United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R09-90/046
June 1990

EPA

Superfund
Record of Decision:

Watkins-Johnson (Stewart Division), CA

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R09-90/046	2.	3. Recipient's Accession No.
4. Title and Subtitle SUPERFUND RECORD OF DECISION Watkins-Johnson (Stewart Division), CA First Remedial Action - Final			5. Report Date 06/29/90
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Orgainization Name and Address			10. Project/Task/Work Unit No.
			11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000
			14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Watkins-Johnson site is an active research and development, manufacturing, and industrial complex in Santa Cruz County, five miles north of Santa Cruz, California. The Watkins-Johnson Company has owned and operated the complex since 1963, conducting such activities as: metal machining, degreasing, metal plating, and photo laboratory activities. During these activities, a variety of organics, inorganics and metals were used. In 1984, Regional authorities found TCE and TCA in the Watkins-Johnson wastewater disposal system. Further investigations revealed soil contamination at the site and ground water contamination in the Santa Margarita aquifer underlying the site. The aquifer has been designated a sole-source aquifer used for drinking water, and is comprised of a perched zone and a regional zone. In addition, the aquifer is easily accessible for drinking water supplies and for contamination from the ground surface. The primary contaminants of concern affecting the soil and ground water are VOCs including PCE and TCE, and metals including silver.
(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - Watkins-Johnson (Stewart Division), CA
First Remedial Action - Final
Contaminated Media: soil, gw
Key Contaminants: VOCs (PCE, TCE), metals (silver)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 50
	20. Security Class (This Page) None	22. Price

(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 soil vapor (vacuum) extraction with pretreatment of extracted vapors using GAC prior to ambient discharge; capping and grading contaminated soil areas to minimize the potential for mobilization of soil contaminants to the ground water; installing infiltration leachfields to prevent offsite migration of ground water contaminants in the perched zone; installing gravity drains to transfer the contaminated ground water from the perched zone to the regional aquifer zone for subsequent extraction; ground water pumping and onsite treatment to remove contamination from both the perched and regional zones using GAC adsorption with offsite regeneration of spent carbon; discharge of treated water onsite for industrial and consumptive use, offsite to surface water, and onsite to recharge the perched zone; and ground water monitoring. The estimated present worth cost for this remedial action is $2,156,243, which includes an estimated annual O&M cost of $167,820.

PERFORMANCE STANDARDS OR GOALS: Ground water treatment standards for both the perched and regional zones were based on chemical-specific SDWA MCLGs or the more stringent of SDWA MCLs or PMCLs and State MCLs, thereby achieving a residual risk of 10^{-4} to 10^{-6}. Chemical-specific goals include PCE 0.005 mg/l (PMCL) and TCE 0.005 mg/l (MCL). Soil remediation will ensure that soil no longer poses a threat to the ground water; however, no chemical-specific goals have been set for the soil.

RECORD OF DECISION

WATKINS-JOHNSON SUPERFUND SITE
SCOTTS VALLEY, CALIFORNIA

RECORD OF DECISION
DECLARATION STATEMENT

SITE NAME AND LOCATION

Watkins-Johnson Superfund Site
Scotts Valley, California

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Watkins-Johnson Superfund site located in Scotts Valley, California, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §9601, (CERCLA) and, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, 55 Fed. Reg. 8666 (NCP). This decision is based on the administrative record for this site.

The State of California has no objection to the technical aspect of 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, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The selected remedy for the Watkins-Johnson site addresses groundwater contamination, in which trichloroethylene is the primary contaminant of concern. Other contaminants detected in groundwater at concentrations exceeding the selected treatment standards include vinyl chloride, tetrachloroethylene, 1,1-dichloroethylene, 1,1-dichloroethane, 1,4-dichlorobenzene, cis-1,2-dichloroethylene, and silver. The selected remedy also addresses an area of soil contaminated with volatile organic chemicals including 1,1-dichloroethylene, cis-1,2-dichloroethylene, tetrachloroethylene, methylene chloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene and chloroform.

This action represents the final remedial action to remove contaminants from groundwater and soil. Several response measures were previously performed at the site by Watkins-Johnson. The major components of the selected remedy will:

