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August 1991

Superfund Record of Decision:

Micro Storage/Intel Magnetics, CA

50272-101

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16. Abstract (Limit: 200 words)

The 3-acre Micro Storage/Intel Magnetics site consists of a former microcomputer disk drive manufacturing facility and a magnetic bubble production and testing facility in Santa Clara, Santa Clara County, California. Land use in the area is predominantly industrial, although approximately 300,000 people reside within a 3-mile radius of the site. In addition, the site overlies two shallow aquifers zones, which in turn, overlie the Santa Clara Valley ground water basin, the primary drinking water source for the 1.4 million residents of the Santa Clara Valley. From 1985 to 1986, Micro Storage Corporation (MSC) researched, developed, and manufactured microcomputer disk drives. Chemicals used onsite were stored in an external shaded storage area in 55-gallon drums. From 1978 to 1987, Intel Magnetics (IM), a magnetic bubble production and testing facility, operated both an underground solvent tank used to store waste solvents, and an inorganic acid neutralization system. As a result of possible improper storage procedures at both facilities, a number of State and EPA investigations identified VOCs including benzene, TCE, and TCA, and other organics in the ground water aquifer beneath the site. Interim remedial measures have included: extracting contaminated ground water at both sites; removing all chemicals stored on

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Micro Storage/Intel Magnetics, CA
First Remedial Action - Final
Contaminated Medium: gw
Key Contaminants: VOCs (benzene, PCE, TCE, toluene), other organics

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

the combined MSC/IM site; and replacing the underground storage tank and excavating contaminated soil at the IM site. Treated ground water is discharged to a storm sewage system tributary of nearby Calabazas Creek. This Record of Decision (ROD) addresses ground water contaminated by past facility operations. The primary contaminants of concern affecting the ground water are VOCs including benzene, PCE, TCE, and toluene; and other organics.

The selected remedial action for this site includes continuing ground water extraction and treatment with carbon adsorption until clean-up standards are achieved in all combined MSC/IM site monitoring wells; installing and sampling a minimum of two new monitoring wells; hydraulically contain the entire 93,000 cubic yards ground water plume above clean-up standards; maintaining hydraulic control to prohibit the further vertical and horizontal migration of the ground water pollution; quarterly ground water monitoring at the combined MSC/IM site during the clean-up period; treating the extracted ground water with an existing carbon absorption system; discharging the treated ground water onsite to Calabazas Creek; and implementing deed restrictions onsite. The estimated present worth O&M cost for this remedial action ranges from $630,000 to $1,100,000 for 10 years.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific ground water clean-up goals are based on the more stringent of Federal and State MCLs standards, and include benzene 1 ug/l, PCE 5 ug/l, TCE 5 ug/l, and toluene 100 ug/l.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105

RECORD OF DECISION

MICRO STORAGE CORPORATION/INTEL MAGNETICS

SUPERFUND SITE

SANTA CLARA, CALIFORNIA

AUGUST 26, 1991

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION IX

SAN FRANCISCO, CA

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RECORD OF DECISION

PART I: DECLARATION

PART II: DECISION SUMMARY

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DECLARATION

1.0 SITE NAME AND LOCATION

MICRO STORAGE CORPORATION /INTEL MAGNETICS SUPERFUND SITE
Santa Clara, California

Micro Storage Corporation
Former Micro Storage Facility
2986 Oakmead Village Court
Santa Clara, Santa Clara County

Intel Corporation
Former Intel Magnetics Facility
3000 Oakmead Village Drive
Santa Clara, Santa Clara County

2.0 STATEMENT OF BASIS AND PURPOSE

This Record of Decision ("ROD") presents the selected remedial actions for the Micro Storage Corporation/Intel Magnetics Superfund sites in Santa Clara, California. This document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. Section 9601 et. seq., and to the extent practicable the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Section 300 et. seq., ("NCP"). This decision is based on the administrative record for this site.

The State of California concurs with the selected remedy.

3.0 ASSESSMENT OF THE SITE

Actual or threatened release of hazardous substances from these sites, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

4.0 DESCRIPTION OF THE REMEDY

The remedial actions address the principal threat remaining at the Micro Storage Corporation/Intel Magnetics sites by removing the contaminants from ground water, thereby significantly

reducing the toxicity, mobility or volume of hazardous substances in the media. These response actions will greatly reduce the possibility of contamination of existing potable water supplies and potential future water supplies.

This action represents the final remedial action to remove contaminants from groundwater. The major components of the selected remedy include the following:

a. Continued groundwater extraction until drinking water standards for TCE (5 ppb); 1,1-DCA (5 ppb); 1,1-DCE (4 ppb); cis 1,2-DCE (6 ppb); trans 1,2-DCE (10 ppb); Freon 113 (1200 ppb); Methylene Chloride (40 ppb); PCE (5 ppb); Toluene (100 ppb); 1,1,1-TCA (200 ppb); 1,1,2 TCA (32 ppb); chloroform (100 ppb) are achieved in all combined MSC/IM site monitoring wells.

b. Hydraulic containment of the entire groundwater plume above cleanup standards and continued groundwater extraction at the four existing wells. Modifications to the system is required in the event that the interim hydraulic control system is demonstrated not to be effective in containing and removing the groundwater pollutants.

c. Maintenance of hydraulic control to prohibit the further vertical and horizontal migration of the groundwater pollution. This requirement shall remain in effect until cleanup standards are achieved.

d. Continued quarterly groundwater monitoring at the combined MSC/IM site during the cleanup period. Water samples will continue to be collected to verify that cleanup is proceeding and that there is no migration of VOCs, above cleanup standard levels, beyond current boundaries or into the deeper B zone. The frequency of monitoring will be decreased from quarterly to triannually two years after approval of a report submitted in compliance with Provision C.4.a. (hydraulic control) of the RWQCB Order. The frequency of monitoring will be further decreased to biannually once cleanup standards have been achieved and stabilized for one year. Detailed sampling and reporting requirements for the combined MSC/IM site are contained in the RWQCB's Self-Monitoring Plan.

e. Treatment of extracted groundwater with an existing carbon adsorption system. The treated groundwater will continue to be discharged to Calabazas Creek, pursuant to a NPDES permit.

f. File a deed restriction prohibiting use of on-site shallow groundwater for drinking water and controlling other subsurface activities. The deed restriction shall remain in place until groundwater cleanup standards are achieved.

5.0 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because the remedy will result in hazardous substances remaining on-site above health-based levels, a five-year review, pursuant to CERCLA Section 121, 42 U.S.C. Section 9621, will be conducted at least once every five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

John Wise

John Wise
Deputy Regional Administrator

8.26.91
Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105

Concurrences for
MICRO STORAGE/INTEL MAGNETICS SUPERFUND SITE
RECORD OF DECISION

Keith Takata
for Harry Seraydarian, Director
Water Management Division

9-25-91
Date

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PART II. DECISION SUMMARY

This Decision Summary provides an overview of the problems posed by the Micro Storage Corporation/Intel Magnetics Superfund sites ("the Study Area" or "MSC/IM"), the remedial alternatives, and the analysis of the remedial alternatives. This Decision Summary explains the rationale for the remedy selection and how the selected remedy satisfies the statutory requirements of CERCLA.

1.0 SITE NAME, LOCATION, AND DESCRIPTION

1.1 SITE NAME AND LOCATION

MICRO STORAGE CORPORATION/INTEL MAGNETICS
Former Micro Storage Facility
2986 Oakmead Village Court
Santa Clara, Santa Clara County, CA

Intel Corporation
Former Intel Magnetics Facility
3000 Oakmead Village Drive
Santa Clara, Santa Clara County, CA

The combined Micro Storage Corporation/Intel Magnetics site is located in the City of Santa Clara in a relatively flat lying portion of the Santa Clara Valley approximately 50 miles south of San Francisco (see Figure 1). Ground surface elevations are generally between 35 feet and 41 feet above mean sea level. This is an industrial park setting, dominated by the electronics industry, particularly semiconductor manufacturing. As such, the majority of the area is developed, with large paved areas for streets and parking lots. Surface water is controlled by the storm sewer system which directs runoff to Calabazas Creek. The nearest residential areas are located 1200 feet south of the site. Other residential areas are located 6000 feet north-northeast of the combined Micro Storage Corporation/Intel Magnetics site. None of these residential areas are within the area impacted by the past chemical releases from the combined MSC/IM site.

1.2 REGIONAL TOPOGRAPHY

The Study Area is located near the center of the Santa Clara Valley which extends southeast from San Francisco Bay and is bounded by the Diablo Range on the northeast, and by the Santa Cruz and Gabilan Ranges on the southwest.

The Santa Clara Valley is a large structural depression in the Central Coastal Ranges of California. The Valley is filled with alluvial and fluvial deposits from the adjacent mountain ranges. These deposits are up to 1,500 feet in thickness. At the base of the adjacent mountains, gently sloping alluvial fans of the basin tributaries laterally merge to form an alluvial apron extending into the interior of the basin.

1.3 CLIMATOLOGY

The San Francisco Bay area has pronounced wet and dry seasons with mild wet winters and warm dry summers characteristic of a Mediterranean climate. The Santa Clara Valley lies in the path of winter storms which periodically sweep inland from the North Pacific. Freezing temperatures and snow are extremely rare. Rainfall from the winter storms ranges from moderate to heavy. Records from the Santa Clara Valley Water District show the average annual rainfall to be about 14 inches. The site averages approximately 10 to 14 inches of rainfall per year. Over 75% of the total annual rainfall in this area occurs during the winter months of November through March. The average annual wind speed is approximately 6 to 7 mph (about 3 m/sec) with slightly stronger winds occuring in the summer. Winds in the area are predominantly from the north and northwest.

1.4 ADJACENT AND HISTORICAL LAND USE

Land use in the general vicinity of the site was primarily agricultural until the 1970's when light industrial and commercial development began. The MSC/IM site is located in an industrial park (see Figure 2). The closest residences are approximately one-half mile to the south and one mile to the northwest. Both residential areas contain predominantly single family residences built on concrete slabs. Several elementary schools are included in each of these residential areas. The campus of Mission College is located approximately one mile north of the site. There are no day care centers or convalescent homes located in the immediate vicinity of the site.

1.5 HYDROGEOLOGY

Regional Hydrogeology

The Santa Clara Valley groundwater basin is divided into two broad areas: 1) the forebay, and 2) the confined area, where the combined MSC/IM site is located. The forebay occurs along the elevated edges of the basin where the basin receives its principal recharge. The confined area is located in the flatter interior portion of the basin and is stratified or divided into individual beds separated by significant aquitards. The confined area is divided into the upper and lower aquifer zones. The division is formed by an extensive regional aquitard that occurs

at depths ranging from about 100 feet near the confined area's southern boundary to about 150 to 250 feet in the center of the confined area and beneath San Francisco Bay. Thickness of this regional aquitard varies from about 20 feet to over 100 feet.

Several aquifer systems occur in the upper aquifer zone separated by aquitards which may be leaky or very tight. Groundwater pollution at the combined MSC/IM site is confined to the shallowmost zone within the upper aquifer zone. The lower aquifer zone occurs beneath the practically impermeable regional aquitard. Numerous individual aquifers occur within this predominantly aquitard zone and all groundwater in this zone occurs confined.

Municipal water supply wells are generally perforated in the lower aquifer zone. Perforated intervals in City of Santa Clara water supply wells located within 2 miles of the combined MSC/IM site begin from 250 to 320 feet below ground surface, although sanitary seals are only installed down to 100 feet below ground surface. Currently, the nearest municipal drinking water supply well downgradient of the combined MSC/IM site is the City of Santa Clara's Well No. 33 located 1.8 miles north of the combined MSC/IM site. No contaminants have been found in this well to date.

Site Hydrogeology

Two shallow aquifer zones have been identified beneath the combined MSC/IM site. These shallow aquifer zones are subdivisions of the upper aquifer zone described in the regional hydrogeology section. The shallowest, or A aquifer zone (A zone), has its upper boundary at about 10 feet below ground surface (BGS), and lower boundary about 20 feet BGS. The B aquifer zone (B zone) lies between about 30 and 40 feet BGS. The two zones are separated by a 2 to 10 feet thick aquitard composed of clay to silty sand. It is suspected that hydraulic separation between the two zones is imperfect owing to the discontinuous nature of sediment types. Shallow groundwater flow in the A and B zone, beneath the combined MSC/IM site, is generally to the north-east. This flow regime is consistent with the northerly regional flow towards the San Francisco Bay.

1.6 WATER USE

The combined MSC/IM site overlies the Santa Clara Valley groundwater basin. Groundwater from this basin provides up to 50% of the municipal drinking water for the 1.4 million residents of the Santa Clara Valley. In 1989, groundwater accounted for approximately 128,000 of the 315,000 acre feet of drinking water delivered to Santa Clara Valley Water District customers. Approximately 300,000 people residing within a 3-mile radius of the Study Area depend on local groundwater for drinking purposes.

The existing and potential beneficial uses of the groundwater underlying and adjacent to the combined MSC/IM site include:

a. Industrial process water supply
b. Industrial service water supply
c. Municipal and Domestic water supply
d. Agricultural water supply

Groundwater Conservation

The potentially responsible parties considered the feasibility of reclamation, reuse, or discharge to a publicly owned treatment works in its NPDES permit application dated January 23, 1990. Based on this evaluation, as well as further evaluation in the FS, the Regional Water Quality Control Board (RWQCB) determined that groundwater reclamation, reuse, or discharge to a POTW at the combined MSC/IM site was not feasible.

1.7 SURFACE AND SUBSURFACE STRUCTURES

The one acre site at 2986 Oakmead Village Court is developed with a single story, tilt-top structure. The building is surrounded with concrete or asphaltic pavement. Less than 10% of the property is unpaved and consists of landscaped areas on the borders of the property. Storm drains which discharge to the Calabazas Creek collect storm runoff water from the flat site area.

