Remedial Investigation / Feasibility Study

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Prepared for

ARCO Products Company

November 22, 1994

Prepared by

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Project 330-006.3C

PACIFIC
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PROFESSIONAL CERTIFICATION

Remedial Investigation / Feasibility Study
ARCO Service Station 0608
San Lorenzo, California

ARCO Products Company
November 22, 1994

Pacific Environmental Group, Inc. (PACIFIC) has prepared this Remedial Investigation/ Feasibility Study (RI/FS) for ARCO Service Station 0608, located at 17601 Hesperian Boulevard in San Lorenzo, California for ARCO Products Company. This RI/FS has been prepared by the staff of PACIFIC under the professional supervision of the Senior Geologist whose seal and signature appears hereon.

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1.0 INTRODUCTION

1.1 Purpose of the Remedial Investigation/Feasibility Study

On behalf of ARCO Products Company (ARCO), Pacific Environmental Group, Inc. (PACIFIC) has prepared this remedial investigation/feasibility study (RI/FS) for the ARCO Service Station 0608, located at 17601 Hesperian Boulevard, San Lorenzo, California (hereafter called "the Site"). This RI/FS presents the finding of various investigations and studies conducted at the Site. **Based on the findings of these investigations and studies, the RI/FS recommends the most appropriate remedial action alternative for Site cleanup.** The recommended alternative complies with federal, state, and local policies, laws and regulations governing the cleanup of hazardous substance releases.

This RI/FS was prepared in accordance with the agreements outlined in the July 8, 1994 meeting between Alameda County Health Care Services Agency (ACHCSA), San Francisco Bay Regional Water Quality Control Board (RWQCB), ARCO, and PACIFIC.

1.2 Summary of Previous Documents

Documents prepared for the Site by PACIFIC and utilized in the preparation of this RI/FS are listed below.

Work Plan with Tank Removal Results, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, October 4, 1989.

Work Plan, Additional Investigation, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, February 4, 1993.

Investigation Report, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, July 27, 1993.

Proposed Methodology, Modified Health Risk Assessment, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, July 27, 1993.

Result, Modified Health Risk Assessment, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, October 5, 1993.

Feasibility Study, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, October 12, 1993.

Addendum, Modified Health Risk Assessment, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, November 8, 1993.

Meeting Minutes, July 8, 1994, Memorandum, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, July 26, 1994.

Quarterly Report - Third Quarter 1994, ARCO Service Station 0608, 17601 Hesperian Boulevard, San Lorenzo, California, issuance pending.

The full citation for all references is provided in the reference section of this report.

1.3 Site Identification

The Site is occupied by ARCO and is located at 17601 Hesperian Boulevard in the City of San Lorenzo, County of Alameda, California (Figures 1 and 2). The Site comprises approximately 0.5 acres and is used as a gasoline retail and service station. The Site is bounded on the north by Hacienda Avenue, to the east by Hesperian Boulevard, to the south by retail shops, and to the west by an alley.

1.4 Scope of the RI/FS

The scope of the RI/FS encompasses the following tasks:

- Present a description of the Site's characteristics, the events that led to the contamination, and the investigations, studies, and work that have been accomplished in cleaning up the Site (interim remedial actions).
- Summarize the remedial investigation findings, health and safety risks, and effects of the contamination.
- Summarize the feasibility study of remedial alternatives for cleaning up the soil and groundwater.
- Recommend the final remedial action, along with an explanation of the Environmental Protection Agency (EPA) criteria as the basis for the selection and rejection of the alternative(s).
- Present an implementation schedule for the recommended remedial actions.

1.5 Organization of the RI/FS

This RI/FS addresses each of the scope items listed above. This information is presented as follows:

Section 1.0: Introduction

Section 2.0: Background and History

This section addresses the Site's characteristics and history of investigations and cleanup activities. It also summarizes the remedial investigation findings and reports on feasibility testing for remedial alternatives including soil vapor extraction, air sparging, and soil bioremediation.

Section 3.0: Groundwater Fate and Transport Modeling Results

This section addresses the feasibility of natural biodegradation of hydrocarbons in groundwater as a remedial alternative.

Section 4.0: Modified Health Risk Assessment

This section describes the health and safety risks and effects of the hydrocarbons in soil and groundwater at the site.

Section 5.0: Remedial Action Objectives

This section describes remedial action objectives for soil and groundwater at the site.

Section 6.0: Remedial Action Alternative Development and Evaluation

This section describes the criteria for evaluating remedial action alternatives, and applies those criteria to five alternatives.

Section 7.0: Recommended Remedial Action Alternative

This section recommends a remedial action alternative, and justifies the recommendation based on the criteria presented in Section 6.0.

Section 8.0: Implementation Schedule

An implementation schedule is presented in Section 8.0.

Included as appendices are the following:

- Groundwater Fate and Transport Modeling Results (Appendix A).
- Modified Health Risk Assessment Results (Appendix B).
- July 8, 1994 Meeting Minutes (Appendix C).

2.0 BACKGROUND AND HISTORY

2.1 Site Description

The Site is an operating service station located at 17601 Hesperian Boulevard in San Lorenzo, California (Figure 1). The fueling facility formerly included three 6,000-gallon (two unleaded gasoline and one regular gasoline) tanks located in a common excavation, and one adjacent 6,000-gallon tank (super unleaded gasoline) located in the northeast portion of the Site. A 550-gallon tank located southwest of the station building was used to store used oil. All underground storage tanks (USTs) were removed in June 1988, and were replaced with three 12,000-gallon gasoline tanks in the location of the former UST complex, and one used oil tank in the same location as the former used oil tank. Land use in the vicinity of the Site is primarily commercial and residential.

2.2 Previous Investigations

Investigations have been conducted at the Site by Emcon Associates (Emcon) in June 1985, Applied GeoSystems (AGS) in January 1988, Gettler-Ryan/EA in August 1992, and PACIFIC from April 1988 to the present. Analytical data collected during previous investigations is summarized on Tables 1 through 9. All borings, wells, and sample locations described in the following paragraphs are shown on Figures 2 through 8.

2.2.1 Pretank Replacement Investigations

Emcon drilled four on-site exploratory soil borings (A-A through A-D), installed one ground-water monitoring well (A-1), and collected selected soil samples for laboratory analysis in January 1985.

- Soil samples collected from borings drilled by Emcon, located adjacent to the UST complex, at depths ranging from 5-1/2 to 14 feet below ground surface (bgs), contained total volatile hydrocarbons calculated as gasoline (TVH-g) at concentrations ranging from 880 to 2,800 parts per million (ppm). Two soil samples collected from a boring located adjacent the used oil tank, at depths of 8-1/2 and 12 feet bgs, contained oil and grease at concentrations of 10,000 and 9,500 ppm, respectively.

- A groundwater sample collected from Well A-1 contained gasoline and benzene concentrations of 32,000 and 1,000 parts per billion (ppb), respectively.

AGS drilled four on-site exploratory soil borings (B-1 through B-4), converted two of the borings (B-1 and B-2) to groundwater monitoring wells (MW-1 and MW-5, respectively), and collected selected soil samples for laboratory analysis during January 1988. During field activities, AGS also discovered two additional undocumented on-site wells, and designated them as Wells MW-3 and MW-4.

- Soil samples collected from borings drilled by AGS, near the former UST complex, at depths ranging from 5 to 11 feet bgs, contained TVH-g at concentrations ranging from non-detectable levels to 10 ppm. A soil sample collected from the boring for Well MW-1, located adjacent the used oil tank, at a depth of 11 feet bgs, contained non-detectable levels of TVH and total oil and grease.

2.2.2 Tank Replacement Activities

During UST removal activities in June 1988, PACIFIC collected soil samples from beneath four gasoline USTs and one used oil tank, and from each side wall of both UST excavations. In addition, three groundwater samples were collected from beneath the gasoline fuel tanks. During tank removal activities, Wells MW-1 and MW-2 were destroyed and another undocumented on-site groundwater well was found, and designated as Well MW-6 and later as Well E-1. Three vadose monitoring wells (V-1 through V-3) were installed during tank replacement activities at the Site.

- During tank removal activities, soil samples collected by PACIFIC from beneath the USTs, at depths ranging from 12 to 15 feet bgs, contained total petroleum hydrocarbons calculated as gasoline (TPH-g) at concentrations ranging from 7 to 2,800 ppm. Side wall soil samples collected from each side of the UST excavation, at a depth of 8 feet bgs, contained TPH-g concentrations ranging from non-detectable levels to 350 ppm.

- Concentrations of TPH-g and benzene in groundwater samples collected from beneath the USTs ranged from 8,200 to 22,000 ppb, and 440 to 1,900 ppb, respectively. A separate-phase hydrocarbon (SPH) sheen was noted on groundwater in both the UST and used oil tank excavations.

- Two soil samples collected from beneath the used oil tank, at a depth of 9 feet bgs, contained total oil and grease at concentrations of 6,100 and 13,000 ppm. In addition, five soil samples collected from the excavation sidewalls and bottom were analyzed for volatile organic compounds

(VOCs). Acetone was detected in the northeast and southwest sidewall samples at concentrations of 220 and 54 ppm, respectively. No other VOCs were detected in any soil sample analyzed. A soil sample collected from the bottom of the excavation, at a depth of 13 feet, contained total oil and grease at a concentration of 20 ppm. Side wall soil samples, collected at depths from 8 to 9 feet bgs, contained oil and grease concentrations ranging from 10 to 200 ppm. High boiling hydrocarbons ranged from non-detectable levels to 30 ppm.

Oil-Water Separator/Clarifier. On March 26, 1992, Gettler-Ryan, Inc. (GR) and EA Engineering, Science and Technology, Inc. (EA) performed services during closure of an oil-water separator/clarifier (clarifier) located at the Site. The clarifier was formerly located within the service bay of the station building.

- Four soil samples were collected during the closure of the clarifier, and consisted of a concrete sample, concrete/soil interface sample, and soil samples from 2 and 5 feet bgs. Total recoverable petroleum hydrocarbons were detected in the concrete, concrete/soil interface and 2-foot samples at 3,000, 1,000 and 3,300 ppm, respectively. VOCs, SVOCs, Toxicity Characteristic Leaching Procedures (TCLP - volatiles, metals, and semi-volatiles), and California Assessment Metals (CAM 17 metals) were not detected in any soil sample analyzed.

2.2.3 Additional Site Assessment

PACIFIC performed a soil gas survey at the Site during February 1989. Nineteen soil gas probes were installed on and off site at depth intervals ranging from 7 to 8 feet bgs and 10 to 11 feet bgs.

- Soil vapors collected from probes during the soil gas survey indicated total hydrocarbons ranging from non-detectable levels to 130 ppm. Concentrations of benzene ranged from non-detectable levels to 390 ppm. The highest concentrations were noted in the northwest portion of the Site, extending off site towards the west. These results were used to select locations for groundwater monitoring wells installed in 1990.

In November 1989, PACIFIC performed aquifer testing at the Site. A step discharge test was performed in a previously installed, 8-inch diameter, corrugated steel cased well (MW-6/E-1).

- Based on the results of the step-discharge test, it was estimated that the aquifer underlying the Site has a specific capacity of approximately 2.45 gallons per minute per foot (gpm/ft), and could sustain a yield of

17 gallons per minute (gpm) with 7 feet of drawdown. These values were approximate since well construction details were not known.

In July 1990, PACIFIC abandoned the on-site undocumented Wells MW-3, MW-4, and MW-6/E-1. Between March 1990 and November 1991, PACIFIC installed the following wells: on-site groundwater extraction Well E-1A (MW-12), on-site groundwater monitoring Wells MW-7 and MW-13, and off-site groundwater monitoring Wells MW-8 through MW-11, and MW-14 though MW-23. Soil samples for laboratory analysis were submitted from the borings for Wells MW-8 and MW-9.

- Soil samples collected from the borings for off-site Wells MW-8 and MW-9, at depths of 11-1/2 and 10-1/2 feet bgs, respectively, contained non-detectable levels of TPH-g.
- Concentrations of TPH-g in groundwater has ranged from non-detectable levels to 1,100,000 ppb (March 29, 1990). The maximum concentration was found in Well MW-3. Benzene concentrations have ranged from non-detectable levels to 13,000 ppb. The highest concentrations of TPH-g and benzene have been noted in on-site wells in the northwestern portion of the Site. SPH have been measured in Well MW-4 at a maximum thickness of 0.01 foot (March 29, 1990).
- Groundwater samples from Well MW-12 were analyzed for VOCs and CAM 17 metals. The only detections were benzene at 3 μg/L, and barium at 0.13 mg/L.

2.2.4 Domestic Irrigation Well Assessment

PACIFIC documented the location and use of 14 domestic irrigation wells downgradient of the Site (Figure 10). Preliminary sampling of the domestic irrigation wells was performed by PACIFIC between September and November 1991. Additional sampling events were performed by PACIFIC in October and December 1992. During the 1991 and 1992 sampling events, several wells contained inoperable pumps or were inaccessible; therefore, no groundwater samples were collected from these wells. Based on the analytical results of the initial sampling event, PACIFIC performed a preliminary risk assessment to determine if a risk to human health existed as a result of benzene noted in groundwater. The results of PACIFIC's risk assessment were documented in a letter to ACHCSA dated March 13, 1992 and are summarized below.

- Concentrations of TPH-g in groundwater collected from the domestic irrigation wells during the 1991 sampling event ranged from non-detectable levels to 780 ppb. Benzene was detected in groundwater at concentrations ranging from non-detectable levels to 13 ppb.

- During the November 22, 1992 sampling event, TPH-g was detected at concentrations ranging from non-detectable levels to 2,200 ppb. Benzene ranged between non-detectable levels and less than 5 ppb.
- During the December 1992 sampling event, TPH-g was detected at concentrations ranging from non-detectable levels to 1,500 ppb. Benzene ranged from non-detectable levels to 14 ppb.
- Results of the risk assessment indicate estimated human health risks due to ingestion and dermal absorption of groundwater were from 4.46 x10^{-6} to 1.08 x10^{-5}, and 2.01 x10^{-6} to 3.47 x10^{-6}, respectively.

In a letter dated June 5, 1992, ACHCSA requested a more comprehensive assessment. PACIFIC subsequently modified the risk assessment in cooperation with ACHCSA. The modified risk assessment was approved by ACHCSA in November 1993, and is summarized in Section 4.0.

Beginning in 1993, ARCO contacted these wellowners to request: (1) authorization to collect quarterly groundwater samples from the domestic irrigation well located on their properties, and (2) agreement to discontinue operation of the domestic irrigation wells until ARCO's investigation is complete. The majority of wellowners have agreed to both requests. The table below summarizes wellowner cooperation.

Well Identification/ Address	Well Designation for Sampling Purposes	Authorized Quarterly Sampling	Discontinued Well Use
590 Hacienda Avenue	590 H	Yes	Yes
633 Hacienda Avenue	633 H	Yes	Yes
634 Hacienda Avenue	634 H	*	*
642 Hacienda Avenue	642 H	No	No
675 Hacienda Avenue	675 H	Yes	Yes
17197 Via Magdalena	17197 VM	Yes	Yes
17200 Via Magdalena	17200 VM	Yes	Yes
17203 Via Magdalena	17203 VM	Yes	Yes
17302 Via Magdalena	17302 VM	Yes	No
17348 Via Encinas	17348 VE	Yes	Yes
17349 Via Magdalena	17349 VM	Yes	Yes
17371 Via Magdalena	17371 VM	No	No
17372 Via Magdalena	17372 VM	Yes	No
17393 Via Magdalena	17393 VM	Yes	Yes

* = Well cannot be sampled or used due to blockage

As shown above, currently, 11 of the 14 wellowners have authorized ARCO to collect quarterly groundwater samples from their domestic irrigation wells. Two of the wellowners have refused ARCO sampling authorization and the remaining well, Well 634 H, cannot be physically sampled. However, groundwater samples have been collected at some point from all domestic irrigation wells, except Well 634 H. Table 3 summarizes the analytical results for all domestic irrigation wells. The wells which ARCO is currently authorized to sample should be adequate for monitoring purposes. The two wells which ARCO does not have authorization to sample, Wells 642 H and 17371 VM, are not likely to affect the overall monitoring results. This is because: (1) petroleum hydrocarbons have never been detected during seven previous sampling events in Well 642 H, and (2) data for Well 17371 VM could be approximated if necessary using Wells 17349 VM and 17393 VM, which are located approximately 50 feet upgradient and downgradient of Well 17371 VM, respectively.

ARCO currently reimburses 9 of the 14 wellowners for using municipally-supplied water for irrigation purposes. Four of the wellowners have refused to discontinue operating their wells, and the remaining well cannot be physically used at this time.

2.2.5 Interim Remediation

In 1991, ARCO installed a groundwater extraction and treatment system at the Site. The groundwater remediation system began continuous operation on October 15, 1991. The treatment system uses three granular activated carbon (GAC) vessels to treat the influent groundwater stream before it is discharged into the sanitary sewer. The carbon vessels are arranged in series with valving to permit bed order rotation. This allows for the primary vessel to become the secondary vessel after the carbon has been renewed. Sample ports are located at the treatment system influent, effluent, the mid-point between the carbon vessels, and at each individual well head. A sanitary sewer discharge permit was obtained from the Oro Loma Sanitary District on April 4, 1991. The updated permit is effective through April 4, 1995.

In order to evaluate treatment system performance, PACIFIC monitors water levels, instantaneous and average flow rates, and samples the influent and effluent of the treatment system for TPH-g, benzene, toluene, ethylbenzene, and xylenes (BTEX compounds), on a monthly basis. The effluent sample is also analyzed for arsenic, as requested by the Oro Loma Sanitary District.

- Based on the remedial performance evaluation documented in PACIFIC's August 17, 1994 quarterly report, the groundwater treatment system has extracted approximately 3,665,988 gallons of groundwater at an average pumping rate of 2.9 gpm. A total of 3.9 gallons of dissolved TPH-g, and

0.04 gallon of dissolved benzene have been recovered since the beginning of operation.

2.3 Remedial Investigation

To address the comments in ACHCSA June 5, 1992 letter regarding PACIFIC's risk assessment, PACIFIC performed additional data collection on July 22, 1992. Additional data collected included groundwater analysis for drinking water quality standards from domestic irrigation Wells 17349 VM and 17203 VM, and air monitoring for volatile benzene concentrations from four selected locations and at the domestic irrigation Well 17349 VM. Drinking water quality analyses were performed to determine if local shallow groundwater met California drinking water standards, and air monitoring was performed to gain site-specific data on benzene occurrence in the atmosphere.

- Analysis of groundwater samples collected from domestic irrigation wells indicated odor at 50 units, color ranging between 5 and 20 units and turbidity ranging between 9 and 8.6 Nephelometric Turbidity Units (NTU). These values indicate that that groundwater generally does not meet secondary drinking water standards.
- During air monitoring at selected locations across the Site and vicinity, volatile benzene concentrations were found to range between 2.1 and 9.6 micrograms per cubic meter ($\mu g/m^3$). The highest concentrations were noted at the corner of Hacienda Avenue and Hesperian Boulevard (6.8 $\mu g/m^3$) and the corner of Hacienda Avenue and Via Magdalena (9.6 $\mu g/m^3$). These levels are likely attributable to exhaust fumes from regional automobile traffic. For reference, the National Institute for Occupational Safety and Health (NIOSH) Threshold Limit Value-Time Weighted Average (TLV-TWA) for benzene is 0.1 ppm, or 319 $\mu g/m^3$. This value represents the concentration for a normal 8-hour work day and 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effects.

As requested by ACHCSA, additional analyses for groundwater samples collected from Well MW-8, including VOCs, SVOCs, and metals, were performed during the fourth quarter 1992 groundwater monitoring event. Well MW-8 is located approximately downgradient from the former used oil tank.

- Additional analysis performed on groundwater samples collected from Well MW-8 indicated non-detectable levels of VOCs. However, semi-volatile organic compounds (SVOCs) were detected including: acenaphthene, dibenzofuran, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene. In addition, arsenic, barium, and zinc were detected.

In March and April 1993, PACIFIC performed an exploratory soil boring program. Nineteen on-site and twenty off-site soil borings were taken. The borings were drilled to: (1) further define the lateral and vertical extent of the subsurface channel deposits, (2) define the lateral extent of petroleum hydrocarbons in historical capillary fringe zone across the Site, (3) define the lateral and vertical extent of hydrocarbons in soils adjacent to the former oil-water clarifier and adjacent to the former used oil tank, and (4) collect soil samples for physical and biological testing pertinent to the risk assessment and remedial alternative portions of the remedial investigation.

The following is a summary of the findings for this investigation:

- Soils encountered underlying the Site consisted primarily of surficial clays and silts to a depth of approximately 11 feet bgs. Coarse-grained deposits consisting of clayey sand, silty sand, and sand, ranging in thickness from 1/2 foot to 3 feet, were noted in most borings between the approximate depths of 4 to 15 feet bgs, underlain by clays to the total depth explored 22-1/2 feet bgs. The coarse-grained deposits may represent channel deposits and apparently trend in an east-west direction, increasing in thickness from north to south. Cross-sections A-A' and B-B' (Figure 8) illustrate subsurface conditions.

- Organic vapor concentrations ranged from non-detectable levels to 190 ppm. The highest concentrations were noted within the historical capillary fringe zone (9 to 14 feet bgs) and in the vicinity of the former clarifier and former used oil tank.

- TPH-g was detected in the historical capillary fringe zone at concentrations ranging from 1.6 ppm in Boring B-17 to 650 ppm in Boring B-24. Benzene was detected in the capillary fringe zone at concentrations ranging from 0.010 ppm in Boring B-9 to 0.59 ppm in Boring SP-1/V-4. The highest concentrations of TPH-g (greater than 100 ppm) were noted from on-site soil borings located in the vicinity of the former clarifier, western product island adjacent to the station building, and west of the former UST complex. Only one off-site boring had TPH-g greater than 100 ppm.

- In the vicinity of the former clarifier, oil and grease, CAM metals, SVOCs, and halogenated volatile organic compounds (HVOCs) were detected. Oil and grease were detected at concentrations of 950 ppm at 4 to 6 feet bgs, and 1,900 ppm at 9 to 11 feet bgs, and were not detected at 14 to 16 feet bgs. CAM metals including antimony, arsenic, barium, chromium, cobalt, copper, nickel, vanadium, and zinc were detected in soil samples submitted for analysis. SVOCs and HVOCs detected included: 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 2-methylnaphthalene, naphthalene, and bis(2-ethylhexyl)phthalate. All concentrations were significantly below CCR Title 22 TTLC levels.

- In the vicinity of the former used oil tank, oil and grease were detected only in Boring B-27 at a concentration of 240 ppm at 2 to 3 feet bgs. All other soil samples analyzed from Borings B-27, B-27A, B-28, B-29, B-30, and B-30A had non-detectable levels of oil and grease. The above listed CAM metals were also detected in soil samples from Borings B-27A and B-30. No SVOCs or HVOCs were detected in any soil samples from Borings B-27 and B-30.

In **March 1993**, PACIFIC drilled and installed three groundwater monitoring wells (MW-24 through MW-26) to: (1) provide delineation of petroleum hydrocarbon-impacted groundwater in the upgradient (east) and crossgradient (north) directions, and (2) further define the lateral and vertical extent of the subsurface channel deposit. These wells have been monitored on a quarterly basis. At the same time, **two dual completion air sparging and soil vapor extraction wells (SP-1/V-4 and SP-2/V-5) were installed on and off site to:** (1) further define the lateral and vertical extent of the subsurface channel deposit, (2) collect samples for physical testing pertinent to the risk assessment portion of the remedial investigation, (3) provide vertical and lateral characterization of hydrocarbons in soils, and (4) provide installations to perform air sparging and SVE feasibility tests at the Site. The following was concluded:

- The coarse-grained deposits consisting of clayey sands, silty sands, and sands are relatively thin and extensive, and underlie a broad area across the Site. These coarse-grained deposits are interpreted as channel deposits, and include the historical and present capillary fringe zone; they are defined to the north, but not as well defined to the south. Additionally, the channel deposits increase in thickness from north to south. These channel deposits are more areally extensive than hydrocarbons noted in soil and groundwater, and therefore do not appear to define a preferential path for the downgradient transport of hydrocarbons in groundwater.

- The hydrocarbon plume in groundwater extends off site toward the west and is very localized in extent (Figure 9). The plume extends toward the domestic irrigation wells which have a history of pumping. Additionally, concentrations of hydrocarbons in groundwater off site in the area of the domestic irrigation wells are generally relatively low or non-detect.

- In the vicinity of the Site, the highest hydrocarbon concentrations in groundwater are noted in Wells MW-8 and MW-10, directly downgradient (west) of the Site.
- Based on current data, PACIFIC concludes that the sand channel is a factor in hydrocarbon migration, but that other factors also may have influenced hydrocarbon migration to the current plume configuration. These factors may include local variations in channel thickness, depth, and permeability, and pumping of domestic irrigation wells.

2.4 Feasibility Studies

2.4.1 Aquifer Testing

During the week of March 29, 1993, PACIFIC performed aquifer testing at the Site to determine the hydraulic characteristics of the shallow water-bearing zone both on and off site. This testing was intended to update the previous aquifer testing by using wells with known construction and nearby observations wells. The testing consisted of step-discharge tests in Wells E-1A and MW-10. In addition to the pumping tests, slug tests were performed in Wells MW-14 and MW-23. The shallow, unconfined aquifer appears to be capable of producing 2 to 4 gpm, or more, in the vicinity of the Site. A computer model was employed to determine the radius of groundwater capture for this Site. The model is called AqModel (O'Neill, 1990), and is distributed by WellWare of Davis, California. The time-dependent head distribution from which the capture zone was determined is based on the Theis analytical solution for flow to a pumping well. The capture zones thus determined have a radius of approximately 30 to 40 feet for Well E-1A, and approximately 70 to 80 feet for Well MW-10.

2.4.2 Air Sparge Testing

PACIFIC conducted an off-site air sparge test on May 4, 1993 and an on-site air sparge test on May 5, 1993. The objective of conducting air sparge testing was to determine the feasibility of using this technology at the Site. Given the observed radius of sparge influence (less than 16 feet) and changes in VOCs, dissolved oxygen (DO), and helium concentrations, PACIFIC concluded that the feasibility of using air sparge technology on or off site is limited.

2.4.3 Soil Vapor Extraction Testing

PACIFIC conducted an off-site soil vapor extraction test on April 29, 1993 and an on-site soil vapor extraction test on April 30, 1993. The objective of conducting a soil vapor extraction test was to determine the feasibility of using soil vapor extraction technology at the Site. The data for both tests indicated that the vacuum application limit was restricted to a radial boundary which did not encompass the nearest monitoring point. By fitting field data from the off-site test to the steady-state radial flow equation, the effective radius of influence (Re) was determined to be 9.5 feet. Given the estimated flow rate and extraction well spacing requirements, **PACIFIC concluded that the feasibility of using soil vapor extraction technology on or off site is limited.**

2.4.4 In-situ Soil Bioremediation Testing

PACIFIC initiated an off-site in-situ soil bioremediation feasibility test on March 9, 1993. The objective of testing was to evaluate the feasibility of using in-situ bioremediation technology at the Site. A description of results and conclusions is presented below.

- Ammonia and phosphate were not detected in any sample. Nitrate was not detected in any sample, except for sample B-11 at a concentration of 2.4 ppm. Elevated concentrations of potassium, calcium, magnesium, and iron were detected in all samples.
- Moisture content and pH concentrations were within the normal range to support microbiological growth.
- Normal levels of heterotrophic plate count organisms should be in the 10^5 to 10^6 colony forming units per gram (CFU/g) range. The results of the heterotrophic plate counts showed levels that are below normal, which ranged from non-detected (less than 10^3) to 6.2×10^4 CFU/g.
- The fluorescent *Pseudomonas* and hydrocarbon degraders levels should be in the 10^3 and 10^5 CFU/g range, respectively, if natural biodegradation is occurring in soils. Fluorescent *Pseudomonas* were not detected in any sample. Hydrocarbon degraders were not detected in any sample, except for sample B-11 at a concentration of 4.0×10^3 CFU/g.

Based on the results, insignificant natural bioremediation of hydrocarbons is taking place in the soils at this time. However, the biodegradation rate may be limited by the low concentrations of petroleum hydrocarbons. Bioremediation could be enhanced by nutrient addition; however, further column testing was not performed.

3.0 GROUNDWATER FATE AND TRANSPORT MODELING RESULTS

3.1 Modeling

To supplement the feasibility studies conducted previously, PACIFIC conducted groundwater fate and transport modeling to examine and predict effects of biodegradation of hydrocarbons in the groundwater. Benzene was selected as the optimum constituent for modeling, for the following reasons: (1) benzene represents the highest toxicity and lowest action levels of the BTEX compounds, and (2) decay rates and other physical characteristics for benzene are available from published literature (see references).

PACIFIC performed fate and transport modeling using two widely accepted finite-difference numerical models. The objective of the modeling was to evaluate dissolved benzene transport under conditions likely to be found in the on- and off-site subsurface, including the effects of (1) pumping of off- and on-site shallow wells, and (2) potential biodegradation of dissolved benzene. The overall goal of the modeling was to provide an estimate of the concentrations of dissolved benzene which might reasonably be expected in groundwater at potential receptors (domestic irrigation wells) downgradient from the Site over a period of 2 to 5 years from the present. Domestic irrigation Well 633 H is of key interest in this analysis because of its proximity to the existing plume. — But this well is inoperable? Was it repaired — See results under Tables!

The following discussion summarizes model selection, model grid and parameters, and model results. Figures, tables, and printed model output are presented as Appendix A.

3.1.1 Model Selection

Two models were used for this fate and transport study: (1) MODFLOW, and (2) MT3D. MODFLOW is a three-dimensional, finite-difference numerical model which simulates groundwater flow in aquifers (McDonald and Harbaugh, 1988). It is a widely used and accepted model employed by academic, industry, and government hydrogeologists to predict groundwater flow under various conditions. MODFLOW was used in this study to provide calculated groundwater elevations within the model grid area (for example, see Figures A-2, A-6, and A-7 in Appendix A), and thus provide the flow direction and gradient from which the groundwater velocity is calculated during transport modeling.

→ horizontal transport

MT3D is a three-dimensional, finite-difference transport model which simulates advection, dispersion and chemical reactions of contaminants in groundwater systems (Zheng, 1992). MT3D is specifically designed to be used in conjunction with MODFLOW and is based on the same block-centered finite-difference grid, allowing simple passing of input and output between the two models.

The applicability and accuracy of MT3D for calculating contaminant transport has been verified by checking and comparing numerical solutions for simple problems where analytical solutions are also available (Zheng, 1992).

Modeling was facilitated by using MODELCAD$^{386™}$ (Rumbaugh, 1993), a user-friendly software package which allows integration of model design and data input, and model execution of both the models employed in this study. Modeling was performed using a microcomputer based on a 80486 microprocessor running at 33 MHz with 8 megabytes of random-access memory.

Printed model output for each of the scenarios discussed below is presented as Attachment 1 in Appendix A. Attachment 2 contains printed output of benzene concentrations observed in downgradient domestic irrigation wells. It should be noted that model output printed directly from the computer contains units as follows:

- Length - feet
- Time - days
- Volume - cubic feet
- Mass - pounds per cubic feet

In the figures in Appendix A, benzene concentration units are converted from pounds per cubic feet into micrograms per liter.

3.1.2 Model Grid

The model grid employed in this study covers a rectangular 1,200 foot by 1,700 foot area aligned so that the grid boundaries are parallel and perpendicular to the groundwater flow direction estimated from field measurements (Figure A-1, Appendix A). The Site is located centrally in the eastern third of the grid, with off-site wells located downgradient in the western two-thirds of the grid. Grid size was selected to provide detailed 25 foot by 25 foot coverage of grid nodes in the vicinity of the dissolved contaminant plume and immediately downgradient of the plume, and with grid edges located at a sufficient distance from pumped wells such that boundary effects should be negligible. Each model used in this study employs a block-centered approach to grid nodes.

3.1.3 Model Parameters

Aquifer Properties. Aquifer properties were obtained from field studies (PACIFIC, October 12, 1993 report; PACIFIC, March 1994 Groundwater Monitoring Report), and estimates based upon lithologies at the Site (Freeze and Cherry, 1979; PACIFIC, February 4, 1993). The following aquifer properties were used in the model simulations (see also, Table A-1, Appendix A):

Hydraulic conductivity:	6.5 to 40 feet day^{-1} (field data)
Storativity:	0.1 (estimate for unconfined conditions)
Porosity:	0.25 (estimate typical for Site lithology)
Saturated thickness:	14 feet (field studies)
Dispersivity (longitudinal):	10 feet (estimate [Anderson and Woessner, 1992])
Dispersivity (horizontal):	1 foot (estimate, see above)
Hydraulic gradient:	Variable, approximately 0.0027 feet per foot (field data)

Boundary and Initial Conditions. Boundary conditions include hydraulic head at grid edges, any grid locations where constant benzene concentrations are applicable, and the pumping conditions of on- and off-site wells. For this study, constant groundwater heads at grid edges were used (estimated from field data), and result in the approximate hydraulic gradient listed above (Figures A-2, A-6, and A-7, Appendix A).

The grid nodes which approximate the area where the former USTs existed on site have been set in the model so that there is a constant concentration of dissolved benzene at these nodes (330 micrograms per liter [µg/L] benzene). This boundary condition simulates constant input of benzene to groundwater from a soil source at the capillary fringe. This boundary condition would be applicable until soil remediation has completely removed the benzene source in the on-site subsurface.

Two combinations of pumping for off- and on-site wells were simulated:

- No on-site pumping and no pumping of off-site domestic irrigation wells (Scenario 1).
- On-site pumping at 3 gpm with pumping of off-site domestic irrigation wells (Scenario 2).

These two scenarios simulate the cases where wellowners pump their wells according the rates listed in Table A-1, Appendix A, and on-site control of dissolved benzene through pumping is either off or on. Steady-state flow conditions were employed throughout the interval of time simulated by the model, and domestic irrigation wells are assumed to be constantly pumping. An explanation of how pumping rates were derived for domestic irrigation wells is presented in Appendix A.

Initial Conditions. Initial conditions include the initial concentrations of dissolved benzene observed in groundwater at the Site and in the Site vicinity during first quarter 1994 groundwater monitoring (PACIFIC, March 1994). This includes a dissolved benzene plume which extends in a westerly direction from the Site to the vicinity of Well 633 H (Figure A-3, Appendix A). Initial hydraulic head conditions are input based upon extrapolation of the field measurements obtained during the first quarter 1994 monitoring program (Figure A-2). Steady-state hydraulic heads are calculated by MODFLOW for each individual model run using input such as initial head distribution and assigned pumping rates for the various wells.

OK [illegible] dtd 6/19/94

Transport Properties. The model used for the Site includes advective transport of dissolved benzene including natural attenuation of benzene through dispersion and biodegradation. Retardation of dissolved benzene was not considered in these model scenarios in order to lend a more conservative nature to the transport evaluation and calculation of downgradient dissolved benzene concentrations. Dispersivity values used in the model are listed above under the discussion of aquifer properties.

→ Previous study dated 10/12/93 indicated insufficient biodegradation was occurring on-site

Biodegradation rates for dissolved benzene in the model were estimated from a literature review of rates that are typical for shallow, fine sand, unconfined aquifers where dissolved oxygen is in excess of 2.0 milligrams per liter (mg/L) (see discussion below in Section 3.2). Rates of 110 day half-life and 250 day half-life were employed.

The parameter used in the model is known as the decay factor which is:

- decay factor (alpha) = ln (2) / half-life

The above range in half-life gives the following range in decay factor:

- 0.63 percent per day through 0.28 percent per day

Biodegradation under aerobic conditions where dissolved oxygen is in excess of 2.0 mg/L has rates that are typically around 0.63 percent per day (McAllister and Chiang, 1994; Salanitro, 1993). PACIFIC has determined that groundwater in the site vicinity has dissolved oxygen values that meet this criteria (see Section 3.2).

3.1.4 Model Results

Two basic modeling scenarios and one sensitivity study (with respect to biodegradation rate) were performed to evaluate the behavior of the dissolved benzene plume over the next 5 years:

- No pumping on site with no pumping of domestic irrigation wells (Scenario 1).
- Pumping on site with selected domestic irrigation wells pumping (Scenario 2).
- Scenario 2 with benzene half-life increased to 250 days (Sensitivity Study).

Scenario 1. Modeling runs were performed using the above parameters, specifically with the 110 day benzene half-life (the most reasonable choice based upon literature review - see above). The results for Scenario 1 can be summarized as follows:

?

ask [illegible]

- At time = 0 (March 1994), the dissolved benzene plume extends approximately 150 feet west of Well MW-10, but has not reached Well 633 H (Figure A-3, Appendix A).

Was not sampled 3/94!

- At time = 0 (March 1994), the concentrations of dissolved benzene within this plume range from non-detect at the boundary to as high as 470 μg/L at Well MW-10.
- At time = 1 year, the plume extends approximately 50 feet west of Well 633 H, but plume concentrations have diminished considerably, with the bulk of the plume remaining on site and concentrations ranging up to approximately 15 μg/L off site between Wells MW-10 and 633 H (Figures A-4 and A-13, Appendix A).

to what levels?

- At time = 2 years, the plume has achieved a at what steady-state configuration, extending from the Site to approximately 50 feet east of the intersection between Hacienda Avenue and Via Arriba (Figure A-5, Appendix A).

clarify

Data to support? Provide data for plume at time > 2 yrs

After approximately 2 years, the plume for this first scenario maintains its constant configuration because the two competing effects, biodegradation and constant source at the station, reach mass balance, resulting in no further migration of the plume beyond the above named intersection. As seen below in Scenario 2, on-site pumping will result in a smaller steady-state plume configuration with the leading plume edge closer to the Site, in spite of the effects of pumping of off-site domestic irrigation wells.

?

Scenario 2. The second scenario was performed using similar initial conditions, specifically with the 110 day benzene half-life, and employs pumping at 3 gpm at the on-site extraction well (E-1A) to control off-site migration of dissolved benzene originating at the former tank-pit area. In addition, selected downgradient domestic irrigation wells are pumping continuously at three times their effective pumping rates (see Table A-1 for individual rates).

Figure A-6, Appendix A, shows the groundwater elevation contours for the situation where only the on-site well is pumping at 3 gpm. This latter situation was used to calibrate the flow model, because it closely follows the existing data obtained from groundwater monitoring studies (PACIFIC, March 1994). The MODFLOW flow field used in Scenario 2 with the effects of pumping of domestic irrigation wells is shown on Figure A-7, Appendix A.

No data assumes no pumping residential wells

Results are summarized as follows:

- At time = 1 year, the plume extends from the Site to approximately 25 feet west of Well 633 H with concentrations in that well estimated to be between <1 and 17.7 μg/L at various times up to 1 year (Figures A-8 and A-14, Appendix A).
- At time = 2 years, the plume has achieved a steady-state configuration with benzene concentrations greater than 1 μg/L extending no further than 50 feet off site to the west (Figures A-9 and A-14, Appendix A).

75 ft smaller

This last result is similar to Scenario 1, except the extent of the plume is much smaller because of the on-site pumping and source control.

[illegible] 75ft smaller

Sensitivity Study. The sensitivity study involved running the model under conditions similar to Scenario 2, except with a benzene half-life of 250 days instead of 110 days. This was performed in the interest of checking a more conservative decay scenario. It should be noted that literature review indicates that a half-life of 110 days is more likely representative of the benzene decay rate, forming the mean of rates that have been estimated to vary between 0.3 and 1.3 percent per day.

[illegible] natural [illegible]

Results of the sensitivity study show similar characteristics to Scenario 2 (Figures A-10, A-11, and A-15, Appendix A), except that the plume stabilizes its configuration over a longer time (2 to 4 years) and in the beginning extends slightly further (between Well 633 H and the domestic irrigation wells immediately north of the intersection between Hacienda Avenue and Via Magdelena). The plume stabilizes its areal extent after 2 years, achieving a steady-state condition between source input of benzene and biodegradation at a point approximately 10 to 25 feet further to the west than in Scenario 2 (Figure A-12, Appendix A).

[illegible]

3.1.5 Summary of Modeling Results

Extent of Dissolved Benzene Plume. Benzene concentrations downgradient from the site have been estimated over a period from March 1994 to 5 years into the future from that date. The dissolved benzene plume shrinks to a stable configuration within 2 to 5 years, extending in the stable configuration from the site to as much as 100 feet downgradient from the site, but not west of Well MW-10.

Need to get this well tested!

Benzene Concentrations at Well 633 H. During the length of time modeled, the only domestic irrigation well which shows more than 1 µg/L dissolved benzene is Well 633 H. Figures A-13, A-14, and A-15 (Appendix A) show the behavior of benzene concentrations with time in Well 633 H. The computer output used to prepare these figures is presented as Attachment 2, Appendix A. Concentrations at that well range up to 17.7 µg/L (Figures A-13 and A-14, Appendix A) using the most reasonable estimate of half-life for benzene (110 days). At longer half-life (250 days), Well 633 H contains as much as 28.8 µg/L dissolved benzene (Figure A-15, Appendix A), although biodegradation and dispersion cause the plume to shrink back towards the Site after 2 years.

Pumping of On-site and Off-site Wells. Pumping on site from groundwater extraction Well E-1A (3 gpm) reduces the size of the stabilized benzene plume by as much as 100 linear feet along plume axis as compared with the Scenario 1 (no on-site pumping). Off-site pumping of domestic irrigation wells listed in Table A-1, Appendix A appears to not appreciably affect benzene migration. This is likely due to the competing effects of biodegradation which shrinks plume size, and the on-site pumping which occurs at a much greater rate than off-site pumping.

Comparison with Monitoring Data. PACIFIC's fate and transport model has been run using conservative parameters. The conservative nature of the model includes:

- Benzene half-life in the median range of values from the literature review.
- Pumping schedules for off-site wells assume 24-hour pumping all year.
- Permeabilities characteristic for sands (certain areas in the neighborhood likely show lower permeabilities than used in the model).

Because of the inherent inhomogeneities of the local stratigraphy, and the fact that certain parameters are estimated, the model will approximate conditions in the field, but will not always be 100 percent accurate. This is shown by comparison of third quarter 1994 monitoring data with model data predictions.

This well was not sampled 3rd Quarter - it was inoperable!

Analytical data from Well 633 H shows that benzene is not detected in groundwater from that well. The model would have predicted between 1 and 17 µg/L for Well 633 H. Conversely, Well MW-10 shows 79 µg/L benzene in groundwater which fits into the general model trend of a shrinking benzene plume (MW-10 contained 470 µg/L benzene in March 1994). In addition, Well 17349 VM yielded groundwater with 1.8 µg/L benzene, whereas the model would predict non-detectable amounts of benzene in groundwater from that well.

located west of 633H

In general these monitoring results support the idea of plume shrinkage through natural attenuation. Even the value of 1.8 µg/L at Well 17349 VM is, taken over a period of the last 2 years, evidence for natural attenuation since groundwater there originally contained 13 µg/L

?

benzene. The fact that groundwater from MW-10 is decreasing markedly in dissolved benzene lends strong support to the general model conclusion that the dissolved plume will, over a period of 1 to 2 years, attain a steady-state configuration centered on the site with its downgradient leading edge only 50 to 100 feet off site. → Plume currently extends 600 ft+

USTs were removed June 1988 (6.5 yrs)

The following section describes additional information which indicates that biodegradation of petroleum hydrocarbons is occurring at the Site.

1988 On-site Benzene Conc

gw 1900 ppb

soil 36000 ppb (36 ppm)

3.2 Biodegradation Evaluation

During the July 8, 1994 meeting, the RWQCB requested that a qualitative evaluation be performed to confirm that biodegradation of petroleum hydrocarbons is occurring in the groundwater at the Site. The evaluation below satisfies this request by: (1) identifying that biodegradation of petroleum hydrocarbons occurs naturally, (2) comparing the characteristics favorable to groundwater biodegradation of petroleum hydrocarbons to Site conditions, and (3) showing that hydrocarbon concentrations and extent have declined over the past 3 years.

The EPA states that biodegradation in the subsurface is common, and that:

> "natural biorestoration does occur in the subsurface environment. Contaminants in solution as well as vapors in the unsaturated zone can be completely degraded or transformed to new compounds. Undoubtedly, thousands of contamination events are remediated naturally before the contamination reaches a point of detection" (EPA, 1990).

Further, the process of biodegradation results in the complete destruction of the petroleum hydrocarbon compounds by incorporating the carbon molecules into the biological structure or into the production of carbon dioxide. It has been shown that the rate of biodegradation is nutrient and oxygen dependent; however, microbiological organisms will continue to degrade petroleum hydrocarbons over a wide range of nutrient and oxygen conditions. provided that these microbes [illegible] indigenous to this site

During the past decade studies have been performed at several gasoline service station sites to document that naturally occurring microbiological organisms reduce the volume and extent of hydrocarbon-impacted groundwater. In one study, natural bioremediation was evaluated as an alternative to active remediation (Caldwell et al, 1992). In this case, several groundwater characteristics were measured and used to model the transport and biodegradation of the dissolved petroleum hydrocarbon plume. The modeling results were compared with the results of groundwater sampling and the study concluded that: (1) groundwater conditions at that site were favorable to biodegradation, and (2) natural biodegradation processes could be

Soil permeability

constraining the plume and limiting off-site migration. The table below shows a comparison of the groundwater characteristics at the case study site where biodegradation was occurring and at the ARCO Site.

\#

Other literature?

Oxidized state?

Groundwater Characteristic	Case Study	ARCO 0608
Dissolved Oxygen	1.35 mg/L	3.7 mg/L
Calcium	150 mg/L	120 mg/L
Iron	1.8 mg/L	0.8 mg/L
Magnesium	5.9 mg/L	40 mg/L
Manganese	Not-detected	3.8 mg/L
Petroleum Hydrocarbons	ppm range	ppm/ppb range
Total dissolved solids, sulfates, chlorides, alkalinity, and pH were all in similar ranges.		

? How so

The groundwater characteristics at the Site are remarkably similar to those of the case study, where groundwater degradation was concluded to be occurring. Oxygen, which is generally regarded as the limiting factor for biodegradation, is sufficient to support biodegradation in the groundwater at the Site. The decrease in the size of the plume that was predicted in the case study model and confirmed through field testing parallels the decrease of hydrocarbon concentrations at the Site, is discussed below.

Observations during quarterly monitoring in the Site vicinity indicate that between 1991 and 1994, the areal extent of the dissolved TPH-g and benzene plumes decreased markedly (Figures 11 and 12). During the fall of 1991, for example, the benzene plume extended from the Site to as far west as Wells 17200 VM (2.7 µg/L benzene) and 17349 VM (13 µg/L benzene). By fall of 1993, the plume extended primarily from the Site to an undefined point west of Well MW-10 with an isolated concentration (13 µg/L benzene) in Well 17349 VM. By spring of 1994, the westernmost indication of the benzene plume's presence is at Well MW-10. This trend is also apparent on Table 2 for Monitoring Wells MW-15, MW-16, MW-17, and on Table 3 for domestic irrigation Wells 17200 VM, 17302 VM, 17349 VM, and 17372 VM. Although other factors, such as dilution, may be affecting the petroleum hydrocarbon groundwater plume, the results of this evaluation suggest that biodegradation of petroleum hydrocarbons is occurring in the groundwater at the Site.

4.0 MODIFIED HEALTH RISK ASSESSMENT

A Modified Health Risk Assessment (RA) was completed for the Site by PACIFIC in November 22, 1993, and approved by ACHCSA in November 1993. A summary of the methodology, results, and conclusions of that assessment are presented below. The results of this RA are also presented in Tables 10 and 11, and Appendix B.

4.1 Methodology

4.1.1 Objectives and Assumptions

The RA was an evaluation of the potential risks to human health and environment associated with exposure to the petroleum hydrocarbon chemicals found in soil vapor and groundwater at the Site; exposure to soil was not determined to be a complete exposure pathway. The modified health risk assessment provided health-conservative estimates of the individual lifetime excess carcinogenic and noncarcinogenic risks posed by the chemicals of concern (COCs) detected in these media. Exposure to the detected COCs was evaluated based on the current residential land use at the Site. The maximum COC concentrations detected in groundwater were used to determine chemical intake. These concentrations were assumed to remain constant during lifetime exposure. Risk-determination methodologies were based on specific guidance from ACHCSA, the EPA, and published literature. Potential health risk was determined using parameters based on site-specific data or worst-case assumptions, if unknown.

4.1.2 Chemicals of Concern

The first step in the modified health risk assessment was to identify the COCs. Petroleum hydrocarbons, quantitated as gasoline, were detected in the Site's soil, soil vapor, and groundwater. The principal components of gasoline, which are BTEX compounds, were selected as COCs.