Table of Contents

List of Figures

List of Tables

DECISION SUMMARY

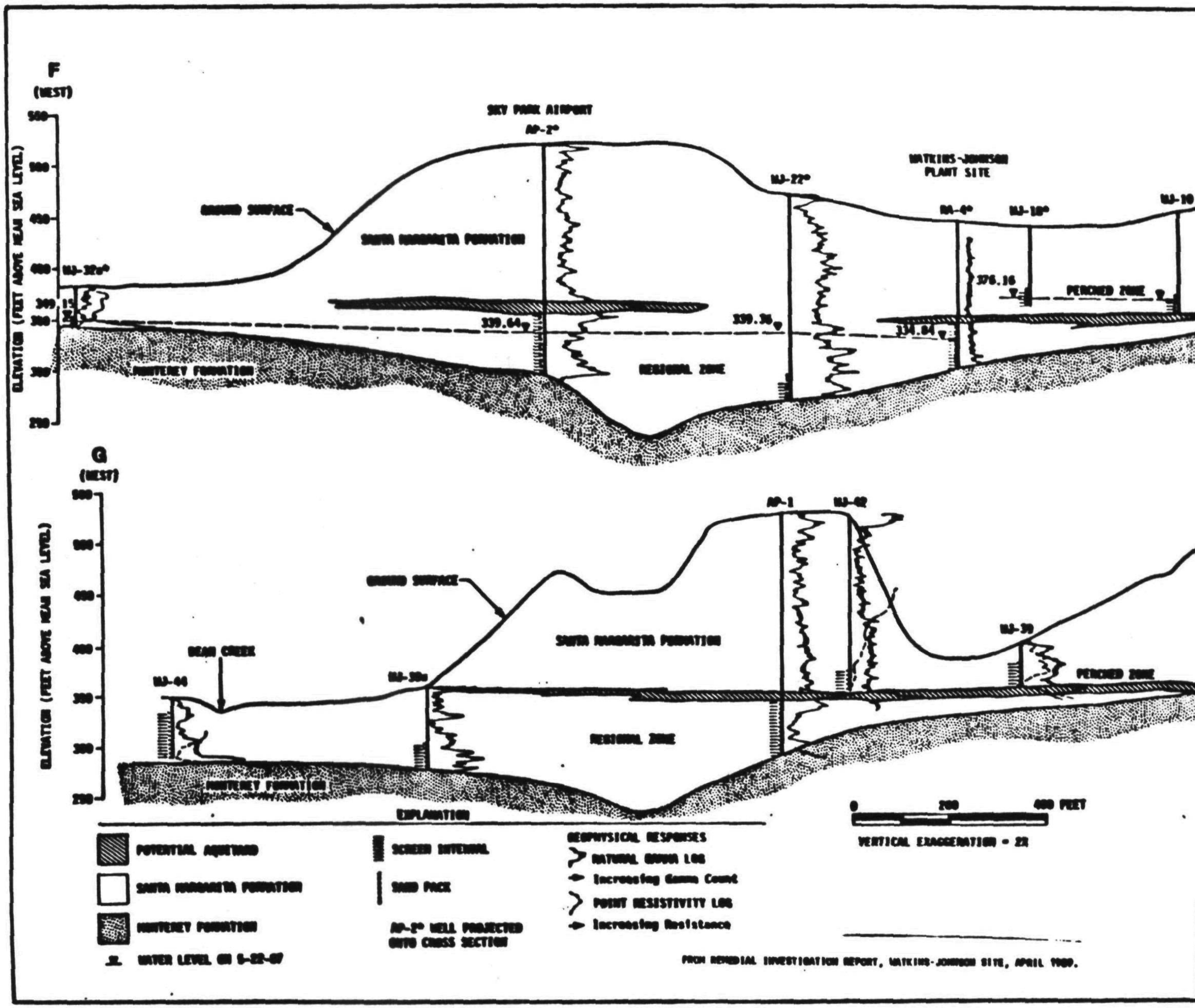
I. SITE DESCRIPTION

The Watkins-Johnson Superfund site (the site) is located in Santa Cruz County, approximately 5 miles north of the City of Santa Cruz, in a small valley located west of the city of Scotts Valley, east of Sky Park Airport, and southwest of the Santa Cruz Mountains (Figure 1). This area is considered to be within the California Coast Range and is in close proximity to California's Pacific coastal zone.

The elevation at the Watkins-Johnson site is approximately 460 feet above mean sea level (MSL). The area north of the site is comprised of forested mountains that are incised by numerous stream channels. Surface elevations within this mountainous area range from 400 to 1,200 feet above MSL. The area south of the site is comprised predominantly of rolling grassy hills with surface elevations ranging from 560 to 800 feet above MSL.

Several creeks drain the region. These include Bean Creek, Carbonera Creek, Lockhart Gulch, Ruins Creek, and Zayante Creek. Bean Creek, a tributary to Zayante Creek, crosses north of the site and roughly divides the major aquifer, the Santa Margarita, into northern and southern portions. Both Zayante and Carbonera Creeks drain into the San Lorenzo River, which is west of the site. The San Lorenzo River flows southward and eventually enters the Pacific Ocean at Monterey Bay.

The Santa Margarita aquifer which underlies the site, is a major source of groundwater for the Camp Evers, Scotts Valley, and Mission Springs areas. EPA designated the Santa Margarita aquifer as a sole source aquifer, used for drinking water. In the Scotts Valley area, the aquifer is unconfined, and the Santa Margarita Formation crops out over much of the land surface. In the immediate vicinity of the Watkins-Johnson site, the Santa Margarita aquifer is comprised of a perched zone in addition to the regional zone (Figure 2). The perched zone is elevated about 35 feet above the regional zone. The aquitard which supports the perched groundwater and separates the two zones is a moderately cemented conglomerate. The aquifer is accessible for development of drinking water supplies and for contamination by chemicals migrating from the ground surface.



HYDROGEOLOGIC CROSS SECTIONS F-F' AND G-G'

FIGURE 2

III. COMMUNITY PARTICIPATION ACTIVITIES

EPA has maintained three information repositories containing the Community Relations Plan, RI/FS Reports, technical documents, fact sheets, and other reference material. These repositories are located at the Scotts Valley Branch of the Santa Cruz Public Library, the Scotts Valley Water District Office, and the Scotts Valley Wastewater Division Office. In addition, the entire Administrative Record is available at the Scotts Valley Branch Library. The availability of these documents, as well as the announcement of a public comment period extending from February 14, 1990 until April 14, 1990 was published in the Santa Cruz Sentinel on February 7, 1990 and in the Scotts Valley Banner on February 14, 1990.

On February 28, 1990, EPA representatives briefed members of the Scotts Valley Town Council on the Proposed Plan for remediation of the site. In addition, a public meeting was held on March 7, 1990, at which EPA representatives presented the Proposed Plan for the site and answered questions. A response to comments received during the public comment period is included in the Response Summary, which is part of this Record of Decision (ROD).