Chemicals used in on-site processes at Micro Storage were stored in an external shade storage area located on the west side of the building on a concrete platform. Large quantities were contained in 55-gallon drums which were stored on wood pallets inside the shade area. Other chemicals were contained in 5-gallon or less containers which were stored in a metal cabinet inside the shade storage area as well.

The former IM operations were housed at 3000 Oakmead Village Court in a single story structure located on approximately 2 acres of property. Approximately 90% of the site is covered with buildings or pavement. The only unpaved areas are the landscaped areas located on the borders of the facility. Storm drains which discharge to the Calabazas Creek collect storm runoff water from the nearly level site area.

As reported in its response to a facility questionnaire issued by the RWQCB (1982), IM operated a 500-gallon underground waste solvent tank and a 1000-gallon, in-ground, cement-lined acid neutralization system on the site along with associated underground piping. In addition, several shaded exterior storage areas were observed on the southwest side of the building during a site visit in 1989.

The underground storage tank was installed in 1978 and was used to store waste solvents which typically consisted of 70% water, 25% isopropanol, and small amounts of Freon, N-butyl acetate, Hunt Developer, acetone, xylene, and polymer solids. In July 1985, as a result of on-going soil and groundwater contamination studies, Intel removed the solvent tank and installed a new underground 1000-gallon, double-walled stainless steel tank in an adjacent excavation.

The acid neutralization system was installed in 1978. The system consisted of three underground compartments in which a dilute acid waste stream containing hydrochloric, hydrofluoric, acetic, phosphoric, and sulfuric acids was neutralized prior to discharge to the sanitary sewer. According to RWQCB documents approximately 2000 gallons of wastewater was treated per day.

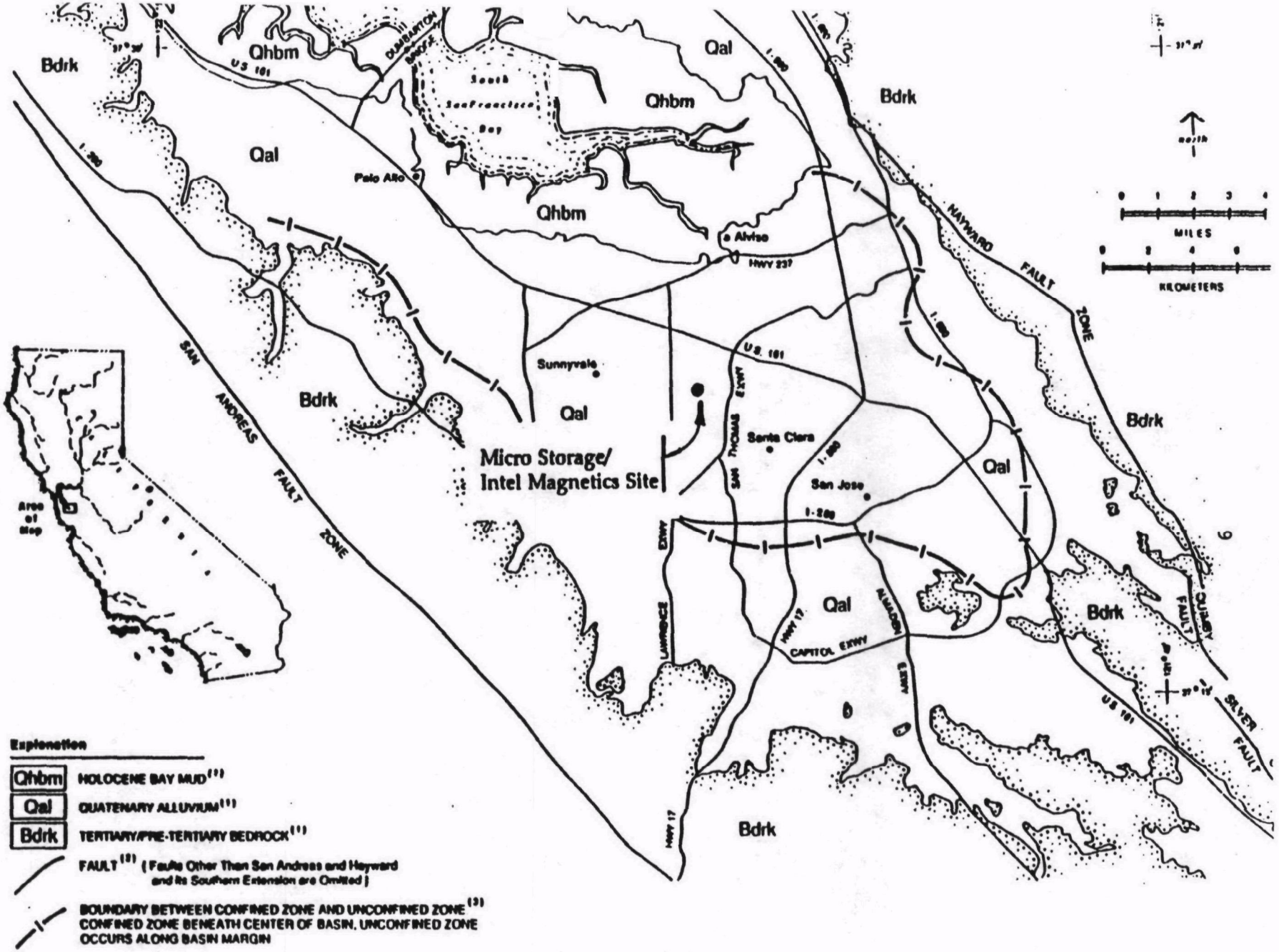
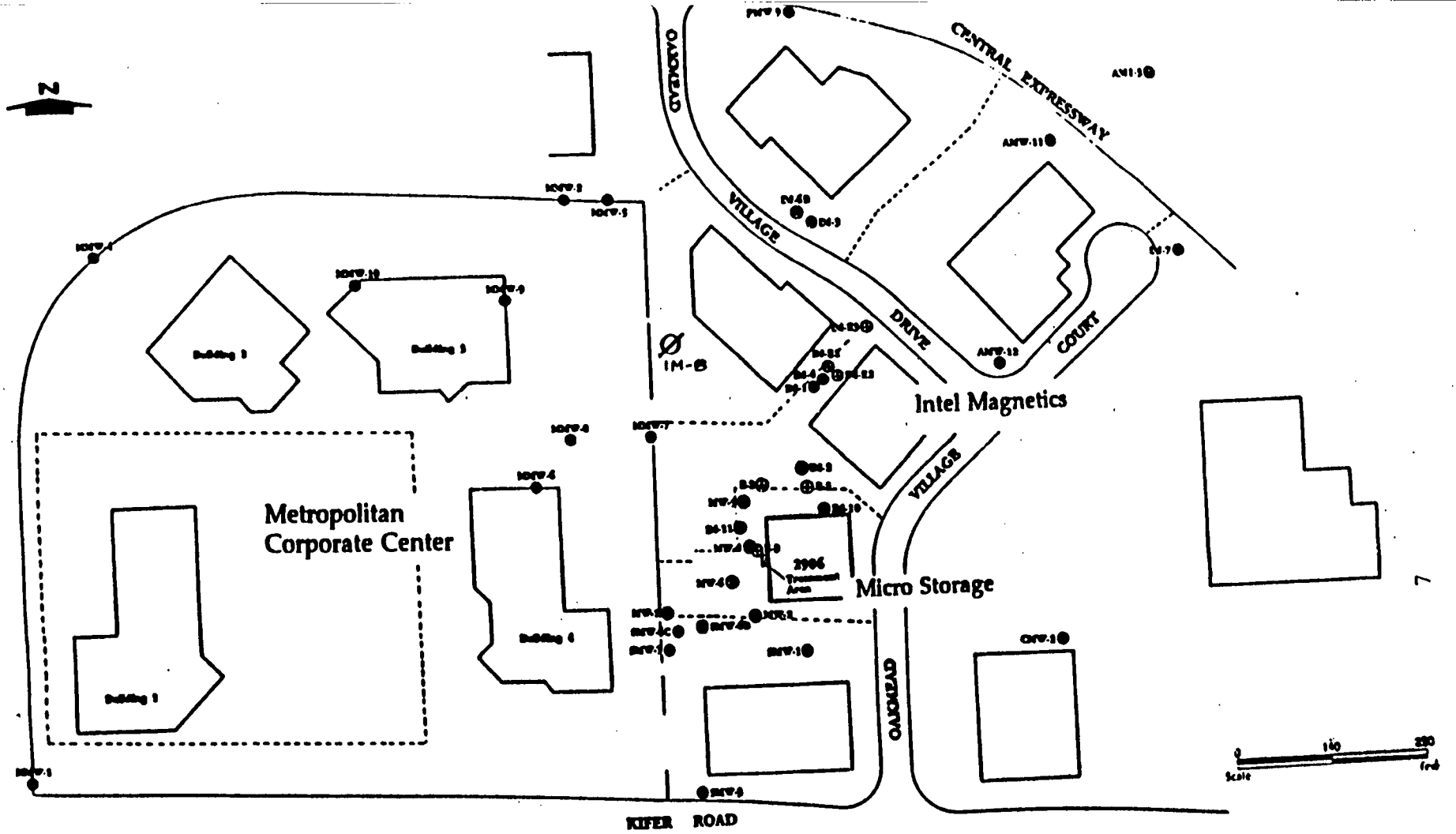


Figure 1. Micro Storage/Intel Magnetics Locality Map



LEGEND

- ● - Approximate location of monitoring well
- ⊕ - Approximate location of extraction well

Figure 2. Micro Storage/Intel Magnetics Site Map

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 HISTORY OF ENFORCEMENT ACTIONS

Pursuant to the South Bay Multi-Site Cooperative Agreement and the South Bay Ground Water Contamination Enforcement Agreement, entered into on May 2, 1985 (as subsequently amended) by the Regional Water Quality Control Board ("the Board" or "RWQCB"), EPA and the California Department of Health Services (DHS), the Board has been acting as the lead agency for the combined MSC/IM site. The combined MSC/IM site is on the NPL and has been regulated by RWQCB Orders.

Kim Camp III (KCIII) is the property owner of the former Micro Storage Corporation Facility (MSC site) located at 2986 Oakmead Village Court, Santa Clara (Figures 1 and 2). Micro Storage Corporation (MSC) occupied the MSC site from January 1985 to December 1986, and used the MSC site for research and development and pilot manufacturing of microcomputer disk drives. The chemicals used by MSC included Freon 113 and other unspecified nonflammable/chlorinated solvents, which have been found in the groundwater at the MSC site. EPA and RWQCB staff was advised by Counsel for MSC that MSC was dissolved as a corporation by the State of California on August 16, 1988.

3000 Oakmead Village Drive Limited (OVDL) is the property owner of the former Intel Magnetics Facility (IM site) located at 3000 Oakmead Village Drive, Santa Clara. Intel Magnetics (IM), a wholly owned subsidiary of the Intel Corporation (Intel), occupied the IM site from 1978 to 1987, and operated a magnetic bubble production and testing facility at the IM site. An underground solvent tank and an in-ground acid neutralization system were formerly operated by IM at the facility. Chemicals used in IM operations included isopropanol, Freon, chlorinated hydrocarbons (unspecified, but reportedly does not include tetrachloroethene and 1,1,1,-trichloroethane), N-butyl acetate, Hunt Developer (isodecane C_{11} and C_{12}), acetone, xylene, dilute acids, and the metals arsenic, chromium, lead, and tin. Among others, TCA and Freon 113 have been found in the groundwater at the IM site.

The IM site was placed on the National Priority List (NPL) in May 1986. In 1988 the MSC site was included with the IM site as one combined Superfund site. EPA conducted a PRP Search from August 1990 to December 1990 and MSC, Kim Camp III, Kimball Small Investments III, Westall Corporation, Campeau Corporation California, Intel, and Oakmead Village Drive Limited were identified as Potentially Responsible Parties under Federal Superfund (CERCLA/SARA) regulations.

The following is a chronology of important Micro Storage Corporation/Intel Magnetics regulatory activities.

a. June 16, 1982 Intel submits completed Board Facility Questionnaire.

b. March 19, 1986 Board adopted NPDES Permit No. CA0028941 (Order No. 86-014), for the discharge of treated extracted groundwater at the IM site.

c. May 1986 IM site added to the final NPL.

d. February 2, 1987 KCIII submits its tenants' Hazardous Chemical Use History Report. October 12, 1988, EPA changes name of site from IM to the combined MSC/IM site.

d. February 15, 1989 Board adopted Order No. 89-017 issuing Site Cleanup Requirements to MSC and KCIII.

e. March 17, 1989 Board adopted Order No. 89-086 amending Site Cleanup Requirements to MSC, KCIII, Intel, and OVDL (approving RI/FS workplan and rescinding Order No. 89-017).

f. March 21, 1990 Board adopted NPDES Permit No. CA0029670 (Order No. 90-040), for the discharge of treated extracted groundwater at the combined MSC/IM site.

2.2 HISTORY OF SITE INVESTIGATIONS

In early 1982, the Regional Board initiated a leak detection program to define the extent of leakage from underground storage tanks and pipes in the South Bay area. As a result of these efforts, subsurface investigations at the IM site detected trichloroethene (TCE), trichlorethane (TCA), and Freon-113 in the A aquifer zone (the shallowest or first encountered aquifer below the ground surface) at the IM site.

Based on the results from wells installed on the upgradient MSC site, the Board requested that KCIII conduct additional investigation on the MSC site. A September 1988 technical report prepared by Jacobs Engineering, a consulting firm under contract to EPA, concluded that, "A primary source of VOC contamination is indicated at the Micro Storage facility where maximum levels of VOC concentrations including trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), and Freon 1123 are found". The Jacobs Engineering Report also concluded that, "a secondary source of Freon 113 and possibly TCA is believed to exist at the Intel Magnetics site...".