`4.1.3Toxicity Assessment

The toxicity of each chemical of potential concern was evaluated using dose-response estimates obtained from EPA sources. One of the COCs detected at the Site, benzene, is classified by the EPA as known human carcinogen. The remaining COCs are not classified as potential human carcinogens and have chronic health effects only. For each chemical, slope factors (SFs) or reference doses (RfDs) were obtained from EPA references and used in the RA. Slope factors and RfDs are toxicity values which are used to estimate potential health effects. Slope factors are used to estimate the risk of carcinogenic effects for specific chemicals, and RfDs estimate "threshold doses," or the amount of a chemical an individual could consume each day for a lifetime without adverse health effects. The units of SFs and RfDs are mg/kg day.

4.1.4 Exposure Assessment

A detailed exposure assessment was performed for the COCs. Potential exposures to the COCs were evaluated based on the current residential land use at the Site. Three potential routes of human exposure were identified. The three exposure scenarios are briefly described below.

- **Children Playing in Irrigating Groundwater:** This scenario assumes that children could play in extracted groundwater potentially containing dissolved petroleum hydrocarbons. As a consequence, children could be exposed to petroleum hydrocarbons via the inhalation, dermal contact, and ingestion exposure route pathways.
- **Adults Working or Resting Adjacent to Irrigating Groundwater:** This scenario assumes that adults will work or rest adjacent to extracted groundwater potentially containing dissolved petroleum hydrocarbons. As a consequence, adults could be exposed to petroleum hydrocarbons via the inhalation exposure route pathway.
- **Benzene Vapor Transport Through Soil:** This scenario assumes that dissolved petroleum hydrocarbons will volatilize from the groundwater, and that the vapor will migrate through the soil to the ground surface. As a consequence, children and adults could potentially be exposed to soil vapors containing petroleum hydrocarbons via the inhalation exposure route pathway. → [illegible]

Quantitative exposure estimates were provided for each COC using various modeling strategies. Chemical concentrations in environmental media at points of human exposure, or exposure point concentrations (EPCs), were estimated. Based on the EPCs, Chronic Daily Intake (CDI) estimates were derived for each chemical and exposure pathway. CDI is a measure of chemical intake per kilogram of body weight per day (mg/kg-day) at a site. CDIs are used in the risk assessment to quantify carcinogenic and non-carcinogenic health effects for all exposure routes.

4.1.5 Risk Characterization

Potential risks were estimated by mathematically combining the CDI estimates with the dose-response health criteria. The carcinogenic risk estimate for a person exposed to a particular chemical via a particular exposure route is the product of the CDI for that exposure pathway and the SF for that particular chemical. Carcinogenic risk estimates are unitless estimates of the increased probability of tumor formation under the assumed conditions of exposure. In contrast, a noncarcinogenic risk estimate, termed an Health Hazard Index (HHI), is the ratio of the CDI to the RfD. An HHI of unity or greater indicates that noncarcinogenic adverse health effects may occur in an exposed population. Carcinogenic risk estimates and HHIs are summed across all chemicals to provide total risk estimates for a specific exposure route, and the totals for individual routes are summed to provide risk estimates for each exposure scenario.

4.2 Results

4.2.1 Carcinogenic Health Risk Results

for [illegible]

The potential carcinogenic health risk to both child and adult residents is less than 1 x 10^{-6}, also known as the point of departure for risk management decisions. Risks which exceed this level generally indicates that a risk management strategy should be considered.

The potential carcinogenic health risk to child residents ranges from 4.3 x 10^{-7} to 8.5 x 10^{-7}. The majority of risk is attributable to inhalation of soil vapor, at 4.3 x 10^{-7}. The remaining risk ranges from 3.6 x 10^{-8} to 3.5 x 10^{-7} for dermal contact with irrigated groundwater, 1.4 x 10^{-9} to 2.0 x 10^{-8} for ingestion of irrigated groundwater, and 4.6 x 10^{-10} to 1.4 x 10^{-8} for inhalation of COCs from irrigated groundwater.

The potential carcinogenic health risk to adult residents ranges from 8.9 x 10^{-7} to 9.1 x 10^{-7}. The majority of risk is attributable to inhalation of soil vapor, at 8.9 x 10^{-7}. The remaining risk ranges from 1.3 x 10^{-9} to 4.0 x 10^{-8} for inhalation of COCs from irrigated groundwater.

4.2.2 Non-carcinogenic Health Risk Results

The potential non-carcinogenic health risk to both child and adult residents is less than 1, or unity. Risks which exceed this level generally indicate that a risk management strategy should be considered.

Non-carcinogenic health risk for child residents ranges from 4.4×10^{-1} to 4.5×10^{-1}. The majority of risk is attributable to inhalation of soil vapor. The remaining risk ranges from 4.4×10^{-7} to 2.7×10^{-4} for dermal contact with irrigated groundwater, 9.1×10^{-7} to 2.1×10^{-4} for ingestion of irrigated groundwater, and 8.2×10^{-5} to 5.4×10^{-3} for inhalation of COCs from irrigated groundwater.

The potential non-carcinogenic health risk to adult residents is 5.6×10^{-1}. The majority of risk is attributable to inhalation of soil vapor, at 5.6×10^{-1}. The remaining risk ranges from 6.2×10^{-6} to 4.0×10^{-3} for inhalation of COCs from irrigated groundwater.

4.3 Conclusions

Based on the results of the RA, the potential health risk to child and adult residents at the Site is below federal and state action levels. These levels range from 1×10^{-4} to 1×10^{-6} for carcinogenic risk and 1 for non-carcinogenic risk; the State of California Proposition 65 legislation sets the acceptable carcinogenic risk level at 1×10^{-5}. As a result, no adverse health effects would be expected to occur due to exposure to the COCs at the Site, based on the maximum hydrocarbon concentrations observed to date.

4.3.1 Sensitivity Analysis

The actual risk may be much lower than the calculated risk. This is because of existing mitigating factors and the conservative assumptions that were applied to several of the exposure pathways. Despite the following mitigating factors, the calculated risk does not exceed the regulatory benchmarks which would support a risk management strategy.

- The shallow aquifer is of low quality with respect to drinking water standards. Analysis of groundwater samples collected from two domestic irrigation water wells indicated odor at 50 units, color ranging from 5 to 20 units, and turbidity ranged from 8.6 to 9 NTU. These results suggest that the irrigated groundwater looks, smells, and tastes poorly. Thus, the ingestion rate is considered to be very conservative.

- Based on discussions with ACHCSA, exposure duration was considered to be lifetime (70 years), whereas it is generally accepted by EPA that exposure duration should range between 9 to 30 years. Because risk is a linear product of concentration and exposure, using this value more than doubled the calculated risk.

- Based on discussions with ACHCSA, potential health risk was determined using constant COC concentrations throughout the exposure period, whereas concentrations have been shown to decrease over time at the Site due to natural attenuation. The COC concentrations in all domestic irrigation water wells, except at 17349 VM, have been below detection limits during the past year. The COC concentrations at 17349 VM have been below or near detection limits during the past year. Additionally, potential health risk was determined using the highest COC concentrations detected in each domestic irrigation well, rather than averaging the COC concentrations. As a result of using the historical maximum as a constant concentration throughout the exposure period, the calculated risk could be at least an order of magnitude greater than the actual risk.

- Potential health risk was determined assuming child and adult residents would play in, or work adjacent to the irrigating groundwater during every irrigation event throughout the year, regardless of seasonal conditions. Thus, exposure to COCs is considered to be very conservative.
- Based on discussions with ACHCSA, risk from inhalation of soil vapor was estimated assuming near-continuous exposure (approximately 15 hours per day for a lifetime) to the vapors originating from the area of Well MW-10, which has the highest COC concentrations off site. However, wellowners are not likely to be in the area of Well MW-10 on a continuous basis. If this model was revised to assume that the wellowners would be in the area of their domestic irrigation wells on a continuous basis, the actual risk would be at least an order of magnitude lower than the calculated risk.

→ nonsense!
[illegible]
houses [illegible] gw [illegible]
[illegible] to
MW10

5.0 REMEDIAL ACTION OBJECTIVES

5.1 Remedial Action Objectives

Remedial action objectives for soil and groundwater at the Site were developed considering a number of factors, primarily the type and the amount of chemical present, land use, the volume and location of affected soil, a subsurface environmental chemical fate and transport model, possible human and environmental receptors, and regulatory agency requirements. Based on these factors, the following remedial action objectives for the Site were identified:

- Reduce groundwater petroleum hydrocarbon concentrations to federal and state maximum contaminant levels (MCLs).
- Reduce soil petroleum hydrocarbon concentrations to 100 milligrams per kilogram (mg/kg) for TPH-g and 1 mg/kg for each BTEX compound.

6.0 REMEDIAL ACTION ALTERNATIVE DEVELOPMENT AND EVALUATION

6.1 Screening Criteria

EPA, through the National Contingency Plan, has required evaluation of nine criteria for selection of a remedial action. These criteria incorporate the six required by H&SC Section 25356.1 and provide a comprehensive evaluation framework that forms a basis for selecting an appropriate remedial action(s). These criteria were confirmed at the July 8, 1994 meeting. The nine criteria are:

1. Overall protection of human health and environment
2. Compliance with Applicable or Relevant and Appropriate Regulations (ARARs)
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
5. Short-term effectiveness
6. Implementability
7. Cost
8. Regulatory agency acceptance
9. Community acceptance

The following sections briefly describe each screening criteria.

6.1.1 Overall Protection of Human Health and the Environment

An assessment of overall protection of human health and the environment was made for the Site based on the overall implications of other criteria. The combined evaluation of other criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs, is considered.

6.1.2 Compliance with Applicable or Relevant and Appropriate Regulations

ARARs are applicable or relevant and appropriate requirements which are standards, criteria or limits promulgated under federal or state law. Potential ARARs for the Site were identified based on anticipated regulatory actions. **The final determination of which requirements are ARARs will made by the lead regulatory agency, the ACHCSA.** The terms "applicable" and "relevant and appropriate" are described in the National Contingency Plan as follows:

- **Applicable requirements** are those remedial standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site.
- **Relevant and appropriate requirements** are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the Site that their use is well suited to the particular site.

Additionally, nonpromulgated policy, advisories, or guidance documents issued by federal or state agencies may be considered when developing remediation levels necessary to protect public health and the environment, although they are not ARARs.

6.1.3 Long-Term Effectiveness and Permanence

This criterion addressed the results of remedial actions in terms of the risk remaining after response objectives have been met. The magnitude of risk remaining from untreated residuals was examined for both soil and groundwater. Control measures, such as monitoring and system maintenance, were examined on the bases of adequacy and reliability.

6.1.4 Reduction of Toxicity, Mobility, or Volume

This criterion established preference for alternatives that would produce permanent, significant reductions. The evaluation focused on the amount of chemicals destroyed or treated, the irreversibility of the treatment, and the type and quantity of residuals that would remain after treatment.

6.1.5 Short-Term Effectiveness

Short-term effectiveness refers to the effects of an alternative during the construction and implementation phases and prior to obtaining response objectives. Four major aspects of short-term effectiveness were used to evaluate each alternative: protection of the community, protection of workers, environmental impacts from construction and implementation, and the time required to achieve the objectives.

6.1.6 Implementability

This criterion covers three major categories of implementability: technical feasibility, administrative feasibility, and availability of support services and materials.

Technical feasibility refers to the ease of construction given the site constraints, the reliability of the technology, and the ability to monitor the effectiveness of an alternative. For example, if a technology were to require large, unobstructed space for implementation, this could present a hindrance to technical feasibility at a site with buildings, utility corridors, loading areas, parking, or traffic lanes. Technical feasibility also infers that the treatment must work despite limitations which are associated with a given soil or hydrogeologic condition.

Administrative feasibility refers to necessary coordination with other regulatory or local agencies. For example, if a groundwater extraction system were to discharge treated water to surface water, permits may be needed from several agencies having jurisdiction over the surface water.

Availability of support services and materials refers to the ability to provide diverse needs such as equipment, competitive bids, and trained personnel.

6.1.7 Cost

This criterion was used to assess capital and operations and maintenance (O&M) costs on a conceptual level only. Capital costs included direct costs, such as equipment, site development, and relocation expenses. Indirect costs included engineering, permits, and start-up costs. O&M costs included labor, materials, repairs, disposal, administrative fees, and reporting costs. Cost estimates were prepared for each alternative using present worth analysis, assuming a 5 percent inflation factor. Estimates were accurate to within +50 to -30 percent.

6.1.8 Regulatory Agency Acceptance

This criterion was used to assess the likelihood of acceptance of the various alternatives by regulatory agencies having jurisdiction over remedial actions.

6.1.9 Community Acceptance

Community acceptance addresses the issues and concerns the public may have to each of the alternatives.

6.2 Development of Remedial Action Alternatives

Several remedial action alternatives were developed based on the results of modeling, risk assessment, and feasibility studies conducted at the Site. These alternatives were presented and agreed upon during the July 8, 1994 meeting with ACHCSA and RWQCB. A copy of the minutes for this meeting are provided as Appendix C. The remedial action alternatives which were approved for consideration during that meeting follow.

1. Alternative 1: No action for soil and groundwater.

2. ☆ Alternative 2: No action for soil, institutional controls for groundwater off site, and groundwater extraction on site. This alternative allows pumping @ offsite domestic irrigation wells, See 7-2

3. Alternative 3: No action for soil; institutional controls for groundwater off site, biosparging groundwater on site.

4. Alternative 4: Soil vapor extraction of soil on site, institutional controls for groundwater off site, air sparging and groundwater extraction on site.

Additionally, the following remedial action alternative has been developed since the July 8, 1994 meeting for consideration.

5. Alternative 5: Excavation of soil on site, institutional controls for groundwater off site, and groundwater extraction on site.

As approved during the July 8, 1994 meeting with ACHCSA and the RWQCB, all of the alternatives apply institutional controls to the off-site groundwater, except for Alternative 1. **Institutional controls consist of a groundwater management plan which includes regular, groundwater monitoring and sampling, and health risk evaluation.** The current groundwater monitoring and sampling schedule would be maintained initially, but would be expected to be modified during the project life. The health risk evaluation would coincide with groundwater sampling and consists of revising the November 22, 1993 risk assessment in the event that future COC concentrations exceed the concentrations used in the risk assessment. The revised potential health risk would be estimated using a COC concentration represented by the 95 percent upper confidence limit of the average.

6.3 Detailed Analysis Of Remedial Action Alternatives

This section presents a comparative analysis of the five remedial alternatives against the nine evaluation criteria outlined in Section 6.1. To aid in this discussion, a summary of this comparative analysis is presented in Table 12.

6.3.1 Alternative 1: No Action for Soil and Groundwater

The no action alternative is required under CERCLA (EPA, 1988b) to provide a baseline to compare against other alternatives. Under this alternative, no further action would be taken to remediate groundwater and soil, and groundwater monitoring would be discontinued.

Protection of Human Health and Environment. Based on the results of the modeling and risk assessment, this alternative should be protective of human health and the environment. However, this alternative provides no monitoring data to evaluate protection of human health and the environment in the long term.

Compliance with ARARs. The concentrations of COCs in soil and groundwater presently exceed the remedial action goals established for the Site. On a long-term basis, these remedial goals would likely be met through natural attenuation and biodegradation.

Long-Term Effectiveness and Permanence. Theoretically this alternative would achieve soil and groundwater remedial goals through natural attenuation and biodegradation.

Reduction of Toxicity, Mobility, and Volume. This alternative would not actively reduce the toxicity, mobility, or volume of COCs in groundwater or soil in the near term. In fact, the mobility of the COCs in groundwater would likely increase with cessation of operation of the existing groundwater extraction system. In the long term, the toxicity and volume of COCs in soil and groundwater would likely be reduced through natural attenuation and biodegradation.

Short-Term Effectiveness. This alternative does not affect the COCs in the soil or groundwater at the Site in the short term. This alternative increases the mobility of the COCs without providing any monitoring data to evaluate long-term protection of human health and environment. There would be no hazards relating to implementation of this alternative which a safety plan could not adequately address (i.e. groundwater monitoring and treatment system demolition activities).

Implementability. This alternative is readily implementable.

Present Worth Cost. The cost of this alternative is estimated at $30,000 and is based on demolition of the existing groundwater monitoring wells and extraction and treatment system.

Regulatory Acceptance. This alternative is not likely to be accepted by the regulatory agencies because the alternative does not actively remediate and monitor VOC-impacted soil and groundwater at the Site.

Community Acceptance. Based on historical input from the similar communities, this alternative is not likely to be accepted by the public.

6.3.2 Alternative 2: No Action for Soil, Institutional Controls for Groundwater Off Site, Groundwater Extraction On Site

Alternative 2 consists of no action for soil, institutional controls for groundwater off site, and extraction of groundwater via one existing groundwater extraction well located on site. Institutional controls would be applied for approximately 20 years. Groundwater would be extracted for migration control purposes until field testing confirmed stabilization of the impacted groundwater plume, approximately 5 years. Extracted groundwater would be treated using the existing groundwater treatment system prior to discharge to the Oro Loma Sanitary Sewer District.

How so?

Protection of Human Health and Environment. This alternative would be protective of human health and the environment based on the results of the modeling and risk assessment. This alternative also provides monitoring data to evaluate protection of human health and the environment in the long term. Additionally, this alternative should reduce the actual exposure time of the population to the COCs.

Compliance with ARARs. The concentrations of COCs in soil and groundwater presently exceed the remedial action goals established for the Site. Although the remedial goals would likely be met through natural attenuation and biodegradation over time, extraction of groundwater would reduce the time required to achieve the groundwater remedial goals. The no action component of this alternative would not meet the soil remedial goals for the Site in the short term. Proper operation and maintenance of the groundwater extraction and treatment system should satisfy the groundwater discharge permit requirements.

Long-Term Effectiveness and Permanence. Groundwater extraction offers migration control and permanent removal of the COCs from the groundwater. The groundwater remedial goals would likely be achieved in less time as a result of groundwater extraction. This alternative does not address removal of the COCs from soil.

Reduction of Toxicity, Mobility, and Volume. Groundwater extraction should reduce the toxicity, mobility, and volume of the COCs in groundwater. However, the COCs would be transferred to GAC for ultimate disposal or destruction through regeneration. The no action soil component of this alternative should gradually reduce the toxicity and volume of the

COCs in soil over a long period of time; however, it would not affect the mobility of the COCs in soil.

Short-Term Effectiveness. Groundwater extraction would use existing equipment, and exposure to additional sources of COCs (i.e. from discharge of treated groundwater) are considered negligible. Extraction of groundwater should inhibit additional COCs from migrating off site and reduce the time necessary to achieve the groundwater remedial action goals. There would be no hazards relating to implementation of this alternative which a safety plan and operation and maintenance plan could not adequately address.

Implementability. Groundwater extraction for migration control purposes does not pose technical difficulties, as the equipment is available and on site. Extraction of groundwater at the Site has been approved by the ACHCSA as an interim measure. There are no technical barriers to implementing the no action soil remediation component of this alternative.

Present Worth Cost. The cost of this alternative is estimated at $290,000 and includes groundwater monitoring, operation and maintenance, and demolition costs.

Regulatory Acceptance. It is likely that this alternative would gain regulatory acceptance because groundwater extraction has been successful as an interim measure and inhibits the migration of COCs off site, thus reducing the potential health risk and exposure duration to the exposed population. Additionally, this alternative provides monitoring data to evaluate protection of human health and the environment.

Community Acceptance. It is likely that this alternative would gain community acceptance because of the reasons discussed under regulatory acceptance.

6.3.3 Alternative 3: No Action for Soil, Institutional Controls for Groundwater Off Site, Biosparging Groundwater On Site

Alternative 3 consists of no action for soil, institutional controls for groundwater off site, and biosparging of groundwater on site. Institutional controls would be applied for approximately 15 years. Biosparging of on-site groundwater would be accomplished using five new sparge wells which would be operated for approximately 5 years. Biosparging should stimulate the biodegradation of the COCs in the groundwater and may inhibit or partially inhibit off-site migration of the COCs.

Protection of Human Health and Environment. This alternative would be protective of human health and the environment based on the results of the modeling and risk assessment. This alternative also provides monitoring data to evaluate protection of human health and the environment in the long term. Additionally, this alternative should reduce the actual exposure time of the population to the COCs.

Compliance with ARARs. The concentrations of COCs in soil and groundwater presently exceed the remedial action goals established for the Site. Although the remedial goals would likely be met through natural attenuation and biodegradation over time, biosparging on-site groundwater should reduce the time required to achieve the groundwater remedial goals. The no action component of this alternative would not meet the soil remedial action goals for the Site in the short term.

Long-Term Effectiveness and Permanence. Biosparging should increase the rate of COC biodegradation in the on-site groundwater. Biodegradation provides permanent destruction of the COCs from the groundwater and should achieve the groundwater remedial action goals in less time. A secondary benefit of biosparging could result in an increased biodegradation rate in the soil.

Reduction of Toxicity, Mobility, and Volume. Biosparging should reduce the toxicity and volume of the COCs in groundwater. Biosparging may reduce the mobility of COCs in groundwater by the creation of a hydraulic barrier, however this would need to be confirmed by field testing. The no action soil component of this alternative would gradually reduce the toxicity and volume of COCs in the soil over a long period of time; however, it should not affect the mobility of COCs in the soil.

Short-Term Effectiveness. Implementation of biosparging would require construction of a new remedial system. Exposure to additional sources of COCs is considered negligible, but is unknown. Biosparging could also result in the volatilization of the COCs in groundwater, thus potentially increasing the soil vapor inhalation health risk. Biosparging may inhibit off-site migration of COCs, however this would need to be confirmed by field testing. There would be no hazards relating to implementation of this alternative which a safety plan and operation and maintenance plan could not adequately address.

Where?
on-site

Implementability. Biosparging is a relatively new remedial technology, and no specific field studies have been conducted at the Site. Based on case studies of other sites, biosparging may be effective at the Site, but would need to be confirmed by field testing. Until confirmed, technical difficulties could occur which would increase the cost of the alternative. There are no known technical or administrative barriers to implementing this alternative and support services are readily available. An air discharge permit would not be required, however periodic air monitoring could be performed to evaluate system effectiveness and potential health risk due to inhalation of soil vapor.

Present Worth Cost. The cost of this alternative is estimated at $365,000 and includes additional field testing, capital and construction, groundwater monitoring, operation and maintenance, and demolition costs.

Regulatory Acceptance. It is unknown if this alternative would gain regulatory acceptance because biosparging may not prevent the COCs from migrating off site and could result in increased COC concentrations in the soil vapor. However, this alternative would provide monitoring data to evaluate protection of human health and the environment and reduce the time required to achieve the groundwater remedial goals.

Community Acceptance. It is unknown if this alternative would be accepted by the community given the reasons discussed in regulatory acceptance.

6.3.4 Alternative 4: Soil Vapor Extraction On Site, Institutional Controls for Groundwater Off Site, Air Sparging and Groundwater Extraction On Site

Alternative 4 consists of soil vapor extraction to remove VOCs from the on-site soil, institutional controls for groundwater off site, and air sparging and groundwater extraction for groundwater on site. A soil vapor extraction system consisting of approximately eight wells would be constructed on site and operated for less than 5 years. Extracted soil vapor would be treated using GAC prior to discharge to the atmosphere. An air discharge permit would be required from the Bay Area Air Quality Management District (BAAQMD).* Institutional controls would be applied for approximately 10 years. An air sparging system consisting of approximately 10 wells would be constructed on site and operated in conjunction with the existing groundwater extraction and treatment system. Extracted groundwater would be treated using the existing groundwater treatment system and discharged to the Oro Loma Sanitary Sewer District.* The combined air sparging/groundwater extraction and treatment system would be operated for approximately 5 years. *

Protection of Human Health and Environment. This alternative would be protective of human health and the environment based on the results of the modeling and risk assessment. This alternative also provides monitoring data to evaluate protection of human health and the environment in the long term. Additionally, this alternative should reduce the actual exposure time of the population to the COCs.

Compliance with ARARs. The concentrations of COCs in soil and groundwater presently exceed the remedial action goals established for the Site. Although the remedial goals would likely be met through natural attenuation and biodegradation over time, soil vapor extraction, air sparging, and groundwater extraction would decrease the amount of time required to achieve the groundwater and soil remedial action goals. Proper operation and maintenance of this combined system should satisfy the air and groundwater discharge permits requirements.

Long-Term Effectiveness and Permanence. Air sparging should increase the rate of volatilization of COCs in the on-site groundwater. Volatilized COCs should be removed by the soil vapor extraction system, and COCs removed with extracted groundwater would be treated using GAC, which provides permanent removal of the COCs. This alternative should achieve the soil and groundwater remedial action goals in the least time.

Reduction of Toxicity, Mobility, and Volume. This alternative provides for the permanent removal of the COCs from the soil and groundwater, thereby achieving reductions in toxicity, mobility, and volume. However, the COCs would be transferred to GAC for ultimate disposal or destruction through regeneration.

Short-Term Effectiveness. A soil vapor extraction and air sparging system would require construction. Groundwater extraction would use existing equipment, and exposure to additional sources of COCs (i.e. from discharge of treated soil vapor and groundwater) are considered negligible. Air sparging and groundwater extraction should inhibit additional COCs from migrating off site and reduce the time necessary to achieve the groundwater remedial action goals. Soil vapor extraction should reduce the time necessary to achieve the soil remedial action goals and minimize the potential health risk due to volatilized COCs. There would be no hazards relating to implementation of this alternative which a safety plan and operation and maintenance plan could not adequately address.

Implementability. Groundwater extraction does not pose technical difficulties, as the equipment is available and on site. Extraction of groundwater at the Site has been approved by the ACHCSA as an interim measure. Soil vapor extraction and air sparging feasibility studies have been completed for the Site and indicate that these technologies are feasible, but are limited. As a result, technical difficulties are likely to occur which would increase the cost of the alternative. There are no technical or administrative barriers to implementing this alternative and support services are readily available.

Present Worth Cost. The cost of this alternative is estimated at $400,000 and includes additional field testing, capital and construction, groundwater monitoring, operation and maintenance, and demolition costs.

Regulatory Acceptance. It is likely that this alternative would gain regulatory acceptance because it is the most comprehensive approach, and groundwater extraction has been successful as an interim measure and inhibits the migration of COCs off site, thus reducing the potential health risk and exposure duration to the exposed population. Additionally, this alternative provides monitoring data to evaluate protection of human health and the environment.

Community Acceptance. It is likely that this alternative would gain community acceptance because of the reasons discussed under regulatory acceptance.

6.3.5 Alternative 5: Excavation of Soil On Site, Institutional Control for Groundwater Off Site, Groundwater Extraction On Site

Alternative 5 consists of excavation of the impacted on-site soil, institutional controls for groundwater off site, and groundwater extraction on site. The impacted on-site soil would be excavated to remove the remaining source material following demolition of the existing service station. Demolition of the service station would likely occur if and when ARCO's lease is not renewed. For comparison purposes, excavation was arbitrarily set to occur in 20 years. Institutional controls would be applied for approximately 20 years. The existing groundwater extraction and treatment system would be operated until the impacted soil is excavated. Extracted groundwater would be treated using the existing groundwater treatment system and discharged to the Oro Loma Sanitary Sewer District.

Protection of Human Health and Environment. This alternative would be protective of human health and the environment based on the results of the modeling and risk assessment. This alternative also provides monitoring data to evaluate protection of human health and the environment in the long term. Additionally, this alternative should reduce the actual exposure time of the population to the COCs.

Compliance with ARARs. The concentrations of COCs in the soil and groundwater presently exceed the remedial action goals established for the Site. Although the remedial goals would likely be met through natural attenuation and biodegradation over time, groundwater extraction decreases the amount of time required to achieve the remedial action goals for groundwater. Because renewal of ARCO's lease is an unknown factor, this alternative may or may not reduce the time required to achieve the remedial action goals for soil. Proper operation and maintenance of the system should satisfy the groundwater discharge permit requirements.

Long-Term Effectiveness and Permanence. Groundwater extraction offers permanent removal of the COCs from the groundwater. The groundwater remedial action goals would likely be achieved in less time as a result of groundwater extraction. Excavation of the impacted soil also offers permanent removal of the COCs from the Site.

Reduction of Toxicity, Mobility, and Volume. Groundwater extraction should reduce the toxicity, mobility, and volume of the COCs in groundwater. However, the COCs would be transferred to GAC for ultimate disposal or destruction through regeneration. Excavation of the impacted soil effectively reduces the toxicity, mobility, and volume of the COCs in the soil at the Site by transferring the COCs to another location.

Short-Term Effectiveness. Groundwater extraction would use existing equipment, and exposure to additional sources of COCs are considered negligible. Extraction of groundwater should inhibit additional COCs from migrating off site and reduce the time necessary to achieve the groundwater remedial action goals. The excavation of impacted soil is not likely to occur in the short term. There would be no hazards relating to implementation of this alternative which a safety plan and operation and maintenance plan could not adequately address.

Implementability. Groundwater extraction does not pose technical difficulties, as the equipment is available and on site. Extraction of groundwater at the Site has been approved by the ACHCSA as an interim measure. Excavation of the impacted soil would be contingent on ARCO's lease expiring and demolition of the service station. There are no technical barriers to implementing the no action soil remediation component of this alternative.

Present Worth Cost. The cost of this alternative is estimated at $485,000 and includes construction and soil disposal, groundwater monitoring, operation and maintenance, and demolition costs.

Regulatory Acceptance. It is likely that this alternative would gain regulatory acceptance because groundwater extraction has been successful as an interim measure and inhibits the migration of COCs off site, this reducing the potential health risk and exposure duration to the exposed population. Additionally, this alternative provides monitoring data to evaluate protection of human health and the environment and long-term removal of impacted on-site soils.

Community Acceptance. It is likely that this alternative would gain community acceptance because of the reasons discussed under regulatory acceptance.

6.4 Comparative Analysis of Remedial Action Alternatives

Each remedial alternative for the Site was compared on the basis of the nine detailed analysis criteria described in Section 6.1. These comparisons are summarized below.

Protection of Human Health and Environment: All of the alternatives are protective of human health and environment based on the results of the modeling and risk assessment. Unlike Alternative 1, Alternatives 2 through 5 provide monitoring data to evaluate protection of human health and the environment in the long term. Additionally, Alternatives 2 through 5 reduce the exposure time of the population to the COCs. Alternative 3 may increase the COC concentrations in the on-site soil vapor, thus increasing the potential health risk due to inhalation of soil vapor.

Compliance with ARARs: None of the alternatives immediately reduce the COC concentrations in the soil and groundwater to the remedial action goals. All of the alternatives should achieve the remedial action goals in the long term, with Alternative 1 requiring the longest time and Alternative 4 requiring the least time. However, the current COC concentrations are health protective which minimizes the necessity to achieve the remedial action goals in the short term.

Long-Term Effectiveness and Permanence: All of the alternatives are effective in the long term and are permanent. Alternative 1 requires the longest time and Alternative 4 requires the least time to achieve the remedial action goals. Alternatives 1 and 3 rely on natural attenuation and biodegradation to destroy the COCs, whereas Alternatives 2, 4, and 5 transfer the COCs to GAC for ultimate disposal or destruction by regeneration. Additionally, Alternative 5 transfers the location of the soil-based COCs from the Site to a disposal facility.

Reduction of Toxicity, Mobility, and Volume: Alternative 1 would not actively reduce the toxicity and volume of the COCs in the soil and groundwater, and would increase the mobility of the COCs in the groundwater. Alternatives 2, 4, and 5 reduce the toxicity, mobility, and volume of COCs in the groundwater. Alternatives 2 and 3 would not actively reduce the toxicity, mobility, and volume of COCs in the soil. Alternative 3 would reduce the toxicity and volume, and may reduce the mobility of COCs in the groundwater, but this would need to be confirmed by field testing. Alternatives 4 and 5 provide the greatest reduction of toxicity, mobility, and volume of COCs in the soil and groundwater. However, the soil component of Alternative 5 is not expected to be implemented in the short term.

Short-Term Effectiveness: Alternative 1 is not effective in the short term because it provides no monitoring data to evaluate potential health risk. This data is provided by Alternatives 2 through 5. Alternative 3 may increase the potential health risk to the exposed population in the short term due to the possibility of increased soil vapor migration.

Implementability: All of the alternatives are readily implementable, except Alternative 3 which may require further field testing tor evaluate its effectiveness at the Site. Alternatives 2 through 5 require discharge permits which are readily available.

Present Worth Cost: Alternative 1 is the least costly at $30,000; Alternatives 2, 3, and 4 range from $290,000 to $400,000; Alternative 5 is the most costly at $485,000.

Regulatory Acceptance: Alternative 1 is not likely to gain regulatory acceptance because it does not actively remediate and monitor VOC-impacted soil and groundwater at the Site. Alternatives 2, 4, and 5 are likely to gain regulatory acceptance because they are health protective and actively reduce the concentrations of COCs in the soil and/or groundwater. Alternative 3 may not gain regulatory acceptance because it may not inhibit the COCs from migrating off site and could increase the potential health risk in the short term.

This opinion does
not support that
investigation to indicate
biodegradation is occurring

Community Acceptance. Alternative 1 is not likely to gain community acceptance because it does not actively remediate and monitor VOC-impacted soil and groundwater at the Site. Alternatives 2, 4, and 5 are likely to gain community acceptance because they are health protective and actively reduce the concentrations of COCs in the soil and/or groundwater. Alternative 3 may not gain community acceptance because it may not inhibit the COCs from migrating off site and could increase the potential health risk in the short term.

7.0 RECOMMENDED REMEDIAL ACTION ALTERNATIVE

7.1 Recommended Remedial Action Alternative

*Previous study showed insufficient biodegradation was occurring!

Based on the analysis of remedial action alternatives summarized in Section 6.5 and the results of the remedial investigation, feasibility testing, modeling, and modified health risk assessment, Alternative 2 is the recommended remedial action for the Site. Alternative 2 consists of no action for soil, institutional controls off site, and groundwater extraction on site.

Implementation of Alternative 2 would not result in active remediation of the impacted on-site soils. Instead, natural attenuation and biodegradation should reduce the COC concentrations in soil to the remedial action goals. This is expected to require a long period of time. Although the COCs in the soil are expected to further impact the on-site groundwater, operation of the existing groundwater extraction system should inhibit the COCs from migrating off site. Additionally, there are no complete pathways for exposure to impacted soil given present site use conditions. If this is true, why is 17340VM still getting hits since the extraction system has been operating for 3+ years?

Capture and extraction of impacted groundwater will continue, using the existing groundwater extraction Well E-1A. Operation and maintenance activities will include monthly inspection and maintenance of the system by a trained technician. The technician will collect water samples, inspect all equipment and exposed piping and fittings, record system readings, and coordinate replacement of the GAC. Long-term treatment of the extracted groundwater would occur through the existing GAC treatment system. Treated groundwater would be discharged to the Oro Loma Sanitary Sewer District under the provisions of the existing discharge permit. The quality of the discharge water would be routinely tested to verify that it meets all discharge standards. Treatment system sampling and operational data would be reported to ACHCSA on a quarterly basis. Groundwater extraction for migration control purposes will continue until field data confirm that the impacted groundwater plume has stabilized, approximately 5 years.

Which is? Per letter 2/18/93 - QM until [illegible]

Monitoring and groundwater sampling of the monitoring wells and domestic irrigation water wells will continue in accordance with the ACHCSA-approved schedule. This schedule will be reviewed periodically and any proposed changes would be submitted to ACHCSA for its review and approval. All groundwater samples collected from the monitoring wells and domestic irrigation water wells would be analyzed by EPA Methods 8015 (modified) and

8020 for TPH-g and BTEX compounds. Evaluation of human health will coincide with groundwater sampling and consists of updating the potential health risk in the event that the COC concentrations exceed the concentrations used in the November 22, 1993 modified health risk assessment. In the event health risk is revised, the concentration, represented by the 95 percent upper confidence limit of the average, for the applicable well(s) would be used. Results of all sampling and human health and environment evaluation would be reported to each wellowner and to the ACHCSA on a quarterly basis. In addition, each wellowner will receive results for their own well on a quarterly basis. **The wellowners would be allowed to operate their domestic irrigation wells provided that the quarterly evaluation confirms protection of human health.**

7.2 Justification of Selected Remedial Action Alternative

Alternative 2 is recommended for the reasons outlined below.

1. **This alternative would be protective of human health and the environment**. Concentrations of COCs are presently health protective. This alternative also monitors protection of human health and the environment in the long term. Additionally, groundwater extraction will provide migration control, thus reducing the exposure time of the population to the COCs.

2. **This alternative complies with ARARs**. Although the concentrations of COCs presently exceed the remedial action goals, these goals should be achieved through natural attenuation and biodegradation processes. — Proof? Extraction of groundwater should decrease the time required to achieve the groundwater remedial action goals. Additionally, proper operation and maintenance of the system should satisfy all groundwater discharge requirements. However, soil (source reduction) is not addressed.

Need to study contaminant migration in soil

3. **This alternative provides long-term effectiveness and permanence**. This alternative would effectively contain and remove impacted groundwater from beneath the Site. Additionally, natural attenuation and biodegradation processes would result in the permanent destruction of VOCs in the soils beneath the Site. — no data available to support this statement!

4. **This alternative reduces toxicity, mobility, and volume of the COCs in groundwater**. Extraction and treatment of groundwater by GAC provides for permanent removal of VOCs, thereby achieving reductions in toxicity, mobility, and volume. The no action component of this alternative should gradually reduce the toxicity and volume of the COCs in soil over a long

→ nat'l transport in soil?

period of time; however, **it would not affect the mobility of COCs in the soil.**

5. **The alternative provides short-term effectiveness**. Using GAC to treat extracted groundwater does not produce air emissions. Provided that restricted access is maintained and the system is operated by trained personnel, exposure to residents and workers would be negligible. It is not expected that the public would be affected by system operation and maintenance activities. Therefore, short-term impacts to human health and the environment would be very low. Additionally, this alternative is effective in the short term because it inhibits off-site migration of COCs until the impacted groundwater plume stabilizes in approximately 2 to 5 years.

6. **This alternative is implementable**. Groundwater extraction for migration control purposes, and treatment using GAC does not pose technical difficulties.

7. **This alternative is cost-effective.** This is the most cost-effective "active" remedial action alternative. The only alternative less costly is the no action alternative.

8. **This alternative is likely to be acceptable to the regulatory agencies.** This alternative is likely to gain regulatory acceptance because groundwater extraction has been successful as an interim measure and inhibits the migration of COCs off site, thus reducing the potential health risk and exposure duration to the exposed population. Additionally, this alternative evaluates human health and the environment in the long term.

9. **This alternative is likely to be acceptable to the community**. This alternative is likely to gain regulatory acceptance because groundwater extraction has been successful as an interim measure and inhibits the migration of COCs off site, thus reducing the potential health risk and exposure duration to the exposed population. Additionally, this alternative evaluates human health and the environment in the long term.

7.3 Justification for Rejection of Alternatives

The rationale for rejection of the remaining four remedial action alternatives that were evaluated in Section 6.3 is presented in this section. The rejection of the remaining alternatives was based on effectiveness of the method, overall protection of human health and environment, cost, and the anticipated acceptance or rejection of the alternative by the regulatory agencies and the community. The alternatives, with a brief discussion of why each was rejected for Site remediation, are as follows:

- **Alternative 1: No Action for Soil or Groundwater.** Alternative 1 was rejected because: (1) it is not effective in the short or long term, (2) it does not monitor the protection of human health and environment in the long term, (3) it could result in additional off-site migration of the COCs, and (4) it may not be accepted by regulatory agencies or the community.

- **Alternative 3: No Action for Soil; Institutional Controls for Groundwater Off Site, Biosparging Groundwater On Site.** Alternative 3 was rejected because: (1) it may not inhibit the off-site migration of the COCs, (2) no field studies have been conducted to determine if biosparging would be effective at the Site, (3) it is more costly than the recommended alternative, and (4) it may not be accepted by regulatory agencies or the community.

- **Alternative 4: Soil Vapor Extraction of Soil On Site, Institutional Controls for Groundwater Off Site, Air Sparging, and Groundwater Extraction On Site.** Alternative 4 was rejected because: (1) field studies have shown that soil vapor extraction and air sparging have only limited feasibility at the Site, (2) it is much more disruptive to site activities than the recommended remedial alternative, and (3) it is more costly than the recommended alternative.

- **Alternative 5: Excavation of Soil On Site, Institutional Controls for Groundwater Off Site, and Groundwater Extraction On Site.** Alternative 5 was rejected because: (1) excavation is dependent on demolition of the service station which is not likely to occur in the short term, and (2) it is the most costly of all alternatives.

A I assume Alternative 4 was [illegible] consideration. We present data that support natural attenuation is occurring in the soil.

8.0 IMPLEMENTATION SCHEDULE

The proposed remedial action implementation schedule is as follows:

Activity	Date
RI/FS Submittal to ACHCSA	November 1994
ACHCSA Approval of RI/FS Community Meeting	February 1995
Implementation of Remedial Action	February 1995

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Table 1
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-1	01/11/88	NA	NA	--	NA
	06/14/88	Well Destroyed			
MW-2	07/05/85	NA	NA	--	NA
	01/11/88	NA	NA	--	NA
	06/14/88	Well Destroyed			
MW-3	01/11/88	33.27	NA	--	NA
	03/07/89		11.96	--	21.31
	06/21/89		12.85	--	20.42
	12/12/89		13.46	--	19.81
	03/29/90		13.21	--	20.06
	05/08/90		13.23	--	20.04
	06/22/90		NA	--	NA
	07/18/90	Well Destroyed			
MW-4	01/11/88	32.43	NA	--	NA
	09/12/88		NA	--	NA
	03/07/89		10.76	--	21.67
	06/21/89		11.96	--	20.47
	12/12/89		NA	--	NA
	03/29/90		11.72	0.01	20.71
	05/08/90		12.19	--	20.24
	06/22/90		NA	--	NA
	07/18/90	Well Destroyed			
MW-5	01/16/92	33.99	Dry	--	NA
	02/19/92		13.5	--	20.49
	03/17/92		11.90	--	22.09
	04/15/92		12.18	--	21.81
	05/14/92		12.78	--	21.21
	06/15/92	Well Dry			
	07/14/92	Well Dry			
	08/18/92	Well Dry			
	09/15/92	Well Dry			
	10/16/92	Well Dry			
	11/18/92	Well Dry			
	12/17/92		12.74	--	21.25
	01/19/93		10.92	--	23.07
	02/22/93		11.10	--	22.89
	03/15/93		11.13	--	22.86
	04/09/93		11.46	--	22.53

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-5 (cont.)	05/13/93		12.19	--	21.80
	06/04/93		12.51	--	21.48
	06/15/93		12.59	--	21.40
	09/13/93		13.40	--	20.59
	12/28/93		13.25	--	20.74
	03/28/94		12.22	--	21.77
	06/13/94		12.54	--	21.45
	09/19/94		13.55	--	20.00
MW-6 (E-1)	06/21/89	32.95	12.48	--	20.47
	12/12/89		13.16	--	13.16
	03/29/90		12.39	--	12.39
	05/08/90		12.93	--	12.93
	06/22/90		12.94	--	12.94
	07/18/90			Well Destroyed	
MW-7	01/16/92	34.40	13.33	--	21.83
	02/19/92		12.16	--	NA
	03/17/92		11.86	--	22.54
	04/15/92		12.30	--	22.10
	05/14/92		13.04	--	21.36
	06/15/92		13.78	--	20.62
	07/14/92		14.20	--	20.20
	08/18/92		14.79	--	19.61
	09/15/92		15.12	--	19.28
	10/16/92		15.38	--	19.02
	11/18/92		15.10	--	19.30
	12/17/92		13.69	--	20.71
	01/19/93		10.92	--	23.48
	02/22/93		10.91	--	23.49
	03/15/93		11.13	--	23.03
	04/09/93		11.46	--	22.94
	05/13/93		12.22	--	22.18
	06/04/93		12.51	--	21.89
	06/15/93		12.66	--	21.74
	09/13/93		13.78	--	20.62
	12/28/93		13.43	--	20.97
	03/28/94		12.32	--	22.08
	06/13/94		12.70	--	21.70
	09/19/94		14.16	--	20.24
MW-8	01/16/92	32.79	13.40	--	19.39
	02/19/92		11.26	--	21.53

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-8 (cont.)	03/17/92		10.90	--	21.89
	04/15/92		11.35	--	21.44
	05/14/92		12.06	--	20.73
	06/15/92		12.83	--	19.96
	07/14/92		12.75	--	20.04
	08/18/92		13.83	--	18.96
	09/15/92		14.17	--	18.62
	10/16/92		14.51	--	18.28
	11/18/92		14.15	--	18.64
	12/17/92		12.68	--	20.11
	01/19/93		9.79	--	23.00
	02/22/93		9.95	--	22.84
	03/15/93		10.31	--	22.48
	04/09/93		10.47	--	22.32
	05/13/93		11.18	--	21.61
	06/04/93		11.47	--	21.32
	06/15/93		11.62	--	21.17
	09/13/93		12.70	--	20.09
	12/28/93		12.23	--	20.56
	03/28/94		11.28	--	21.51
	06/13/94		11.60	--	21.19
	09/19/94		13.07	--	19.72
MW-9	01/16/92	32.11	12.45	--	19.66
	02/19/92		10.25	--	21.86
	03/17/92		10.01	--	22.10
	04/15/92		10.49	--	21.62
	05/14/92		11.19	--	20.92
	06/15/92		11.86	--	20.25
	07/14/92		12.28	--	19.83
	08/18/92		12.89	--	19.22
	09/15/92		13.28	--	18.83
	10/16/92		13.60	--	18.51
	11/18/92		13.24	--	18.87
	12/17/92		11.76	--	20.35
	01/19/93		8.99	--	23.12
	02/22/93		9.13	--	22.98
	03/15/93		9.48	--	22.63
	04/09/93		9.63	--	22.48
	05/13/93		10.35	--	21.76
	06/04/93		10.65	--	21.46
	06/15/93		10.81	--	21.30
	09/13/93		11.87	--	20.24

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-9	12/28/93		11.61	--	20.50
(cont.)	03/28/94		10.48	--	21.63
	06/13/94		10.80	--	21.31
	09/19/94		12.25	--	19.86
MW-10	01/16/92	31.67	12.55	--	19.12
	02/19/92		10.50	--	21.17
	03/18/92		10.12	--	21.55
	04/15/92		10.59	--	21.08
	05/14/92		11.30	--	20.37
	06/15/92		11.93	--	19.74
	07/14/92		12.42	--	19.25
	08/18/92		13.03	--	18.64
	09/15/92		13.42	--	18.25
	10/16/92		13.74	--	17.93
	11/18/92		13.42	--	18.25
	12/17/92		11.94	--	19.73
	01/19/93		9.13	--	22.54
	02/22/93		9.22	--	22.45
	03/15/93		9.64	--	22.03
	04/09/93		9.75	--	21.92
	05/13/93		10.49	--	21.18
	06/04/93		10.78	--	20.89
	06/15/93		10.93	--	20.74
	09/13/93		12.01	--	19.66
	12/28/93		11.41	--	20.26
	03/28/94		10.60	--	21.07
	06/13/94		10.95	--	20.72
	09/19/94		12.37	--	19.30
MW-11	01/16/92	32.54	13.28	--	19.26
	02/19/92		11.29	--	21.25
	03/17/92		10.81	--	21.73
	04/15/92		11.23	--	21.31
	05/14/92		11.96	--	20.58
	06/15/92		12.64	--	19.90
	07/14/92		13.08	--	19.46
	08/18/92		13.72	--	18.82
	09/15/92		14.13	--	18.41
	10/16/92		14.45	--	18.09
	11/18/92		14.11	--	18.43
	12/17/92		12.69	--	19.85
	01/19/93		9.91	--	22.63
	02/22/93		9.95	--	22.59

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-11 (cont.)	03/15/93		10.30	--	22.24
	04/09/93		10.42	--	22.12
	05/13/93		11.16	--	21.38
	06/04/93		11.44	--	21.10
	06/15/93		11.59	--	20.95
	09/13/93		12.68	--	19.86
	12/28/93		12.05	--	20.49
	03/28/94		11.23	--	21.31
	06/13/94		11.62	--	20.92
	09/19/94		13.05	--	19.49
E-1A (MW-12)	01/16/92	33.06	23.68	--	9.38
	02/19/92		18.71	--	14.35
	03/17/92		23.10	--	9.96
	04/15/92		20.54	--	12.52
	05/14/92		23.09	--	9.97
	06/15/92		23.72	--	9.34
	07/14/92		13.25	--	19.81
	08/18/92		23.73	--	9.33
	09/15/92		23.62	--	9.44
	10/16/92		23.78	--	9.28
	11/18/92		23.80	--	9.26
	12/17/92		22.65	--	10.41
	01/19/93		23.65	--	9.41
	02/22/93		23.70	--	9.36
	03/15/93		22.92	--	10.14
	04/09/93		22.50	--	10.56
	05/13/93		20.40	--	12.66
	06/04/93		18.74	--	14.32
	06/15/93		20.00	--	13.06
	09/13/93		19.50	--	13.56
	12/28/93		20.35	--	12.71
	03/28/94		18.13	--	14.93
	06/13/94		11.60	--	21.46
	09/19/94		19.61	--	13.45
MW-13	01/16/92	35.42	15.70	--	19.72
	02/19/92		13.60	--	21.82
	03/17/92		13.20	--	22.22
	04/15/92		13.64	--	21.78
	05/14/92		14.34	--	21.08
	06/15/92		15.13	--	20.29
	07/14/92		15.45	--	19.97