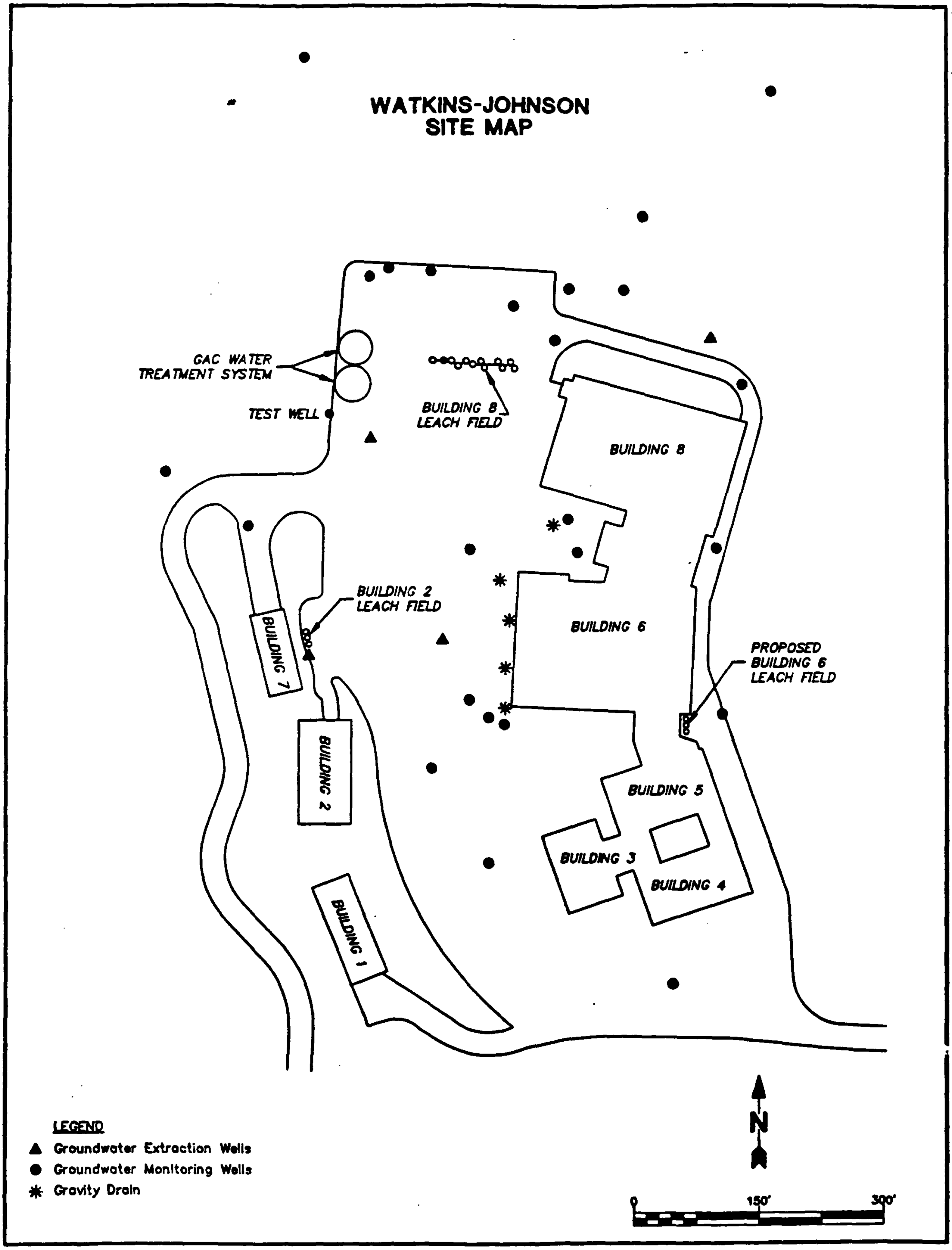

WATKINS-JOHNSON
SITE MAP
GAC WATER
TREATMENT SYSTEM
TEST WELL
BUILDING 8
LEACH FIELD
BUILDING 8
BUILDING 2
LEACH FIELD
BUILDING 7
BUILDING 6
PROPOSED
BUILDING 6
LEACH FIELD
BUILDING 2
BUILDING 5
BUILDING 3
BUILDING 4
BUILDING 1
LEGEND
Groundwater Extraction Wells
Groundwater Monitoring Wells
Gravity Drain
N
0
150'
300'

FIGURE 3

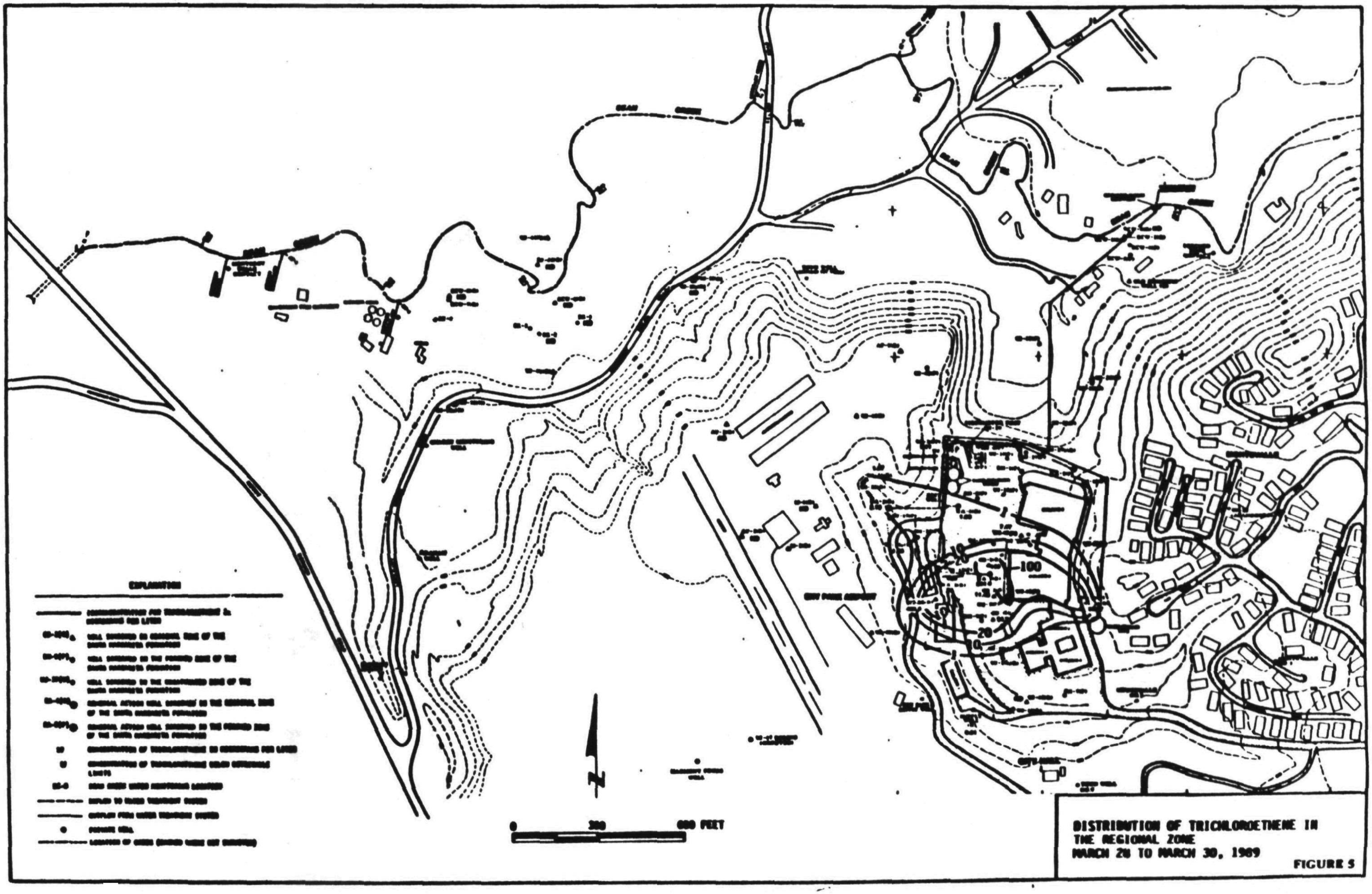
- TCE is the major contaminant of concern in the perched zone. The area consistently containing the highest concentrations is near the former Building 6 dilution tank. TCE values analyzed from groundwater samples in this area range from 34 to 13,000 ug/l. In addition to TCE, 1,1-dichloroethylene (1,1-DCE) and vinyl chloride are constituents of interest for the perched zone (Table 1). Detection of 1,1-DCE in concentrations equal to or greater than 2 ug/l was limited to test wells on the edge of the TCE plume. Vinyl chloride was detected in three wells in September 1988.

- TCE was the major contaminant detected in the regional zone together with lesser concentrations of 1,1,1-trichloroethane (1,1,1-TCA), 1,2-DCE, and 1,1-DCE (Table 1). The concentrations of TCE formed a narrow cigar-shaped plume which extended to the northwest, to Bean Creek in May 1987 (Figure 4). The highest concentrations of TCE were north of the Building 6 dilution tank area. Data collected since the initiation of aquifer restoration indicate that the contaminant plume, within the regional zone, has steadily diminished and is now contained almost entirely within the plant area (Figure 5).

- Six private wells have been found north of the Watkins-Johnson site that are considered potential receptors. These wells are located downgradient from the site in the generally northward flow path of the perched zone. However, not only has the TCE distribution, which is limited to the plant area, not changed in extent over time, but the present aquifer restoration control scheme is preventing northward flow of contamination toward these wells.

