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September 1990

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Superfund Record of Decision:

Intel (Santa Clara III), CA

50272-101

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First Remedial Action - Final

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Intel (Santa Clara III) site includes a plant that performs quality control testing of chemicals and electrical testing of semiconductors in Santa Clara, Santa Clara County, California. The site is in a predominantly industrial area, and overlies a major ground regional source of ground water, the Santa Clara Valley ground water basin. In 1982, the State conducted a leak detection program, which identified VOC contamination in an onsite shallow aquifer. Possible sources for the contamination may include the accidental dumping of solvents into an acid neutralization tank, accidental spills near an above-ground solvent storage facility, and cleaning of solvent-contaminated pipes during plant construction. It has been determined that no onsite source is presently contributing to ground water contamination. Since 1985, Intel has been pumping and treating ground water using granular activated carbon as an Initial Remedial Measure (IRM). This Record of Decision (ROD) addresses a final solution for restoring ground water to its beneficial use. The primary contaminants of concern affecting the ground water are VOCs including TCE.

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Intel (Santa Clara III), CA
First Remedial Action - Final
Contaminated Medium: gw
Key Contaminants: VOCs (TCE)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

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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 selected remedial action for this site includes installing an additional extraction well onsite; continuing the pumping and treatment of ground water using an existing granular activated carbon adsorption system, with regeneration of carbon filters offsite; discharging treated water to onsite surface water; conducting a treatability study to evaluate the effectiveness of pulsed pumping techniques that enhance the removal of contaminants adsorbed to soil and allow for aquifer equilibration; ground water monitoring; and implementing institutional controls, including deed restrictions to limit ground water use. The estimated present worth cost for this remedial action is $594,400. O&M costs were not provided.

PERFORMANCE STANDARDS OR GOALS: Ground water cleanup goals will reduce the excess lifetime cancer risk for carcinogens from 10^{-4} to 10^{-6}, and will reduce the Hazard Index (HI) for non-carcinogens to a value of 1 or less. Chemical-specific goals include TCE 5 ug/l (State MCL).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, CA 94103

RECORD OF DECISION

INTEL SANTA CLARA III SUPERFUND SITE

SANTA CLARA, CALIFORNIA

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CA

SEPTEMBER 1990

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
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RECORD OF DECISION
DECLARATION STATEMENT

SITE NAME AND LOCATION

Intel Santa Clara III Superfund Site
Santa Clara, California

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Intel Santa Clara III (SC3) Superfund site located in Santa Clara, California, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Section 9601, (CERCLA) and, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, 55 Fed. Reg. 8666 (3/9/90) (NCP). This decision is based on the administrative record for this site.

The State of California concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Intel Santa Clara III site addresses groundwater contamination, in which trichloroethylene (TCE) is the primary contaminant detected above drinking water standards in the A-zone. As of November, 1989, TCE had been detected at a maximum of 140 parts per billion (ppb) at the site. However, breakdown products of TCE have historically been detected in groundwater at the site, including 1,1-dichloroethane (1,1 DCA), 1,1-dichloroethylene (1,1-DCE), cis 1,2-

dichloroethylene (1,2-DCE), trans 1,2-dichloroethylene (1,2-DCE), and 1,2-dichloroethane (1,2-DCA). Although vinyl chloride is also a breakdown product of TCE, it has never been detected at Intel Santa Clara III. In addition, 1,1,1-TCA and Freon 113, and to a much lesser extent Freon 11, have been detected at the site.

This action represents the final remedial action to remove contaminants from groundwater. Several response measures were previously performed at the site by Intel Santa Clara III. The major components of the selected remedy are:

Continue groundwater pumping from existing extraction wells and one additional well until drinking water standards for TCE (5 ppb); 1,2-DCA (0.5 ppb); 1,1-DCE (6 ppb); 1,1-DCA (5 ppb), cis 1,2-DCE (6 ppb); trans 1,2-DCE (10 ppb); 1,1,1-TCA (200 ppb), Freon 113 (1200 ppb) and Freon 11 (150 ppb) are achieved;

File a deed restriction to prevent the installation of a shallow drinking water well and other subsurface activities at the site until cleanup standards are achieved. The deed restriction will remain in place until safe drinking water levels are achieved;

Continue quarterly ground water monitoring at the site during the cleanup period;

Treat extracted groundwater by using an existing granular activated carbon adsorption (GAC) system (expanded with one additional carbon canister, if necessary);

Discharge treated water to surface water pursuant to a NPDES permit. The extracted groundwater is treated and then discharged to a storm sewer system tributary of San Tomas Aquino Creek;

Modify the existing extraction well lay-out if evaluations indicate the need to do so;

Conduct a demonstration project to evaluate the efficacy of intermittent pumping of the extraction wells to remove residual contaminants adsorped to soil particles.

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) technology, 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.

A review of the remedial action will be conducted every five years after commencement to ensure that the remedy continues to provide protection of human health and the environment.

9.20.90
Date

John Wise
for Daniel W. McGovern
Regional Administrator
EPA Region IX

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, CA 94103

DECISION SUMMARY

INTRODUCTION

The U.S. Environmental Protection Agency ("EPA") and the California Regional Water Quality Control Board, San Francisco Bay Region ("Regional Board"), have worked together to select the remedy for the Intel Santa Clara III site. Consequently, portions of the documents by which the Regional Board has embodied its selection of the remedy under state law reflect the efforts of both agencies to investigate the site, to assess the risks which it poses, and to evaluate and compare possible remedial alternatives. Particularly, certain portions of Order No. 90-105 which was adopted by the Regional Board on July 18, 1990, referred to hereafter as the "Order", and the Internal Memo dated March 30, 1990 (Revised June 19, 1990), referred to hereafter as the "Staff Report", accurately set forth the views and rationale of EPA. Consequently, this Decision Summary will refer to portions of those documents, and by such reference they are thereby deemed to be incorporated into this Decision Summary.

1. Site Name, Location and Description

See Section 1, and Figures 1 through 5 of the Staff Report and Findings 1 and 2 of the Order.

2. Site History and Enforcement Activities

See Subsections 2.1 and 2.3 of the Staff Report and Findings 4, 5, 6, 7, and 9 of the Order.

3. Highlights of Community Participation

The RI/FS and Proposed Plan for the Intel Santa Clara III site were released to the public on Wednesday, April 18, 1990. These two documents were made available to the public in the information repository maintained at the Santa Clara City Library. A public comment period was held from April 18, 1990 through May 18, 1990, and a public meeting was held on May 2, 1990. In addition, a final public hearing occurred on July 18, 1990 at the Regional Water Quality Control Board monthly hearing. The attached responsiveness summary provides responses to the comments submitted in writing during the public comment period by various public agencies and Intel. No major issues were raised by the local community. See Subsection 2.5 of the Staff Report and Finding 19 of the Order.

4. Scope and Role of Response Action Within Site Strategy

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.

5. Summary of Site Characteristics

Currently, TCE, in the A-zone aquifer, is the only chemical detected above drinking water standards. The horizontal extent of the plume covers an area approximately 400 feet long by 300 feet wide and extends to a depth of 27.5 feet below ground surface. Please see Subsections 2.1, 2.2, and 2.4 of the Staff Report and Finding 8 of the Order for additional information on site characteristics.

6. Summary of Site Risks

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 1800 feet south of the site. See Appendix B of the Staff Report for risk assumptions and risk calculations.

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 Intel Santa Clara III 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.

See Section 3.0, and Sub-Sections 6.3, and 6.4, and Table 3 of the Staff Report and Finding 16 of the Order for a detailed analysis of site risks and conclusions.

7. Description of Alternatives

Intel submitted a revised Remedial Investigation/ Feasibility Study, dated February 16, 1990. 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 con-

tained 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 the Regional Board disagreed with the portions of the RI/FS addressing: 1) Applicable or Relevant and Appropriate Requirements, 2) Asymptotic Levels, and 3) The Selected Remedy. See Appendix C of the Staff Report for detailed information regarding these issues. As part of comments submitted on the September, 1989 draft RI/FS, Intel was informed of these areas of disagreement. In revising the RI/FS, Intel did not address these three areas.

As discussed hereafter EPA has determined that drinking water standards, and the Regional Board's Basin Plan are ARARs, that asymptotic levels for TCE have not yet been reached at Intel Santa Clara III, and Alternative 4 is the preferred remedy.

EPA and the Regional Water Quality Control Board evaluated four remedial action alternatives for the Intel Santa Clara III 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 eleven remedial action technologies. Technologies or their components which were determined to be environmentally unsound, difficult to implement, ineffective, or having limited effectiveness were eliminated from further consideration. A summary of this evaluation is shown in Table 2 of the Staff Report. Technologies or their components which were considered applicable were further screened based on effectiveness, implementability and cost. Pursuant to OSWER Directive No. 9355.0-19, remedial action alternatives are to be developed ranging from those that would eliminate the need for long-term management (including monitoring) to alternatives involving treatment that would permanently reduce the mobility, toxicity or volume of the hazardous substances as their principal element. In addition, containment options involving little or no treatment, and a no action alternative are to be developed. The remedial action alternatives developed are 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. The use of remedial technologies are not proposed at the Santa Clara III facility under this alternative. The existing groundwater recovery, treatment and discharge operation would be discontinued, 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 restrictions
- Groundwater monitoring
- Pumping from existing extraction wells
- Treatment with the existing Granular Activated Charcoal System
- Discharge of treated water to surface water under existing RWQCB NPDES permit

Total present worth cost = $386,500

Remedial Alternative 3

Remedial Alternative 3 consists of the following:

- Deed restrictions
- Groundwater monitoring
- Utilizing cyclic pumping of the existing extraction system
- Discharge of treated water to surface water under existing RWQCB NPDES permit

Total present worth cost = $168,000

Remedial Alternative 4

Remedial Alternative 4 consists of the following:

- Deed restrictions
- Groundwater monitoring
- Pumping from existing extraction wells and one additional well
- Treatment with a Granular Activated Charcoal system (expanded with one additional carbon canister, if necessary)
- Discharge of treated water to surface water under existing RWQCB NPDES permit
- Demonstration project that will evaluate pulsed pumping from the extraction wells in conjunction with components listed above. This project will evaluate various groundwater pumping strategies for cleaning up residual levels of VOCs left behind in aquifer material if normal groundwater pumping and treating has been shown to be less effective.

Total present worth cost = $594,400

8. Summary of Comparative Analysis of Alternatives

Threshold Criteria

Overall protection of human health and the environment

Alternatives 2, 3 and 4 would be protective of human health and the environment. Alternative 1, the "no action" alternative is 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 4 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 for TCE, each of which is 5 ppb. Alternatives 2, 3, and 4 would meet this ARAR, but alternative 4 would reach ARAR's in the shortest time period. Spent carbon canisters will be disposed of in a manner that complies with federal and state requirements, including RCRA.

Primary Balancing Criteria

Long-term effectiveness and permanence

Alternatives 2, 3, and 4 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 in the shortest period by implementing Remedial Alternative 4.

Reduction of toxicity, mobility, or volume through treatment

Alternatives 2, 3, and 4 would reduce contaminants at the site through extraction and treatment of contaminated groundwater. Alternative 1 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 4 would be the most effective. To increase the rate of VOC removal, an additional extraction well will be installed near SC3-7A, where the highest concentrations of TCE and Freon-113 currently exist. While groundwater containing VOCs in this area is already captured by the existing extraction wells, installing an additional well will steepen the hydraulic gradient, increase groundwater velocity, shorten the groundwater flow path to the extraction point, and thereby increase the rate and efficiency of VOC extraction. Pulse pumping will also be implemented. The extraction system will be shut down periodically to allow water levels to rebound. This will provide contact time between shallow soils which may contain VOCs and groundwater, and will allow VOCs adsorbed to soil particles to desorb back into groundwater.

Short-term effectiveness

Implementation of alternatives 2, 3, and 4 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.

Alternative 1 will not be effective in containing the contaminant plume.

Implementability

Alternatives 2 and 3 utilize existing recovery and treatment systems which are already implemented at the site. Alternative 4 utilizes existing systems and involves an additional groundwater extraction well which can be readily implemented.

Alternative 1, "no action", can be readily implemented at the site as it involves discontinuing the current remedial actions.

Cost

The cost to implement Alternative 1 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 2 would be low 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 is $386,500 for Alternative 2.

The capital cost to implement Alternative 3 would be low, consisting mainly of monitoring costs and cyclic pumping costs. The present worth value of Alternative 3 is $168,000.

The capital cost to implement Alternative 4 consists of installing the additional extraction well(s). Another GAC unit may also be needed to supplement the groundwater treatment system already in use at the site. Additional operation and maintenance will be required for the additional system components, and the carbon units must be replaced every eight months. The spent carbon is removed from the site and regenerated by the manufacturer. Alternative 4 has a present worth value of $595,400.

Modifying Criteria

State/support agency acceptance

The State of California concurs with EPA's preferred alternative.

Community acceptance

The RWQCB did not receive any written comments from community members on the proposed plan for the Intel Santa Clara III Site. Intel indicated a preference for Alternative 3.

9. ARARS

CERCLA requires that final cleanup actions conform to all federal, state, and local applicable or relevant and appropriate requirements (ARARs). ARARs for this site include:

1. Water quality goals from the Water Quality Control Plan for San Francisco Bay Basin, RWQCB; and

2. Federal and State Drinking Water Maximum Contaminant Levels (MCLs).

See Section 4 of the Staff report for a complete analysis of site ARARS.

10. The Selected Remedy

Based upon consideration of the requirements of CERCLA, the selected remedy is Alternative 4. Alternative 4 includes the following components: 1) a deed restriction, 2) groundwater monitoring, 3) pumping from existing extraction wells and one additional well, 4) treatment with an expanded GAC system, and 5) discharge of treated water to surface water under an NPDES permit. The selected remedy will also include a requirement for submittal of a proposal to evaluate pulsed pumping as a demonstration project at the site.

The goal of this remedial action is to restore groundwater to its beneficial use. Based on information obtained during the remedial investigation and on a careful analysis of all remedial alternatives, EPA and the State of California believe that the selected remedy will achieve this goal. It may become apparent, during implementation or operation of the ground water extraction system and its modifications, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal over some portion of the contaminated plume. In such a case, the system performance standards and /or the remedy may be reevaluated.

The selected remedy will include groundwater extraction and treatment. The system's performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. (Please see the Groundwater Self-Monitoring Report that is included in the Board Order, and the report on pulse pumping.) Possible adjustments may include the following:

a) pulse pumping to allow aquifer equilibration and encourage adsorbed contaminants to partition into groundwater.

b) installation of additional extraction wells to facilitate or accelerate cleanup of the contaminant plume.

c) discontinuing operation of extraction wells in areas where cleanup standards have been attained; and

d) alternating pumping at wells to eliminate stagnation points.

See Section 6 of the Staff Report and Finding 13 and Specification B4 of the Order.

11. Statutory Determinations

The selected remedy is protective of human health and the environment in that contaminated groundwater is treated to at least maximum contaminant levels (MCLs) and falls within EPA's acceptable carcinogenic risk range of one-in-a-million (10^{-6}) to one-in-ten-thousand (10^{-4}) individual lifetime excess cancers that may develop in a population. In addition, the remedy complies with the requirements of all ARAR's including federal and State MCLs and State Drinking Water Action Levels. Furthermore, the selected remedy utilizes cost effective technologies. The selected remedy is more expensive, but it is more effective in achieving remediation goals in the shortest period of time. The selected remedy will permanently and significantly reduce the toxicity, mobility, and volume of hazardous substances with respect to their presence in groundwater and utilizes treatment of groundwater as a principal element.

12. Documentation of Significant Changes

The Proposed Plan for the Intel Santa Clara III site was released for public comment in April 1990. The Proposed Plan identified Alternative 4, groundwater extraction, as the preferred alternative. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, Fact Sheet #2, were necessary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, CA 94103

Staff Report on the Final Remedial Action Plan for the Intel Santa Clara 3 Site, dated March 30, 1990 and revised on June 19, 1990.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, CA 94103

ATTACHMENTS:

Figure 1	Site Location Map - Intel Santa Clara 3.
Figure 2	Site Map of Intel Santa Clara 3 (showing distribution of TCE in the A Water-Bearing Zone, August 16, 1989).
Figure 3	Representative Log for Intel Santa Clara 3 (Boring Log for Monitoring Well SC3-5B).
Figure 4	Potentiometric Surface of the A Water- Bearing Without Pumping, 8 June, 1988 - Intel Santa Clara 3.
Figure 5	Potentiometric Surface of the A Water-Bearing Zone with pumping - Intel Santa Clara 3 - August 16, 1989.
Figure 6	Concentration of TCE vs. Time in Monitoring Well SC3-1 and Extraction Wells SC3-E1 and E2.
Figure 7	Concentration of TCE vs. Time in Monitoring Well SC3-7A.
Figure 8	Idealized effect of pulse pumping over time.
Table 1	Federal and State drinking water standards.
Table 2	Remedial Technology Screening: Groundwater, Inter SC3, Feasibility Study.
Table 3	The Cancer Risk and Hazard Index Associated With the Groundwater Cleanup Standards.
Appendix B:	Assumptions Used to Calculate Hazard Index and Carcinogenic Risk.
Appendix C:	Agency Addendum for the RI/FS Report.
Appendix D:	Self-Monitoring Program for Intel Santa Clara

REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION
INTERNAL MEMO

TO: Steven R. Ritchie
Executive Officer

DATE: March 30, 1990
(Revised June 19, 1990)

FROM: Gregory W. Bartow
Associate Engineering Geologist

SUBJECT: Staff Report on the Final Remedial Action Plan for the Intel Santa Clara 3 Site, Santa Clara

SUMMARY

This staff report contains background information used in developing the Final Remedial Action Plan (RAP) for the Intel Santa Clara 3 (SC3) Superfund site. Groundwater below the site is primarily polluted with trichloroethylene (TCE). Subsurface investigations by the discharger have determined that the oval shaped plume covers an area approximately 400 feet by 300 feet. The vertical extent of groundwater pollution extends to a depth of approximately 30 feet below ground surface in the first (or "A") aquifer zone. Only trace groundwater pollution has been found to date in any of the deeper (or "B") zone monitoring wells.

The selected remedy includes the following components: 1) a deed restriction to preclude future use of the A zone until cleanup standards are achieved, 2) groundwater monitoring, 3) pumping groundwater from existing extraction wells and at least one additional extraction well, 4) treatment of pumped groundwater with an expanded granular activated charcoal system (GAC), 5) discharge of treated groundwater to surface water as specified by the existing National Pollutant Discharge Elimination System (NPDES) permit, and 6) submittal of a proposal to evaluate pulsed pumping as a demonstration project at the site. Pulsed pumping is the cycling of extraction wells on and off in active and resting periods.

Currently there are three areas of disagreement at the site. These issues involve 1) applicability of drinking water requirements (defined by CERCLA as applicable or relevant and appropriate requirements or "ARARs") to the SC3 site; 2) the selected remedy; and 3) asymptotic groundwater pollutant concentration levels. Board staff recommends that these issues be resolved in the RAP as well as in an agency addendum to the RI/FS, rather than in another revised version of the Remedial Investigation / Feasibility Study (RI/FS).

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 maximum contaminant levels (MCLs) and falls within EPA's acceptable Carcinogenic Risk range of one-in-a-million (10^{-6}) to one-in-ten-thousand (10^{-4}) individual lifetime excess cancers that may develop in a population. In addition, the remedy at least attains the requirements of all ARARs, including Federal and State MCLs and State Drinking Water Action Levels.

Furthermore, the selected remedy includes cost effective technologies. The selected remedy will permanently and significantly reduce the toxicity, mobility, and volume of hazardous substances with respect to their presence in groundwater.

1.0 SITE LOCATION AND DESCRIPTION

Intel Corporation's Santa Clara 3 Facility performs quality control of chemicals and electrical testing of semiconductors at a site located at 2800 Northwestern Parkway, Santa Clara, Santa Clara County (Figure 1 and 2). SC3 has been in operation since 1976.

SC3 is located in the City of Santa Clara in a relatively flat lying portion of the Santa Clara Valley. Ground surface elevations are generally between 38 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 San Tomas Aquino Creek. The nearest residential areas are located 1800 feet south of the site. Other residential areas are located 7200 feet north-northeast of the site and 7800 feet northwest of the site. None of these residential areas are within the area impacted by past chemical releases from SC3.

1.1 Groundwater Resources

The 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. The Intel SC3 site is a Superfund site primarily because of the past chemical releases' potential threat to the quality of this valuable resource.

1.2 Regional Hydrogeology

The SC3 site 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.

The Santa Clara Valley groundwater basin is divided into two broad areas: 1) the forebay, and 2) the confined area, where SC3 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 in 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 SC3 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 (Santa Clara Valley Water District, Geology and Water Quality, 1989).

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 SC3 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 site is the City of Santa Clara's Well No. 33 located 1.6 miles north of the site.

1.3 Site Hydrogeology

Two water bearing layers, designated as the A and B zones, have been identified at SC3. The shallowest, or A zone, has its upper boundary at about 10 to 18 feet deep, and lower boundary about 25 to 27 feet deep. The top of the B zone is 29 to 36 1/2 feet deep, and the bottom of the B zone is between 35 1/2 to 43 feet deep. The A and B zones are separated by an aquitard of 5 to 10 feet of silty clay to clayey silt. Below the B zone is the next confining layer, which appears to be at least 4 feet thick as determined from over drilling of wells SC3-4B, 5B and 6B. The boring log for monitoring well 5B, shown on Figure 3, can be considered a representative log for the site. However, it should be noted that there is considerable variation in lithology and thickness of the A and B zones, as well the aquitard between the A and B zones, across the site.

A potentiometric surface map for the site, under non-pumping conditions, is shown in Figure 4. The gradient is fairly uniform at 0.005 toward N 15° E to N 15° W. A potentiometric surface map for water levels measured during on-site pumping conditions is shown in Figure 5.

2.0 SITE HISTORY

2.1 Subsurface Investigation

In early 1982, the 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 in the A zone at SC3 detected trichloroethylene (TCE); 1,1,1-trichloroethane (1,1,1- TCA); 1,1-dichloroethylene (1,1-DCE); 1,1-dichloroethane (1,1-DCA); 1,2-dichloroethane (1,2-DCA); cis 1,2-dichloroethylene (cis 1,2-DCE); trans 1,2-

dichloroethylene (trans 1,2-DCE); Freon 113; and Freon 11.

Since 1982, Intel has installed eleven A zone monitoring wells and four B zone monitoring wells to define the vertical and horizontal extent of the plume. Following installation of A zone monitoring wells SC3-8A, 9A, and 10A in 1987, Board staff concluded that the vertical and horizontal extent of the plume had been defined. The oval shaped plume covers an area approximately 400 feet by 300 feet. The vertical extent of groundwater pollution in the A zone extends to the bottom of well SC3-3 at a depth of 27.5 feet below ground surface.

The vast majority of samples collected and analyzed from the B zone have not detected any volatile organic chemicals (VOCs). Occasionally, VOCs have been detected in the B zone, usually at concentrations below 1 ppb. Board staff believes that the VOCs detected in the B zone are likely due to sampling and/or laboratory contamination. In addition, trace amounts of VOCs may have been introduced to the B zone during installation of B zone monitoring wells.

2.2 Groundwater Pollution

Groundwater samples from SC3 monitoring wells have been collected and analyzed on 39 separate occasions between July 1982 and November 1989. Currently, TCE, in the A zone, is the only chemical detected above drinking water standards. However, as described above, other VOCs have been detected in the A zone. Following is a list of chemicals detected at least once since 1982 and the maximum concentration of the chemical. In addition, the maximum 1989 level for each chemical is shown:

Chemical	Maximum Historical Concentration ('82-'89)	1989 Maximum Concentration	Drinking Water Criteria[1]
1,1 DCA	8.2	ND	5.0
1,2 DCA	16.0	ND	0.5
1,1 DCE	84.0	ND	6.0
cis-1,2 DCE	<7.9[2]	ND	6.0
trans-1,2 DCE	<7.9[2]	ND	10.0
1,1,1 TCA	810.0	2.1	200.0
TCE	490.0	230.0	5.0
Freon 113	1300.0	35.0	1200.0
Freon 11	2.8	ND	150.0

All concentrations in parts-per-billion (ppb)
ND - Not Detected (detection levels ranged between 0.5 and 5.0 ppb)
[1]Proposed or adopted CA State Maximum Contaminant Level
[2]Reported as total 1,2DCE

2.3 Interim Remedial Actions

Intel has been extracting A zone groundwater from two extraction wells since February 1985. A general decline in groundwater pollution levels has been observed in all but one of the wells at SC3 since pumping started. Prior to implementing Interim Remedial Actions, the groundwater contained levels of TCE up to 490 parts per billion (ppb), 1,1,1-TCA up to 810 ppb, 1,1-DCE up to 84 ppb, and Freon 113 up to 1300 ppb. Figure 6 shows the concentration of TCE in three representative wells at the site. The exception to the general decline in pollution levels is monitoring well SC3-7A. Figure 7 shows the concentration of TCE over time in well SC3-7A. Pumped groundwater is treated and then discharged to a storm sewer system tributary to San Tomas Aquino Creek as specified under NPDES Permit #CA0028941.