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-13	08/18/92		16.15	--	19.27
(cont.)	09/15/92		16.51	--	18.91
	10/16/92		16.81	--	18.61
	11/18/92		16.50	--	18.92
	12/17/92		15.07	--	20.35
	01/19/93		12.40	--	23.02
	02/22/93		12.35	--	23.07
	03/15/93		12.69	--	22.73
	04/09/93		12.85	--	22.57
	05/13/93		13.55	--	21.87
	06/04/93		13.83	--	21.59
	06/15/93		13.97	--	21.45
	09/13/93		15.09	--	20.33
	12/28/93		14.47	--	20.95
	03/28/94		13.64	--	21.78
	06/13/94		13.98	--	21.44
	09/19/94		15.45	--	19.97
MW-14	01/16/92	30.46	11.34	--	19.12
	02/19/92		9.32	--	21.14
	03/17/92		9.04	--	21.42
	06/15/92		10.83	--	19.63
	09/15/92		12.27	--	18.19
	12/17/92		10.69	--	19.77
	03/15/93		8.70	--	21.76
	06/15/93		9.90	--	20.56
	09/13/93		10.89	--	19.57
	12/28/93		10.24	--	20.22
	03/28/94		9.55	--	20.91
	06/13/94		9.92	--	20.54
	09/19/94		11.25	--	19.21
MW-15	01/16/92	31.41	12.80	--	18.61
	02/19/92		10.85	--	20.56
	03/18/92		10.41	--	21.00
	06/15/92		12.19	--	19.22
	09/15/92		13.69	--	17.72
	12/17/92		12.26	--	19.15
	03/15/93		10.05	--	21.36
	06/15/93		11.32	--	20.09
	09/13/93		12.35	--	19.06
	12/28/93		11.76	--	19.65
	03/28/94		10.95	--	20.46
	06/13/94		11.34	--	20.07
	09/19/94		12.68	--	18.73

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-16	01/16/92	31.39	13.09	--	18.30
	02/19/92		10.99	--	20.40
	03/18/92		10.85	--	20.54
	06/15/92		12.64	--	18.75
	09/15/92		14.07	--	17.32
	12/17/92		12.56	--	18.83
	03/15/93		10.60	--	20.79
	06/15/93		11.86	--	19.53
	09/13/93		12.83	--	18.56
	12/28/93		12.14	--	19.25
	03/28/94		11.46	--	19.93
	06/13/94		11.87	--	19.52
	09/19/94		13.15	--	18.24
MW-17	01/16/92	32.43	13.92	--	18.51
	02/19/92		11.65	--	20.78
	03/18/92		11.71	--	20.72
	06/15/92		13.50	--	18.93
	09/15/92		14.95	--	17.48
	12/17/92		13.34	--	19.09
	03/15/93		11.47	--	20.96
	06/15/93		12.69	--	19.74
	09/13/93		13.66	--	18.77
	12/28/93		12.96	--	19.47
	03/28/94		12.33	--	20.10
	06/13/94		12.71	--	19.72
	09/19/94		14.00	--	18.43
MW-18	03/18/92	29.70	9.73	--	19.97
	06/15/92		11.50	--	18.20
	09/15/92		12.90	--	16.80
	12/17/92		11.21	--	18.49
	03/15/93		9.62	--	20.08
	06/15/93		10.85	--	18.85
	09/13/93		11.75	--	17.95
	12/28/93		11.06	--	18.64
	03/28/94		10.43	--	19.27
	06/13/94		10.80	--	18.90
	09/19/94		12.03	--	17.67
MW-19	03/18/92	29.02	9.22	--	19.80
	06/15/92		10.94	--	18.08
	09/15/92		12.38	--	16.64
	12/17/92		10.51	--	18.51
	03/15/93		9.23	--	19.79

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-19 (cont.)	06/15/93		10.28	--	18.74
	09/13/93		11.16	--	17.86
	12/28/93		10.58	--	18.44
	03/28/94		9.92	--	19.10
	06/13/94		10.26	--	18.76
	09/19/94		11.45	--	17.57
MW-20	03/18/92	29.54	9.49	--	20.05
	06/15/92		11.11	--	18.43
	09/15/92		12.50	--	17.04
	12/17/92		10.74	--	18.80
	03/15/93		9.44	--	20.10
	06/05/93		10.45	--	19.09
	10/11/93	---------- Well Destroyed ----------			
MW-21	03/18/92	28.72	9.55	--	19.17
	06/15/92		11.30	--	17.42
	09/15/92		12.78	--	15.94
	12/17/92		10.80	--	17.92
	03/15/93		9.59	--	19.13
	06/15/93		10.77	--	17.95
	09/13/93		11.63	--	17.09
	12/28/93		11.02	--	17.70
	03/28/94		10.30	--	18.42
	06/13/94		10.69	--	18.03
	09/19/94		11.89	--	16.83
MW-22	03/17/92	29.29	10.05	--	19.24
	06/15/92		11.84	--	17.45
	09/15/92		13.27	--	16.02
	12/17/92		11.58	--	17.71
	03/15/93		10.03	--	19.26
	06/15/93		11.22	--	18.07
	09/13/93		12.17	--	17.12
	12/28/93		11.34	--	17.95
	03/28/94		10.78	--	18.51
	06/13/94		11.24	--	18.05
	09/19/94		12.43	--	16.86
MW-23	03/17/92	30.99	11.20	--	19.79
	06/15/92		12.94	--	18.05
	09/15/92		14.40	--	16.59
	12/17/92		13.01	--	17.98
	03/15/93		11.01	--	19.98
	06/15/93		12.26	--	18.73

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Liquid (feet, TOB)	Separate-Phase Hydrocarbon Thickness (feet)	Liquid Surface Elevation (feet, MSL)
MW-23	09/13/93		13.23	--	17.76
(cont.)	12/28/93		12.57	--	18.42
	03/28/94		11.86	--	19.13
	06/13/94		12.26	--	18.73
	09/19/94		13.55	--	17.44
MW-24	06/15/93	34.38	13.39	--	20.99
	09/13/93		14.38	--	20.00
	12/28/93		13.83	--	20.55
	03/28/94		13.02	--	21.36
	06/13/94		13.37	--	21.01
	09/19/94		14.72	--	19.66
MW-25	04/09/93	34.12	11.18	--	22.94
	06/15/93		12.35	--	21.77
	09/13/93		13.45	--	20.67
	12/28/93		12.89	--	21.23
	03/28/94		12.02	--	22.10
	06/13/94		12.39	--	21.73
	09/15/94		13.82	--	20.30
MW-26	06/15/93	33.71	12.66	--	21.05
	09/13/93		13.70	--	20.01
	12/28/93		13.06	--	20.65
	03/28/94		12.30	--	21.41
	06/13/94		12.65	--	21.06
	09/19/94		14.05	--	19.66

MSL = Mean sea level
TOB = Top of box
NA = Not available
Well elevations are measured from set mark at top of vault box.
For groundwater elevation data prior to January 1992, see previous groundwater monitoring reports.

Table 2
Groundwater Analytical Data
Groundwater Monitoring Wells
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-1	01/11/88	300	20	10	50	80
	06/14/88	Well Destroyed				
MW-2	07/05/85	32,000	1,000	690	NA[a]	1,500[a]
	01/11/88	3,300	804	115	168	166
	06/14/88	Well Destroyed				
MW-3	01/11/88	1,800	20	20	80	60
	03/07/89	150,000	4,600	5,200	5,600	13,000
	06/21/89	63,000	2,700	5,800	3,300	12,000
	12/12/89	Well Dry				
	03/29/90	1,100,000[b]	13,000	60,000	17,000	91,000
	06/22/90	Well Dry				
	07/18/90	Well Destroyed				
MW-4	01/11/88	62,000	2,700	7,900	850	5,200
	09/12/88	Separate-Phase Hydrocarbon Sheen				
	03/07/89	84,000	2,400	3,400	2,500	7,600
	06/21/89	31,000	400	800	200	1,500
	12/12/89	Well Dry				
	03/29/90	0.01 foot of Separate-Phase Hydrocarbon				
	06/22/90	Well Dry				
	07/18/90	Well Destroyed				
MW-5	01/11/88	31,000	4,000	2,700	3,800	5,500
	03/07/89	1,300	340	ND	140	50
	06/21/89	1,100	200	ND	130	40
	12/12/89	Well Dry				
	03/29/90	Well Dry				
	06/22/90	Well Dry				
	09/19/90	Well Dry				
	12/27/90	Well Dry				
	03/21/91	Well Dry				
	06/26/91	Well Dry				
	09/24/91	Well Dry				
	12/19/91	Well Dry				
	03/18/92	11,000	110	2.0	410	150
	06/15/92	Well Dry				
	09/16/92	Well Dry				
	12/22/92	960	220	6.5	4.0	2.0
	03/17/93	2,600	180	1.4	28	1.2
	06/17/93	2,500	450	7.5	55	<5

Table 2 (continued)
Groundwater Analytical Data
Groundwater Monitoring Wells
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-5 (cont.)	09/17/93	1,400	230	<5.0	6.7	<5.0
	12/29/93	690	38	2.1	2.7	3.8
	03/30/94	1,400	30	<5	<5	<5
	06/14/94	1,700	42	<5	<5	<5
	09/20/94	500	18	<0.5	<0.5	0.52
MW-6 (E-1)	06/21/89	1,700	170	170	85	290
	12/12/89	500	26	7	8	18
	03/29/90	130	14	9	4	11
	06/22/90	150	15	5	4	13
	07/18/90			Well Destroyed		
MW-7	04/13/90	<50	<0.3	<0.3	<0.3	<0.3
	06/22/90	<50	0.5	1	0.6	3
	09/19/90	<50	<0.3	<0.3	<0.3	<0.3
	12/27/90	69	<0.3	0.3	0.4	2
	03/21/91	<30	<0.3	<0.3	<0.3	<0.3
	06/26/91	<30	<0.3	<0.3	<0.3	<0.3
	09/24/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3
	06/17/92	<30	<0.3	<0.3	<0.3	<0.3
	09/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/14/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-8	04/13/90	4,900	350	16	450	33
	06/22/90	3,700	370	12	330	28
	09/19/90	140	4	3	3	3
	12/27/90	1,200	7	0.3	53	<0.3
	03/21/91	540	8.8	<6.0	21	9.6
	06/26/91	2,100	290	<6.0	56	<6.0
	09/24/91	260	51	0.34	7.9	<0.3
	12/19/91	5,300	300	<3.0	21	4.8
	03/17/92	9,200	370	3.0	48	4.9
	06/17/92	3,300	460	2.7	63	6.9
	09/16/92	1,500	58	<0.5	6.1	4.5
	12/22/92	3,600	410	56	62	4.4

Table 2 (continued)

Groundwater Analytical Data
Groundwater Monitoring Wells

Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-8	03/18/93	3,800	61	<0.5	11	1.2
(cont.)	06/17/93	2,400	430	<5	11	<5
	09/14/93	1,900	36	1.4	32	8.6
	12/29/93	2,100	50	0.65	2.9	4.7
	03/29/94	1,900	220	<10	<10	<10
	06/14/94	2,800	340	<5	<5	<5
	09/20/94	2,100	46	<1.0	<1.0	<1.0
MW-9	04/13/90	<50	<0.3	<0.3	<0.3	2
	06/22/90	12,000	200	3	250	180
	09/19/90	<50	<0.3	<0.3	<0.3	0.6
	12/27/90	<50	<0.3	<0.3	<0.3	<0.3
	03/21/91	<30	<0.3	<0.3	<0.3	<0.3
	06/26/91	<30	<0.3	<0.3	<0.3	<0.3
	09/24/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3
	06/16/92	<30	<0.3	<0.3	<0.3	<0.3
	09/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	75[c]	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/14/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-10	04/13/90	10,000	150	4	280	200
	06/22/90	9,700	28	<0.3	131	210
	09/19/90	1,800	<0.3	4	0.8	10
	12/27/90	5,700	7	3	95	61
	03/21/91	6,900	22	<15	92	33
	06/26/91	9,300	51	<0.3	59	34
	09/24/91	360	8.6	5.2	14	6.2
	12/19/91	3,300	9.2	8.4	11	17
	03/18/92	4,700	14	<6.0	29	10
	06/16/92	4,800	0.46	0.34	7.4	3.8
	09/16/92	2,000	8.3	3.0	3.3	5.5
	12/22/92	2,700[c]	6.2	<1.0	7.5	2.8
	03/16/93	4,100	340	2.4	58	54
	06/17/93	4,900	860	<10	540	92
	09/17/93	4,500	670	<10.0	240	7.2
	12/28/93	5,000	1,200[d]	12	46	31

Table 2 (continued)
Groundwater Analytical Data
Groundwater Monitoring Wells
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-10	03/29/94	4,700	470	<10	29	45
(cont.)	06/14/94	3,700	370	<1.0	<1.0	<1.0
	09/20/94	2,600	79	<2.5	7.4	2.7
MW-11	04/13/90	<50	<0.3	<0.3	<0.3	<0.3
	06/22/90	63	0.4	0.9	0.7	3
	09/19/90	<50	<0.3	<0.3	<0.3	<0.3
	12/27/90	<50	<0.3	<0.3	<0.3	<0.3
	03/21/91	<30	<0.3	<0.3	<0.3	<0.3
	06/26/91	<30	<0.3	<0.3	<0.3	<0.3
	09/24/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3
	06/16/92	<30	<0.3	<0.3	<0.3	<0.3
	09/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/22/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
E-1A	09/19/90	<50	7	0.9	1	2
(MW-12)	12/27/90	<50	3	0.5	1	1
	03/21/91	<30	4.2	<0.3	1.1	0.89
	06/26/91	41	6.3	<0.3	1.2	0.59
		Converted to Extraction Well 8/91				
	03/28/94	120	4.8	<0.50	5.7	4.1
	06/14/94*	230	12	<0.5	16	1.5
	09/20/94*	<50	<0.5	<0.5	<0.5	<0.5
MW-13	07/03/91	<30	<0.3	<0.3	<0.3	<0.3
	09/24/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3
	06/17/92	<30	<0.3	<0.3	<0.3	<0.3
	09/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5

Table 2 (continued)

Groundwater Analytical Data

Groundwater Monitoring Wells

Total Petroleum Hydrocarbons

(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-13 (cont.)	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/14/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-14	07/03/91	<30	<0.3	<0.3	<0.3	<0.3
	09/24/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3
	06/16/92	<30	<0.3	<0.3	<0.3	<0.3
	09/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/22/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/15/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-15	07/03/91	570	1.8	1.0	1.0	2.2
	09/24/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	360	<0.6	<0.6	0.64	<0.6
	03/18/92	730	0.74	0.98	1.8	0.68
	06/16/92	310	0.54	0.34	0.96	2.5
	09/16/92	100	1.0	<0.5	<0.5	<0.5
	12/22/92	130^c	<0.5	<0.5	<0.5	<0.5
	03/18/93	130^c	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/17/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	52	<0.5	<0.5	<0.5	1.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-16	07/03/91	2,700	31	6.9	4.6	3.1
	09/24/91	430	1.8	1.3	1.9	1.5
	12/19/91	75	<0.3	<0.3	<0.3	<0.3
	03/18/92	1,500	4.0	0.73	2.2	1.3
	06/16/92	80	<0.3	<0.3	<0.3	<0.3
	09/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/22/92	<50	<0.5	<0.5	<0.5	<0.5
	03/18/93	380^c	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/17/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	0.72	<0.5

Table 2 (continued)
Groundwater Analytical Data
Groundwater Monitoring Wells
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-16 (cont.)	03/28/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-17	07/03/91	1,200	12	1.9	28	40
	09/24/91	150	2.7	0.5	3.9	0.59
	12/19/91	370	2.6	<0.3	7.2	6.5
	03/18/92	470	3.1	<0.3	9.1	8.6
	06/16/92	310	1.7	0.56	12	9.6
	09/16/92	77	1.5	<0.5	1.2	1.0
	12/21/92	220	1.2	<0.5	9.8	9.4
	03/17/93	250	<0.5	<0.5	7.8	3.3
	06/17/93	90	0.92	<0.5	2.7	2.4
	09/16/93	140	<0.5	<0.5	5.4	3.9
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	62	<0.5	<0.5	1.2	<0.90
	09/19/94	<50	<0.5	<0.5	<0.5	<0.5
MW-18	10/04/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/18/92	<30	<0.3	<0.3	<0.3	<0.3
	06/15/92	<30	<0.3	<0.3	<0.3	<0.3
	09/15/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	<0.5	<0.5
	03/28/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-19	10/04/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/18/92	<30	<0.3	<0.3	<0.3	<0.3
	06/15/92	<30	<0.3	<0.3	<0.3	<0.3
	09/15/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	<0.5	<0.5

Table 2 (continued)

Groundwater Analytical Data

Groundwater Monitoring Wells

Total Petroleum Hydrocarbons

(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-19	03/28/94	<50	<0.5	<0.5	<0.5	<0.5
(cont.)	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/19/94	<50	<0.5	<0.5	<0.5	<0.5
MW-20	10/04/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/18/92	<30	<0.3	<0.3	<0.3	<0.3
	06/15/92	<30	<0.3	<0.3	<0.3	<0.3
	09/15/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	10/11/93	Well Destroyed				
MW-21	10/04/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/18/92	<30	<0.3	<0.3	<0.3	<0.3
	06/15/92	<30	<0.3	<0.3	<0.3	<0.3
	09/15/92	<50	<0.5	<0.5	<0.5	<0.5
	12/22/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	<0.5	<0.5
	03/28/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/19/94	<50	<0.5	<0.5	<0.5	<0.5
MW-22	10/04/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3
	06/15/92	<30	<0.3	<0.3	<0.3	<0.3
	09/15/92	<50	<0.5	<0.5	<0.5	<0.5
	12/22/92	<50	<0.5	<0.5	<0.5	<0.5
	03/17/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	<0.5	<0.5
	03/28/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/19/94	<50	<0.5	<0.5	<0.5	<0.5
MW-23	10/04/91	<30	<0.3	<0.3	<0.3	<0.3
	12/19/91	<30	<0.3	<0.3	<0.3	<0.3
	03/17/92	<30	<0.3	<0.3	<0.3	<0.3

Table 2 (continued)

Groundwater Analytical Data

Groundwater Monitoring Wells

Total Petroleum Hydrocarbons

(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
MW-23	06/15/92	<30	<0.3	<0.3	<0.3	<0.3
(cont.)	09/15/92	<50	<0.5	<0.5	<0.5	<0.5
	12/22/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/15/93	<50	<0.5	<0.5	<0.5	<0.5
	12/28/93	<50	<0.5	<0.5	<0.5	<0.5
	03/28/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/19/94	<50	<0.5	<0.5	<0.5	<0.5
MW-24	03/29/93	<50	<0.5	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-25	03/29/93	<50	0.69	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5
MW-26	03/29/93	<50	<0.5	<0.5	<0.5	<0.5
	06/15/93	<50	<0.5	<0.5	<0.5	<0.5
	09/14/93	<50	<0.5	<0.5	<0.5	<0.5
	12/29/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/13/94	<50	<0.5	<0.5	<0.5	<0.5
	09/20/94	<50	<0.5	<0.5	<0.5	<0.5

ppb = Parts per billion
NA = Not available
a. Ethylbenzene and xylenes given as a combined value.
b. Well contained slight product sheen.
c. Non-typical gasoline chromatograph pattern.
d. Anomalous data point.
< = Denotes minimum laboratory detection limits. See attached certified analytical reports.
* = Value taken from system influent sampling.
MW-1 and MW-2 destroyed prior to March 7, 1989 sampling event.
MW-3, MW-4, and MW-6 (E-1) destroyed June 18, 1990.

Table 3
Groundwater Analytical Data
Domestic Irrigation Wells
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Address	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
590 H	11/13/91	<30	<0.3	<0.3	<0.3	<0.3
	10/14/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93[a]	NS	NS	NS	NS	NS
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/16/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94	<50	<0.5	<0.5	<0.5	<0.5
633 H	09/11/91[b,d]	NS	NS	NS	NS	NS
	10/14/92[a]	NS	NS	NS	NS	NS
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/15/93[b,d]	NS	NS	NS	NS	NS
	12/30/93[b,d]	NS	NS	NS	NS	NS
	03/29/94[b,d]	NS	NS	NS	NS	NS
	06/15/94[b,d]	NS	NS	NS	NS	NS
	09/21/94[b,d]	NS	NS	NS	NS	NS
	10/07/94	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**
634 H	09/11/91[b,d]	NS	NS	NS	NS	NS
	10/14/92[a]	NS	NS	NS	NS	NS
	12/21/92[b,d]	NS	NS	NS	NS	NS
	03/16/93[b,d]	NS	NS	NS	NS	NS
	06/17/93[b,d]	NS	NS	NS	NS	NS
	09/15/93[a]	NS	NS	NS	NS	NS
	12/30/93[b,d]	NS	NS	NS	NS	NS
	03/29/94[b,d]	NS	NS	NS	NS	NS
	06/15/94	NS	NS	NS	NS	NS
	09/21/94[b,d]	NS	NS	NS	NS	NS
642 H	11/13/91	<30	<0.3	<0.3	<0.3	<0.3
	10/16/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93[a]	NS	NS	NS	NS	NS
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	NS	NS	NS	NS	NS
	09/21/94[b,d]	NS	NS	NS	NS	NS

Table 3 (continued)

Groundwater Analytical Data
Domestic Irrigation Wells

Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Staiton 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Address	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
675 H	09/11/91[b,d]	NS	NS	NS	NS	NS
	10/14/92[a]	NS	NS	NS	NS	NS
	12/21/92[b,d]	NS	NS	NS	NS	NS
	03/16/93[b,d]	NS	NS	NS	NS	NS
	06/17/93[b,d]	NS	NS	NS	NS	NS
	09/15/93[a]	NS	NS	NS	NS	NS
	12/30/93[a]	NS	NS	NS	NS	NS
	03/29/94[a]	NS	NS	NS	NS	NS
	06/15/94[a]	NS	NS	NS	NS	NS
	09/22/94	<50	<0.5	<0.5	<0.5	<0.5
17197 VM	11/13/91	<30	<0.3	<0.3	<0.3	<0.3
	10/14/92	<50	<0.5	<0.5	<0.5	<0.5
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93	<50	<0.5	<0.5	<0.5	<0.5
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94[a]	NS	NS	NS	NS	NS
17200 VM	11/13/91	440	2.7	<0.3	<0.3	12
	10/14/92[a]	NS	NS	NS	NS	NS
	12/18/92	160	1.4	<0.5	<0.5	3.4
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/15/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93	<50	<0.5	<0.5	<0.5	<0.5
	03/29/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94	<50	<0.5	<0.5	<0.5	<0.5
17203 VM	11/13/91	<30	<0.3	<0.3	<0.3	<0.3
	10/16/92[a]	NS	NS	NS	NS	NS
	12/21/92	<50	<0.5	<0.5	<0.5	1.3
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/16/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93	<50	<0.5	<0.5	<0.5	<0.5

Table 3 (continued)

Groundwater Analytical Data
Domestic Irrigation Wells

Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Address	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
17203 VM (cont.)	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94[a]	NS	NS	NS	NS	NS
17302 VM	10/21/91	72	0.64	<0.3	0.44	<0.3
	10/14/92[a]	NS	NS	NS	NS	NS
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93[b,d]	NS	NS	NS	NS	NS
	09/16/93	66	<0.5	<0.5	<0.5	<0.5
	12/30/93	<50	<0.5	<0.5	<0.5	<0.5
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94[a]	NS	NS	NS	NS	NS
17348 VM	11/13/91[b,d]	NS	NS	NS	NS	NS
	10/14/92[a]	NS	NS	NS	NS	NS
	12/21/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/16/93	<50	<0.5	<0.5	<0.5	<0.5
	09/15/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93[b,d]	NS	NS	NS	NS	NS
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94[a]	NS	NS	NS	NS	NS
17349 VM	09/27/91	780	13	<3.0	<3.0	<3.0
	10/14/92	2,200	<50	<50	<50	110
	12/18/92	1,500	14	1.8	7.1	56
	03/16/93	1,100	16	4.2	1.8	1.8
	06/17/93	1,100	1.5	6.7	2.9	7.9
	09/16/93	1,200	13	21	3.0	10
	12/30/93[a]	NS	NS	NS	NS	NS
	03/30/94	420	<1	<1	<1	5.3
	06/15/94	460	<0.5	<0.5	<0.5	1.8
	09/21/94	590	1.8	<0.5	1.1	7.6
17371 VM	11/13/91	870	9.0	1.0	2.1	4.5
	10/14/92	<50	<0.5	<0.5	<0.5	<0.5
	12/18/92	<50	<0.5	<0.5	<0.5	<0.5

Table 3 (continued)

Groundwater Analytical Data
Domestic Irrigation Wells

Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Address	Date Sampled	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)
17371 VM (cont.)	03/16/93	500	8.7	<0.5	3.9	3.1
	06/17/93[c]	NS	NS	NS	NS	NS
	09/16/93[c]	NS	NS	NS	NS	NS
	12/30/93[c]	NS	NS	NS	NS	NS
	03/30/94[c]	NS	NS	NS	NS	NS
	06/15/94[c]	NS	NS	NS	NS	NS
	09/21/94[c]	NS	NS	NS	NS	NS
17372 VM	09/27/91	300	5.5	<0.60	1.3	0.72
	10/14/92	220	<1.0	<1.0	<1.0	<1.0
	12/18/92	290	3.8	0.88	0.99	1.2
	03/16/93	110*	<0.5	<0.5	<0.5	<0.5
	06/17/93	140	<0.5	1.3	0.63	1.1
	09/15/93	120	<0.5	1.1	0.62	1.2
	12/30/93	<50	<0.5	<0.5	<0.5	<0.5
	03/30/94	<50	<0.5	<0.5	<0.5	<0.5
	06/15/94	110	<0.5	<0.5	<0.5	<0.5
	09/21/94	55	<0.5	<0.5	<0.5	<0.5
17393 VM	11/13/91	31	<0.3	<0.3	<0.3	<0.3
	10/14/92[a]	NS	NS	NS	NS	NS
	12/18/92	<50	<0.5	<0.5	<0.5	<0.5
	03/16/93	<50	<0.5	<0.5	<0.5	<0.5
	06/17/93	<50	<0.5	<0.5	<0.5	<0.5
	09/15/93	<50	<0.5	<0.5	<0.5	<0.5
	12/30/93[a]	NS	NS	NS	NS	NS
	12/30/93	<50	<0.5	<0.5	<0.5	<0.5
	03/30/94	50	<0.5	<0.5	<0.5	<0.5
	06/15/94	<50	<0.5	<0.5	<0.5	<0.5
	09/21/94[a]	NS	NS	NS	NS	NS

ppb = Parts per billion
H = Hacienda Avenue
VM = Via Magdalena
< = Denotes laboratory detection limit
NS = Not sampled
* = Non-typical chromatogram pattern.
a. Owner not available to approve sampling access, well not sampled.
b. Pump not functioning, well not sampled.
c. Access denied by owner, well not sampled.
d. Pumping equipment obstructing sampling access, well not sampled.
Homeowners are contacted 1 week prior to sampling event.

Table 4
Groundwater Analytical Data
Volatile Organic Compounds, Semi-Volatile Organic Compounds, and Metals

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Analyses		MW-8 (10/22/92) (ppb)	MW-12/E-1A (12/28/90) (ppb)
Volatile Organic Compounds		(all ND)	
Benzene			3
Semi-Volatile Organic Compounds			(all ND)
Acenaphthene		2.7	
Dibenzofuran		1.2	
Fluorene		1.6	
2-Methylnaphthalene		14	
Naphthalene		34	
Phenanthrene		1.8	
Metals	STLC (ppm)	TTLC (ppm)	
Arsenic	ND	0.025	ND
Barium	ND	0.21	0.13
Zinc	ND	0.015	ND

ppb = Parts per billion
ppm = Parts per million
ND = Not detected
STLC = Soluble Threshold Limit Concentration
TTLC = Total Threshold Limit Concentration

Table 5
Soil Analytical Data
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	TPH as Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)
B-1	03/08/93	10 - 11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-2	03/08/93	10 - 11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-3	03/08/93	9 - 10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-4	03/08/93	8 - 9	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-5	03/08/93	10 - 11	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-6	03/08/93	12 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-7	03/09/93	11 - 12	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-8	03/09/93	11 - 12	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-9	03/09/93	10 - 12	5.8	0.010	<0.0050	0.029	<0.0050
B-10	03/09/93	11 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-11	03/09/93	11 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-12	03/09/93	11 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-13	03/10/93	12 - 13	1.6	<0.0050	<0.0050	<0.0050	<0.0050
B-14	03/10/93	12 - 13	9.6	<0.25*	<0.25*	0.39	0.94
B-15	03/10/93	12.5 - 13.5	<1.0	<0.0050	0.0070	<0.0050	<0.0050
B-16	03/11/93	14 - 15	90	0.095	0.25	0.76	0.46
B-17	03/10/93	12 - 13	1.6	0.028	<0.0050	0.032	0.0080
B-18	03/10/93	12 - 13	19	<0.025*	<0.025*	0.19	0.21
B-19	03/10/93	12 - 13	160	<0.25*	<0.25*	1.3	0.60
B-20	03/10/93	12 - 13	16	<0.010*	0.013	0.11	0.14
B-21	03/10/93	12 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-22	03/11/93	12 - 13	4.1	<0.010*	<0.010*	<0.010*	<0.010*

Table 5 (continued)
Soil Analytical Data
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	TPH as Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)
B-23	03/11/93	4 - 5	1.4	<0.0050	<0.0050	<0.0050	<0.0050
		9 - 10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
		14 - 15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-24	03/11/93	4 - 5	**210**	<0.25*	<0.25*	<0.25*	2.0
		9 - 10	**650**	<0.5*	<0.5*	0.80	6.4
		14 - 15	2.6	<0.0050	<0.0050	<0.0050	<0.0050
B-25	03/11/93	12 - 14	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-26	03/11/93	12 - 14	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-27	03/11/93	2 - 3	1.2	0.013	0.024	0.025	0.041
		4 - 5	<1.0	<0.0050	0.0050	<0.0050	<0.0050
		9 - 10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
		14 - 15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-28	03/11/93	4 - 5	<1.0	<0.0050	0.0080	<0.0050	<0.0050
		9 - 10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
		14 - 15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-29	03/11/93	4 - 5	6.8	<0.010*	0.024	<0.010*	0.028
		9 - 10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
		14 - 15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-30	03/11/93	14 - 15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-31	03/13/93	12 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-32	03/13/93	14 - 15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-33	03/13/93	13 - 14	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-34	03/13/93	13 - 14	**130**	<0.10*	<0.10*	0.12	0.28
B-35	03/13/93	12 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
B-36	03/13/93	12 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
MW-24	03/17/93	11 - 12	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
MW-25	03/17/93	12 - 13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
MW-26	03/19/93	15 - 16.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

Table 5 (continued)
Soil Analytical Data
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	TPH as Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)
SP-1/V-4	03/18/93	12 - 13	500	0.59	3.8	7.9	26
SP-2/V-5	03/18/93	12 - 13	<1.0	0.056	<0.0050	0.021	0.0080

ppm = Parts per million
< = Denotes minimum laboratory detection limit.
* Laboratory detection limits raised due to high analyte concentration requiring sample dilution.

Table 6

Soil Analytical Data

Total Recoverable Petroleum Oil

(Oil and Grease)

ARCO Service Station 0608

17601 Hesperian Boulevard at Hacienda Avenue

San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	Concentration (ppm)
B-23	03/11/93	4 - 5	<50
		9 - 10	<50
		14 - 15	<50
B-24	03/11/93	4 - 5	500*
		9 - 10	550*
		14 - 15	<50
B-24A	04/06/93	4 - 6	950
		9 - 11	1,900
		14 - 16	<50
B-27	03/11/93	2 - 3	240*
		4 - 5	<50
		9 - 10	<50
		14 - 15	NA **
B-27A	04/06/93	14 - 16	<50
B-28	03/11/93	4 - 5	<50
		9 - 10	<50
		14 - 15	<50
B-29	03/11/93	4 - 5	<50
		9 - 10	<50
		14 - 15	<50
B-30	03/11/93	14 - 15	<330
B-30A	04/06/93	4 - 6	<50
		9 - 11	<50

ppm = Parts per million

< = Denotes minimum laboratory detection limit.

NA = Not analyzed

* Quantative result. Insufficient sample was available for representative quantitation.

** Not enough of this sample was available for this analysis.

Table 7
Soil Analytical Data
California Assessment Metals
(Inorganic Persistent and Bioaccumulative Toxic Substances)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	Analyte	Sample Results (ppb)	TTLC Max. Limit (ppb)
B-23	03/11/93	4 - 5	Arsenic	27	500
			Barium	140	10,000
			Chromium	31	500
			Cobalt	7.4	8,000
			Copper	16	2,500
			Nickel	33	2,000
			Vanadium	32	2,400
			Zinc	880	5,000
	03/11/93	9 - 10	Arsenic	30	500
			Barium	130	10,000
			Chromium	36	500
			Cobalt	8.4	8,000
			Copper	15	2,500
			Nickel	43	2,000
			Vanadium	33	2,400
			Zinc	860	5,000
	03/11/93	14 - 15	Arsenic	33	500
			Barium	150	10,000
			Chromium	44	500
			Cobalt	9.0	8,000
			Copper	21	2,500
			Nickel	49	2,000
			Vanadium	29	2,400
			Zinc	190	5,000
B-24	03/11/93	4 - 5	Antimony	7.2	500
			Arsenic	31	500
			Barium	140	10,000
			Chromium	34	500
			Cobalt	7.4	8,000
			Copper	15	2,500
			Nickel	34	2,000
			Vanadium	33	2,400
			Zinc	300	5,000

Table 7 (continued)
Soil Analytical Data
California Assessment Metals
(Inorganic Persistent and Bioaccumulative Toxic Substances)

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	Analyte	Sample Results (ppb)	TTLC Max. Limit (ppb)
B-24 (cont.)	03/11/93	9 - 10	Arsenic	3.0	500
			Barium	130	10,000
			Chromium	39	500
			Cobalt	7.2	8,000
			Copper	16	2,500
			Lead	49	1,000
			Nickel	41	2,000
			Vanadium	27	2,400
			Zinc	740	5,000
	03/11/93	14 - 15	Arsenic	32	500
			Barium	130	10,000
			Chromium	36	500
			Cobalt	7.0	8,000
			Copper	16	2,500
			Nickel	38	2,000
			Vanadium	38	2,400
			Zinc	1,200	5,000
B-27A	04/16/93	14 - 16	Arsenic	8.3	500
			Barium	82	10,000
			Chromium	22	500
			Cobalt	6.5	8,000
			Copper	9.3	2,500
			Nickel	29	2,000
			Vanadium	26	2,400
			Zinc	31	5,000
B-30	03/11/93	14 - 15	Arsenic	31	500
			Barium	s130	10,000
			Chromium	41	500
			Cobalt	7.1	8,000
			Copper	19	2,500
			Lead	11	1,000
			Nickel	44	2,000
			Vanadium	23	2,400
			Zinc	2,300	5,000

ppb = Parts per billion
TTLC = Total threshold level concentrations
Only detected compounds are listed.

Table 8

Soil Analytical Data

Semi-Volatile Organic Compounds

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	Analyte	Sample Results (ppb)	Detection Limit (ppb)
B-23	03/11/93	4 - 5	2-Methylnaphthalene	100	100
			Naphthalene	140	100
		9 - 10	ND	ND	--
		14 - 15	ND	ND	--
B-24	03/11/93	4 - 5	1,4-Dichlorobenzene	150	100
			1,2-Dichlorobenzene	480	100
			2-Methylnaphthalene	710	100
			Naphthalene	570	100
		9 - 10	*Bis*(2-ethylhexyl)phthalate	500	500
			1,2-Dichlorobenzene	160	100
			2-Methylnaphthalene	1,100	100
			Naphthalene	760	100
		14 - 15	ND	ND	--
B-27	03/11/93	14 - 15	ND	ND	--
B-30	03/11/93	14 - 15	ND	ND	--

ppb = Parts per billion
ND = Not detected
Only detected compounds are listed.

Table 9

Soil Analytical Data

Halogenated Volatile Organic Compounds

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Boring Number	Date Sampled	Sample Depth (feet)	Analyte	Sample Results (ppb)	Detection Limit (ppb)
B-23	03/11/93	4 - 5	ND	ND	--
		9 - 10	ND	ND	--
		14 - 15	ND	ND	--
B-24	03/11/93	4 - 5	1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene	7.1 45 110	5.0 5.0 5.0
		9 - 10	ND	ND	--
		14 - 15	ND	ND	--
B-27	03/11/93	14 - 15	ND	ND	--
B-30	03/11/93	14 - 15	ND	ND	--

ppb = Parts per billion
ND = Not detected
Only detected compounds are listed.

Table 10

Summary of Potential Health Risk to Childern

ARCO Service Station
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Well Number	Carcinogenic Risk					Non-Carcinogenic Risk				
			Inhalation					Inhalation		
	Dermal Contact	Ingestion	Volatilized Groundwater	Soil Vapor	Cumulative Risk	Dermal Contact	Ingestion	Volatilized Groundwater	Soil Vapor	Cumulative Risk
590	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
633	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
634	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
642	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
675	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
17197	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
17200	NA	NA	NA	4.3E-07	4.3E-07	NA	8.4E-06	1.6E-04	7.4E-01	7.4E-01
17203	NA	NA	NA	4.3E-07	4.3E-07	4.8E-06	9.1E-07	NA	7.4E-01	7.4E-01
17302	4.2E-08	1.4E-09	4.6E-10	4.3E-07	4.8E-07	4.4E-07	6.2E-06	8.2E-06	7.4E-01	7.4E-01
17348	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01
17349	3.5E-07	5.9E-08	1.4E-08	4.3E-07	8.5E-07	2.7E-04	2.1E-04	5.4E-03	7.4E-01	7.5E-01
17371	3.6E-08	3.1E-09	9.5E-10	4.3E-07	4.7E-07	2.4E-05	6.5E-05	4.3E-04	7.4E-01	7.4E-01
17372	2.4E-07	2.0E-08	3.13E-09	4.3E-07	7.0E-07	6.7E-06	2.5E-05	8.7E-05	7.4E-01	7.4E-01
17393	NA	NA	NA	4.3E-07	4.3E-07	NA	NA	NA	7.4E-01	7.4E-01

NA = Not applicable

November 22, 1994

Table 11
Summary of Potential Health Risk to Adults

ARCO Service Station
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

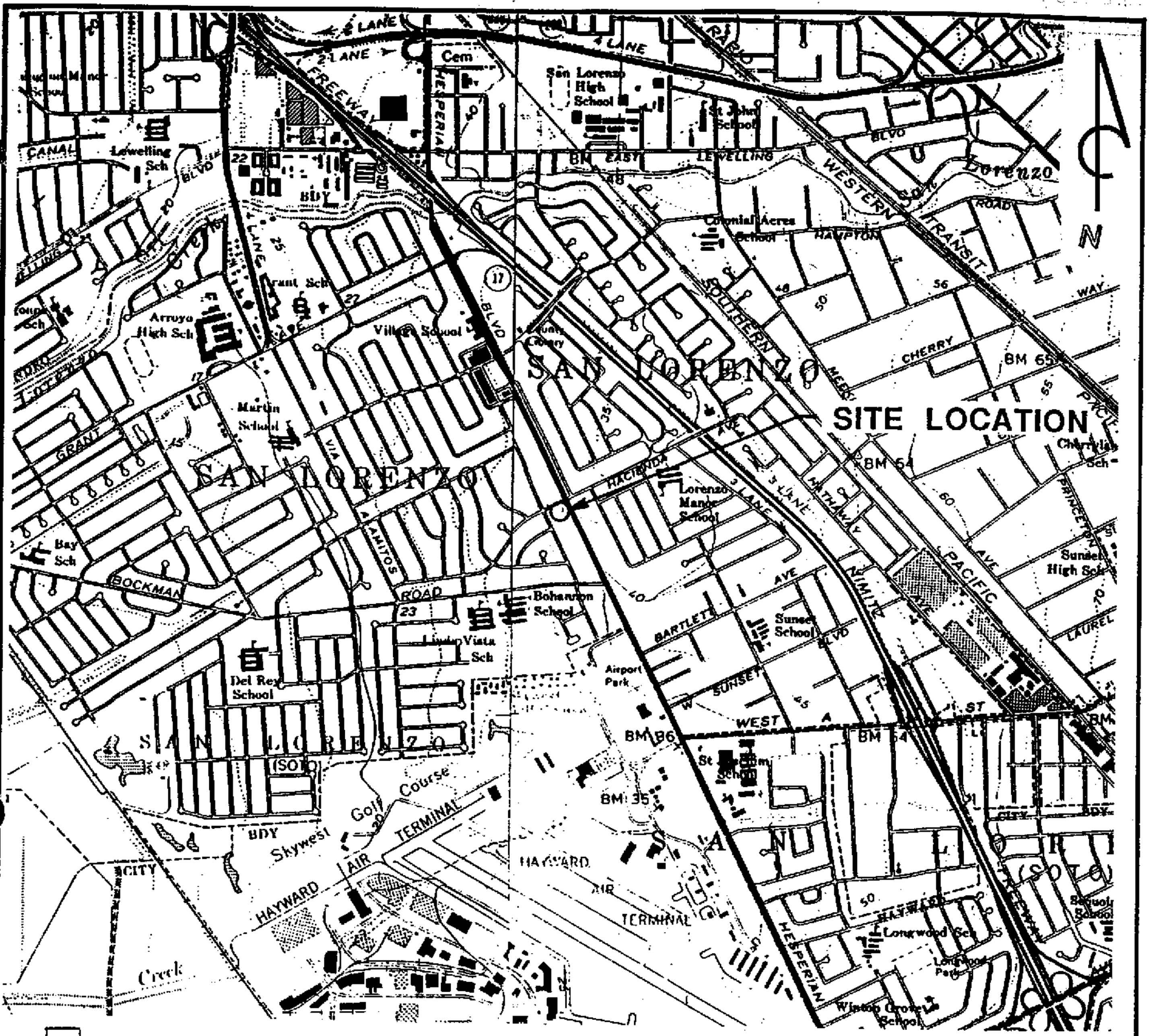
Well Number	Carcinogenic Risk Inhalation Volatilized Groundwater	Carcinogenic Risk Inhalation Soil Vapor	Carcinogenic Risk Inhalation Cumulative Risk	Non-Carcinogenic Risk Inhalation Volatilized Groundwater	Non-Carcinogenic Risk Inhalation Soil Vapor	Non-Carcinogenic Risk Inhalation Cumulative Risk
590	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
633	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
634	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
642	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
675	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
17197	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
17200	NA	8.9E-07	8.9E-07	1.2E-04	5.6E-01	5.6E-01
17203	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
17302	1.3E-09	8.9E-07	9.0E-07	6.2E-06	5.6E-01	5.6E-01
17348	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01
17349	4.0E-08	8.9E-07	9.3E-07	4.0E-03	5.6E-01	5.6E-01
17371	2.7E-09	8.9E-07	9.0E-07	3.2E-04	5.6E-01	5.6E-01
17372	9.0E-09	8.9E-07	9.1E-07	6.5E-05	5.6E-01	5.6E-01
17393	NA	8.9E-07	8.9E-07	NA	5.6E-01	5.6E-01

NA = Not applicable

Table 12
Comparative Analysis of Remedial Action Alternatives

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

Alternative	Protection of Public Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Present Worth Cost	Regulatory Acceptance	Community Acceptance
1	Maybe	Yes	Yes	T, V: Yes M: No	No	Yes	$30,000	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes	$290,000	Yes	Yes
3	Yes	Yes	Yes	T, V: Yes M: Maybe	Maybe	Maybe	$365,000	Maybe	Maybe
4	Yes	Yes	Yes	Yes	Yes	Maybe	$400,000	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes	$485,000	Yes	Yes



QUADRANGLE LOCATION

REFERENCES:

USGS 7.5 MIN. TOPOGRAPHIC MAP
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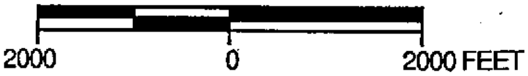
DATED: 1959 REVISED: 1980
TITLED: SAN LEANDRO, CALIFORNIA
DATED: 1959 REVISED: 1980

SCALE



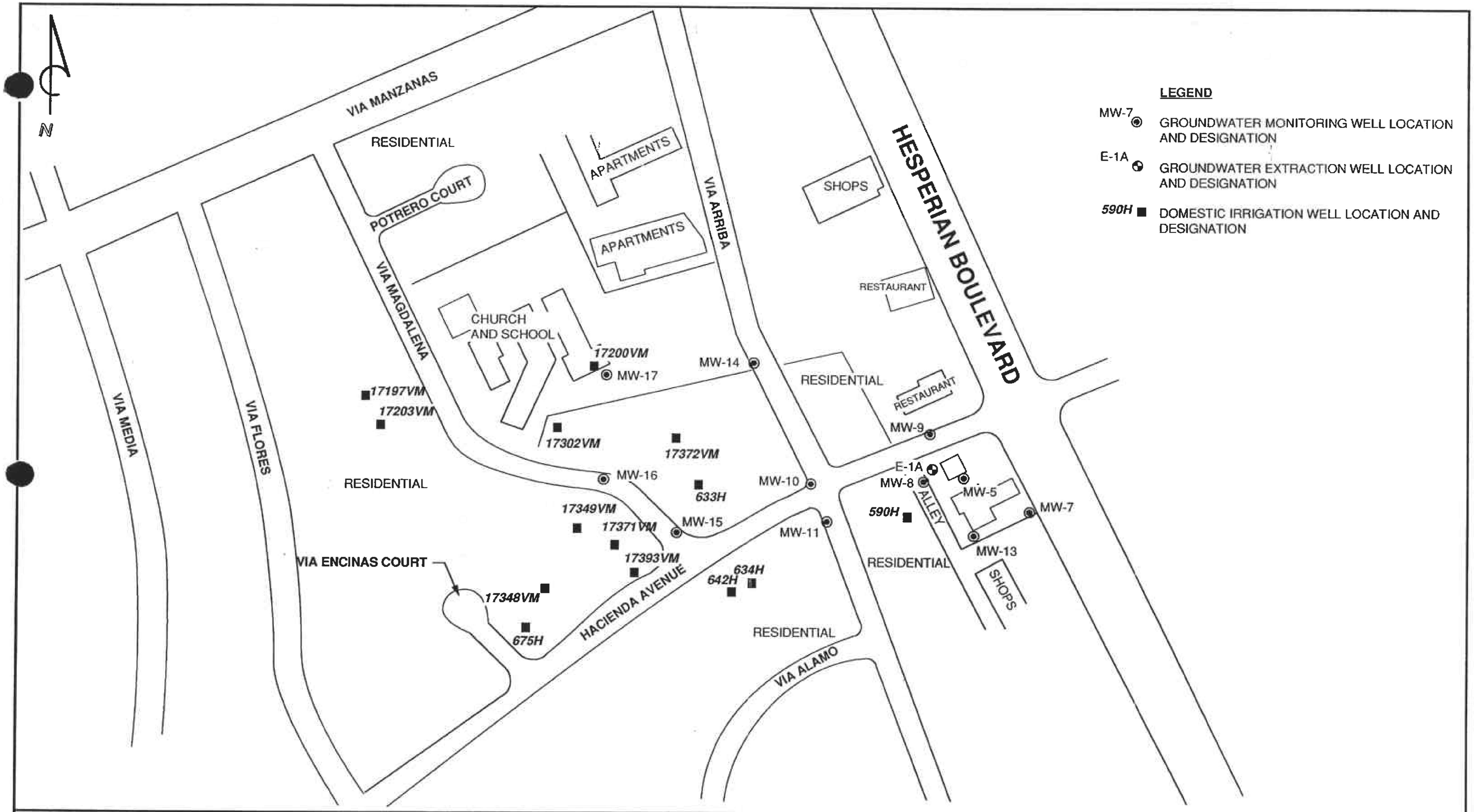
PACIFIC
ENVIRONMENTAL
GROUP, INC.