- The aquifers in the Monterey and Lompico formations underlie the contaminated Santa Margarita Formation. There is an apparent upward gradient from the Lompico to the Monterey, which indicates that the potential for contaminants to flow from the Santa Margarita to the Monterey or Lompico in the vicinity of the plume is very small.

- Bean Creek is directly connected to the perched zone in the area upstream from Ruins Creek extending at least to the point where treated water is discharged to Bean Creek. Downstream from Ruins Creek, Bean Creek is hydraulically connected to the regional aquifer. Although contamination had previously been found in Bean Creek, more recent sampling shows contamination is below detection limits.



DISTRIBUTION OF TRICHLOROETHENE IN THE REGIONAL ZONE
MARCH 28 TO MARCH 30, 1989

FIGURE 5

The third step of the risk assessment is the toxicity assessment. Chemicals present at this site include both carcinogens and non-carcinogens. Three contaminants are of concern based on their potential ability to cause cancer: TCE is a Group B-2 agent, probable human carcinogen; 1,1-DCE is a Group C Agent, possible human carcinogen; and vinyl chloride is a Group A Agent, known human carcinogen. These classifications are based on the strength of scientific evidence that these agents may be carcinogenic. For TCE, there is sufficient evidence of carcinogenicity in animals, and inadequate evidence that the compound is carcinogenic in humans. For 1,1-DCE, there is only limited evidence the compound is carcinogenic in animals and the available evidence on humans is inadequate. For vinyl chloride, there is sufficient evidence of carcinogenicity in animals and humans. Cancer Potency Factors (CPFs) have been developed by the EPA's Carcinogenic Assessment Group (CAG) for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of mg/kg-day, are multiplied by the estimated intake of a potential carcinogen in milligrams per kilogram per day (mg/kg/day) to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risks highly unlikely. CPFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Several non-carcinogenic chemicals have been identified to be chemicals of concern at this site. Reference doses (RfDs) have been developed by the EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting non-carcinogenic effects. The RfD is an estimate, with an uncertainty of perhaps an order of magnitude, of a lifetime daily exposure for the entire population (including sensitive individuals) that is expected to be without appreciable risk of deleterious effects. Estimated intake of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to RfDs. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effect on humans). These uncertainty factors help ensure that the RFDs will not underestimate the potential for adverse non-carcinogenic effects to occur.

The last step in the risk assessment process is the risk characterization. At this point the information from the proceeding steps is combined to determine if an excess health risk is present at the site. Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factors. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper-bound, an individual has a one in one million tial endangerment to wildlife in the vicinity of the site which might occur due to contamination of Bean Creek. Based on the more recent rounds of surface water sampling, no contaminant concentrations have been detected in Bean Creek. Furthermore, the ongoing aquifer restoration begun in October 1986 has significantly reduced the extent of the groundwater contaminant plume so that it no longer intercepts or threatens to intercept Bean Creek.

There is no evidence, based on the survey, that any fish or wildlife trust resources inhabit the property. The industrial nature of the property and extensive coverage of soil by buildings and pavement prevent potential exposure of migratory birds to contaminated soil. The failure to detect volatile organic compounds in Bean Creek downstream of where the groundwater intercepts the creek suggests that aquatic life in the creek is not presently at risk from site-related contaminants.

perched zone gravity drains plus the Building 8 leachfield, gravity drains plus Building 8, 2, and 6 leachfields and the Test Well (existing well to be used for extraction), and gravity drains plus Building 8, 2, and 6 leachfields and soil flushing at the former Building 6 dilution tank.

Groundwater Extraction: This technology uses a combination of existing and new extraction wells to create a cone of depression to capture and remove the contaminant plume from the regional aquifer. Groundwater extraction from the perched zone has been shown to be difficult due to the local hydraulic characteristics and dewatering problems. There is currently one perched zone extraction well on-site that is operated intermittently and is considered a part of this option.

No Action: The no-action option represents a baseline against which the other alternatives are compared. No effective remedial strategies would be implemented in either the perched or regional zones. Existing gravity drains would be plugged, infiltration through the existing leachfield would be discontinued, and existing extraction wells would be abandoned. Contaminated groundwater would be allowed to migrate off-site and into Bean Creek.

Perched zone groundwater would migrate northward, leaking into the regional zone and eventually discharging into Bean Creek. This option provides no mitigation of existing risks, and would allow other areas to be impacted. These conditions would persist indefinitely until the contaminant plume had been diluted, completely discharged, or reduced by natural biological and chemical processes.

Groundwater Treatment

Several processes have been evaluated to remove chlorinated hydrocarbons from extracted groundwater consistent with the existing National Pollution Discharge Elimination System (NPDES) permit and as a requirement for discharge in conjunction with other disposal methods. The treatment technologies described below include granular activated carbon (GAC) adsorption, air stripping, and ultra violet (UV) oxidation. The no-action option is also summarized.

Granular Activated Carbon (GAC) Adsorption: This technology uses large volumes of GAC to filter contaminated groundwater. The filtration bed would be replaced with fresh GAC as necessary for the effective removal of contaminants; the spent GAC would be regenerated off-site. The current GAC treatment system on-site consists of two pressurized vessels each containing 20,000 pounds of GAC. The units are operated in a continuous mode with groundwater pumped directly into the distribution system at 20 pounds per square inch gauge (psig).

GAC is very effective in removing chlorinated hydrocarbons from water provided that the carbon is replaced periodically. The existing system has been shown to treat groundwater down to

Treated Water End Use

Watkins-Johnson currently uses treated groundwater in three ways: on-site industrial and drinking water, off-site discharge to Bean Creek, and recharge to the perched zone. Concern has been raised that the water currently discharged to Bean Creek could be used as an off-site drinking water supply to offset existing groundwater pumpage. At this time, we estimate that only 25 gallons per minute of treated groundwater will be discharged to Bean Creek; this is the estimated minimum flow necessary to maintain the habitat and support aquatic life. If the estimated volume of the discharge to Bean Creek should increase significantly, EPA may consider designating other uses for the treated effluent. Such a change may be reflected in an Explanation of Significant Difference or other appropriate document. A change in the designated use of the treated effluent may include the off-site domestic use of treated groundwater in conjunction with the Creek discharge. The discharge to Bean Creek is an off-site discharge for which Watkins-Johnson must continue to obtain all appropriate permits, including an NPDES permit from the Regional Board, and comply with all applicable State and federal laws.

Source Control

The Risk Assessment prepared for this site indicates that existing soil contamination poses no significant risk to human health or the environment through direct contact. However, direct exposure may occur as a result of on-site excavation. In addition, existing contamination continues to threaten groundwater quality. Contamination has not been identified within the uppermost fifteen feet of soil. Most areas of detected soil contamination are beneath asphalt caps which significantly reduce the downward mobility of the residuals. The highest concentrations of soil contamination are in the area of the former Building 6 dilution tank. The detailed analysis evaluated four source control options. These were treatment by vapor extraction, by soil flushing, stabilization by capping and grading, and the no action option. A source control option(s) will be required to treat soils to a level that no longer presents a threat to the groundwater.