2.4 Source Identification

No source of the groundwater pollution has ever been positively identified at the site. Three possible sources have been proposed and, to the extent practical, evaluated. One possible source of the pollution is leaks that may have occurred from the acid waste neutralization tank (AWN). The AWN was installed in 1976 and consists of an open top metal neutralization tank in a concrete containment vault which is open to the atmosphere. Two soil samples were collected from monitoring well SC3-1, installed 8 feet from the AWN in 1982. The soil samples were collected from 4 and 7 feet below ground surface and contained 48 and 18 ppb TCE respectively. In 1984, Intel removed the AWN at SC3. According to Intel, the removed AWN was not leaking and the vault containing the system showed no signs of moisture or corrosion.

Intel admits that accidental dumping of solvents into the acid neutralization tank has occurred in the past. However, based on the decline in concentration of VOCs in SC3-1 and SC3-E1 (see Figure 3), there does not appear to be any lingering source of VOCs which may have leaked from the AWN. In addition, Board staff believes that any VOC's that would have leaked out of the AWN would have migrated directly into the groundwater, since the base of the AWN is at or below the water table. As such, it is now difficult to identify the AWN, conclusively, as a source.

Another possible source is accidental spills near the above ground solvent storage facility. Prior to 1983, outside storage was above ground on a concrete pad which was covered and fenced. In 1983, an above ground, double-contained storage facility was created with a maximum capacity of five 55 gallon drums. A soil gas survey conducted 1989, at the request of the Regional Board, included five points near the solvent storage facility. The results from the soil gas survey do not indicate any major lingering source in this vicinity.

The third possible source of groundwater pollution is that solvents were used to clean out the pipes put in place during the construction of the SC3 building. As previously stated, a soil gas survey was conducted in 1989 to investigate the possibility of a source of VOCs in soils at the site. A total of 36 separate locations were sampled. No evidence indicating a vadose zone source of VOCs was discovered.

EPA's consultant, Metcalf & Eddy, reviewed the soil gas survey report and stated in a letter dated November 28, 1988, "Based on the low levels of detectable VOCs, namely Freon 113,

TCA and TCE, we are in general agreement with the report's conclusions that 1) no sources of VOCs exist or are identifiable in the surveyed area, and 2) soil venting is not suitable for remediation at SC3. It is our opinion that further efforts to identify a site source(s) of VOC contamination in the groundwater will prove futile."

Positive identification of a pollution source during groundwater pollution site investigation and evaluation is useful in ensuring that: 1) the source is no longer contributing to identified groundwater pollution, and 2) the affect of residual pollutants present in the source area is considered in developing a remedial action plan for the site. While positive identification of a pollution source has not been possible at SC3, by performing the evaluations of potential sources described above, it has been possible to determine that there is no source continuing to contribute pollutants to SC3's existing groundwater pollution and to develop a remedial action plan that considers the possible affect of residual pollutants in the vadose zone. As such, Board staff concurs with Metcalf & Eddy's conclusion that no further action to identify a pollution source at SC3 be undertaken.

2.5 Community Relations

An aggressive Community Relations program has been established by the Board's Community Relations staff for all Santa Clara Valley Superfund sites, including the SC3 site. A Community Relations Plan for SC3 was developed and distributed in September 1989. The Plan calls for mailing a total of three fact sheets to the community during key stages of the Superfund program. An Administrative Record was compiled for the site. A copy of the Administrative Record is located at the Santa Clara City Library. The index to the Administrative Record is included as an appendix to this report.

The Regional Board held an initial public hearing on the proposed RAP at their regular meeting on Wednesday, April 18, 1990. This began the 30 day public comment period. A public meeting was held on May 2, 1990 at 7:00 pm at the Santa Clara County Convention Center. All comments received regarding the RAP were addressed in the Responsiveness Summary attached to this staff report.

A final public hearing and consideration of the final RAP is expected to occur on July 18, 1990 during the Regional Board's regular meeting.

3.0 SUMMARY OF SITE RISKS

The draft Public Health Evaluation (PHE) was prepared by Geraghty and Miller and submitted to the Regional Board in May, 1989. This report was reviewed by the Board's contractor ICF Clement and an EPA toxicologist. A revised PHE addressing both ICF Clement and EPA's comments was submitted to the Board on February 20, 1990.

3.1 Potential Human Exposure Pathways

In order for a chemical to pose a human health risk, a complete exposure pathway must be identified. A complete exposure pathway consists of four elements: 1) a source and mechanism of chemical release to the environment, 2) an environmental transport medium (e.g., air or soil) for the released chemical, 3) a point of potential human contact with the contaminated medium (known as the exposure point), and 4) a human exposure route

(e.g., inhalation) at the contact point. Exposure pathways are evaluated for both current and potential future land uses at the site.

3.2 Current Use Conditions

Land uses surrounding the SC3 site are predominantly light industry. The nearest residences are approximately 1800 feet south of the site and 7200 feet north-northeast of the site. Therefore, the primary exposures under current conditions are to individuals working at or in the vicinity of the SC3. Potential exposures to workers were not evaluated in this assessment since these exposures are outside the scope of a CERCLA/SARA baseline PHE.

The likelihood of exposure was evaluated for each potentially contaminated environmental medium: soil, groundwater, surface water, and air. No pathways were identified as having a moderate or high likelihood of occurrence and, therefore no current-use conditions were quantitatively evaluated in the assessment. Board staff, ICF Clement, and EPA concur with this exposure assessment approach.

3.3 Future Use Conditions

In the future, in the absence of deed restrictions, the SC3 site could be converted to different land uses, including retail business or residential. If this change were to occur without remediation of the site, on-site workers or residents could potentially be exposed to site pollutants. Conversion of the property to residential uses is less likely than conversion to other industrial or commercial uses, due to the industrial nature of the adjacent properties. However, residential uses would lead to higher potential exposures than would commercial uses, due to the possibility of a private well being installed in the A zone. Since Intel plans on obtaining a deed restriction, future use was not evaluated.

Generally, Board staff has required that the future risk at a site be based on the risk of drinking and showering with water from a hypothetical onsite well. This calculation was not required at the SC3 site since a deed restriction is planned. The deed restriction will prohibit the installation of any well into the A zone for any purposes other than site remediation (see Section 6.0). The Board's PHE contractor, ICF Clement, concurs with this decision. Board staff believes this is an appropriate decision since the groundwater pollution is confined onsite and in the shallowmost aquifer.

Board staff estimated the baseline risk at the site based on the assumptions presented in Section 6.4 and Appendix B. Using the maximum concentrations of chemicals detected in the groundwater in 1989, the Carcinogenic Risk and Hazard Index, as defined in Section 4.4, associated with drinking and showering with water from the A zone is $7x10^{-5}$ and 0.001 respectively. As such, the Carcinogenic Risk currently is within EPA's acceptable Carcinogenic Risk range of one-in-a-million ($1x10^{-6}$) to one-in-ten-thousand ($1x10^{-4}$) individual lifetime excess cancers that may develop in a population. However, the concentration of TCE currently exceeds ARARs. It is ARARs then, that are driving the cleanup at the site, rather than the Carcinogenic Risk (see Section 4.0).

3.4 Preliminary Health Assessment

A Preliminary Health Assessment for the site was prepared for the site by the Agency for

Toxic Substances and Diseases Registry, U.S. Public Health Services, dated January 19, 1989. This report states that based on available information, this site is not considered to be of a current public health concern because of the apparent absence of human exposure to hazardous substances. Board staff concurs with this assessment.

3.5 Environmental Risks

EPA requires that risks at the site be evaluated relative to the affects on critical habitats and endangered species.

The SC3 site is located in 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. Over 90% of the property is covered with blacktop or a building slab. Chemical constituents are only present in the shallow groundwater. Therefore, Board staff believes that there is no probable pathway for exposure to critical habitats or endangered species.

4.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Under Section 121(d) of CERCLA, as amended by SARA, the selected remedy must achieve a level or standard of cleanup that assures protection of human health and the environment. In addition, CERCLA requires that remedial actions achieve a level or standard or cleanup that meets legally applicable or relevant and appropriate requirements, standards, criteria or limitations (ARARs).

ARARs associated with the site can generally be separated into two categories: 1) ambient or chemical specific requirements that set health or risk-based concentration limits or ranges for particular chemicals, and 2) performance, design, or action-specific requirements that govern particular activities. For this site, the selection of ARARs is dependent on the defined beneficial use of groundwater as a source of drinking water.

4.1 Beneficial Use of Local Groundwater as A Source of Drinking Water

The regulatory framework associated with the cleanup of groundwater and soil at the site is driven by the beneficial (current or potential) use of local groundwater. As stated in 40 CFR 300.430(a)(ii)(F), "The goal of EPA's Superfund approach is to return usable ground waters to their beneficial uses wherever practicable within a timeframe that is reasonable given the particular circumstances of the site". Drinking water is considered to be the highest beneficial use and affords the greatest level of protection and cleanup.

As required by the California Porter-Cologne Water Quality Control Act, the Regional Board defines the beneficial uses of various water bodies in greater San Francisco Bay Area. Water bodies and their beneficial uses are presented in The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). The Basin Plan, as adopted by the Regional Board on December 16, 1986, and approved by the State Water Resources Control Board (SWRCB) on May 21, 1987, has been promulgated and is an ARAR for this site. In the Basin Plan, the Regional Board classifies the shallow aquifers in the area of the SC3 plume as "potentially suitable for municipal or domestic water supply". In addition, the Basin Plan states that the "use of waters in the vicinity represent the best information on beneficial uses".

On March 15, 1989, the Regional Board incorporated the SWRCB 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: 1) the total dissolved solids in the groundwater exceed 3000 mg/L, and 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 Intel, Board staff has concluded that neither of these two exceptions apply to the A zone at SC3. Thus, the A zone at SC3 is a potential source of drinking water.

4.2 State Board Resolution 68-16

On October 28, 1968, the State 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 this site was in violation of this policy; therefore, the groundwater quality needs to be restored to its original quality to the extent reasonable. For the purpose of establishing cleanup objectives, the shallow groundwater at the site is designated a potential source of drinking water, and protective levels shall be those levels which have been established as protective of drinking water. A beneficial use of the groundwater is drinking water. Establishing a cleanup level which maintains this beneficial use should attain the requirements of Resolution 68-16. State Board Resolution 68-16 is an ARAR for the site.

4.3 Chemical-Specific ARARs

Chemical-specific ARARs for the SC3 site are Federal and State of California drinking water standards. Each is relevant and appropriate to set cleanup standards at the site. A list of Federal and State drinking water standards are presented in Table 1.

4.4 Action-Specific ARARs

Primary remedial actions evaluated at SC3 incorporate groundwater extraction and treatment. Groundwater extraction and treatment involves pumping, treating, and discharging the treated groundwater to surface waters and/or reinjecting it into the aquifer. The following ARARs are associated with components of groundwater extraction and treatment.

Discharge to Surface Water - Substantive National Pollutant Discharge Elimination System (NPDES) permit requirements would apply to extracted and treated groundwater discharges to surface waters. These are primarily effluent limitations and monitoring requirements. Intel currently has a NPDES permit for discharging treated groundwater extracted at the SC3 site to San Tomas Aquino Creek.

Carbon Adsorption - Groundwater, extracted at SC3, will continue to be treated by Granular Activated Carbon (GAC) adsorption. GAC use requires consideration of ARARs associated with carbon regeneration or disposal. Currently, the GAC canisters are replaced

approximately once per year. The spent GAC canisters are removed from the site and regenerated by Calgon Carbon Corporation.

Regeneration of activated carbon, using a high-temperature thermal process, is considered "recycling" under both Federal and California hazardous waste regulations. Transportation, storage, and generation of hazardous waste for recycling must comply with requirements in RCRA and California hazardous waste control regulations. On-site storage of contaminated carbon may trigger substantive requirements under municipal or county hazardous materials ordinances. If the spent carbon is hazardous waste, construction and monitoring requirements for storage facilities may also apply.

4.5 Other Criteria To Be Considered

In establishing selected remedial alternatives, EPA and the Regional Board consider various procedures, criteria and resolutions. These "to be considered" criteria (TBCs) do not rise to the level of ARARs, but are relevant to the cleanup of the site. The following discussion presents selected criteria relevant to the selection of remedial alternatives.

State Criteria for Groundwater Cleanup - Drinking Water Action Levels are health-based concentration limits established by DHS to limit public exposure to substances not yet regulated by promulgated standards such as MCLs. They are advisory standards that would apply at the tap for public water supplies, and do not rise to the level of ARARs. Nonetheless, they have been considered in developing cleanup standards for the SC3 site, especially for those chemicals that currently have action levels established and that have proposed MCLs. Groundwater criteria, to be considered for determining cleanup levels, are presented in Table 1.

Health Advisories - Pollutants in the groundwater at SC3 are divided into: 1) possible or probable cancer-causing substances (carcinogens), and 2) toxins (noncarcinogens). When carcinogens are present, and a threat of exposure to these carcinogens exists, a potential risk is present. There is no "zero-risk" level associated with the threat of exposure to carcinogens. The potential aggregate effects of carcinogens are evaluated by use of Carcinogenic Risk numbers, usually expressed as the number of excess cancers that may develop in a population; i.e., the one-in-a-million or 10^{-6} risk. The Regional Board and EPA consider that for a remedial action of a drinking water source to be protective, it should have a Carcinogenic Risk that is as close as possible to one-in-a-million (10^{-6}) individual lifetime excess cancers that may develop in a population. If meeting a Carcinogenic Risk of 10^{-6} is infeasible, the remedial action must at least have a Carcinogenic Risk that falls within a range of 10^{-6} to one-in-ten-thousand (10^{-4}) individual lifetime excess cancers that may develop in a population.

The Hazard Index is the method used by the Board to assess the public health risk associated with the presence of multiple noncarcinogens. Potential risks are assessed for noncarcinogens by taking the ratio of the chronic daily intake (CDI) to the reference dose (RfD). In general, if the CDI:RfD ratio is less than one (i.e., if the daily intake is below the designated health criterion), the pollutant is considered unlikely to be associated with any significant health risks.

Toxic effects of noncarcinogenic chemicals are initially assumed to be additive, in

accordance with EPA guidance on health risk assessment of complex mixtures. For each scenario, the CDI:RfD ratios for each individual chemical are summed to produce a Hazard Index for total toxic risks. If the Hazard Index is less than one, the combined intake of chemicals by the exposure route under consideration is unlikely to pose a health risk.

The Hazard Index and Carcinogenic Risk associated with the cleanup standards for SC3 are presented in Section 6.3.

5.0 DESCRIPTION OF ALTERNATIVES

The Feasibility Study initially screened eleven remedial action technologies. Technologies or their components which are environmentally unsound, difficult to implement, ineffective, or have limited effectiveness were eliminated from further consideration. A summary of this evaluation is shown on Table 2. Technologies or their components which were considered potentially applicable for SC3 were further screened based on effectiveness, implementability and cost. The remedial technologies that survived the further 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 SC3 under this alternative. The existing ground water recovery treatment and discharge operation would cease, as would any ground water monitoring. The total present worth cost of this alternative is negligible.

Remedial Alternative 2

Remedial Alternative 2 consists of the following:

- Deed restrictions
- Ground water monitoring
- Pumping from existing extraction wells
- Treatment with the existing GAC system
- Discharge of treated water to surface water under existing NPDES permit

Total present worth cost = $386,500

Remedial Alternative 3

Remedial Alternative 3 consists of the following:

- Deed restrictions
- Ground water monitoring
- Cease continuous pumping from existing extraction system with some cyclic pumping
- Keeping the existing extraction system in stand-by mode, with some cyclic pumping
- Discharge of treated water to surface water under existing NPDES permit

Total present worth cost = $168,000

Remedial Alternative 4

Remedial Alternative 4 consists of the following:

- Deed restrictions
- Ground water monitoring
- Pumping from existing extraction wells and one additional well
- Treatment with a GAC system (expanded with one additional carbon canister, if necessary)
- Discharge of treated water to surface water under existing NPDES permit

Total present worth cost = $594,400

6.0 THE RECOMMENDED SELECTED REMEDY

Intel's recommended remedy is Alternative 3. However, based upon the conclusions in the FS that Alternative 4 could potentially achieve long-term effectiveness and permanence and reduction of toxicity, mobility and/or volume of VOCs in the shortest time, Board staff believes that Alternative 4 is a more appropriate remedy than Alternative 3 for the site. Furthermore, Alternative 3 would not necessarily attain cleanup standards. Board staff therefore recommends modifying the proposed plan to include Alternative 4 in the selected remedy.

Based on Alternative 4, the selected remedy includes the following components: 1) a deed restriction, 2) groundwater monitoring, 3) pumping from existing extraction wells and one additional well, 4) treatment with an expanded GAC system, and 5) discharge of treated water to surface water under existing NPDES permit. As discussed in Section 6.1, Board staff also recommends modifying the selected remedy to include a requirement for submittal of a proposal to evaluate pulsed pumping as a demonstration project at the site.

The institutional control of a deed restriction will prohibit the installation of a shallow drinking water well at the site. Since the entire plume is located beneath the site, the deed restriction will provide an extra margin of safety, should the property be sold during the long term remediation phase. This phase is expected to last 11 years, or into the indefinite future. Intel has submitted the following draft language to be used in the deed restriction with the County of Santa Clara:

> "No person shall drill, bore, excavate or otherwise construct a shallow well as defined below, for the purpose of extracting water for beneficial use as defined in Section 13050 of the California Water Code. A shallow well is defined as any well, boring or excavation that allows extraction of water from any water bearing zone above a depth of approximately 50 feet (approximately 10 feet below mean sea level) below 1989 ground surface.
>
> It is intended that the burden of this restrictive covenant shall run with the land and any and all successors to any interest in the land shall be bound by this covenant.
>
> This restrictive covenant may be waived, modified or removed only subsequent to a written decision from the California Regional Water Quality Control Board, San

Francisco Bay Region and the Santa Clara Valley Water District that specifically approves: the construction of a shallow well; extraction of water from a shallow zone; and, beneficial use of the extracted water.

Nothing in this negative covenant shall restrict drilling, boring or excavation for any purpose not described above, including: borings for the purpose of testing soils; excavation for foundations or underground utilities; wells for monitoring the quality of the water, or borings to define the geology."

Groundwater monitoring will continue at the site during the cleanup period. An additional monitoring well will be installed between wells SC3-1 and SC3-7A. Water levels will be measured to verify that hydraulic control of the groundwater pollution is maintained. 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 gradually be decreased once cleanup standards have been achieved.

Groundwater extraction will continue at the two existing wells SC3-E1 and SC3-E2. In addition, at least one new extraction well, in the vicinity of SC3-7A, will be installed. To increase the efficiency of groundwater extraction, additional extraction wells may be necessary in the future. The need for different extraction well locations will be evaluated at least once every year.

The extracted groundwater will be treated with a granular activated charcoal (GAC) system to remove VOCs. A GAC system has already been implemented to treat groundwater from the two existing extraction wells. It consists of two carbon canisters each with 1600 lbs of carbon, and a flow capacity of 10 gallons per minute (gpm). They are connected in parallel, providing 20 gpm total flow capacity. Useful life is about eight months per canister at present pumping and VOC loading rates. The existing GAC system is effective in treating the SC3 groundwater, has already been implemented, and is cost effective. The spent canisters are currently regenerated offsite by Calgon Carbon Corporation.

The treated groundwater will be discharged to San Tomas Aquino Creek, as is currently done, under existing NPDES Permit No. CA0028941. The effluent from the treatment system has consistently met drinking water levels since discharging began in 1985. The permit's effluent limit of 5 ppb for Freon 113 has been exceeded on a few occasions since discharging began in 1985. However, the concentrations of Freon 113 in the effluent on these occasions was between 7 and 24 ppb, well below the drinking water level of 1200 ppb for Freon 113. Based on Intel's response on these occasions, immediate actions are anticipated to be taken by Intel to prevent or correct any violation of their NPDES permit. Board staff believes that the beneficial use of San Tomas Aquino Creek will not be affected by continuing this discharge.

6.1 Demonstration Project

During the last two years, Intel has often requested that the Regional Board use SC3 as a demonstration project to determine the fate of low concentrations of VOCs in the groundwater following an extended period of groundwater extraction and treatment. However, Board staff feels that Intel's proposal to discontinue groundwater extraction

because Intel contends asymptotic groundwater pollutant concentration levels have been reached is unacceptable until drinking water standards are met or sufficient data exists to demonstrate that drinking water standards are unattainable.

Nonetheless, Board staff has informed Intel that staff would include a task in the RAP requiring Intel to submit a proposal for a demonstration project. The demonstration project would involve evaluating pulsed pumping from the extraction wells in conjunction with Alternative 4. Pulsed pumping implies the cycling of extraction wells on and off in active and resting phases. During the resting or nonpumping phase, groundwater levels will rebound. This will provide greater contact time between the shallow soils and groundwater, and potentially allow VOCs adsorbed to soil particles to desorb back into the groundwater. The demonstration project would evaluate various groundwater pumping strategies for cleaning up residual levels of VOC left behind in aquifer material once normal groundwater pumping and treating has been shown to be less effective.

Recent literature, as well as practical examples in the South Bay, have shown that removing the final 10% of groundwater pollution at a site may be more difficult than removing the initial 90% of groundwater pollution.

Following is an excerpt from a recent EPA technical memorandum promoting pulsed pumping:

> One of the promising innovations in pump-and-treat remediations is pulsed pumping. Pulsed operation of hydraulic systems is the cycling of extraction or injection wells on and off in active and resting phases (Figure 5). The resting phase of a pulsed-pumping operation can allow sufficient time for contaminants to diffuse out of low permeability zones and into adjacent high permeability zones, until maximum concentrations are achieved in the higher permeability zones. For sorbed contaminants and NAPL residuals, sufficient time can be allowed for equilibrium concentrations to be reached in local groundwater. Subsequent to each resting phase, the active phase of the cycle removes the minimum volume of contaminated ground water, at the maximum possible concentrations, for the most efficient treatment. By occasionally cycling only select wells, stagnation zones may be brought into active flowpaths and remediated.
>
> Pulsed operation of remediation wellfields incurs certain additional costs and concerns that must be compared with its advantages for site-specific applications. During the resting phase of pulsed-pumping cycles, peripheral gradient control may be needed to ensure adequate hydrodynamic control of the plume. In an ideal situation, peripheral gradient control would be unnecessary. Such might be the case where there are no active wells, major streams, or other significant hydraulic stresses nearby to influence the contaminant plume while the remedial action wellfield is in the resting phase. The plume would migrate only a few feet during the tens to hundreds of hours that the system was at rest, and that movement would be rapidly recovered by much higher flow velocities back toward the extraction wells during the active phase. (Keely, J.F., 1989, Performance Evaluations of Pump and Treat Remediations, USEPA 540/4-89/005).

Board staff believes that this site would be an ideal candidate for such a demonstration

project for a number of reasons: 1) the plume is relatively small and confined to the A zone, 2) existing groundwater monitoring wells can easily be sampled, and water levels measured, to determine if any migration has occurred during non-pumping periods, 3) there are no significant nearby hydraulic stresses (e.g. streams or other extraction system), 4) current total VOC levels at the SC3 site are in the tens to hundreds of ppb range whereas most of the other Santa Clara Valley groundwater pollutant sites are in the thousands to tens-of-thousands ppb range.

Potential benefits associated with a demonstration project of pulsed pumping include: 1) a decrease in the amount of groundwater extracted, 2) provide critical data to evaluate Intel's hypothesis that asymptotic levels have been or are about to be reached in all wells at the site, and 3) a reduction of energy consumption associated with operating the extraction system. This demonstration project will not effect the cleanup standards of the Final Remedial Plan.

Intel submitted a draft proposal regarding the demonstration project on March 7, 1990. Ingredients that Board staff have requested in the final proposal include: 1) additional monitoring of water levels and water chemistry (performance data), 2) running gamma logs in selected monitoring wells to provide additional stratigraphic control, 3) conducting grain size analysis of aquifer material from the site, and 4) reinfiltration of some or all of the extracted groundwater particularly if pulsed pumping is shown to significantly lengthen the cleanup time.