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SITE LOCATION MAP

FIGURE:
1
PROJECT:
330-006.3C

REORDER NO. A54081



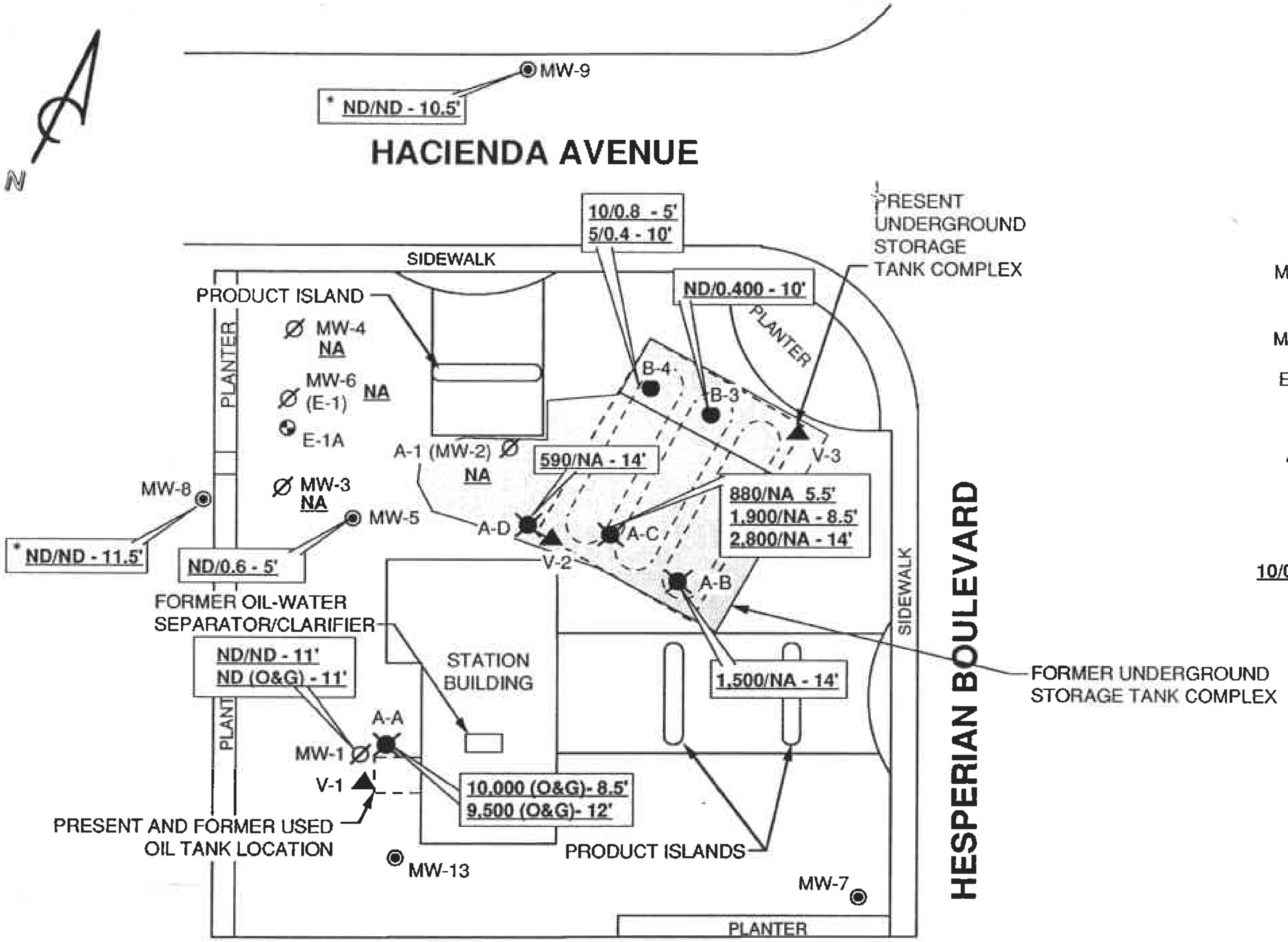
PACIFIC
ENVIRONMENTAL
GROUP, INC.

APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SITE MAP

FIGURE:
2
PROJECT:
330-006.3C



LEGEND

MW-5 ◉	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
MW-3 ∅	DESTROYED WELLS LOCATION AND DESIGNATON
E-1A ◕	EXTRACTION WELL LOCATION AND DESIGNATION
B-3 ●	SOIL BORING LOCATION AND DESIGNATION (AGS, 1988)
A-A ✱	SOIL BORING LOCATION AND DESIGNATION (EMCON, 1985)
V-1 ▲	VADOSE WELL LOCATION AND DESIGNATION
10/0.8 - 5'	TVH-GASOLINE/BENZENE CONCENTRATION IN PARTS PER MILLION (ppm), AT DEPTH INDICATED IN FEET. (O&G) INDICATES OIL and GREASE CONCENTRATION IN ppm. * INDICATES TPH-GASOLINE/BENZENE CONCENTRATION IN ppm
ND	NOT DETECTED
NA	NOT ANALYZED

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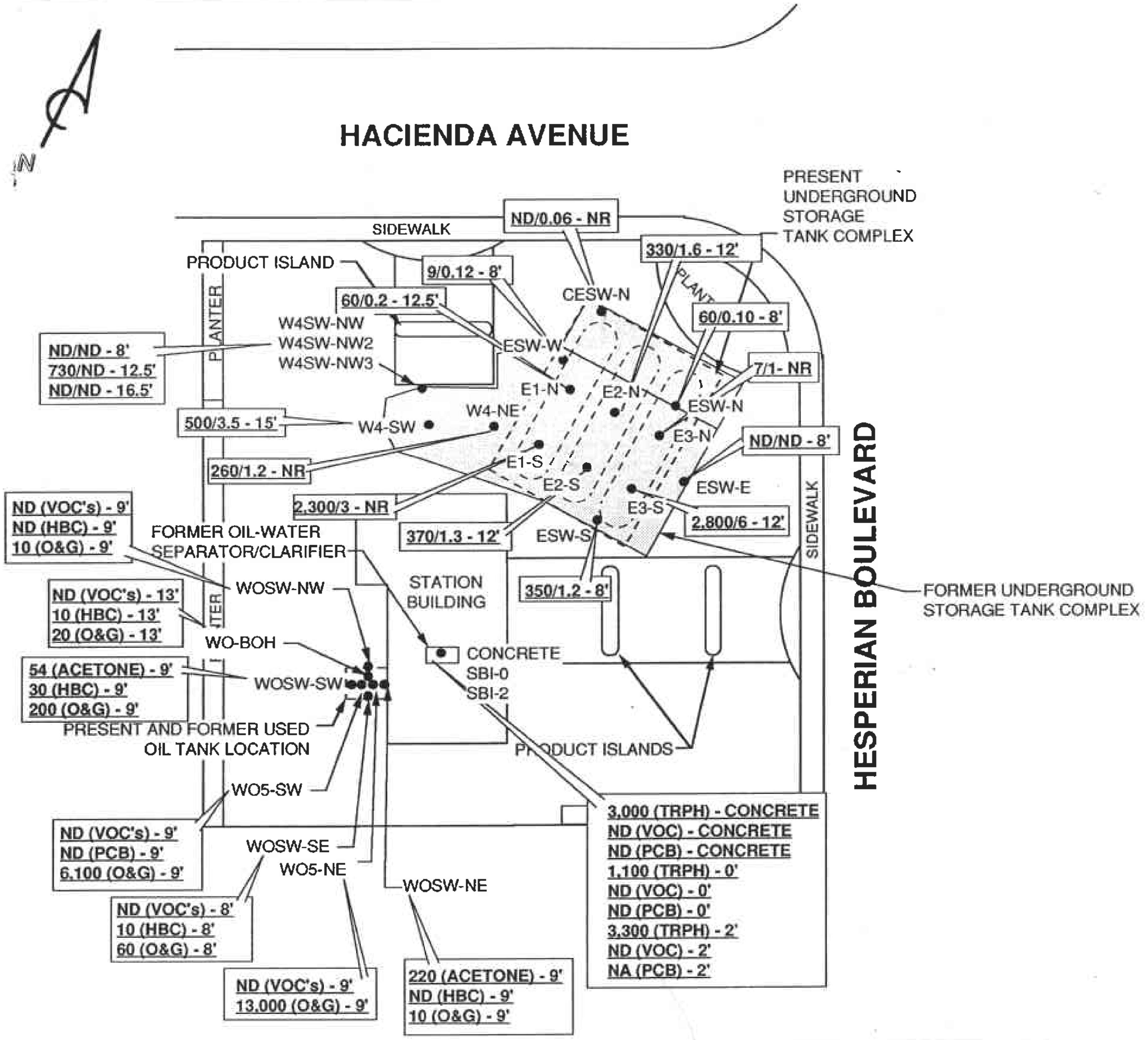
GROUP, INC.

SCALE
0 30 60 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SOIL ANALYTICAL RESULTS MAP - SOIL BORINGS AND WELLS

FIGURE
3
PROJECT:
330-006.3C



LEGEND

E2-N ● SOIL SAMPLE LOCATION AND DESIGNATION

60/0.10 - 8' TPH-GASOLINE/BENZENE CONCENTRATON IN PARTS PER MILLION (ppm), AT DEPTH INDICATED IN FEET

(O&G) - INDICATES OIL and GREASE CONCENTRATION IN ppm
(HBC) - INDICATES HIGH BOILING HYDROCARBONS IN ppm
(PCB) - INDICATES POLYCHLORINATED BIPHENYLS IN ppm
(VOC's) - INDICATES VOLATILE ORGANIC COMPOUNDS IN ppm
(TRPH) - INDICATES TOTAL RECOVERABLE PETROLEUM HYDROCARBONS IN ppm.

ND NOT DETECTED

NR NOT RECORDED

Date: 6/88

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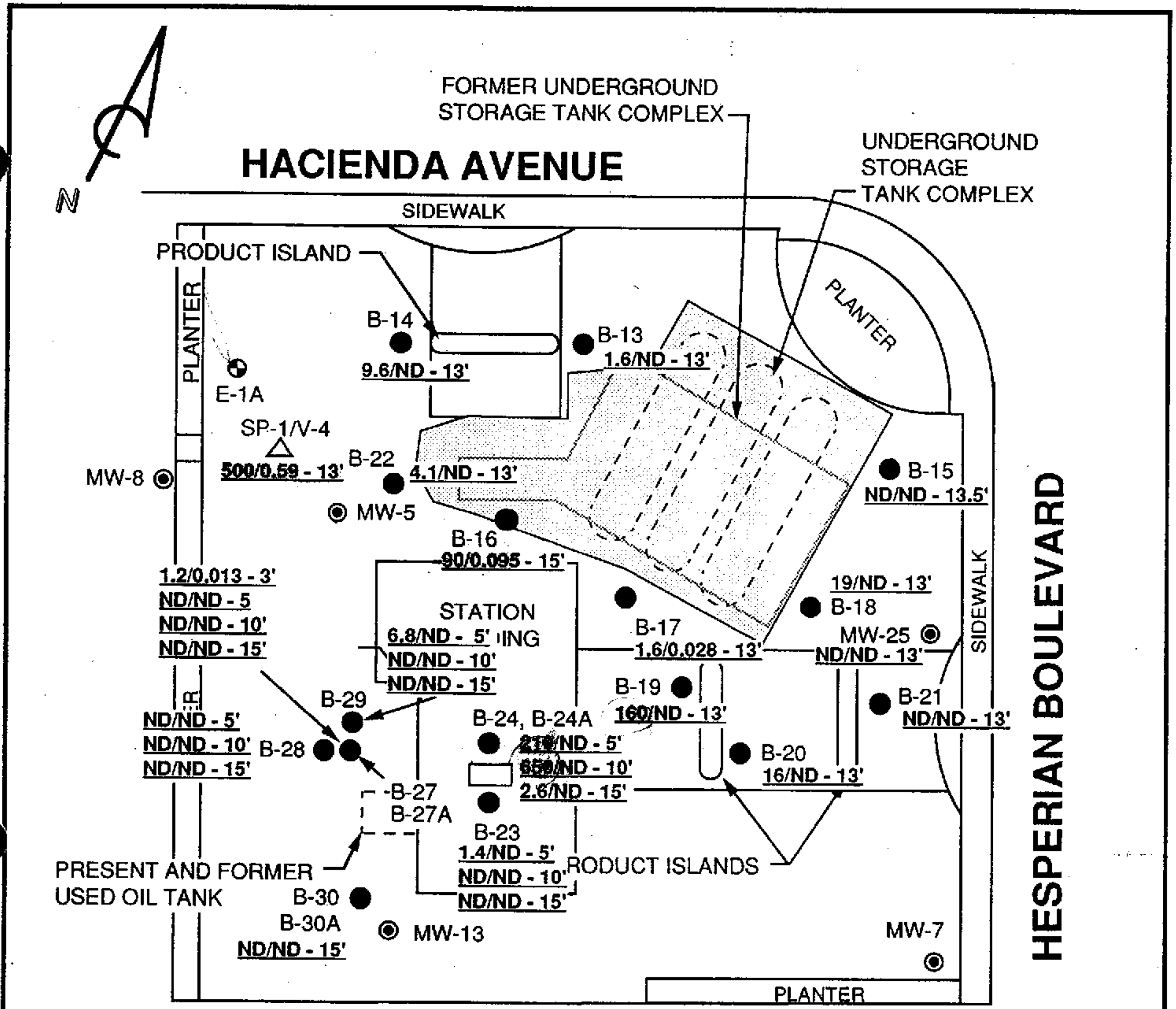
SCALE
0 30 60 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SOIL ANALYTICAL RESULTS MAP - TANK EXCAVATION

FIGURE
4
PROJECT:
330-006.3C



LEGEND

MW-25 ◉	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
E-1A ⊕	GROUNDWATER EXTRACTION WELL LOCATION AND DESIGNATION
SP-1/V-4 △	DUAL COMPLETION AIR SPARGING/SOIL VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
B-16 ●	SOIL BORING LOCATION AND DESIGNATION
16/ND - 13'	TPH-g/BENZENE CONCENTRATIONS IN SOIL, IN PARTS PER MILLION AT DEPTH INDICATED IN FEET
ND	NOT DETECTED

Date?
1993

SCALE
0 30 60 FEET

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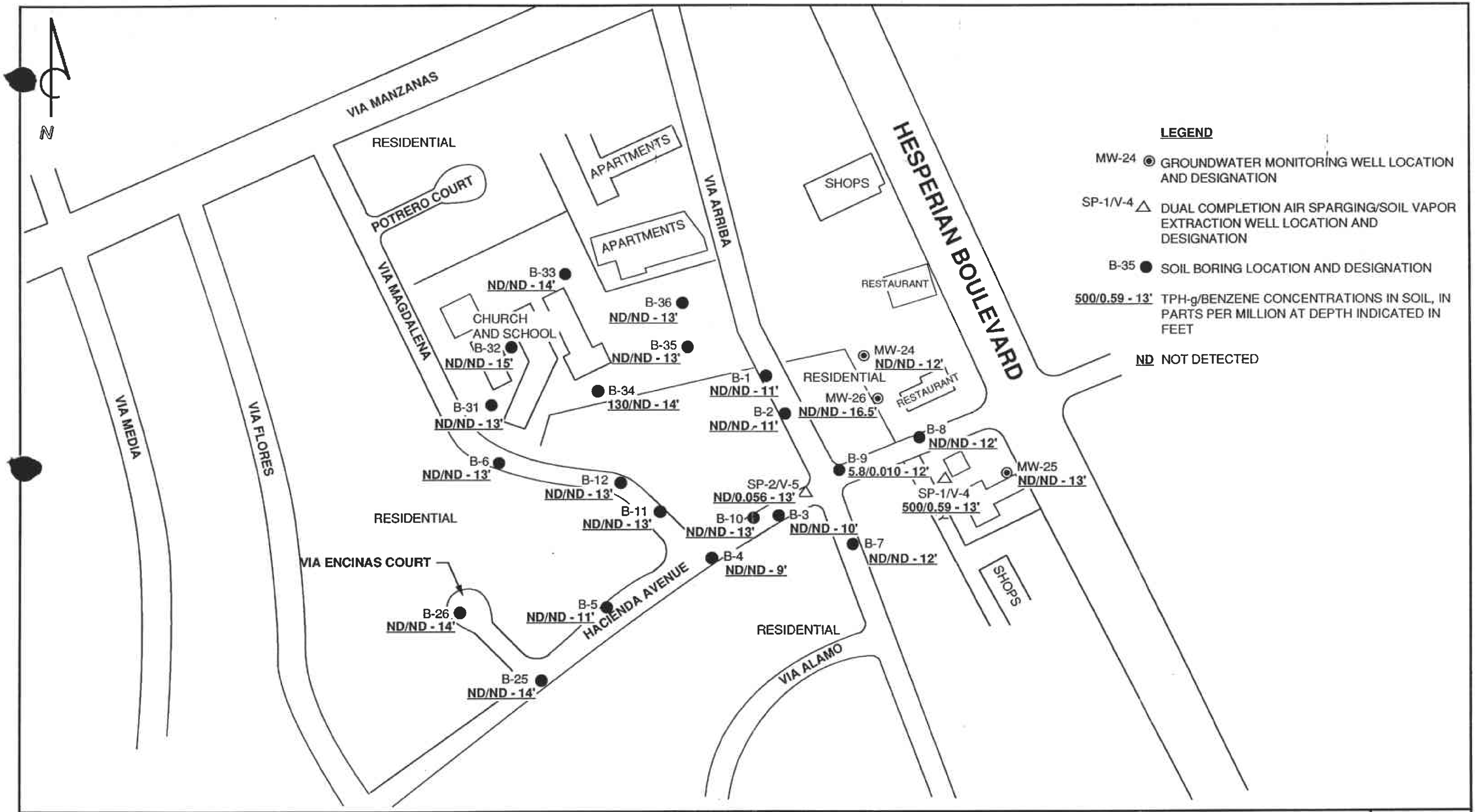
ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

ON-SITE SOIL ANALYTICAL RESULTS MAP

FIGURE:
5
PROJECT:
330-006.3C



PACIFIC
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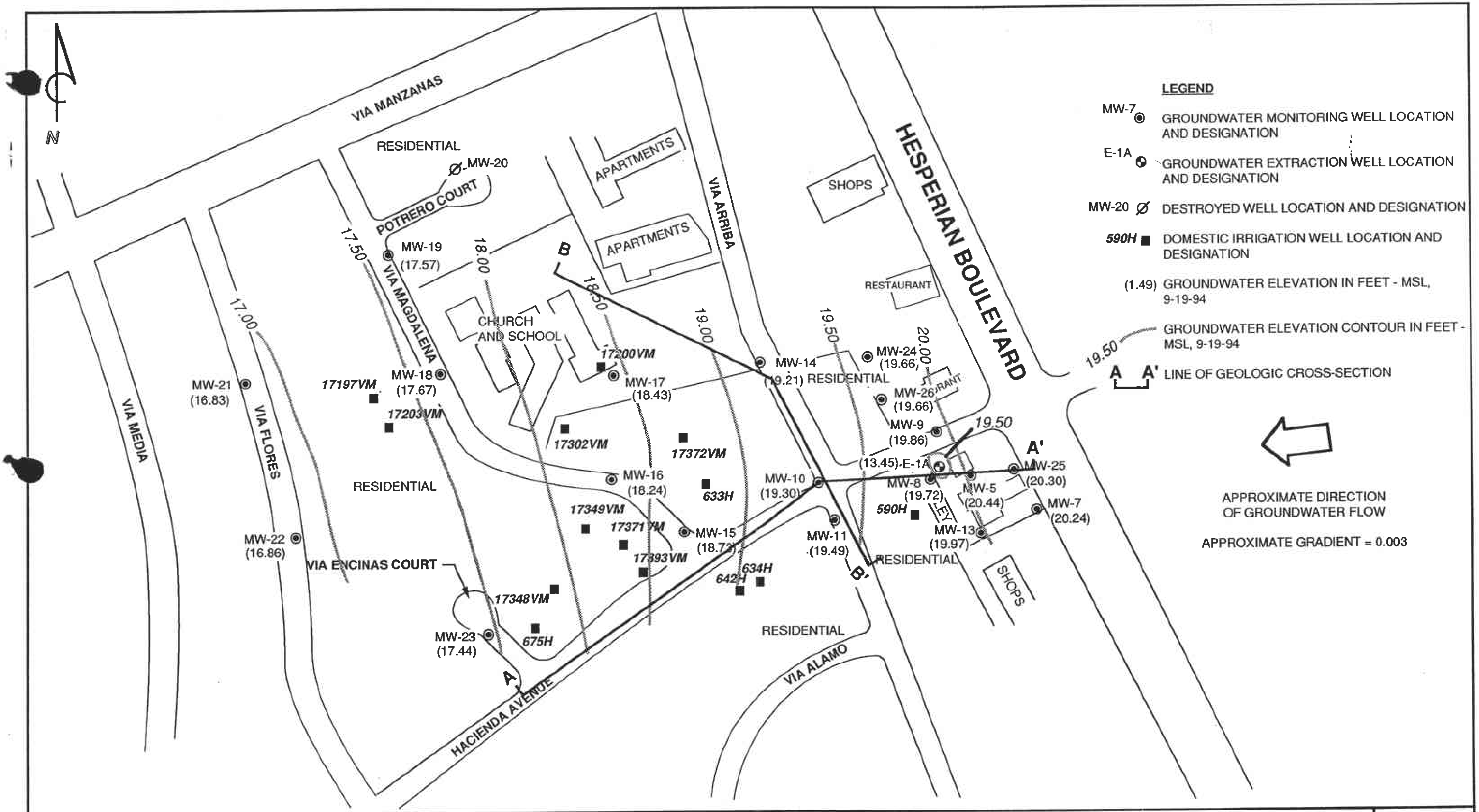
APPROXIMATE SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

OFF-SITE SOIL ANALYTICAL RESULTS MAP

FIGURE:
6
PROJECT:
330-006.3C



PACIFIC ENVIRONMENTAL GROUP, INC.

APPROXIMATE SCALE

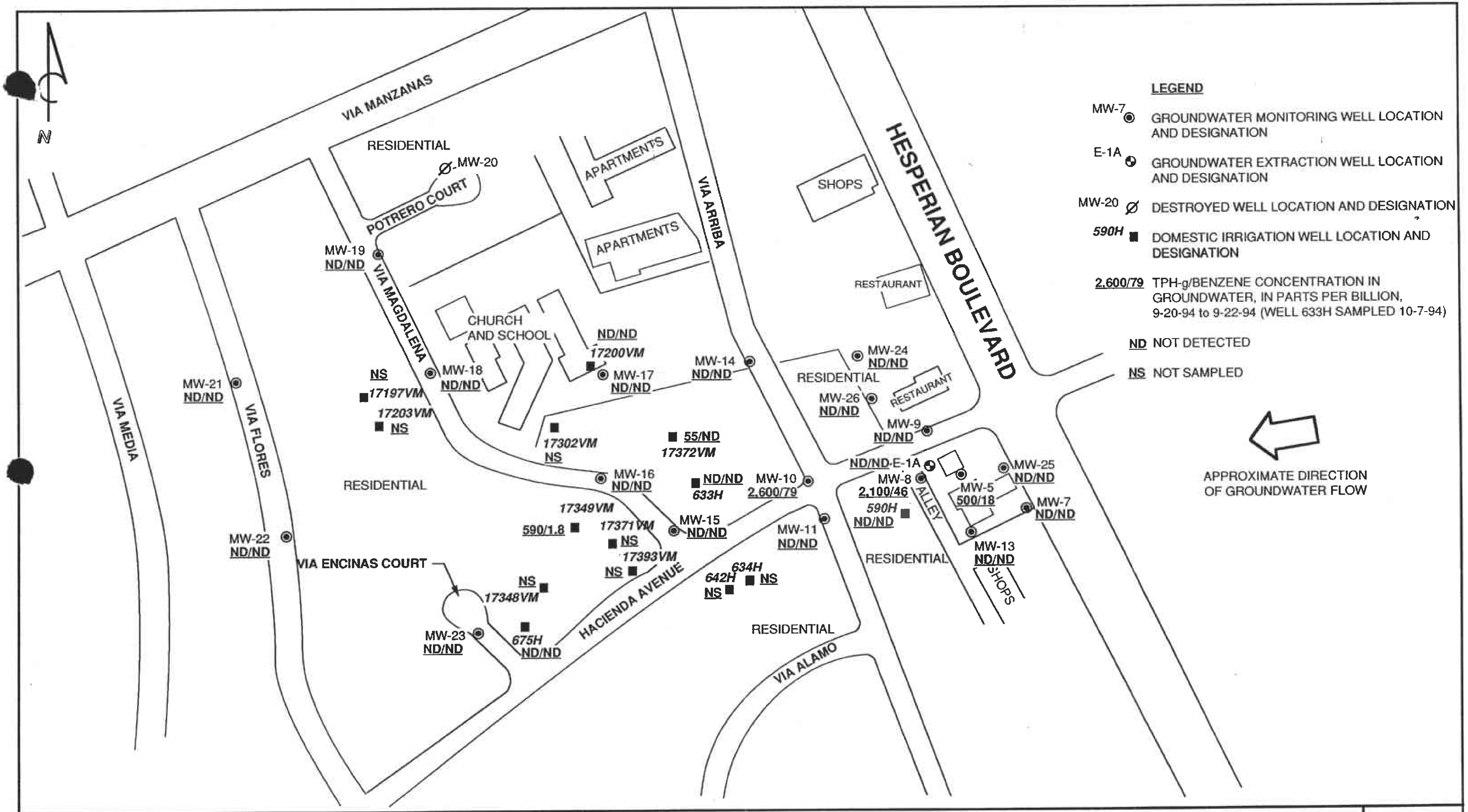
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

GROUNDWATER ELEVATION CONTOUR MAP

FIGURE:
7
PROJECT:
330-006.3C

LARGE MAP REMOVED



PACIFIC
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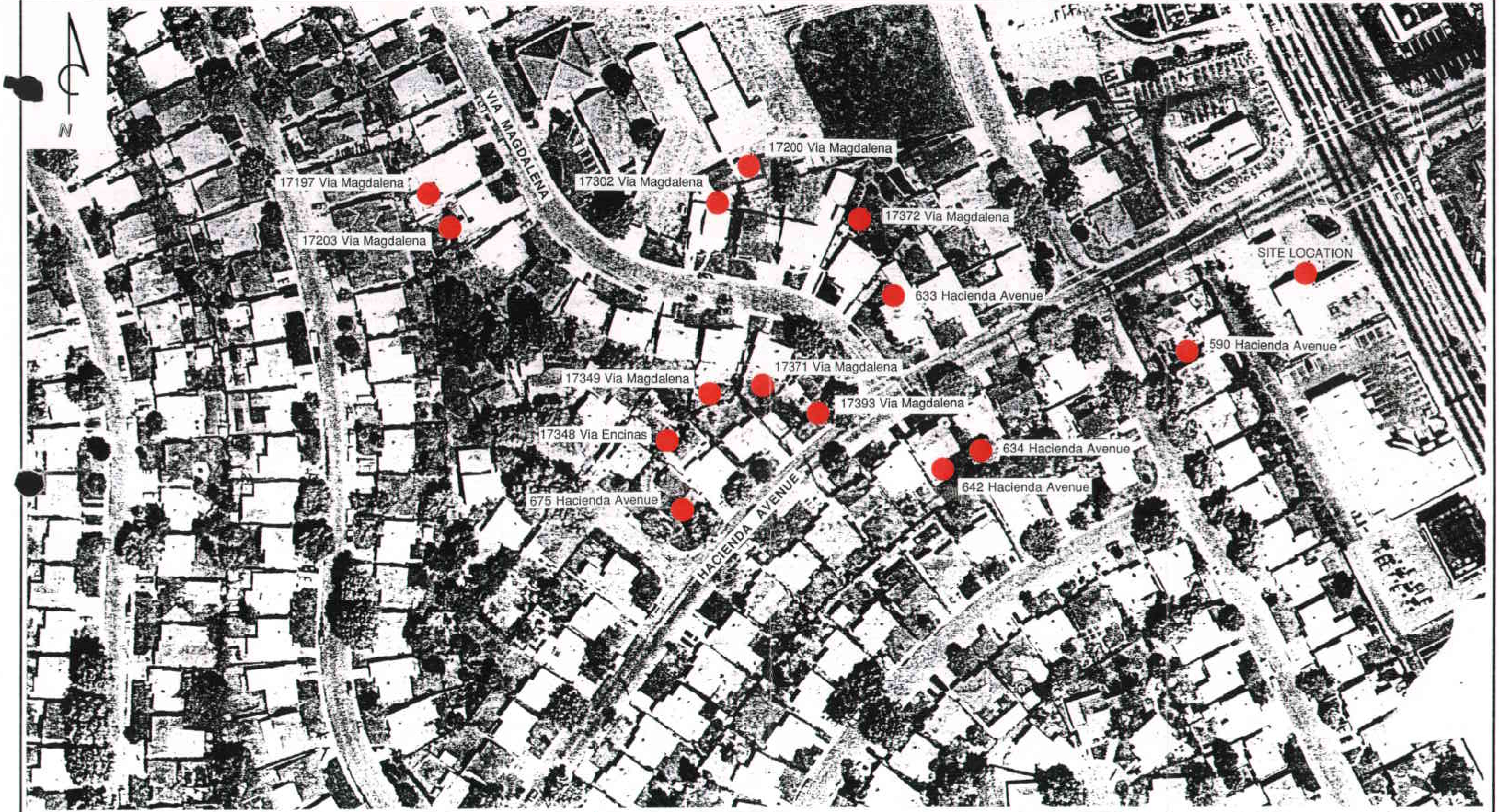
APPROXIMATE SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

TPH-g/BENZENE CONCENTRATION MAP Date 9/20/94-9/22/94

FIGURE:
9
PROJECT:
330-006.3C



PACIFIC
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GROUP, INC.

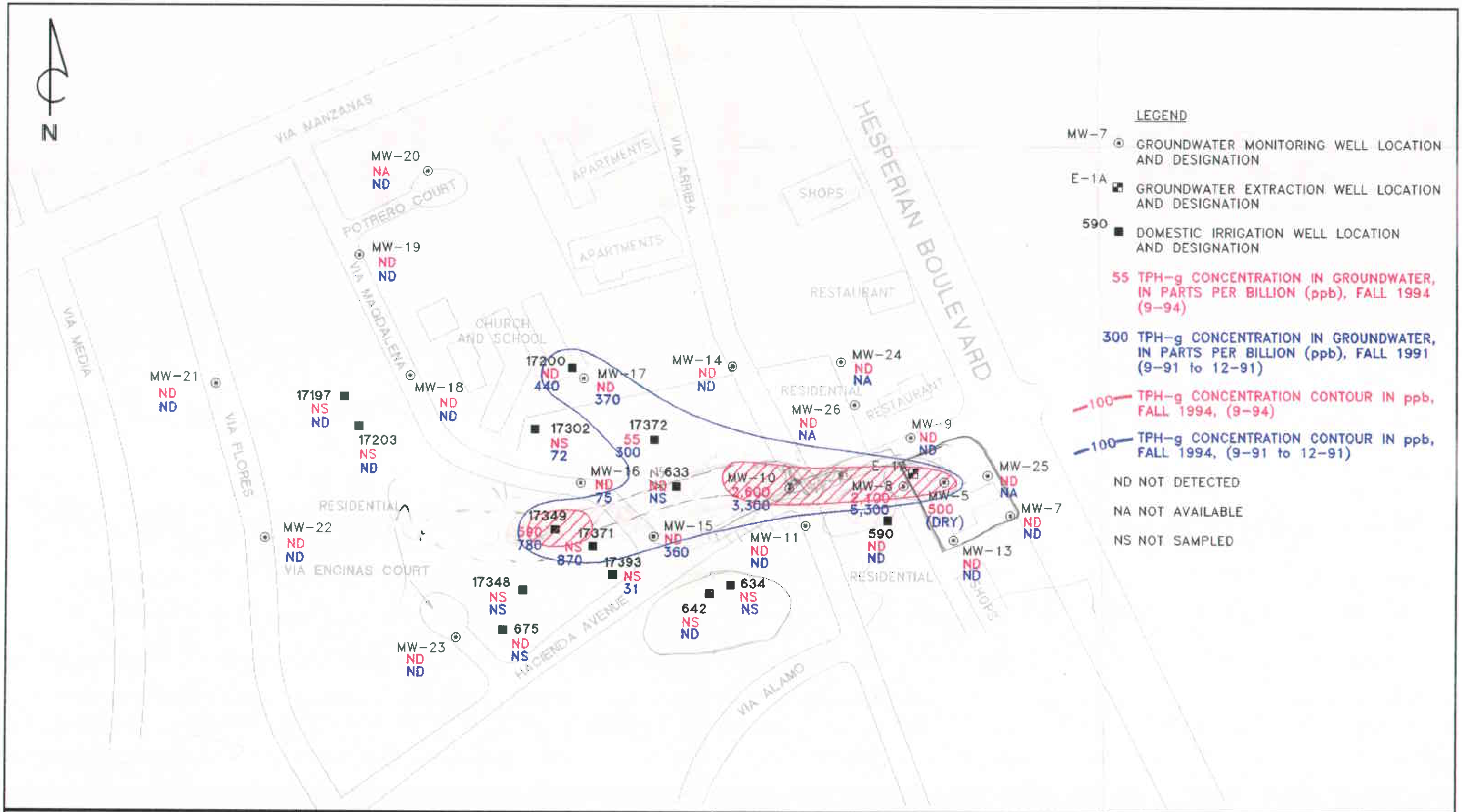
SCALE

0 100 200 FEET

ARCO SERVICE STATION #608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

AERIAL PHOTOGRAPH OF DOMESTIC IRRIGATION WELLS

FIGURE:
10
PROJECT:
330-006.3C



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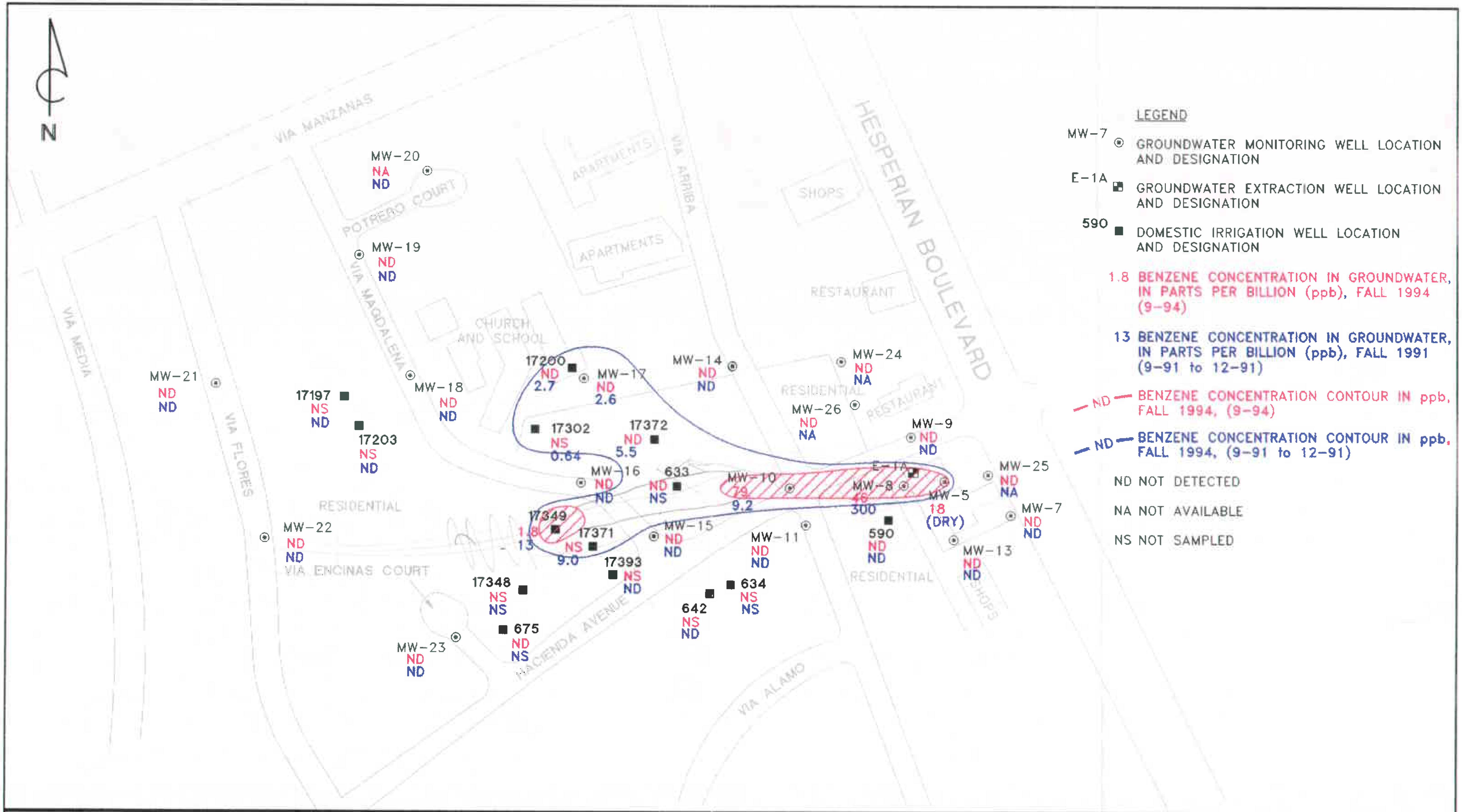
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

GENERALIZED EXTENT OF TPH-g IN GROUNDWATER

FIGURE:
11

PROJECT:
330-006.3C



PACIFIC
ENVIRONMENTAL
GROUP, INC.

SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

GENERALIZED EXTENT OF BENZENE IN GROUNDWATER

FIGURE:
12
PROJECT:
330-006.3C

APPENDIX A

GROUNDWATER FATE AND TRANSPORT MODELING RESULTS

APPENDIX A
GROUNDWATER FATE AND TRANSPORT MODELING RESULTS

A.1 Key to Appendix A

Appendix A contains figures, a table, and raw computer printed material from the fate and transport study discussed in Section 3.1. Computer printed output is contained in Attachments 1 and 2. Computer output uses data values expressed in feet, days, and pounds.

Model Grid. Figure A-1 depicts the grid used in modeling. Grid size is 1,700 feet by 1,200 feet. The smallest grid squares are 25 feet by 25 feet (see scale on Figure A-1). The grid was designed so that the eastern end contains the site with homeowner wells and other features in the downgradient area of the grid. Grid boundaries are roughly parallel and perpendicular to groundwater flow direction in the site vicinity. There are 45 columns, 32 rows and 1 layer. MODFLOW and MT3D use a block-centered scheme for calculating spatial variations of parameters within the grid. In the vicinity of homeowner wells, the discrepancy between block-centered values and locations of wells should not exceed 10 to 20 feet.

Contour Maps. Figures A-2 through A-12 show contours derived from model output for benzene concentrations (converted from pounds per cubic foot to micrograms per liter for the maps), and for groundwater elevations (feet above mean sea level). These contours were derived by processing the computer output (Attachments 1 and 2) with a gridding and contouring software package SURFER™ by Golden Software, Inc. of Golden, Colorado.

Model Parameters. Table A-1 contains important model parameters with their sources. Included are homeowner well pumping rates for Scenario 2 and the sensitivity study. To estimate **homeowner well pumping** rates in the model, the frequency of operation (days per year) and duration of operation (hours per day) were obtained from **Table 2 in PACIFIC's July 27, 1993 letter to Alameda County Department of Environmental Health.**

From these values, an average daily pumping rate was calculated. This was derived by taking the frequency and duration data and computing total volume of groundwater extracted per year for each well. Then for the model, an average daily rate was obtained by dividing the yearly total by 365. This type of scheme was employed so that steady-state flow and pumping conditions could be used in the model (to avoid complicated scheduling of pumping and transient flow conditions).

In addition, each average daily pumping rate was multiplied by a factor of 3 times to be conservative. The 24-hour known pumping rate for the on-site extraction well is 3 gallons per minute, and this was included in the model.

Homeowner Well 633 Benzene Concentrations. Figures A-13, A-14, and A-15 show dissolved benzene concentrations (μg/L) versus time (days). Data used for constructing these figures is listed in Attachment 2. Well 633 is the only well that the model predicts to contain dissolved benzene. Also included in Attachment 2 are data for Wells 642 H, 17302 VM, 17349 VM, 17371 VM, and 17372 VM. These wells are included for observation because they are directly downgradient from the existing dissolved benzene plume.

3 gpm on site
Pumping, domestic wells

Table A-1
Fate and Transport Model Parameters

ARCO Service Station 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

	No Pumping	Model Run	
Parameter (units) [h]	**Scenario 1**	**Scenario 2**	**Sensitivity Study**
Biodegradation Rate (day) [a]	110	110	250
Constant Head at Grid Edges [b]	yes	yes	yes
Constant Benzene Source (µg/L) [c,d]	330	330	330
Pumping Rate (cubic feet per day) [e]			
Well No.			
17197	0.0	[redacted]	0.0
17203	0.0	[redacted]	0.0
17302	0.0	[redacted]	0.0
17349	0.0	[redacted]	51.3
17371	0.0	[redacted]	9.6
17372	0.0	[redacted]	103.0
633	0.0	[redacted]	153.0
642	0.0	[redacted]	77.0
590	0.0	[redacted]	0.0
E-1A	0.0	577.5	577.5
Permeability (feet/day) [f]	6.5 to 40	6.5 to 40	6.5 to 40
Storativity [g]	0.1	0.1	0.1
Porosity [g]	0.25	0.25	0.25
Saturated Thickness (feet) [g]	14	14	14
Longitudinal Dispersivity (feet) [g]	10	10	10
Transverse Dispersivity (feet) [g]	1	1	1

µg/L = Micrograms per liter

a. See McAllister and Chiang, 1994; Salanitro, 1993

b. PACIFIC, March, 1994 Quarterly Monitoring Report

c. Estimate based on site well data (see reference b above)

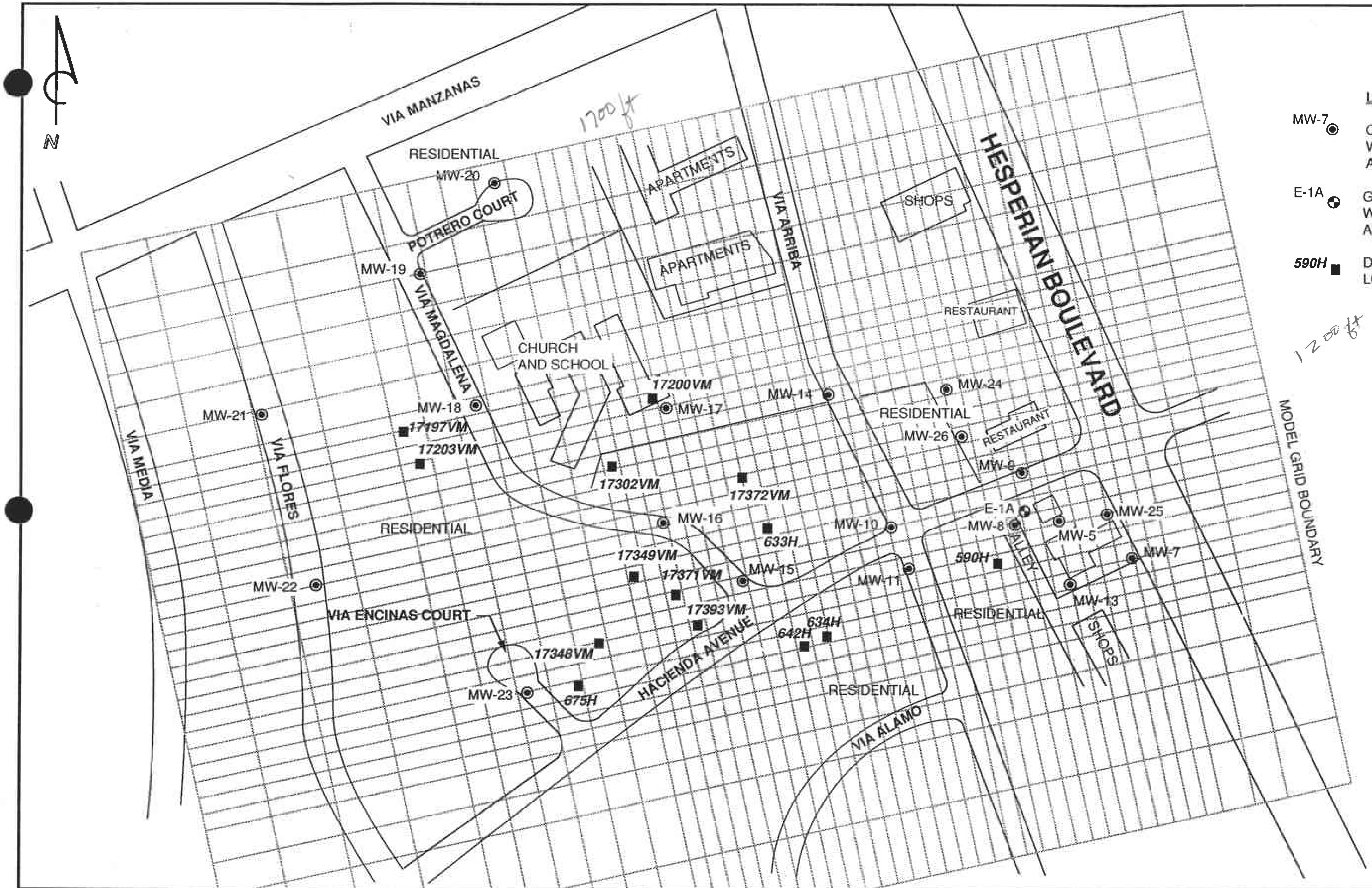
d. Concentration units for benzene in model are in pounds per cubic foot

e. PACIFIC July 27, 1993 Letter to Alameda County Health Care Services Division
See Appendix A text for further discussion on pumping rates

f. Based on field tests - PACIFIC, October 12, 1993 Report

g. Based on estimates from field testing, stratigraphy and other sources:
see: PACIFIC, February 4, 1993 Workplan; Freeze and Cherry, 1979; Anderson and Woessner, 1992

h. See Attachments 1 through 6, Appendix A for data input values in mass (lbs), time (days), length (feet)



LEGEND

MW-7 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

E-1A ◐ GROUNDWATER EXTRACTION WELL LOCATION AND DESIGNATION

590H ■ DOMESTIC IRRIGATION WELL LOCATION AND DESIGNATION

1200 x 1700 ft Grid

PACIFIC ENVIRONMENTAL GROUP, INC.