Soil Vapor Extraction: This technology uses a suction to remove organic contaminants from the soil matrix. A vacuum is applied to a dry well screened in the contaminated vadose zone. The vacuum applied is sufficient to cause residual contaminants to partition from the soil matrix into the soil gas and be evacuated from the well. Soil vapor may be treated at the surface to remove organic constituents prior to ambient discharge.

A pilot system operated at the site of the former Building 6 dilution tank indicated that soil vapor extraction is capable of removing small quantities of residual soil contamination. Effluent from the pilot system contained such small quantities of contaminants that health-based risk from this source would be negligible. However, a full-scale vapor extraction operation groundwater from both the perched and regional zones; GAC adsorption to treat the extracted groundwater; soil vapor extraction to remove VOCs from the soil; capping and grading to minimize the potential for mobilization of soil contaminants to the groundwater; and on-site industrial and consumptive use of treated water, off-site discharge to Bean Creek, and on-site recharge to the perched zone.

The capital cost for this alternative is estimated to be $837,738; the annual operation and maintenance cost (O&M) is estimated to be $167,820. The present worth of this alternative is estimated to be $2,156,243.

Alternative 2: This alternative includes the use of leachfields to control movement of the perched zone contaminant plume; gravity drainage to transfer perched zone contamination to the regional zone; groundwater extraction to remove contaminated groundwater from both the perched and regional zones; air stripping to treat the extracted groundwater with GAC adsorption to treat air emissions; soil vapor extraction to remove VOCs from the soil; capping and grading to minimize the potential for mobilization of soil contaminants to the groundwater; and on-site industrial and consumptive use of treated water, off-site discharge to Bean Creek, and on-site recharge to the perched zone.

The capital cost for this alternative is estimated to be $611,938; the annual operation and maintenance cost (O&M) is estimated to be $167,820. The present worth of this alternative is estimated to be $1,930,443.

Alternative 3: This alternative includes the use of leachfields to control movement of the perched zone contaminant plume; gravity drainage to transfer perched zone contamination to the regional zone; groundwater extraction to remove contaminated groundwater from both the perched and regional zones; UV oxidation to treat the extracted groundwater; soil vapor extraction to remove VOCs from the soil; capping and grading to minimize the potential for mobilization of soil contaminants to the groundwater; and on-site industrial and consumptive use of treated water, off-site discharge to Bean Creek, and on-site recharge to the perched zone.

The capital cost for this alternative is estimated to be $703,938; the annual operation and maintenance cost (O&M) is estimated to be $139,000. The present worth of this alternative is estimated to be $1,796,171.

Reduction of Toxicity, Mobility, or Volume Through Treatment

All three alternatives use treatment to permanently and significantly reduce the toxicity, mobility or volume of contaminants in both the soil and groundwater. Therefore, all three satisfy the statutory preference for remedies utilizing as a principal element treatment that significantly reduces the toxicity, mobility or volume of the hazardous substance.

Short Term Effectiveness

Alternative 1 performs best under this criterion because it poses the least risk to human health and the environment during implementation. Although Alternative 3 has the potential to be equally effective in the short term, no data is currently available to indicate whether implementation would pose any risk to human health and the environment. Alternative 2, using treatment by air stripping and GAC adsorption, has the potential for posing impacts to human health and the environment during implementation. While air stripping is capable of treating to nondetectable levels and permanently destroying the removed contaminants, a large influent contaminant concentration could exceed the design capacity of the stripper, allowing effluent discharges in excess of the treatment standards. All the remedial alternatives will achieve their remediation goals within similar time frames.

Implementability

The three alternatives perform equally under this criterion. The administrative and technical feasibility of each of the alternatives is comparable.

Cost

Alternative 3 is the least costly alternative. Alternative 1 is the most costly alternative.

State Acceptance

It is believed that the State would accept any of the three alternatives evaluated.

Community Acceptance

It is believed that the community would accept any of the three alternatives evaluated.

In the case of zinc, the only number available was the Secondary federal MCL, and this number was selected as the treatment standard. For several chemicals (1,2-dichlorobenzene, cadmium and lead), only proposed MCLs or MCLGs exist, and these values were chosen as treatment standards. In the case where no federal MCLGs, federal MCLs or State MCLs are promulgated or proposed, then the State Action Level or Applied Action Level was selected as the treatment standard. This was the case for 1,1-dichloroethane. In the case of nickel, the only value available was an EPA Health Advisory, and this value was selected as the treatment standard. In the case of vanadium, no values were identified for selection as treatment standards. However, this chemical was only detected in 1 of 21 perched zone samples and 2 of 32 regional zone samples, and was, thus, eliminated from further consideration.

The following compounds were detected in groundwater at concentrations exceeding their selected treatment standards: trichloroethylene, vinyl chloride, tetrachloroethylene, 1,1-dichloroethylene, 1,1-dichloroethane, 1,4-dichlorobenzene, cis-1,2-dichloroethylene and silver. Treatment to the specified standards will result in a residual risk within the range of 10^{-4} to 10^{-6}.

Health-based ARARs pertaining to soil contamination are not available for the site. The soil contamination will be remediated to a level that no longer poses a threat to the groundwater. This alternative also complies with the Monterey Bay Unified Air Pollution Control District (MBUAPCD) Rule 1000 which is applicable to any air emissions associated with this remedial action.

The land disposal restrictions of Subtitle C of the Resource Conservation and recovery Act (RCRA) are not ARAR for this remedial action. The treatment technology used in this alternative will treat the contaminated groundwater to nondetectable levels. Once the groundwater is so treated, it no longer contains hazardous waste and no longer is subject to regulation under Subtitle C of RCRA.

Technical Aspects of the Selected Remedy

The selected remedy for the site involves several components, including containment and removal of contaminated groundwater within the perched and regional zones, treatment of extracted groundwater, and implementation of limited source control measures. The costs for the selected remedy are summarized in Table 8.

At several points during the discussion of the selected remedy, specific remedial designs are referenced including the number and general location of gravity drains, extraction wells, and leachfields; the pumping rates of extraction wells; the discharge rate from the GAC system; the method of discharge from the GAC system; etc. EPA recognizes that specific engineering tures a major portion of the regional zone contaminant plume. The well on the airport property will be used to capture any portion of the contaminant plume that migrates beyond the influences of the on-site extraction wells. Groundwater quality monitoring will be necessary to ensure that contaminant levels remain below the treatment standards and to evaluate the progress of the remedy. It is estimated that this system will require 8 years to reach the treatment standards in the regional zone.