Thus, Board staff recommends that the selected remedy include a task requiring Intel to submit a proposal to evaluate pulsed pumping as a demonstration project at the site.

6.2 Regional Board Resolution No. 88-160

Intel has considered the feasibility of reclamation, reuse, or discharge to a publicly owned treatment works (POTW) of treated, extracted groundwater, as specified in Board Resolution No. 88-160. Reclamation of extracted groundwater at SC3 was tried in 1986. Extracted groundwater was routed through the facility's wet air scrubber. However, scaling caused by the high hardness of the groundwater quickly shut down the scrubber. Intel claims the independent operational requirements of the scrubber and the groundwater extraction system may only be overcome by installing a complex and expensive system of process controls and backup systems. The only other substantial use of water at SC3 is landscape irrigation. However, the total area of landscaping is less than one acre; the present 20,000 gallon per day flow would apply more than 1/2 inch of water per day or 200 inches per year to the landscaping, far more than it could absorb, especially in the rainy season. Thus, Intel believes reclamation or reuse of treated, extracted groundwater at SC3 is not feasible. Since the City of Santa Clara does not allow any discharges of treated groundwater into its sewer system on a permanent basis, Board staff concurs that treated, extracted groundwater reclamation, reuse, or discharge to a POTW at SC3 is currently not feasible.

However, a demonstration project to be conducted at the site may decrease the amount of treated groundwater discharged to surface waters. Three features of the demonstration project as described in Section 6.1,, which should decrease the amount of groundwater discharged are: 1) pulsed pumping allows for the removal of a minimum volume of

polluted ground water, at the maximum possible concentrations, thus reducing the total amount of groundwater extracted, 2) Intel will be required to evaluate returning extracted groundwater to the source aquifer as part of the demonstration project proposal, and 3) Intel will be required to evaluate the feasibility of partial reclamation of the extracted groundwater through irrigation as part of the demonstration project proposal.

6.3 Cleanup Standards

Cleanup standards at the site are set at drinking water standards. Chemicals identified for cleanup, as well as the risk associated with the cleanup standards, are discussed below.

Since January 1986, TCE has been the only chemical detected above drinking water standards at SC3. However, because breakdown products of TCE have been detected in the past, they may appear again in the future. Breakdown products of TCE that have historically been detected at the site are: 1,1-DCA, 1,1-DCE, cis 1,2-DCE, trans 1,2-DCE, and 1,2-DCA. Vinyl chloride is also a breakdown product of TCE. However, vinyl chloride has never been detected at SC3. In addition, 1,1,1-TCA and Freon 113, and to much lesser extent Freon 11, have been detected at the site. 1,1,1-TCA and Freon 113 are currently detected well below drinking water standards.

Thus, Board staff recommends that Cleanup Standards for the following chemicals be included in the final RAP: TCE, 1,1-DCA, 1,1-DCE, cis 1,2-DCE, trans 1,2-DCE, 1,2-DCA, 1,1,1-TCA, Freon 113 and Freon 11.

Drinking water standards used to establish cleanup standards for the groundwater at this site are shown on Table 1. The actual cleanup standards for the site are shown below.

GROUNDWATER CLEANUP STANDARDS FOR INTEL SANTA CLARA 3

Chemical	Cleanup Standard[1] (ug/l)	1989 Maximum[2] (ug/l)
POTENTIAL CARCINOGENS		
1,1-dichloroethane (1,1-DCA)	5	ND
1,2-dichloroethane (1,2-DCA)	0.5	ND
1,1-dichloroethylene (1,1-DCE)	6	ND
trichloroethylene (TCE)	5	140
NONCARCINOGENS		
1,2-dichloroethylene (1,2-DCE)		
cis	6	ND
trans	10	ND
1,1,1-trichloroethane (1,1,1-TCA)	200	2.1
Freon 113	1,200	35.0
Freon 11	150	ND

[1]California State Maximum Contaminant Level (MCL) for Drinking Water (proposed or adopted).
[2]1989 Maximum Concentration Levels at SC3 (ug/l).
ND - Not Detected (detection levels ranged between 0.5 and 5.0 ppb)

6.4 Risk Associated with Cleanup Standards

The Carcinogenic Risk and the Hazard Index were described in Section 4.5. Estimations of the Carcinogenic Risk and Hazard Index associated with the above cleanup standards for the site are shown on Table 3. Appendix B contains the assumptions used in the estimation.

Potential carcinogens historically detected at SC3 are 1,1-DCA, 1,2-DCA, 1,1-DCE, and TCE. All four of these chemicals have been assigned cleanup standards for the site. Board staff have made the risk management decision of not including 1,1-DCE in the risk calculation for the cleanup standards.

The decision to not include 1,1-DCE in the risk calculation is based on the following factors: 1) 1,1-DCE has only been detected at SC3 above its MCL (of 6 ppb) on five occasions out of over 450 separate analyses, 2) during the last two years 1,1-DCE has never been detected in any of the monitoring and extraction wells above detection limits (detection limits have ranged from 0.1 to 5.0 ppb), and 3) due to 1,1-DCE's high inhalation

cancer potency factor, if 1,1-DCE were to be included in the risk calculation, it would literally drive the cleanup standards downward unnecessarily below MCLs.

The Carcinogenic Risk associated with the cleanup standards for 1,1-DCA, 1,2-DCA, and TCE is $1.3x10^{-5}$, and falls within EPA's acceptable Carcinogenic Risk range of one-in-a-million (10^{-6}) to one-in-ten-thousand (10^{-4}) individual lifetime excess cancers that may develop in a population.

The Regional Board and EPA consider that for a remedial action of a drinking water source to be protective, it should have a Carcinogenic Risk of $1x10^{-6}$ as the point of departure for setting remedial standards, and a least protective endpoint of $1x10^{-4}$. A departure from the Carcinogenic Risk of $1x10^{-6}$ to $1.3x10^{-5}$ is necessary at SC3 because the cleanup standards that would be necessary to meet a Carcinogenic Risk of $1x10^{-6}$ are unlikely to be technically achievable.

Nonetheless, Board staff regards the Carcinogenic Risk associated with the cleanup standards as extremely conservative. In cleaning up TCE to the 5 ppb cleanup standard, it is quite likely that concentration of other VOCs will be reduced to levels below detection limits. The Carcinogenic Risk associated with the 5 ppb cleanup standard for TCE alone is $1.5x10^{-6}$. Board staff therefore concludes that a departure from the $1.0x10^{-6}$ is protective of human health.

Toxic non-carcinogens detected at SC3 are 1,1-DCA, cis 1,2-DCE, trans 1,2-DCE, Freon 113, Freon 11, and 1,1,1 TCA. The Hazard Index associated with the cleanup standards for these chemicals is 0.2. Board staff conclude that since the Hazard Index is less than one, the combined intake of chemicals is unlikely to pose a health risk.

7.0 AREAS OF DISAGREEMENT

Currently there are three areas of disagreement at the site. Board staff recommends that these issues be resolved in the RAP as well as in an agency addendum to the RI/FS, rather than in another revised version of the RI/FS. A discussion of these areas of disagreement follows:

7.1 Applicability of drinking water ARARs to the SC3 site.

Intel's Position: Intel states in the RI/FS that, "While the A-aquifer potentially satisfies EPA and RWQCB criteria as a potential drinking water supply, the Santa Clara Valley Water District (SCVWD), which is the controlling agency, does not allow the use of the A-aquifer as a water supply source (Ordinance 85-01). The A zone can only be used for monitoring wells . Since the shallow ground water (A zone) will not be used for drinking, drinking water standards are not applicable as remediation goals".

Regional Board staff's Position: The SCVWD's Ordinance 85-1 requires a minimum 50 feet sanitary seal in all drinking water wells. Tom Iwamura, of the SCVWD, has informed Board staff that this requirement is intended to protect the public from biological pollution which may be present in the shallow aquifers from pollution sources such as septic tanks at a time when use of the shallow aquifer as drinking

water supply is not yet necessary. The Ordinance is not intended to allow the degradation of the shallow groundwater zones.

The regulatory frame work associated with the cleanup of groundwater at the site is driven by the beneficial (current or potential) use of local groundwater. As stated in 40 CFR 300.430(a)(ii)(F), "The goal of EPA's Superfund approach is to return usable ground waters to their beneficial uses wherever practicable within a timeframe that is reasonable given the particular circumstances of the site". Drinking water is considered to be the highest beneficial use and affords the greatest level of protection and cleanup.

The Regional Board's Basin Plan classifies the shallow ground water in the area of SC3 as "potentially suitable for municipal or domestic water supply". EPA has consistently upheld this policy in the South Bay. Therefore, drinking water standards are applicable as remediation goals for the A-aquifer zone.

Additionally, this Regional Board has incorporated the SWRCB 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. As described in Section 4.1., based on data submitted by Intel, these two exceptions do not apply to the A zone at SC3.

Recommendation: Based on the above discussion, the A zone at SC3 is, in fact, a potential source of drinking water. Therefore, cleanup standards contained in the RAP must be based on drinking water standards.

7.2 The Selected Remedy.

Intel's Position: Intel's recommended remedy consists of a deed restriction, groundwater monitoring, and keeping the existing extraction system in stand-by mode with some pulsed pumping.

Regional Board staff's Position: Intel's selected remedy is predicated on the assumption that drinking water standards do not apply to the A zone. As discussed in Section 7.1, Board staff disagrees with this assumption. As such, Alternative 3 would not necessarily attain cleanup standards. In addition, based on conclusions in the FS that Alternative 4 could potentially achieve long-term effectiveness and permanence and reduction of toxicity, mobility and/or volume of VOCs in the shortest time, Board staff believes that Alternative 4 is a more appropriate remedy than Alternative 3 for the site. Alternative 4 consists of a deed restriction, continued ground water monitoring, pumping from existing extraction wells and one additional well, and treatment with an expanded granular activated carbon system.

Recommendation: The proposed plan must be modified to include Alternative 4 in the selected remedy. As discussed in Section 6.1, Board staff also recommends that the selected remedy include a task requiring Intel to submit a proposal to evaluate pulsed pumping as a demonstration project at the site.

7.3 Asymptotic Levels

Intel's Position: Throughout the RI/FS, reference is made to the claim that the concentrations of most VOCs in the wells are at or approaching asymptotic levels. While the concentrations of most VOC's in most wells have decreased since the initiation of extraction, Intel contends that little additional decrease is likely.

Regional Board's Position: Based on information submitted by Intel, asymptotic levels are predicted in the RI/FS for the following wells:

100 ppb TCE for well SC3-E2,
30 ppb TCE for well SC3-1,
15 ppb TCE for well SC3-E1,
5 ppb TCE for well SC3-3.

The Regional Board's Technical Assistance contractor, Camp Dresser, McKee (CDM), evaluated Intel's hypothesis of asymptotic levels in a report dated October 5, 1989. CDM's report states that with the exception of well SC3-3, these values are considerably higher than the asymptotic values observed at a nearby site. Asymptotic values of 2 to 6 ppb were observed at the Stanford/Moffett NAS Field Site (Semprini, L., P.V. Roberts, G.D. Hopkins, and D.M. MacKay, 1987, A Field Evaluation of In-Situ Biodegradation Methodologies for the Restoration of Aquifers Contaminated with Chlorinated Aliphatic Compounds, Stanford Tech. Report No. 302).

On the other hand, Board staff recognize that the two sites also have significant differences. Major differences between the Stanford/Moffett NAS Field Site (NAS) and the SC3 site are 1) the aquifer material at the NAS site is more coarse grained, 2) the initial concentration of the TCE was lower at the NAS site, and 3) the time between the TCE release and cleanup was shorter at the NAS site.

However, as shown on Figures 6 and 7, asymptotic levels do not appear to have been conclusively reached in all wells at SC3. With the installation of an additional extraction well and pulsed pumping, TCE levels are likely to decrease.

Recommendation: Additional extraction wells need to be installed to evaluate whether or not asymptotic levels truly have been reached. The RAP includes tasks which require Intel to: 1) continue groundwater extraction until drinking water quality is achieved, if feasible, or, as long as significant quantities of chemicals are being removed, 2) install additional extraction well(s), and 3) modify the existing extraction well lay-out if reductions in removal efficiencies continue.

Furthermore, the demonstration project to evaluate pulsed pumping, described in Section 6.1, may produce additional reductions of pollutant concentrations in the groundwater.

If drinking water quality cannot be achieved at SC3, Intel would need to demonstrate to the satisfaction of the Regional Board that the conditions for waiving an ARAR are met (e.g., that meeting the ARAR is technically impracticable from an

engineering perspective) and that the alternative proposed will be protective of human health and the environment. The RAP would then need to be modified by the Regional Board and approved by EPA to allow a less stringent groundwater cleanup level.

8.0 CONCLUSION

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 of 10^{-4} to 10^{-6}. In addition, the remedy at least attains the requirements of all ARARs, including Federal and State MCLs and State Drinking Water Action Levels.

Furthermore, the technologies forming the selected remedy - pumping, and treating with GAC - are cost effective technologies. The selected remedy will permanently and significantly reduce the toxicity, mobility, and volume of hazardous substances with respect to their presence in groundwater.

Pollution is controlled and removed from the groundwater, thereby reducing the potential threat to the nearby public water supply wells and also restoring the aquifers to meet drinking water standards.

9.0 RECOMMENDATION

Staff recommends that the Board adopt the remedial action plan contained in the Tentative Order. The Tentative Order approves the RI/FS submitted February 18, 1990 as modified by the Addendum, this staff report, and the Tentative Order.

Concur with revision: /s/ Bruce H. Wolfe

Bruce H. Wolfe, Section Leader

Concur with revision:

Stephen I. Morse, Division Chief

Attachments:

Figure 1	Site Location Map - Intel Santa Clara 3.
Figure 2	Site Map of Intel Santa Clara 3 (showing distribution of TCE in the A Water-Bearing Zone, August 16, 1989).
Figure 3	Representative Log for Intel Santa Clara 3 (Boring Log for Monitoring Well SC3-5B).
Figure 4	Potentiometric Surface of the A Water-Bearing Zone Without Pumping, 8 June, 1988 - Intel Santa Clara 3.
Figure 5	Potentiometric Surface of the A Water-Bearing Zone with pumping - Intel Santa Clara 3 - August 16, 1989.
Figure 6	Concentration of TCE vs. Time in Monitoring Well SC3-1 and Extraction Wells SC3-E1 and E2.
Figure 7	Concentration of TCE vs. Time in Monitoring Well SC3-7A.
Figure 8	Idealized effect of pulse pumping over time.
Table 1	Federal and State drinking water standards.
Table 2	Remedial Technology Screening: Groundwater, Intel SC3, Feasibility Study.
Table 3	The Cancer Risk and Hazard Index Associated With the Groundwater Cleanup Standards.
Appendix A:	Index To the Administrative Record (available upon request).
Appendix B:	Assumptions Used To Calculate Hazard Index and Carcinogenic Risk.
Appendix C:	Agency Addendum for the RI/FS Report.
Appendix D:	Responsiveness Summary

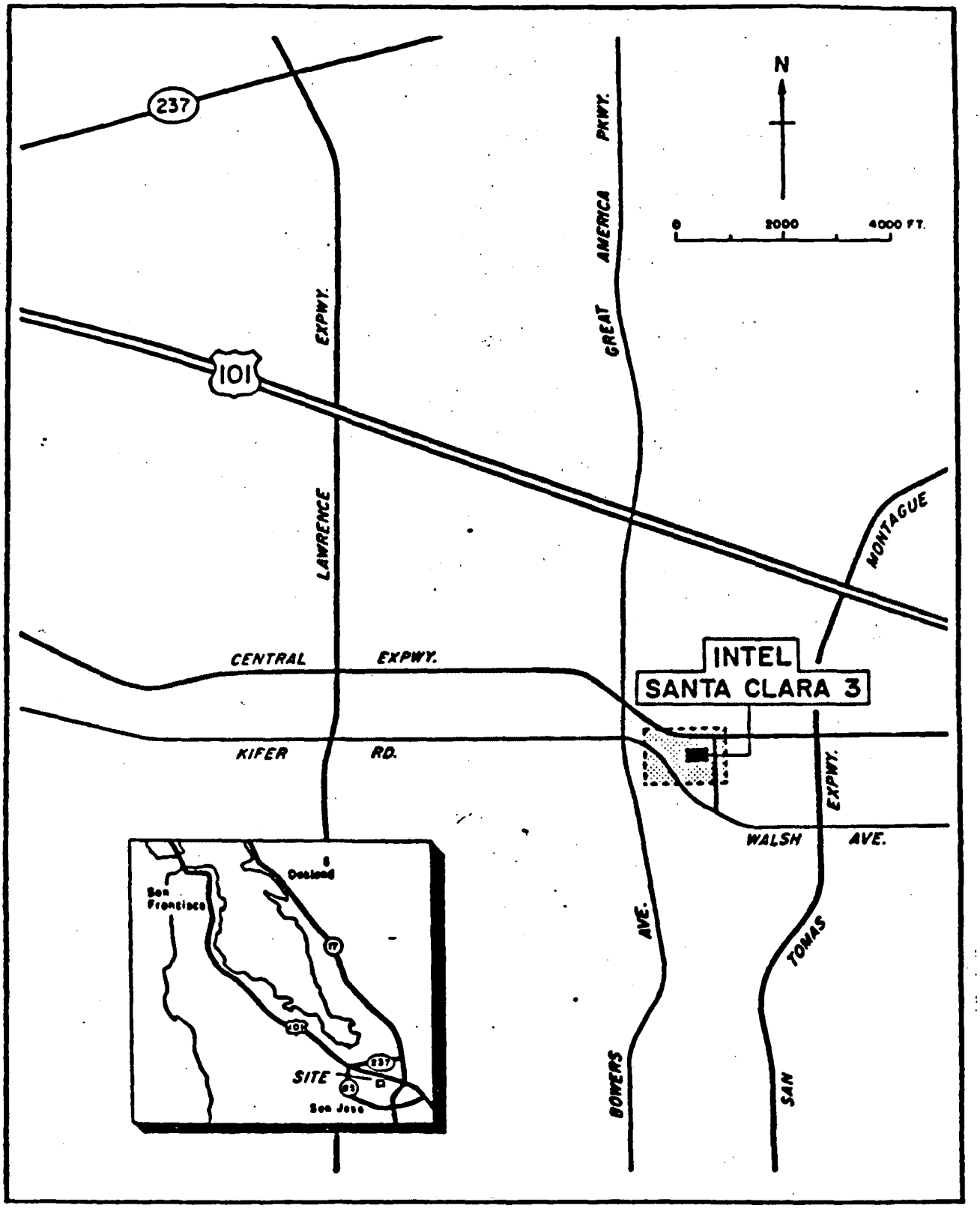


Figure 1. Site Location Map - Intel Santa Clara 3

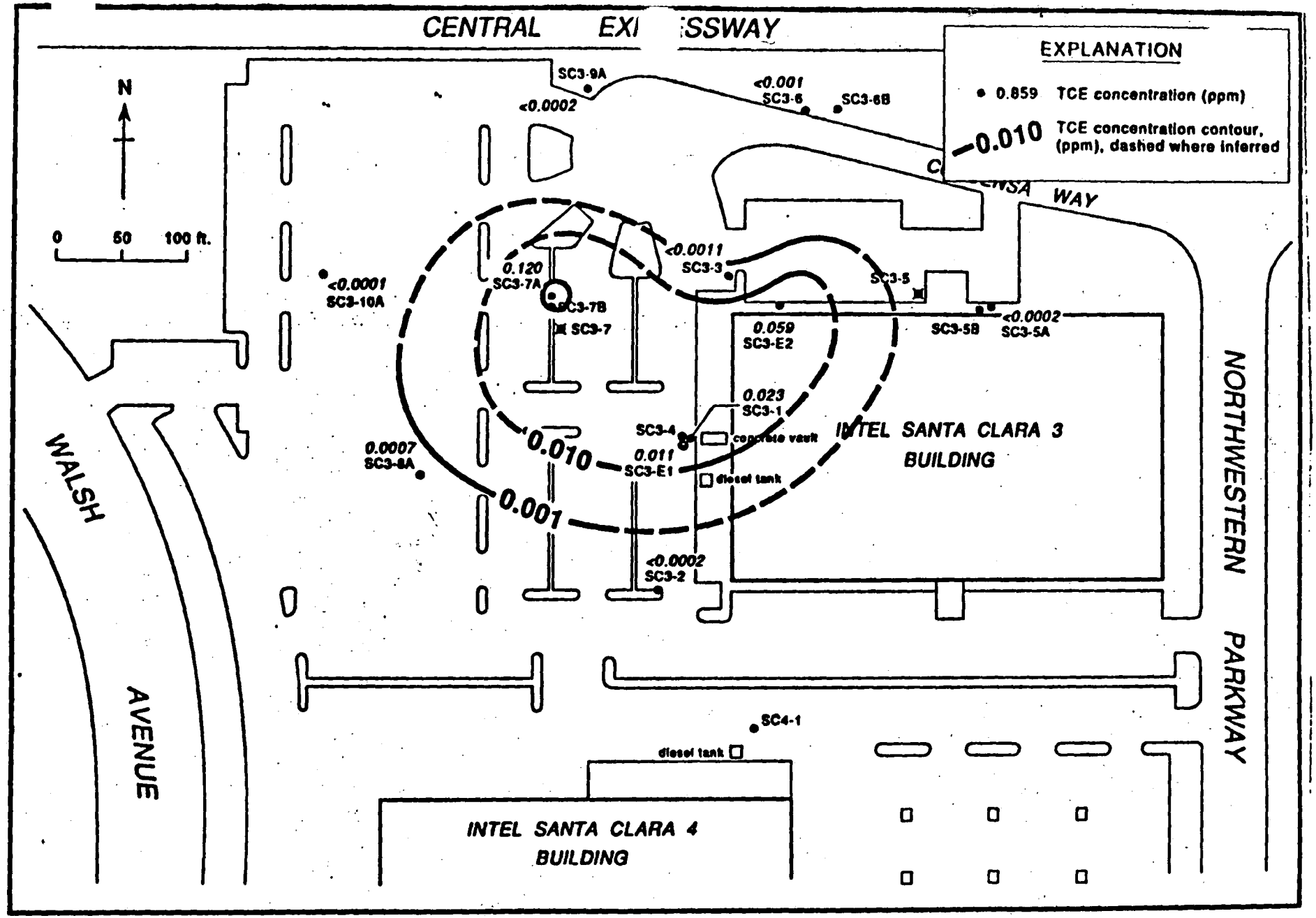


Figure 2. Site Map of Intel Santa Clara 3 (showing distribution of TCE in the A Water-Bearing Zone, August 16, 1989)

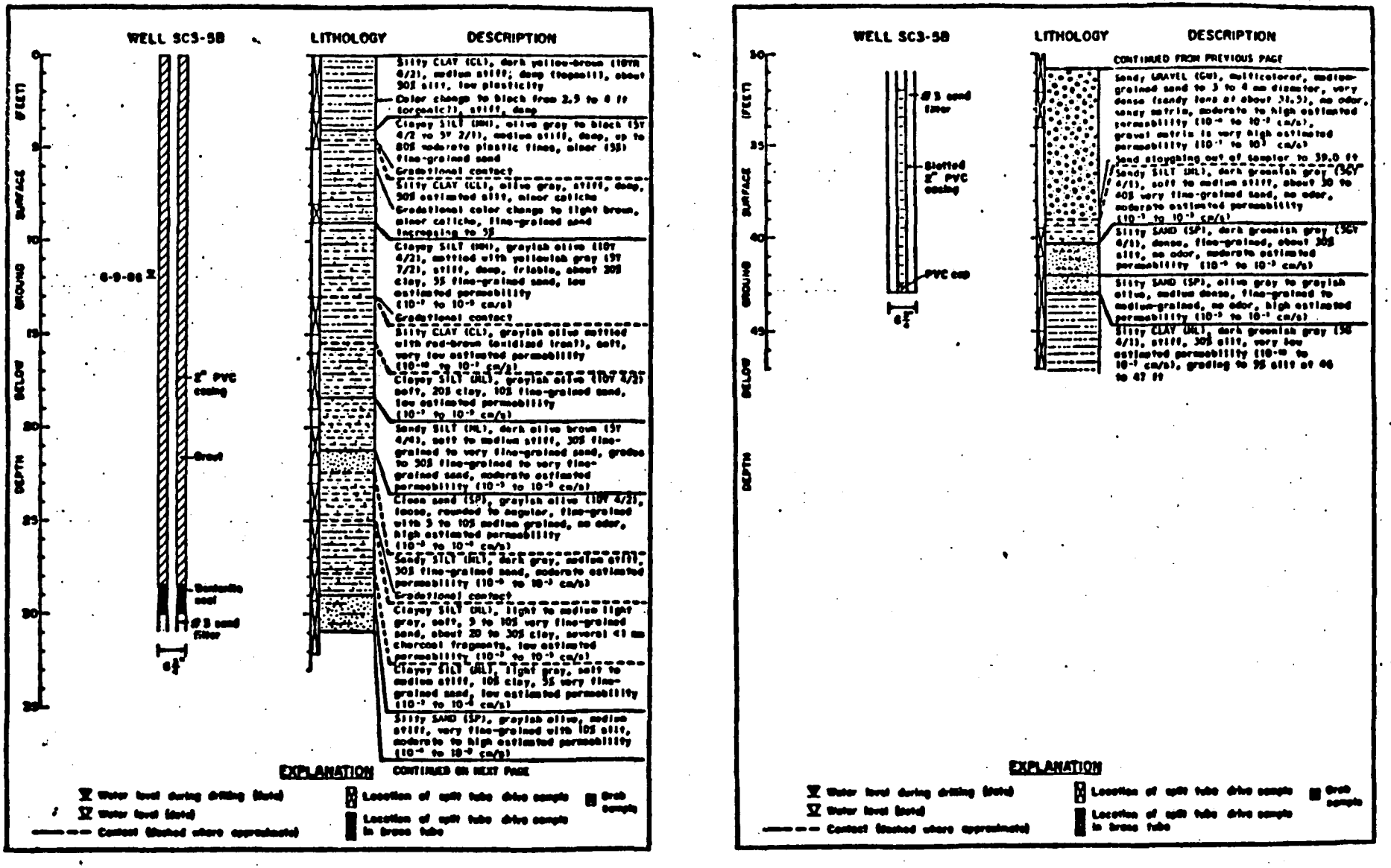


Figure 3. Representative Log for Intel Santa Clara 3 (Boring Log for Monitoring Well SC3-5B)