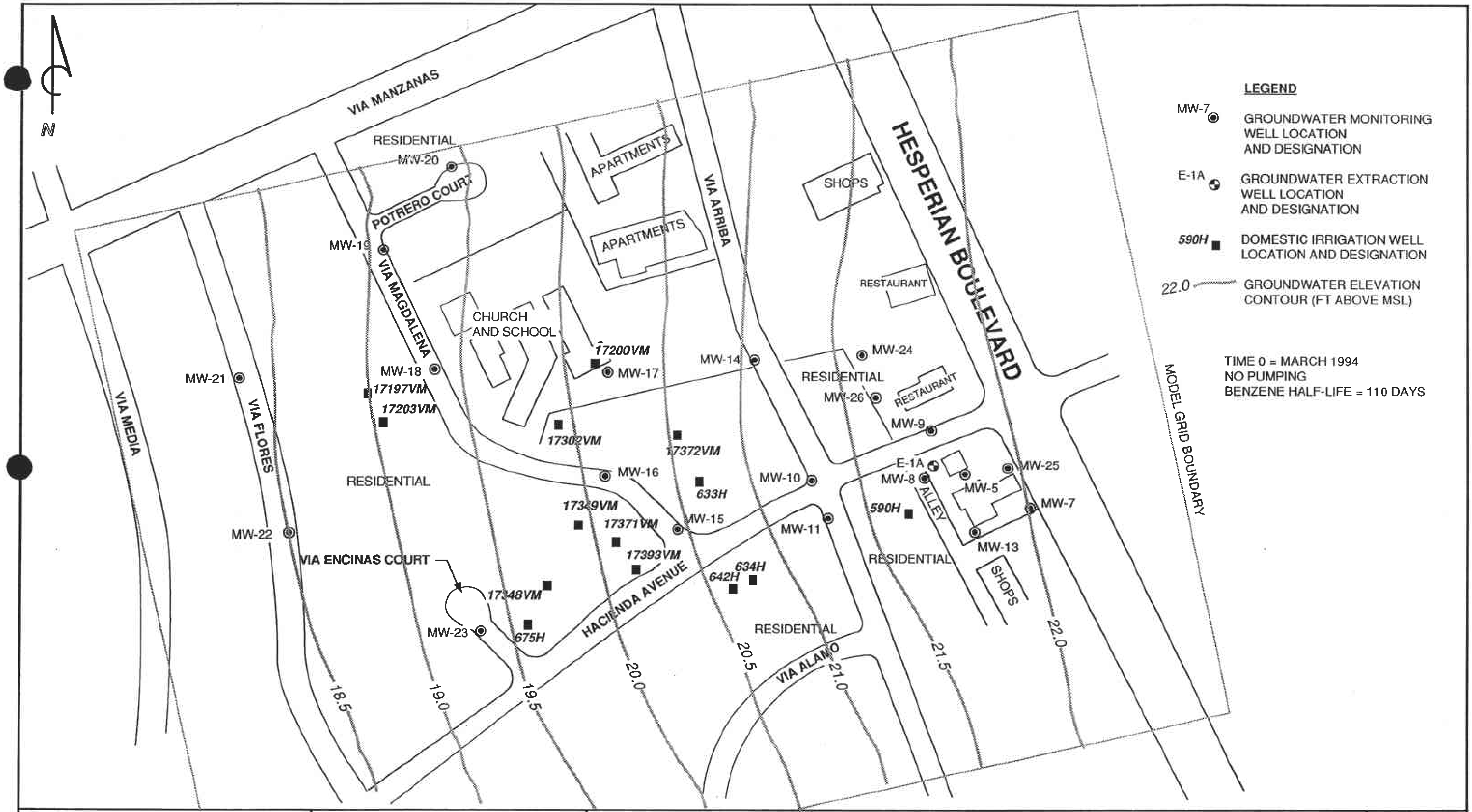
APPROXIMATE SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

EXTENDED SITE MAP WITH MODEL GRID

FIGURE:
A-1
PROJECT:
730-001.01



TIME 0 = MARCH 1994
NO PUMPING
BENZENE HALF-LIFE = 110 DAYS

PACIFIC
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APPROXIMATE SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
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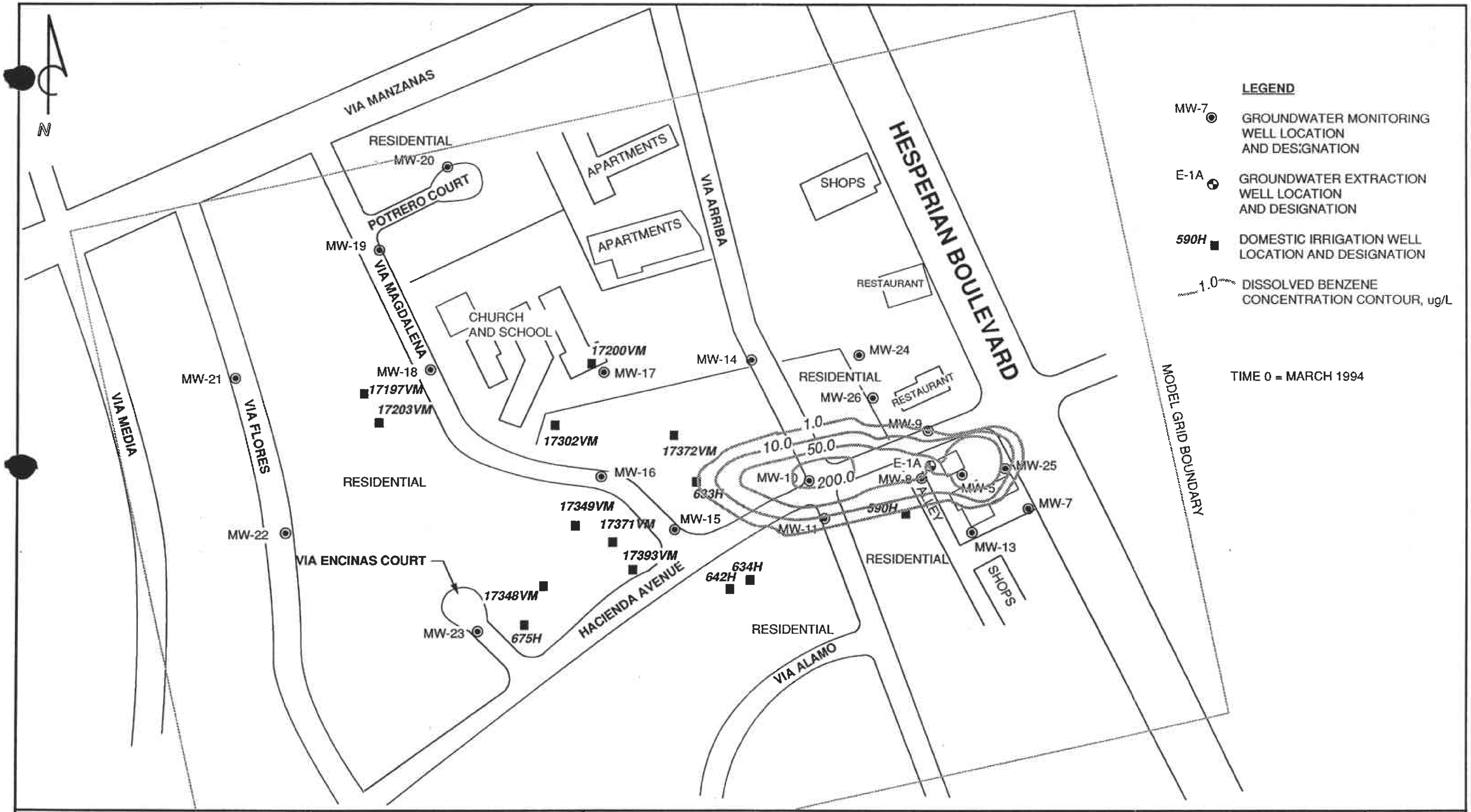
San Lorenzo, California

SCENARIO 1: GROUNDWATER ELEVATION CONTOURS

FIGURE:
A-2
PROJECT:
730-001.01



PACIFIC
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GROUP, INC.

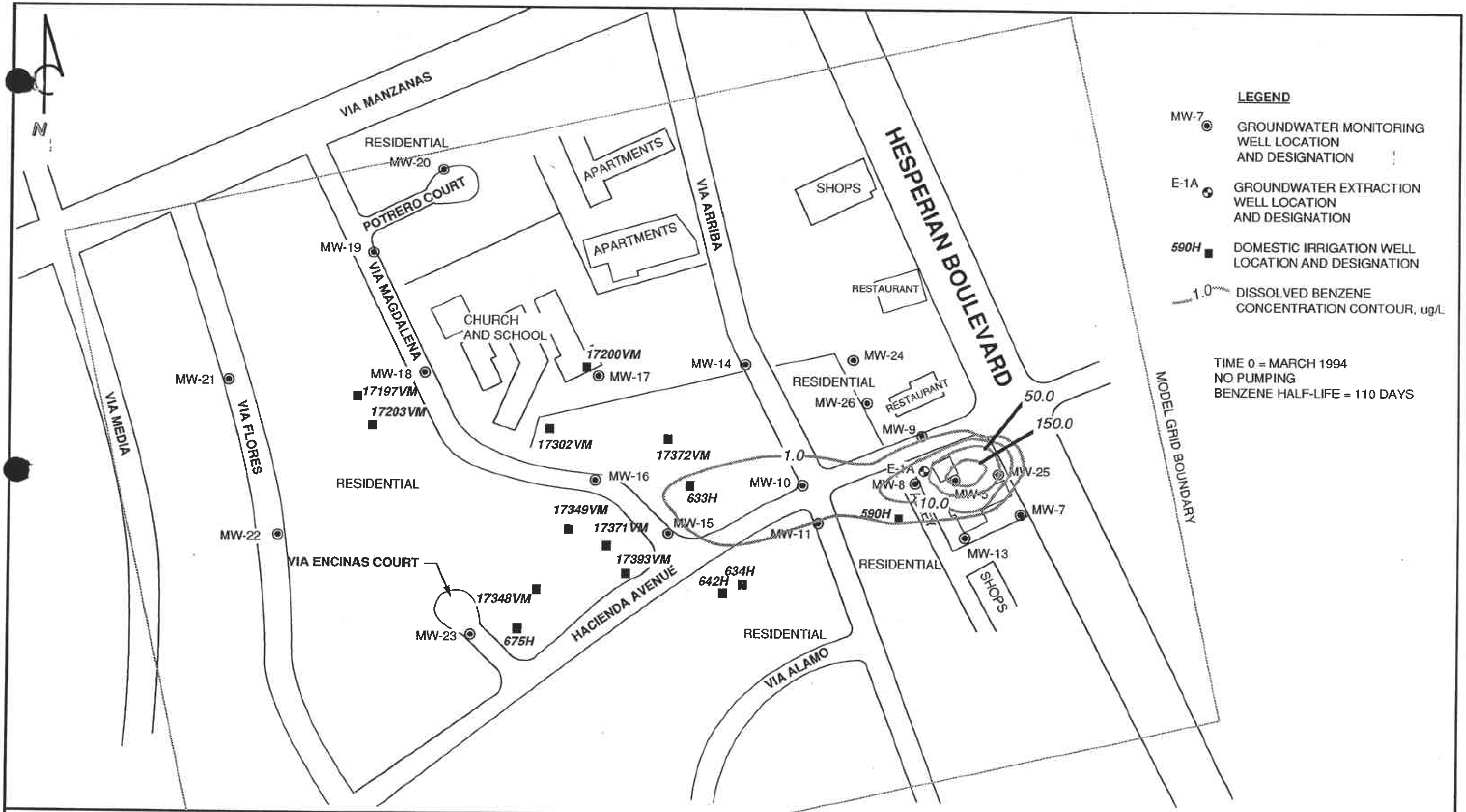
APPROXIMATE SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

INITIAL BENZENE CONCENTRATIONS AT TIME = 0

FIGURE:
A-3
PROJECT:
730-001.01



PACIFIC
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GROUP, INC.

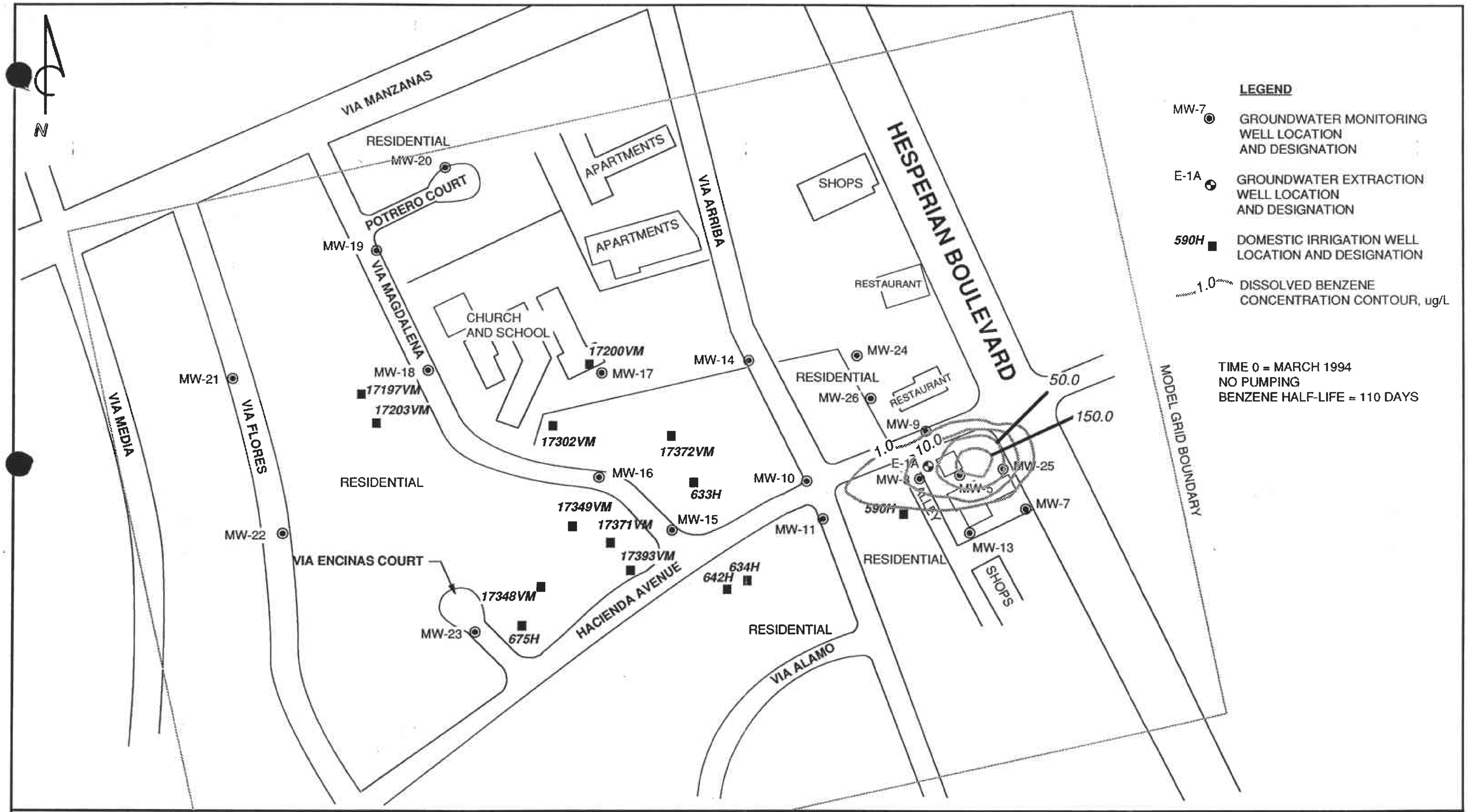
APPROXIMATE SCALE

0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SCENARIO 1: TIME = 1 YEAR

FIGURE:
A-4
PROJECT:
730-001.01



TIME 0 = MARCH 1994
NO PUMPING
BENZENE HALF-LIFE = 110 DAYS

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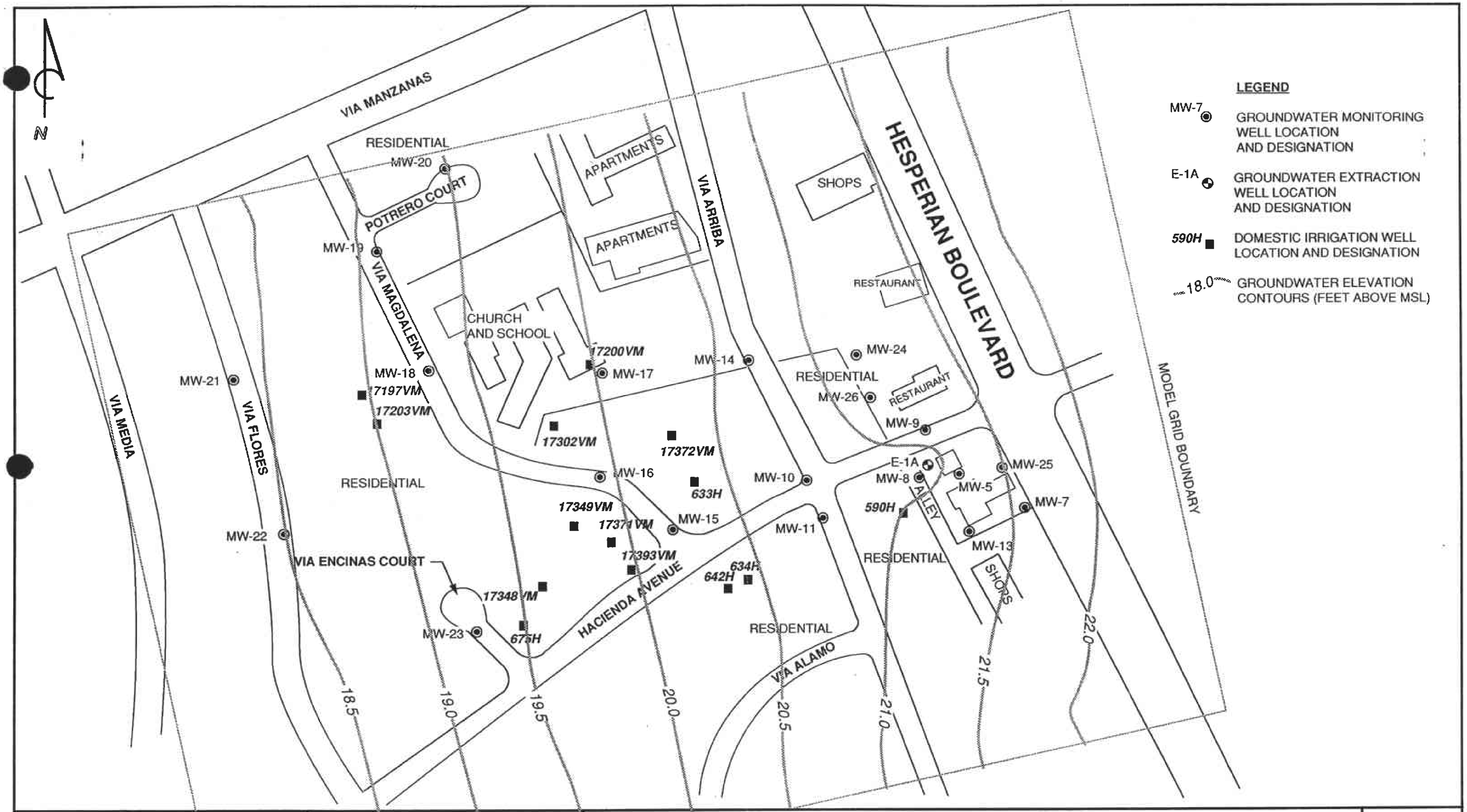
APPROXIMATE SCALE

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SCENARIO 1: TIME = 2 YEARS

FIGURE:
A-5
PROJECT:
730-001.01



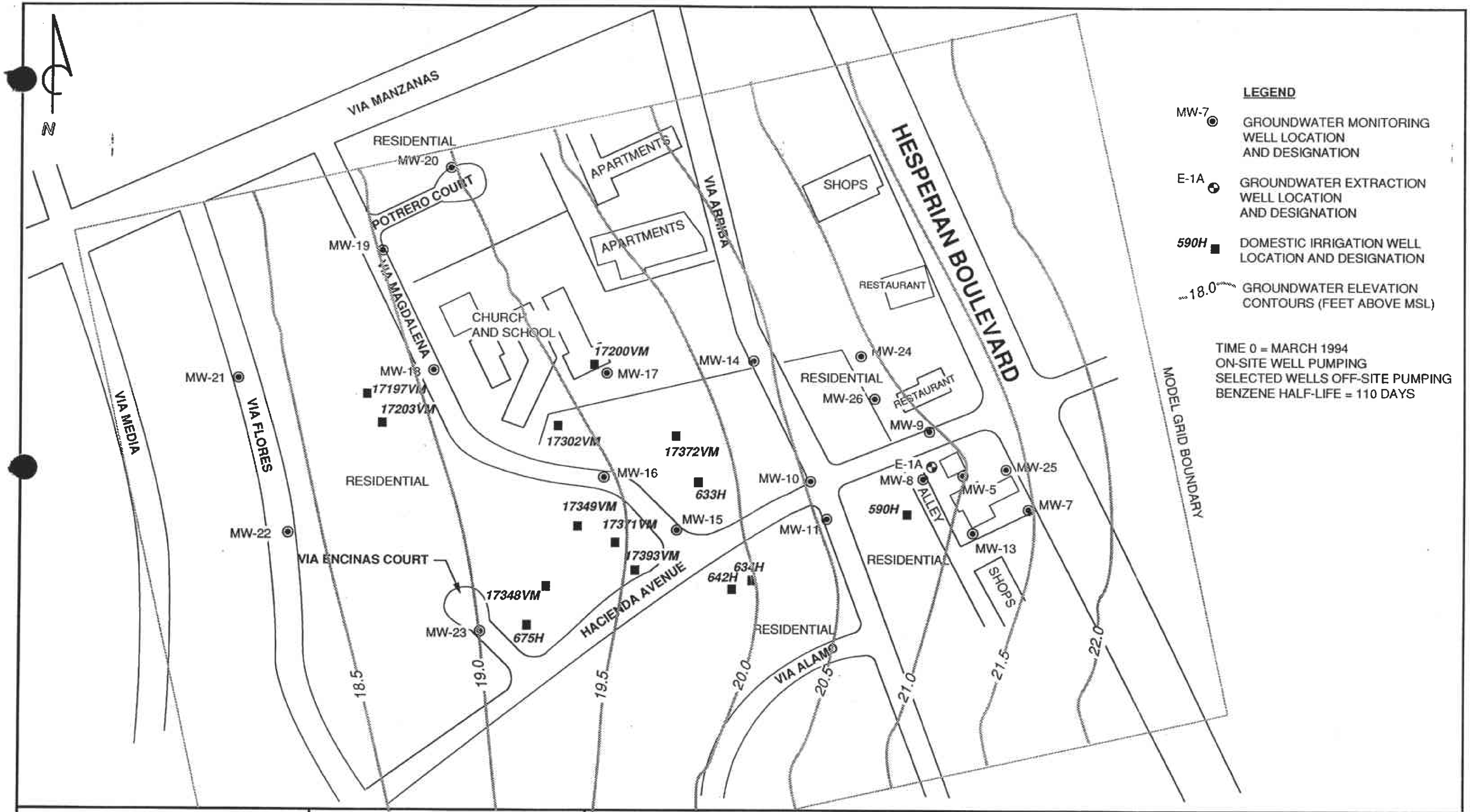
PACIFIC
ENVIRONMENTAL
GROUP, INC.

APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

MODFLOW RESULTS WITH ON-SITE PUMPING (3 GPM)

FIGURE:
A-6
PROJECT:
730-001.01



PACIFIC
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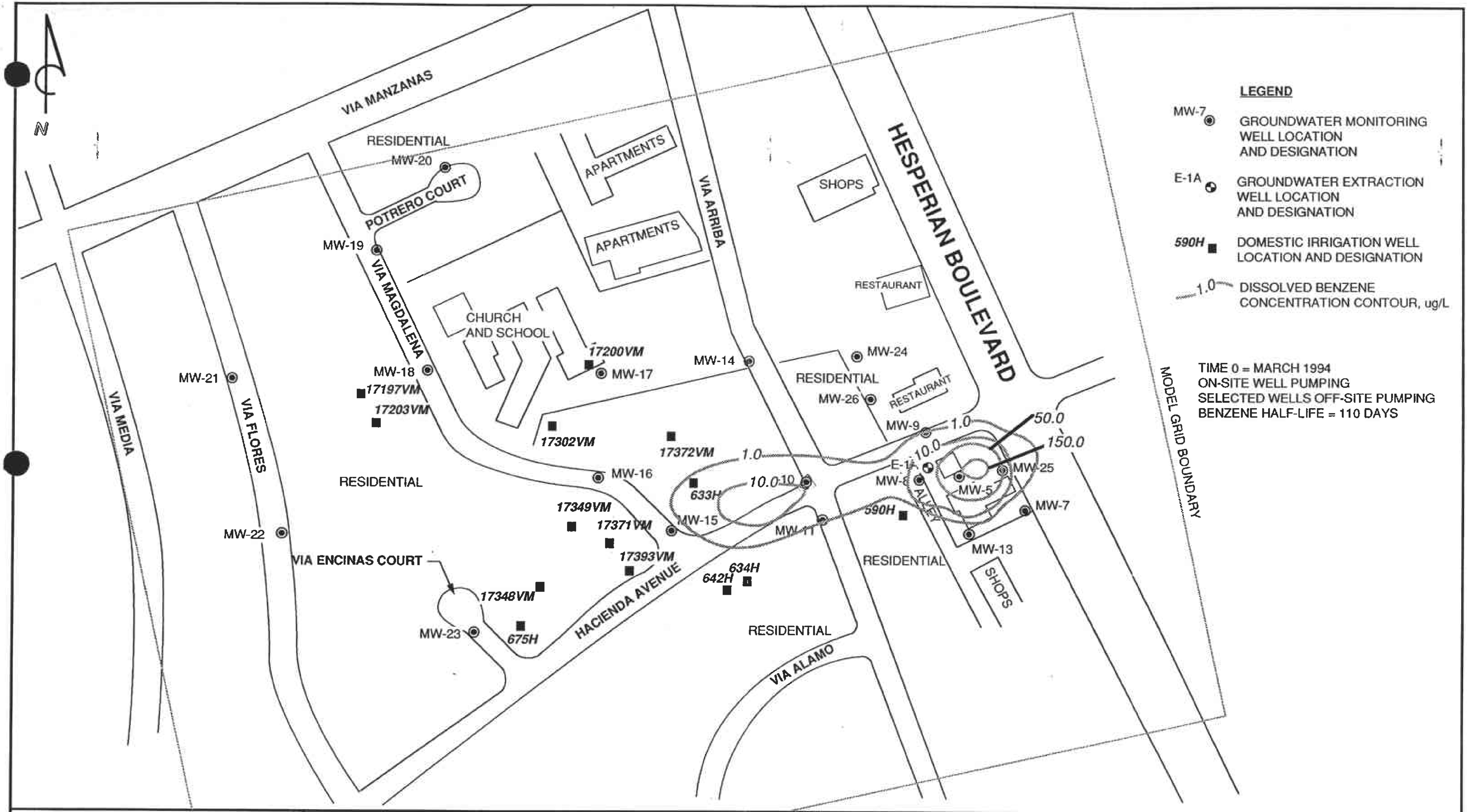
GROUP, INC.

APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SCENARIO 2: ON-SITE AND OFF-SITE WELLS PUMPING

FIGURE:
A-7
PROJECT:
730-001.01



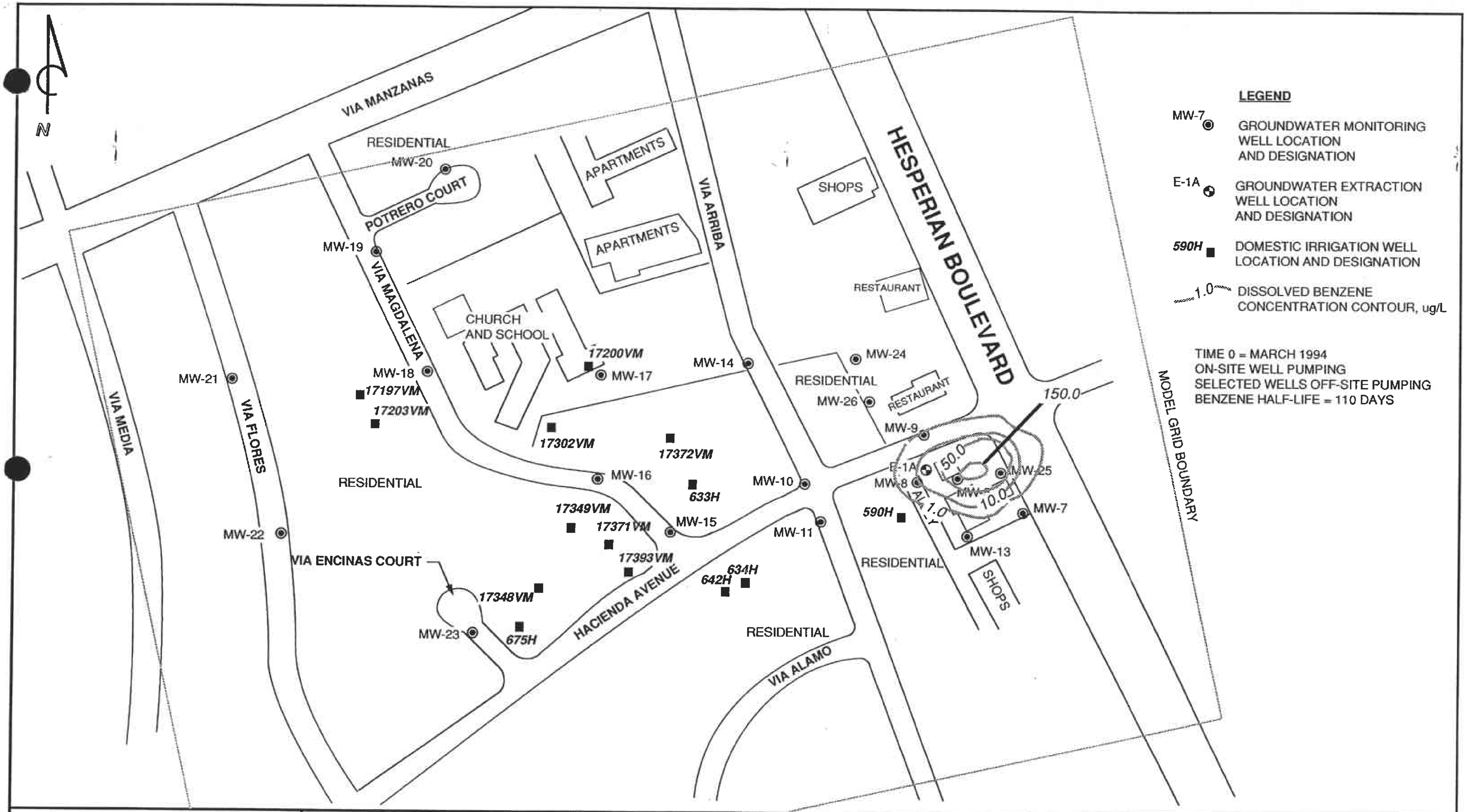
PACIFIC
ENVIRONMENTAL
GROUP, INC.

APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SCENARIO 2: TIME = 1 YEAR

FIGURE:
A-8
PROJECT:
730-001.01



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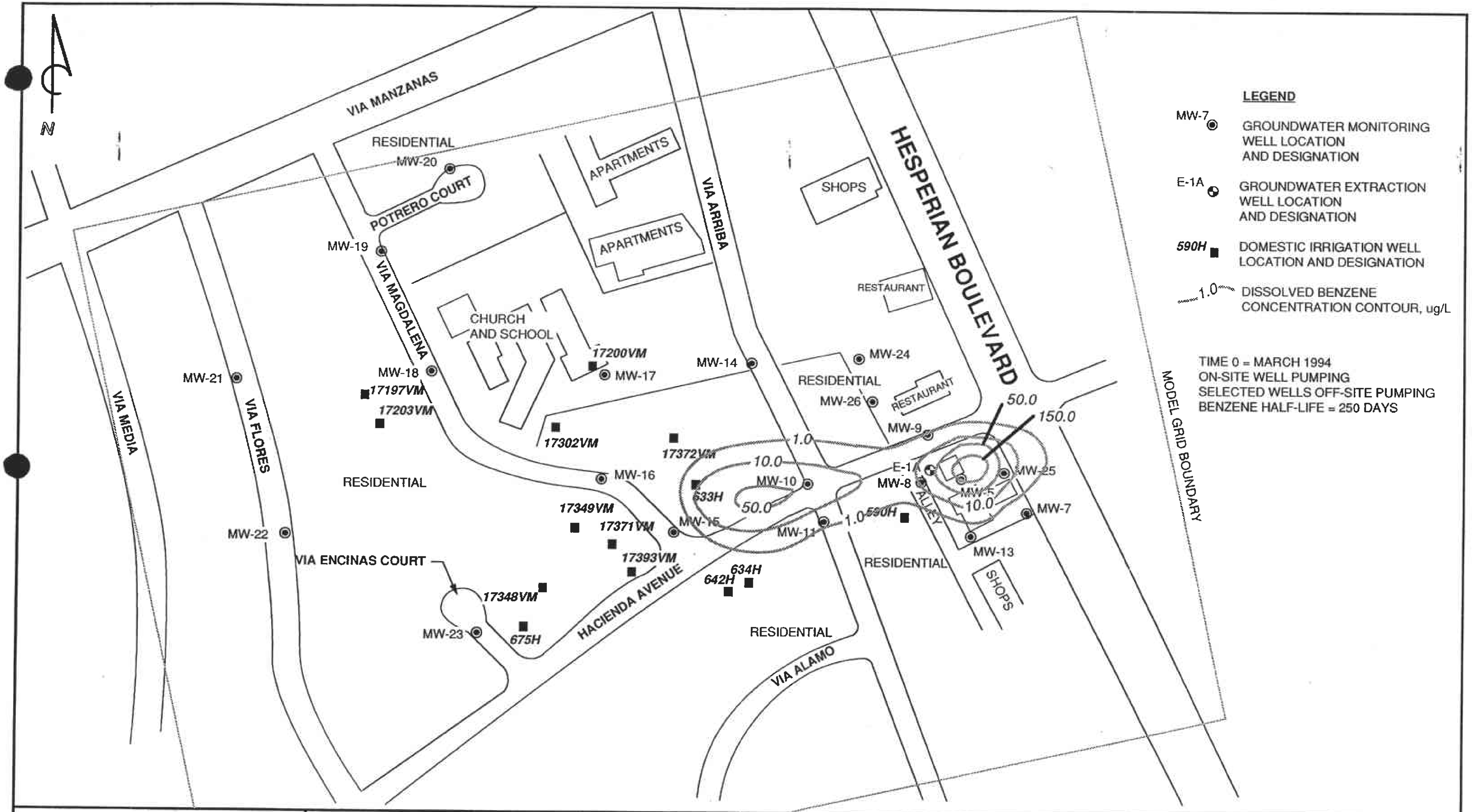
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SCENARIO 2: TIME = 2 YEARS

FIGURE:
A-9
PROJECT:
730-001.01



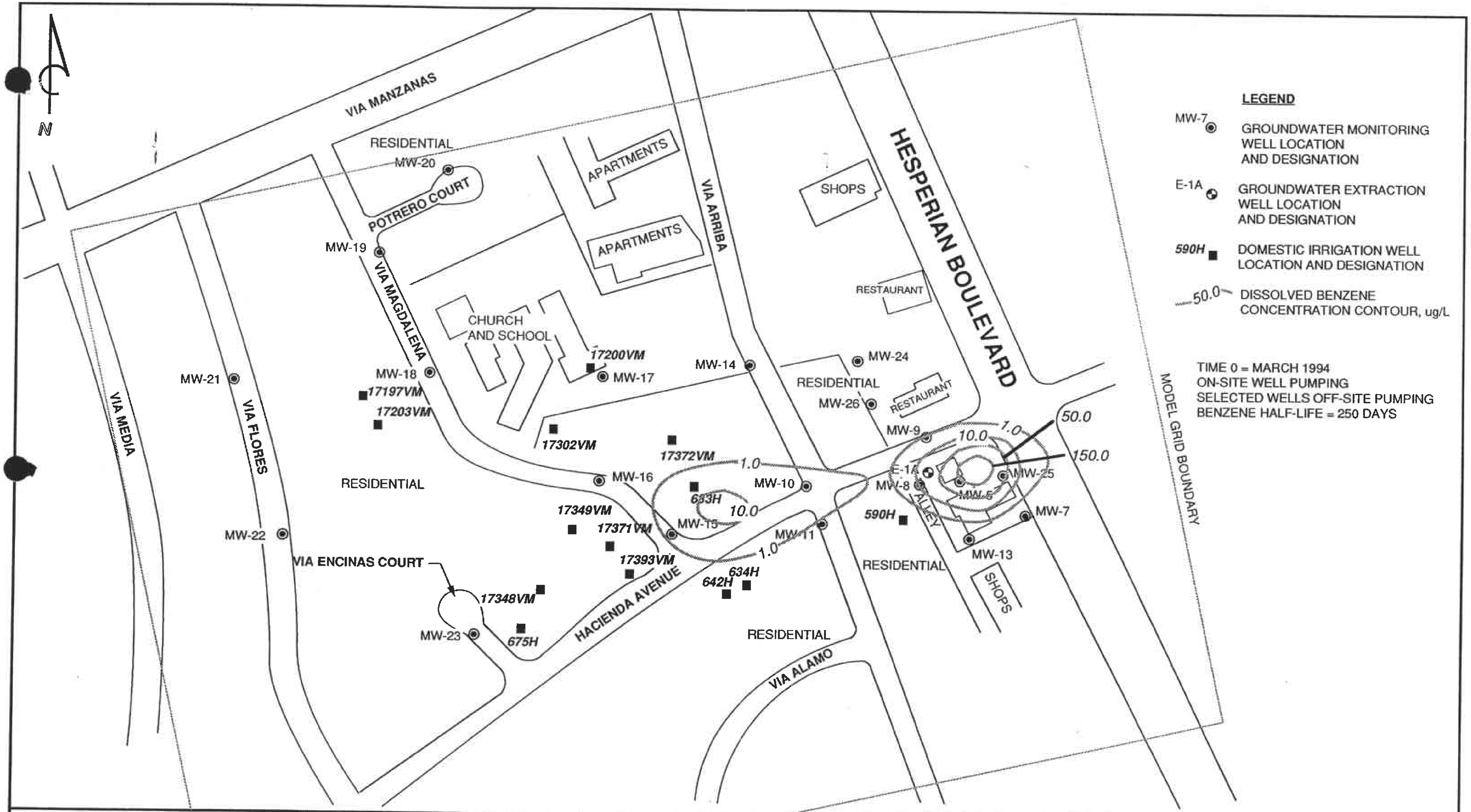
PACIFIC
ENVIRONMENTAL
GROUP, INC.

APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SENSITIVITY STUDY: TIME = 1 YEAR

FIGURE:
A-10
PROJECT:
730-001.01



LEGEND

MW-7 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

E-1A ⊗ GROUNDWATER EXTRACTION WELL LOCATION AND DESIGNATION

590H ■ DOMESTIC IRRIGATION WELL LOCATION AND DESIGNATION

50.0 DISSOLVED BENZENE CONCENTRATION CONTOUR, ug/L

TIME 0 = MARCH 1994
ON-SITE WELL PUMPING
SELECTED WELLS OFF-SITE PUMPING
BENZENE HALF-LIFE = 250 DAYS

PACIFIC
ENVIRONMENTAL
GROUP, INC.

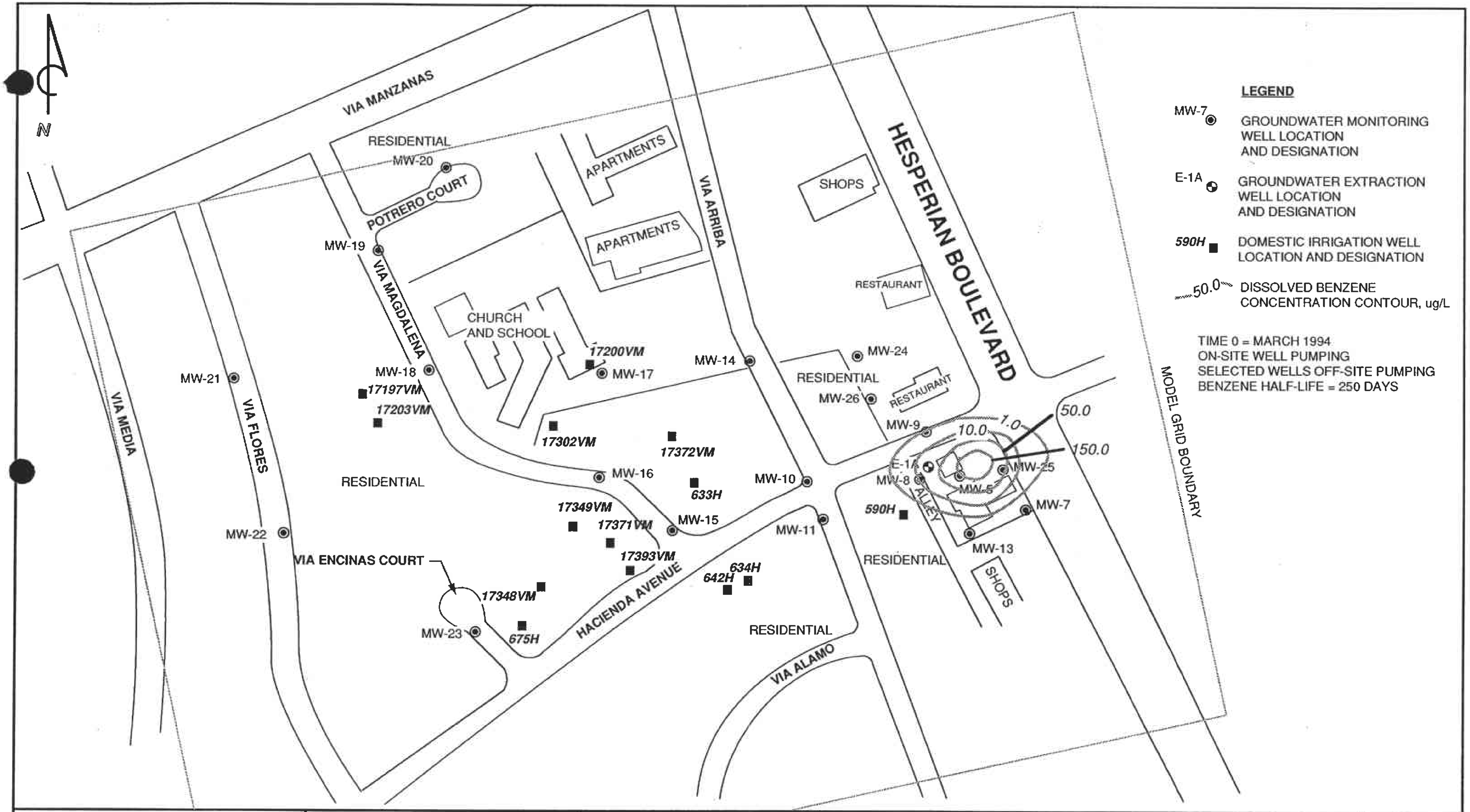
APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SENSITIVITY STUDY: TIME = 2 YEARS

FIGURE:
A-11

PROJECT:
730-001.01



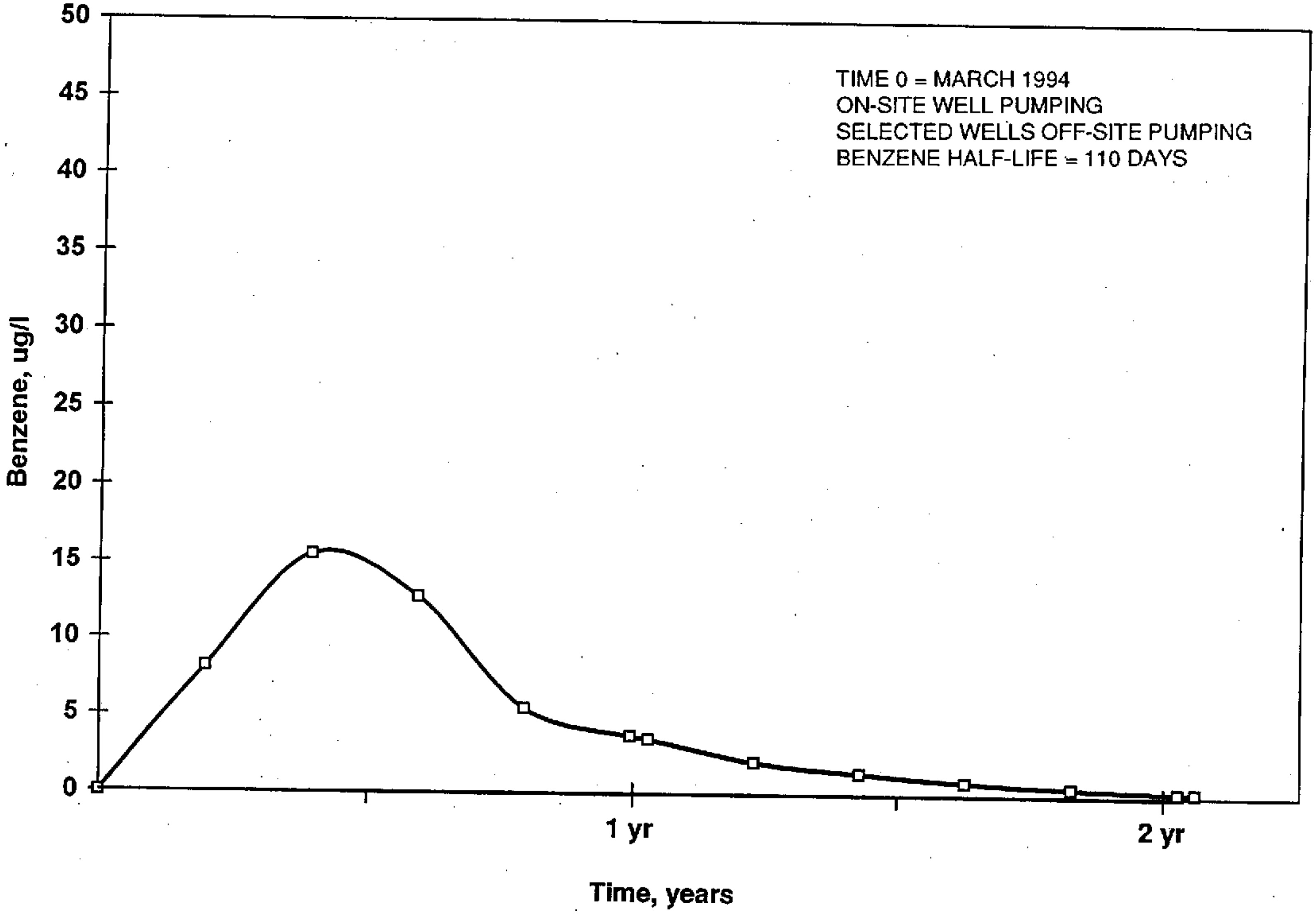
PACIFIC
ENVIRONMENTAL
GROUP, INC.