Based on the new information, submitted in late 1987 and early 1988, regarding groundwater pollution at the upgradient MSC site, EPA changed the name of the Superfund site from the Intel

Magnetics site to the combined Micro Storage Corporation/Intel Magnetics site. In making this change, EPA, in an October 12, 1988 letter to Board staff, stated that "Intel is still a responsible party...". Since October 1988, EPA and the Board have regulated the MSC site and the IM site as one combined Superfund site.

In May 1990 the Board adopted Order No.89-086 which approved the Remedial Investigation/Feasibility Study (RI/FS) workplan. Order No. 89-086 was an interim Order which remained in effect while the RI/FS was being completed. The RWQCB adopted Order No. 91-119 on July 17, 1991. This Order requires MSC/IM to implement remedial actions that are equivalent to the remedy chosen in this Record of Decision.

2.3 HISTORY OF SITE ACTIVITIES

Interim Remedial Actions

Interim remedial measures (IRMs) at MSC have included the extraction of contaminated groundwater and the removal of all chemicals stored on the combined MSC/IM site. IRMs at the IM site have included the extraction of polluted groundwater, the replacement of the underground solvent tank and excavation of contaminated soils.

Between 1986 and 1990 Intel extracted and treated groundwater from two IM site wells. The treated water was discharged to a storm sewer system tributary of Calabazas Creek as specified under NPDES Permit #CA0028941.

In January 1991, KCIII began operation of an expanded groundwater extraction and treatment system on the MSC site. This system pumps water from an existing IM site extraction well and three new extraction wells located on the MSC site. The treated water is discharged to a storm sewer system tributary of Calabazas Creek as specified under NPDES Permit #CA0029670.

Metropolitan Corporate Center

A separate VOC groundwater plume has been identified beneath a property located immediately west of the MSC site (see Figure 2). The property, known as the Metropolitan Corporate Center (MCC), is located at 3165 Kifer Road, Santa Clara and owned by the Metropolitan Life Insurance Company (Metropolitan). TCE has been detected in groundwater monitoring wells at levels up to 180 ppb and in reconnaissance groundwater samples at levels up to 400 ppb. To date, no source has been located for the MCC plume. No underground solvent storage tanks are known to have been installed at the MCC property. While the lateral and vertical extent of the MCC plume has not been completely defined, data submitted by both Metropolitan and KCIII indicate that either the

plumes are not commingled or they are only commingled near the lateral leading edge at levels less than approximately 50 ppb total volatile organic compounds.

The RWQCB issued Site Cleanup Requirements under Order No. 91-100 on June 19, 1991 to Metropolitan for the MCC. Because the MCC plume and the MSC/IM plume are in close proximity to each other, Provision 2 of both the MCC Order and the Site Cleanup Requirement Order for this site (Order No. 91-119) require that the operation of any extraction system at the MCC and MSC/IM sites be done in a coordinated effort. This coordinated effort includes locating extraction wells and selecting pumping rates that maximize pollutant removal and minimize the hydraulic effects on the other site's groundwater plume.

3.0 COMMUNITY RELATIONS

An aggressive Community Relations program has been ongoing for all Santa Clara Valley Superfund sites, including the combined MSC/IM site, and the requirements for public participation under CERCLA Section 113(k)(2)(B)(i-v) have been met. The RI/FS and Proposed Plan for Micro Storage Corporation/Intel Magnetics was released to the public in April 1991. These two documents were made available to the public in both the administrative record and an information repository maintained at the RWQCB offices in Oakland, CA and the Santa Clara Public Library. The RWQCB published a notice in the Santa Clara Weekly on April 10, 1991 and April 17, 1991, announcing the RI/FS, Proposed Plan and opportunity for public comment at the Board Hearing of April 17, 1991 in Oakland, and announcing the opportunity for public comment at an evening public meeting at Bracher Elementary School in the City of Santa Clara on April 24, 1991. A sixty day public comment period on the RI/FS Report and the Proposed Plan ran from April 17, 1991 to June 17, 1991. A presentation of the proposed final cleanup plan was made at the April 17, 1991 Board Hearing and the April 24th public meeting. Representatives from the RWQCB and EPA attended the meeting. The RWQCB staff person answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision.

Fact Sheets for the combined MSC/IM site were mailed to interested residents, local government officials, and media representatives. Fact Sheet 1, mailed in January 1990, summarized the pollution problem, the results of investigations to date, and the interim remedial actions. Fact Sheet 2, mailed in April 1991, described the cleanup alternatives evaluated, explained the proposed final cleanup plan, announced opportunities for public comment at the Board Hearing of April 17, 1991 in Oakland and the Public Meeting of April 24, 1991 in Santa Clara and described the availability of further information at the Information Repository at the City of Santa Clara Public Library.

This decision document presents the selected remedial action for the Micro Storage Corporation/ Intel Magnetics Site, in Santa Clara, California chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the administrative record.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

This ROD addresses the entire site which consists of contamination of the groundwater aquifer. The purpose of this response is to prevent any further migration of contaminants in the groundwater, prevent any future exposure to the public of contaminated groundwater, and to restore the A-zone groundwater to drinking water quality. The response action does not address soils because investigations have not demonstrated that soils contain contaminants at levels of concern.

For the site, twelve chemicals have been identified as the primary contaminants of concern in the groundwater. Cleanup standards have been assigned to all twelve chemicals. The highest concentrations of contaminants in the A-zone groundwater are: TCE (770 ug/l), TCA (570 ug/l), and Freon(3,400 ug/l). DCA, DCE, and PCE have also been detected in smaller concentrations.

The selected remedy presented herein addresses the documented potential threats from the site. Treatment of the contaminated groundwater will significantly reduce the possibility of future migration of contaminants into a potential drinking water source. The groundwater cleanup standards for the combined MSC/IM site are based on Environmental Protection Agency (EPA) maximum contaminant levels (MCLs), California Department of Health Services (DHS) MCLs (proposed or adopted), and DHS Action Levels. The cleanup standards are defined in Table 4.1.

As shown on Table 4.1, the groundwater cleanup standards for all contaminants except benzene and 1,1 DCE are Federal or State (MCLs), either adopted or proposed, whichever is more stringent. The cleanup standard for 1,1 DCE is less than its proposed or adopted MCL. This reduction was necessary so that the cumulative risk associated with the cleanup standards would be within acceptable levels. The final cleanup standards for the suite of chemicals detected in the shallow zone equate to a future use scenario and carcinogenic risk level for groundwater ingestion and inhalation of 1×10^{-4}.

SOIL CONTAMINATION

The final Remedial Investigation report concluded that the volatile organic contaminants (VOCs) detected in the soil represent a limited release confined to the small area of the parking lot near the former storage area. There are currently no ARARs established for cleanup levels in contaminated soil. However, a RWQCB policy of cleanup to background or 1 ppm total VOCs for soils is a TBC criteria and has been set as the soil cleanup standard. Experience at other sites has shown that this level

will prevent recontamination of groundwater. Current soil conditions are two orders of magnitude below 1 ppm. Because of this low level, remedial actions for soil were not developed.

GROUNDWATER CONTAMINATION

Contaminated groundwater extends in a northeasternly direction along the approximate hydraulic gradient of the A-zone potentiometric surface. The plume's center is currently located near the northern property boundary of 2986 Oakmead Village Court and impacts approximately 10,000 cubic yards of aquifer material. The combined plume is approximately 850 feet in length and 450 feet in width at its widest point, and occupies an approximate aquifer volume of 93,000 cubic yards.

TABLE 4.1

GROUNDWATER CLEANUP STANDARDS
GROUNDWATER SELF-MONITORING PROGRAM

The Combined Micro Storage/Intel Magnetics Site
2986 Oakmead Village Court and 3000 Oakmead Village Drive
Santa Clara, Santa Clara County

(all values in µg/l)

Compound	FEDERAL MCLG	FEDERAL MCL	CA ACTION LEVEL	CA MCL	CLEANUP STANDARD
Benzene	0	5	--	1	1
1,1-Dichloroethane	--	--	--	5	5
cis 1,2-Dichloroethene	70	70	--	6	6
trans 1,2-Dichloroethene	100	100	--	10	10
1,1-Dichloroethene	7	7	--	6	4
Freon 113	--	--	--	1200	1200
Methylene Chloride	(0)	(5)	40	--	40
Tetrachlorothene	0	5	--	5	5
Toluene	1000 (40)PS	1000	100	--	100
1,1,1 - Trichloroethane	200	200	--	200	200
1,1,2 - Trichloroethane	--	--	--	32	32
Trichloroethene	0	5	--	5	5

MCLG Maximum Contaminant Level Goal
MCL Maximum Contaminant Level
PS Proposed Secondary MCL
() criteria in parentheses are proposed MCLs
-- no criteria

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 SOURCES OF CONTAMINATION

Source Investigation

The RI identified two potential source areas for the groundwater pollution: 1) a 500 gallon underground storage tank located on the IM site, and 2) an above ground outdoor chemical storage area located on the MSC site.

Intel Source Investigation

A secondary source of groundwater pollution is associated with the former underground waste solvent storage tank at IM. In response to the RWQCB 1982 questionnaire, Intel described the tank as a non-vaulted steel tank with a capacity of 400 gallons. The tank was reportedly used to store approximately 350 gallons of solvents per month. At a meeting between the RWQCB and Intel in August, 1983, the RWQCB concluded that the contamination at the site was the result of an overflowing tank (EPA Responsible Party Search report dated August 28, 1985). The overflowing fluid would have seeped into the gravel backfill that surrounded the tank. In July 1985, the tank and 35 cubic yards of soil were excavated from the IM site. The tank was reportedly tested both in the ground and after its removal and found to not have any leaks. The chemicals used by IM included TCA and Freon 113.

MSC Source Investigation

No discrete source of the groundwater contamination has been positively located at MSC. No underground tanks, sumps, or piping (except piping for water, natural gas, electrical or domestic sewage) are known to have been installed at the Micro Storage property. However, Micro Storage reported that they did store chemicals in 55 gallon drums in an external above-ground storage area. The chemicals used by Micro Storage included Freon-113 and other unspecified nonflammable chlorinated solvents.

Currently, the highest levels of groundwater contaminantion are beneath the parking lot of the MSC site. Vadose zone sources generally overlie the area of highest groundwater pollution. In an attempt to characterize the soil pollution at the MSC site, KCIII collected and analyzed 37 shallow soil samples collected from 17 borings. In addition, 70 soil gas samples were collected during three soil gas surveys. Normally these 107 data points would be considered sufficient for characterizing an area of this size (approximately 1 acre). However, confirmation soil and soil

gas sampling has yielded contradictory results. For example, the soil samples collected in June 1988 contained an average of approximately 120,000 parts per billion (ppb), Freon-113. Confirmation soil samples collected in 1989 and 1990 contained a maximum of 6.4 ppb Freon-113. Similar contradictions are also noted in the soil gas survey. For example, SG-10 (collected in October 1987) contained 84 ppb Freon-113. Confirmation soil gas sampling at SG-59 (collected in April 1989) contained 2270 ppb Freon-113.

While some of the data was contradictory, the majority of the data supports the conclusions presented in the RI that the VOCs detected represent a limited release confined to the parking lot near the former storage area. Soil, soil-gas and groundwater data suggests that the original source of VOCs has leached or volatilized out of the source area and that only low levels of VOCs remain. These low levels are not prone to impacting the groundwater, and no further soil action is recommended.

Vertical Conduit Study

A well search for abandoned agricultural wells within 1/2 mile radius of the combined MSC/IM site was completed in August 1989. The focus of the well search was to identify wells that potentially may form migration pathways to the deeper aquifer. This study also evaluated whether existing monitoring wells could provide a conduit between the polluted A zone and the clean B zone. The study identified three former agricultural wells (06S1W28K02, 06S1W28K03, and 06S1W28K05) located approximately 750-1000 feet northeast of the leading edge of the plume. Well 06S1W28K05 was subsequently destroyed by Avantek Inc. in 1990. No well destruction information was available on the other two wells. Since these wells lie over 750 feet beyond the leading edge of the plume, no further work was required.

The vertical conduit study also determined that four existing monitoring wells had the potential to cross contaminate the B zone. These four wells (IM-5, 6, 8, and 9) were properly destroyed in 1990.

5.2 DESCRIPTION OF CONTAMINATION

As a result of subsurface investigations, IM detected trichloroethene (TCE), trichlorethane (TCA), 1,1 dichloroethene (1,1 DCE), and Freon-113 in the A aquifer zone which is the shallowest or first encountered aquifer below the ground surface.

The RI used data from twenty-nine A and B zone monitoring and extraction wells in an attempt to define the vertical and horizontal extent of the plume (see Figures 5.1 and 5.2). The A zone plume covers an area approximately 850 long feet by 450 feet wide. With the exception of monitoring well MMW-2, only one B

zone sample has shown a trace level of pollution during the last four years. This trace level is likely due to laboratory contamination. Monitoring well MMW-2 appears to be screened across both the A and B aquifers. In 1990, MMW-2 had an average concentration of TCE of 32 ppb. Board Order No. 91-100 requires Metropolitan Life Insurance Company to consider replacing MMW-2 with a mono-aquifer screened well and properly destroy MMW-2.

Table 5.3 provides geometric means of concentrations of chemicals detected in A-zone groundwater, maximum contaminant concentrations and frequency of detection. Based on data from the April 1991 sampling round, the only chemicals detected in the A zone above drinking water standards were TCE, 1,1-DCE, 1,2-DCE, and Freon-113 at maximum levels of 750, 13, 43, and 3500 parts per billion (ppb) respectively.

5.3 CONCLUSION

EPA expects that up to 20,000 gallons (15 gpm pumping rate) of contaminated groundwater may need to be treated each day for approximately 10 years. Groundwater treatment remedies should be adequate to prevent surface water releases and a surface water remedy is not proposed at this time.