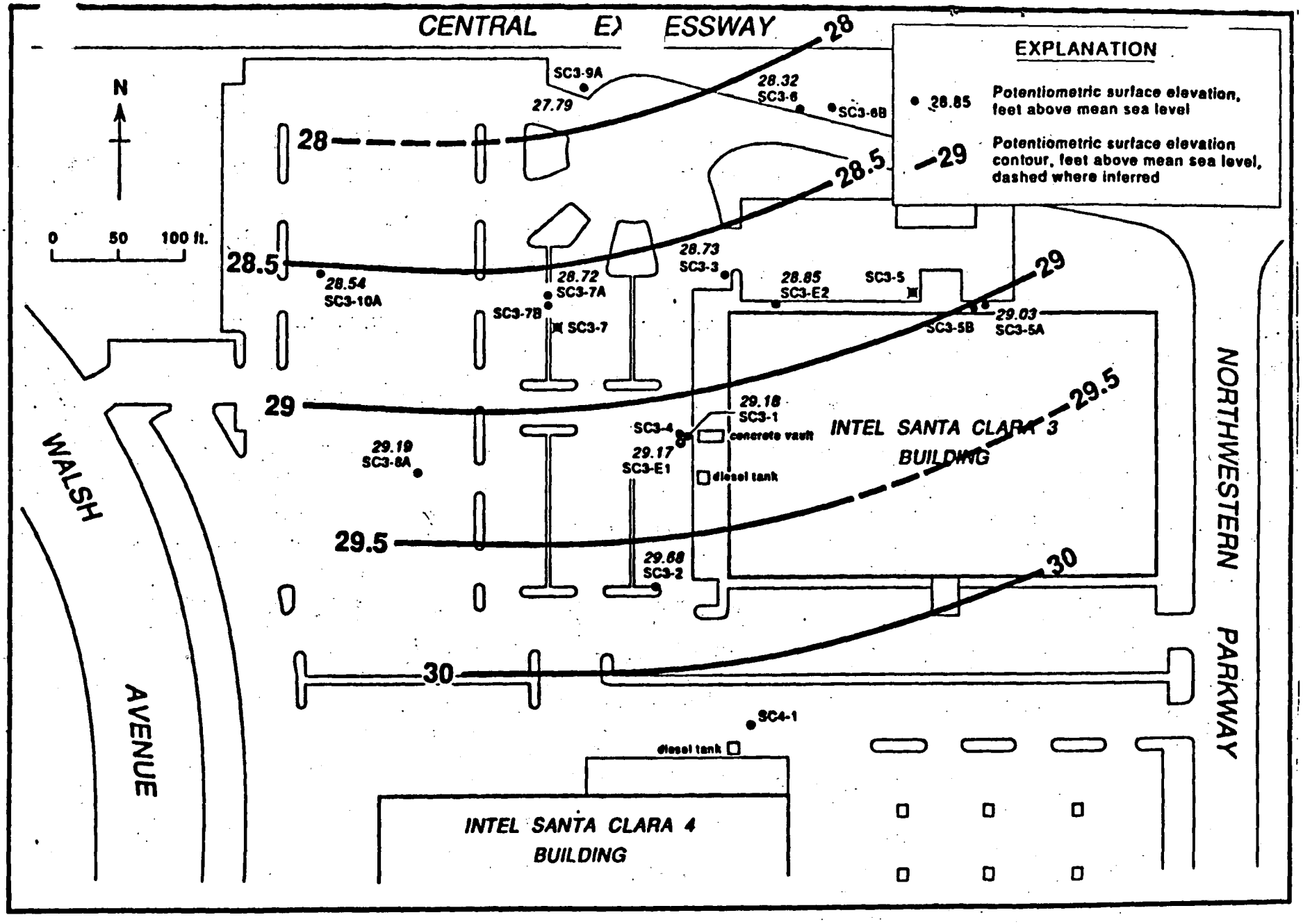


Figure 4. Potentiometric Surface of the A Water-Bearing Zone Without Pumping, June 8, 1988 - Intel Santa Clara 3

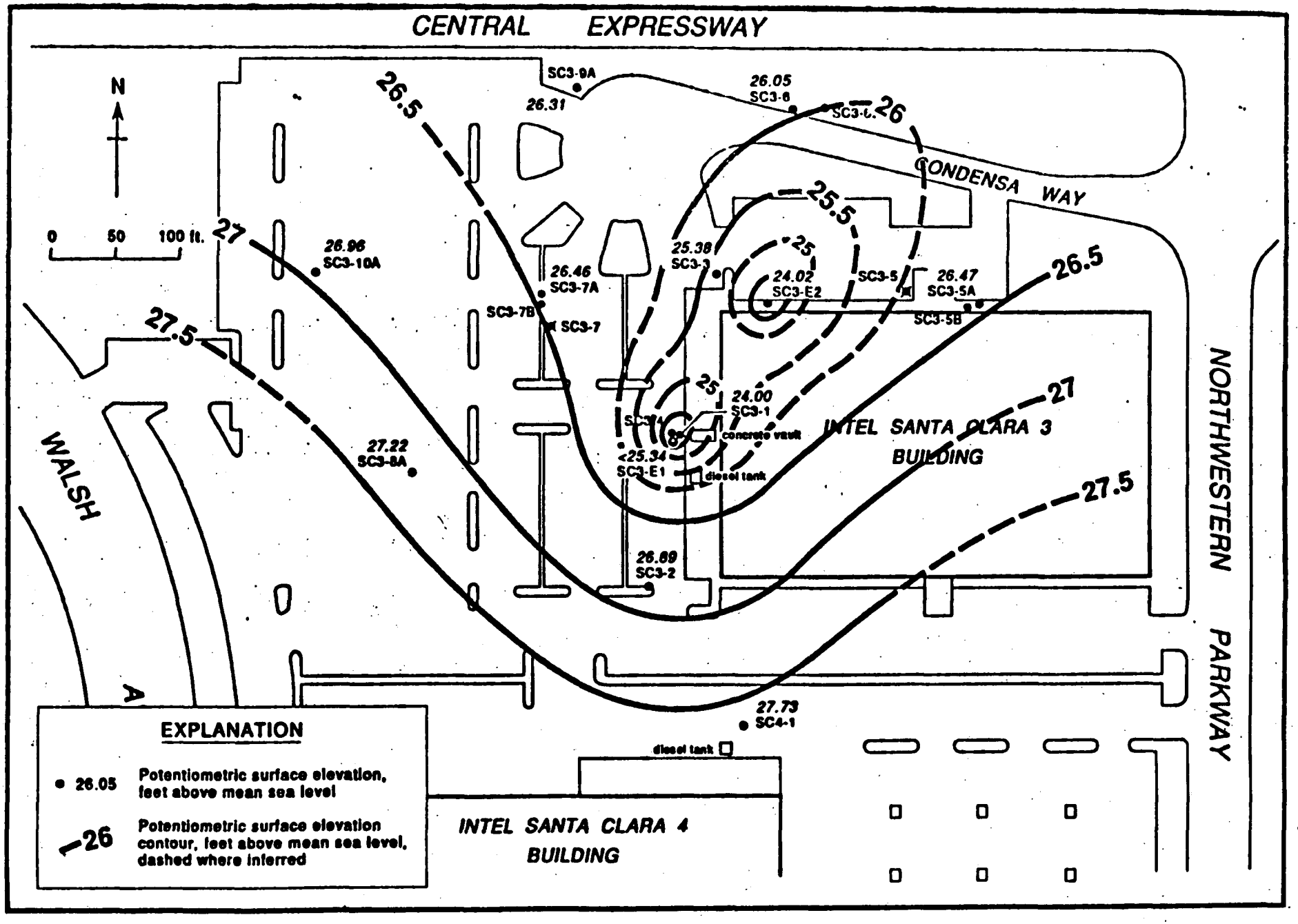
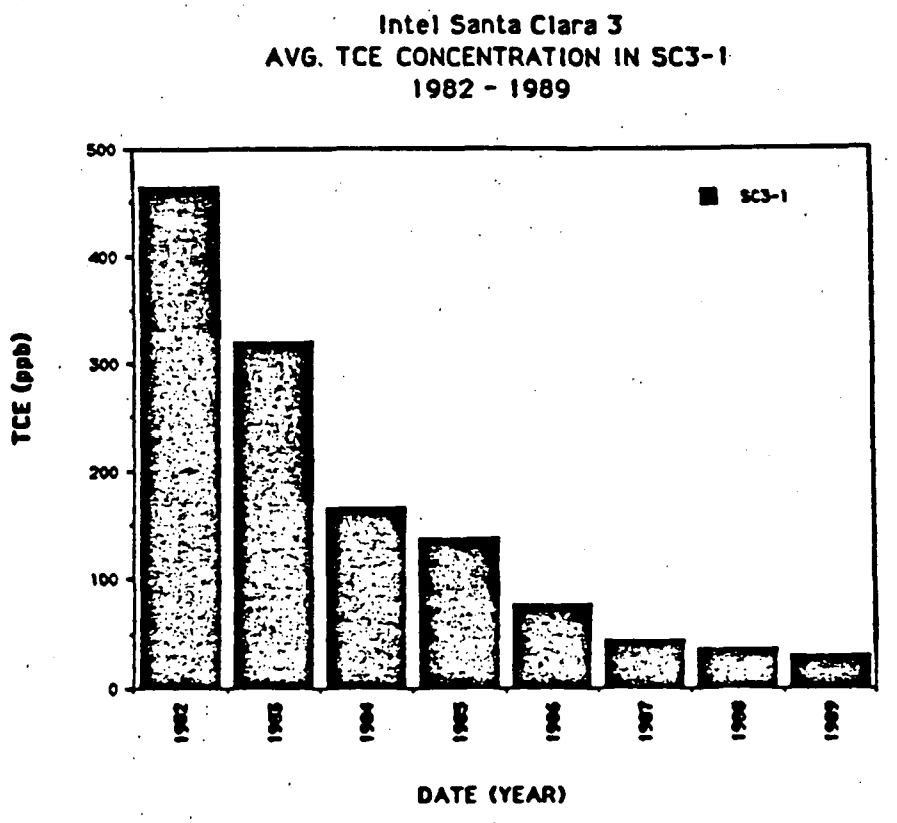


Figure 5. Potentiometric Surface of the A Water-Bearing Zone with Pumping - Intel Santa Clara 3 - August 16, 1989



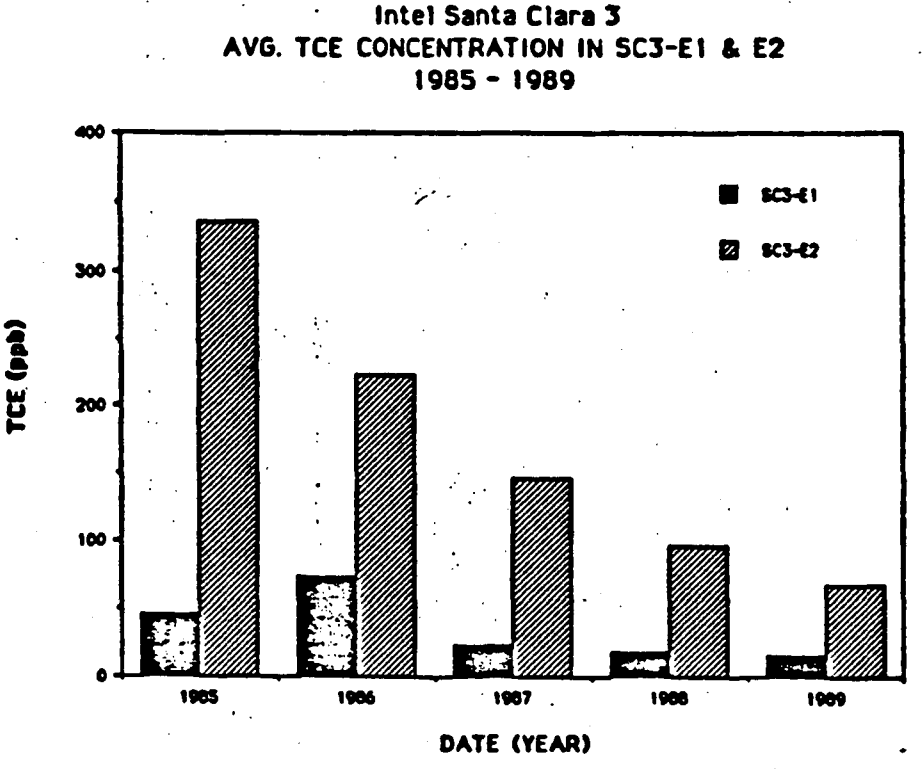


Figure 6 Concentration of TCE vs. Time in Monitoring Well SC3-1 and Extraction Wells SC3-E1 and E2.

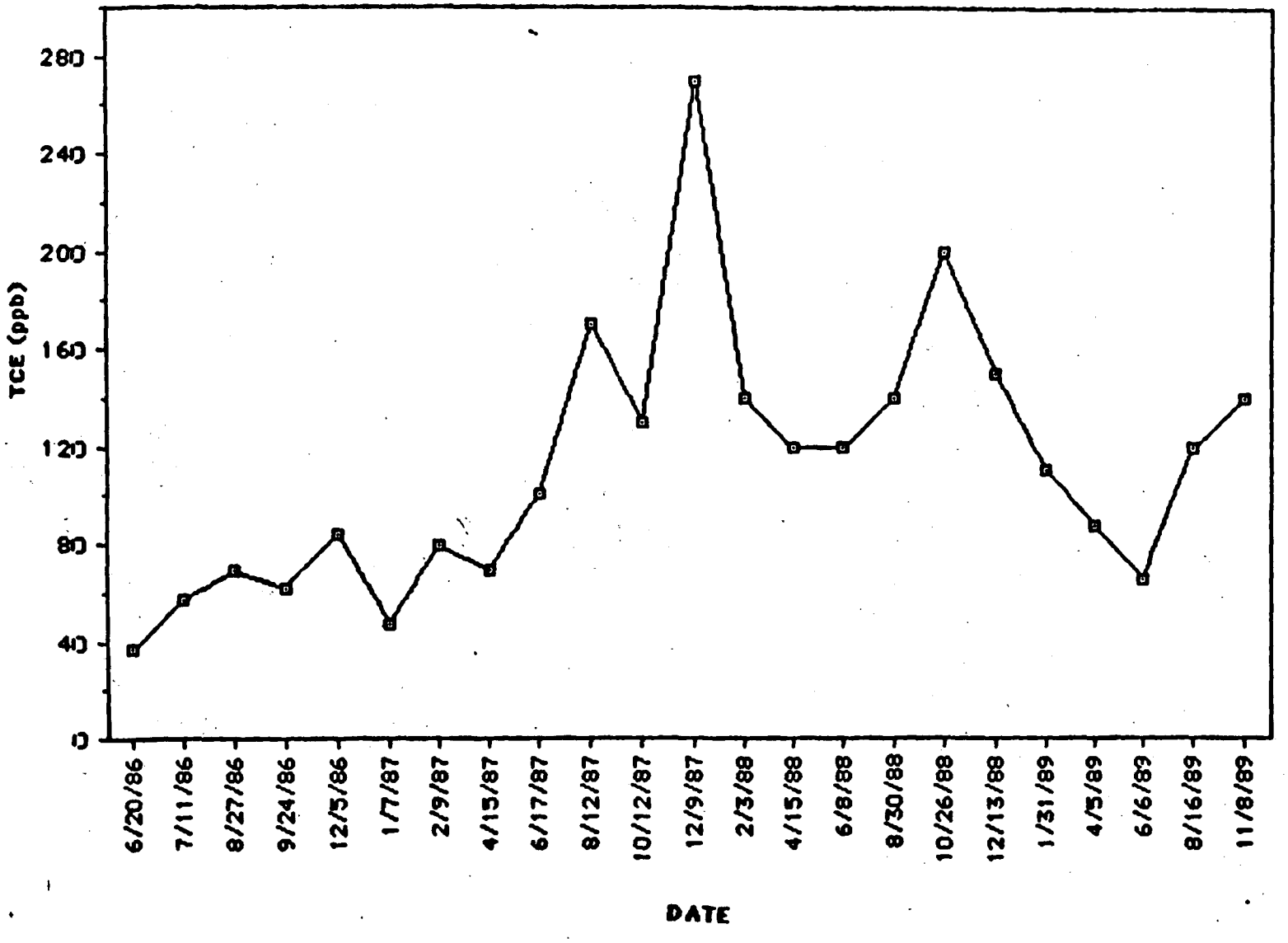


Figure 7. Concentration of TCE vs. Time Detected in Monitoring Well SC3-7A

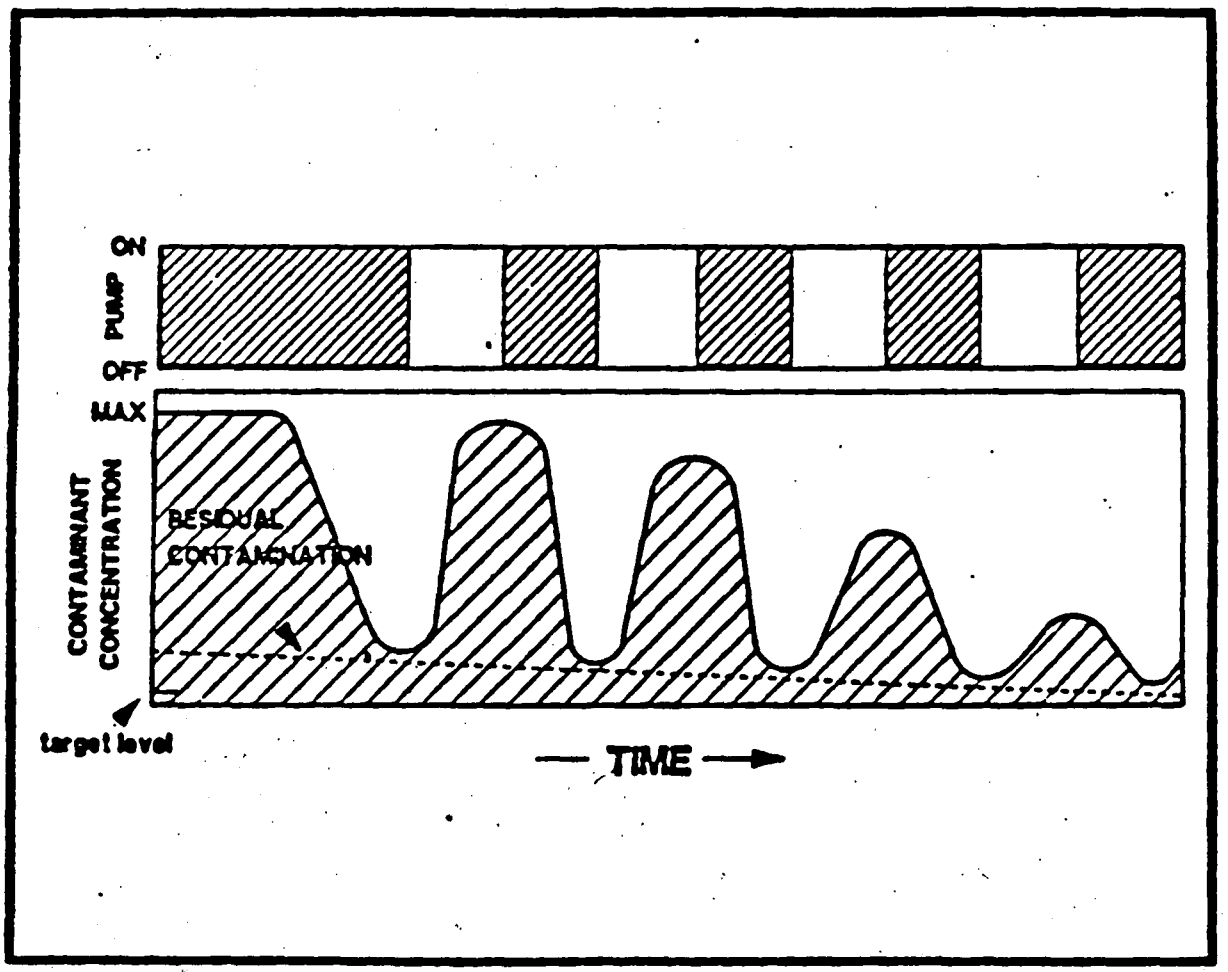


Figure 8. Idealized effect of pulsed pumping over time. (From: Keely, J.F., 1989, Performance Evaluations of Pump and Treat Remediations USEPA 540/4-89/005)

TABLE 1

STATE AND FEDERAL DRINKING WATER STANDARDS

INTEL SANTA CLARA 3

Chemical	Federal Maximum Contaminant Levels (MCLs) (ug/L)	CA State MCLs (ug/L)	CA State Drinking Water Action Levels (ug/L)
1,1-dichloroethane (1,1-DCA)	-	proposed: 5.0	5.0
1,2-dichloroetane (1,2-DCA)	-	proposed: 0.5	1.0
1,1-dichloroethene (1,1-DCE)	7.0	6.0	-
cis 1,2-dichloroethene (cis 1,2-DCE)	-	proposed: 6.0	6.0
trans 1,2-dichloroethene (trans 1,2-DCE)	-	proposed: 10.0	10.0
Freon-11	-	proposed: 150.0	150.0
Freon-113	-	proposed: 1200.0	1200.0
1,1,1-trichloroethane (1,1,1-TCA)	200.0	200.0	-
trichloroethene (TCE)	5.0	5.0	-

"-" implies no criteria

Ground Water General Response Action	Remedial Technology	Process Option	Description	Screening Comments
No Action	None	Not Applicable	No Action	Required by NCP to establish baseline for comparison purposes
Institutional Actions	Legal Controls	Deed Restrictions	Deed modifications to restrict development/ resource use at SC3	Potentially applicable
	Monitoring	Ground water monitoring	On-going ground water quality and level monitoring. May incorporate use of existing wells	Potentially applicable
Access Restrictions	Physical Control	Fences	Perimeter fence around SC3 treatment system to restrict access	Not needed based on PRE.
Pumping	Extraction	Recovery Wells	Installation of wells for extraction of ground water	Potentially applicable
		Subsurface Drains	Installation of a collection trench for recovery of ground water	Not applicable; geologic conditions favor wells instead of drains
On-Site Treatment	Biological	Aerobic	Degradation of organics using micro-organisms in an oxygenated environment	Not applicable; has not been shown to be technically achievable for the VOCs at the site, especially at these very low concentrations.
	Physical Treatment	Air Stripping	Mass transfer of volatile constituents from water to air	Potentially applicable for removing the VOCs detected at the site
		Carbon Adsorption	Removal of constituents from water by adsorption onto carbon	Potentially applicable for removing the VOCs detected at the site. Currently in use and effective.
		Steam Stripping	Separation of volatile components from a liquid mixture via direct contact of the mixture with steam and separate recovery of the vapors from the residue.	Potentially applicable for removing the VOCs detected at the site.
		Reverse Osmosis	Separation of solutes from a solvent via application of a pressure gradient across a semi-permeable membrane	Not applicable; very limited for organic constituents

Table 2. Remedial Technology Screening: Groundwater, Intel Santa Clara 3 Feasibility Study

Ground Water General Response Action	Remedial Technology	Process Option	Description	Screening Comments
On-Site Treatment (continued)	Physical Treatment (continued)	Distillation	Components of a liquid mixture are separated by partially vaporizing the mixture through the indirect addition of heat and separately recovering the vapors from the residue.	Potentially applicable
		Liquid/Liquid Extraction	The separation of components in a liquid mixture by contacting the mixture with a liquid solvent that has a selective affinity for one or more of the components	Not applicable based on the limited availability of environmentally acceptable solvents.
		Evaporation	Separation of dissolved solids from water by forced vaporization of the water through the indirect addition of heat	Not applicable for solutes with volatilities greater than or equal to that of the solvent, such as constituents detected in ground water beneath SC3.
		Filtration	Physical separation of suspended particles from a liquid via flow across a porous medium	Not applicable for organics
	Chemical Treatment	Precipitation, Flocculation and Sedimentation	Chemical reaction which decreases a constituent's solubility generating a precipitate that gravity settles.	Not applicable for the organics detected at the site
		Neutralization	Chemical adjustment of pH	Not applicable; has no effect on VOCs.
		Oxidation/ Reduction	A chemical reaction which transfers electrons from compounds which subsequently alters the characteristics of those compounds	Potentially applicable
		Dechlorination	Dechlorination is the addition of an oxidant to chemically cleave chlorine molecules from aqueous contaminants.	Not feasible for the destruction of aqueous chlorinated organics detected at the site
	In-Situ Treatment	Bioreclamation	Injection of nutrients and/or micro-organisms in subsurface to enhance biological degradation	Technology not sufficiently developed to produce predictable non-toxic products within time frames of other applicable technologies

Table 2. - continued -

Ground Water General Response Action	Remedial Technology	Process Option	Description	Screening Comments
Discharge	On-Site Discharge	Injection Wells	Reinject treated ground water into the water-bearing zone	Potentially applicable
	Off-Site Discharge	Surface Water	Discharge treated ground water to permitted NPDES outfall	Potentially applicable; currently in use
		POTW	Discharge to municipal sanitary sewer	May not be feasible based on reported communications with POTW

Table 2. continued

TABLE 3

INTEL SANTA CLARA 3
DETERMINATION OF EXCESS LIFETIME
CARCINOGENS RISK BASED ON CLEAN UP STANDARD

CW = Clean Up Standard
CPF = Cancer Potency factor (mg/kg/day)-1
CDI = Chronic Daily Intake (mg/kg/day) = Cw x 0.011
Risk = CDI x CPF

Chemical	Cw	CDI	CPF (ORAL)	ORAL RISK	CPF (INHAL)	INHAL RISK	RSIK (ORAL + INHAL)
1,1-DCA	0.005	5.50E-05	0.091	5.01E-06	* 0.091	5.01E-06	1.00E-05
1,2-DCA	0.0005	5.50E-06	0.091	5.01E-07	* 0.091	5.01E-07	1.00E-06
TCE	0.005	5.50E-05	0.011	6.05E-07	0.017	9.35E-07	1.54E-06
					Total Carcinogens Risk =		1.26E-05

* Oral CPF, no inhal CPF available.