APPROXIMATE SCALE
0 150 300 FEET

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SENSITIVITY STUDY: TIME = 4 YEARS

FIGURE:
A-12
PROJECT:
730-001.01



TIME 0 = MARCH 1994
ON-SITE WELL PUMPING
SELECTED WELLS OFF-SITE PUMPING
BENZENE HALF-LIFE = 110 DAYS

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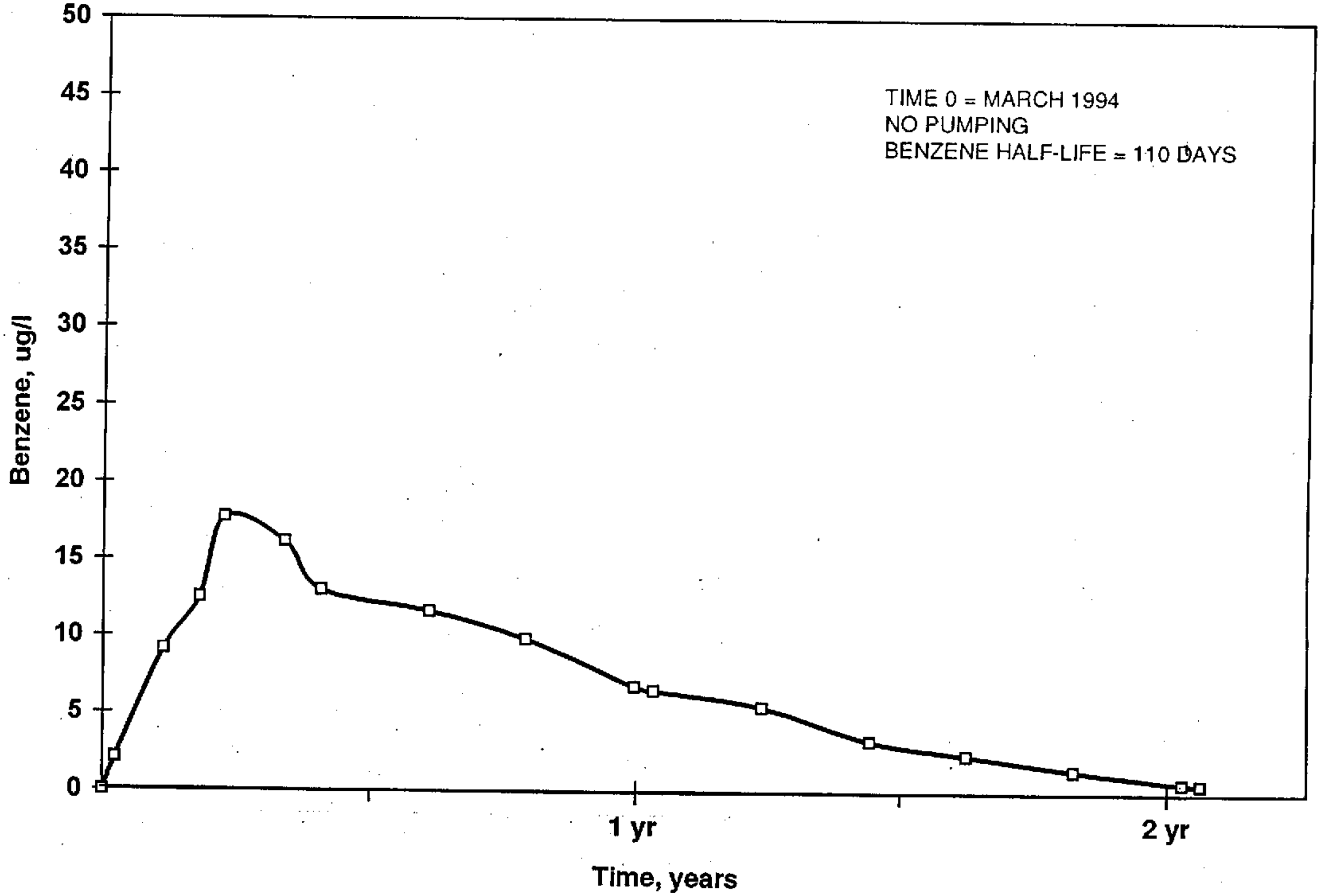
ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SCENARIO 4 ; BENZENE CONCENTRATION AT WELL 633 (ug/l)

FIGURE:
A-13
PROJECT:
330-006.3C



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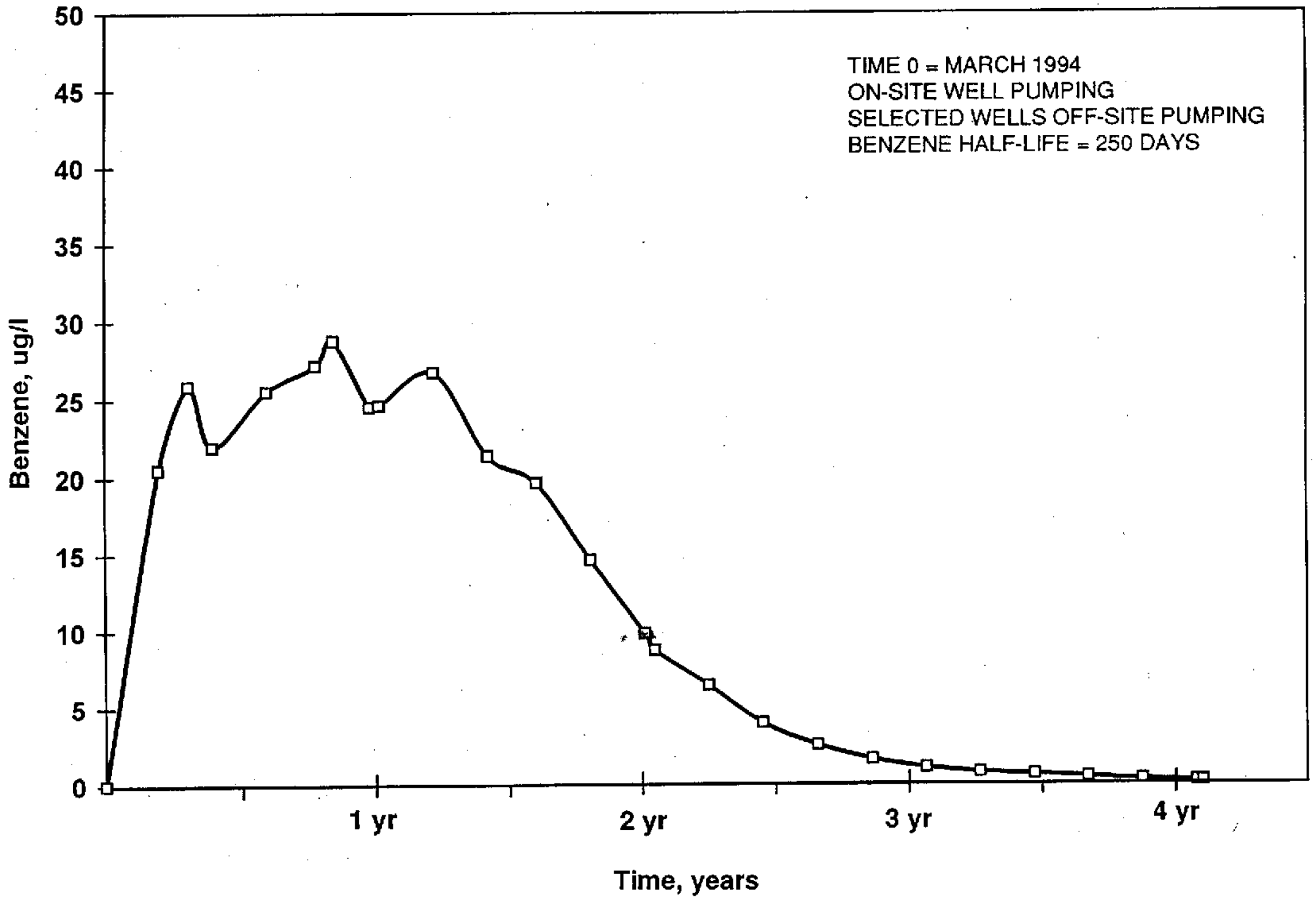
San Lorenzo, California

SCENARIO 2: BENZENE CONCENTRATION AT WELL 633 (ug/l)

FIGURE:
A-14
PROJECT:
330-006.3C



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GROUP, INC.

ARCO SERVICE STATION 0608
17601 Hesperian Boulevard at Hacienda Avenue
San Lorenzo, California

SENSITIVITY STUDY: BENZENE CONCENTRATION AT WELL 633 (µg/l)

FIGURE:
A-15
PROJECT:
330-006.3C

ATTACHMENT 1

COMPUTER OUTPUT

```
1            U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER MODEL
0Scenario 1; No Source control No offsite wells  110 day HfLf
   1 LAYERS       32 ROWS       45 COLUMNS
  1 STRESS PERIOD(S) IN SIMULATION
 MODEL TIME UNIT IS DAYS
0I/O UNITS:
 ELEMENT OF IUNIT:  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
       I/O UNIT: 11 12  0  0  0  0  0  0 19  0  0 22  0  0  0  0  0  0  0  0 24  0  0
0BAS1 -- BASIC MODEL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT  1
 ARRAYS RHS AND BUFF WILL SHARE MEMORY.
 START HEAD WILL NOT BE SAVED -- DRAWDOWN CANNOT BE CALCULATED
   11601 ELEMENTS IN X ARRAY ARE USED BY BAS
   11601 ELEMENTS OF X ARRAY USED OUT OF 9999999
0BCF2 -- BLOCK-CENTERED FLOW PACKAGE, VERSION 2, 7/1/91 INPUT READ FROM UNIT 11
 STEADY-STATE SIMULATION
 HEAD AT CELLS THAT CONVERT TO DRY=  999.99
 WETTING CAPABILITY IS ACTIVE
 WETTING FACTOR=  1.00000     WETTING ITERATION INTERVAL=  5
 FLAG THAT SPECIFIES THE EQUATION TO USE FOR HEAD AT WETTED CELLS=  0
    LAYER  AQUIFER TYPE
    ---------------
      1      1
    4321 ELEMENTS IN X ARRAY ARE USED BY BCF
   15922 ELEMENTS OF X ARRAY USED OUT OF 9999999
0WEL1 -- WELL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM 12
 MAXIMUM OF   11 WELLS
      44 ELEMENTS IN X ARRAY ARE USED FOR WELLS
   15966 ELEMENTS OF X ARRAY USED OUT OF 9999999
0SIP1 -- STRONGLY IMPLICIT PROCEDURE SOLUTION PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 19
 MAXIMUM OF 100 ITERATIONS ALLOWED FOR CLOSURE
  5 ITERATION PARAMETERS
    6165 ELEMENTS IN X ARRAY ARE USED BY SIP
   22131 ELEMENTS OF X ARRAY USED OUT OF 9999999
1Model T; No Source control No offsite wells  110 day HfLf
0


                    BOUNDARY ARRAY FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT: (25I3)
                    ----------------------------------------------------------------------
0AQUIFER HEAD WILL BE SET TO  999.99      AT ALL NO-FLOW NODES (IBOUND=0).
0


                    INITIAL HEAD FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT: (10e12.4)
                    -----------------------------------------------------------------------
0HEAD PRINT FORMAT IS FORMAT NUMBER   0    DRAWDOWN PRINT FORMAT IS FORMAT NUMBER   0
0HEADS WILL BE SAVED ON UNIT 30    DRAWDOWNS WILL BE SAVED ON UNIT  0
0OUTPUT CONTROL IS SPECIFIED EVERY TIME STEP
0                           COLUMN TO ROW ANISOTROPY =   1.000000
0


                          DELR WILL BE READ ON UNIT 11 USING FORMAT: (10E12.4)
                    ----------------------------------------------------

   100.00      100.00      100.00      100.00      50.000      50.000      50.000      50.000      50.000      50.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      50.000      50.000      100.00
0


                          DELC WILL BE READ ON UNIT 11 USING FORMAT: (10E12.4)
                    ----------------------------------------------------

   100.00      50.000      50.000      50.000      50.000      50.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      50.000      50.000
   100.00      100.00
0
```

```
                     HYD. COND. ALONG ROWS FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT: (10e12.4)
                     ----------------------------------------------------------------------------------
0

                           BOTTOM FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT: (10e12.4)
                     ----------------------------------------------------------------------------------
0                              WETDRY PARAMETER =  0.1000000    FOR LAYER  1
0


                              SOLUTION BY THE STRONGLY IMPLICIT PROCEDURE
                              -------------------------------------------
0                          MAXIMUM ITERATIONS ALLOWED FOR CLOSURE =     100
                                  ACCELERATION PARAMETER =     1.0000
                             HEAD CHANGE CRITERION FOR CLOSURE =   0.10000E-02
                             SIP HEAD CHANGE PRINTOUT INTERVAL =       5
0                            CALCULATE ITERATION PARAMETERS FROM MODEL CALCULATED WSEED
1                            STRESS PERIOD NO.   1, LENGTH =  3650.000
                             ----------------------------------------------

                             NUMBER OF TIME STEPS =     1

                              MULTIPLIER FOR DELT =     1.000

                           INITIAL TIME STEP SIZE =   3650.000
0        11 WELLS
                          LAYER   ROW   COL   STRESS RATE   WELL NO.
                          ----------------------------------------
                            1     20    35     0.00000         1
                            1      7     5     0.00000         2
                            1      9     5     0.00000         3
                            1      8    14     0.00000         4
                            1     12    11     0.00000         5
                            1     19    11     0.00000         6
                            1     21    13     0.00000         7
                            1     14    19     0.00000         8
                            1     25    20     0.00000         9
                            1     23    32     0.00000        10
                            1     18    20     0.00000        11
0AVERAGE SEED = 0.00091951
 MINIMUM SEED = 0.00008685
0
   5 ITERATION PARAMETERS CALCULATED FROM AVERAGE SEED:

       0.0000000E+00 0.8258637E+00 0.9696766E+00 0.9947196E+00 0.9990805E+00
0
   21 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD
CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
 -------------------------------------------------------------------------------------
  -1.868    ( 1, 31,  2) -0.8410    ( 1,  5,  3) -0.7060    ( 1, 27,  4) -0.7059    ( 1, 10,  6) 0.6186     ( 1, 24, 30)
  0.8178E-01 ( 1, 31, 26) -0.9138E-01 ( 1, 28, 29) 0.7692E-01 ( 1, 20,  9) 0.2392     ( 1, 22, 11) 0.9793E-01 ( 1,  6, 15)
  0.1268E-01 ( 1, 27, 28) -0.1150E-01 ( 1, 23, 15) -0.2353E-01 ( 1, 22, 13) -0.1720E-01 ( 1, 27, 12) -0.1874E-01 ( 1, 23,  7)
 -0.2419E-02 ( 1, 14, 10) -0.4165E-02 ( 1, 15, 11) 0.3312E-02 ( 1, 28, 11) 0.5629E-02 ( 1, 25,  7) -0.3596E-02 ( 1, 28, 11)
 -0.6990E-03 ( 1, 23,  9)
0
0HEAD/DRAWDOWN PRINTOUT FLAG = 1     TOTAL BUDGET PRINTOUT FLAG = 0     CELL-BY-CELL FLOW TERM
FLAG = 0
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
  HEAD    DRAWDOWN  HEAD  DRAWDOWN
 PRINTOUT  PRINTOUT  SAVE    SAVE
 ----------------------------
    1       0       1      0

 HEADS AND FLOW TERMS SAVED ON UNIT 24 FOR USE BY MT3D TRANSPORT MODEL
1              HEAD IN LAYER  1 AT END OF TIME STEP  1 IN STRESS PERIOD  1
       ---------------------------------------------------------------
```

```
       1      2      3      4      5      6      7      8      9      10
       11     12     13     14     15     16     17     18     19     20
       21     22     23     24     25     26     27     28     29     30
       31     32     33     34     35     36     37     38     39     40
       41     42     43     44     45
..........................................................................
0 1  18.00  18.08  18.32  18.62  18.84  18.99  19.14  19.29  19.44  19.59
     19.71  19.78  19.86  19.93  20.01  20.08  20.16  20.23  20.31  20.38
     20.46  20.53  20.61  20.68  20.76  20.84  20.91  20.99  21.06  21.14
     21.21  21.29  21.36  21.44  21.51  21.59  21.66  21.74  21.81  21.89
     21.97  22.04  22.15  22.26  22.50
0 2  18.00  18.16  18.39  18.68  18.90  19.05  19.21  19.36  19.51  19.66
     19.77  19.85  19.92  19.99  20.07  20.14  20.21  20.29  20.36  20.44
     20.51  20.59  20.66  20.74  20.82  20.89  20.97  21.04  21.12  21.19
     21.26  21.34  21.41  21.49  21.56  21.63  21.70  21.77  21.84  21.91
     21.98  22.05  22.16  22.29  22.50
0 3  18.00  18.19  18.44  18.72  18.94  19.09  19.25  19.40  19.55  19.70
     19.81  19.89  19.96  20.03  20.11  20.18  20.25  20.32  20.40  20.47
     20.55  20.62  20.70  20.77  20.85  20.93  21.01  21.08  21.16  21.23
     21.30  21.37  21.45  21.52  21.59  21.66  21.73  21.80  21.86  21.93
     22.00  22.07  22.17  22.30  22.50
0 4  18.00  18.21  18.47  18.75  18.98  19.13  19.29  19.45  19.60  19.75
     19.86  19.93  20.00  20.07  20.14  20.21  20.28  20.36  20.43  20.50
     20.58  20.65  20.73  20.81  20.89  20.97  21.05  21.12  21.20  21.27
     21.34  21.41  21.48  21.55  21.62  21.69  21.75  21.82  21.89  21.95
     22.02  22.08  22.18  22.31  22.50
0 5  18.00  18.22  18.49  18.78  19.01  19.17  19.33  19.49  19.65  19.81
     19.91  19.98  20.05  20.12  20.18  20.25  20.32  20.38  20.45  20.53
     20.60  20.68  20.76  20.84  20.93  21.01  21.09  21.17  21.24  21.32
     21.39  21.46  21.53  21.59  21.66  21.72  21.78  21.85  21.91  21.97
     22.03  22.10  22.19  22.32  22.50
0 6  18.00  18.23  18.50  18.80  19.04  19.20  19.37  19.54  19.71  19.86
     19.95  20.01  20.08  20.14  20.21  20.28  20.34  20.40  20.46  20.53
     20.62  20.70  20.79  20.88  20.97  21.05  21.14  21.22  21.30  21.37
     21.44  21.51  21.58  21.64  21.70  21.76  21.82  21.88  21.94  21.99
     22.05  22.11  22.20  22.33  22.50
0 7  18.00  18.23  18.51  18.82  19.06  19.22  19.39  19.57  19.72  19.85
     19.95  20.02  20.09  20.16  20.23  20.29  20.36  20.43  20.50  20.57
     20.64  20.71  20.79  20.90  21.00  21.10  21.19  21.27  21.35  21.42
     21.49  21.56  21.62  21.68  21.73  21.78  21.84  21.90  21.96  22.01
     22.05  22.10  22.18  22.30  22.50
0 8  18.00  18.24  18.52  18.82  19.07  19.24  19.41  19.57  19.72  19.85
     19.96  20.03  20.10  20.17  20.24  20.31  20.38  20.45  20.52  20.59
     20.66  20.72  20.81  20.92  21.03  21.13  21.22  21.31  21.39  21.46
     21.52  21.59  21.65  21.70  21.75  21.80  21.85  21.90  21.96  22.01
     22.06  22.10  22.17  22.28  22.50
0 9  18.00  18.25  18.53  18.83  19.07  19.25  19.40  19.57  19.71  19.85
     19.96  20.03  20.10  20.17  20.25  20.32  20.39  20.46  20.54  20.61
     20.68  20.74  20.84  20.95  21.07  21.17  21.26  21.36  21.43  21.48
     21.55  21.61  21.66  21.71  21.76  21.80  21.85  21.90  21.95  22.01
     22.06  22.10  22.17  22.26  22.50
0 10  18.00  18.26  18.54  18.84  19.08  19.25  19.40  19.56  19.71  19.85
     19.96  20.04  20.11  20.18  20.26  20.33  20.40  20.48  20.56  20.63
     20.71  20.78  20.87  20.99  21.11  21.21  21.30  21.38  21.44  21.50
     21.56  21.62  21.68  21.72  21.76  21.80  21.85  21.90  21.95  22.00
     22.05  22.09  22.16  22.25  22.50
0 11  18.00  18.26  18.54  18.84  19.08  19.24  19.40  19.56  19.71  19.86
     19.97  20.04  20.12  20.19  20.27  20.34  20.42  20.49  20.57  20.65
     20.74  20.82  20.91  21.03  21.16  21.24  21.32  21.39  21.45  21.51
     21.56  21.62  21.68  21.72  21.76  21.80  21.85  21.90  21.95  21.99
     22.04  22.09  22.16  22.24  22.50
0 12  18.00  18.27  18.55  18.85  19.08  19.24  19.40  19.56  19.71  19.86
     19.97  20.04  20.12  20.20  20.27  20.35  20.43  20.51  20.59  20.67
     20.76  20.85  20.95  21.06  21.17  21.27  21.34  21.41  21.47  21.51
     21.56  21.62  21.67  21.71  21.76  21.80  21.85  21.90  21.94  21.99
     22.04  22.08  22.15  22.24  22.50
0 13  18.00  18.27  18.55  18.85  19.09  19.24  19.40  19.56  19.71  19.86
     19.97  20.05  20.13  20.20  20.28  20.36  20.44  20.52  20.61  20.69
     20.78  20.88  20.98  21.09  21.21  21.30  21.35  21.41  21.46  21.51
     21.56  21.61  21.66  21.71  21.75  21.80  21.85  21.89  21.94  21.99
```

	22.03	22.08	22.15	22.24	22.50					
0 14	18.00	18.27	18.55	18.85	19.09	19.24	19.40	19.55	19.71	19.86
	19.97	20.05	20.13	20.21	20.29	20.37	20.45	20.53	20.62	20.71
	20.80	20.90	21.00	21.11	21.22	21.31	21.36	21.41	21.46	21.51
	21.56	21.61	21.66	21.71	21.75	21.80	21.84	21.89	21.94	21.99
	22.03	22.08	22.14	22.23	22.50					
0 15	18.00	18.27	18.56	18.85	19.09	19.24	19.40	19.55	19.71	19.86
	19.98	20.05	20.13	20.21	20.29	20.37	20.45	20.54	20.63	20.72
	20.81	20.91	21.01	21.12	21.23	21.32	21.36	21.41	21.46	21.51
	21.56	21.61	21.66	21.70	21.75	21.80	21.84	21.89	21.94	21.98
	22.03	22.07	22.14	22.23	22.50					
0 16	18.00	18.27	18.56	18.85	19.09	19.24	19.40	19.55	19.71	19.86
	19.98	20.06	20.14	20.22	20.30	20.38	20.46	20.54	20.63	20.72
	20.82	20.92	21.02	21.13	21.24	21.32	21.37	21.41	21.46	21.51
	21.56	21.61	21.65	21.70	21.75	21.79	21.84	21.89	21.93	21.98
	22.03	22.07	22.14	22.23	22.50					
0 17	18.00	18.27	18.56	18.85	19.09	19.24	19.40	19.56	19.71	19.86
	19.98	20.06	20.14	20.22	20.30	20.38	20.46	20.55	20.64	20.73
	20.82	20.92	21.02	21.13	21.24	21.32	21.37	21.41	21.46	21.51
	21.56	21.60	21.65	21.70	21.75	21.79	21.84	21.89	21.93	21.98
	22.03	22.07	22.14	22.23	22.50					
0 18	18.00	18.27	18.56	18.85	19.09	19.24	19.40	19.56	19.71	19.86
	19.98	20.06	20.14	20.22	20.30	20.38	20.46	20.55	20.64	20.73
	20.82	20.92	21.02	21.13	21.24	21.32	21.37	21.41	21.46	21.51
	21.56	21.60	21.65	21.70	21.75	21.79	21.84	21.89	21.93	21.98
	22.02	22.07	22.14	22.23	22.50					
0 19	18.00	18.27	18.55	18.85	19.08	19.24	19.40	19.56	19.71	19.86
	19.98	20.06	20.14	20.22	20.30	20.38	20.46	20.54	20.63	20.72
	20.82	20.91	21.01	21.12	21.23	21.32	21.37	21.41	21.46	21.51
	21.56	21.60	21.65	21.70	21.75	21.79	21.84	21.89	21.93	21.98
	22.02	22.07	22.14	22.23	22.50					
0 20	18.00	18.27	18.55	18.85	19.08	19.24	19.40	19.56	19.71	19.86
	19.98	20.06	20.14	20.21	20.29	20.37	20.46	20.54	20.63	20.72
	20.81	20.91	21.00	21.11	21.22	21.31	21.36	21.41	21.46	21.51
	21.56	21.60	21.65	21.70	21.74	21.79	21.84	21.88	21.93	21.98
	22.02	22.07	22.14	22.23	22.50					
0 21	18.00	18.27	18.55	18.84	19.08	19.24	19.40	19.56	19.71	19.86
	19.98	20.06	20.13	20.21	20.29	20.37	20.45	20.53	20.62	20.71
	20.80	20.89	20.99	21.09	21.19	21.29	21.36	21.41	21.46	21.51
	21.56	21.60	21.65	21.70	21.74	21.79	21.84	21.88	21.93	21.98
	22.02	22.07	22.14	22.23	22.50					
0 22	18.00	18.26	18.54	18.84	19.08	19.24	19.40	19.56	19.72	19.87
	19.98	20.05	20.13	20.21	20.28	20.36	20.44	20.52	20.61	20.70
	20.79	20.88	20.97	21.06	21.16	21.26	21.35	21.41	21.46	21.51
	21.56	21.61	21.65	21.70	21.74	21.79	21.84	21.88	21.93	21.98
	22.02	22.07	22.14	22.23	22.50					
0 23	18.00	18.26	18.53	18.83	19.07	19.23	19.40	19.56	19.72	19.87
	19.98	20.05	20.13	20.20	20.28	20.35	20.43	20.51	20.60	20.68
	20.77	20.86	20.95	21.04	21.13	21.23	21.33	21.41	21.46	21.51
	21.56	21.61	21.65	21.70	21.74	21.79	21.84	21.88	21.93	21.98
	22.02	22.07	22.14	22.23	22.50					
0 24	18.00	18.26	18.52	18.82	19.07	19.23	19.40	19.57	19.72	19.87
	19.97	20.05	20.12	20.19	20.27	20.35	20.42	20.50	20.58	20.67
	20.75	20.84	20.92	21.01	21.11	21.20	21.29	21.38	21.44	21.51
	21.57	21.61	21.66	21.70	21.75	21.79	21.84	21.88	21.93	21.98
	22.03	22.07	22.14	22.24	22.50					
0 25	18.00	18.25	18.51	18.81	19.06	19.23	19.40	19.58	19.73	19.87
	19.97	20.04	20.11	20.19	20.26	20.34	20.41	20.49	20.57	20.65
	20.73	20.81	20.90	20.98	21.07	21.17	21.26	21.35	21.43	21.49
	21.55	21.61	21.66	21.70	21.74	21.79	21.84	21.88	21.93	21.98
	22.03	22.07	22.15	22.24	22.50					
0 26	18.00	18.24	18.50	18.80	19.04	19.22	19.41	19.59	19.73	19.87
	19.97	20.04	20.11	20.18	20.25	20.32	20.40	20.47	20.55	20.63
	20.71	20.79	20.87	20.95	21.03	21.13	21.23	21.32	21.41	21.49
	21.54	21.60	21.65	21.69	21.74	21.79	21.83	21.88	21.93	21.98
	22.03	22.08	22.15	22.26	22.50					
0 27	18.00	18.23	18.49	18.79	19.04	19.22	19.40	19.59	19.74	19.87
	19.96	20.03	20.10	20.17	20.24	20.31	20.38	20.46	20.53	20.61
	20.69	20.77	20.84	20.91	21.00	21.10	21.20	21.29	21.37	21.45
	21.53	21.59	21.64	21.68	21.73	21.78	21.83	21.88	21.93	21.98
	22.03	22.08	22.16	22.28	22.50					

```
0 28  18.00   18.22   18.48   18.78   19.03   19.21   19.39   19.59   19.75   19.86
      19.96   20.03   20.09   20.16   20.23   20.30   20.37   20.44   20.51   20.59
      20.67   20.75   20.83   20.89   20.97   21.07   21.17   21.26   21.34   21.42
      21.49   21.56   21.62   21.67   21.72   21.77   21.82   21.87   21.93   21.98
      22.03   22.08   22.17   22.29   22.50
0 29  18.00   18.21   18.46   18.77   19.02   19.19   19.37   19.57   19.74   19.86
      19.95   20.01   20.08   20.14   20.21   20.27   20.34   20.41   20.48   20.54
      20.62   20.72   20.80   20.88   20.96   21.05   21.13   21.21   21.29   21.37
      21.44   21.51   21.58   21.64   21.69   21.75   21.81   21.86   21.92   21.98
      22.03   22.09   22.18   22.30   22.50
0 30  18.00   18.19   18.45   18.75   18.99   19.16   19.33   19.52   19.70   19.85
      19.93   19.99   20.05   20.11   20.17   20.22   20.29   20.38   20.46   20.53
      20.61   20.69   20.77   20.85   20.93   21.01   21.09   21.17   21.25   21.32
      21.40   21.47   21.53   21.60   21.66   21.73   21.79   21.85   21.91   21.98
      22.04   22.10   22.19   22.31   22.50
0 31  18.00   18.17   18.41   18.70   18.94   19.10   19.26   19.43   19.59   19.74
      19.85   19.92   19.99   20.06   20.13   20.20   20.27   20.34   20.42   20.50
      20.57   20.65   20.73   20.80   20.88   20.96   21.04   21.12   21.19   21.27
      21.34   21.41   21.49   21.56   21.63   21.70   21.77   21.84   21.90   21.97
      22.04   22.10   22.20   22.33   22.50
0 32  18.00   18.08   18.31   18.62   18.85   19.01   19.16   19.32   19.47   19.62
      19.74   19.82   19.89   19.97   20.05   20.13   20.20   20.28   20.36   20.43
      20.51   20.59   20.67   20.74   20.82   20.90   20.98   21.05   21.13   21.21
      21.28   21.36   21.44   21.52   21.59   21.67   21.75   21.82   21.90   21.98
      22.06   22.13   22.25   22.36   22.50
0HEAD WILL BE SAVED ON UNIT 30 AT END OF TIME STEP  1, STRESS PERIOD  1
0


            VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  1
            ------------------------------------------------------------------------------
0       CUMULATIVE VOLUMES      L**3                  RATES FOR THIS TIME STEP      L**3/T
        ------------------                            ------------------------

          IN:                                      IN:
          ---                                      ---
            STORAGE =  0.00000                          STORAGE =  0.00000
       CONSTANT HEAD =  0.21334E+07                 CONSTANT HEAD =   584.49
              WELLS =  0.00000                            WELLS =  0.00000
0           TOTAL IN =  0.21334E+07                    TOTAL IN =   584.49
0         OUT:                                     OUT:
          ----                                     ----
            STORAGE =  0.00000                          STORAGE =  0.00000
       CONSTANT HEAD =  0.21366E+07                 CONSTANT HEAD =   585.37
              WELLS =  0.00000                            WELLS =  0.00000
0          TOTAL OUT =  0.21366E+07                   TOTAL OUT =   585.37
0           IN - OUT =  -3214.5                        IN - OUT =  -0.88074
0    PERCENT DISCREPANCY =          -0.15     PERCENT DISCREPANCY =          -0.15


0


     TIME SUMMARY AT END OF TIME STEP  1 IN STRESS PERIOD  1
                  SECONDS      MINUTES      HOURS       DAYS        YEARS
                  -----------------------------------------------------------
    TIME STEP LENGTH   0.315360E+09  0.525600E+07  87600.0    3650.00     9.99316
  STRESS PERIOD TIME   0.315360E+09  0.525600E+07  87600.0    3650.00     9.99316
TOTAL SIMULATION TIME  0.315360E+09  0.525600E+07  87600.0    3650.00     9.99316
1
```

```
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+                                                                       +
+                              M T 3 D                                  +
+               A Modular Three-Dimensional Transport Model             +
+     For Simulation of Advection, Dispersion and Chemical Reactions    +
+                of Contaminants in Groundwater Systems                 +
+                              (V. 1.80)                                +
+                                                                       +
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ----
|M T| Scenario 1; No Source Control No Offsite Wells
|3 D| Half life 110 days for benzene
 ----

THE TRANSPORT MODEL CONSISTS OF    1 LAYER(S)  32 ROW(S)  45 COLUMN(S)
NUMBER OF STRESS PERIOD(S) IN SIMULATION =   1
UNIT FOR TIME IS D  ; UNIT FOR LENGTH IS FT  ; UNIT FOR MASS IS LB
MAJOR TRANSPORT COMPONENTS TO BE SIMULATED:
 1  ADVECTION
 2  DISPERSION
 3  SINK AND SOURCE MIXING
 4  CHEMICAL REACTIONS (DECAY AND/OR SORPTION)

BTN1 -- BASIC TRANSPORT PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  1
  15994 ELEMENTS OF THE  X ARRAY USED BY THE BTN PACKAGE
   1441 ELEMENTS OF THE IX ARRAY USED BY THE BTN PACKAGE

ADV1 -- ADVECTION PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  2
ADVECTION IS SOLVED WITH THE HYBRID [MOC]/[MMOC] SCHEME
COURANT NUMBER ALLOWED IN SOLVING THE ADVECTION TERM =  1.00
MAXIMUM NUMBER OF MOVING PARTICLES ALLOWED =   80000
 320000 ELEMENTS OF THE  X ARRAY USED BY THE ADV PACKAGE
   1440 ELEMENTS OF THE IX ARRAY USED BY THE ADV PACKAGE

DSP1 -- DISPERSION PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  3
   7203 ELEMENTS OF THE  X ARRAY USED BY THE DSP PACKAGE
      0 ELEMENTS OF THE IX ARRAY USED BY THE DSP PACKAGE

SSM1 -- SINK & SOURCE MIXING PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  4
MAJOR STRESS COMPONENTS PRESENT IN THE FLOW MODEL:
 1  WELL
MAXIMUM NUMBER OF POINT SINKS/SOURCES =     165
    990 ELEMENTS OF THE  X ARRAY USED BY THE SSM PACKAGE
      0 ELEMENTS OF THE IX ARRAY BY THE SSM PACKAGE

RCT1 -- CHEMICAL REACTIONS PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  9
NO SORPTION ISOTHERM IS SIMULATED
FIRST-ORDER RATE REACTION [DECAY OR BIODEGRADATION] IS SIMULATED
      2 ELEMENTS OF THE  X ARRAY USED BY THE RCT PACKAGE
      0 ELEMENTS OF THE IX ARRAY USED BY THE RCT PACKAGE

..................................................
 344190 ELEMENTS OF THE  X ARRAY USED OUT OF  9999999
   2882 ELEMENTS OF THE IX ARRAY USED OUT OF  9999999
..................................................

LAYER NUMBER  AQUIFER TYPE
------------  ------------
     1             1

                 WIDTH ALONG ROWS (DELR)  READ ON UNIT  1 USING FORMAT: "(10E12.4)          "
                 ---------------------------------------------------------------

                 WIDTH ALONG COLS (DELC)  READ ON UNIT  1 USING FORMAT: "(10E12.4)          "
                 ---------------------------------------------------------------

                 TOP ELEV. OF 1ST LAYER   READ ON UNIT  1 USING FORMAT: "(10E12.4)          "
                 ---------------------------------------------------------------

                        CELL THICKNESS (DZ)     =   100.0000    FOR LAYER  1
                        EFFECTIVE POROSITY      =  0.2500000    FOR LAYER  1
```

```
                  CONCN. BOUNDARY ARRAY    FOR LAYER  1 READ ON UNIT  1 USING FORMAT: "(25I3)          "
                  ------------------------------------------------------------------------------------

          1    2    3    4    5    6    7    8    9   10
         11   12   13   14   15   16   17   18   19   20
         21   22   23   24   25   26   27   28   29   30
         31   32   33   34   35   36   37   38   39   40
         41   42   43   44   45
 ...............................................................................................
   1      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   2      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   3      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   4      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   5      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   6      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   7      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   8      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   9      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  10      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  11      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  12      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  13      1    1    1    1    1    1    1    1    1    1
```

```
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
14    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
15    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
16    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
17    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
18    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
19    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
20    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1   -1   -1    1    1
      1    1    1    1    1
21    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1   -1   -1    1    1
      1    1    1    1    1
22    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
23    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
24    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
25    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
26    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
27    1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
```

```
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  28     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  29     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  30     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  31     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  32     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1

         INITIAL CONCENTRATION    FOR LAYER  1 READ ON UNIT  1 USING FORMAT: "(10E12.4)        "
         ----------------------------------------------------------------

 VALUE INDICATING INACTIVE CONCENTRATION CELLS =  999.9900

 OUTPUT CONTROL OPTIONS
 ----------------------

 PRINT CELL CONCENTRATION USING FORMAT CODE:   1
 DO NOT PRINT PARTICLE NUMBER IN EACH CELL
 DO NOT PRINT RETARDATION FACTOR
 DO NOT PRINT DISPERSION COEFFICIENT
 SAVE CONCENTRATION IN UNFORMATTED FILE [MT3D.UCN] ON UNIT 18

 NUMBER OF TIMES AT WHICH SIMULATION RESULTS ARE SAVED =   4
 TOTAL ELAPSED TIMES AT WHICH SIMULATION RESULTS ARE SAVED:
   365.00     730.00     1460.0     2190.0

 NUMBER OF OBSERVATION POINTS =   6
 CONCENTRATION AT OBSERVATION POINTS SAVED IN FILE [MT3D.OBS] ON UNIT 17
 LOCATION OF OBSERVATION POINTS
 ..............................
 NUMBER  LAYER  ROW   COLUMN
   1      1     14    19
   2      1     19    11
   3      1     21    13
   4      1     25    30
   5      1     12    11
   6      1     18    20

 A ONE-LINE SUMMRY OF MASS BALANCE FOR EACH STEP WILL NOT BE SAVED

 MAXIMUM LENGTH ALONG THE X (J) AXIS =   1700.000
 MAXIMUM LENGTH ALONG THE Y (I) AXIS =   1200.000
 MAXIMUM LENGTH ALONG THE Z (K) AXIS =   100.0000

 ADVECTION SOLUTION OPTIONS
 --------------------------

 METHOD FOR PARTICLE TRACKING IS [MIXED ORDER]
```

```
CONCENTRATION WEIGHTING FACTOR =    0.500
THE CONCENTRATION GRADIENT CONSIDERED NEGLIGIBLE [DCEPS] = 0.1000000E-04
INITIAL PARTICLES ARE PLACED RANDOMLY WITHIN CELL BLOCK
PARTICLE NUMBER PER CELL IF DCCELL =< DCEPS =    0
PARTICLE NUMBER PER CELL IF DCCELL  > DCEPS =  16
MINIMUM PARTICLE NUMBER ALLOWD PER CELL     =   2
MAXIMUM PARTICLE NUMBER ALLOWD PER CELL     =  32
MULTIPLIER OF PARTICLE NUMBER AT SOURCE     = 1.00
SCHEME FOR CONCENTRATION INTERPOLATION IS [LINEAR]
PARTICLES FOR APPROXIMATING A SINK CELL IN THE [MMOC] SCHEME
ARE PLACED RANDOMLY WITHIN CELL BLOCK
NUMBER OF PARTICLES USED TO APPROXIMATE A SINK CELL IN THE [MMOC] SCHEME =  16
CRITICAL CONCENTRATION GRADIENT USED IN THE "HMOC" SCHEME [DCHMOC] = 0.5000E-02
THE "MOC"  SOLUTION IS USED WHEN DCCELL  > DCHMOC
THE "MMOC" SOLUTION IS USED WHEN DCCELL =< DCHMOC


DISPERSION PARAMETERS
---------------------

                    LONG. DISPERSIVITY (AL) =   10.00000    FOR LAYER  1

           H. TRANS./LONG. DISP.    READ ON UNIT  3 USING FORMAT: "(10E12.4)        "
           ---------------------------------------------------------

           V. TRANS./LONG. DISP.    READ ON UNIT  3 USING FORMAT: "(10E12.4)        "
           ---------------------------------------------------------

           DIFFUSION COEFFICIENT    READ ON UNIT  3 USING FORMAT: "(10E12.4)        "
           ---------------------------------------------------------


SORPTION AND 1ST ORDER RATE REACTION PARAMETERS
-----------------------------------------------


           DISSOLVED RATE CONSTANT  READ ON UNIT  9 USING FORMAT: "(10E12.4)        "
           ---------------------------------------------------------

           SORBED RATE CONSTANT     READ ON UNIT  9 USING FORMAT: "(10E12.4)        "
           ---------------------------------------------------------

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE REACTION TERM
= 79.37    AT K=   1, I=   1, J=   1


                 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         STRESS PERIOD NO.  001
                 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++


LENGTH OF CURRENT STRESS PERIOD =   2190.000
NUMBER OF TIME STEPS FOR CURRENT STRESS PERIOD =    1
TIME STEP MULTIPLIER =   1.000000
USER-SPECIFIED TRANSPORT STEPSIZE =  0.0000000    D
MAXIMUM NUMBER OF TRANSPORT STEPS ALLOWED  IN ONE TIME STEP =      1000

NO. OF POINT SINKS/SOURCES OF SPECIFIED CONCONCENTRATIONS =    0 IN STRESS PERIOD  1


                   ================================================
                          TIME STEP NO.  001
                   ================================================

FROM TIME =  0.00000     TO    2190.0


        "HEAD        " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
        ---------------------------------------------------------------

        "QXX         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
```

```
          ------------------------------------------------------------------
          "QYY         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------------------

MAXIMUM STEPSIZE DURING WHICH ANY PARTICLE CANNOT MOVE MORE THAN ONE CELL
=  70.65   (WHEN MIN. R.F.=1)  AT K=   1, I=  13, J=  27
          "CNH         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------------------

          "WEL         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------------------


TOTAL NUMBER OF POINT SOURCES/SINKS PRESENT IN THE FLOW MODEL =   150

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE SINK & SOURCE TERM
=  363.9   (WHEN MIN. R.F.=1)  AT K=   1, I=  19, J=  45

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE DISPERSION TERM
=  79.18   (WHEN MIN. R.F.=1)  AT K=   1, I=  13, J=  27


                         ------------------------------
                            TRANSPORT STEP NO.    6
                         ------------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   365.0000     D
.........................................................

          CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP    6, TIME STEP  1, STRESS PERIOD  1
          ------------------------------------------------------------------

        1       2       3       4       5       6       7       8       9      10      11
       12      13      14      15      16      17      18      19      20      21      22
       23      24      25      26      27      28      29      30      31      32      33
       34      35      36      37      38      39      40      41      42      43      44
       45
 ....................................................................................
 1  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000
 2  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000
 3  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000
 4  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000
 5  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   1.842E-30 7.269E-29 9.480E-28 4.615E-27 4.714E-27 1.962E-27 -4.813E-27 -7.479E-27
   -6.925E-27 2.264E-27 1.820E-26 -8.397E-27 -1.828E-26 7.644E-27 4.110E-27 -1.397E-27 9.906E-29 8.640E-31 0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000
 6  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   9.921E-34 3.248E-31
    1.585E-29 3.231E-28 3.728E-27 2.813E-26 1.868E-25 1.610E-24 1.292E-23 4.403E-23 2.601E-23 -6.514E-24 -2.422E-23
   -2.647E-23 -2.807E-23 3.698E-23 1.888E-23 -3.683E-23 -4.309E-24 5.892E-24 -8.441E-25 3.251E-26 2.800E-28 0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000
 7  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.971E-31 1.171E-28
```

```
  7.096E-27 1.758E-25 2.411E-24 2.069E-23 1.240E-22 6.405E-22 3.515E-21 1.491E-20 2.526E-20 1.487E-20 -2.400E-20
 -3.074E-20 -3.962E-20 3.710E-21 2.085E-20 -6.757E-21 -4.731E-21 1.090E-21 -6.354E-23 5.169E-25 6.767E-28 -5.272E-30
  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
  0.000
8  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    -1.249E-33 3.760E-29 1.657E-26
  9.516E-25 2.412E-23 3.445E-22 3.085E-21 1.864E-20 8.325E-20 3.239E-19 1.150E-18 2.988E-18 4.319E-18 -2.347E-19
 -6.049E-18 -7.820E-18 -3.422E-18 2.265E-18 2.501E-19 -3.558E-19 2.335E-20 4.117E-22 -2.236E-23 -2.809E-25 -2.798E-28
  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
  0.000
9  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    -1.276E-31 3.261E-27 1.241E-24
  6.601E-23 1.648E-21 2.375E-20 2.176E-19 1.346E-18 5.929E-18 2.034E-17 6.037E-17 1.626E-16 3.307E-16 2.732E-16
 -2.741E-16 -4.840E-16 -4.190E-16 1.028E-17 3.407E-17 -3.723E-18 -5.440E-19 1.830E-20 4.094E-22 8.813E-24 4.303E-26
 -5.898E-27 0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
  0.000
10  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    -8.567E-31 1.742E-25 6.041E-23
  2.965E-21 7.130E-20 1.012E-18 9.265E-18 5.782E-17 2.563E-16 8.484E-16 2.232E-15 5.231E-15 1.083E-14 1.447E-14
  4.014E-16 -8.463E-15 -1.194E-14 -4.309E-15 1.625E-16 1.161E-16 -6.714E-18 -5.242E-19 1.418E-21 6.239E-23 4.568E-24
 -1.894E-25 0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
  0.000
11  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     4.878E-28 6.281E-24 2.047E-21
  9.348E-20 2.150E-18 2.965E-17 2.670E-16 1.651E-15 7.255E-15 2.341E-14 5.691E-14 1.131E-13 1.993E-13 2.776E-13
  1.913E-13 2.832E-14 -4.301E-14 -7.822E-14 -2.701E-14 7.633E-16 2.962E-16 2.668E-18 7.275E-20 3.409E-19 2.280E-19
  2.675E-20 8.708E-22 8.920E-24 0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
  0.000
12  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.853E-26 1.654E-22 5.098E-20
  2.190E-18 4.815E-17 6.421E-16 5.641E-15 3.419E-14 1.468E-13 4.545E-13 1.025E-12 1.777E-12 2.610E-12 3.399E-12
  3.321E-12 2.066E-12 1.256E-12 3.035E-13 -2.982E-13 -5.527E-14 -9.285E-16 8.618E-16 2.535E-16 9.730E-17 3.937E-17
  8.518E-18 1.085E-18 1.164E-19 9.859E-21 5.710E-22 1.724E-23 0.000     0.000     0.000     0.000     0.000
  0.000
13  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.671E-24 3.407E-21 9.778E-19
  3.976E-17 8.384E-16 1.080E-14 9.249E-14 5.502E-13 2.304E-12 6.779E-12 1.402E-11 2.152E-11 2.732E-11 3.227E-11
  3.332E-11 2.812E-11 2.042E-11 1.034E-11 1.805E-12 2.962E-13 1.002E-13 5.672E-14 2.284E-14 8.611E-15 2.989E-15
  7.959E-16 1.612E-16 2.481E-17 2.695E-18 1.903E-19 8.294E-21 2.276E-22 5.928E-24 0.000     0.000     0.000
  0.000
14  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     5.124E-23 5.868E-20 1.507E-17
  5.787E-16 1.169E-14 1.453E-13 1.215E-12 7.156E-12 2.966E-11 8.355E-11 1.567E-10 2.121E-10 2.397E-10 2.597E-10
  2.598E-10 2.235E-10 1.747E-10 1.151E-10 4.382E-11 1.447E-11 4.973E-12 2.014E-12 8.507E-13 3.631E-13 1.334E-13
  4.062E-14 1.053E-14 2.258E-15 4.967E-16 1.635E-16 5.370E-17 1.211E-17 1.709E-18 1.291E-19 3.856E-21 3.704E-23
  0.000
15  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.244E-21 9.045E-19 1.949E-16
  6.949E-15 1.328E-13 1.577E-12 1.282E-11 7.514E-11 3.126E-10 8.544E-10 1.449E-09 1.738E-09 1.839E-09 1.877E-09
  1.778E-09 1.461E-09 1.214E-09 8.698E-10 4.750E-10 2.338E-10 1.024E-10 4.448E-11 2.206E-11 8.822E-12 3.704E-12
  1.251E-12 4.040E-13 1.540E-13 7.340E-14 3.436E-14 1.281E-14 3.070E-15 4.303E-16 3.103E-17 7.560E-19 5.780E-21
  0.000
16  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     2.610E-20 1.344E-17 2.253E-15
  7.136E-14 1.245E-12 1.371E-11 1.049E-10 5.924E-10 2.420E-09 6.371E-09 9.656E-09 1.084E-08 1.197E-08 1.157E-08
  1.081E-08 9.426E-09 8.259E-09 5.063E-09 2.978E-09 2.338E-09 1.212E-09 7.350E-10 3.091E-10 1.677E-10 5.928E-11
  2.874E-11 1.349E-11 8.998E-12 5.824E-12 3.127E-12 1.289E-12 3.575E-13 5.450E-14 3.953E-15 7.849E-17 5.108E-19
  0.000
17  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     5.196E-19 2.095E-16 2.585E-14
  6.805E-13 1.009E-11 9.613E-11 6.101E-10 2.648E-09 1.036E-08 2.382E-08 3.799E-08 5.145E-08 5.488E-08 6.145E-08
  6.640E-08 6.729E-08 5.971E-08 3.998E-08 3.295E-08 1.760E-08 1.314E-08 6.244E-09 4.032E-09 1.482E-09 9.552E-10
  5.188E-10 4.817E-10 4.075E-10 3.252E-10 1.942E-10 7.088E-11 2.397E-11 4.222E-12 3.316E-13 5.966E-15 3.170E-17
  0.000
18  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     8.967E-18 3.426E-15 3.271E-13
  6.950E-12 8.464E-11 6.935E-10 4.262E-09 1.942E-08 6.494E-08 1.388E-07 1.685E-07 2.173E-07 2.472E-07 3.184E-07
  3.486E-07 3.513E-07 2.857E-07 1.951E-07 1.601E-07 8.790E-08 8.598E-08 2.037E-08 2.678E-08 1.023E-08 1.205E-08
  1.227E-08 1.267E-08 1.508E-08 1.526E-08 8.942E-09 2.736E-09 8.656E-10 1.888E-10 1.947E-11 3.472E-13 1.457E-15
  0.000
19  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     7.835E-19 3.742E-16 4.906E-14
  1.328E-12 2.055E-11 2.084E-10 1.454E-09 7.309E-09 2.949E-08 9.028E-08 1.923E-07 2.928E-07 5.257E-07 7.517E-07
  8.612E-07 7.330E-07 6.688E-07 5.054E-07 3.482E-07 3.180E-07 1.053E-07 1.782E-07 5.045E-08 1.512E-07 1.418E-07
  1.951E-07 2.319E-07 4.535E-07 5.964E-07 4.712E-07 1.203E-07 1.699E-08 3.792E-09 6.877E-10 1.572E-11 4.652E-14
  0.000
20  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     5.700E-20 3.403E-17 5.920E-15
  1.986E-13 3.800E-12 4.617E-11 3.856E-10 2.367E-09 1.107E-08 3.897E-08 1.333E-07 1.838E-07 4.166E-07 5.659E-07
  5.267E-07 5.201E-07 3.659E-07 3.335E-07 2.853E-07 2.565E-07 2.532E-07 2.771E-07 4.678E-07 8.736E-07 1.076E-06
  1.378E-06 3.260E-06 4.583E-06 2.059E-05 2.059E-05 3.636E-06 3.989E-07 5.489E-08 9.305E-09 3.832E-10 3.355E-12
  0.000
21  0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.143E-21 2.627E-18 6.033E-16
  2.470E-14 5.728E-13 8.367E-12 8.378E-11 6.025E-10 3.041E-09 1.056E-08 2.563E-08 7.894E-08 1.825E-07 2.025E-07
```