The total pumping rate for the four extraction wells during the fourth quarter of 1989 was 209 gallons per minute (gpm); however, the total projected pumping rate is estimated to be 110 gpm. The pumping rate is likely to change during the remedial action process. Once the regional zone contaminant plume concentrations have reached the treatment standards, the extraction wells will be shut down. This will result in the dissipation of the cone of depression and a return to natural flow conditions. Continued groundwater quality monitoring on at least a quarterly basis will occur to ensure that contaminant levels remain below the treatment standards. The specific details of the groundwater monitoring program and the long term O&M requirements will be determined during the RD/RA phases.

Contaminated groundwater removed by the 5 extraction wells will be treated using a GAC adsorption system. This system is already on site and operating.

The on-site GAC system treats contaminant concentrations to non-detectable levels. Effluent from the GAC system is discharged in three manners: on-site use at the Watkins-Johnson plant, on-site recharge through leachfields to maintain the perched zone groundwater mounds, and off-site discharge to Bean Creek. Discharge to Bean Creek is an off-site activity; therefore, Watkins-Johnson must comply with all applicable laws and obtain all applicable permits for this discharge.

Table 8 indicates the current (based on fourth quarter 1989 data) and projected water use rates for effluent from the GAC system. Discharge to Bean Creek is considered a beneficial use of a relatively minimal amount of water. This water assists in maintaining flow within Bean Creek, thereby protecting the associated natural habitat.

Based on the Risk Assessment, there is no significant risk posed to human health or the environment by leaving currently documented, residual soil contamination in place. However, by using source control measures and preventing further release of contaminants from soil to groundwater, the overall time for the groundwater remedy will be reduced. This will be accomplished through soil vapor extraction and capping and grading.

Using this method, a vacuum is applied to a dry well screened in the contaminated portion of the vadose zone. The applied vacuum is sufficient to cause residual contaminants to partition from the soil matrix into the soil gas and be evacuated

X. STATUTORY DETERMINATIONS

The selected remedial action is protective of human health and the environment. For each pathway of exposure at the site, the remedy eliminates, reduces or controls the risks posed. The overall site risk will be reduced to within the 10^{-4} to 10^{-6} range for carcinogens and the Hazard Indices for non-carcinogens will be less than one. Implementation of the remedy will cause no unacceptable short-term risks or cross-media impacts.

The selected remedial action complies with all federal and State ARARs. These ARARs are listed on Tables 5 and 6, attached to and incorporated herein by reference.

The selected remedial action is cost-effective. The overall effectiveness of the selected remedial action is proportional to its cost, in that it represents a reasonable value for the money to be spent.

As discussed in the Comparison of Alternatives Section of this ROD, the selected remedy utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy provides the best balance of tradeoffs among the alternatives with respect to the evaluation criteria, especially the five balancing criteria. The selected remedy was superior to the other alternatives under the long-term effectiveness and permanence and short-term effectiveness criteria. All the remedial alternatives evaluated in the remedy selection process were acceptable to the State and the community.

The selected remedial action satisfies the statutory preference for selecting remedies in which treatment that permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants and contaminants is a principal element. The remedial action uses treatment to address the contaminated groundwater, which is the principal threat posed by the site. GAC adsorption will remove volatile organic chemicals from the groundwater and will achieve a permanent and significant reduction of the toxicity, mobility or volume of the contaminants. Similarly, vacuum extraction followed by vapor-phase GAC adsorption will remove volatile organic chemicals from contaminated soil, thereby also meeting the statutory preference.

XII. RESERVATION OF RECORD

The precise identification of long-term operation and maintenance activities and the use of engineering and institutional controls, the details of an ongoing groundwater monitoring program, and the costs of each of these activities will be identified during the RD/RA phase for the site.

RESPONSE SUMMARY

The Proposed Plan for the Watkins-Johnson site was issued to the public and announced that the public comment period would extend from February 14, 1990 through April 14, 1990. The Proposed Plan described EPA's preferred remedial alternatives for contaminated groundwater and soil at the site. On February 28, 1990, EPA briefed members of the Scotts Valley Town Council on the Proposed Plan, and on March 7, 1990 EPA presented the Proposed Plan at the public meeting.

SUMMARY OF COMMENTS RECEIVED

During the public comment period, EPA received only two letters regarding the Proposed Plan for the site. One comment letter, dated February 28, 1990 was provided by a group of residents from a local condominium mobile home park, and second comment letter, dated April 13, 1990, was provided by the Watkins-Johnson Company. The Chairman of the Board of Directors for the same residents group also provided verbal comment during the public meeting. EPA received written comments on the proposed remedy from the California Department of Health Services and the Central Coast Region of the California Regional Water Quality Control Board. The substantive comments and EPA's responses are summarized below.

Residents Group Comment:

The residents group requested access to that effluent from the on-site GAC system which is currently being discharged to Bean Creek, in order to help to help satisfy their water supply needs. Based on their calculations, the group estimated that with access to this water they could cut back their demands on the Santa Margarita aquifer, thereby saving approximately 280 ac/ft per year. The group pointed out that the transfer of this water was a relatively simple matter and that the distance involved was less than 100 yards.

EPA Response:

EPA considered, but rejected at this time, the residents' proposed option of allowing the treated effluent to be used as a public water supply source rather than discharging the treated effluent into Bean Creek. The residents' calculations were based on a discharge rate of 187 gpm from the on-site GAC system to Bean Creek. However, the current discharge rate to Bean Creek is 157 gpm, and the projected discharge rate is estimated to be 25 gpm. Based on the projected discharge rate to Bean Creek, EPA has determined that continued discharge to Bean Creek is a beneficial use of this water, as it assists in maintaining flow within the Creek, thereby protecting the associated natural habitat. In the event that the actual discharge to Bean Creek significantly exceeds the estimated 25 gpm rate, EPA may consider changing the designated method of disposal of the treated ef-

"This section of the ROD remedy selection should mention that some changes may be made to the remedy as a result of the the remedial design and construction process. The ROD should include a clear statement that such changes in general, reflect modifications resulting from the engineering design process."

EPA Response:

EPA acknowledges the comment and has incorporated it into the "Selected Remedy" section of the ROD. The Selected Remedy specifies requirements regarding gravity drains and extractions wells; however, provisions have been included in the event that engineering modifications are required during RD/RA.

4. WJ pointed out that recent computer modeling indicates that the rate of groundwater extraction and the rate of discharge from the GAC system can be decreased, while still allowing for effective containment of the contaminant plume.

EPA Response:

EPA has revised the "Selected Remedy" section of the ROD to clarify that engineering details such as the rate of groundwater extraction and discharge may be determined during the RD/RA.

5. WJ pointed out that the exposed area of residual soil contamination which the Proposed Plan requires to be capped, has already been capped. Therefore, WJ felt that this section of the Proposed Plan was no longer required.