TABLE 3 (Continued)

INTEL SANTA CLARA 3
DETERMINATION OF TOTAL HAZARD INDEX
FOR NON-CARCINOGENS BASED ON CLEANUP STANDARD

Cw = Clean Up Standard
RfD = Reference Dose (mg/kg/day)
CDI = Chronic Daily Intake (mg/kg/day) = Cw x 0.029
HI = Hazard Index = CDI/RfD

CHEMICAL	Cw	CDI	RfD(ORAL)	ORAL HI	RfD(INHAL)	INHAL HI	HI(ORAL + INHAL)
1,1-DCA	0.005	1.45E-04	1.00E-01	1.45E-03	0.100	1.5E-03	2.90E-03
cis1,2-DCE	0.006	1.74E-04	1.00E-02	1.74E-02	N/A	N/A	1.74E-02
trans1,2-DCE	0.010	2.90E-04	2.00E-02	1.45E-02	N/A	N/A	1.45E-02
FREON 11	0.150	4.35E-03	3.00E-01	1.45E-02	0.200	0.022	3.63E-02
FREON 113	1.200	3.48E-02	3.00E+01	1.16E-03	N/A	N/A	1.16E-03
1,1,1-TCA	0.200	5.80E-03	8.60E-02	6.74E-02	0.300	0.019	8.68E-02
					Total Hazard Index =		1.59E-01

Note: Assumptions used to estimate CDI are presented in Appendix B.
CPF and Rfd from EPA's Integrated Risk Information System (IRIS).

N/A - Inhalation RfD not available

APPENDIX B

ASSUMPTIONS USED TO CALCULATE HAZARD INDEX AND CARCINOGENIC RISK ASSOCIATED WITH CLEANUP STANDARDS

Introduction

Assumptions and methods used to calculate the Hazard Index and Carcinogenic Risk associated with the cleanup standards are explained in this Appendix. These assumptions and methods are based on EPA guidance documents and generic aspects of Public Health Evaluations prepared by the Regional Board's contractor, ICF Clement.

Background

The ideal goal of groundwater cleanup is to restore the aquifer to its original pristine condition. However, it is technically impossible to remove every molecule of the chemical from the aquifer. Cleanup standards are therefore established with the knowledge that some residual chemical levels will remain in the aquifer, even after long term cleanup.

Chemicals in the groundwater are divided into: 1) known, possible, or probable cancer causing substances (carcinogens), and 2) toxins (noncarcinogens). The health risk associated with the cleanup standards for carcinogens is called the Carcinogenic Risk. The risk associated with cleanup standards for noncarcinogens is quantified using the Hazard Index.

Routes of Exposure

The probable route of exposure to the groundwater affected by SC3 would be by means of: 1) drinking the groundwater, and 2) inhalation of VOCs while showering. According to EPA Region IX guidance documents, the exposure due to inhalation while showering is considered to be equal to the exposure associated with the drinking water scenario.

Estimation of Chronic Daily Intake

To estimate the Carcinogenic Risk and Hazard Index associated with the cleanup standards, an estimation must first be made of the amount of chemicals that may be ingested if groundwater affected by SC3 were used as drinking water. The amount of the chemicals ingested is known as the chronic daily intake (CDI).

The estimated intakes of contaminants from ingestion of groundwater were calculated using the following equation:

ITK_s = (Cw) x (W) x (G) x (D)

where,

ITK_s = chemical intake from groundwater (mg/day),
Cw = cleanup goal (mg/liter),
W = daily water consumption (liters/day),
G = drinking water ingestion absorption factor, and
D = dietary fraction of water ingested at home.

and

CDI = $[(ITK_s)(D)(F)]/[(BW)(E)(365)]$

where,

CDI = average chronic daily intake via groundwater (mg/kg/day),
ITK_s = daily chemical intake via groundwater (mg/day),
D = duration of exposure (years),
F = frequency of exposure (days/year),
BW = body weight (kg),
E = extrapolation factor (years):
for noncarcinogens - 30 year period;
for carcinogens - 75 year lifetime, and
365 = conversion factor (days/year).

For all groundwater exposure scenarios, it was assumed that residents ingest groundwater on a daily basis for 30 years under plausible maximum conditions. The exposure period used in this scenario corresponds to the 90th percentile for length of residence in a U.S. house. Residents are assumed to consume 2 liters of water per day under maximum plausible conditions. Residents are assumed to obtain 100% of their drinking water at home. Subsequent absorption of the chemicals from the groundwater into the gut is assumed to be 100%.

ASSUMPTIONS FOR USE IN RISK ASSESSMENT FOR GROUNDWATER CLEANUP STANDARDS

PARAMETER	PLAUSIBLE MAXIMUM EXPOSURE
Quantity of Water Ingested (W)	2 liter/day
Diet Fraction (D)	1.0
Absorption from Water (G)	100 percent
Frequency of Exposure (F)	365 days/year
Duration of Exposure (D)	30 years
Body Weight (BW)	70 kg
Average Lifetime	75 years

Calculation of Carcinogenic Risk Based on Cleanup Standards

Carcinogenic Risk is defined as the product of the chronic daily intake (CDI) multiplied by the cancer potency factor (CPF). The CDI is estimated using the above assumptions. The CPF for both the oral and inhalation exposure routes are obtained from EPA's Integrated Risk Information System (IRIS).

In general, CPF's based on animal data represent the 95-percent upper-confidence limit values based on a linearized-multistage model. Thus, the actual risks associated with exposure to a potential carcinogen quantitatively evaluated based on animal data are not likely to exceed the risks estimated using these cancer potency factors. However, they may be lower.

The Regional Board and EPA consider that for a remedial action of a drinking water source to be protective, it should have a Carcinogenic Risk that falls within a range of one-in-a-million (10^{-6}) to one-in-ten-thousand (10^{-4}) individual lifetime excess cancers that may develop in a population.

An estimations of the Carcinogenic Risk associated with the cleanup standards presented in Section 6.3 is shown on Table 3. Potential carcinogens detected at SC3 are 1,1 DCA, 1,2-DCA, 1,1-DCE, and TCE. As discussed in Section 6.4, 1,1-DCE was not included in this calculation. The Carcinogenic Risk associated with the cleanup standards for 1,1 DCA, 1,2-DCA, and TCE is 1.3×10^{-5}.

Calculation of the Hazard Index Based on Cleanup Standards

Potential risks are assessed for noncarcinogens by taking the ratio of the chronic daily intake (CDI) to the reference dose (RfD). The CDI is estimated using the above assumptions. The RfD for both the oral and inhalation exposure routes are obtained from EPA's Integrated Risk Information System (IRIS).

Toxic effects of noncarcinogenic chemicals are initially assumed to be additive, in accordance with EPA guidance on health risk assessment of complex mixtures. For each scenario, the CDI:RfD ratios for each individual chemical are summed to produce a Hazard Index for total toxic risks. If the Hazard Index is less than one, the combined intake of chemicals by the exposure route under consideration is unlikely to pose a health risk.

An estimation of the Hazard Index associated with the cleanup standards presented in Section 6.3 is shown on Table 3. Toxic non-carcinogens detected at SC3 are 1,1-DCA, cis 1,2-DCE, trans 1,2-DCE, Freon 113, Freon 11, and 1,1,1 TCA. The Hazard Index associated with the cleanup standards for these chemicals is 0.2.

Thus, Board staff concludes that the Cleanup Standards for the site are protective of human health, have a Carcinogenic Risk that falls within a range of 10^{-6} to 10^{-4}, and a Hazard Index of less than one.

APPENDIX C

ATTACHMENT TO THE STAFF REPORT

AGENCY ADDENDUM FOR

REMEDIAL INVESTIGATION / FEASIBILITY STUDY
INTEL SANTA CLARA 3 FACILITY

Intel submitted a revised Remedial Investigation / Feasibility Study, dated February 16, 1990. The report contains the results of the subsurface investigation, a description of the groundwater pollution, and an evaluation of the interim cleanup actions, remedial alternatives, and groundwater conservation measures. Regional Board staff have determined that the technical information contained in the RI/FS is acceptable for developing a final cleanup plan; however, Regional Board and other agency staff do not accept all interpretations and recommendations contained in the RI/FS.

In making this determination, staff disagreed with the portions of the RI/FS addressing: 1) Applicable or Relevant and Appropriate Requirements, 2) Asymptotic Levels, and 3) The Selected Remedy. As part of the Regional Board's comments on the September, 1989 draft RI/FS, Intel was informed of these three areas of disagreement. In revising the RI/FS, Intel did not address these three areas.

Board staff, therefore, recommends that these issues be resolved in this agency addendum to the RI/FS and in the RAP, rather than in another revised version of the Remedial Investigation / Feasibility Study (RI/FS).

I. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS.

Cleanup at a Superfund site must comply with legally applicable or relevant and appropriate requirements (ARARs). Regional Board, EPA, and Santa Clara Valley Water District (SCVWD) staff disagree with several of Intel's conclusions regarding ARARs. ARARs for the site consist of the ARARs identified on pages 110-112 of Intel's RI/FS with the following modifications.

A. Groundwater as a potential Source of Drinking Water. The RI/FS states that "While the A-aquifer potentially satisfies EPA and RWQCB criteria as a potential drinking water supply, the SCVWD, which is the controlling agency, does not allow the use of the A-aquifer as a water supply source (Ordinance 85-01). The A zone can only be used for monitoring wells . Since the shallow ground water (A zone) will not be used for drinking, drinking water standards are not applicable as remediation goals".

The SCVWD's Ordinance 85-1 requires a minimum 50 feet sanitary seal in all drinking water wells. However, this requirement is primarily intended to protect the public from biological pollution which may be present in the shallow aquifers from pollution sources such as septic tanks at a time when

use of the shallow aquifer as drinking water supply is not yet necessary. The Ordinance is not intended to allow the degradation of the shallow groundwater zones.

The regulatory frame work associated with the cleanup of groundwater at the site is driven by the beneficial (current or potential) use of local groundwater. The description of the revision to 40 CFR 300, contained on page 51433 of the Federal Register stated, "the goal of EPA's Superfund approach is to return usable groundwaters to their beneficial uses within a timeframe that is reasonable". Drinking water is considered to be the highest beneficial use and affords the greatest level of protection and cleanup. The Regional Board's Basin Plan as amended is an ARAR and classifies the shallow ground water in the area of SC3 as "potentially suitable for municipal or domestic water supply".

Thus, drinking water standards, and the Regional Board's Basin Plan as amended are ARARs.

B. State Board Resolution 68-16. Intel's opinion is that State Board Resolution 68-16 is not an ARAR because it has not been consistently applied. The Regional Board's position is that State Board Resolutions are legally enforceable ARARs.

II. ASYMPTOTIC LEVELS

Throughout the RI/FS, reference is made to the claim that the concentrations of most VOCs in most wells are at or approaching asymptotic levels. While the concentrations of most VOC's in most wells have decreased since the initiation of extraction, Intel contends that little additional decrease is likely.

Based on information submitted by Intel, asymptotic levels are predicted in the RI/FS for the following wells:

100 ppb TCE for well SC3-E2,
30 ppb TCE for well SC3-1,
15 ppb TCE for well SC3-E1,
5 ppb TCE for well SC3-3.

With the exception of well SC3-3, these values are considerably higher than the asymptotic values observed at a nearby site with similar geology. Asymptotic values of 2 to 6 ppb were observed at the Stanford/Moffett NAS Field Site (Semprini, L., P.V. Roberts, G.D. Hopkins, and D.M. MacKay, 1987, A Field Evaluation of In-Situ Biodegradation Methodologies for the Restoration of Aquifers Contaminated with Chlorinated Aliphatic Compounds, Stanford Tech. Report No. 302). Based on the this field test, Board staff concludes that asymptotic levels for TCE have not yet been reached at SC3. Furthermore, as shown on Figures 6 and 7 of the March 30, 1990 staff report (revised June 19, 1990), asymptotic levels do not appear to have been conclusively reached in all wells at SC3. With the installation of an additional

extraction well and pulsed pumping, TCE levels are likely to decrease.

Additional extraction wells need to be installed to evaluate whether or not asymptotic levels truly have been reached. The RAP includes tasks which require Intel to: 1) continue groundwater extraction until drinking water quality is achieved, if feasible, or, as long as significant quantities of chemicals are being removed, 2) install additional extraction well(s), and 3) modify the existing extraction well lay-out if reductions in removal efficiencies continue.

Moreover, the demonstration project to evaluate pulsed pumping, described in Section 6.1 of the March 30, 1990 staff report (revised June 19, 1990), may produce additional reductions of pollutant concentrations in the groundwater.

If drinking water quality cannot be achieved at SC3, Intel would need to demonstrate to the satisfaction of the Regional Board that the conditions for waiving an ARAR are met (e.g., that meeting the ARAR is technically impracticable from an engineering perspective) and that the alternative proposed will be protective of human health and the environment. The RAP would then need to be modified by the Regional Board and approved by EPA to allow a less stringent groundwater cleanup level.

III. THE SELECTED REMEDY

Intel's recommended remedy is Alternative 3 and consists of a deed restriction, groundwater monitoring, and keeping the existing extraction system in stand-by mode with some pulsed pumping.

Intel's selected remedy is predicated on the assumption that drinking water standards do not apply to the A zone. As discussed in Section I.A., the agency staff disagrees with this assumption. As such, Alternative 3 would not necessarily attain cleanup goals. In addition, based on conclusions in the FS that Alternative 4 could potentially achieve long-term effectiveness and permanence and reduction of toxicity, mobility and/or volume of VOCs in the shortest time, agency staff believes that Alternative 4 is a more appropriate remedy than Alternative 3 for the site. Alternative 4 consists of the following elements: a deed restriction, continued ground water monitoring, pumping from existing extraction wells and at least one additional well, and treatment with an expanded granular activated carbon system.

The proposed plan is hereby modified to substitute Alternative 4 as the selected remedy. Alternative 4 is further modified to require Intel to submit a proposal for a demonstration project. The demonstration project involves pulsed pumping from the extraction wells in conjunction with Alternative 4. Pulsed pumping implies the cycling of extraction wells on and off in active and resting phases.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, CA 94103

SELF-MONITORING PROGRAM FOR INTEL SANTA CLARA 3.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

INTEL CORPORATION
INTEL SANTA CLARA 3 FACILITY
2800 NORTHWESTERN PARKWAY
SANTA CLARA, SANTA CLARA COUNTY

GROUNDWATER SELF-MONITORING PROGRAM

A. GENERAL

Reporting responsibilities of waste dischargers are specified in Sections 13225(a), 13267(b), 13268, 13383, and 13387(b) of the California Water Code and this Regional Board's Resolution No. 73-16.

The principal purposes of a waste discharger's monitoring program, also referred to as a self-monitoring program, are: (1) To document compliance with site cleanup requirements and prohibitions established by this Regional Board, (2) To facilitate self-policing by the waste discharger in the prevention and abatement of pollution arising from waste discharge, (3) To develop or assist in the development of effluent or other limitations, discharger prohibitions, national standards of performance, pretreatment and toxicity standards, and other standards, and (4) To prepare water and wastewater quality inventories.

B. SAMPLING AND ANALYTICAL METHODS

Sample collection, storage, and analyses shall be performed according to the EPA Method 8000 series described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," dated November 1986; or other methods approved and specified by the Executive Officer of this Regional Board.

C. REPORTS TO BE FILED WITH THE REGIONAL BOARD

1. Violations or Potential Violations of Requirements

   a. The discharger shall file a written technical report at least 15 days prior to advertising for bid on any construction project which may potentially adversely effect the dischargers' soil and groundwater cleanup activities. All projects involving subsurface construction shall be reported.

   b. In the event the discharger is unable to comply with the conditions of the site cleanup requirements and prohibitions due to:

(1) maintenance work, power failures, or breakdown of waste treatment equipment, or

(2) accidents caused by human error or negligence, or

(3) other causes such as acts of nature, or

(4) poor operation or inadequate system design,

the waste discharger shall promptly accelerate the pertinent portions of the monitoring program to weekly or as required by the Regional Board's Executive Officer for those constituents which have been violated. Such analysis shall continue until such time as the discharger is back in compliance with the conditions and prohibitions of the site cleanup requirements, or until such time as the Executive Officer determines to be appropriate. The results of such monitoring shall be included in the regular Self-Monitoring Report.

2. Bypass Reports

Bypass reporting shall be an integral part of the regular monitoring program report. A report on bypassing of treatment units shall be made which will include cause, time and date, duration and estimated volume bypassed, method used in estimating volume, and persons and agencies notified. Notification to the Regional Board shall be made immediately by telephone (415-464-1255), followed by a written account within 15 days.

3. Self-Monitoring Reports

a. Reporting Period:

Written reports shall be filed regularly each quarter within thirty days from the end of the quarter monitored. The first quarterly report is due July 31, 1990.

b. Letter of Transmittal:

A letter transmitting self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period and actions taken or planned for correcting any requirement violation. If the dischargers have previously submitted a detailed time schedule for correcting requirement violations, a reference to this correspondence will be satisfactory. Monitoring reports and the letter

transmitting reports shall be signed by either a principal executive officer or his duly authorized employee. The letter shall contain a statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true and correct.

c. Data Results:

(1) Results from each required analysis and observation shall be submitted in the quarterly self-monitoring regular reports. Results shall also be submitted for any additional analyses performed by the discharger at the specific request of the Regional Board. Quarterly water level data shall also be submitted in the quarterly report.

(2) The quarterly report shall include a discussion of unexpected operational changes which could affect performance of the extraction system, such as flow fluctuations, maintenance shutdown, etc.

(3) The quarterly report shall also identify the analytical procedures used for analyses either directly in the report or by reference to a standard plan accepted by the Regional Board's Executive Officer. Any special methods shall be identified and shall have prior approval of the Executive Officer.

(4) Original lab results shall be retained and shall be made available for inspection for six years after origination or until after all continuing or impending legal or administrative actions are resolved.

(5) Maps shall accompany the quarterly report, showing sampling locations and pollutant plume contours.

(6) The dischargers shall describe in the quarterly monitoring report the effectiveness of the actions taken to regain compliance if compliance is not achieved. The effectiveness evaluation shall include the basis of determining the effectiveness, water surface elevations for each well used to determine water surface elevation contours and water quality data.

(7) The annual report shall be combined with the quarterly report submitted on January 31, of each year and shall include cumulative data for the current year for each parameter of the attached Table 2. The annual report shall also include minimum, maximum, median and average water quality data for the year. Water level data and GC/MS results shall be included in the annual report. The annual report shall also include contour maps for each chemical present above detectable concentrations.

d. Self-Monitoring Program (SMP) Revisions:

Additional long term or temporary changes in the sample collection frequency and routine chemical analysis may become warranted as monitoring needs change. These changes shall be based on the following criteria and shall be proposed in a quarterly report. The changes shall be implemented no earlier than 45 days after a self-monitoring report is submitted for review or not at all if the proposal is found to be unacceptable by the Regional Board's Executive Officer.

Criteria for SMP revisions:

(1) Discontinued analysis for a routine chemical parameter for a specific well after a one-year period of below detection limit values for that parameter.

(2) Changes in sampling frequency for a specific well after a one-year period of below detection limit values for all chemical parameters from that well.

(3) Temporary increases in sampling frequency or changes in requested chemical parameters for a well or group of wells because of a change in data needs (e.g., evaluating groundwater extraction effectiveness or other cleanup strategies).

(4) Add routine analysis for a chemical parameter if the parameter appears as an additional chromatographic peak in three consecutive samples from a particular well.

(5) Add routine chemical parameters for new wells based on the results of initial GC/MS analysis.

(6) Alter sampling frequency based on evaluation

of collective data base.

(7) Following a temporary increase in sampling frequency, as described in C.1, the regular sampling frequency will resume after 4 samples show stable or decreasing concentrations provided the sampling indicates compliance with the Site Cleanup Requirements.

D. DESCRIPTION OF GROUNDWATER SAMPLING STATIONS

Stations	Description
Listed in Table 1 and shown in Figure 1	All current and future monitoring and extraction wells.

E. SCHEDULE AND CONDITIONS OF SAMPLING AND ANALYSIS

The schedule and conditions of sampling and analysis shall be as given herein and as shown on Table 3:

1. Once every three months, while cleanup standards are being achieved, representative samples shall be collected for analyses from monitoring wells listed in Table 1 and as shown on Figure 1. All samples of one event shall be collected at approximately the same time.

2. For any new extraction or monitoring well that may be constructed, sampling and analysis shall be conducted on a quarterly schedule for a term to be decided by the Regional Board's Executive Officer but not less than one year. A GC/MS analysis shall be performed on each new well immediately after installation and well development and all peaks identified and reported on each well in the next quarterly report.

3. After cleanup standards have been achieved, samples shall be collected for analyses from all monitoring and extraction wells identified in E.1. above, quarterly (every three months) during the one-year stability period.

4. Following completion of the stability period, samples shall be collected for analyses from all identified wells shown on Table 3 , twice annually during the long-term monitoring period, as long as cleanup standards are not exceeded, or as shall be determined by the Regional Board's Executive Officer. The long term monitoring period shall not last for less than five years after the end of the one-year stability period. At the end of the long term monitoring period, specific wells will be identified for biannual post closure monitoring. At this

time the post closure monitoring period is expected to last approximately twenty-five years after the end of the long term monitoring.