All data used to develop the Feasibility Study, to select remedial alternatives and to develop conclusions and clean-up standards presented in this Record of Decision were based on the following data quality requirements:

1) All data were collected under the guidance of a Quality Assurance Project Plan developed under EPA protocols and reviewed and approved by EPA Quality Assurance Management staff.

2) All data were collected in accordance with procedures presented in an approved Sampling and Analysis Plan. The Sampling and Analysis Plan was developed in accordance with EPA Region 9 guidance and were reviewed and approved by EPA Quality Assurance Management staff.

3) Random sample splits were collected by Board staff to confirm the validity of data generated by Intel and KCIII.

4) Selected data was validated by the Department of Health Services and found to be qualitatively and quantitatively acceptable.

5) There has been reasonable repeatability of the data based on six years of monitoring.

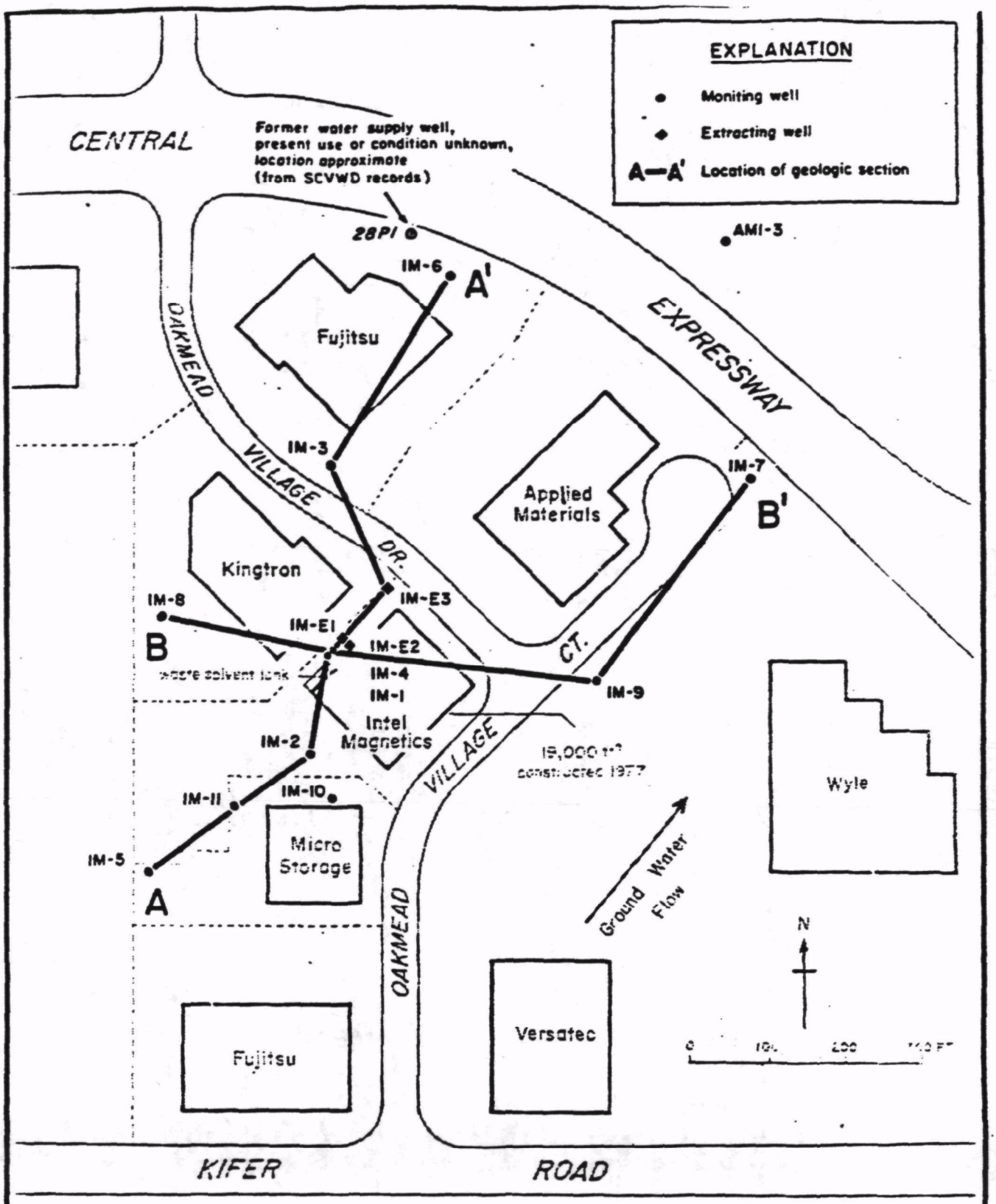


Figure 5.1

Well and Geologic Cross-Section Location Map

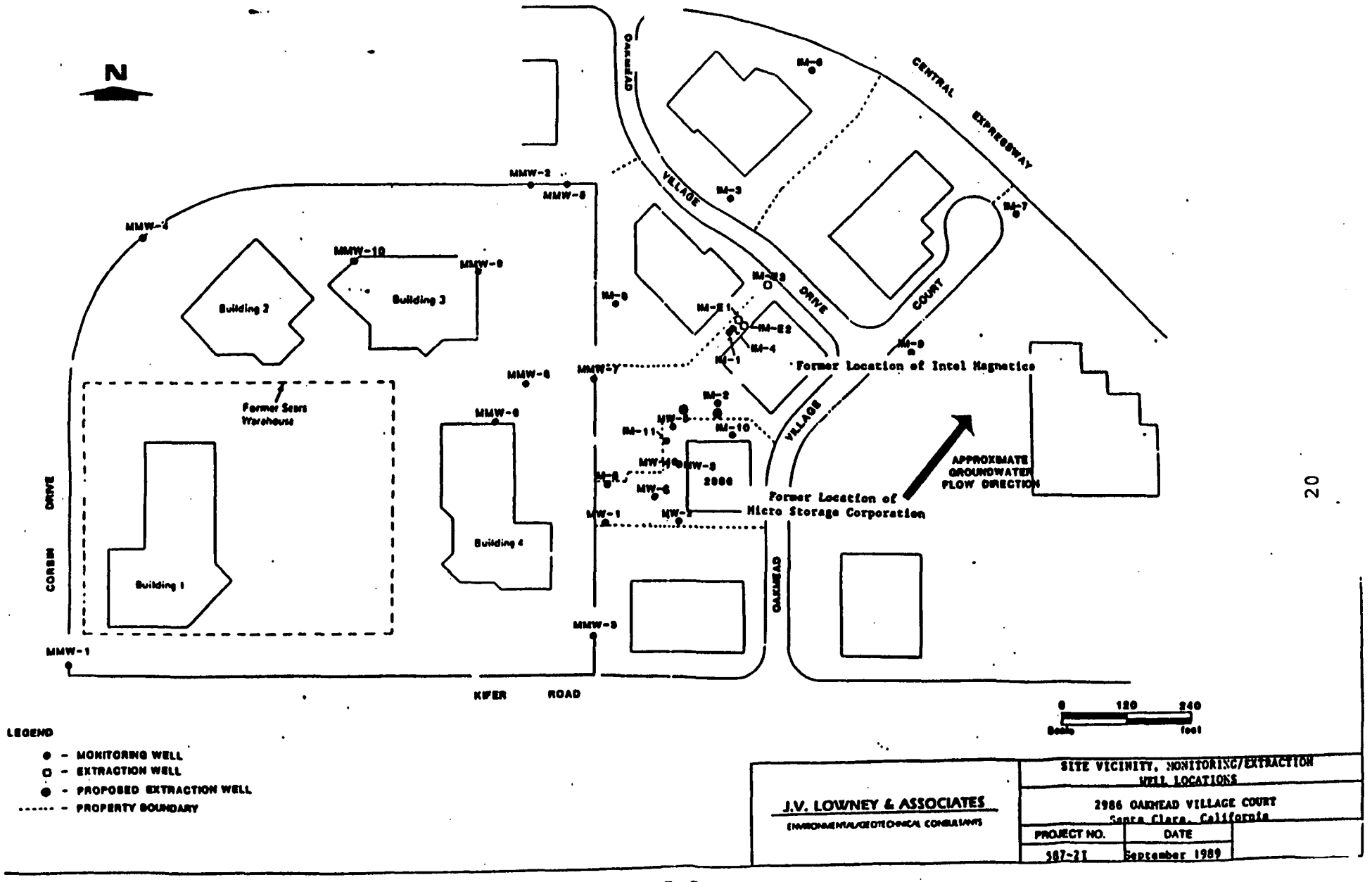

N
OAKHEAD
VILLAGE
DRIVE
COURT
CENTRAL
EXPRESSWAY
CORSIN
DRIVE
KIFER
ROAD
Building 1
Building 2
Building 3
Building 4
Former Sears Warehouse
Former Location of Intel Magnetics
Former Location of Micro Storage Corporation
APPROXIMATE GROUNDWATER FLOW DIRECTION
2986
MMW-1
MMW-2
MMW-3
MMW-4
MMW-5
MMW-6
MMW-7
MMW-8
MMW-9
MMW-10
M-1
M-2
M-3
M-4
M-5
M-6
M-7
M-8
M-9
M-10
M-11
M-21
M-22
M-23
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
0
120
240
Scale
feet
LEGEND
● - MONITORING WELL
○ - EXTRACTION WELL
● - PROPOSED EXTRACTION WELL
------ - PROPERTY BOUNDARY
J.V. LOWNEY & ASSOCIATES
ENVIRONMENTAL/GEOTECHNICAL CONSULTANTS
SITE VICINITY, MONITORING/EXTRACTION WELL LOCATIONS
2986 OAKHEAD VILLAGE COURT
Santa Clara, California
PROJECT NO.
DATE
587-21
September 1989

FIGURE 5.2

TABLE 5.3

CONCENTRATIONS OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES
A-ZONE

MICRO STORAGE/INTEL MAGNETICS
SANTA CLARA, CALIFORNIA

CHEMICAL	GEOMETRIC MEAN [a,b] (μg/liter)	MAXIMUM CONC. (μg/liter)	FREQUENCY OF DETECTION	LOCATION OF MAXIMUM
Bromodichloromethane	NA	2.2	1/1	IM-E2
Chloroform	0.50	3.7	11/11	IM-E1
1,1-Dichloroethane	1.2	22	141/255	IM-6
1,2-Dichloroethane	1.8	18	8/241	IM-5
1,1-Dichloroethene	4.6	46	151/257	IM-11
1,2-Dichloroethene (trans)	8.4	34	2/5	MW-4
1,2-Dichloroethene (cis/trans)	3.6	69	130/251	IM-11
Difluoromethane	NA	1.3	1/1	IM-10
Ethylbenzene	NA	1.1	1/11	MW-2
Freon (Freon 113 & Freon 11)	51	8,200	160/242	IM-10
Freon 11	NA	7.9	1/14	IM-10
Freon 12	NA	2.8	1/1	IM-E2
Freon 13	NA	3,400	1/2	MW-3
Freon 113	53	1,300	6/6	MW-3
Freon 123	3.1	50	79/79	IM-2
Methylene chloride	22	90	3/17	IM-E1
Tetrachloroethene	1.4	28	40/48	MW-3
Toluene	6.4	29	2/11	MW-3
1,1,1-Trichloroethane	15	570	198/258	MW-3
1,1,2-Trichloroethane	0.20	0.50	2/16	IM-10
Trichloroethene	32	770	169/256	IM-11

[a] Geometric mean of detects only.
[b] NA = Geometric mean not calculated when chemical detected once.
All values are rounded to two significant figures.

6.0 SUMMARY OF SITE RISKS

6.1 CONTAMINANT IDENTIFICATION

Twelve chemicals of potential concern were identified within the Study Area. The twelve chemicals are as follows:

chloroform
1,1-dichloroethane (1,1-DCA)
cis 1,2-dichloroethene (cis 1,2-DCE)
trans 1,2-dichloroethene (trans 1,2-DCE)
1,1 dichloroethene (1,1-DCE)
1,1,2-trichloro-1,2,2-trifluroethane (Freon 113)
methylene chloride
tetrachloroethylene (PCE)
toluene
1,1,1-trichloroethane (1,1,1-TCA)
1,1,2-trichloroethane (1,1,2-TCA)
trichloroethylene (TCE)

The reasons for selecting the listed chemicals as indicator chemicals are as follows:

1. Each of the indicator chemicals was consistently detected in the samples throughout the plume area. Table 6.1 lists detection freqencies for these compounds.

2. Each of the indicator chemicals possesses physiochemical properties (relatively high water solubility and relatively low soil sorption) which tend to promote their dispersion in ground water. Toluene has a relatively low soil sorption coefficient, therefore, has the potential to leach from soil into ground-water. In addition, they are all quite volatile and can easily escape into soil gas or the atmosphere. Table 6.2 provides physical/chemical properties for the chemicals of concern.

3. Most of the indicator chemicals are potential carcinogens. TCE, PCE and 1,1-DCA were identified by EPA as probable human carcinogens (Group B2) based on available laboratory animal data. 1,1-DCE was identified by EPA as a possible human carcinogen (Group C) based on available laboratory animal data. TCA remains unclassified as a potential carcinogen because there is inadequate evidence of its carcinogenicity in animal studies. Freon 113 and cis 1,2-DCE are noncarcinogens.

4. The 1,1-DCA is a potential breakdown product of the major plume contaminant, 1,1,1-TCA. The most common plume contaminant, TCE, breaks down into DCE and ultimately vinyl chloride which has not been detected at this site.

EXPOSURE ASSESSMENT

Potential environmental pathways include those related to contaminated groundwater. Potential human exposures to contaminants include ingestion of and direct contact with groundwater, and inhalation of volatilized contaminants during showering by area residents. Residential areas are located 1200 feet south of the site and 6000 feet north-northeast of the site. Table 6.3 and 6.4 provide a summary of the human exposure pathways under current and future use conditions.