EPA Response:

EPA has addressed this change in site condition in the "Documentation of Significant Changes" section of the ROD. Although the cap component of the preferred alternative identified in the Proposed Plan has been completed, the remedy selected in this ROD maintains a cap as a component of the remedial action. The ROD incorporates the cap component to ensure that the cap is maintained as part of the remedial action.

6. WJ proposed groundwater treatment standards consisting of MCLs at the property line with a goal of five times the MCL inside the property line or until a zero slope occurs on the groundwater concentration vs. time graph for a period of one year. WJ supported this comment with the following statement taken from an October 18, 1989 memorandum from Jonathan Z. Cannon, OSWER Acting Assistant Administrator:

"In many cases it may not be possible to determine the ultimate concentration reductions achievable in the groundwater until the groundwater extraction system has been implemented and monitored for some period of time.

"Here Watkins-Johnson has already spent over $50,000 on vapor extraction. This effort was cost-effective at the outset -- eight kilograms of contaminant mass were extracted in the first few weeks. However, after that, the effectiveness of the remedy dropped off quickly, to the point where only 20 grams per day were being removed. Therefore, the incremental costs of removing the remaining mass will be proportionally high compared with the effectiveness of the process. Unless EPA identifies a soil cleanup goal, it is not possible to perform the cost-effectiveness analysis that the NCP requires. Because EPA has already concluded that soil contamination presents no health hazards, EPA should follow its guidance document entitled "Determining Soil Response Action Levels Based on Potential Contaminant Migration to Groundwater," EPA/540/2-89/057/, Oct. 1989."

EPA Response:

On May 8, 1990 representatives from WJ, EPA and DHS met to discuss the issue of whether soil vapor extraction is needed as part of the remedial action at the site. WJ representatives presented evidence to document that vapor extraction was no longer necessary. EPA and DHS representatives both agreed, however, that existing information is not adequate to document that contamination in the vadose zone is not a continuing source of contamination of the groundwater. Therefore, EPA has selected a remedial action that includes soil vapor extraction as a component. However, WJ may provide technical information to EPA during the remedial design stage to show that vapor extraction is no longer necessary. EPA will consider such information and decide whether any change of a component of the selected remedial action is warranted. Such a change would be reflected in an Explanation of Significant Differences or other appropriate document.

EPA can provide WJ with a numerical model developed to approximate the leaching of soil contaminants to the groundwater. This model may be calibrated and used with site-specific data to aid in determining when residual soil contamination no longer poses a threat to groundwater.

California Regional Water Quality Control Board, Central Coast Region (The Regional Board) Comments:

1. The Regional Board submitted comments to EPA strongly objecting to any change to the remedial action allowing a cleanup standard less stringent than State or federal drinking water standards. The Regional Board referred to the Cleanup and Abatement Order it issued to WJ in 1986 which required the company to attain approximately one-half the level of the present MCLs. The Regional Board urged a conservative approach in establishing cleanup levels due to the aquifer's designation as a sole source aquifer.

3. DHS commented that the California Environmental Quality Act (CEQA) should be included as an ARAR for the WJ site.

EPA Response:

EPA has determined that the requirements of CEQA are no more stringent than the requirements for environmental review under CERCLA, as amended by SARA. Pursuant to the provisions of CERCLA, the NCP and other federal requirements, EPA's prescribed procedures for evaluation of environmental impacts, selecting a remedial action with feasible mitigation measures, and providing for public review, are designed to ensure that the proposed action provides for the short-term and long-term protection of the environment and public health and hence perform the same function as and are substantially parallel to the State's requirements under CEQA.

Since EPA has found that CERCLA, the NCP, and other federal requirements are no less stringent than the requirements of CEQA, EPA has determined that CEQA is not an ARAR for this site.

EPA will continue to cooperate with DHS and other State and federal agencies during the design phase of the remedial action to clarify further environmental review and mitigation requirements and ensure that they are fulfilled.

Table 1

Concentrations of Contaminants at the Watkins-Johnson Site

Chemical	Ground Water, mg/L						Soil, mg/kg		
	Perched Zone			Regional Zone					
	Maximum[1]	Mean[2]	Detects[3]	Maximum	Mean	Detects	Maximum	Mean	Detects
Organics									
Chloroform	7.0E-3	1.1E-3	2/73	2.0E-3	5.2E-4	4/81	6.1E-1	5.3E-2	6/9
1,2-Dichlorobenzene	4.0E-3	1.7E-3	19/73	7.5E-4	4.8E-4	3/81	---[4]	---	ND[5]
1,4-Dichlorobenzene	8.0E-3	1.3E-3	15/73	---	---	ND	---	---	ND
1,1-Dichloroethane	1.0E-2	2.0E-3	34/73	3.0E-3	5.5E-4	11/113	---	---	ND
1,1-Dichloroethene	1.1E-2	1.8E-3	23/73	7.5E-3	8.2E-4	14/81	1.0E-1	3.5E-2	1/3
cis-1,2-Dichloroethene	5.3E-2	5.1E-3	37/73	8.0E-3	7.5E-4	22/113	8.9E-2	6.8E-2	1/1
Methylene Chloride	---	---	ND	---	---	ND	1.1E+1	1.9E+0	12/30
Tetrachloroethene	2.5E-2	4.2E-3	13/73	2.9E-2	9.8E-4	14/113	1.4E+0	2.5E-1	4/9
1,1,1-Trichloroethane	4.3E-2	2.8E-3	9/73	8.0E-3	7.2E-4	19/113	3.1E-1	1.2E-1	4/12
1,1,2-Trichloroethane	3.0E-3	1.1E-3	4/73	3.0E-3	5.5E-4	8/113	1.0E-1	4.5E-2	1/3
Trichloroethene	5.5E-1	4.6E-2	47/73	1.1E-1	9.0E-3	42/113	9.3E+0	1.8E-1	18/41
Vinyl Chloride	6.0E-3	1.3E-3	11/73	---	---	ND	---	---	ND
Metals									
Arsenic	1.7E-2	2.7E-3	2/21	---	---	ND	1.4E+0	1.4E+0	1/16
Barium	1.4E-1	3.1E-2	20/21	3.4E-2	7.3E-3	24/32	8.3E+1	4.5E+1	16/16
Cadmium	4.8E-3	1.7E-3	5/21	7.4E-3	1.5E-4	3/32	6.2E-1	1.2E-1	4/16
Chromium	1.4E-3	2.3E-2	12/21	3.4E-2	8.2E-3	3/32	1.1E+1	6.9E+0	16/16
Copper	2.7E-2	7.0E-3	2/21	1.4E-2	5.8E-3	1/32	5.6E+1	1.2E+1	16/16
Lead	1.0E-3	5.2E-4	1/21	---	---	ND	1.3E+0	8.6E-1	14/16
Mercury	2.0E-4	1.1E-4	2/21	2.0E-4	1.0E-6	1/32	---	---	ND
Nickel	3.7E-2	1.1E-2	9/21	6.9E-2	7.9E-3	2/32	6.7E+1	1.1E+1	14/16
Silver	1.2E-2	5.1E-3	11/21	6.1E-2	9.4E-3	21/32	7.5E+0	7.5E+0	1/16
Vanadium	1.3E-2	2.9E-3	1/21	6.7E-3	2.7E-3	2/32	1.1E+1	3.6E+0	13/16
Zinc	1.7E+0	1.1E-1	8/21	9.2E-1	1.7E-2	19/32	9.4E+1	2.2E+1	16/16