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    2.514E-07 2.145E-07 1.377E-07 7.356E-08 6.509E-08 6.725E-08 8.249E-08 1.589E-07 3.954E-07 8.056E-07 1.238E-06
    1.441E-06 2.130E-06 4.882E-06 2.059E-05 2.059E-05 2.955E-06 2.808E-07 6.165E-08 8.668E-09 3.913E-10 3.938E-12
    0.000
 22 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    1.212E-22 1.728E-19 5.228E-17
    2.605E-15 7.131E-14 1.209E-12 1.387E-11 1.113E-10 6.256E-10 2.514E-09 7.857E-09 2.119E-08 4.360E-08 5.106E-08
    5.935E-08 4.985E-08 3.068E-08 2.039E-08 8.882E-09 7.126E-09 7.874E-09 1.269E-08 3.319E-08 8.734E-08 1.412E-07
    2.085E-07 2.483E-07 4.865E-07 5.722E-07 4.207E-07 8.563E-08 1.463E-08 3.027E-09 6.177E-10 2.236E-11 2.554E-13
    0.000
 23 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    2.348E-24 9.567E-21 3.857E-18
    2.340E-16 7.346E-15 1.409E-13 1.831E-12 1.679E-11 1.112E-10 5.438E-10 1.937E-09 4.865E-09 8.157E-09 1.061E-08
    1.183E-08 1.101E-08 6.754E-09 3.807E-09 2.117E-09 1.539E-09 8.979E-10 5.266E-10 1.026E-09 3.353E-09 7.290E-09
    1.170E-08 1.370E-08 1.486E-08 1.369E-08 6.447E-09 2.150E-09 4.606E-10 1.056E-10 1.354E-11 5.508E-13 7.721E-15
    0.000
 24 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000   -5.839E-26 4.375E-22 2.426E-19
    1.779E-17 6.262E-16 1.359E-14 2.054E-13 2.229E-12 1.746E-11 9.669E-11 3.531E-10 8.012E-10 1.144E-09 1.346E-09
    1.484E-09 1.462E-09 9.731E-10 5.765E-10 3.973E-10 2.645E-10 8.350E-11 2.549E-11 7.846E-12 4.290E-11 1.777E-10
    3.894E-10 4.777E-10 4.370E-10 2.962E-10 1.262E-10 4.423E-11 1.084E-11 1.450E-12 1.208E-13 5.198E-15 1.012E-16
    0.000
 25 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000   -6.457E-27 1.636E-23 1.302E-20
    1.133E-18 4.424E-17 1.117E-15 2.024E-14 2.588E-13 2.282E-12 1.343E-11 4.995E-11 1.162E-10 1.792E-10 2.137E-10
    2.168E-10 1.973E-10 1.305E-10 6.382E-11 3.964E-11 1.651E-11 1.238E-12 2.126E-13 4.397E-13 9.923E-13 4.052E-12
    1.242E-11 1.541E-11 1.169E-11 5.884E-12 2.116E-12 6.053E-13 7.308E-14 4.751E-15 1.148E-16 -2.462E-18 8.878E-20
    0.000
 26 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000   -2.395E-28 5.154E-25 5.962E-22
    5.954E-20 2.606E-18 8.013E-17 1.746E-15 2.515E-14 2.354E-13 1.420E-12 5.402E-12 1.325E-11 2.200E-11 2.676E-11
    2.430E-11 1.644E-11 6.378E-12 -3.186E-13 1.084E-12 1.882E-13 -4.424E-13 -5.217E-14 1.510E-14 5.045E-14 2.283E-13
    3.792E-13 3.704E-13 2.179E-13 7.397E-14 1.369E-14 -2.206E-16 -1.524E-16 -1.934E-17 -2.908E-18 -2.759E-19 -1.722E-20
    0.000
 27 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000   -3.814E-30 1.505E-26 2.317E-23
    2.532E-21 1.296E-19 5.070E-18 1.284E-16 1.966E-15 1.865E-14 1.129E-13 4.341E-13 1.064E-12 1.641E-12 1.668E-12
    6.071E-13 -1.636E-12 -1.792E-12 -3.918E-13 5.901E-14 -1.580E-14 -4.240E-14 1.818E-15 7.062E-16 1.629E-15 5.401E-15
    6.311E-15 4.471E-15 1.697E-15 1.943E-16 -1.004E-16 -2.115E-17 -4.489E-19 -5.910E-20 -7.703E-21 -6.529E-22 -3.200E-23
    0.000
 28 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000   -2.187E-33 3.486E-28 6.631E-25
    7.660E-23 5.078E-21 2.583E-19 7.223E-18 1.124E-16 1.046E-15 6.324E-15 2.487E-14 5.931E-14 6.151E-14 2.134E-14
   -1.106E-13 -1.910E-13 -4.740E-14 2.827E-15 4.113E-15 -1.226E-15 -1.484E-15 2.682E-16 1.142E-17 3.484E-17 6.610E-17
    5.544E-17 2.653E-17 3.659E-18 -3.286E-18 -1.131E-18 6.756E-21 1.070E-21 -8.111E-26 -4.686E-25 -7.033E-27 0.000
    0.000
 29 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    3.753E-35 3.719E-30 1.040E-26
    1.211E-24 1.248E-22 7.993E-21 2.313E-19 3.352E-18 2.518E-17 1.312E-16 4.563E-16 8.774E-16 3.036E-16 -7.003E-16
   -1.984E-15 -1.165E-15 1.480E-17 1.208E-16 2.150E-17 -3.390E-17 -1.260E-17 4.928E-18 -6.195E-19 1.273E-19 1.948E-19
    1.065E-19 1.428E-20 -2.284E-20 -1.340E-20 -3.198E-22 2.370E-22 3.168E-25 4.984E-27 2.708E-29 0.000    0.000
    0.000
 30 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    1.300E-32 8.546E-29
    9.825E-27 1.890E-24 1.245E-22 3.230E-21 3.792E-20 1.735E-19 6.371E-19 1.417E-18 1.211E-18 -3.362E-19 -4.334E-18
   -6.233E-18 -1.160E-18 1.098E-18 3.551E-19 -1.360E-19 -2.158E-19 -6.662E-21 2.585E-20 -6.550E-21 3.650E-22 1.465E-22
    2.144E-23 -4.874E-23 -4.049E-23 -5.214E-24 1.788E-24 1.365E-25 -5.418E-27 1.129E-30 4.163E-33 0.000    0.000
    0.000
 31 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    2.222E-31
    2.730E-29 1.044E-26 4.629E-25 7.332E-24 4.232E-23 1.807E-22 6.353E-22 9.411E-22 1.773E-22 -2.006E-21 -5.641E-21
   -3.703E-21 1.986E-21 1.514E-21 -1.310E-22 -5.050E-22 -2.119E-22 9.231E-23 2.955E-23 -1.538E-23 1.296E-24 4.030E-26
   -1.888E-26 -1.149E-26 -2.630E-28 2.330E-27 4.556E-28 -7.404E-30 -7.360E-31 2.711E-34 0.000    0.000    0.000
    0.000
 32 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
    8.972E-33 1.672E-29 1.620E-27 3.443E-26 3.138E-25 1.850E-24 2.936E-24 1.176E-24 -3.882E-24 -3.500E-23 -6.195E-24
    3.534E-24 1.917E-23 3.359E-24 -2.069E-24 -4.188E-24 -1.863E-25 2.774E-25 4.514E-25 -1.251E-25 -1.309E-26 -1.142E-28
   -3.146E-30 0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
    0.000

TOTAL PARTICLES USED IN THE CURRENT STEP =     2099
PARTICLES ADDED AT BEGINNING OF THE STEP =       64
PARTICLES REMOVED AT END OF LAST STEP    =      192

          CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP   6, TIME STEP   1, STRESS PERIOD   1
          ------------------------------------------------------------------------

                            IN              OUT
                         ---------       ---------

           CONSTANT CONCENTRATION:  0.6139662          -0.1896285E-04
                  CONSTANT HEAD:  0.0000000            0.1809183E-21
                          WELLS:  0.0000000            0.0000000
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              DECAY OR BIODEGRADATION:  0.0000000              -0.9928242
                MASS STORAGE (SOLUTE):  0.7698656             -0.1805167
              -------------------------------------------------------
                         [TOTAL]:   1.383832    LB        -1.173360    LB

                                  NET (IN - OUT):  0.2104719
                            DISCREPANCY (PERCENT):   16.46117


                                  -------------------------
                                   TRANSPORT STEP NO.  12
                                  -------------------------

 TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   730.0000   D
 ...........................................................

        CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP   12, TIME STEP  1, STRESS PERIOD  1
        --------------------------------------------------------------------

     1      2      3      4      5      6      7      8      9     10     11
    12     13     14     15     16     17     18     19     20     21     22
    23     24     25     26     27     28     29     30     31     32     33
    34     35     36     37     38     39     40     41     42     43     44
    45
 ..........................................................................
 1  0.000     5.605E-45 1.519E-41 1.439E-39 2.816E-38 8.171E-36 1.834E-34 2.131E-33 1.274E-32 3.342E-31 1.182E-30
    3.006E-30 3.532E-29 2.395E-29 1.046E-29 1.236E-29 2.279E-29 -2.052E-28 -5.588E-29 -1.784E-28 -3.184E-28 -2.160E-28
   -3.315E-29 1.001E-28 -2.284E-28 -2.726E-28 -3.446E-29 5.443E-29 1.557E-29 -1.407E-29 -3.484E-31 7.254E-32 -1.524E-32
   -5.221E-33 -3.783E-35 5.363E-37 3.293E-38 2.316E-39 -7.378E-40 -7.381E-42 -1.261E-44 0.000     0.000     0.000
    0.000
 2  0.000    -5.045E-44 1.251E-41 4.820E-39 6.920E-37 4.047E-35 1.410E-33 3.082E-32 4.477E-31 4.771E-30 3.438E-29
    1.492E-28 5.062E-28 1.417E-27 3.057E-27 4.456E-27 3.257E-27 -1.823E-27 -9.278E-27 -1.292E-26 -1.309E-26 -1.125E-26
   -3.199E-27 4.310E-27 1.083E-29 -1.112E-26 -6.225E-27 1.932E-27 4.308E-28 -4.672E-28 1.196E-29 4.894E-30 -4.306E-31
   -3.074E-33 3.146E-34 -3.458E-36 2.709E-36 -1.343E-37 -1.227E-39 -3.611E-42 7.006E-45 0.000     0.000     0.000
    0.000
 3 -1.275E-43 -5.154E-42 -2.516E-40 1.270E-37 2.738E-35 2.119E-33 9.920E-32 2.894E-30 5.148E-29 6.070E-28 4.640E-27
    2.105E-26 7.604E-26 2.338E-25 5.806E-25 1.056E-24 1.179E-24 4.719E-25 -8.373E-25 -1.895E-24 -2.325E-24 -2.520E-24
   -1.988E-24 8.360E-26 7.661E-25 -5.682E-25 -1.146E-24 -6.797E-26 1.095E-25 -1.650E-26 -5.104E-27 4.007E-28 6.459E-30
   -9.074E-31 -1.926E-32 -4.962E-33 6.061E-34 2.271E-37 -1.281E-37 -1.092E-39 -1.396E-42 5.885E-44 1.401E-45 0.000
    1.401E-45
 4 -2.735E-42 -2.297E-40 -4.174E-38 5.283E-38 6.366E-34 6.465E-32 4.009E-30 1.606E-28 3.966E-27 5.642E-26 4.579E-25
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 31 -2.772E-39 2.182E-38 3.936E-35 2.705E-32 8.222E-30 9.669E-28 7.345E-26 3.801E-24 1.322E-22 2.913E-21 3.190E-20
    1.827E-19 7.598E-19 2.356E-18 5.052E-18 6.523E-18 6.933E-18 8.567E-18 5.774E-18 -1.849E-18 -1.431E-17 -2.360E-17
   -2.058E-17 -8.391E-18 -9.579E-19 1.150E-19 -9.909E-19 -9.915E-19 1.696E-20 1.084E-19 4.431E-20 2.576E-20 -4.801E-21
   -1.089E-20 -4.714E-21 -1.261E-21 -5.151E-23 1.494E-23 1.668E-24 3.900E-26 1.331E-27 3.862E-29 -1.953E-29 -3.112E-28
   -2.356E-26
 32  3.293E-42 7.489E-38 3.132E-35 1.425E-32 1.366E-30 1.712E-28 8.016E-27 1.069E-24 1.366E-23 3.883E-22 2.157E-21
    8.999E-21 3.698E-20 7.259E-20 1.096E-19 1.191E-19 4.050E-19 1.944E-19 7.701E-20 -4.614E-19 -9.182E-19 -1.405E-18
   -1.901E-18 -4.573E-19 -9.412E-20 -2.991E-21 -3.825E-20 -4.832E-20 -5.828E-22 4.590E-21 1.521E-21 4.236E-22 -5.180E-22
   -4.476E-22 -1.579E-22 -6.891E-23 -7.666E-24 5.296E-25 7.562E-26 1.560E-26 3.530E-28 1.208E-29 -6.352E-31 -3.654E-30
   -9.705E-29

TOTAL PARTICLES USED IN THE CURRENT STEP =      961
PARTICLES ADDED AT BEGINNING OF THE STEP =       32
PARTICLES REMOVED AT END OF LAST STEP    =      83

           CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP   12, TIME STEP    1, STRESS PERIOD    1
           ------------------------------------------------------------------------------------

                                    IN              OUT
                                 --------        ----------

            CONSTANT CONCENTRATION:  1.239980          -0.3792551E-04
                 CONSTANT HEAD:  0.0000000          0.2233370E-15
                         WELLS:  0.0000000          0.0000000
           DECAY OR BIODEGRADATION:  0.0000000          -1.319399
             MASS STORAGE (SOLUTE):  0.8231160          -0.1968713
            ---------------------------------------------------------------
                         [TOTAL]:   2.063096    LB       -1.516308    LB

                            NET (IN - OUT):   0.5467879
                       DISCREPANCY (PERCENT):   30.55190


                       ---------------------------------------
                            TRANSPORT STEP NO.   23
                       ---------------------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   1460.000   D
.....................................................................
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          CONCENTRATIONS  IN LAYER  1 AT END OF TRANSPORT STEP  23, TIME STEP  1, STRESS PERIOD  1
          ----------------------------------------------------------------------

       1      2      3      4      5      6      7      8      9     10     11
      12     13     14     15     16     17     18     19     20     21     22
      23     24     25     26     27     28     29     30     31     32     33
      34     35     36     37     38     39     40     41     42     43     44
      45
 ..........................................................................
 1  4.816E-34 3.729E-32 6.305E-31 1.439E-29 8.585E-29 1.507E-27 1.600E-26 4.336E-26 4.319E-25 1.056E-24 2.366E-24
    2.746E-24 3.267E-24 3.099E-24 3.049E-24 4.477E-25 -1.192E-23 -3.554E-23 -9.720E-23 -1.083E-22 -1.350E-22 -1.704E-22
   -6.922E-23 -3.983E-23 -3.118E-24 6.512E-26 -6.404E-26 -4.160E-25 -4.303E-25 -1.025E-25 -5.779E-27 3.457E-28 -7.778E-29
   -5.289E-29 -8.264E-30 -2.794E-31 -9.478E-33 -2.850E-33 -4.001E-34 -1.708E-35 -1.842E-37 5.487E-38 6.015E-37 2.454E-36
    2.344E-35
 2  1.226E-32 4.308E-32 2.052E-30 6.291E-29 1.213E-27 1.220E-26 9.610E-26 5.849E-25 2.678E-24 9.360E-24 2.217E-23
    3.565E-23 4.875E-23 5.602E-23 5.133E-23 2.685E-23 -5.828E-23 -2.828E-22 -5.992E-22 -8.964E-22 -1.070E-21 -1.041E-21
   -7.741E-22 -3.848E-22 -8.710E-23 8.189E-24 5.101E-24 -1.764E-24 -2.196E-24 -5.412E-25 1.634E-27 7.847E-27 -5.618E-29
   -2.577E-28 -1.914E-29 5.351E-31 -6.492E-33 -1.511E-32 -5.512E-34 3.404E-35 1.642E-36 2.941E-37 2.609E-36 4.539E-35
    1.204E-33
 3  5.935E-32 5.790E-31 3.066E-29 1.090E-27 2.328E-26 2.578E-25 2.262E-24 1.533E-23 7.747E-23 2.856E-22 6.830E-22
    1.120E-21 1.597E-21 1.971E-21 2.022E-21 1.579E-21 4.310E-22 -3.081E-21 -9.710E-21 -1.742E-20 -2.380E-20 -2.651E-20
   -2.359E-20 -1.537E-20 -6.234E-21 -8.815E-22 1.867E-22 6.127E-23 -1.735E-23 -1.561E-23 -2.813E-24 3.432E-26 2.980E-26
    2.594E-28 -4.578E-28 -2.375E-29 2.728E-32 -2.404E-31 -4.148E-32 -1.680E-33 -3.254E-35 1.974E-35 1.796E-34 2.410E-33
    9.804E-32
 4  1.194E-30 7.237E-30 4.134E-28 1.583E-26 3.569E-25 4.182E-24 3.991E-23 3.026E-22 1.742E-21 7.075E-21 1.708E-20
    2.857E-20 4.242E-20 5.566E-20 6.273E-20 5.773E-20 3.806E-20 8.992E-22 -9.946E-20 -2.457E-19 -3.934E-19 -4.946E-19
   -5.110E-19 -4.092E-19 -2.305E-19 -7.817E-20 -8.258E-21 1.933E-21 5.455E-22 -6.143E-23 -6.566E-23 -1.049E-23 -1.529E-25
    5.406E-26 3.665E-27 3.871E-29 1.298E-29 8.867E-31 -4.105E-31 -6.736E-32 -1.188E-32 -4.347E-34 6.889E-33 7.906E-32
    2.251E-30
 5  1.300E-28 9.885E-29 5.817E-27 2.216E-25 4.901E-24 5.670E-23 5.486E-22 4.401E-21 2.840E-20 1.346E-19 3.408E-19
    5.846E-19 9.019E-19 1.246E-18 1.517E-18 1.577E-18 1.311E-18 7.110E-19 -2.759E-19 -2.415E-18 -4.889E-18 -6.736E-18
   -7.763E-18 -7.245E-18 -5.010E-18 -2.421E-18 -7.144E-19 -7.551E-20 9.851E-21 3.280E-21 6.423E-23 -1.283E-22 -2.422E-23
   -1.803E-24 -1.133E-26 4.653E-27 6.484E-28 1.085E-28 1.174E-29 2.121E-30 1.996E-31 3.769E-32 4.062E-32 1.595E-30
    9.286E-29
 6  4.077E-27 3.671E-27 1.032E-25 3.404E-24 6.841E-23 7.240E-22 6.400E-21 4.834E-20 3.034E-19 1.618E-18 5.181E-18
    9.368E-18 1.496E-17 2.128E-17 2.702E-17 3.044E-17 2.973E-17 2.344E-17 9.555E-18 -1.807E-17 -4.763E-17 -6.605E-17
   -7.982E-17 -8.251E-17 -6.463E-17 -3.799E-17 -1.602E-17 -4.374E-18 -5.728E-19 1.036E-20 8.026E-21 7.452E-22 -2.303E-23
   -2.820E-23 -4.529E-24 -4.378E-25 -3.694E-26 -7.083E-28 5.018E-28 2.824E-28 8.080E-29 1.821E-29 -8.541E-30 -9.860E-29
    3.928E-27
 7  1.899E-25 3.805E-25 3.258E-24 5.408E-23 9.061E-22 8.268E-21 6.050E-20 4.006E-19 2.223E-18 1.228E-17 3.975E-17
    7.356E-17 1.203E-16 1.753E-16 2.295E-16 2.697E-16 2.813E-16 2.506E-16 1.664E-16 2.397E-17 -1.662E-16 -3.335E-16
   -4.211E-16 -4.170E-16 -3.394E-16 -2.222E-16 -1.125E-16 -4.204E-17 -1.068E-17 -1.459E-18 -8.590E-20 2.689E-21 1.312E-21
    1.216E-22 -2.938E-24 -2.005E-24 -3.052E-25 -1.218E-26 1.461E-26 1.774E-26 9.218E-27 3.417E-27 2.126E-27 4.655E-27
    5.294E-26
 8  2.523E-24 1.230E-23 9.681E-23 8.269E-22 9.812E-21 7.801E-20 4.145E-19 2.708E-18 1.535E-17 6.671E-17 1.903E-16
    3.332E-16 5.228E-16 7.371E-16 9.387E-16 1.080E-15 1.116E-15 1.022E-15 8.061E-16 5.210E-16 2.392E-16 -6.926E-17
   -4.535E-16 -5.784E-16 -5.569E-16 -4.241E-16 -2.488E-16 -1.098E-16 -3.569E-17 -7.845E-18 -1.282E-18 -1.521E-19 -9.550E-21
    4.741E-22 1.193E-22 1.474E-23 2.933E-24 8.189E-25 6.697E-25 7.461E-25 5.663E-25 2.413E-25 1.320E-25 1.730E-26
    1.080E-24
 9  2.202E-23 1.746E-22 2.000E-21 1.866E-20 1.299E-19 7.556E-19 4.338E-18 2.035E-17 8.833E-17 3.277E-16 8.238E-16
    1.351E-15 2.012E-15 2.718E-15 3.339E-15 3.734E-15 3.792E-15 3.482E-15 2.877E-15 2.122E-15 1.372E-15 7.001E-16
    1.715E-16 -6.784E-17 -2.806E-16 -3.501E-16 -2.731E-16 -1.437E-16 -5.569E-17 -1.800E-17 -4.851E-18 -1.059E-18 -1.617E-19
   -1.308E-20 2.071E-22 3.040E-22 1.190E-22 5.357E-23 3.628E-23 2.912E-23 2.513E-23 1.328E-23 4.915E-24 2.515E-24
    4.272E-23
10  1.188E-22 1.333E-21 1.820E-20 2.021E-19 1.354E-18 6.028E-18 2.897E-17 1.208E-16 4.526E-16 1.463E-15 3.266E-15
    5.010E-15 7.051E-15 9.075E-15 1.069E-14 1.153E-14 1.137E-14 1.022E-14 8.381E-15 6.245E-15 4.195E-15 2.420E-15
    9.635E-16 3.871E-16 1.512E-16 -4.592E-18 -1.047E-16 -8.453E-17 -4.458E-17 -1.837E-17 -6.086E-18 -1.555E-18 -2.730E-19
   -1.781E-20 1.061E-20 7.540E-21 4.072E-21 2.364E-21 1.433E-21 9.082E-22 6.111E-22 3.505E-22 1.335E-22 1.016E-22
    4.097E-22
11  9.488E-22 8.556E-21 1.201E-19 1.336E-18 9.158E-18 3.991E-17 1.710E-16 6.384E-16 2.105E-15 5.999E-15 1.201E-14
    1.730E-14 2.304E-14 2.827E-14 3.194E-14 3.317E-14 3.160E-14 2.755E-14 2.199E-14 1.600E-14 1.055E-14 6.179E-15
    3.133E-15 1.346E-15 6.405E-16 2.413E-16 5.177E-17 1.524E-17 5.693E-18 2.015E-18 9.542E-19 7.496E-19 9.858E-19
    7.682E-19 4.620E-19 2.664E-19 1.539E-19 8.785E-20 4.965E-20 2.785E-20 1.533E-20 7.968E-21 2.999E-21 1.354E-21
    2.488E-21
12  4.878E-21 5.114E-20 7.262E-19 8.089E-18 5.564E-17 2.324E-16 9.045E-16 3.049E-15 8.975E-15 2.282E-14 4.149E-14
    5.646E-14 7.148E-14 8.392E-14 9.118E-14 9.146E-14 8.444E-14 7.165E-14 5.596E-14 4.026E-14 2.687E-14 1.681E-14
    9.880E-15 5.511E-15 3.450E-15 1.826E-15 4.109E-16 1.347E-16 6.265E-17 3.726E-17 2.526E-17 2.233E-17 2.392E-17
    2.207E-17 1.514E-17 9.499E-18 5.626E-18 3.134E-18 1.661E-18 8.417E-19 4.071E-19 1.924E-19 6.453E-20 2.366E-20
    8.356E-20
13  3.397E-20 2.813E-19 3.994E-18 4.431E-17 3.020E-16 1.204E-15 4.311E-15 1.326E-14 3.534E-14 8.108E-14 1.356E-13
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   1.755E-13 2.126E-13 2.400E-13 2.519E-13 2.451E-13 2.204E-13 1.832E-13 1.414E-13 1.024E-13 7.108E-14 4.894E-14
   3.450E-14 2.529E-14 1.933E-14 1.289E-14 4.396E-15 1.461E-15 8.777E-16 7.620E-16 6.887E-16 6.625E-16 6.561E-16
   5.968E-16 4.632E-16 3.182E-16 1.963E-16 1.087E-16 5.492E-17 2.566E-17 1.122E-17 4.843E-18 1.427E-18 4.372E-19
   1.251E-18
14  1.885E-19 1.408E-18 1.979E-17 2.177E-16 1.458E-15 5.553E-15 1.854E-14 5.272E-14 1.290E-13 2.699E-13 4.205E-13
   5.223E-13 6.090E-13 6.645E-13 6.767E-13 6.411E-13 5.641E-13 4.622E-13 3.563E-13 2.638E-13 1.951E-13 1.518E-13
   1.284E-13 1.172E-13 1.112E-13 1.016E-13 5.652E-14 2.944E-14 1.917E-14 1.803E-14 1.846E-14 1.892E-14 1.891E-14
   1.756E-14 1.452E-14 1.066E-14 6.851E-15 3.796E-15 1.857E-15 8.042E-16 3.185E-16 1.251E-16 3.176E-17 7.572E-18
   1.352E-17
15  7.098E-19 6.333E-18 8.752E-17 9.485E-16 6.213E-15 2.269E-14 7.140E-14 1.902E-13 4.338E-13 8.428E-13 1.241E-12
   1.489E-12 1.682E-12 1.782E-12 1.767E-12 1.635E-12 1.413E-12 1.148E-12 8.920E-13 6.874E-13 5.565E-13 5.034E-13
   5.168E-13 5.815E-13 6.799E-13 7.751E-13 6.338E-13 4.868E-13 4.063E-13 4.227E-13 4.728E-13 5.185E-13 5.398E-13
   5.210E-13 4.611E-13 3.651E-13 2.469E-13 1.401E-13 6.503E-14 2.633E-14 9.331E-15 3.257E-15 6.965E-16 1.293E-16
   1.960E-16
16  3.188E-18 2.557E-17 3.450E-16 3.666E-15 2.338E-14 8.203E-14 2.460E-13 6.220E-13 1.340E-12 2.461E-12 3.470E-12
   4.054E-12 4.457E-12 4.603E-12 4.455E-12 4.039E-12 3.440E-12 2.786E-12 2.213E-12 1.818E-12 1.669E-12 1.799E-12
   2.242E-12 3.051E-12 4.254E-12 5.750E-12 6.444E-12 6.872E-12 7.527E-12 9.039E-12 1.114E-11 1.306E-11 1.438E-11
   1.472E-11 1.455E-11 1.275E-11 9.495E-12 5.290E-12 2.477E-12 8.933E-13 2.822E-13 8.469E-14 1.466E-14 2.025E-15
   1.362E-15
17  9.925E-18 9.202E-17 1.200E-15 1.228E-14 7.520E-14 2.539E-13 7.323E-13 1.782E-12 3.699E-12 6.564E-12 8.996E-12
   1.031E-11 1.110E-11 1.122E-11 1.064E-11 9.479E-12 8.007E-12 6.557E-12 5.470E-12 5.021E-12 5.473E-12 7.157E-12
   1.072E-11 1.717E-11 2.744E-11 4.246E-11 6.231E-11 8.628E-11 1.177E-10 1.661E-10 2.238E-10 2.808E-10 3.338E-10
   3.875E-10 4.278E-10 4.506E-10 3.733E-10 2.193E-10 8.955E-11 3.080E-11 8.277E-12 2.197E-12 2.923E-13 3.040E-14
   8.120E-15
18  2.011E-17 2.455E-16 3.049E-15 2.983E-14 1.761E-13 5.791E-13 1.640E-12 3.949E-12 8.189E-12 1.455E-11 1.988E-11
   2.263E-11 2.413E-11 2.411E-11 2.262E-11 2.008E-11 1.722E-11 1.490E-11 1.414E-11 1.604E-11 2.235E-11 3.648E-11
   6.538E-11 1.179E-10 2.046E-10 3.565E-10 6.108E-10 9.479E-10 1.513E-09 2.392E-09 3.430E-09 4.763E-09 6.820E-09
   9.643E-09 1.159E-08 1.541E-08 1.576E-08 1.017E-08 2.306E-09 9.639E-10 2.280E-10 5.268E-11 5.407E-12 4.287E-13
   1.133E-13
19  1.747E-17 1.823E-16 2.427E-15 2.545E-14 1.625E-13 5.802E-13 1.798E-12 4.753E-12 1.075E-11 2.053E-11 2.919E-11
   3.381E-11 3.653E-11 3.696E-11 3.532E-11 3.254E-11 3.017E-11 3.052E-11 3.682E-11 5.438E-11 9.418E-11 1.794E-10
   3.495E-10 6.782E-10 1.326E-09 2.555E-09 4.519E-09 7.582E-09 1.524E-08 2.395E-08 3.615E-08 5.644E-08 7.774E-08
   1.614E-07 3.566E-07 4.362E-07 6.555E-07 4.698E-07 1.221E-07 1.575E-08 5.051E-09 1.061E-09 8.376E-11 5.209E-12
   2.832E-13
20  8.862E-18 9.387E-17 1.336E-15 1.497E-14 1.030E-13 3.986E-13 1.346E-12 3.881E-12 9.516E-12 1.947E-11 2.897E-11
   3.440E-11 3.808E-11 3.966E-11 3.964E-11 3.964E-11 4.280E-11 5.472E-11 8.506E-11 1.532E-10 3.014E-10 6.226E-10
   1.324E-09 2.764E-09 5.460E-09 1.065E-08 2.156E-08 4.211E-08 7.467E-08 1.235E-07 2.118E-07 4.021E-07 7.616E-07
   1.735E-06 3.364E-06 9.592E-06 2.059E-05 2.059E-05 3.574E-06 4.263E-07 6.833E-08 1.179E-08 7.695E-10 4.201E-11
   1.151E-12
21  2.486E-18 3.898E-17 5.831E-16 6.816E-15 4.916E-14 2.006E-13 7.214E-13 2.234E-12 5.911E-12 1.307E-11 2.070E-11
   2.556E-11 2.944E-11 3.205E-11 3.392E-11 3.677E-11 4.413E-11 6.272E-11 1.045E-10 1.930E-10 3.777E-10 7.580E-10
   1.532E-09 3.038E-09 5.643E-09 1.009E-08 2.002E-08 4.197E-08 7.267E-08 1.200E-07 2.126E-07 3.797E-07 5.734E-07
   1.400E-06 2.737E-06 5.369E-06 2.059E-05 2.059E-05 3.697E-06 3.304E-07 5.186E-08 9.943E-09 7.570E-10 4.043E-11
   1.145E-12
22  1.511E-18 1.407E-17 2.193E-16 2.629E-15 1.940E-14 8.151E-14 3.059E-13 1.005E-12 2.860E-12 6.859E-12 1.169E-11
   1.513E-11 1.828E-11 2.095E-11 2.355E-11 2.741E-11 3.528E-11 5.247E-11 8.836E-11 1.606E-10 3.032E-10 5.779E-10
   1.086E-09 1.965E-09 3.274E-09 4.871E-09 6.675E-09 9.799E-09 1.527E-08 2.288E-08 3.999E-08 5.767E-08 8.764E-08
   1.650E-07 2.528E-07 3.981E-07 5.991E-07 4.952E-07 1.025E-07 1.225E-08 3.859E-09 9.536E-10 9.340E-11 6.849E-12
   5.930E-13
23  5.609E-19 4.594E-18 7.425E-17 9.023E-16 6.700E-15 2.845E-14 1.099E-13 3.804E-13 1.165E-12 3.039E-12 5.592E-12
   7.605E-12 9.661E-12 1.167E-11 1.387E-11 1.710E-11 2.304E-11 3.483E-11 5.782E-11 1.014E-10 1.818E-10 3.243E-10
   5.599E-10 9.090E-10 1.341E-09 1.770E-09 2.184E-09 2.627E-09 2.529E-09 2.416E-09 3.344E-09 5.160E-09 7.484E-09
   1.089E-08 1.324E-08 1.539E-08 1.281E-08 8.610E-09 2.657E-09 6.221E-10 1.654E-10 4.506E-11 6.423E-12 7.137E-13
   1.165E-13
24  6.314E-20 1.382E-18 2.306E-17 2.805E-16 2.062E-15 8.693E-15 3.428E-14 1.250E-13 4.157E-13 1.188E-12 2.366E-12
   3.384E-12 4.513E-12 5.718E-12 7.138E-12 9.201E-12 1.277E-11 1.934E-11 3.131E-11 5.254E-11 8.890E-11 1.481E-10
   2.360E-10 3.485E-10 4.628E-10 5.517E-10 6.122E-10 5.737E-10 3.167E-10 2.032E-10 1.973E-10 2.769E-10 3.994E-10
   5.264E-10 5.779E-10 5.409E-10 3.714E-10 1.787E-10 6.582E-11 1.923E-11 5.270E-12 1.638E-12 3.282E-13 5.784E-14
   9.605E-15
25  2.709E-20 3.881E-19 6.640E-18 7.955E-17 5.682E-16 2.319E-15 9.250E-15 3.572E-14 1.319E-13 4.197E-13 9.084E-13
   1.365E-12 1.906E-12 2.519E-12 3.272E-12 4.358E-12 6.157E-12 9.282E-12 1.461E-11 2.341E-11 3.737E-11 5.832E-11
   8.666E-11 1.173E-10 1.352E-10 1.251E-10 1.042E-10 6.735E-11 3.065E-11 2.422E-11 2.662E-11 2.380E-11 2.720E-11
   3.233E-11 2.954E-11 2.097E-11 1.147E-11 4.626E-12 1.639E-12 4.807E-13 1.507E-13 5.412E-14 1.435E-14 3.924E-15
   1.768E-15
26  6.455E-21 8.125E-20 1.235E-18 1.014E-17 5.142E-17 2.110E-16 1.239E-15 7.902E-15 3.710E-14 1.356E-13 3.210E-13
   5.061E-13 7.370E-13 1.011E-12 1.353E-12 1.842E-12 2.624E-12 3.919E-12 5.983E-12 9.120E-12 1.364E-11 1.984E-11
   2.731E-11 3.314E-11 3.048E-11 1.952E-11 1.291E-11 6.629E-12 3.215E-12 3.032E-12 2.995E-12 3.172E-12 3.721E-12
   2.800E-12 1.805E-12 9.470E-13 3.904E-13 1.300E-13 3.650E-14 9.960E-15 3.403E-15 1.420E-15 5.070E-16 2.481E-16
   1.664E-16
27  1.034E-21 1.030E-20 1.150E-19 5.459E-19 3.397E-18 2.888E-17 2.136E-16 1.362E-15 8.754E-15 4.100E-14 1.055E-13
   1.739E-13 2.629E-13 3.718E-13 5.087E-13 6.996E-13 9.932E-13 1.456E-12 2.139E-12 3.044E-12 4.094E-12 5.322E-12
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    6.491E-12 6.649E-12 3.346E-12 1.734E-12 1.183E-12 6.328E-13 4.367E-13 4.693E-13 3.770E-13 3.952E-13 3.476E-13
    1.889E-13 8.797E-14 3.383E-14 1.053E-14 2.764E-15 6.397E-16 1.518E-16 5.561E-17 2.672E-17 1.252E-17 8.560E-18
    1.862E-17
 28 1.146E-22 8.009E-22 5.765E-21 3.988E-20 6.069E-19 6.464E-18 5.652E-17 4.111E-16 2.526E-15 1.196E-14 3.241E-14
    5.547E-14 8.680E-14 1.261E-13 1.750E-13 2.396E-13 3.320E-13 4.710E-13 6.583E-13 8.436E-13 8.900E-13 9.112E-13
    8.369E-13 5.814E-13 2.022E-13 1.292E-13 9.727E-14 6.338E-14 5.819E-14 6.219E-14 5.497E-14 5.540E-14 3.228E-14
    1.250E-14 4.279E-15 1.193E-15 2.669E-16 5.193E-17 9.360E-18 1.802E-18 6.779E-19 3.658E-19 2.104E-19 2.015E-19
    8.622E-19
 29 1.443E-23 2.201E-23 1.952E-22 5.205E-21 1.228E-19 1.434E-18 1.353E-17 9.993E-17 5.494E-16 2.265E-15 6.421E-15
    1.138E-14 1.837E-14 2.732E-14 3.790E-14 4.884E-14 5.673E-14 6.891E-14 8.286E-14 8.878E-14 6.233E-14 5.053E-14
    3.305E-14 1.390E-14 5.519E-15 5.121E-15 4.425E-15 3.738E-15 4.048E-15 4.203E-15 3.772E-15 3.026E-15 1.263E-15
    3.345E-16 7.635E-17 1.178E-17 7.186E-19 -5.433E-19 -2.231E-19 -4.339E-20 -2.344E-21 1.036E-21 1.456E-21 7.690E-21
    1.052E-19
 30 2.990E-25 4.431E-25 1.815E-23 7.840E-22 1.897E-20 2.224E-19 2.074E-18 1.484E-17 7.878E-17 3.226E-16 8.744E-16
    1.473E-15 2.243E-15 3.116E-15 3.953E-15 4.400E-15 3.529E-15 3.246E-15 2.740E-15 1.800E-15 1.224E-15 1.058E-15
    5.965E-16 2.145E-16 1.227E-16 1.458E-16 1.417E-16 1.455E-16 1.633E-16 1.590E-16 1.285E-16 7.792E-17 2.212E-17
    2.935E-18 -2.873E-19 -7.339E-19 -3.383E-19 -1.010E-19 -1.996E-20 -2.852E-21 -3.285E-22 -2.708E-23 1.742E-23 2.755E-22
    1.046E-20
 31 9.452E-27 2.901E-26 1.748E-24 6.983E-23 1.586E-21 1.773E-20 1.568E-19 1.073E-18 5.578E-18 2.133E-17 4.768E-17
    7.328E-17 9.944E-17 1.172E-16 1.145E-16 8.706E-17 6.279E-17 5.505E-17 3.901E-17 2.155E-17 1.109E-17 -1.048E-19
   -1.983E-17 -2.206E-17 -1.164E-17 -1.848E-18 1.727E-18 2.711E-18 3.026E-18 2.613E-18 1.724E-18 7.160E-19 4.367E-20
   -1.466E-19 -8.812E-20 -3.565E-20 -9.285E-21 -1.591E-21 -1.599E-22 -1.033E-23 -1.405E-24 -1.550E-25 1.050E-24 1.610E-23
    3.086E-22
 32 5.367E-28 4.149E-26 1.093E-24 5.734E-23 6.909E-22 6.449E-21 3.825E-20 1.677E-19 7.423E-19 3.389E-18 6.325E-18
    9.414E-18 5.097E-18 1.007E-17 5.329E-18 9.207E-18 5.825E-18 3.227E-18 6.539E-19 -4.612E-18 -8.152E-18 -1.047E-17
   -1.112E-17 -7.764E-18 -5.623E-18 -1.953E-18 -3.713E-19 2.499E-19 2.348E-19 9.136E-20 9.401E-20 2.115E-20 -1.127E-20
   -2.524E-20 -1.193E-20 -5.939E-21 -1.502E-21 -2.811E-22 -8.962E-23 -1.166E-23 -5.499E-25 -4.006E-26 2.417E-25 2.449E-24
    2.595E-23

TOTAL PARTICLES USED IN THE CURRENT STEP =      894
PARTICLES ADDED AT BEGINNING OF THE STEP =       96
PARTICLES REMOVED AT END OF LAST STEP    =     84

          CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  23, TIME STEP   1, STRESS PERIOD   1
          -------------------------------------------------------------------------------------

                                  IN               OUT
                               --------          --------

               CONSTANT CONCENTRATION:  2.483095          -0.7585102E-04
                    CONSTANT HEAD:  0.0000000        -0.8481665E-13
                         WELLS:  0.0000000          0.0000000
              DECAY OR BIODEGRADATION:  0.0000000           -1.909658
               MASS STORAGE (SOLUTE):  0.8479181         -0.2371252
              -------------------------------------------------------
                         [TOTAL]:  3.331013   LB      -2.146859   LB

                              NET (IN - OUT):  1.184155
                         DISCREPANCY (PERCENT):  43.23412


                         ----------------------------------
                               TRANSPORT STEP NO.  34
                         ----------------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =  2190.000   D
..................................................................

          CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP  34, TIME STEP  1, STRESS PERIOD  1
          -------------------------------------------------------------------------------------