5. If a previously undetected compound or peak is detected in a sample from a well, a second sample shall be taken within a week after the results from the first sample are available. All chromatographic peaks detected in two consecutive samples for purgeable halocarbons and/or volatile organics shall be identified and quantified in the quarterly report.

6. A GC/MS analysis shall be performed annually and all peaks identified and reported for all operating extraction wells and pits.

7. All chemical analyses shall have detection limits below the state action level for water for all constituents analyzed.

8. Groundwater elevations shall be obtained and reported on a quarterly basis from each monitoring and extraction well listed in Table 1. In addition, the depth of the pump in all extraction wells shall be obtained and submitted in the quarterly report with the sampling results.

9. Depths of wells in Table 1 shall be determined on an annual basis and compared to the depth of the well as constructed. The results of this comparison shall be reported in the annual report specified in 3.C.(1).

I, Steven R. Ritchie, Regional Board Executive Officer, hereby certify that the foregoing Self-Monitoring Program:

1. Has been developed in accordance with the procedure set forth in this Regional Board's Resolution No. 73-16 in order to obtain data to determine compliance with Regional Board Order No. 90-105.

2. Is effective on the date shown below.

3. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger and revisions will be ordered by the Executive Officer.

Effective Date: July 18, 1990

Steven R. Ritchie
Executive Officer

Attachments:
Table 1 - List of wells identified for the self monitoring program.
Table 2 - Final Cleanup Standards.
Table 3 - Monitoring Frequency.
Figure 1 - Facility map including well locations.

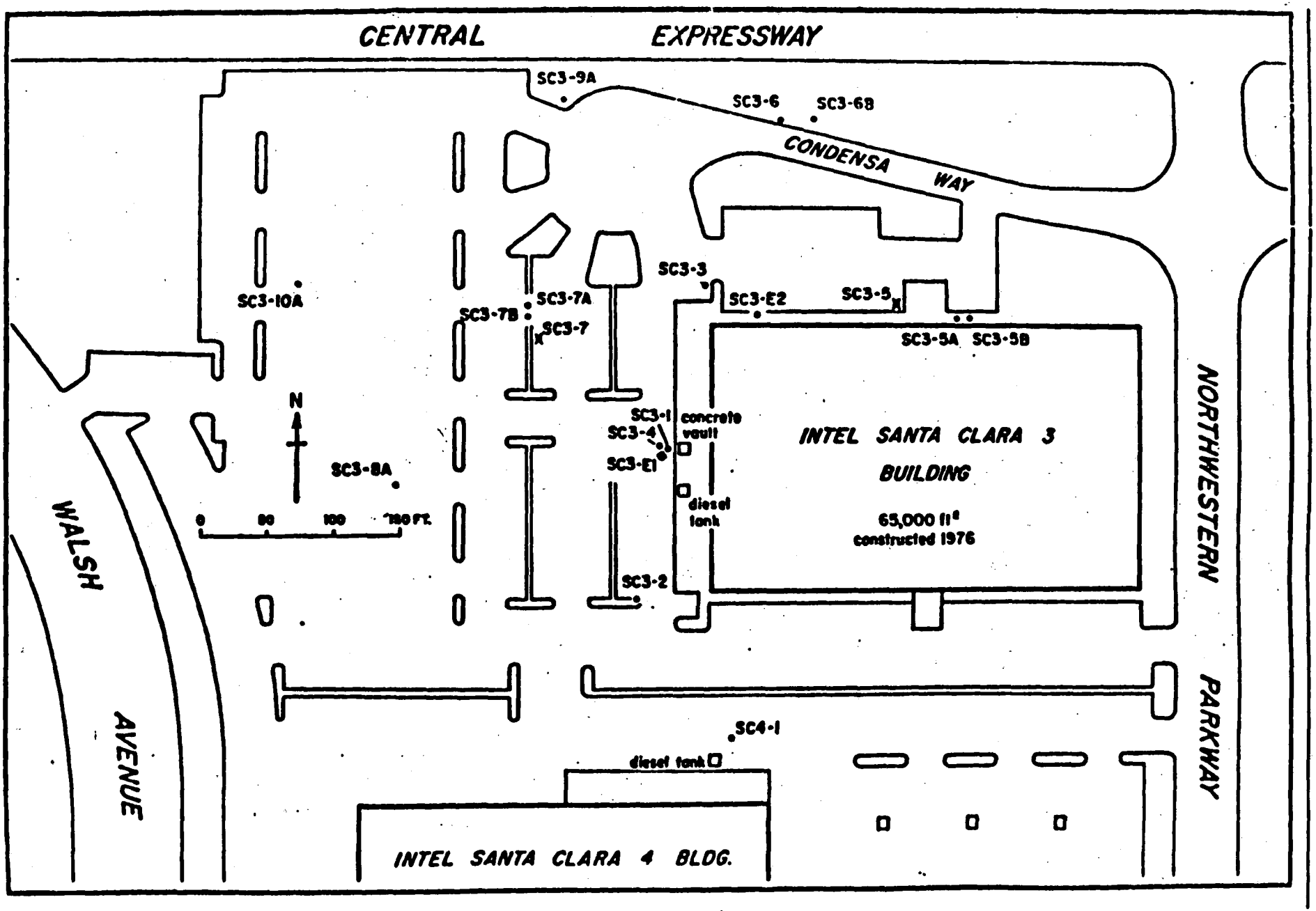


Figure 1. Intel Santa Clara 3 - Facility Map

TABLE 1
SCHEDULE FOR SAMPLING, MEASUREMENTS, AND ANALYSIS

INTEL SANTA CLARA 3 FACILITY
2800 NORTHWESTERN PARKWAY
SANTA CLARA

SAMPLING STATION >>>>	SC3-1,2,3,4,5A,5B,6A,6B,7A,7B,8A 9A,10A,E1, and E2.			
TYPE OF SAMPLE	G			
EPA 8010 for: purgeable priority pollutants, Freon-113, and Freon 11	Q			
GC/MS (EPA 8240) Open Scan	1/Y*			

LEGEND FOR TABLE 1

G = grab sample
Q = quarterly
1/Y = once per year

* EPA 8010 not required for months when EPA 8240 is performed.

TABLE 2
FINAL CLEANUP STANDARDS

INTEL CORPORATION
INTEL SANTA CLARA 3 FACILITY
2800 NORTHWESTERN PARKWAY
SANTA CLARA

Chemical	Cleanup Standard[1] (ug/l)	1989 Maximum[2] (ug/l)
POTENTIAL CARCINOGENS		
1,1-dichloroethane (1,1-DCA)	5	ND
1,2-dichloroethane (1,2-DCA)	0.5	ND
1,1-dichloroethylene (1,1-DCE)	6	ND
trichloroethylene (TCE)	5	140
NONCARCINOGENS		
1,2-dichloroethylene (1,2-DCE)		
cis	6	ND
trans	10	ND
1,1,1-trichloroethane (1,1,1-TCA)	200	2.1
Freon 113	1,200	35.0
Freon 11	150	ND

[1]California State Maximum Contaminant Level (adopted).

[2]1989 Maximum Concentration Levels at SC3 (ug/l).

ND - Not Detected

TABLE 3

SELF MONITORING PLAN

INTEL CORPORATION
INTEL SANTA CLARA 3 FACILITY
2800 NORTHWESTERN PARKWAY
SANTA CLARA

MONITORING FREQUENCY

Monitoring Phase	Time Length	Monitoring Frequency	Sampling Station
Cleanup Phase (Cleanup Standards not achieved)	Estimated 11 Years	Quarterly	All Wells
One Year Stability Phase (Cleanup Standards achieved)	One Year	Quarterly	All Wells
Long Term Phase	Five Years	Twice Annually	SC3-1, 6A, 7A, 9A, and 6B
Post Closure Monitoring Phase	Twenty-five Years	Every other year	SC3-1, 6A, 7A 9A, and 6B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, CA 94103

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SITE CLEANUP REQUIREMENTS

INDEX

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN FRANCISCO BAY REGION

ORDER No. 90-105

AN ORDER PRESCRIBING SITE CLEANUP REQUIREMENTS AND RESCINDING ORDER No. 89-064 FOR:

INTEL CORPORATION
INTEL SANTA CLARA 3 FACILITY
2800 NORTHWESTERN PARKWAY
SANTA CLARA
SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter called the Regional Board) finds that:

1. Site Location. Intel Corporation, hereinafter called the discharger, owns and operates the Intel Santa Clara 3 Facility (SC3) which performs quality control of chemicals and electrical testing of semiconductors. The SC3 site is located at 2800 Northwestern Parkway, Santa Clara, Santa Clara County (Figures 1 and 2) near the intersection of Bowers Avenue and the Central Expressway. SC3 has been in operation since 1976.

2. Reason for Action. The 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. The Intel SC3 site is on the National Priority List (NPL) primarily because of the past chemical releases' potential threat to the quality of this valuable resource.

3. Responsible Party. Pursuant to Health and Safety Code Sections 25356.1 (c) and (d), the discharger is the only identified or known responsible party associated with the release of pollutants to the subsurface at this location.

4. Site Chronology. The site is on the NPL and is regulated by Regional Board Orders, as indicated herein:

   a. September 15, 1982 Intel submits completed Regional Board Facility Questionnaire.

   b. October 15, 1984 Site proposed for the NPL.

c.	October 30, 1984	Regional Board staff approves Intel's proposal for interim remedial measures.
d.	March 19, 1986	Regional Board adopted NPDES Permit No. CA0028941, for the discharge of treated groundwater.
e.	June, 1986	Site added to the final NPL.
f.	April 19, 1989	Regional Board adopted Order No. 89-064 issuing Site Cleanup Requirements and approving the Remedial Investigation / Feasibility Study (RI/FS) workplan.

5. Lead Agency. 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 Board, EPA and DHS, the Regional Board has been acting as the lead regulatory agency for this NPL site. The Regional Board will continue to regulate the discharger's remediation and administer enforcement actions under CERCLA as amended by SARA, the California Water Code, Health and Safety Code, and regulations adopted there under.

6. Hydrogeology. The facility is in the Santa Clara Valley which is a sedimentary basin filled with unconsolidated heterogeneous alluvial material up 1500 feet thick. The alluvium is a mixture of permeable water-bearing sands and gravels interbedded with less permeable silts and clays. The soils are extremely variable over short distances, both horizontally and vertically.

   Two water bearing layers, designated as the A and B zones, have been identified at SC3. The shallowest, or A zone, has its upper boundary at about 10 to 18 feet deep, and lower boundary about 25 to 27 feet deep. The top of the B zone is 29 to 36 1/2 feet deep, and the bottom of the B zone is between 35 1/2 to 43 feet deep. The A and B water bearing zones are separated by an aquitard of 5 to 10 feet of silty clay to clayey silt.

   Water in the A and B zones at this site is not withdrawn for any use other than interim remedial action at present.

7. Subsurface Investigation. 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 SC3 have detected the following chemicals

in the A water bearing zone at the historical high of: trichloroethylene (TCE) at 490 parts per billion (ppb); 1,1,1 trichloroethane (1,1,1 TCA) at 810 ppb; 1,1 dichloroethylene (1,1 DCE) at 84 ppb; 1,1 dichloroethane (1,1 DCA) at 8.2 ppb; 1,2 dichloroethane (1,2 DCA) at 16.0 ppb; cis-1,2 dichloroethylene (cis-1,2 DCE) less than 7.8 ppb; trans-1,2 dichloroethylene (trans-1,2 DCE) less than 7.8 ppb; Freon 113 at 1300 ppb; and Freon 11 at 2.8 ppb.

Since 1982, the discharger has installed eleven A zone monitoring wells and four B zone monitoring wells to define the vertical and horizontal extent of the plume. The oval shaped plume covers an area approximately 400 feet by 300 feet. The vertical extent of groundwater pollution in the A zone extends to the bottom of well SC3-3 at a depth of 27.5 feet. Only trace levels of groundwater pollution have been found to date in B zone monitoring wells. The vast majority of samples collected and analyzed from the B zone have not detected any volatile organic chemicals (VOCs). Occasionally, VOCs have been detected in the B zone, usually at concentrations below 1 ppb.

8. Source Identification. No source of the groundwater pollution has ever been positively identified at the site. Three potential sources have been proposed and, to the extent practical, evaluated. The potential sources are: 1) leaks from the secondarily contained acid waste neutralization tank, 2) accidental spills near the above ground solvent storage facility, and 3) speculated solvent spills associated with cleaning out pipes put in place during the construction of the SC3 building.

While positive identification of a pollution source has not been possible at SC3, by performing the evaluations of potential sources described above, it has been possible to determine that there is no source continuing to contribute pollutants to SC3's existing groundwater pollution and to develop a remedial action plan that considers the possible affect of residual pollutants in the vadose zone.

9. Interim Actions. The discharger has been extracting A zone groundwater from two extraction wells since February, 1985. A general decline in groundwater pollution levels has been observed in all but one of the wells at SC3 since pumping started. Prior to implementing Interim Remedial Actions, the groundwater contained levels of TCE up to 490 parts per billion (ppb), TCA up to 810 ppb, 1,1 DCE up to 84 ppb, and Freon 113 up to 1300 ppb. As of November, 1989, TCE, at a maximum of 140 ppb, is the only pollutant found in the groundwater exceeding drinking water standards. As of November 1989, Intel had withdrawn 28 million gallons of

groundwater and removed approximately 29 pounds of VOCs from the groundwater beneath the site.

10. NPDES Discharge. The extracted groundwater is treated and then discharged to a storm sewer system tributary of San Tomas Aquino Creek. Currently, approximately 20,000 gallons per day of groundwater is discharged as specified under NPDES Permit #CA0028941. San Tomas Aquino Creek is a tributary of Guadalupe Slough which flows into south San Francisco Bay. Effluent limits set in the permit prohibit the discharge of groundwater containing concentrations greater than 5 ppb for the individual VOCs identified at the site. The permit expires on March 19, 1991. The discharger must file a Report of Waste Discharge in accordance with Title 23, California Administrative Code, not later than 180 days in advance of the expiration date as application for issuance of new waste discharge requirements.

11. RI/FS Report and Remedial Action Plan (RAP). The discharger has submitted a RI/FS Report, dated February 16, 1990, which satisfies the requirements of Regional Board Order No. 89-064, Site Cleanup Requirements. The report contains the results of the subsurface investigation, a description of the groundwater pollution, and an evaluation of the interim cleanup actions, remedial alternatives, groundwater conservation measures.

Based on the recommendation in the March 30, 1990 (revised June 19, 1990) staff report (Internal Memo from Gregory Bartow to Steven Ritchie), the Regional Board has determined that the technical information contained in the RI/FS is acceptable for developing a final Remedial Action Plan (RAP) for the site. In making this recommendation, staff did not accept the portions of the RI/FS addressing: 1) Applicable or Relevant and Appropriate Requirements (ARARs), 2) Asymptotic Levels, and 3) The Selected Remedy. These areas are addressed in the Addendum to the RI/FS dated March 30, 1990, prepared by Regional Board staff. The RI/FS submitted February 16, 1990, as modified by the Addendum, the March 30, 1990 staff report (revised June 19, 1990), this Order, and Order No. 86-14 (NPDES Permit No. CA 0028941), satisfies the requirements of the California Water Code Section 13304 and the Health and Safety Code Section 2536.1, Section 121 of CERCLA; is protective of human health and the environment; attains ARARs; utilizes permanent solutions and alternative treatment technologies and resource recovery technologies to the maximum extent possible for short-term effectiveness; is implementable; is cost effective; is acceptable based on State regulations, policies, and guidance; and reduces toxicity, mobility, and volume of pollutants.

12. Cleanup Alternatives. In the Feasibility Study, the discharger initially screened eleven remedial action technologies. Technologies or their components which are environmentally unsound, difficult to implement, ineffective, or have limited effectiveness were eliminated from further consideration. Technologies or their components which were considered potentially applicable for SC3 were further screened based on effectiveness, implementability and cost. The remedial technologies that survived the further screening were assembled into a group of alternative and evaluated in detail. A complete description of these alternatives is contained in the RI/FS dated February 16, 1990. The alternatives were evaluated based on nine criteria: 1) overall protection of human health and the environment; 2) compliance with ARARs; 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility or volume; 5) short-term effectiveness; 6) implementability; 7) cost; 8) State acceptance; and 9) community acceptance.

13. Final RAP. Based primarily on information submitted by the discharger in the RI/FS Report, this Order provides for a final RAP that includes:

    a. Continued groundwater extraction until drinking water quality is achieved, if feasible. If these standards are determined to be infeasible, groundwater extraction shall continue as long as significant quantities of chemicals are being removed through groundwater extraction.

       Achieving drinking water quality is an ARAR for this site. If drinking water quality cannot be achieved, the discharger must demonstrate to the satisfaction of the Regional Board that the conditions for waiving an ARAR are met (e.g., that meeting the ARAR is technically impracticable from an engineering perspective) and that the alternative proposed will be protective of human health and the environment. The Order will then need to be modified by the Regional Board and approved by EPA to allow a less stringent groundwater cleanup level.

    b. Submittal of a proposal for conducting a demonstration project to evaluate various groundwater pumping strategies for cleaning up residual levels of volatile organic chemicals (VOCs) left behind in aquifer material once conventional groundwater pump and treat is shown to be less effective. Pulsed pumping implies the cycling of extraction wells on and off in pumping and nonpumping periods. During the nonpumping period, groundwater levels will rebound. In theory, this could provide greater contact time between the shallow soils and groundwater, and potentially allow VOCs adsorbed to soil

particles to desorb back into the groundwater, allowing further extraction of VOCs.

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. The only exception to this requirement shall be to allow the dischargers to temporarily stop groundwater extraction as part of the demonstration project described in Finding 12.b.

d. Continued quarterly groundwater monitoring at the site during the cleanup period. An additional monitoring well will be installed between wells SC3-1A and SC3-7A. Water levels will be measured to verify that hydraulic control of the groundwater pollution is maintained. 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 biannually once cleanup standards have been achieved and stabilized for one year. Detailed sampling and reporting requirements for the site are contained in the attached Self-Monitoring Plan for SC3.

e. Continued groundwater extraction at the two existing wells SC3-E1 and SC3-E2. In addition, at least one new extraction well, in the vicinity of SC3-7A, will be installed. To increase the efficiency of groundwater extraction, additional extraction wells may be necessary in the future. The need for different and/or additional extraction well locations will be evaluated at least once every year.

f. Treatment of extracted groundwater with a granular activated charcoal (GAC) system to remove VOCs. An existing GAC system has been implemented to treat groundwater from the two existing extraction wells.

The treated groundwater will continue to be discharged to San Tomas Aquino Creek, under existing NPDES Permit No. CA0028941. Regional Board staff believes that the beneficial use of San Tomas Aquino Creek will not be affected by continuing this discharge.

g. A deed restriction. The discharger 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 safe drinking water levels are achieved.

14. Groundwater Cleanup Standards. Cleanup standards (also known as goals) are set at California proposed or adopted Maximum Contaminant Levels (MCLs). Board staff view these cleanup standards as conservative. In cleaning up TCE to the 5 ppb cleanup standard it is quite likely that the concentration of the other chemicals will be reduced below detection levels. These cleanup standards are defined in Specification B.4.

15. Time Required to Reach Cleanup Standards. Intel estimates that it will take 11 years to reduce the concentration of TCE to the cleanup standard of 5 ppb in all monitoring wells at the site. The total present worth cost of the cleanup plan is $637,000. Intel also notes that the cost and time to cleanup are only rough estimates, and in all likelihood underestimate both the time and the cost for cleanup.

16. Risk Associated With Cleanup Standards. 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 maximum contaminant levels (MCLs) and falls within EPA's acceptable Carcinogenic Risk range. The risk due to non-carcinogens at this site was assessed using the Hazard Index. If the Hazard Index is less than one, the combined intake of chemicals is unlikely to pose a health risk.

The Carcinogenic Risk associated with the potential future use scenario of groundwater ingestion and inhalation of VOCs is 1.3×10^{-5}. The Regional Board regards the Carcinogenic Risk associated with the cleanup standards as extremely conservative. Currently TCE is the only VOC detected at the SC3 above drinking water standards. However other VOCs have been detected in the past and may be detected in the future. In cleaning up TCE to the 5 ppb cleanup standard, it is quite likely that concentration of other VOCs will be reduced to levels below detection limits. The Carcinogenic Risk associated with the 5 ppb cleanup standard for TCE alone is 1.5×10^{-6}.

The Hazard Index associated with the cleanup standards is 0.2. The method and assumptions used to obtain the Carcinogenic Risk and the Hazard Index associated with the cleanup standards are contained in the March 30, 1990 staff report (revised June 19, 1990). Thus, the Regional Board finds that the cleanup standards for the site are protective of human health, have a Carcinogenic Risk that falls within a range of 10^{-6} to 10^{-4}, and a Hazard Index of less than one.

The Carcinogenic Risk and Hazard Index associated with the cleanup standards are based on a hypothetical scenario in which the site is redeveloped residential and a private

shallow drinking water well is installed in the affected groundwater. This private well is then used for a duration of 30 years. As such, the Carcinogenic Risk and Hazard Index associated with the cleanup standards represent a maximum plausible risk. For consistency, this scenario is being used in accessing the risk at all of the sites on the NPL where the Regional Board is the lead agency.

17. Future Changes to Cleanup Standards. If new information indicates cleanup standards cannot reasonably be attained or can reasonably be surpassed, the Regional Board will decide if further final cleanup actions, beyond those completed, shall be implemented at this site. If changes in health criteria, administrative requirements, site conditions, or remediation efficiency occur, the discharger will submit an evaluation of the effects of these changes on cleanup standards as defined in Specification B.4.

The Regional Board recognizes that the discharger has already performed extensive investigative and remedial work onsite and that the discharger is being ordered hereby to perform additional remedial tasks. It is in the public interest to have the discharger undertake such remedial actions promptly and without prolonged litigation or the expenditure of public funds. The Regional Board recognizes that an important element in encouraging the discharger to invest substantial resources in undertaking such remedial actions is to provide the discharger with reasonable assurances that the remedial actions called for in this Order will be the final remedial actions required to be undertaken by the discharger. On the other hand, the Regional Board also recognizes its responsibility to protect water quality, public health, and the environment and that future developments could indicate that some additional remedial actions may be necessary.

The Regional Board has considered and balanced these important considerations, and has determined that the remedial actions ordered herein represent the Regional Board's best, current judgement of the remedial actions to be required of the discharger. The Regional Board will not require the discharger to undertake additional remedial actions with respect to the matters previously described herein unless: (1) conditions on the site, previously unknown to the Regional Board, are discovered after adoption of this Order, or (2) new information is received by the Regional Board, in whole or in part after the date of this Order, and these previously unknown conditions or this new information indicates that the remedial actions required in this Order may not be protective of public health and the environment. The Regional Board will also consider technical practicality, cost effectiveness, State Board Resolution No. 68-16 and other factors evaluated by the Regional Board in issuing this Order in determining

whether such additional remedial actions are appropriate and necessary.

18. Groundwater Conservation. The discharger has considered the feasibility of reclamation, reuse, or discharge to a publicly owned treatment works (POTW) of treated, extracted groundwater, as specified in Board Resolution No. 88-160. Reclamation of extracted groundwater at SC3 was tried in 1986. Extracted groundwater was routed through the facility's wet air scrubber. However, scaling caused by the high hardness of the groundwater quickly shut down the scrubber. The discharger claims the independent operational requirements of the scrubber and the groundwater extraction system may only be overcome by installing a complex and expensive system of process controls and backup systems. The only other substantial use of water at SC3 is landscape irrigation. However, the total area of landscaping is less than one acre; the present 20,000 gallon per day flow would apply more than 1/2 inch of water per day or 200 inches per year to the landscaping, far more than it could absorb, especially in the rainy season. Thus, the discharger believes reclamation or reuse of treated, extracted groundwater at SC3 is not feasible. Since the City of Santa Clara does not allow any discharges of treated ground water into its sewer system on a permanent basis, the Regional Board concurs that treated, extracted groundwater reclamation, reuse, or discharge to a POTW at SC3 is not feasible.

However, the RAP requires submittal of a proposal for a demonstration project evaluating pulsed pumping at the site, (as described in Finding 13.b.) which may decrease the amount of treated groundwater discharged to surface waters. Three features which may decrease the amount of groundwater discharged are : 1) theoretically, pulsed pumping allows for the removal of a minimum volume of polluted ground water, at the maximum possible concentrations, thus reducing the total amount of groundwater extracted, 2) the discharger will be required to evaluate returning extracted groundwater to the source aquifer as part of the demonstration project proposal, and 3) the discharger will be required to evaluate the feasibility of partial reclamation of the extracted groundwater through irrigation as part of the demonstration project proposal.