1 Maximum value detected
2 The concentration of each analyte reported as not detected was included in the computations as one-half the detection limit. Estimated concentrations of detected analytes included in the computation and duplicate samples are averaged
3 Number of samples above method detection limit/total number of samples
4 No value available
5 [illegible]

Table 3

Summary of Estimated Noncarcinogenic Risk at Watkins-Johnson Site (Maximally Exposed Individual)[1]

Exposed Population	Route	Medium	Subchronic	Chronic
Adult Residents (Well in Perched Zone)[2]	Ingestion	Ground Water	0.036	0.249
	Ingestion	Soil	0.000	0.000
	Dermal	Soil	0.001	0.001
	Total[3]		0.039	0.252
Child Residents (Well in Perched Zone)	Ingestion	Ground Water	0.063	0.435
	Ingestion	Soil	0.009	0.011
	Dermal	Soil	0.006	0.006
	Total		0.078	0.452
Adult Worker (Well in Perched Zone)	Ingestion	Ground Water	0.018	0.134
	Ingestion	Soil	0.001	0.002
	Dermal	Soil	0.002	0.002
	Total		0.021	0.138
Adult Residents (Well in Regional Zone)[4]	Ingestion	Ground Water	0.041	0.245
	Ingestion	Soil	0.002	0.002
	Dermal	Soil	0.001	0.001
	Total		0.044	0.248
Child Residents (Wel in Regional Zone)	Ingestion	Ground Water	0.072	0.428
	Ingestion	Soil	0.009	0.011
	Dermal	Soil	0.006	0.006
	Total		0.087	0.445
Adult Worker (Well in Regional Zone)	Ingestion	Ground Water	0.021	0.149
	Ingestion	Soil	0.001	0.002
	Dermal	Soil	0.002	0.002
	Total		0.024	0.153

1 Based on the upper-bound concentration estimates.
2 Based on a hypothetical drinking water well in the perched zone.
3 All routes, media.
4 Based on a hypothetical drinking water well in the regional zone.

Table 5

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE WATKINS-JOHNSON SITE

Standard, Requirement, Criteria, or Limitation	Description
Federal:	
Safe Drinking Water Act	Use of MCLs and MCLGs as treatment standards for current or potential drinking water source. See Table 6.
State:	
Air Resources Act	Establishes allowable discharge standards for point sources within each air pollution control district, and Ambient air Quality Standards.
Hazardous Substances Account Act/Hazardous Substances Cleanup Bond Act	Establishes state authority to clean up hazardous substance releases and compensate person injured by hazardous substances; establishes state "Superfund".
California Safe Drinking Water Act	Regulations and standards for public water systems; sets Maximum Contaminant Levels (MCLs) and Secondary MCLs (SMCLs) which are enforceable in California; requirements for water quality analyses and laboratories.
Porter-Cologne Water Quality Control Act	Establishes authority for State and Regional Water Boards to determine site-specific discharge requirements and to regulate disposal of waste to land.

Table 6
FEDERAL AND STATE GROUNDWATER ARARS AND TREATMENT STANDARDS
WATKINS-JOHNSON SUPERFUND SITE
(expressed in milligrams per liter)

Chemical	Maximum Detection	Federal MCLG[1]	Federal MCL[1]	CA-DHS MCL	CA-DHS Action Level	DHS Applied Action Level	Treatment Standard
Organics							
Chloroform	0.007	---	0.100[3]	---	---	0.006	0.100
1,2-Dichlorobenzene	0.004	0.600[2]	0.600[2]	---	---	0.130	0.600
1,4-Dichlorobenzene*	0.008	0.075	0.075	0.005	---	---	0.005
1,1-Dichloroethane*	0.010	---	---	---	---	0.005	0.005
1,1-Dichloroethylene*	0.011	0.007	0.007	0.006	---	---	0.006
cis-1,2-dichloroethylene*	0.053	0.070[2]	0.070[2]	0.006	0.016	---	0.006
Methylene Chloride	---	0	0.005	---	0.040	---	0.005
Tetrachloroethylene*	0.029	0	0.005[2]	0.005	0.004	---	0.005
1,1,1-Trichloroethane	0.043	0.200	0.200	0.200	---	---	0.200
1,1,2-Trichloroethane	0.003	---	---	0.032	0.100	---	0.032
Trichloroethylene*	0.550	0	0.005	0.005	0.005	---	0.005
Vinyl Chloride*	0.006	0	0.002	0.0005	---	---	0.0005
Metals							
Arsenic	0.017	0.050[2]	0.050	---	---	---	0.050
Barium	0.140	5.000[2]	5.000[2]	1.000	---	---	1.000
Cadmium	0.0048	0.005[2]	0.005[2]	---	---	---	0.005
Chromium	0.023	0.050	0.050	0.050	---	---	0.050
Copper	0.027	1.300	1.300	---	---	---	1.300
Lead	0.001	0[2]	0.005[2]	---	---	---	0.005
Mercury	0.0002	0.002[2]	0.002[2]	---	---	---	0.002
Nickel	0.069	---	---	---	---	---	0.100[5]
Silver*	0.061	---	0.050	0.050	---	---	0.050
Vanadium	0.013	---	---	---	---	---	---
Zinc	1.700	---	5.000[4]	---	---	---	5.000

NOTES:

* - Maximum detection exceeded the treatment goal.
1 - Safe Drinking Water Act (SDWA), 42 U.S.C. Section 300(f)
2 - Proposed value (CFR Vol. 54, No. 97, p. 22064, May 22, 1989).
3 - Drinking water quality standard for total trihalomethanes.
4 - Secondary Federal MCL.
5 - EPA Health Advisory.
6 - Proposed value, State of California.
--- No value available.

TABLE 8

WATKINS-JOHNSON WATER USE RATES

Fourth Quarter 1989

TOTAL GPM EXTRACTED	209		
TOTAL GPM REUSED ON-SITE	37	or	18%
TOTAL GPM REINJECTED*	15	or	7%
TOTAL GPM DISCHARGED TO CREEK	157	or	75%

* REINJECTING INTO ONE LEACHFIELD

FUTURE PROJECTED DATA

TOTAL GPM EXTRACTED	110		
TOTAL GPM REUSED ON-SITE	37	or	34%
TOTAL GPM REINJECTED*	45	or	42%
TOTAL GPM DISCHARGED TO CREEK	25	or	24%

* REINJECTING INTO THREE LEACHFIELDS 15 GPM

GPM = Gallons per Minute