	200	EA	$15	$3,000	CDM/SOUTH BAY ASBESTOS,1988
	FENCING	25000	LF	$15	$375,000	R.S.MEANS SITE WORK COST DATA 1988
	SOIL SAMPLING(COLL. & ANAL.)	350	EA	$100	$35,000	EMS LABORATORIES, 1988
	CLEARING AND GRUBBING	662000	SY	$1	$662,000	LSI CURRENT CONSTRUSTION COSTS, 1988
	GRADING	662000	SY	$1	$662,000	LSI CURRENT CONSTRUSTION COSTS, 1988
	COMPACTED SOIL (M/P)	110300	CY	$15	$1,654,500	CDM/MGM BRAKES, 1988
	TOPSOIL (M/P)	27600	CY	$24	$662,400	CDM/MGM BRAKES, 1988
	REVEGETATION	662000	SY	$2	$1,324,000	LSI CURRENT CONSTRUSTION COSTS, 1988, P.
	IRRIGATION	18	WK	$400	$7,200	CDM/SOUTH BAY ASBESTOS,1988
	1-1/2" ASPHALT (M/P)					
	-GREATER THAN 50,000 SY		SY	$10	$0	RENEW SEALER ASHALT QOUTE,1987
	-LESS THAN 50,000 SY	21900	SY	$12	$262,800	RENEW SEALER ASHALT QOUTE,1987
	14" ASPHALT COMPOSITE(M/P)					
	-GREATER THAN 50,000 SY	66550	SY	$16	$1,064,800	CALIFORNIA PAVEMENT QOUTE,1988
	-LESS THAN 50,000 SY		SY	$19	$0	CALIFORNIA PAVEMENT QOUTE,1988
	8" ASPHALT COMPOSITE(M/P)					
	-GREATER THAN 50,000 SY	66550	SY	$9	$599,000	CALIFORNIA PAVEMENT QOUTE,1988
	-LESS THAN 50,000 SY		SY	$19	$0	CALIFORNIA PAVEMENT QOUTE,1988

	VACUUM SWEEPING	45300 LF	$29	$1,313,700	SOS INTERNATIONAL QOUTE, 1988
	EXCAVATION	170200 CY	$7	$1,191,400	CDM/MGM BRAKES, 1988
	STOCKPILING/HANDLING	170200 CY	$6	$1,021,200	
	TRANSPORT	170200 CY	$60	$10,212,000	CHEMICAL WASTE MGMT.QUOTE, 1989
	DISPOSAL	170200 CY	$96	$16,339,200	CHEMICAL WASTE MGMT.QUOTE, 1989
	BACKFILL/COMP. (M/P)	CY	$3	$0	R.S. MEANS SITE WORK COST DATA 1988, P.
		CAPITAL COST SUBTOTAL =		$38,352,600	
		ENGINEERING & DESIGN (8%) =		$3,068,200	
		CONSTRUCTION MGMT (7%) =		$2,684,700	
		CONTINGENCY (10%) =		$3,835,300	
		TOTAL CAPITAL COST =		$47,940,800	
4.0	OPERATIONS AND MAINTENANCE				
	YEARLY INSPECTION	1 EA	$2,500	$2,500	CDM/SOUTH BAY ASBESTOS,1988
	SITE MONITORING	1 EA	$0	$0	
	REPLACE 25% WARNING SIGNS	50 EA	$15	$800	
	REPLACE 5% OF FENCE	1250 LF	$15	$18,800	
	REVEGETATE OVER 10%	66200 SY	$2	$132,400	
	TEMPORARY IRRIGATION	18 WK	$400	$7,200	
	REPAIR/REPLACE 5% OF ASPHALT				
	- 1-1/2" ASPHALT	1095 SY	$12	$13,100	
	- 14" ASPHALT COMPOSITE	3328 SY	$19	$63,200	
	- 8" ASPHALT COMPOSITE	3328 SY	$19	$63,200	
		SUBTOTAL YEARLY O&M COST =		$301,200	
		CONTINGENCY (5%) =		$15,100	
		TOTAL YEARLY O&M COST =		$316,300	
5.0	5 YEAR SITE ASSESSMENT	6 EA	$15,000	$90,000	
6.0	PRESENT WORTH COST				
	PRESENT WORTH CAPITAL	1 LS	$47,940,800	$47,940,800	
	PRESENT WORTH O&M	30 YR	$316,300	$5,573,000	
	PRESENT WORTH 5-YEAR PHE	6 EA	$15,000	$49,000	
	TOTAL PRESENT WORTH COST			$53,563,000	
	EQUIVALENT UNIT COST =	$48 /SY			

NOTE: INFORMATION PRESENTED ON THIS FIGURE IS APPROXIMATE AND MAY NOT REPRESENT ACTUAL CONDITIONS. RECTIFIED AERIAL PHOTOGRAPH WAS ORIGINALLY PROVIDED BY AEL-TEK, INC. AT 1"=100'. THE PHOTOGRAPH WAS NOT RTHO-NORMALIZED AND THEREFORE SOME DISTORTION IS PRESENT.

SOUTH BAY ASBESTOS SITE
ALVISO, CALIFORNIA

SUBUNIT LOCATION MAP

PROJ. NO		FIGURE
288-FS1	CAMP DRESSER & McKEE INC.	C-1