The primary route of exposure is to people working at or near the facility. Currently, chemicals in the groundwater do not contact human or environmental receptors. There are no surface water bodies in the immediate vicinity of the facility, and there are no drinking water supply wells within or near the Micro Storage/Intel Magnetics facility. A municipal water system supplies water to businesses and residents. Future exposure could only occur during excavation of the site or if a shallow drinking water well was installed.

TOXICITY ASSESSMENT

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes

underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

EPA also assigns weight-of-evidence classifications to potential carcinogens. Under this system, chemicals are classified as either Group A, Group B1, Group B2, Group C, Group D, or Group E. Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer. Groups B1 and B2 chemicals (probable human carcinogens) are agents for which there is limited (B1), or inadequate (B2) evidence of carcinogenicity from human studies, but for which there is sufficient evidence of carcinogenicity from animal studies. Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals, and Group D chemicals (not classified as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available. Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity in adequate human or animal studies. Several of the chemicals of concern at the MSC/IM site have been classified in Group B2 (chloroform, 1,1-DCA, methylene chloride, tetrachloroethene, and trichloroethene) and benzene has been classified in Group A.

Tables 6.5 and 6.6 contain reference doses, cancer potency factors, and weight of evidence for site chemicals.

6.2 RISK CHARACTERIZATION

A Baseline Public Health Evaluation (BPHE) dated May 1, 1990, was prepared by Clement Associates Inc. under contract to the Board. The BPHE was conducted to evaluate current and potential future health risks posed by the combined MSC/IM site. Since the shallow zone groundwater from beneath the combined MSC/IM site is not currently used for drinking water supply, no current risk was identified at the combined MSC/IM site. Potential future health risks are based on exposures that could occur in the future if untreated shallow zone groundwater was used for human consumption and residential development occurred on the combined MSC/IM site. To ensure that human health is protected, the BPHE incorporated conservative assumptions. Therefore, it is unlikely that the actual risks posed by the combined MSC/IM site in the future would be greater than estimated. Average case and maximum case scenarios are presented in the BPHE. The information below refers to the maximum case scenarios using a 30 year exposure duration.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific

notation(e.g., 1×10^{-6} or 1E-6). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Using the above hypothetical scenario of future groundwater use, the carcinogenic risk from ingestion and inhalation of VOCs at the MSC/IM site is 1×10^{-3}. A carcinogenic risk of 1×10^{-3} is equal to one excess occurrence of cancer in a population of 1000. EPA's acceptable carcinogenic risk range for cleanup standards selected for a site is 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000).

Using the same scenario, the noncarcinogenic Hazard Index for ingestion and inhalation of VOCs from the use of shallow groundwater is 5.0. If the noncarcinogenic Hazard Index is less than one, EPA considers the combined intake of chemicals unlikely to pose a health risk. Table 6.7 provides calculations of risks associated with the future-use scenario.

Thus the carcinogenic risk and Hazard Index associated with a "no action" remedy exceed EPA's acceptable carcinogenic risk and Hazard Index range. Table 6.8 provides the calculation of the carcinogenic risk based on clean-up standards, and Table 6.9 depicts the hazard index for noncarcinogens.

The carcinogenic risk at the cleanup standards (chemicals listed on Table 6.8) associated with the potential future use scenario of groundwater ingestion and inhalation of VOCs from groundwater, using the maximum exposure scenario is 1×10^{-4}. In cleaning up TCE to the 5 ppb cleanup standard it is quite likely that the concentrations of other VOCs will be reduced to levels below the 5 ppb range. The carcinogenic risk for TCE alone is 1.5 $\times 10^{-6}$. These risks were calculated using a potential future use scenario with a 30 year duration exposure per EPA guidance.

The noncarcinogen Hazard Index associated with the cleanup standards is 0.38. The selected remedy is protective of human health and the environment -- as required by Section 121 of CERCLA -- in that pollution in groundwater is treated to at least MCLs and falls within EPA's acceptable carcinogenic risk range (10^{-6} to 10^{-4}) and noncarcinogenic Hazard Index of less than one.

As shown on Table 4.1, the groundwater cleanup standards for all contaminants, except 1,1 DCE are Federal or State (MCLs), either adopted or proposed, whichever is more stringent. The cleanup standard for 1,1 DCE is less than its proposed or adopted MCLs. This reduction was necessary so that the cumulative risk associated with the cleanup standards would be within acceptable levels. The final cleanup standards for the suite of chemicals detected in the shallow zone equate to a future use scenario carcinogenic risk level for groundwater ingestion and inhalation of VOCs of 1×10^{-4}

6.3 PRESENCE OF SENSITIVE HUMAN POPULATIONS

In order for a chemical to pose a human health risk, a complete exposure pathway must be identified. The greatest potential for exposure to chemicals at the site would be from residential uses. The BPHE did not identify potential exposure pathways under current land use conditions and did not identify sensitive human populations. The closest residences are approximately one-half mile to the south and one mile to the northwest. Although several elementary schools are included in each of these residential areas, the closest school is Bracher Elementary School (grades K-5, approximately 440 students) which is located at 2700 Chromite Drive. There are no day care centers or convalescent homes located in the immediate vicinity of the site.

6.4 PRESENCE OF SENSITIVE ECOLOGICAL SYSTEMS

Two endangered species are reported to use South San Francisco Bay, located approximately 11 miles northwest of the Study Area. The California clapper rail and the salt marsh harvest mouse are reported to exist in the tidal marshes of the Bay and bayshore. The endangered California brown pelican is occasionally seen in the Bay Area, but does not nest in the South Bay. Ranges of the endangered American peregrine falcon and southern bald eagle include the Bay Area. The southern bald eagle does not use bay and bayshore habitats, but the perigrine falcon has started to make a comeback at some northern locations in San Francisco Bay.

The combined MSC/IM site is located near the geographic center of the City of Santa Clara, in a commercial-light industrial setting. No parks or surface water are adjacent to the site, and over 80% of the property is covered with blacktop or a building slab. Chemical constituents are only present in the shallow groundwater. Therefore, the Study Area does not constitute critical habitat for endangered species nor does it include or impact any "wetlands."

6.5 CONCLUSION

Actual or threatened releases of hazardous substances from the Micro Storage/Intel Magnetics Superfund site, if not addressed by implementing the response action selected in this ROD may present an imminent and substantial endangerment to the public health, welfare or environment. Based on the fact that a variety of the VOCs detected in the Study Area pose significant health risks as carcinogens or as noncarcinogens and complete exposure pathways exist, EPA has determined that remediation is warranted.

TABLE 6-1

SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR ORGANIC CHEMICALS IN GROUNDWATER

MICRO STORAGE/INTEL MAGNETICS
SANTA CLARA, CALIFORNIA

CHEMICAL	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (µg/liter)	SELECTED (Y/N)	COMMENT
Bromodichloromethane	1/1	2.2	N	Professional Judgement
Chloroform	11/11	3.7	Y	Potential carcinogen
1,1-Dichloroethane	141/255	22	Y	Frequency > 5%
1,2-Dichloroethane	8/241	18	N	Frequency < 5%
1,1-Dichloroethene	151/257	46	Y	Frequency > 5%
1,2-Dichloroethene (trans)	2/5	34	Y	1,2-Dichloroethene (cis/trans) selected
1,2-Dichloroethene (cis/trans)	130/251	69	Y	Frequency > 5%
Difluoromethane	1/1	1.3	N	Professional Judgement
Ethylbenzene	1/11	1.1	N	Professional Judgement
Freon (Freon 113 & Freon 11)	160/242	8,200	Y	Frequency > 5%
Freon 11	1/14	7.9	Y	Freon selected
Freon 12	1/1	2.8	N	Professional Judgement
Freon 13	1/2	3,400	N	Professional Judgement
Freon 113	6/6	1,300	Y	Freon selected
Freon 123	79/79	50	Y	Frequency > 5%
Methylene chloride	3/17	90	Y	Potential carcinogen
Tetrachloroethene	40/48	28	Y	Frequency > 5%
Toluene	2/11	29	Y	Used in on-site processes
1,1,1-Trichloroethane	198/258	570	Y	Frequency > 5%
1,1,2-Trichloroethane	2/16	0.50	Y	Potential carcinogen
Trichloroethene	169/256	770	Y	Frequency > 5%

Physical/Chemical Properties of the Organic Chemicals of Potential Concern

	Molecular Weight (g/mol)	Water Solubility (mg/l)	Sol. Ref.	Vapor Pressure (mm Hg)	VP Ref.	Henry's Law Constant (atm-m3/mole)	HL Ref.	--Partition Coefficients-- Soil Organic Carbon (log Koc)	Koc Ref.	Octanol-Water (log Kow)	Log Kow Ref.	Density (g/m3)	Dens. Ref.
Chlorinated aliphatic hydrocarbons													
Chloroform	119.0	8,200	A	1.51E+02	B	3.80E-03	C	1.49	D	1.97	E	1.48	F
1,1-Dichloroethane	98.9	55,000	I	1.82E+03	I	5.70E-03	C	0.48	H	1.79	I	1.18	G
1,1-Dichloroethene	96.9	2,250	AB	5.91E+02	G	1.50E-01	C	1.81	H	1.84	AB	1.22	L
1,2-Dichloroethene (cis)	96.9	3,500	AC	2.08E+02	AC	6.60E-03	C	1.77	H	2.06	K	1.23	L
1,2-Dichloroethene (trans)	96.9	6,300	J	3.24E+02	J	6.56E-03	C	1.77	H	2.09	K	1.23	L
Freon 11	137.4	1,100	N	6.67E+02	N	5.83E+02	R	2.20	H	2.53	S	NA	NA
Freon 113	187.4	170	K	2.70E+02	G	3.90E-01	V	2.41	D	2.00	G	1.50	G
Freon 123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	84.9	20,000	M	3.62E+02	M	2.60E-03	C	0.94	H	1.30	O	1.33	L
Tetrachloroethene	165.9	150	G	1.78E+01	P	2.30E-02	C	2.56	H	2.60	P	1.62	G
1,2,4-Trichlorobenzene	181.5	30	AA	2.90E-01	H	2.31E-03	R	3.96	H	4.30	AA	1.46	F
1,1,1-Trichloroethane	133.4	1,330	Q	1.23E+02	Q	2.80E-02	C	2.18	H	2.50	H	1.34	L
1,1,2-Trichloroethane	133.4	4,500	W	3.00E+01	W	1.20E-03	C	1.74	H	2.47	W	NA	NA
Trichloroethene	131.3	1,100	G	5.79E+01	C	8.90E-03	C	2.10	H	2.38	E	1.46	L
Monocyclic aromatic hydrocarbons													
Benzene	78.0	1,750	T	9.52E+01	T	5.59E-03	C	1.92	D	2.12	T	0.88	L
Toluene	92.2	535	G	2.81E+01	U	6.60E-03	C	2.48	H	2.73	U	0.89	L

NA: Not Available

SOURCES FOR PHYSICAL/CHEMICAL PROPERTIES ARE ON THE NEXT PAGE

TABLE 6-3

HUMAN EXPOSURE PATHWAYS FOR MICRO STORAGE/INTEL MAGNETICS
UNDER CURRENT-USE CONDITIONS

Environmental Media	Exposure Point	Potential Receptors	Route of Exposure	Pathway Complete?
Surface Soil	MS/IM Site	None	Direct contact, and inhalation of airborne particulates.	No. The site is currently paved. Therefore, direct contact with contaminated soils and generation of airborne particulates are unlikely. Not evaluated at MS/IM site.
Groundwater	MS/IM Site	None	Ingestion, and inhalation of volatile chemicals released from groundwater during indoor use.	No. Shallow groundwater in the A- and B-zones is not used for drinking. Not evaluated at MS/IM site.
Surface Water	Calabazas Creek	None	Direct contact with contaminated surface waters.	No. Intel releases its treated effluent under an NPDES permit to a storm drain which discharges to the Calabazas Creek. Since this is a permitted release, it is outside the scope of this assessment. Not evaluated at MS/IM site.

Table continued on next page.

TABLE 6-3 (CONTINUED)
HUMAN EXPOSURE PATHWAYS FOR MICRO STORAGE/INTEL MAGNETICS
UNDER CURRENT-USE CONDITIONS

Environmental Media	Exposure Point	Potential Receptors	Route of Exposure	Pathway Complete?
Air	Off-Site Residences	None	Inhalation of volatile chemicals released from groundwater.	No. The groundwater plume in the A-zone extends off the site predominantly beneath pavement and industrial buildings. The plume does not extend beneath residences and, therefore, will not be evaluated at MS/IM site.
Air	Off-Site Residences	None	Inhalation of volatile chemicals released from subsurface soils.	No. If volatile organic chemicals volatilized from on-site subsurface soils on site, it is unlikely that detectable concentrations would be contained in ambient air of off-site residents located 0.5 to 1 mile from the MS/IM site.

TABLE 6-4

HUMAN EXPOSURE PATHWAYS FOR MICRO STORAGE/INTEL MAGNETICS UNDER FUTURE-USE CONDITIONS

Environmental Media	Exposure Point	Potential Receptors	Route of Exposure	Pathway Complete?
Surface Soil	MS/IM Site	On-Site Residents	Direct Contact.	Yes. Inorganics and semi-volatile organics may persist in soils but inadequate data are available to quantitatively evaluate pathways. Volatile organic chemicals are not anticipated to have a long residence time in surface soils. Not evaluated at MS/IM site.
Groundwater	MS/IM Site	On-Site Residents	Ingestion. Inhalation from indoor uses of groundwater.	Yes. Groundwater in the A- and B-zones underlying the MS/IM site may be used in the future for drinking water and other domestic uses. Evaluated at MS/IM site.
Air	MS/IM Site	On-Site Residents	Inhalation of volatile chemicals released from subsurface soils and groundwater.	Yes. Volatile organic chemicals may be released from subsurface soils and groundwater and may migrate into on-site residences. Evaluated at MS/IM site.
Surface Water	None	On-Site Residents	Direct contact with contaminated surface waters.	No. Releases to surface water are not anticipated to occur in the future. Not evaluated at MS/IM site.