19. Community Involvement. An aggressive Community Relations program has been ongoing for all Santa Clara Valley Superfund sites, including the SC3 site. The Regional Board published a notice for SC3 and two other sites in the Peninsula Times Tribune on April 11, 1990, announcing the proposed final RAP and opportunity for public comment at the Regional Board Public Hearing of April 18, 1990 in Oakland. This Regional Board Hearing began the 30 day public comment period. The

April 11, 1990 notice also announced an evening public meeting held at the Santa Clara Convention Center in the City of Santa Clara on May 2, 1990. The notice announcing the public meeting was published again in the Peninsula Times Tribune on April 18, and April 25, 1990.

Fact Sheets 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, 1990, described the cleanup alternatives evaluated, explained the proposed final RAP, announced opportunities for public comment at the Regional Board Hearing of April 18, 1990 in Oakland and the Public Meeting of May 2, 1990 in Santa Clara, and described the availability of further information at the Information Repository at the Santa Clara Public Library. Public concerns expressed at the Board Hearing and at the Public Meeting, and in comments received by the Regional Board through May 18, 1990, the close of the public comment period, were reviewed and evaluated. A Responsiveness Summary was prepared dated June 19, 1990. Based upon comments received, amendments were incorporated by appropriate response in this Order. While the official public comment period ran from April 18, 1990 to May 18, 1990; public comment was allowed up to the adoption of this Order at the July 18, 1990 Regional Board Public Hearing. However, only comments received prior to May 18, 1990 were addressed in the Responsiveness Summary.

Fact Sheet 3, to be mailed in September, 1990, will explain the final adopted cleanup plan contained in this Order.

20. State Board Resolution 68-16. On October 28, 1968, the State 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 this site was in violation of this policy; therefore, the groundwater quality needs to be restored to its original quality to the extent reasonable. For the purpose of establishing cleanup objectives, the shallow groundwater at the site is designated a potential source of drinking water, and protective levels shall be those levels which have been established as protective of drinking water. State Board Resolution 68-16 is an ARAR for the site.

21. 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: 1) the total dissolved solids in the groundwater exceed 3000 mg/L, and 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 the discharger, the Regional Board finds that neither of these two exceptions apply to the A zone at SC3. Thus, the A zone at SC3 is a potential source of drinking water.

22. Development of the Regional Board's final Remedial Action Plan was based on the Regional Board's evaluation of eight years of water and soil quality data. Random samples have been collected and analyzed by the Regional Board to confirm the validity of data generated by the discharger. Data has been validated using EPA validation guidance. Some data was determined to be questionable, however, other data was determined to be both qualitatively and quantitatively acceptable. The Regional Board finds that there is sufficient acceptable data to make cleanup decisions.

23. The Regional Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on December 16, 1986. The Basin Plan contains water quality objectives and beneficial uses for South San Francisco Bay and contiguous surface and underground waters.

24. The existing and potential beneficial uses of the groundwater underlying and adjacent to the facility include:

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

25. The discharger has caused or permitted, and threatens to cause or permit, pollution to be discharged or deposited where it is or probably will be discharged to waters of the State and creates or threatens to create a condition of pollution or nuisance. Final containment and remediation measures need to be implemented to alleviate the threat to the environment posed by the plume of pollutants.

26. Groundwater cleanup objectives are: (1) restore the quality of a polluted water source to its potential suitability as a drinking water supply, (2) prevent exposure to polluted water, and (3) prevent migration of polluted groundwater to the deeper aquifers (C zone) which presently supply water for domestic (drinking) and other beneficial uses.

27. This action is an order to enforce the laws and regulations administered by the Regional Board. This action is categorically exempt from the provisions of the CEQA pursuant to Section 15321 of the Resources Agency Guidelines.

28. The Regional Board has notified the discharger and interested agencies and persons of its intent under California Water Code Section 13304 to prescribe Site Cleanup Requirements for the discharge and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.

29. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, pursuant to Section 13304 of the California Water Code, that the discharger shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous materials in a manner which will degrade water quality or adversely affect the beneficial uses of the waters of the State is prohibited.

2. Further significant migration of chemicals through subsurface transport to waters of the State is prohibited.

3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of chemicals are prohibited.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of soil or groundwater containing chemicals shall not create a nuisance as defined in Section 13050 (m) of the California Water Code.

2. The discharger shall conduct monitoring activities as needed to define the current local hydrogeologic conditions, and the lateral and vertical extent of soil and groundwater containing chemicals. Should monitoring results show evidence of continuing pollutant migration, additional plume characterization may be required.

3. The identification of which wells are to be used to determine if cleanup standards have been achieved may be modified by the Executive Officer. Currently the wells identified for determining that cleanup standards have

been achieved are those herein and all other onsite and offsite wells that may be installed for monitoring or extraction:

Extraction Wells:	SC3-E1,E2
Monitoring Wells:	SC3-1,2,3,4,5A,5B,6A,6B, 7A,7B,8A,9A, and 10A

4. Final cleanup standards for all onsite and offsite wells shall not be greater than the levels as provided in Finding 14. The numerical final cleanup standards, therefore, shall not exceed the following in any well during the one year stability period as set forth in the Self-Monitoring Plan for SC3:

Chemical	Cleanup Standard[1] (ug/l)	1989 Maximum[2] (ug/l)
POTENTIAL CARCINOGENS		
1,1-dichloroethane (1,1-DCA)	5	ND
1,2-dichloroethane (1,2-DCA)	0.5	ND
1,1-dichloroethylene (1,1-DCE)	6	ND
trichloroethylene (TCE)	5	140
NONCARCINOGENS		
1,2-dichloroethylene (1,2-DCE)		
cis	6	ND
trans	10	ND
1,1,1-trichloroethane (1,1,1-TCA)	200	2.1
Freon 113	1,200	35.0
Freon 11	150	ND

[1]California State Maximum Contaminant Level (MCL) for Drinking Water (adopted).

[2]1989 Maximum Concentration Levels at SC3 (ug/l).

ND - Not Detected (detection levels ranged from 0.5 to 5.0 ug/l).

5. The discharger shall implement the final cleanup plan described in Finding 13.

C. PROVISIONS

1. The discharger shall submit to the Regional Board acceptable monitoring program reports containing results of work performed according to a program prescribed by the Regional Board's Executive Officer.

2. The discharger shall comply with this Order immediately upon adoption and the discharger shall further comply with the PROHIBITIONS and SPECIFICATIONS above, in accordance with the following tasks and compliance time schedule:

a. DEMONSTRATION PROJECT

1) COMPLETION DATE: July 31, 1990

TASK 1: PROPOSAL FOR DEMONSTRATION PROJECT. Submit a technical report acceptable to the Executive Officer containing a proposal and a schedule for conducting a demonstration project of pulse pumping that considers the issues contained in the Regional Board staff report dated March 30, 1990 (revised June 19, 1990). This report shall contain criteria to judge the future performance of the demonstration project. This report shall also evaluate the feasibility, including cost estimates, of returning extracted groundwater to the source-aquifer, and the partial reclamation of the extracted groundwater through irrigation. The report shall include an implementation schedule for these measures. If the discharger proposes that reinfiltration and reclamation are infeasible, the report shall include documentation that a) groundwater reinfiltration and reclamation is infeasible, or b) a proposal for active groundwater reinfiltration and reclamation. This report may be contained in the quarterly status report due July 31, 1990.

2) COMPLETION DATE: January 31, 1991

TASK 2: DEMONSTRATION PROJECT STATUS REPORT. Submit a technical report acceptable to the Executive Officer which includes a status report and results of the demonstration project to date. This report may be contained in the quarterly status report due January 31, 1991.

3) COMPLETION DATE: July 31, 1991

TASK 3: DEMONSTRATION PROJECT, EVALUATION AND RECOMMENDATIONS FOR FURTHER ACTIONS. Submit a technical report acceptable to the Executive Officer which includes an evaluation of the demonstration project to date and recommendation for further action. If the report shows that pulsed pumping is feasible then a schedule for full scale implementation should be included. This report may be contained in the quarterly status report due July 31, 1991.

3) COMPLETION DATE: September 30, 1992

TASK 4: DEMONSTRATION PROJECT FINAL REPORT Submit a technical report acceptable to the Executive Officer which includes a final report on the demonstration project.

b. UPDATING ADMINISTRATIVE RECORD

1) COMPLETION DATE: August 15, 1990

TASK 5: PROPOSED UPDATE. Submit a technical report acceptable to the Executive Officer containing an updated index for the Administrative Record for the period February 17, 1990 to July 30, 1990.

2) COMPLETION DATE: September 28, 1990

TASK 6: UPDATE ADMINISTRATIVE RECORD. Submit a technical report acceptable to the Executive Officer containing the updated Administrative Record for the period February 17, 1990 to July 30, 1990.

c. INSTITUTIONAL CONSTRAINTS

1) COMPLETION DATE: July 31, 1990

TASK 7: PROPOSED CONSTRAINTS. Submit a technical report acceptable to the Executive Officer documenting procedures to be implemented by the discharger, including a deed restriction prohibiting the use of the A zone

groundwater as a source of drinking water, and for controlling onsite activities that could endanger the public health or the environment due to exposure to VOCs. Constraints shall remain in effect until groundwater cleanup standards have been achieved and pollutant levels have stabilized in onsite aquifers. This report may be contained in the quarterly status report due July 31, 1990.

2) COMPLETION DATE: September 28, 1990

TASK 8: CONSTRAINTS IMPLEMENTED. Submit a technical report acceptable to the Executive Officer documenting that the proposed and approved constraints have been implemented.

d. EXTRACTION SYSTEM AND MONITORING SYSTEM

1) COMPLETION DATE: July 31, 1990

TASK 9: PROPOSAL FOR ADDITIONAL EXTRACTION AND MONITORING WELLS NEAR SC3-7A. Submit a technical report acceptable to the Executive Officer which contains a proposal to install additional extraction and monitoring wells in the vicinity of SC3-7A as outlined in the Feasibility Study. This report may be contained in the quarterly status report due July 31, 1990.

2) COMPLETION DATE: September 28, 1990

TASK 10: DOCUMENTATION OF INSTALLATION OF ADDITIONAL EXTRACTION AND MONITORING WELLS NEAR SC3-7A. Submit a technical report acceptable to the Executive Officer which documents the installation of additional extraction and monitoring wells in the vicinity of SC3-7A as outlined in the Feasibility Study.

3) COMPLETION DATE: 60 days prior to implementation by the discharger

TASK 11: MODIFYING EXISTING EXTRACTION AND TREATMENT SYSTEM OR MONITORING WELL SYSTEM. Submit a technical report acceptable to the Executive Officer which documents a proposal to modify, workover or replace any existing extraction well or pit, or install one or more new extraction wells or pits associated with

cleanup activities at this site; or a proposal to modify the monitoring well system by making major well-construction changes, abandoning an existing well(s) or installing a new well(s).

This report is required only if a change is proposed, and for all changes that are proposed.

4) COMPLETION DATE: 30 days following implementation by the discharger

TASK 12: IMPLEMENTATION OF CHANGE. Submit a technical report acceptable to the Executive Officer which documents any change made in the extraction/treatment system and any major change in the monitoring well system.

e. CURTAILING ONSITE GROUNDWATER EXTRACTION

1) COMPLETION DATE: 90 days prior to proposed implementation of onsite groundwater extraction curtailment

TASK 13: ONSITE WELL PUMPING CURTAILMENT CRITERIA AND PROPOSAL. Submit a technical report acceptable to the Executive Officer containing a proposal for curtailing pumping from onsite groundwater extraction well(s) and pit(s) and the criteria used to justify such curtailment. This report shall include data to show that groundwater cleanup standards for all VOCs have been achieved and pollutant levels have stabilized or are stabilizing, and that the potential for pollutant levels rising above cleanup standards is minimal. This report shall also include an evaluation of the potential for pollutants to migrate downwards to the C aquifer at this location.

If the discharger determines that it is not feasible to achieve cleanup standards, the report shall evaluate the alternate standards that can be achieved.

2) COMPLETION DATE; 30 days after the Regional Board approves onsite curtailment.

TASK 14: IMPLEMENTATION OF ONSITE CURTAILMENT. Submit a technical report acceptable to the Executive Officer documenting completion of the

necessary tasks identified in the technical report submitted for Task 13.

f. STATUS REPORT

1) COMPLETION DATE: July 31, 1995

TASK 15: FIVE-YEAR STATUS REPORT AND EFFECTIVENESS EVALUATION. Submit a technical report acceptable to the Executive Officer containing the results of any additional investigation including results from the demonstration project; an evaluation of the effectiveness of installed final cleanup measures and cleanup costs; additional recommended measures to achieve final cleanup objectives and standards, if necessary; a comparison of previous expected costs with the costs incurred and projected costs necessary to achieve cleanup objectives and standards; and the tasks and time schedule necessary to implement any additional final cleanup measures. This report shall also describe the reuse of extracted groundwater and evaluate and document the cleanup of polluted groundwater. If safe drinking water levels have not been achieved onsite and are not expected to be achieved through continued groundwater extraction and/or soil remediation, this report shall also contain an evaluation addressing whether it is technically feasible to achieve drinking-water quality onsite, and if so, a proposal for procedures to do so.

g. NEW HEALTH CRITERIA

1) COMPLETION DATE: 60 days after request made by the Executive Officer

TASK 16: EVALUATION OF NEW HEALTH CRITERIA. Submit a technical report acceptable to the Executive Officer which contains an evaluation of how the final plan and cleanup standards would be affected, if the concentrations as listed in Specification B.4. change as a result of promulgation of drinking water standards, maximum contaminant levels or action levels.

h. NEW TECHNICAL INFORMATION

1) COMPLETION DATE: 60 days after request made

by the Executive Officer

TASK 17: EVALUATION OF NEW TECHNICAL INFORMATION. Submit a technical report acceptable to the Executive Officer which contains an evaluation of new technical and economic information which indicates that cleanup standards and/or technology in some areas may be considered for revision. Such technical reports shall not be required unless the Executive Officer or the Regional Board determines that such new information indicates a reasonable possibility that the Order may need to be changed under the criteria described in Finding 17.

3. The submittal of technical reports evaluating additional final remedial measures will include a projection of the cost, effectiveness, benefits, and impact on public health, welfare, and environment of each alternative measure. If any additional remedial investigations or feasibility studies are found to be necessary, they shall be consistent with the guidance provided by Subpart E of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), Section 25356.1 (c) of the California Health and Safety Code, CERCLA/SARA guidance documents, the State Board's Resolution No. 68-16, and this Order.

4. If the discharger is delayed, interrupted or prevented from complying with this Order or meeting one or more of the time schedules in this Order, the discharger shall promptly notify the Executive Officer. In the event of such delays or noncompliance, the Regional Board may consider modification of the time schedules established in this Order.

5. Technical reports summarizing the status of compliance with the Prohibitions, Specifications, and Provisions of this Order shall be submitted on a quarterly basis, according to the schedule below, commencing with the report for the second quarter 1990, due July 31, 1990.

Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Period	Jan.-March	April-June	July-Sept.	Oct.-Dec.
Due Date	April 30	July 31	October 31	January 31

The quarterly reports shall include:

a. a summary of work completed since the previous quarterly report, and work projected to be completed by the time of the next quarterly report,
b. appropriately scaled and labeled maps showing the location of all monitoring wells, extraction wells, and existing structures,
c. cross sections depicting subsurface geologic information and corresponding correlations showing actual boring lithology data if new information has changed interpretations since the previous quarter,
d. updated water table and piezometric surface maps for all affected water bearing zones, and isoconcentration maps for key pollutants in all affected water bearing zones,
e. a cumulative tabulation of all well construction data, groundwater levels and chemical analysis results for site monitoring wells specified in the sampling plan,
f. identification of potential problems which will cause or threaten to cause noncompliance with this Order and what actions are being taken or planned to prevent these obstacles from resulting in noncompliance with this Order, and
g. in the event of noncompliance with the Provisions and Specifications of this Order, the report shall include written justification for noncompliance and proposed actions to achieve compliance.

6. On an annual basis beginning on January 31, 1991 or as required by the Executive Officer, the discharger's January 31 progress reports shall include, but need not be limited to, an evaluation of the progress of cleanup measures and the feasibility of meeting groundwater cleanup standards established in this Order. This report shall include a discussion of the efficiency of the existing groundwater extraction wells at removing groundwater pollution during the previous year. If significant reductions in groundwater pollution levels are not being achieved, then the report shall propose construction of new and/or alternative extraction wells in order to increase the efficiency of the groundwater extraction system. If the discharger determines that it is not feasible to meet the cleanup standards established by this Order, the report shall also contain an evaluation of maximum cleanup levels that could be achieved.

7. All hydrogeological plans, specifications, reports and documents shall be signed by or stamped with the seal of a registered geologist, engineering geologist or professional engineer and submitted on recycled paper.

8. All samples shall be analyzed by laboratories certified to perform analysis on Hazardous Materials or laboratories using approved EPA methods or an equivalent method acceptable to the Executive Officer. The discharger shall request laboratories to follow EPA guidance, "Documentation Requirements for Data Validation of Non-CLP Laboratory Data for Organic and Inorganic Analyses", dated May 1988, and DHS guidance, "Documentation Requirements for Project Data Packages", dated December 29, 1989, for preparation of data validation packages when required by the Executive Officer. The discharger shall request the laboratories to maintain quality assurance/quality control records for Regional Board review for six years and will inform the Regional Board of each laboratory's response.

9. The discharger shall maintain in good working order, and operate as efficiently as possible, any facility or control system or monitoring system installed to achieve compliance with this Order.

10. Copies of all correspondence, reports, and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order shall be provided to:

    a. Santa Clara Valley Water District
    b. Santa Clara County Health Department
    c. City of Santa Clara
    d. U.S. Environmental Protection Agency, Region IX (H-6-3)

    Additional copies of correspondence, reports and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order shall be provided for public use when requested by the Executive Officer.

11. The discharger shall permit the Regional Board or its authorized representative, in accordance with Section 13267 (c) of the California Water Code:

    a. Entry upon premises in which any pollution sources exist, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

    b. Access to copy any records required to be kept under the terms and conditions of this Order.

    c. Inspection of any monitoring equipment or methodology implemented in response to this Order.

d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.

12. The discharger shall file a report on any changes in site occupancy and ownership associated with the facility described in this Order.

13. If any hazardous substance is discharged in or on any waters of the State, or discharged and deposited where it is, or probably will be discharged in or on any waters of the State, the discharger shall immediately report such discharge to this Regional Board, at (415) 464-1255 on weekdays during office hours from 8 a.m. to 5 p.m., and to the Office of Emergency Services at (800) 852-7550 during non-office hours. A written report shall be filed with the Regional Board within five working days and shall contain information relative to: the nature of waste or pollutant, quantity involved, duration of incident, cause of spill, Spill Prevention and Containment Plan (SPCC) in effect, if any, estimated size of affected area, nature of effects, corrective measures that have been taken or planned, and a schedule of these activities, and persons notified.

14. The Regional Board will review this Order periodically and may revise the requirements when necessary under the criteria in Finding No. 17.

15. Regional Board Order No. 89-064 is hereby rescinded.

I, Steven R. Ritchie, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on July 18, 1990.

STEVEN R. RITCHIE
Executive Officer

Attachments: Figure 1 Site Location Map - Intel Santa Clara 3.

Figure 2 Site Map of Intel Santa Clara 3 (showing distribution of TCE in the A Water-Bearing Zone, August 16, 1989).

Self-Monitoring Program for Intel Santa Clara 3.

Staff Report on the Final Remedial Action Plan for the Intel Santa Clara 3 Site, dated March 30, 1990 and revised on June 19, 1990.

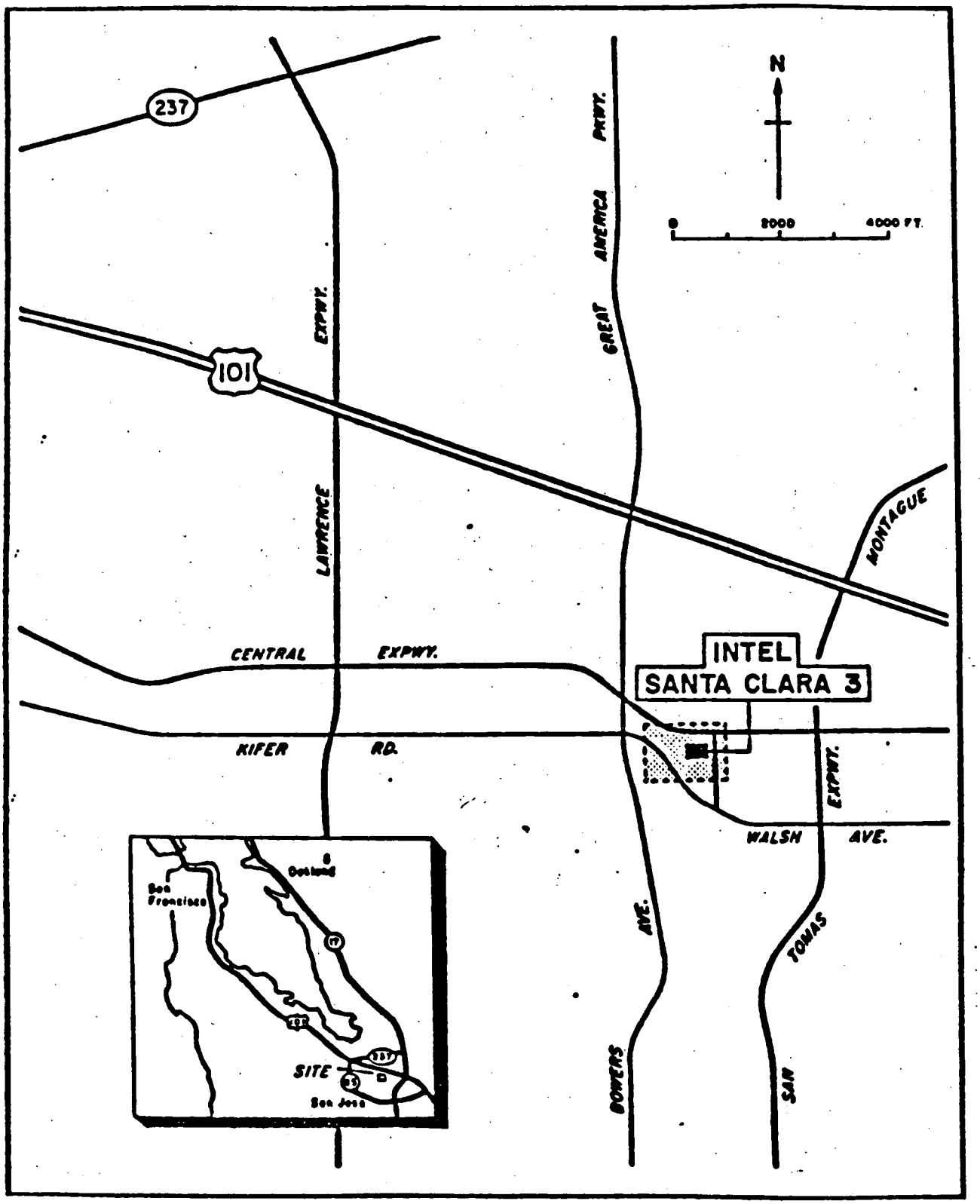


Figure 1, Site Location Map - Intel Santa Clara 3

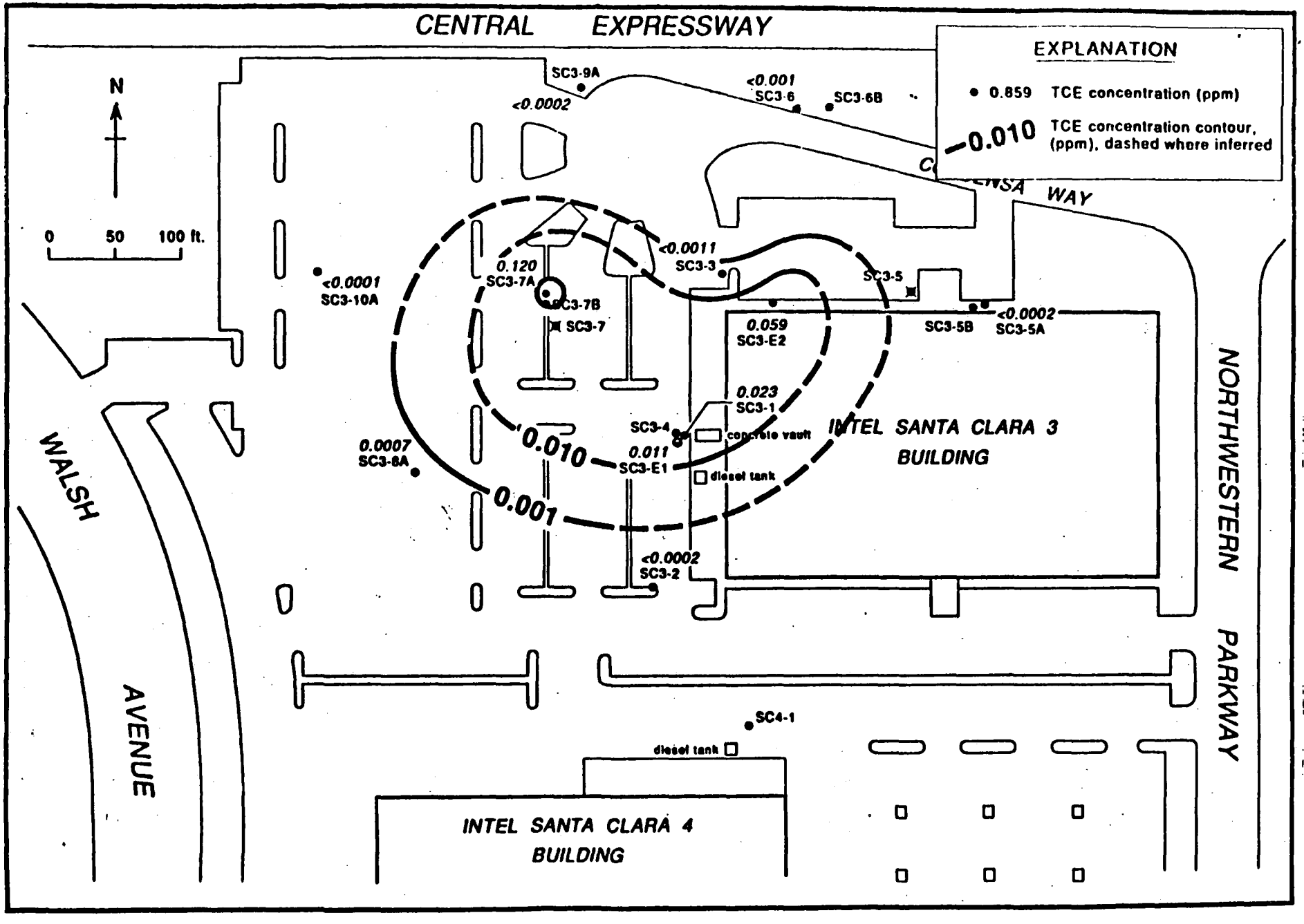


Figure 2 Site Map of Intel Santa Clara 3 (showing distribution of TCE in the A Water-Bearing Zone, August 16, 1989)

RESPONSIVENESS SUMMARY

Intel Santa Clara 3
2880 Northwestern Parkway
Santa Clara

1.0 Introduction

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The initial Tentative Order (dated March 30, 1990) for SC3 was submitted to Intel and EPA on March 30, 1990. On April 6, 1990, Intel met with Board staff to discuss the Tentative Order. The March 30, 1990 Order was subsequently revised based on verbal comments received by Board staff from EPA and Intel. The Revised Tentative Order (dated April 9, 1990) was presented as an informational item to the Regional Board at the Board's regular meeting on April 18, 1990. One of the Board's actions at this meeting was to open the 30-day public comment period for the RAP for SC3.