MICRO STORAGE/INTEL MAGNETICS
SANTA CLARA, CALIFORNIA

Chemical	RfD (mg/kg/day) [Uncertainty Factor][a]	Cancer Potency Factor $(mg/kg/day)^{-1}$	EPA Weight of Evidence[b]	Source[c]
Benzene	-- [d]	2.9×10^{-2}	A	IRIS
Chloroform	1×10^{-2} [1000]	6.1×10^{-3}	B2	IRIS
1,1-Dichloroethane	1×10^{-1} [1000]	9.1×10^{-2}	B2	HEA
1,1-Dichloroethene	9×10^{-3} [1000]	6.0×10^{-1}	C	IRIS
cis-1,2-Dichloroethene	1×10^{-2} [1000]	--	--	HA, 3/31/87
trans-1,2-Dichloroethene	2×10^{-2} [1000]	--	--	IRIS
Freon 11	3×10^{-1} [1000]	--	--	HEA
Freon 113	3×10^{1} [10]	--	--	IRIS
Freon 123	--	--	--	--
Methylene chloride	6×10^{-2} [100]	7.5×10^{-3}	B2	IRIS
Tetrachloroethene	1×10^{-2} [1000]	5.1×10^{-2} [d]	B2	IRIS, HEA
Toluene	3×10^{-1} [100]	--	--	IRIS
1,1,1-Trichloroethane	9×10^{-2} [1000]	--	--	IRIS
1,1,2-Trichloroethane	4×10^{-3} [1000]	5.7×10^{-2}	C	IRIS
1,2,3-Trichlorobenzene	--	--	--	--
1,2,4-Trichlorobenzene	2×10^{-2} [1000]	--	D	IRIS
Trichloroethene	7.4×10^{-3} [1000]	1.1×10^{-2}	B2	HA, 3/31/87, HEA

[a] Uncertainty factors used to develop reference doses consist of multiples of 10, each factor representing a specific area of uncertainty inherent in the data available. The standard uncertainty factors include:
- a ten-fold factor to account for the variation in sensitivity among the members of the human population;
- a ten-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a ten-fold factor to account for the uncertainty in extrapolating from less than chronic NOELs to chronic NOAELs; and
- a ten-fold factor to account for uncertainty in extrapolating from LOAELs to NOAELs.

[b] Weight of evidence classification schemes for carcinogens: A - Human Carcinogen, sufficient evidence from human epidemiological studies; B1 - Probable Human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies; B2 - Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies; C - Possible Human Carcinogen, limited evidence in animals in the absence of human data; D - Not Classified as to human carcinogenicity; and E - Evidence of Noncarcinogenicity.

[c] Sources: IRIS - Integrated Risk Information System; HEA - Health Effects Assessment Summary Tables; HA - Health Advisory.

[d] Pending review by EPA.

MICRO STORAGE/INTEL MAGNETICS
SANTA CLARA, CALIFORNIA

Chemical	RfD (mg/kg/day) [Uncertainty Factor][a]	Cancer Potency Factor $(mg/kg/day)^{-1}$	EPA Weight of Evidence[b]	Source[c]
Benzene	--	2.9×10^{-2}	A	IRIS
Chloroform	--	8.1×10^{-2}	B2	IRIS
1,1-Dichloroethane	1.0×10^{-1} [1000]	--	--	HEA
1,1-Dichloroethene	--	1.2	C	IRIS
cis-1,2-Dichloroethene	--	--	--	--
trans-1,2-Dichloroethene	--	--	--	--
Freon 11	2.0×10^{-1} [10000]	--	--	HEA
Freon 113	--	--	--	--
Freon 123	--	--	--	--
Methylene chloride	8.6×10^{-1} [d]	1.4×10^{-2}	B2	HEA, IRIS
Tetrachloroethene	--	3.3×10^{-3} [e]	B2	HEA
Toluene	5.7×10^{-1} [d] [100]	--	--	HEA
1,1,1-Trichloroethane	3.0×10^{-1} [1000]	--	--	HEA
1,1,2-Trichloroethane	--	5.7×10^{-2}	C	IRIS
1,2,3-Trichlorobenzene	--	--	--	--
1,2,4-Trichlorobenzene	3.0×10^{-3} [1000]	--	--	HEA
Trichloroethene	--	1.3×10^{-2}	B2	IRIS[e]

[a] Uncertainty factors used to develop reference doses consist of multiples of 10, each factor representing a specific area of uncertainty inherent in the data available. The standard uncertainty factors include:
- a ten-fold factor to account for the variation in sensitivity among the members of the human population;
- a ten-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a ten-fold factor to account for the uncertainty in extrapolating from less than chronic NOEL to chronic NOAELs; and
- a ten-fold factor to account for uncertainty in extrapolating from LOAELS to NOAELs.

[b] Weight of evidence classification schemes for carcinogens: A - Human Carcinogen, sufficient evidence from human epidemiological studies; B1 - Probable Human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies; B2 - Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies; C - Possible Human Carcinogen, limited evidence in animals in the absence of human data; D - Not Classified as to human carcinogenicity; and E - Evidence of Noncarcinogenicity.

[c] Sources: IRIS - Integrated Risk Information System; HEA - Health Effects Assessment; HA - Health Advisory.

[d] Converted from units of mg/m^3, assuming that an average adult weighs 70 kg and respires at an average rate of 20 m^3 air per day.

[e] Pending review by EPA.

Future-Use Scenario:
Chronic Daily Intakes and Potential Risks due to
Ingestion of Groundwater and Inhalation of Volatiles
A-Zone

MICRO STORAGE/INTEL MAGNETICS

A. POTENTIAL CARCINOGENS

Chemical	ESTIMATED EXPOSURE POINT CONCENTRATIONS (ug/L)		CHRONIC DAILY INTAKE (CDI) FOR INGESTION (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK (INGESTION)		LIFETIME UPPER BOUND EXCESS CANCER RISK (INHALATION)	
	AVERAGE	MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM
Benzene (a)	2.4	2.4	8.2E-06	2.7E-05	2E-07	8E-07	2E-07	8E-07
Chloroform	0.50	3.7	1.7E-06	4.2E-05	1E-08	3E-07	1E-07	3E-06
1,1-Dichloroethane	1.2	22	4.1E-06	2.5E-04	4E-07	2E-05	----	----
1,1-Dichloroethene	4.6	46	1.6E-05	5.3E-04	9E-06	3E-04	2E-05	6E-04
Methylene chloride	22	90	7.5E-05	1.0E-03	6E-07	8E-06	1E-06	1E-05
Tetrachloroethene	1.4	28	4.8E-06	3.2E-04	2E-07	2E-05	2E-08	1E-06
1,1,2-Trichloroethane	0.20	0.50	6.9E-07	5.7E-06	4E-08	3E-07	4E-08	3E-07
Trichloroethene	32	770	1.1E-04	8.8E-03	1E-06	1E-04	1E-06	1E-04
				TOTAL RISK	1E-05	5E-04	2E-05	7E-04

Table continued on next page.

Fu ise Scenario:
Chronic Daily Intakes and Potential Risks due to
Ingestion of Groundwater and Inhalation of Volatiles
A-Zone

MICRO STORAGE/INTEL MAGNETICS

B. NONCARCINOGENS

Chemical	ESTIMATED EXPOSURE POINT CONCENTRATIONS (ug/L)		CHRONIC DAILY INTAKE (CDI) FOR INGESTION (mg/kg/day)		CDI:RfD RATIO (INGESTION)		CDI:RfD RATIO (INHALATION)	
	AVERAGE	PLAUSIBLE MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM
Chloroform	0.50	3.7	1.4E-05	1.1E-04	1E-03	1E-02	--	--
1,1-Dichloroethane	1.2	22	3.4E-05	6.3E-04	3E-04	6E-03	3E-04	6E-03
1,1-Dichloroethene	4.6	46	1.3E-04	1.3E-03	1E-02	1E-01	--	--
1,2-Dichloroethene (cis/trans) (b)	3.6	69	1.0E-04	2.0E-03	5E-03	1E-01	--	--
trans-1,2-Dichloroethene	8.4	34	2.4E-04	9.7E-04	1E-02	5E-02	--	--
Freon 113 (c)	54	8200	1.5E-03	2.3E-01	5E-05	8E-03	8E-03	1E+00
Methylene chloride	22	90	6.3E-04	2.6E-03	1E-02	4E-02	7E-04	3E-03
Tetrachloroethene	1.4	28	4.0E-05	8.0E-04	4E-03	8E-02	--	--
Toluene	6.4	29	1.8E-04	8.3E-04	6E-04	3E-03	3E-04	1E-03
1,1,1-Trichloroethane	15	570	4.3E-04	1.6E-02	5E-03	2E-01	1E-03	5E-02
1,1,2-Trichloroethane	0.20	0.50	5.7E-06	1.4E-05	1E-03	4E-03	--	--
Trichloroethene	32	770	9.1E-04	2.2E-02	1E-01	3E+00	--	--
				HAZARD INDEX	2E-01	4E+00	1E-02	1E+00

-- - No inhalation toxicity criteria were available for these chemicals.
(a) - Estimated groundwater concentration assuming equilibrium with a soil concentration of 2 ug/kg. See Appendix A for details.
(b) - This value is the sum of the non-speciated 1,2-dichloroethene and the trans-1,2-dichloroethene.
(c) - Freon is a combination of Freon 113 (reported on a combination of Freon 11 and Freon 113) and Freon 123.

TABLE 6-8 Determination of Excess Lifetime Carcinogens
Risk Based on Clean-Up Standard,
2986 and 3000 Oakmead Village Court,
Santa Clara, California

Chemical	Cleanup Standard mg/1	Chronic Daily Intake	Cancer Potency Factor Oral	Oral Risk	CPF Inhale	Inhale Risk	Risk
Benzene	1.0×10^{-3}	1.1×10^{-5}	2.9×10^{-2}	3.19×10^{-7}	2.9×10^{-2}	3.19×10^{-7}	6.38×10^{-7}
1,1 Dichloroethane	5.0×10^{-3}	5.5×10^{-5}	9.1×10^{-2}	5.00×10^{-6}	9.1×10^{-2}	5.00×10^{-5}	1.00×10^{-5}
1,1 Dichloroethene	4.0×10^{-3}	4.4×10^{-5}	6.0×10^{-1}	2.64×10^{-5}	1.2	5.28×10^{-5}	7.92×10^{-5}
Methylene Chloride	5.0×10^{-3}	5.5×10^{-5}	7.5×10^{-3}	6.05×10^{-7}	1.4×10^{-2}	7.70×10^{-7}	1.38×10^{-6}
Tetrachloroethene	5.0×10^{-3}	5.5×10^{-5}	5.1×10^{-2}	2.81×10^{-6}	3.3×10^{-3}	1.82×10^{-7}	2.99×10^{-6}
Trichloroethene	5.0×10^{-3}	5.5×10^{-5}	1.1×10^{-2}	6.05×10^{-7}	1.7×10^{-2}	9.35×10^{-7}	1.54×10^{-6}

Cancer Potency Factor $(mg/kg/day)^{-1}$
Chronic Daily Intake (mg/kg/day) = Clean-up Stardard x 0.011
Risk = CDIxCPF

Total Carinogen Risk = 9.57×10^{-5}

TABLE 6-9 Determination of Total Hazard Index, for Non-Carcinogens Based on Clean-Up Standards, 2986 and 3000 Oakmead Village Court, Santa Clara, California

Chemical	Cleanup Standard MCL (mg/1)	Chronic Daily Intake	Reference Dose Oral	Oral Hazard Index	Reference Dose Inhale	Inhale Hazard Index	Hazard Index Oral & Inhale
1,1 Dichloroethane	5.0×10^{-3}	1.45×10^{-4}	1.0×10^{-1}	1.00×10^{-3}	1.0×10^{-1}	1.45×10^{-3}	2.90×10^{-3}
1,1 Dichloroethene	6.0×10^{-3}	1.74×10^{-4}	9.0×10^{-3}	1.93×10^{-2}	NA	NA	1.93×10^{-2}
1,2 Dichloroethene (cis+trans)	6.0×10^{-3}	1.74×10^{-4}	3.0×10^{-3}	5.80×10^{-2}	NA	NA	5.80×10^{-2}
Trans Dichloroethene	1.0×10^{-2}	2.90×10^{-4}	2.0×10^{-2}	1.45×10^{-2}	NA	NA	1.45×10^{-2}
Freon (Freon 113 + Freon 11)	1.2	3.48×10^{-2}	30.3	1.15×10^{-3}	2.0×10^{-1}	1.74×10^{-1}	1.75×10^{-1}
Methylene Chloride	5.0×10^{-3}*	1.45×10^{-4}	6.0×10^{-2}	2.40×10^{-3}	NA	NA	2.40×10^{-3}
Tetrachloroethene	5.0×10^{-3}	1.45×10^{-4}	1.0×10^{-2}	1.45×10^{-2}	NA	NA	1.45×10^{-3}
Toluene	4.0×10^{-2}	1.16×10^{-3}	2.0×10^{-1}	5.80×10^{-3}	5.7×10^{-1}	2.04×10^{-3}	5.80×10^{-3}
1,1,1 Trichloroethane	2.0×10^{-1}	5.80×10^{-3}	9.0×10^{-2}	6.40×10^{-2}	3.0×10^{-1}	1.93×10^{-2}	8.33×10^{-2}
Trichloroethene	5.0×10^{-3}	1.45×10^{-4}	7.4×10^{-3}	1.96×10^{-2}	NA	NA	1.96×10^{-2}

*Proposed Federal MCL

Reference Dose (mg/kg/Day)
Chronic Daily Intake (mg/kg/Day) = Cleanup Standard x 0.029
Hazard Index = CDI/RfD
NA = Not Available

Hazard Index < 1.0

7.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Under Section 121(d)(1) of CERCLA, remedial actions must attain a degree of clean-up which assures protection of human health and the environment. Additionally, remedial actions that leave any hazardous substance, pollutant, or contaminant on-site must meet 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 in certain instances, as stated in Section 121(d)(4) of CERCLA.

"Applicable" requirements are those clean-up 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 are clean-up 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. See the National Contingency Plan, 40 C.F.R. Section 300.6, 1986).

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. If no ARAR covers a particular situation, or if an ARAR is not sufficient to protect human health or the environment, then non-promulgated standards, criteria, guidance, and advisories must be used to provide a protective remedy. Table D-1 depicts documentation of contaminant specific ARARs to be met by the MSC/IM site.

7.1 TYPES OF ARARS

There are three types of ARARs. The first type includes "contaminant specific" requirements. These ARARs set limits on concentrations of specific hazardous substance, contaminants, and contaminants in the environment. Examples of this type of ARAR are ambient water quality criteria and drinking water standards. The second type of ARAR includes location-specific requirements that set restrictions on certain types of activities based on site characteristics. These include restriction 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.

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.

7.2 CONTAMINANT-SPECIFIC ARARS AND TBCS

Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300g-1

Under Section 1412 of the Safe Drinking Water Act, EPA is required to set Maximum Contaminant Levels Goals (MCLGs) for ground and surface water. Under CERCLA, MCLGs that are set at levels above zero, shall be attained by remedial actions for ground or surface water that are current or potential sources of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release based on the factors in §300.400 (g)(2).

The appropriate remedial goal for each indicator chemical in ground water is the MCLG (if not equal to zero), the federal MCL, or the State MCL, whichever is most stringent.

State Board Resolution 88-63

On March 30, 1989, the Regional Board incorporated the State Board Policy of "Sources of Drinking Water" into the Basin Plan. The policy provides for a municipal and domestic supply designation for all waters of the State with some exceptions. Groundwaters of the State are considered to be suitable or potentially suitable for municipal or domestic supply with the exception of where: 1) the total dissolved solids in the groundwater exceed 3000 mg/L, and/or 2) the water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day. Based on data submitted by KCIII and Intel, the Regional Board has determined that neither of these two exceptions apply to the A and B zones at the combined MSC/IM site. Thus, the A and B zones at the combined MSC/IM site are potential sources of drinking water under state authority.

National Primary Drinking Water Standards, 40 CFR Part 141

Establishes primary maximum contaminant levels (MCLs) that are health based standards for public water systems. MCLs are ARARs for any water that is considered to be a source or potential source of drinking water. MCLs are applicable at the tap when the water is directly provided to 25 or more people or 15 or more service connections. Otherwise, MCLs are relevant and appropriate.

California's Resolution 68-16

On October 28, 1968, the State Water Resources Control Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California". This policy calls for maintaining the existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses. The original discharge of waste to the groundwater at the combined MSC/IM site was in violation of this policy; therefore, the groundwater quality needs to be restored to its original quality as determined by the cleanup standards in Table 4.1.

7.3 ACTION SPECIFIC ARARS AND TBCS

California Department of Health Services Drinking Water Action Levels (DWALs)

California Department of Health Services (DHS) DWALs are health-based concentration limits set by the DHS to limit public exposure to substances not yet regulated by promulgated stan-

dards. They are advisory standards that apply at the tap for public water supplies. The DWAL for toluene is 100 ppb. These DWALs are not ARARs, but are "To Be Considereds" or TBCs. ARARs with more stringent requirements take precedence over these DWALs.

National Pollutant Discharge Elimination System (NPDES)

NPDES substantive permit requirements and/or RWQCB Waste Discharge Requirements (WDRs) are potential ARARs for effluent discharges. The effluent limitations and monitoring requirements of an NPDES permit or WDRs legally apply to point source discharges such as those from a treatment system with an outfall to surface water or storm drains. The RWQCB established effluent discharge limitations and permit requirements based on Water Quality Standards set forth in the San Francisco Bay Regional Basin Plan.

Safe Drinking Water Act, Underground Injection Control (UIC)

If treated ground water is injected, it must be done in compliance with regulations for a Class V underground injection well. These regulations are found in the 40 CFR 144, especially 144.13 (4) (c).

Resource Conservation Recovery Act (RCRA) Land Disposal Restrictions

The contaminated ground water contains two spent solvents that are RCRA listed wastes. TCE is an F001 listed waste, and TCA is an F002 listed waste. Adsorbents and other materials used for remediation of groundwater VOCs, such as activated carbon, chemical-adsorbing resins, or other materials used in the treatment of ground water or air will contain the chemicals after use. RCRA land disposal restrictions are not applicable but are relevant and appropriate to disposal of treatment media due to the presence of constituents which are sufficiently similar to RCRA wastes.

Preparedness and Prevention, 40 CFR 264.30, et seq. Subpart C

Applicable for on-site treatment, storage or disposal of hazardous waste.

Contingency Plan and Emergency Procedures 40 CFR 264.50 et seq. Subpart D

Applicable for on-site treatment, storage or disposal of hazardous waste.

Manifest System, Recordkeeping, and Reporting 40 CFR 264.70 et.seq. Subpart E.

Applicable when waste is transported for off-site treatment, storage, or disposal.

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

Regulates worker health and safety. Applies to all response activities under the NCP.

Hazardous Material Transportation Act, 49 U.S.C. Sections 1801-1813

Hazardous Materials Transportation Regulations 49 CFR Parts 107, 171-177

Regulates transportation of hazardous materials. Applicable when carbon canisters are shipped off-site.

7.4 LOCATION-SPECIFIC ARARS

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act is an applicable requirement for the locations adjacent to Calabazas Creek and other tributary streams and marshes.

TABLE D-1. Documentation of ARARs, 2986 and 3000 Oakmead Village Court, Santa Clara, California

Chemical Specific ARARs	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Ground Water Extraction and Biological Treatment
TCE	5µg/l California MCL and site specific standard may be met in several decades or longer.	5µg/l California MCL and site specific standard may be met in several decades or longer.	5µg/l California MCL and site specific standard may be met in 10-12 years.	5µg/l California MCL and site specific standard may be met in 10-12 years.	5µg/l California MCL and site specific standard may be met in 10-12 years.
Freon 113	1,200 µg/l California MCL and site specific standard may be met in several decades or longer.	1,200 µg/l California MCL and site specific standard may be met in several decades or longer.	1,200 µg/l California MCL and site specific standard may be met in 10 years or less.	1,200 µg/l California MCL and site specific standard may be met in 10 years or less.	1,200 µg/l California MCL and site specific standard may be met in 10 years or less.
1,1 DCE	4 µg/l site specific standard may be met in several decades or longer.	4 µg/l site specific standard may be met in several decades or longer.	4 µg/l site specific standard may be met in 10 years or less.	4 µg/l site specific standard may be met in 10 years or less.	4 µg/l site specific standard may be met in 10 years or less
Total 1,2 DCE	6 µg/l California MCL and site specific standard may be met in several decades or longer.	6 µg/l California MCL and site specific standard may be met in several decades or longer.	6 µg/l California MCL and site specific standard may be met in 10-12 years.	6 µg/l California MCL and site specific standard may be met in 10-12 years.	6 µg/l California MCL and site specific standard may be met in 10-12 years.
Trans 1,2 DCE	10 µg/l California MCL and site specific standard may be met in several decades or longer.	10 µg/l California MCL and site specific standard may be met in several decades or longer.	10 µg/l California MCL and site specific standard may be met in 10 years or less.	10 µg/l California MCL and site specific standard may be met in 10 years or less.	10 µg/l California MCL and site specific standard may be met in 10 years or less.
Benzene	1 µg/l California MCL and site specific standard have been met.	1 µg/l California MCL and site specific standard have been met.	1 µg/l California MCL and site specific standard have been met.	1 µg/l California MCL and site specific standard have been met.	1 µg/l California MCL and site specific standard have been met.
1,1 DCA	5 µg/l California MCL and site specific standard have been met.	5 µg/l California MCL and site specific standard have been met.	5 µg/l California MCL and site specific standard have been met.	5 µg/l California MCL and site specific standard have been met.	5 µg/l California MCL and site specific standard have been met.

TABLE D1. Documentation of ARARs,
2986 and 3000 Oakmead Village Court,
Santa Clara, California
(continued)

Chemical Specific ARARs	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Ground Water Extraction and Biological Treatment
PCE	5 µg/l California MCL and site specific standard may be met in several decades or longer.	5 µg/l California MCL and site specific standard may be met in several decades or longer.	5 µg/l California MCL and site specific standard may be met in 10 years or less.	5 µg/l California MCL and site specific standard may be met in 10 years or less.	5 µg/l California MCL and site specific standard may be met in 10 years or less.
Methylene Chloride	5 µg/l site specific standard has been met.	5 µg/l site specific standard has been met.	5 µg/l site specic standard has been met.	5 µg/l site specific standard has been met.	5 µg/l site specific standard has been met.
Toluene	10(µg/l California MCL and site specific standard have been met.	100 µg/l California MCL and site specific standard have been met.	100µg/l California MCL and site specific standard have been met.	100 µg/l California MCL and site specific standard have been met.	100µg/l California MCL and site specific standard have been met.
1,1,1 TCA	200 µg/l California MCL and site specific standard have been met.	200 µg/l California MCL and site specific standard have been met.	200 µg/l California MCL and site specific standard have been met.	200 µg/l California MCL and site specific standard have been met.	200 µg/l California MCL and site specific standard have been met.

8.0 DESCRIPTION OF ALTERNATIVES

KCIII submitted a Remedial Investigation/Feasibility Study dated January 9, 1991. The report contains the results of the subsurface investigation, a description of the groundwater contamination, and an evaluation of the interim cleanup actions, remedial alternatives, and groundwater conservation measures. EPA and the Regional Board staff determined that the technical information contained in the RI/FS was acceptable for developing a final cleanup plan; however EPA, and the Regional Board did not accept all interpretations and recommendations contained in the RI/FS. Specifically, EPA and Board staff disagreed with the portions of the RI addressing the extent of the groundwater pollution along the northwest edge of the plume. EPA and Board staff interpret the water quality data differently than is shown in the RI. EPA and Board staff have addressed these issues in an Agency Addendum to the RI, rather than in another revised version of the RI. This Agency Addendum is included as Part IV of this ROD.

EPA and the Regional Water Quality Control Board evaluated five remedial action alternatives for the Micro Storage/Intel Magnetics site in accordance with CERCLA Section 121, the National Contingency Plan ("NCP"), and the Interim Guidance on Superfund Selection of Remedy, December 24, 1986 (Oswer Directive No. 9355.0-19).

The Feasibility Study initially screened 21 remedial action technologies. These technologies were screened based on implementability, effectiveness, and cost criteria. The remedial technologies that survived the screening were assembled into a group of alternatives as follows:

Remedial Alternative 1

Remedial Alternative 1 is a "no further action" alternative, retained for base-line comparison purposes in accordance with CERCLA/SARA guidance. Remedial technologies are not implemented at the combined MSC/IM site under this alternative. The existing groundwater recovery treatment and discharge operation would cease, as would any groundwater monitoring. The total present worth cost of this alternative is negligible.

Remedial Alternative 2

Remedial Alternative 2 consists of the following:
- Deed restriction
- Groundwater monitoring

Total present worth cost = $46,000 to $73,000

Remedial Alternative 3

Remedial Alternative 3 consists of the following:

- Deed restriction
- Groundwater monitoring
- Groundwater extraction wells
- Carbon adsorption treatment of extracted groundwater
- Discharge of treated water to surface water under existing NPDES permit

Total present worth cost = $630,000 to $1,100,000

Remedial Alternative 4

Remedial Alternative 4 consists of the following:

- Deed restriction
- Groundwater monitoring
- Groundwater extraction wells
- Oxidation/reduction treatment of extracted groundwater
- Discharge of treated water to surface water under existing NPDES permit

Total present worth cost = $1,600,000 to $3,600,000

Remedial Alternative 5

Remedial Alternative 5 consists of the following:

- Deed restriction
- Groundwater monitoring
- Groundwater extraction wells
- Biological treatment of extracted groundwater
- Discharge of treated water to surface water under existing NPDES permit

Total present worth cost = $1,000,000 to $1,300,000

9.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides an explanation of the criteria used to select the remedy, and an analysis of the remedial action alternatives in light of those criteria, highlighting the advantages and disadvantages of each of the alternatives.

Criteria

The alternatives were evaluated using nine component criteria. These criteria, which are listed below, are derived from requirements contained in the National Contingency Plan (NCP) and CERCLA Sections 121(b) and 121(c).

The alternatives were evaluated in detail with respect to the nine criteria in the FS report. A detailed analysis of the alternatives was completed in the FS. A summary of this detailed analysis is shown on Table 1.

1. Overall protection of human health and the environment. This criterion addresses whether a remedy provides adequate protection of human health and the environment.

2. Compliance with applicable or relevant and appropriate requirements (ARARs). This criterion addresses whether a remedy will meet all of the ARARs or other Federal and State environmental laws.

3. Long-term effectiveness and permanence. This criterion refers to expected residual risk and residual chemical concentrations after cleanup standards have been met and the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of toxicity, mobility or volume through treatment. This criterion refers to the anticipated performance of the treatment technologies a remedy may employ.

5. Short-term effectiveness. This criterion addresses the period of time needed to achieve cleanup and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup standards are achieved.

6. Implementability. This criterion refers to the technical and administrative feasibility of a remedy.

7. Cost. This criterion includes estimated capital and operation and maintenance, usually presented in a 30 year present worth format.

8. Support Agency Acceptance This criterion addresses EPA's acceptance of the selected remedy and any other EPA comments.