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During the public meeting questions were asked by the two members of the public on the following general topics: 1) background on the Superfund process, 2) the source of the groundwater pollution, 3) the pulsed pumping demonstration project, 4) the leak detection program in the Santa Clara Valley, 5) the nearby groundwater pollution sites, 6) the municipal water supply system, and 7) the monitoring frequency of the municipal supply groundwater wells.

No member of the public has requested modification of the proposed RAP for the site. Therefore, no changes were made to the RAP as a result of public comment.

A representative of the City of Santa Clara's Water Utility also commented on the RAP at the public meeting. The Water Utility supported the RAP, however, they also wanted the record to show that the current municipal water supply has not been impacted by the groundwater pollution at SC3.

3.0 Specific Comments

This section addresses the specific written comments submitted by the Santa Clara Water District and Intel on the proposed RAP.

3.1 General Comment (Santa Clara Valley Water District)

It is my understanding that the proposed cleanup goals of the shallow groundwater specified for this site are to Maximum Contaminant Levels (MCL) or to California Department of Health Services' action levels, whichever are more stringent. The District fully supports the cleanup of shallow groundwaters to at least these goals with the understanding that further remediation requirements would be evaluated based on feasibility and risk assessment evaluations.

Response by RWQCB: The cleanup standards (also known as goals) are set at California proposed or adopted MCLs. Board staff view these cleanup standards as conservative. In cleaning up TCE to the 5 ppb cleanup standard, it is quite likely that the concentration of the other chemicals will be reduced to below detection levels. Therefore, the Regional Board will only require Intel to clean up the groundwater beneath the site to those levels specified in the proposed RAP.

3.2 General Comment (Intel)

There was an extensive discussion regarding the inclusion of the Public Health Evaluation (PHE). The report concludes that there is no current or future risk to public health or the environment as a result of the current conditions which exist at Intel Santa Clara 3. Therefore, it is important that the RWQCB represent to the public that there is no significant risk associated with this site. The justification for establishing the cleanup goal of 5 ppb of TCE is based upon the fact that the RWQCB established that the waters in the A-zone aquifer are a potential drinking water source and, therefore, must be returned to this beneficial use. As a potential drinking water source, the ARAR to establish a clean-up goal is the maximum contaminant level (MCLs) which is 5 ppb for TCE.

Response by RWQCB: The role of the PHE is to access the current and future risk at the site under a no-further-action scenario. Board staff is in agreement with Intel that there is no current risk to the public with regard to the site because the polluted shallow groundwater beneath the site is not currently being used as a drinking water supply. However, Board staff disagrees with Intel relative to the future risk. The potential future risks at the site under a no-further-action scenario are: 1) a shallow private well could be installed if the site were redeveloped residential and 2) the plume could hypothetically migrate to the lower aquifer zone which is a current drinking water supply.

3.3 Finding 14 (Intel)

With regard to the Tentative Order, Finding 14, Intel suggests the following:

"Clean-up Goals - The selected remedy is designed to achieve the maximum contaminant levels within the A-zone. As set forth in Section 121 of CERCLA, the MCLs are protective of human health and the environment and fall within EPA's acceptable carcinogenic risk range. The non-carcinogenic risk at this site is assessed using the Hazard Index. If the Hazard Index is less than one, a combined intake of

chemicals is unlikely to propose a health risk.

The Hazard Index associated with the clean-up goals is 0.2. The methods and assumptions used to obtain the Hazard Index associated with the cleanup goals are contained in the March 30, 1990 staff report."

The carcinogenic risk calculations that are presented in the staff report are a mathematical calculation, using either the drinking water standards or the action levels. As discussed during the meeting, this calculation is not representative of current or potential future site conditions and, therefore, the results should not be contained in the Order.

Response by RWQCB:

Board staff have revised the Tentative Order to include the following statement in Finding 16 (formerly Finding 14): "The Carcinogenic Risk and Hazard Index associated with the cleanup standards are based on a hypothetical scenario in which the site is redeveloped residential and a private shallow drinking water well is installed in the affected groundwater. As such, the Carcinogenic Risk and Hazard Index associated with the cleanup standards represent a maximum plausible risk. For consistency, this scenario is being used in accessing the risk at all of the NPL sites where the Regional Board is the lead agency."

3.4 Finding 12.b. (Intel)

It is Intel's intention to proceed as quickly as possible with the demonstration project. As discussed in our meeting, the new monitoring wells will be installed between SC3-1 and SC3-7A. The new extraction well will not be installed until after data is obtained and interpreted from the installation of the new monitoring wells.

Although in theory, pulse pumping can have effects on removal of material in non-saturated areas which are returned to saturation when pumping is ceased, the particular situation in Santa Clara 3 does not lend itself physically to the theoretical benefits of pulse pumping, due to the fact that the A-zone is confined and has not become non-saturated due to pumping. As discussed in the meeting, there are other benefits which would be examined through the demonstration project. Therefore, it is advantageous to increase the non-pumping time by two months proceeding each cycle. In other words, two months of pumping, followed by two months of shut-down, with the progression proceeding in the same manner. Intel has agreed that we will monthly collect samples from SC3-9A and SC3-6 to insure

that there is no forward migration of the plume. It should be noted that during the three years prior to pumping, there was no detectable forward migration of the plume. During the five years of pumping, there has also been no detectable forward migration of the plume. Intel predicts that the plume will remain stationary. This is one of the primary reasons for implementing the cyclic pumping scheme.

Response by RWQCB: Board staff will consider Intel's comments on the Demonstration Project when staff reviews the "Proposal For a Demonstration Project" for the site. Provision C.2.a.1) of the Tentative Order requires submittal of the proposal by July 31, 1990. It should be noted that Board staff has commented on a number of these issues in a letter to Intel dated May 10, 1990 that addressed a preliminary demonstration project proposal submitted by Intel on March 7, 1990.

3.5 Agency Addendum, Asymptotic Levels. (Intel)

It is apparent that Intel and the RWQCB have received different interpretations of the asymptote information presented in the Stanford Report. Weiss Associates will proceed to schedule a technical meeting in late April or early May to review the information among the RWQCB staff, Intel, Weiss Associates and L. Semprini of Stanford.

Response by RWQCB: Board staff attended a meeting on this subject with Intel, Weiss Associates and L. Semprini that took place on June 8, 1990. During the meeting L. Semprini stated that the Stanford/Moffett NAS Field Site (NAS) and the SC3 site have significant differences. Major differences between the NAS and the SC3 site are 1) the aquifer material at the NAS site is more coarse grained, 2) the initial concentration of the TCE was lower at the NAS site, and 3) the time between the TCE release and cleanup was shorter at the NAS site. Based on this information Board staff believe that a comparison of the asymptotic or tailing conditions at the two sites should be viewed cautiously.

However, as shown on Figures 6 and 7 of the March 30, 1990 Staff Report (revised June 19, 1990), asymptotic levels do not appear to have been conclusively reached in all wells at SC3. With the installation of an additional extraction well and pulsed pumping, TCE levels are likely to decrease.

3.6 Finding 3. (Intel)

This finding should be retitled as "site chronology" and include both the 1982 request by the RWQCB for groundwater data and the Fall 1984 approval by the Executive Officer for the interim clean-up plan, and implemented by Intel.

Response by RWQCB: Finding 3 has been modified as requested.

3.7 Finding 6. (Intel)

The issue of false positive from laboratory data regarding B-zone sampling was discussed. It was agreed that the language used in the staff report would be inserted into the discussion in the Tentative Order in Finding 6.

Response by RWQCB: Staff previously made this change to the Revised Tentative Order (dated April 9, 1990). Therefore no further change is necessary.

3.8 Finding 12.a. (Intel)

Subparagraph A discusses that the groundwater extraction will continue until drinking water quality is achieved, if feasible. The sentence following that one will be deleted. The paragraph will continue on beginning with the sentence, "Achieving drinking water quality if an ARAR ..."

Response by RWQCB: The sentence which Intel requested for deletion reads: "If these (cleanup) standards are determined to be infeasible, groundwater extraction shall continue as long as significant quantities of chemicals are being removed through groundwater extraction". Board staff believes that this sentence should remain in the Order. Otherwise, there is no incentive for Intel to aggressively work toward reaching the cleanup standards.

3.9 Specification B.4. (Intel)

In Specification 4, include a column in the table which presents the current site concentrations.

Response by Regional Board: Staff previously made this change to the Revised Tentative Order (dated April 9, 1990). Therefore, no further change is necessary.

3.10 Specification B.5. (Intel)

Specification 5 will be moved to the Findings section of the Order.

Response by Regional Board: Staff previously made this change to the Revised Tentative Order. Therefore, no further change is necessary. Specification 5 was moved to the Findings section of the Tentative Order. The subject text is now included in Finding 24 of the Revised Tentative Order (dated June 19, 1990).

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The quarterly report will present appropriate tables and figures, based upon new information which is generated since the previous quarterly report. It will be the annual report that contains an overall summary for the year. Therefore, subparagraph c, d, e and f should be modified to reflect the fact that the quarterly reports will only present the new information, as opposed to being repetitive in nature and continuing to present the same tables and figures each time.

Response by RWQCB: Provision C.5.c. of the Tentative Order was modified such that cross sections need to be included only if the interpretations have changed since the previous quarter. The most current set of cross sections will continue to be required in the annual report. Subparagraphs C.5.d., e. and f. refer to maps and table showing the most recent groundwater and chemical data. This data is required to be collected on a quarterly basis, so that it can be reported on a quarterly basis. Board Staff need to use the results from the quarterly monitoring reports to verify that: 1) hydrologic control is maintained, 2) cleanup is proceeding and, 3) no vertical or horizontal migration of the groundwater pollution is occurring.

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Intel requests that this paragraph be modified to be consistent with CERCLA and require a five year review process, as opposed to establishing a set 25 year monitoring requirement. The status of the site should be reviewed each five years to determine whether any additional efforts are necessary, as opposed to pre-establishing a 25 year monitoring requirement.

Response by RWQCB: A longterm monitoring program has been included in the Self Monitoring Program (SMP) for the site. In an effort to make the SMP less confusing, a table has been added (Table 3) which explains the four monitoring phases. While it is unclear at this time whether 25 years is the exact length of time needed for long term monitoring, Board staff believes that the language of the SMP is general enough to provide the needed flexibility to the Executive Officer if a shorter or longer term is necessary.

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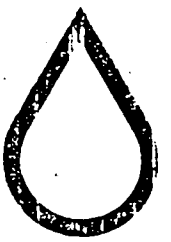
Santa Clara Valley Water District
5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118
TELEPHONE (408) 265-2600
FACSIMILE (408) 266-0271
AN AFFIRMATIVE ACTION EMPLOYER



May 18, 1990

Mr. Gregory Bartow
Regional Water Quality Control Board
1800 Harrison, Suite 700
Oakland, CA 94612

Dear Mr. Bartow:

Subject: Comments on Tentative Order, Proposed Remedial Action Plan and Site Cleanup Requirements for Intel Corporation, Santa Clara 3 Facility

This letter presents our comments on the above subject site located at 2800 Northwestern Parkway.

It is my understanding that the proposed cleanup goals of the shallow groundwater specified for this site are to Maximum Contaminant Levels (MCL) or to California Department of Health Services' action levels, whichever are more stringent. The District fully supports the cleanup of shallow groundwaters at least to these goals with the understanding that further remediation requirements would be evaluated based on feasibility and risk assessment evaluations.

We are also in concurrence with the proposal to make efforts to reuse treated waters and with other water conservation practices specified in the order.

Please call Tom Iwamura should you have any questions.

Sincerely,

David J. Chesterman
Division Engineer
Groundwater Protection Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
1235 Mission Street
San Francisco, Ca. 94103

Memorandum

May 10, 1990

From: Sharon Seidel
Regional Toxicologist (H-8-4) Sharon Seidel

To: Rose Marie Caraway
Project Manager (H-6-3)

Subject: Intel Santa Clara III risk calculations

I reviewed the risk estimates in the RWQCB "Executive Officer Summary Report" on Intel Santa Clara III. There are some errors in the calculations, which when corrected increase the final cancer risk estimate to 1.3E-4, from 9.2E-5. The non-carcinogenic hazard index has minor changes which revise it downwards The corrections in the calculations are as follows:

1. 1,1-Dichloroethane (1,1-DCA) is listed only in the non-carcinogen table in the report. 1,1-DCA is classified as a B2 carcinogen, with an oral CPF of 9.1E-2 $(mg/kg/day)^{-1}$, and should be included in the carcinogen portion of the risk assessment.

2. Cancer risks associated with the inhalation of VOCs during domestic uses of water, such as showering, should be assessed using inhalation cancer potency factors, where available. Route-to-route extrapolation of oral cancer potency factors for inhalation exposures is less preferable but may be substituted for the VOCs of concern when inhalation cancer potency factors are not available. The assumption in this model is that the dose from the inhalation of VOCs is approximately equal to that from drinking 2 liters of the same water. The following VOCs have inhalation cancer potency factors listed in IRIS or HEAST:

1,2-DCA	0.091 $(mg/kg/day)^{-1}$ (= oral CPF, no change in risk #)
1,1-DCE	1.20 $(mg/kg/day)^{-1}$
TCE	0.017 $(mg/kg/day)^{-1}$

3. The oral cancer potency factor for TCE is incorrectly listed as 0.11 and should be corrected to 0.011 $(mg/kg/day)^{-1}$.

Recalculated risks for the inhalation pathway:

Chemical	Cw	CPF	CDI	Inhalation Risk
1,1-DCA	0.005	0.091*	5.50E-5	5.01E-6
1,2-DCA	0.0005	0.091	5.50E-6	5.01E-7
1,1-DCE	0.006	1.20	6.60E-5	7.92E-5
TCE	0.005	0.017	5.50E-5	9.35E-7
				8.56E-5

*Oral CPF; No Inhal CPF available

Recalculated risks for the drinking water pathway:

Chemical	Cw	CPF	CDI	Oral Risk
1,1-DCA	0.005	0.091	5.50E-5	5.01E-6
1,2-DCA	0.0005	0.091	5.50E-6	5.01E-7
1,1-DCE	0.006	0.6	6.60E-5	3.96E-5
TCE	0.005	0.011	5.50E-5	6.05E-7
				4.57E-5

Total cancer risk: 8.56E-5 + 4.57E-5 = 1.31E-4

4. The inhalation risks for non-carcinogens should be similarly assessed using inhalation RfDs, where available. The following VOCs have inhalation RfDs:

1,1-DCA	0.1 mg/kg/day (= oral RfD, no change in risk #)
Freon 11	0.2 mg/kg/day
1,1,1-TCA	0.3 mg/kg/day

The recalculated inhalation Hazard Index is 7.56E-2. The total Hazard Index is 1.92E-1, a minor reduction from the original total HI of 2.32E-1.

If you have any questions or concerns about these calculations I can be reached at (415) 540-3771.

cc: Jim Hanson
Doug Steele

INTEL CORPORATION
2402 W. Beardsley Road
Phoenix, Arizona 85027
(602) 869-3805

April 10, 1990

Gregory Bartow
California Regional Water Quality Control Board
San Francisco Bay Region
1800 Harrison Street, Suite 700
Oakland, CA 94612

SUBJECT: MEETING OF APRIL 6, 1990

Dear Greg:

Intel Corporation (Intel) appreciated the opportunity to meet with Bruce Wolfe, James Thompson and you on April 6 to review the RWQCB letter of March 29 and the draft Tentative Order dated March 30, 1990. A number of items were discussed during the course of our meeting. The following summarizes several of the key issues and areas of agreement.

PUBLIC HEALTH EVALUATION

There was an extensive discussion regarding the inclusions of the Public Health Evaluation. The report concludes that there is no current or future risk to public health or the environment as a result of the current conditions which exist at Intel Santa Clara 3. Therefore, it is important that the RWQCB represent to the public that there is no significant risk associated with this site. The justification for establishing the clean-up goal of 5 ppb of TCE is based upon the fact that the RWQCB established that the waters in the A-zone aquifer are a potential drinking water source and, therefore, must be returned to this beneficial use. As a potential drinking water source, the ARAR to establish a clean-up goal is the maximum contaminant level (MCLs) which is 5 ppb for TCE.

With regard to the Tentative Order, Finding 14, Intel suggests the following:

"Clean-up Goals - The selected remedy is designed to achieve the maximum contaminant levels within the A-zone. As set forth in Section 121 of CERCLA, the MCLs are protective of human health and the environment and fall within EPA's acceptable carcinogenic risk range. The non-carcinogenic risk at this site is assessed using the Hazard Index. If the Hazard Index is less than one, a combined intake of chemicals is unlikely to propose a health risk.

The Hazard Index associated with the clean-up goals is 0.2. The methods and assumptions used to obtain the Hazard Index associated with the clean-up goals are contained in the March 30, 1990 staff report."

FINDING 14, AS PROPOSED, REFERENCES

The carcinogenic risk calculations that are presented in the staff report as a mathematical calculation, using either the drinking water standards or the action levels. As discussed during the meeting, this calculation is not representative of current or potential future site conditions and, therefore, the results should not be contained in the Order.

DEMONSTRATION PROJECT

It is Intel's intention to proceed as quickly as possible with the demonstration project. As discussed in our meeting, the new monitoring wells will be installed between SC3-1 and SC3-7A. The new extraction well will not be installed until after data is obtained and interpreted from the installation of the new monitoring wells.

Although in theory, pulse pumping can have effects on removal of material in non-saturated areas which are returned to saturation when pumping is ceased, the particular situation in Santa Clara 3 does not lend itself physically to the theoretical benefits of pulse pumping, due to the fact that the A-zone is confined and has not become non-saturated due to pumping. As discussed in the meeting, there are other benefits which would be examined through the demonstration project. Therefore, it is advantageous to increase the non-pumping time by two months proceeding each cycle. In other words, two months of pumping, followed by two months of shut-down, followed by two months of pumping, followed by four months of shut-down, with the progression proceeding in the same manner. Intel has agreed that we will monthly collect samples from SC9A and SC6 to insure that there is no forward migration of the plume. It should be noted that during the three years prior to pumping, there was no detectable forward migration of the plume. During the five years of pumping, there has also been no detectable forward migration of the plume. Intel predicts that the plume will remain stationary. This is one of the primary reasons for implementing the cyclic pumping scheme.

Either Mary Stallard or Bill McIlvride of Weiss Associates will contact you in the next couple of weeks to receive your comments on the draft demonstration project proposal. Weiss Associates will modify the demonstration project and resubmit the proposal to you by May 4, 1990. The demonstration project will also contain information regarding the installation of the two new monitoring wells.

INTERPRETATION OF ASYMPTOTES FROM STANFORD DATA

It is apparent that Intel and the RWQCB have received different interpretations of the asymptote information presented in the Stanford Report. Weiss Associates will proceed to schedule a technical meeting in late April or early May to review the information among the RWQCB staff, Intel, Weiss Associates and L. Semprini of Stanford.

RESPONSE TO MARCH 29 LETTER

Weiss Associates will prepare a response to the RWQCB letter of March 29. This response will be on behalf of Intel and submitted on April 12, 1990. Weiss Associates has been requested to make a mathematical projection of the time to clean-up. This projection will be based upon theoretical considerations and associated assumptions to project a time for clean-up. Intel requests that these results be used and communicated to the Board and the public as non-field substantiated, theoretical assumptions.

TENTATIVE ORDER, FINDING 3

This finding should be retitled as "site chronology" and include both the 1982 request by the RWQCB for groundwater data and the Fall 1984 approval by the Executive Officer for the interim clean-up plan, and implemented by Intel.

TENTATIVE ORDER, FINDING 6

The issue of false positives from laboratory data regarding B-zone samplings was discussed. It was agreed that the language used in the staff report would be inserted into the discussion in the Tentative Order in Finding 6.

TENTATIVE ORDER, FINDING 12

Subparagraph A discusses that the groundwater extraction will continue until drinking water quality is achieved, if feasible. The sentence following that one will be deleted. The paragraph will continue on beginning with the sentence, "Achieving drinking water quality if an ARAR..."

TENTATIVE ORDER - SPECIFICATIONS

- In Specification 4, include a column in the table which presents the current site concentrations.

- Specification 5 will be moved to the Findings section of the Order.

TENTATIVE ORDER - PROVISIONS C.5

The quarterly report will present appropriate tables and figures, based upon new information which is generated since the previous quarterly report. It will be the annual report that contains an overall summary for the year. Therefore, Subparagraph c, d, e and f should be modified to reflect the fact that the quarterly reports will only present the new information, as opposed to being repetitive in nature and continuing to present the same tables and figures each time.

TENTATIVE SELF-MONITORING PROGRAM SECTION E. PARAGRAPH 4

Intel requests that this paragraph be modified to be consistent with CERCLA and require a five year review process, as opposed to establishing a set 25 year monitoring requirement. The status of the site should be reviewed each five years to determine whether any additional efforts are necessary, as opposed to pre-establishing a 25 year monitoring requirement.

Intel appreciates the opportunity to meet with the RWQCB and discuss this proposed Order. It is our understanding that this Order will be presented at the April 18, 1990 Board meeting. At this time, the Order will be open for a 30-day public comment period.

If you would like to discuss or have any questions regarding the information contained in this letter, please feel free to contact either John Masterman at (916) 351-5529 or me at (602) 869-4812.

Sincerely,

Terrence J. McManus

Terrence J. McManus, P.E.
Manager, Corporate Environmental, Health and Safety

CC: Bruce Wolfe
Jim Thompson
Mary Stallard
Bryan Rector
Bill McIlvride
John Masterman