9. Community Acceptance This criterion summarizes the public's general response to the alternatives.

9.1 GROUND WATER

Threshold Criteria

Overall protection of human health and the environment

Alternatives 3, 4 and 5 would be protective of human health and the environment. Alternatives 1 (the "no action" alternative) and 2 (deed restriction with groundwater monitoring) are not protective of human health and the environment, because it is expected that the groundwater plume would continue to migrate, further degrading the aquifer. Alternative 3 would provide the greatest protection.

Compliance with applicable or relevant and appropriate requirements

Cleanup standards for this site are determined to be the California Maximum Contaminant Levels and federal Maximum Contaminant Levels. Alternatives 3, 4, and 5 would meet these ARARs within 10 - 12 years. Spent carbon canisters will be disposed of in a manner that complies with federal and state requirements, including RCRA. Table D-1 in Section 7 shows the contaminant cleanup standards to be achieved.

Primary Balancing Criteria

Long-term effectiveness and permanence

Alternatives 3, 4, and 5 would mitigate any potential future risks by preventing the migration of VOCs in groundwater, and restoring the groundwater quality of the A zone. Long-term monitoring, operation and maintenance would be required. The long-term effectiveness and permanence is anticipated to be achieved most effectively by implementing Remedial Alternative 3.

Reduction of toxicity, mobility, or volume through treatment

Alternatives 3, 4, and 5 would reduce contaminants at the site through extraction and treatment of contaminated groundwater. Alternatives 1 and 2 would not result in a

reduction of toxicity, mobility or volume since it relies on natural attenuation mechanisms, such as dispersion, sorption, diffusion and degradation.

The existing system has proven to be effective in reducing toxicity, mobility and volume of the groundwater plume. However, Alternative 3 would be the most effective. Because the Metropolitan Corporate Center plume and the MSC/IM plume are in close proximity to each other, the Board orders and EPA remedy will require that the operation of any extraction system at the MCC and MSC/IM sites be done in a coordinated effort. Both sites will be required to locate extraction wells and select pumping rates that maximize contaminant removal and minimize the hydraulic effects on the other site's groundwater plume.

Short-term effectiveness

Implementation of alternatives 3, 4, and 5 will provide short-term effectiveness. Risks associated with groundwater monitoring, recovery, treatment and discharge are mitigated by the health and safety plan for the site, and by the fact that no exposures to contaminants are anticipated.

Alternatives 1 and 2 will not be effective in containing the contaminant plume.

Implementability

Alternative 3 would utilize recovery and treatment systems which are already implemented at the site. Alternative 4 would utilize existing extraction wells but would require that a new system be built to accomodate the oxidation/reduction treatment of extracted groundwater. Alternative 5 would also utilize existing extraction wells and require building of a new system for the biological treatment of extracted groundwater.

Alternatives 1 and 2 can be readily implemented at the site as it involves discontinuing the current remedial actions.

Cost

The cost to implement Alternatives 1 and 2 would be minimal in comparison to the other remedial alternatives for the site. The existing wells would need to be plugged and abandoned and the treatment system could be disassembled and removed from the site.

The capital cost to implement Alternative 3 would be low ($119,000) since the groundwater recovery, treatment, and discharge systems are already in use at the site. The system requires periodic maintenance to remain operable, and

the carbon units must be replaced every eight months. The present worth value ranges from $629,800 to $1,102,000 for Alternative 3.

The capital cost to implement Alternative 4 would be higher ($168,000), consisting mainly of costs associated with custom manufacturing of a oxidation/reduction unit. The present worth value of Alternative 4 ranges from $1,554,400 to $3,613,800.

The capital cost to implement Alternative 5 consists of conducting a pilot study, and manufacture of the bioreactor. Alternative 5 has a present worth value that ranges from $1,006,900 to $1,298,800.

SUPPORT AGENCY ACCEPTANCE

The Feasibility Study and the Proposed Plan Fact Sheet were reviewed by California Regional Water Quality Control Board (RWQCB). The RWQCB concurs with EPA's preferred alternative.

COMMUNITY ACCEPTANCE

The Proposed Plan was presented to the community of Mountain View in a fact sheet and at a public meeting. No technical comments were submitted regarding the alternatives. Other comments received are addressed in the Response Summary.

THE SELECTED REMEDY

Remedy Selection Rationale and Statutory Determinations

The selected remedy is protective of human health and the environment. Groundwater contamination is treated so that the remaining potential future risks fall within the 10^{-4} to 10^{-6} carcinogenic risk range for acceptable cleanup standards. The remedy complies with ARARs by achieving cleanup to at least Federal and State MCLs (proposed or adopted).

The selected remedy is effective in the short-term because further plume migration is controlled by groundwater extraction. The selected remedy is effective in the long-term by virtue of the fact that ARARs are achieved. Groundwater extraction and treatment is a permanent solution and significantly reduces pollutant toxicity, mobility and volume at the combined MSC/IM site. The selected remedy is implementable.

Based on an evaluation of the alternatives, the selected remedy for the combined MSC/IM site is Alternative No.3. KCIII has estimated that it will take approximately 10 years to achieve groundwater cleanup standards at a cost of $630,000 to $1,100,000.

The selected remedy consists of the following actions:

a. Continue groundwater extraction until cleanup standards are achieved in all combined MSC/IM site monitoring wells.

b. Install and sample a minimum of two new monitoring wells; one well located midway along a line between MMW-5 and the former location of IM-8, and one located midway along a line between MMW-9 and MMW-7.

c. Hydraulic containment of the entire groundwater plume above cleanup standards and continued groundwater extraction at the four existing wells. Modifications to the system are required in the event that the interim hydraulic control system is demonstrated not to be effective in containing and removing the groundwater contaminants.

d. Maintenance of hydraulic control to prohibit the further vertical and horizontal migration of the groundwater pollution. This requirement shall remain in effect until cleanup standards are achieved.

e. Continued quarterly groundwater monitoring at the combined MSC/IM site during the cleanup period. Water samples will continue to be collected to verify that cleanup is proceeding and that there is no migration of VOCs, above cleanup standard levels, beyond current boundaries or into the deeper B zone. Detailed sampling and reporting requirements for the combined MSC/IM site are contained in the Self-Monitoring Plan attached to the RWQCB Order No. 91-119.

f. Treatment of extracted groundwater with an existing carbon adsorption system. The treated groundwater will continue to be discharged to Calabazas Creek, under existing NPDES Permit No. CA0029670.

g. A deed restriction. MSC/IM shall be required to file a deed restriction prohibiting use of on-site shallow groundwater for drinking water and controlling other subsurface activities. The deed restriction shall remain in place until groundwater cleanup standards are achieved.

TABLE 1 Comparison of Alternatives, 2986 and 3000 Oakmead Village Court, Santa Clara, California

	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Ground Water Extraction and Biological Treatment
1. Compliance With ARARs					
- Chemical Specific	Would take several decades or longer to achieve clean-up standards	Would take several decades or longer to achieve clean-up standards	Would be achieved. Clean-up standards likely would be achieved in approximately 10 to 12 years	Would be achieved. Clean-up standards likely would be achieved in approximately 10 to 12 years	Would be achieved. Clean-up standards likely would be achieved in approximately 10 to 12 years
- Action Specific	No action	No action	Complies with surface water discharge permit requirements	Complies with surface water discharge permit requirements; wastes would be handled in accordance with applicable laws	Complies with surface water discharge permit requirements
- Location Specific	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
2. Short Term Effectiveness					
- Protection of Community	No additional risks. Does not prevent the use of the affected ground water	No additional risks. Prevents the use of affected ground water as a drinking water source	No additional risks. The plume would be contained	No additional risks. The plume would be contained	No additional risks. The plume would be contained
- Protection of Workers	No additional risks	No additional risks	No additional risks	No additional risks	No additional risks
- Environmental Impacts	Discharge of impacted ground water to nearby creeks and/or SF Bay unlikely. Current impact probably negligible	Discharge of impacted ground water to nearby creeks and/or SF Bay unlikely. Current impact probably negligible	The plume would be contained. No impact	The plume would be contained. No impact	The plume would be contained. No impact
- Approximate Time Until Clean-up Standards Are Met	Several decades or longer	Several decades or longer	10 to 12 years	10 to 12 years	10 to 12 years

TABLE 13. Comparison of Alternatives, 2986 and 3000 Oakmead Village Court, Santa Clara, California (continued)

	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Ground Water Extraction and Biological Treatment
3. Long Term Effectiveness and Permanence					
- Magnitude of Residual Risk	Will not change current level of risk, but level of risk will decrease with time. Affected ground water will be above clean-up standards for several decades or longer.	Will not change current level of risk, but level of risk will decrease with time. Affected ground water will be above clean-up standards for several decades or longer.	Ground water will eventually be restored to safe drinking water standards.	Ground water will eventually be restored to safe drinking water standards.	Ground water will eventually be restored to safe drinking water standards.
- Adequacy of Controls	No controls involved	Adequate to prevent potential exposure to humans	Adequate to prevent potential exposure to humans	Adequate to prevent potential exposure to humans	Adequate to prevent potential exposure to humans
-Permanence of Remedial Action	Permanent	Permanent	Permanent	Permanent	Permanent
- Effectiveness in Achieving Remedial Action Objectives	Remedial objectives will be met in several decades or longer by natural attenuation processes	Remedial objectives will be met in several decades or longer by natural attenuation processes	Remedial objectives will be met	Remedial objectives will be met	Remedial objectives will be met
4. Reduction of Toxicity, Mobility and Volume through Treatment					
-Amount of Hazardous Material Treated	None	None	Approximately 2,050,000 gallons affected ground water treated per year. Greater than 99 percent VOC removal prior to discharge	Approximately 2,050,000 gallons affected ground water treated per year. Greater than 99 percent VOC removal prior to discharge	Approximately 2,050,000 gallons affected ground water treated per year. Greater than 99 percent VOC removal prior to discharge

TABLE 13. Comparison of Alternatives, 2986 and 3000 Oakmead Village Court, Santa Clara, California (continued)

	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Ground Water Extraction and Biological Treatment
4. Reduction of Toxicity, Mobility and Volume through Treatment (continued)					
- Reduction of Toxicity, Mobility and Volume	None	None	All significantly reduced	All significantly reduced	All significantly reduced
- Irreversible Treatment	None	None	Yes	Yes	Yes
- Type and Quantity of Treatment Residual	None	None	Approximately 2,000 to 4,000 pounds of spent carbon per year requiring disposal/regeneration	None	None
5. Overall Protection of Human Health and the Environment					
- Human Health					
- Environment	Negligible impact since discharge of impacted ground water to the SF Bay and vicinity creeks unlikely	Negligible impact since discharge of impacted ground water to the SF Bay and vicinity creeks unlikely	Plume contained. Discharge of treated ground water to Calabazas Creek under NPDES permit	Plume contained. Discharge of treated ground water to Calabazas Creek under NPDES permit	Plume contained. Discharge of treated ground water to Calabazas Creek under NPDES permit

TABLE 13. Comparison of Alternatives, 2986 and 3000 Oakmead Village Court, Santa Clara, California (continued)

	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Extraction and Biological Treatment
6. Implementability					
- Technical Feasibility	No construction required	No construction required	System constructed and operational	Oxidation/Reduction unit would likely have to be custom manufactured	Bioreactor would likely have to be custom manufactured. Pilot study would have to be conducted
- Administrative Feasibility	Very little administrative work required	Easily implemented. Enforcement of deed restrictions could be difficult	Required permits already obtained.	Required permits already obtained	Required permits already obtained
- Availability of Materials and Services	None required	None required	Services, components and materials easily obtained. Carbon can be replaced with one to two days notice	Experience technicians to maintain unit may not be readily available	Experienced technicians to perform daily maintenance operations may not be readily vailable
7. Costs					
- Capitol	$0	$5,000 to $8,000	$119,000	$168,000	$188,000
- Annual O & M	$0	$5,000 to $8,000	$63,000 to $121,000	$171,000 to $407,000	$101,000 to $137,000
Present Worth Analysis					
- 10 years of operation	$0	$45,500 to $73,100	$629,800 to $1,102,000	$1,554,400 to $3,613,800	$1,006,900 to $1,298,800
- 12 years of operation	$0	$51,500 to $82,700	$705,300 to $1,247,000	$1,759,400 to $4,123,200	$1,127,900 to $1,463,000

TABLE 13. Comparison of Alternatives, 2986 and 3000 Oakmead Village Court, Santa Clara, California (continued)

	Alternative I No Action	Alternative II Institutional Controls and Ground Water	Alternative III Ground Water Extraction and GAC Treatment	Alternative IV Ground Water Extraction and Oxidation/ Reduction Treatment	Alternative V Ground Water Extraction and Biological Treatment
8. State Acceptance	Acceptance unlikely to be granted.	Acceptance unlikely to be granted.	Ground water extraction and treatment are approved technologies by the CRWQCB and EPA. NPDES permit has been issued for the site.	Ground water extraction and treatment are approved technologies by the CRWQCB and EPA. NPDES permit has been issued for the site.	Ground water extraction and treatment are approved technologies by the CRWQCB and EPA. NPDES permit has been issued for the site.
9. Community Acceptance	Public reaction likely to be negative.	Public reaction likely to be negative.	Public reaction likely to be positive since ground water extraction and treatment has been implemented at the site since 1985.	Public reaction likely to be positive since ground water extraction and treatment has been implemented at the site since 1985.	Public reaction likely to be positive since ground water extraction and treatment has been implemented at the site since 1985.

10.0 STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment, comply with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost-effective. This remedies utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because the remedies will result in hazardous substances remaining on-site above health-based levels, a five-year review, pursuant to CERCLA Section 121, 42 U.S.C. Section 9621, will be conducted at least once every five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

There were no significant changes between the issuing of the preferred plan fact sheet and the Record of Decision.