      1      2      3      4      5      6      7      8      9     10     11
     12     13     14     15     16     17     18     19     20     21     22
     23     24     25     26     27     28     29     30     31     32     33
     34     35     36     37     38     39     40     41     42     43     44
     45
..........................................................................................................................
  1 5.024E-30 1.133E-28 1.237E-27 1.363E-26 6.915E-26 2.434E-25 8.174E-25 1.580E-24 4.052E-24 6.954E-24 4.448E-24
   -2.376E-23 -1.666E-22 -5.221E-22 -1.131E-21 -2.890E-21 -4.424E-21 -6.146E-21 -6.777E-21 -9.021E-21 -5.404E-21 -4.779E-21
   -4.172E-21 -2.307E-21 -7.638E-22 -6.474E-22 -6.044E-23 -1.189E-23 3.196E-25 -3.498E-26 -1.481E-25 -6.324E-26 -1.877E-26
   -1.969E-27 -1.720E-28 -1.009E-29 -7.199E-31 -2.867E-31 -5.432E-32 -9.838E-33 -8.784E-34 1.232E-34 5.916E-34 5.176E-33
    1.870E-32
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2  2.285E-29 1.077E-28 2.115E-27 2.678E-26 2.175E-25 9.807E-25 3.644E-24 1.084E-23 2.470E-23 4.184E-23 4.710E-23
   1.773E-23 -2.834E-22 -1.605E-21 -4.973E-21 -1.102E-20 -1.918E-20 -2.780E-20 -3.466E-20 -3.778E-20 -3.606E-20 -3.000E-20
   -2.126E-20 -1.252E-20 -5.866E-21 -2.008E-21 -4.107E-22 -1.275E-23 7.957E-24 1.174E-24 -3.977E-25 -2.637E-25 -6.286E-26
   -6.700E-27 -5.514E-29 3.745E-29 2.652E-30 -2.820E-31 -9.499E-32 -1.097E-32 -3.689E-34 5.070E-34 2.985E-33 2.558E-32
   1.780E-31
3  2.922E-28 9.688E-28 2.021E-26 2.846E-25 2.445E-24 1.158E-23 4.537E-23 1.429E-22 3.474E-22 6.197E-22 7.369E-22
   6.616E-22 -3.599E-22 -8.062E-21 -3.320E-20 -8.521E-20 -1.624E-19 -2.508E-19 -3.313E-19 -3.854E-19 -3.967E-19 -3.590E-19
   -2.817E-19 -1.873E-19 -1.028E-19 -4.431E-20 -1.382E-20 -2.535E-21 -5.422E-23 4.889E-23 7.460E-24 -5.188E-25 -6.265E-25
   -1.648E-25 -2.086E-26 -8.322E-28 6.039E-29 8.943E-30 2.849E-31 -6.188E-32 -4.987E-33 1.156E-32 5.533E-32 3.112E-31
   7.738E-30
4  7.073E-27 8.341E-27 1.797E-25 2.636E-24 2.310E-23 1.113E-22 4.505E-22 1.492E-21 3.898E-21 7.470E-21 9.088E-21
   8.960E-21 4.173E-21 -3.579E-20 -2.032E-19 -5.822E-19 -1.164E-18 -1.842E-18 -2.511E-18 -3.091E-18 -3.400E-18 -3.300E-18
   -2.821E-18 -2.084E-18 -1.300E-18 -6.663E-19 -2.697E-19 -8.025E-20 -1.485E-20 -7.664E-22 1.467E-22 3.334E-23 2.537E-24
   -5.739E-25 -2.666E-25 -4.756E-26 -4.197E-27 -8.291E-29 1.092E-29 8.992E-31 7.886E-32 2.260E-31 9.549E-31 5.887E-30
   6.584E-29
5  2.577E-25 8.054E-26 1.638E-24 2.319E-23 1.956E-22 9.116E-22 3.616E-21 1.204E-20 3.283E-20 6.871E-20 8.658E-20
   8.575E-20 3.438E-20 -3.387E-19 -1.699E-18 -4.503E-18 -8.478E-18 -1.250E-17 -1.587E-17 -1.968E-17 -2.255E-17 -2.261E-17
   -2.040E-17 -1.623E-17 -1.108E-17 -6.383E-18 -3.040E-18 -1.157E-18 -3.311E-19 -6.320E-20 -6.480E-21 -2.478E-24 7.486E-23
   1.232E-23 6.578E-25 -1.475E-25 -5.132E-26 -7.183E-27 -4.221E-28 1.261E-30 2.259E-30 3.625E-30 1.730E-29 8.922E-29
   9.584E-28
6  3.276E-24 1.853E-24 1.833E-23 2.137E-22 1.620E-21 6.888E-21 2.467E-20 7.612E-20 1.925E-19 4.135E-19 5.967E-19
   5.522E-19 -4.792E-19 -5.684E-18 -1.764E-17 -3.728E-17 -6.247E-17 -8.848E-17 -1.091E-16 -1.176E-16 -1.186E-16 -1.111E-16
   -9.977E-17 -8.186E-17 -5.848E-17 -3.614E-17 -1.911E-17 -8.471E-18 -3.044E-18 -8.407E-19 -1.765E-19 -2.684E-20 -2.532E-21
   -2.387E-23 1.326E-23 1.826E-24 1.148E-25 -7.610E-27 -1.057E-27 4.663E-28 1.905E-28 8.198E-29 2.465E-28 1.556E-27
   2.548E-26
7  4.875E-23 8.809E-23 3.126E-22 1.898E-21 1.178E-20 4.394E-20 1.312E-19 3.573E-19 8.080E-19 1.789E-18 2.808E-18
   3.279E-18 3.340E-18 2.050E-18 -5.357E-18 -2.735E-17 -6.308E-17 -1.102E-16 -1.630E-16 -2.135E-16 -2.425E-16 -2.468E-16
   -2.251E-16 -1.808E-16 -1.302E-16 -8.373E-17 -4.729E-17 -2.310E-17 -9.548E-18 -3.204E-18 -8.808E-19 -1.995E-19 -3.719E-20
   -4.913E-21 -4.723E-22 -2.770E-23 -6.322E-25 3.768E-27 2.301E-26 2.735E-26 1.487E-26 7.294E-27 7.845E-27 -1.050E-28
   3.160E-25
8  3.879E-22 1.295E-21 4.270E-21 1.493E-20 6.605E-20 2.148E-19 5.066E-19 1.308E-18 2.984E-18 5.770E-18 8.382E-18
   9.652E-18 1.032E-17 1.041E-17 9.956E-18 8.446E-18 3.178E-18 -1.471E-17 -4.756E-17 -8.752E-17 -1.263E-16 -1.591E-16
   -1.776E-16 -1.562E-16 -1.224E-16 -8.573E-17 -5.205E-17 -2.711E-17 -1.213E-17 -4.608E-18 -1.482E-18 -4.005E-19 -9.364E-20
   -1.983E-20 -3.582E-21 -5.365E-22 -6.651E-23 -5.547E-24 5.313E-25 9.174E-25 7.152E-25 3.332E-25 1.849E-25 1.919E-25
   1.220E-23
9  2.919E-21 9.587E-21 4.154E-20 1.519E-19 4.295E-19 1.050E-18 2.471E-18 5.105E-18 1.007E-17 1.744E-17 2.342E-17
   2.605E-17 2.722E-17 2.723E-17 2.676E-17 2.684E-17 2.845E-17 3.187E-17 3.563E-17 3.672E-17 3.025E-17 6.534E-18
   -4.200E-17 -5.466E-17 -5.548E-17 -4.983E-17 -3.511E-17 -1.949E-17 -9.060E-18 -3.710E-18 -1.345E-18 -4.244E-19 -1.126E-19
   -2.621E-20 -4.777E-21 -4.453E-22 5.587E-23 5.150E-23 3.851E-23 3.142E-23 2.733E-23 1.516E-23 7.049E-24 1.263E-23
   7.330E-23
10  1.012E-20 4.156E-20 2.008E-19 8.136E-19 2.134E-18 4.247E-18 9.074E-18 1.751E-17 3.132E-17 4.952E-17 6.186E-17
   6.644E-17 6.782E-17 6.741E-17 6.775E-17 7.229E-17 8.494E-17 1.089E-16 1.440E-16 1.841E-16 2.130E-16 1.953E-16
   8.105E-17 3.741E-17 2.117E-17 -3.722E-18 -1.248E-17 -7.711E-18 -3.770E-18 -1.672E-18 -5.861E-19 -1.088E-19 2.356E-20
   2.518E-20 1.509E-20 7.952E-21 4.152E-21 2.413E-21 1.468E-21 9.343E-22 6.333E-22 3.734E-22 1.719E-22 1.964E-22
   5.838E-22
11  6.521E-20 1.585E-19 7.660E-19 3.034E-18 7.984E-18 1.572E-17 3.115E-17 5.612E-17 9.220E-17 1.340E-16 1.569E-16
   1.632E-16 1.635E-16 1.629E-16 1.698E-16 1.954E-16 2.535E-16 3.578E-16 5.138E-16 7.087E-16 8.890E-16 9.296E-16
   6.904E-16 3.600E-16 2.320E-16 9.021E-17 8.604E-18 4.436E-18 3.818E-18 1.973E-18 9.644E-19 7.325E-19 9.865E-19
   7.865E-19 4.777E-19 2.761E-19 1.591E-19 9.047E-20 5.092E-20 2.850E-20 1.574E-20 8.357E-21 3.586E-21 2.502E-21
   6.076E-21
12  2.209E-19 5.847E-19 2.804E-18 1.092E-17 2.858E-17 5.466E-17 1.014E-16 1.707E-16 2.597E-16 3.493E-16 3.861E-16
   3.911E-16 3.872E-16 3.917E-16 4.299E-16 5.375E-16 7.612E-16 1.154E-15 1.750E-15 2.527E-15 3.346E-15 3.879E-15
   3.708E-15 2.836E-15 2.283E-15 1.359E-15 2.497E-16 8.346E-17 4.708E-17 3.329E-17 2.472E-17 2.307E-17 2.548E-17
   2.369E-17 1.615E-17 1.003E-17 5.890E-18 3.257E-18 1.716E-18 8.658E-19 4.188E-19 2.002E-19 7.210E-20 3.274E-20
   6.043E-20
13  5.878E-19 2.067E-18 9.782E-18 3.755E-17 9.726E-17 1.800E-16 3.147E-16 4.973E-16 7.053E-16 8.823E-16 9.274E-16
   9.202E-16 9.098E-16 9.482E-16 1.112E-15 1.516E-15 2.320E-15 3.731E-15 5.916E-15 8.911E-15 1.242E-14 1.565E-14
   1.753E-14 1.760E-14 1.644E-14 1.218E-14 4.153E-15 1.380E-15 8.774E-16 8.038E-16 7.469E-16 7.277E-16 7.203E-16
   6.466E-16 4.935E-16 3.352E-16 2.054E-16 1.134E-16 5.727E-17 2.663E-17 1.156E-17 4.985E-18 1.498E-18 4.435E-19
   3.812E-19
14  2.010E-18 6.920E-18 3.229E-17 1.225E-16 3.134E-16 5.622E-16 9.336E-16 1.393E-15 1.854E-15 2.164E-15 2.181E-15
   2.136E-15 2.137E-15 2.335E-15 2.966E-15 4.402E-15 7.216E-15 1.222E-14 2.025E-14 3.196E-14 4.725E-14 6.481E-14
   8.212E-14 9.673E-14 1.067E-13 1.060E-13 6.018E-14 3.176E-14 2.106E-14 2.015E-14 2.071E-14 2.101E-14 2.056E-14
   1.870E-14 1.529E-14 1.113E-14 7.120E-15 3.975E-15 1.954E-15 8.459E-16 3.297E-16 1.273E-16 3.233E-17 6.956E-18
   3.507E-18
15  5.745E-18 2.171E-17 9.978E-17 3.749E-16 9.472E-16 1.652E-15 2.625E-15 3.721E-15 4.680E-15 5.145E-15 5.021E-15
   4.912E-15 5.058E-15 5.913E-15 8.217E-15 1.322E-14 2.302E-14 4.087E-14 7.079E-14 1.174E-13 1.853E-13 2.780E-13
   3.978E-13 5.455E-13 7.137E-13 8.640E-13 7.193E-13 5.562E-13 4.649E-13 4.815E-13 5.284E-13 5.622E-13 5.724E-13
   5.497E-13 4.825E-13 3.761E-13 2.555E-13 1.449E-13 6.845E-14 2.793E-14 9.783E-15 3.286E-15 6.921E-16 1.153E-16
   7.185E-17
16  1.490E-17 6.277E-17 2.843E-16 1.059E-15 2.642E-15 4.492E-15 6.886E-15 9.358E-15 1.120E-14 1.175E-14 1.129E-14
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    1.123E-14 1.223E-14 1.566E-14 2.397E-14 4.154E-14 7.632E-14 1.416E-13 2.561E-13 4.467E-13 7.535E-13 1.239E-12
    1.996E-12 3.156E-12 4.791E-12 6.745E-12 7.595E-12 8.033E-12 8.694E-12 1.019E-11 1.200E-11 1.376E-11 1.514E-11
    1.589E-11 1.505E-11 1.314E-11 9.663E-12 5.461E-12 2.528E-12 9.308E-13 2.961E-13 8.642E-14 1.447E-14 2.076E-15
    2.456E-15
17  3.515E-17 1.596E-16 7.139E-16 2.624E-15 6.444E-15 1.076E-14 1.608E-14 2.122E-14 2.459E-14 2.521E-14 2.460E-14
    2.579E-14 3.099E-14 4.479E-14 7.581E-14 1.407E-13 2.720E-13 5.273E-13 9.949E-13 1.824E-12 3.295E-12 5.931E-12
    1.072E-11 1.932E-11 3.301E-11 5.189E-11 7.461E-11 1.011E-10 1.349E-10 1.789E-10 2.328E-10 2.999E-10 3.647E-10
    4.213E-10 4.570E-10 4.514E-10 3.780E-10 2.200E-10 8.743E-11 2.993E-11 8.338E-12 2.236E-12 2.905E-13 3.167E-14
    1.055E-14
18  6.518E-17 3.069E-16 1.371E-15 5.047E-15 1.240E-14 2.063E-14 3.064E-14 4.007E-14 4.633E-14 4.862E-14 5.164E-14
    6.113E-14 8.647E-14 1.453E-13 2.736E-13 5.464E-13 1.120E-12 2.288E-12 4.551E-12 8.947E-12 1.772E-11 3.570E-11
    7.361E-11 1.476E-10 2.651E-10 4.438E-10 7.264E-10 1.124E-09 1.698E-09 2.494E-09 3.742E-09 5.391E-09 7.150E-09
    9.243E-09 1.343E-08 1.372E-08 1.538E-08 9.895E-09 2.137E-09 8.727E-10 2.130E-10 5.056E-11 5.314E-12 4.365E-13
    1.184E-13
19  7.236E-17 3.600E-16 1.686E-15 6.453E-15 1.635E-14 2.775E-14 4.203E-14 5.628E-14 6.802E-14 7.952E-14 1.034E-13
    1.496E-13 2.566E-13 4.942E-13 1.015E-12 2.159E-12 4.633E-12 9.808E-12 2.042E-11 4.279E-11 9.198E-11 2.059E-10
    4.609E-10 9.347E-10 1.701E-09 3.060E-09 5.516E-09 9.324E-09 1.561E-08 2.509E-08 4.037E-08 6.471E-08 1.070E-07
    1.581E-07 2.586E-07 3.858E-07 5.820E-07 4.897E-07 1.137E-07 1.404E-08 4.520E-09 9.738E-10 7.639E-11 5.188E-12
    6.148E-13
20  5.812E-17 3.073E-16 1.508E-15 5.973E-15 1.552E-14 2.693E-14 4.199E-14 5.896E-14 7.806E-14 1.107E-13 1.870E-13
    3.239E-13 6.345E-13 1.330E-12 2.890E-12 6.378E-12 1.407E-11 3.080E-11 6.725E-11 1.507E-10 3.503E-10 8.097E-10
    1.731E-09 3.339E-09 6.324E-09 1.269E-08 2.463E-08 4.247E-08 7.350E-08 1.380E-07 2.626E-07 4.332E-07 8.443E-07
    1.546E-06 2.660E-06 4.711E-06 2.059E-05 2.059E-05 3.824E-06 4.862E-07 6.418E-08 1.088E-08 6.993E-10 3.678E-11
    3.586E-12
21  3.829E-17 2.042E-16 1.042E-15 4.217E-15 1.113E-14 1.973E-14 3.192E-14 4.775E-14 7.020E-14 1.169E-13 2.268E-13
    4.192E-13 8.496E-13 1.804E-12 3.929E-12 8.629E-12 1.880E-11 4.036E-11 8.601E-11 1.876E-10 4.208E-10 9.285E-10
    1.898E-09 3.539E-09 6.313E-09 1.126E-08 1.997E-08 3.690E-08 7.073E-08 1.186E-07 2.339E-07 4.280E-07 7.896E-07
    1.515E-06 2.663E-06 4.641E-06 2.059E-05 2.059E-05 3.852E-06 3.518E-07 5.837E-08 1.037E-08 7.087E-10 3.846E-11
    1.663E-12
22  2.431E-17 1.128E-16 5.943E-16 2.429E-15 6.448E-15 1.164E-14 1.963E-14 3.158E-14 5.168E-14 9.762E-14 2.050E-13
    3.892E-13 7.958E-13 1.685E-12 3.635E-12 7.877E-12 1.688E-11 3.535E-11 7.269E-11 1.511E-10 3.200E-10 6.650E-10
    1.284E-09 2.245E-09 3.611E-09 5.370E-09 7.157E-09 9.455E-09 1.349E-08 2.159E-08 3.152E-08 6.558E-08 1.259E-07
    1.781E-07 2.420E-07 4.424E-07 6.223E-07 4.864E-07 1.012E-07 1.465E-08 4.000E-09 9.493E-10 9.395E-11 6.500E-12
    3.847E-13
23  1.323E-17 5.449E-17 2.950E-16 1.207E-15 3.192E-15 5.831E-15 1.025E-14 1.780E-14 3.233E-14 6.763E-14 1.494E-13
    2.872E-13 5.870E-13 1.232E-12 2.617E-12 5.567E-12 1.169E-11 2.387E-11 4.727E-11 9.284E-11 1.830E-10 3.531E-10
    6.348E-10 1.025E-09 1.478E-09 1.950E-09 2.402E-09 2.718E-09 2.455E-09 2.274E-09 3.192E-09 5.444E-09 7.958E-09
    1.317E-08 1.356E-08 1.620E-08 1.435E-08 8.213E-09 2.561E-09 6.215E-10 1.669E-10 4.683E-11 6.428E-12 6.763E-13
    6.123E-14
24  4.064E-18 2.385E-17 1.323E-16 5.374E-16 1.403E-15 2.565E-15 4.682E-15 8.756E-15 1.763E-14 4.029E-14 9.238E-14
    1.787E-13 3.635E-13 7.533E-13 1.571E-12 3.268E-12 6.700E-12 1.333E-11 2.544E-11 4.727E-11 8.647E-11 1.539E-10
    2.570E-10 3.857E-10 5.097E-10 6.078E-10 6.807E-10 6.302E-10 3.392E-10 2.110E-10 1.927E-10 2.741E-10 4.148E-10
    5.879E-10 6.252E-10 5.513E-10 3.704E-10 1.736E-10 6.475E-11 1.945E-11 5.440E-12 1.650E-12 3.227E-13 5.495E-14
    1.094E-14
25  2.107E-18 9.692E-18 5.503E-17 2.199E-16 5.619E-16 1.010E-15 1.894E-15 3.796E-15 8.514E-15 2.120E-14 5.024E-14
    9.746E-14 1.968E-13 4.019E-13 8.207E-13 1.663E-12 3.315E-12 6.404E-12 1.180E-11 2.085E-11 3.559E-11 5.862E-11
    9.098E-11 1.266E-10 1.474E-10 1.367E-10 1.147E-10 7.421E-11 3.313E-11 2.571E-11 2.744E-11 2.391E-11 2.772E-11
    3.462E-11 3.193E-11 2.169E-11 1.144E-11 4.620E-12 1.647E-12 4.840E-13 1.487E-13 5.333E-14 1.426E-14 3.922E-15
    2.393E-15
26  4.674E-19 3.110E-18 1.670E-17 5.103E-17 1.045E-16 1.941E-16 4.835E-16 1.375E-15 3.658E-15 1.008E-14 2.466E-14
    4.788E-14 9.572E-14 1.922E-13 3.833E-13 7.538E-13 1.453E-12 2.709E-12 4.801E-12 8.053E-12 1.282E-11 1.951E-11
    2.784E-11 3.475E-11 3.241E-11 2.078E-11 1.378E-11 7.012E-12 3.331E-12 3.164E-12 3.113E-12 3.250E-12 3.802E-12
    2.909E-12 1.897E-12 9.840E-13 3.950E-13 1.291E-13 3.561E-14 9.698E-15 3.394E-15 1.449E-15 5.152E-16 2.429E-16
    3.182E-16
27  1.509E-19 6.855E-19 3.031E-18 5.968E-18 1.374E-17 4.470E-17 1.379E-16 4.068E-16 1.362E-15 4.427E-15 1.115E-14
    2.157E-14 4.255E-14 8.369E-14 1.623E-13 3.080E-13 5.687E-13 1.013E-12 1.705E-12 2.658E-12 3.797E-12 5.142E-12
    6.459E-12 6.765E-12 3.426E-12 1.780E-12 1.218E-12 6.418E-13 4.397E-13 4.805E-13 3.880E-13 4.065E-13 3.562E-13
    1.936E-13 9.044E-14 3.461E-14 1.059E-14 2.725E-15 6.344E-16 1.558E-16 5.799E-17 2.799E-17 1.317E-17 8.865E-18
    1.201E-17
28  3.276E-20 1.059E-19 3.250E-19 7.373E-19 3.572E-18 1.463E-17 5.307E-17 1.770E-16 5.828E-16 1.866E-15 4.688E-15
    8.964E-15 1.733E-14 3.322E-14 6.230E-14 1.130E-13 1.969E-13 3.304E-13 5.200E-13 7.248E-13 8.093E-13 8.620E-13
    8.132E-13 5.747E-13 2.008E-13 1.299E-13 9.834E-14 6.376E-14 5.861E-14 6.306E-14 5.604E-14 5.675E-14 3.306E-14
    1.277E-14 4.373E-15 1.222E-15 2.740E-16 5.387E-17 1.008E-17 1.975E-18 7.376E-19 3.974E-19 2.323E-19 2.681E-19
    8.002E-19
29  7.175E-21 6.064E-21 1.717E-20 1.232E-19 9.971E-19 4.590E-18 1.830E-17 6.315E-17 1.901E-16 5.342E-16 1.319E-15
    2.460E-15 4.600E-15 8.460E-15 1.497E-14 2.444E-14 3.481E-14 4.891E-14 6.494E-14 7.466E-14 5.529E-14 4.665E-14
    3.140E-14 1.354E-14 5.603E-15 5.305E-15 4.621E-15 3.909E-15 4.186E-15 4.306E-15 3.852E-15 3.091E-15 1.295E-15
    3.446E-16 7.975E-17 1.290E-17 1.182E-18 1.833E-20 -4.768E-20 -1.229E-20 8.562E-22 1.433E-21 1.889E-21 1.240E-20
    2.080E-19
30  5.050E-22 1.741E-22 1.810E-21 2.568E-20 2.264E-19 1.080E-18 4.383E-18 1.489E-17 4.236E-17 1.102E-16 2.432E-16
    4.066E-16 6.696E-16 1.071E-15 1.622E-15 2.179E-15 2.108E-15 2.244E-15 2.105E-15 1.505E-15 1.109E-15 1.006E-15
```

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   6.027E-16 2.499E-16 1.604E-16 1.779E-16 1.688E-16 1.675E-16 1.794E-16 1.695E-16 1.347E-16 8.114E-17 2.345E-17
   3.456E-18 1.914E-19 -5.069E-19 -2.843E-19 -9.900E-20 -2.838E-20 -6.838E-21 -1.396E-21 -2.158E-22 8.528E-23 9.154E-22
   1.827E-20
31  8.095E-24 1.182E-23 2.340E-22 3.366E-21 2.922E-20 1.378E-19 5.480E-19 1.806E-18 4.932E-18 1.124E-17 1.864E-17
   2.595E-17 3.481E-17 4.360E-17 4.794E-17 4.302E-17 3.797E-17 3.900E-17 3.209E-17 2.212E-17 1.730E-17 1.346E-17
   6.862E-18 3.332E-18 3.295E-18 3.772E-18 3.757E-18 3.838E-18 3.726E-18 3.026E-18 1.937E-18 8.047E-19 7.078E-20
  -1.376E-19 -9.399E-20 -4.749E-20 -1.667E-20 -4.503E-21 -9.733E-22 -1.754E-22 -2.974E-23 -7.932E-25 8.274E-24 5.138E-23
   1.288E-21
32  1.350E-24 1.867E-23 2.368E-22 1.835E-21 1.371E-20 3.204E-20 1.590E-19 4.553E-19 1.182E-18 2.251E-18 2.526E-18
   3.128E-18 3.417E-18 4.133E-18 3.868E-18 6.066E-18 3.025E-18 1.298E-18 2.468E-18 1.024E-18 -7.055E-19 -1.461E-18
  -1.796E-18 -6.782E-19 -5.878E-20 3.037E-19 2.577E-19 2.108E-19 2.792E-19 3.501E-19 1.021E-19 1.152E-20 -1.510E-20
  -2.976E-20 -2.384E-20 -1.253E-20 -4.994E-21 -2.021E-21 -5.343E-22 -1.950E-22 -2.169E-23 -8.744E-25 3.765E-24 1.221E-23
   7.369E-23

TOTAL PARTICLES USED IN THE CURRENT STEP =      855
PARTICLES ADDED AT BEGINNING OF THE STEP =       96
PARTICLES REMOVED AT END OF LAST STEP    =      72

         CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  34, TIME STEP   1, STRESS PERIOD   1
         ------------------------------------------------------------------------------

                              IN              OUT
                           ---------       ---------
            CONSTANT CONCENTRATION:  3.730209          -0.1137765E-03
                 CONSTANT HEAD:  0.0000000          -0.3492221E-11
                      WELLS:  0.0000000           0.0000000
           DECAY OR BIODEGRADATION:  0.0000000           -2.517045
             MASS STORAGE (SOLUTE):  0.8952100          -0.2719449
           ------------------------------------------------------------
                       [TOTAL]:  4.625419    LB       -2.789104    LB

                            NET (IN - OUT):  1.836315
                       DISCREPANCY (PERCENT):  49.53293

 ----
 | M T |
 | 3 D | End of Model Output
 ----
```

```
1              U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER MODEL
Scenario 2; Source control/Critical wells 3x intermittent 110 day HfLf          (633, 642, 17349, 17371, 17372)
   1 LAYERS       32 ROWS       45 COLUMNS
  1 STRESS PERIOD(S) IN SIMULATION
 MODEL TIME UNIT IS DAYS
0I/O UNITS:
 ELEMENT OF IUNIT:  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
       I/O UNIT: 11 12  0  0  0  0  0  0 19  0  0 22  0  0  0  0  0  0  0  0 24  0  0
0BAS1 -- BASIC MODEL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT  1
 ARRAYS RHS AND BUFF WILL SHARE MEMORY.
 START HEAD WILL NOT BE SAVED -- DRAWDOWN CANNOT BE CALCULATED
   11601 ELEMENTS IN X ARRAY ARE USED BY BAS
   11601 ELEMENTS OF X ARRAY USED OUT OF 9999999
0BCF2 -- BLOCK-CENTERED FLOW PACKAGE, VERSION 2, 7/1/91 INPUT READ FROM UNIT 11
 STEADY-STATE SIMULATION
 HEAD AT CELLS THAT CONVERT TO DRY=   999.99
 WETTING CAPABILITY IS ACTIVE
 WETTING FACTOR=  1.00000     WETTING ITERATION INTERVAL=   5
 FLAG THAT SPECIFIES THE EQUATION TO USE FOR HEAD AT WETTED CELLS=   0
    LAYER  AQUIFER TYPE
    ---------------
      1      1
    4321 ELEMENTS IN X ARRAY ARE USED BY BCF
   15922 ELEMENTS OF X ARRAY USED OUT OF 9999999
0WEL1 -- WELL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM 12
 MAXIMUM OF   11 WELLS
      44 ELEMENTS IN X ARRAY ARE USED FOR WELLS
   15966 ELEMENTS OF X ARRAY USED OUT OF 9999999
0SIP1 -- STRONGLY IMPLICIT PROCEDURE SOLUTION PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 19
 MAXIMUM OF 100 ITERATIONS ALLOWED FOR CLOSURE
  5 ITERATION PARAMETERS
    6165 ELEMENTS IN X ARRAY ARE USED BY SIP
   22131 ELEMENTS OF X ARRAY USED OUT OF 9999999
1Model P; Source control/Critical wells 3x intermittent 110 day HfLf          (633, 642, 17349, 17371, 17372)
0


                    BOUNDARY ARRAY FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT: (25I3)
                    ------------------------------------------------------------------------
0AQUIFER HEAD WILL BE SET TO  999.99     AT ALL NO-FLOW NODES (IBOUND=0).
0


                    INITIAL HEAD FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT: (10e12.4)
                    ------------------------------------------------------------------------
0HEAD PRINT FORMAT IS FORMAT NUMBER   0    DRAWDOWN PRINT FORMAT IS FORMAT NUMBER   0
0HEADS WILL BE SAVED ON UNIT 30    DRAWDOWNS WILL BE SAVED ON UNIT   0
0OUTPUT CONTROL IS SPECIFIED EVERY TIME STEP
0                              COLUMN TO ROW ANISOTROPY =   1.000000
0


                              DELR WILL BE READ ON UNIT 11 USING FORMAT: (10E12.4)
                    ----------------------------------------------------------

  100.00     100.00     100.00     100.00     50.000     50.000     50.000     50.000     50.000     50.000
  25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000
  25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000
  25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000
  25.000     25.000     50.000     50.000     100.00
0


                              DELC WILL BE READ ON UNIT 11 USING FORMAT: (10E12.4)
                    ----------------------------------------------------------

  100.00     50.000     50.000     50.000     50.000     50.000     25.000     25.000     25.000     25.000
  25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000
  25.000     25.000     25.000     25.000     25.000     25.000     25.000     25.000     50.000     50.000
  100.00     100.00
0
```

```
                HYD. COND. ALONG ROWS FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT: (10e12.4)
                ------------------------------------------------------------------------------
0

                    BOTTOM FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT: (10e12.4)
                ------------------------------------------------------------------------------
0                             WETDRY PARAMETER =  0.1000000     FOR LAYER  1
0


                         SOLUTION BY THE STRONGLY IMPLICIT PROCEDURE
                         -------------------------------------------
0                    MAXIMUM ITERATIONS ALLOWED FOR CLOSURE =      100
                            ACCELERATION PARAMETER =     1.0000
                      HEAD CHANGE CRITERION FOR CLOSURE =    0.10000E-02
                      SIP HEAD CHANGE PRINTOUT INTERVAL =       5
0                      CALCULATE ITERATION PARAMETERS FROM MODEL CALCULATED WSEED
1                     STRESS PERIOD NO.    1, LENGTH =    3650.000
                      ----------------------------------------------

                     NUMBER OF TIME STEPS =     1

                      MULTIPLIER FOR DELT =      1.000

                    INITIAL TIME STEP SIZE =   3650.000
0       11 WELLS
                    LAYER   ROW    COL   STRESS RATE   WELL NO.
                    ----------------------------------------------
                      1     20     35     -577.54         1
                      1      7      5     0.00000         2
                      1      9      5     0.00000         3
                      1      8     14     0.00000         4
                      1     12     11     0.00000         5
                      1     19     11     -51.300         6
                      1     21     13     -9.6000         7
                      1     14     19     -103.00         8
                      1     25     20     -77.000         9
                      1     23     32     0.00000        10
                      1     18     20     -103.00        11
0AVERAGE SEED = 0.00091951
 MINIMUM SEED = 0.00008685
0
   5 ITERATION PARAMETERS CALCULATED FROM AVERAGE SEED:

      0.0000000E+00  0.8258637E+00  0.9696766E+00  0.9947196E+00  0.9990805E+00
0
   21 ITERATIONS FOR TIME STEP    1 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD
CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
--------------------------------------------------------------------------------------------------
  -1.868     ( 1, 31,  2) -0.8410    ( 1,  5,  3) -0.7086    ( 1, 27,  4) -0.7585    ( 1, 11,  6) -0.5936    ( 1, 23, 13)
  0.6925E-01 ( 1, 31, 27)  0.6695E-01 ( 1, 30, 24) -0.5723E-01 ( 1,  6, 20)  0.1823     ( 1, 21, 13)  0.8007E-01 ( 1,  6, 16)
  0.1072E-01 ( 1, 27, 28) -0.1004E-01 ( 1, 13,  9) -0.2107E-01 ( 1, 17, 11) -0.1395E-01 ( 1, 15,  6) -0.1891E-01 ( 1, 23,  8)
  0.2554E-02 ( 1, 31, 17) -0.4455E-02 ( 1, 17, 13) -0.3133E-02 ( 1, 16, 14)  0.6503E-02 ( 1, 25,  8) -0.3449E-02 ( 1, 29, 12)
 -0.6664E-03 ( 1, 24,  9)
0
0HEAD/DRAWDOWN PRINTOUT FLAG = 1     TOTAL BUDGET PRINTOUT FLAG = 0     CELL-BY-CELL FLOW TERM
FLAG = 0
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
  HEAD    DRAWDOWN  HEAD   DRAWDOWN
 PRINTOUT  PRINTOUT  SAVE    SAVE
 ----------------------------------
    1        0        1       0

 HEADS AND FLOW TERMS SAVED ON UNIT 24 FOR USE BY MT3D TRANSPORT MODEL
1               HEAD IN LAYER  1 AT END OF TIME STEP  1 IN STRESS PERIOD  1
      ---------------------------------------------------------------------------
```

```
      1      2      3      4      5      6      7      8      9     10
     11     12     13     14     15     16     17     18     19     20
     21     22     23     24     25     26     27     28     29     30
     31     32     33     34     35     36     37     38     39     40
     41     42     43     44     45
..................................................................................
0 1  18.00  18.08  18.32  18.62  18.84  18.99  19.14  19.29  19.44  19.59
     19.71  19.78  19.86  19.93  20.01  20.08  20.16  20.23  20.31  20.38
     20.46  20.53  20.61  20.68  20.76  20.84  20.91  20.99  21.06  21.14
     21.21  21.29  21.36  21.44  21.51  21.59  21.66  21.74  21.81  21.89
     21.97  22.04  22.15  22.26  22.50
0 2  18.00  18.15  18.36  18.63  18.84  18.98  19.12  19.27  19.41  19.55
     19.65  19.72  19.79  19.87  19.94  20.01  20.08  20.15  20.23  20.30
     20.38  20.45  20.53  20.61  20.69  20.76  20.84  20.92  21.00  21.07
     21.15  21.23  21.30  21.38  21.46  21.53  21.61  21.69  21.77  21.84
     21.92  22.00  22.11  22.26  22.50
0 3  18.00  18.17  18.39  18.64  18.84  18.98  19.11  19.25  19.38  19.52
     19.62  19.68  19.75  19.82  19.89  19.95  20.02  20.09  20.17  20.24
     20.32  20.40  20.47  20.55  20.63  20.71  20.79  20.87  20.95  21.03
     21.11  21.19  21.26  21.34  21.42  21.50  21.58  21.65  21.73  21.81
     21.89  21.97  22.09  22.26  22.50
0 4  18.00  18.18  18.40  18.64  18.84  18.97  19.10  19.23  19.36  19.49
     19.58  19.64  19.70  19.77  19.83  19.90  19.96  20.03  20.10  20.18
     20.26  20.33  20.42  20.50  20.58  20.67  20.75  20.83  20.91  20.99
     21.07  21.15  21.23  21.30  21.38  21.46  21.54  21.62  21.70  21.78
     21.86  21.94  22.07  22.24  22.50
0 5  18.00  18.18  18.40  18.64  18.84  18.96  19.09  19.22  19.34  19.46
     19.54  19.60  19.65  19.71  19.77  19.83  19.89  19.95  20.02  20.10
     20.18  20.27  20.35  20.44  20.53  20.62  20.70  20.79  20.87  20.95
     21.03  21.11  21.19  21.26  21.34  21.42  21.50  21.58  21.66  21.74
     21.83  21.91  22.05  22.23  22.50
0 6  18.00  18.18  18.40  18.64  18.83  18.95  19.08  19.21  19.34  19.44
     19.51  19.56  19.62  19.67  19.72  19.78  19.83  19.89  19.94  20.01
     20.10  20.19  20.28  20.38  20.48  20.57  20.67  20.75  20.84  20.92
     21.00  21.07  21.15  21.23  21.30  21.38  21.46  21.54  21.62  21.70
     21.78  21.87  22.02  22.22  22.50
0 7  18.00  18.18  18.40  18.64  18.82  18.95  19.07  19.20  19.31  19.42
     19.49  19.54  19.59  19.65  19.70  19.75  19.81  19.87  19.93  19.99
     20.06  20.12  20.22  20.34  20.45  20.55  20.65  20.74  20.82  20.90
     20.98  21.05  21.13  21.19  21.26  21.34  21.42  21.51  21.59  21.67
     21.74  21.83  21.96  22.16  22.50
0 8  18.00  18.18  18.40  18.63  18.82  18.94  19.07  19.19  19.30  19.40
     19.48  19.53  19.58  19.63  19.68  19.74  19.79  19.85  19.91  19.98
     20.04  20.10  20.20  20.32  20.44  20.54  20.64  20.73  20.81  20.89
     20.96  21.05  21.12  21.18  21.24  21.31  21.39  21.48  21.56  21.65
     21.73  21.80  21.93  22.11  22.50
0 9  18.00  18.19  18.41  18.63  18.81  18.94  19.06  19.17  19.28  19.38
     19.46  19.51  19.56  19.61  19.67  19.72  19.77  19.83  19.89  19.96
     20.03  20.09  20.19  20.31  20.43  20.54  20.64  20.74  20.81  20.88
     20.95  21.03  21.10  21.16  21.22  21.29  21.37  21.45  21.54  21.63
     21.72  21.79  21.90  22.07  22.50
0 10  18.00  18.19  18.41  18.63  18.81  18.93  19.05  19.16  19.27  19.37
     19.44  19.50  19.55  19.60  19.65  19.70  19.75  19.81  19.87  19.94
     20.02  20.09  20.18  20.31  20.43  20.54  20.64  20.73  20.80  20.86
     20.94  21.02  21.09  21.14  21.21  21.28  21.35  21.43  21.51  21.60
     21.69  21.77  21.89  22.05  22.50
0 11  18.00  18.20  18.41  18.63  18.81  18.93  19.04  19.15  19.26  19.36
     19.43  19.48  19.53  19.58  19.63  19.68  19.73  19.78  19.85  19.92
     20.00  20.09  20.19  20.32  20.45  20.54  20.63  20.71  20.78  20.85
     20.92  21.00  21.07  21.13  21.19  21.26  21.34  21.42  21.50  21.58
     21.67  21.75  21.87  22.03  22.50
0 12  18.00  18.20  18.41  18.64  18.81  18.92  19.03  19.14  19.24  19.34
     19.42  19.46  19.51  19.56  19.61  19.65  19.70  19.75  19.81  19.89
     19.99  20.09  20.20  20.32  20.45  20.55  20.63  20.71  20.78  20.83
     20.89  20.96  21.04  21.10  21.17  21.24  21.32  21.40  21.48  21.56
     21.65  21.73  21.86  22.02  22.50
0 13  18.00  18.20  18.42  18.64  18.81  18.92  19.03  19.13  19.23  19.33
     19.40  19.45  19.50  19.54  19.59  19.63  19.67  19.70  19.74  19.85
     19.97  20.09  20.20  20.33  20.46  20.56  20.62  20.69  20.75  20.81
     20.88  20.94  21.01  21.08  21.14  21.22  21.29  21.38  21.46  21.55
```

	21.63	21.72	21.84	22.01	22.50					
0 14	18.00	18.20	18.42	18.63	18.80	18.91	19.02	19.12	19.22	19.32
	19.39	19.44	19.48	19.53	19.57	19.61	19.64	19.65	19.59	19.80
	19.95	20.08	20.20	20.33	20.47	20.56	20.62	20.68	20.74	20.80
	20.85	20.92	20.98	21.05	21.11	21.19	21.27	21.35	21.44	21.53
	21.61	21.70	21.83	22.00	22.50					
0 15	18.00	18.20	18.42	18.63	18.80	18.91	19.01	19.12	19.21	19.31
	19.37	19.42	19.47	19.52	19.56	19.60	19.64	19.66	19.70	19.81
	19.94	20.07	20.20	20.33	20.46	20.56	20.61	20.67	20.72	20.78
	20.83	20.89	20.95	21.01	21.08	21.16	21.24	21.33	21.42	21.51
	21.60	21.68	21.82	21.99	22.50					
0 16	18.00	18.20	18.42	18.63	18.80	18.91	19.01	19.11	19.21	19.29
	19.36	19.41	19.46	19.51	19.55	19.60	19.64	19.68	19.73	19.81
	19.93	20.06	20.19	20.32	20.46	20.55	20.60	20.66	20.71	20.76
	20.81	20.86	20.91	20.97	21.04	21.12	21.20	21.30	21.39	21.49
	21.58	21.67	21.81	21.98	22.50					
0 17	18.00	18.20	18.42	18.63	18.80	18.90	19.01	19.11	19.20	19.28
	19.34	19.39	19.45	19.50	19.55	19.59	19.64	19.68	19.72	19.77
	19.91	20.05	20.18	20.32	20.45	20.55	20.60	20.65	20.69	20.74
	20.79	20.83	20.87	20.92	20.98	21.07	21.16	21.27	21.37	21.47
	21.56	21.66	21.80	21.98	22.50					
0 18	18.00	18.20	18.41	18.63	18.80	18.90	19.01	19.11	19.20	19.27
	19.31	19.37	19.44	19.49	19.55	19.60	19.64	19.68	19.70	19.66
	19.88	20.04	20.18	20.31	20.45	20.54	20.59	20.64	20.68	20.72
	20.76	20.80	20.83	20.86	20.91	21.01	21.12	21.24	21.35	21.45
	21.55	21.65	21.79	21.97	22.50					
0 19	18.00	18.20	18.41	18.63	18.80	18.90	19.01	19.11	19.20	19.26
	19.25	19.36	19.43	19.49	19.55	19.60	19.65	19.70	19.74	19.79
	19.92	20.05	20.18	20.31	20.44	20.53	20.58	20.63	20.67	20.71
	20.75	20.77	20.79	20.78	20.78	20.93	21.07	21.21	21.33	21.44
	21.54	21.64	21.79	21.97	22.50					
0 20	18.00	18.20	18.41	18.63	18.80	18.91	19.01	19.11	19.20	19.27
	19.32	19.38	19.44	19.50	19.56	19.61	19.66	19.72	19.77	19.85
	19.95	20.06	20.18	20.30	20.43	20.52	20.58	20.62	20.67	20.71
	20.74	20.76	20.76	20.70	20.50	20.85	21.05	21.19	21.32	21.43
	21.54	21.64	21.78	21.97	22.50					
0 21	18.00	18.20	18.41	18.63	18.80	18.91	19.02	19.12	19.21	19.29
	19.35	19.40	19.44	19.51	19.57	19.62	19.68	19.73	19.80	19.87
	19.96	20.07	20.17	20.28	20.40	20.50	20.58	20.62	20.67	20.71
	20.74	20.76	20.78	20.77	20.77	20.92	21.07	21.20	21.32	21.43
	21.54	21.64	21.78	21.97	22.50					
0 22	18.00	18.20	18.41	18.63	18.80	18.91	19.02	19.13	19.22	19.31
	19.38	19.42	19.47	19.53	19.58	19.64	19.69	19.75	19.81	19.88
	19.97	20.06	20.17	20.27	20.38	20.48	20.57	20.63	20.67	20.71
	20.75	20.78	20.81	20.84	20.89	20.99	21.10	21.22	21.33	21.44
	21.54	21.64	21.79	21.97	22.50					
0 23	18.00	18.20	18.40	18.62	18.80	18.91	19.03	19.14	19.24	19.33
	19.40	19.45	19.50	19.55	19.60	19.65	19.70	19.75	19.81	19.87
	19.96	20.06	20.16	20.26	20.36	20.46	20.56	20.63	20.67	20.72
	20.77	20.81	20.85	20.90	20.96	21.04	21.13	21.24	21.34	21.45
	21.55	21.65	21.79	21.98	22.50					
0 24	18.00	18.19	18.40	18.62	18.80	18.92	19.04	19.15	19.26	19.35
	19.42	19.47	19.52	19.57	19.61	19.66	19.71	19.76	19.80	19.84
	19.95	20.05	20.15	20.25	20.35	20.44	20.53	20.61	20.68	20.74
	20.79	20.83	20.88	20.94	21.00	21.07	21.16	21.26	21.36	21.46
	21.56	21.65	21.80	21.99	22.50					
0 25	18.00	18.19	18.39	18.62	18.80	18.92	19.04	19.17	19.28	19.37
	19.44	19.49	19.54	19.58	19.63	19.68	19.72	19.76	19.79	19.76
	19.93	20.05	20.14	20.24	20.33	20.43	20.52	20.61	20.68	20.75
	20.80	20.86	20.91	20.96	21.03	21.10	21.18	21.28	21.37	21.47
	21.57	21.66	21.81	22.00	22.50					
0 26	18.00	18.19	18.39	18.61	18.79	18.93	19.06	19.19	19.30	19.39
	19.46	19.51	19.55	19.60	19.65	19.70	19.74	19.78	19.82	19.86
	19.96	20.06	20.15	20.23	20.31	20.42	20.52	20.61	20.70	20.77
	20.82	20.88	20.94	20.99	21.05	21.13	21.21	21.30	21.39	21.49
	21.58	21.68	21.83	22.04	22.50					
0 27	18.00	18.18	18.38	18.61	18.80	18.94	19.07	19.21	19.32	19.41
	19.48	19.53	19.57	19.62	19.67	19.72	19.76	19.81	19.86	19.91
	19.99	20.07	20.15	20.23	20.32	20.43	20.53	20.62	20.71	20.78
	20.85	20.91	20.96	21.02	21.09	21.16	21.24	21.33	21.42	21.51
	21.61	21.70	21.86	22.08	22.50					

```
0 28  18.00   18.18   18.37   18.61   18.81   18.94   19.08   19.23   19.34   19.43
      19.50   19.54   19.59   19.64   19.69   19.73   19.78   19.83   19.89   19.94
      20.01   20.09   20.17   20.24   20.34   20.45   20.55   20.65   20.73   20.80
      20.87   20.94   21.00   21.06   21.13   21.20   21.28   21.37   21.46   21.55
      21.64   21.74   21.89   22.11   22.50
0 29  18.00   18.17   18.37   18.62   18.82   18.96   19.10   19.25   19.37   19.46
      19.53   19.57   19.62   19.67   19.71   19.76   19.81   19.87   19.92   19.97
      20.05   20.14   20.23   20.32   20.41   20.51   20.60   20.69   20.77   20.85
      20.92   20.99   21.06   21.14   21.21   21.28   21.36   21.45   21.53   21.62
      21.71   21.81   21.95   22.16   22.50
0 30  18.00   18.16   18.38   18.63   18.83   18.97   19.11   19.25   19.39   19.49
      19.56   19.61   19.65   19.70   19.75   19.79   19.86   19.93   20.00   20.08
      20.16   20.25   20.33   20.42   20.50   20.59   20.68   20.76   20.84   20.92
      21.00   21.07   21.15   21.23   21.30   21.38   21.46   21.54   21.62   21.71
      21.80   21.88   22.02   22.21   22.50
0 31  18.00   18.15   18.37   18.63   18.84   18.99   19.13   19.27   19.41   19.54
      19.63   19.69   19.75   19.82   19.88   19.95   20.02   20.09   20.17   20.24
      20.32   20.40   20.48   20.56   20.64   20.72   20.80   20.88   20.96   21.04
      21.12   21.20   21.27   21.35   21.43   21.51   21.59   21.67   21.75   21.83
      21.91   21.99   22.11   22.27   22.50
0 32  18.00   18.08   18.31   18.62   18.85   19.01   19.16   19.32   19.47   19.62
      19.74   19.82   19.89   19.97   20.05   20.13   20.20   20.28   20.36   20.43
      20.51   20.59   20.67   20.74   20.82   20.90   20.98   21.05   21.13   21.21
      21.28   21.36   21.44   21.52   21.59   21.67   21.75   21.82   21.90   21.98
      22.06   22.13   22.25   22.36   22.50
0HEAD WILL BE SAVED ON UNIT 30 AT END OF TIME STEP  1, STRESS PERIOD  1
0


             VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  1
             ---------------------------------------------------------------------------
0        CUMULATIVE VOLUMES      L**3                  RATES FOR THIS TIME STEP      L**3/T
         ------------------                            ------------------------

           IN:                                 IN:
           ---                                 ---
            STORAGE =  0.00000                            STORAGE =  0.00000
        CONSTANT HEAD =  0.45828E+07                        CONSTANT HEAD =   1255.6
              WELLS =  0.00000                            WELLS =  0.00000
0           TOTAL IN =  0.45828E+07                          TOTAL IN =   1255.6
0          OUT:                                  OUT:
           ----                                  ----
            STORAGE =  0.00000                            STORAGE =  0.00000
        CONSTANT HEAD =  0.12220E+07                        CONSTANT HEAD =   334.80
              WELLS =  0.33633E+07                           WELLS =   921.44
0          TOTAL OUT =  0.45853E+07                          TOTAL OUT =   1256.2
0           IN - OUT =  -2515.5                       IN - OUT =  -0.68921
0      PERCENT DISCREPANCY =           -0.05             PERCENT DISCREPANCY =           -0.05


0


       TIME SUMMARY AT END OF TIME STEP  1 IN STRESS PERIOD  1
                  SECONDS       MINUTES       HOURS        DAYS         YEARS
                  -----------------------------------------------------------
    TIME STEP LENGTH       0.315360E+09  0.525600E+07  87600.0      3650.00      9.99316
  STRESS PERIOD TIME       0.315360E+09  0.525600E+07  87600.0      3650.00      9.99316
 TOTAL SIMULATION TIME     0.315360E+09  0.525600E+07  87600.0      3650.00      9.99316
1
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+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+                                                                     +
+                              M T 3 D                                +
+              A Modular Three-Dimensional Transport Model            +
+   For Simulation of Advection, Dispersion and Chemical Reactions    +
+                of Contaminants in Groundwater Systems               +
+                              (V. 1.80)                              +
+                                                                     +
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 -----
| M T | Scenario 2; Source Control/Critical Offsite Wells 3x Intermittent
| 3 D | Half life 110 days for benzene
 -----
THE TRANSPORT MODEL CONSISTS OF    1 LAYER(S)  32 ROW(S)  45 COLUMN(S)
NUMBER OF STRESS PERIOD(S) IN SIMULATION =   1
UNIT FOR TIME IS D  ; UNIT FOR LENGTH IS FT  ; UNIT FOR MASS IS LB
MAJOR TRANSPORT COMPONENTS TO BE SIMULATED:
 1  ADVECTION
 2  DISPERSION
 3  SINK AND SOURCE MIXING
 4  CHEMICAL REACTIONS (DECAY AND/OR SORPTION)

BTN1 -- BASIC TRANSPORT PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  1
  15994 ELEMENTS OF THE  X ARRAY USED BY THE BTN PACKAGE
   1441 ELEMENTS OF THE IX ARRAY USED BY THE BTN PACKAGE

ADV1 -- ADVECTION PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  2
ADVECTION IS SOLVED WITH THE HYBRID [MOC]/[MMOC] SCHEME
COURANT NUMBER ALLOWED IN SOLVING THE ADVECTION TERM =  1.00
MAXIMUM NUMBER OF MOVING PARTICLES ALLOWED =   80000
 320000 ELEMENTS OF THE  X ARRAY USED BY THE ADV PACKAGE
   1440 ELEMENTS OF THE IX ARRAY USED BY THE ADV PACKAGE

DSP1 -- DISPERSION PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  3
   7203 ELEMENTS OF THE  X ARRAY USED BY THE DSP PACKAGE
      0 ELEMENTS OF THE IX ARRAY USED BY THE DSP PACKAGE

SSM1 -- SINK & SOURCE MIXING PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  4
MAJOR STRESS COMPONENTS PRESENT IN THE FLOW MODEL:
 1  WELL
MAXIMUM NUMBER OF POINT SINKS/SOURCES =     165
    990 ELEMENTS OF THE  X ARRAY USED BY THE SSM PACKAGE
      0 ELEMENTS OF THE IX ARRAY BY THE SSM PACKAGE

RCT1 -- CHEMICAL REACTIONS PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  9
NO SORPTION ISOTHERM IS SIMULATED
FIRST-ORDER RATE REACTION [DECAY OR BIODEGRADATION] IS SIMULATED
      2 ELEMENTS OF THE  X ARRAY USED BY THE RCT PACKAGE
      0 ELEMENTS OF THE IX ARRAY USED BY THE RCT PACKAGE

..........................................................
 344190 ELEMENTS OF THE  X ARRAY USED OUT OF  9999999
   2882 ELEMENTS OF THE IX ARRAY USED OUT OF  9999999
..........................................................

LAYER NUMBER  AQUIFER TYPE
------------  ------------
     1             1

              WIDTH ALONG ROWS (DELR)  READ ON UNIT  1 USING FORMAT: "(10E12.4)        "
              ------------------------------------------------------------------

              WIDTH ALONG COLS (DELC)  READ ON UNIT  1 USING FORMAT: "(10E12.4)        "
              ------------------------------------------------------------------

              TOP ELEV. OF 1ST LAYER   READ ON UNIT  1 USING FORMAT: "(10E12.4)        "
              ------------------------------------------------------------------

                   CELL THICKNESS (DZ)     =  100.0000     FOR LAYER  1
                   EFFECTIVE POROSITY      =  0.2500000    FOR LAYER  1
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CONCN. BOUNDARY ARRAY    FOR LAYER  1 READ ON UNIT  1 USING FORMAT: "(25I3)                "
----------------------------------------------------------------------

        1     2     3     4     5     6     7     8     9    10
       11    12    13    14    15    16    17    18    19    20
       21    22    23    24    25    26    27    28    29    30
       31    32    33    34    35    36    37    38    39    40
       41    42    43    44    45
....................................................................
  1     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  2     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  3     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  4     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  5     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  6     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  7     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  8     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
  9     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
 10     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
 11     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
 12     1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1
 13     1     1     1     1     1     1     1     1     1     1
```

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      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
14     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
15     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
16     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
17     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
18     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
19     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
20     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1   -1   -1    1    1
      1    1    1    1    1
21     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1   -1   -1    1    1
      1    1    1    1    1
22     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
23     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
24     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
25     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
26     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1
27     1    1    1    1    1    1    1    1    1    1
      1    1    1    1    1    1    1    1    1    1
```

```
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1
  28     1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1
  29     1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1
  30     1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1
  31     1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1
  32     1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1     1     1     1     1     1
         1     1     1     1     1

          INITIAL CONCENTRATION   FOR LAYER  1 READ ON UNIT  1 USING FORMAT: "(10E12.4)
          ------------------------------------------------------------------

 VALUE INDICATING INACTIVE CONCENTRATION CELLS =  999.9900


 OUTPUT CONTROL OPTIONS
 --------------------

 PRINT CELL CONCENTRATION USING FORMAT CODE:    1
 DO NOT PRINT PARTICLE NUMBER IN EACH CELL
 DO NOT PRINT RETARDATION FACTOR
 DO NOT PRINT DISPERSION COEFFICIENT
 SAVE CONCENTRATION IN UNFORMATTED FILE [MT3D.UCN] ON UNIT 18

 NUMBER OF TIMES AT WHICH SIMULATION RESULTS ARE SAVED =    4
 TOTAL ELAPSED TIMES AT WHICH SIMULATION RESULTS ARE SAVED:
   365.00     730.00     1460.0     2190.0

 NUMBER OF OBSERVATION POINTS =    6
 CONCENTRATION AT OBSERVATION POINTS SAVED IN FILE [MT3D.OBS] ON UNIT 17
 LOCATION OF OBSERVATION POINTS
 ..............................
 NUMBER  LAYER  ROW  COLUMN
   1      1    14    19
   2      1    19    11
   3      1    21    13
   4      1    25    30
   5      1    12    11
   6      1    18    20

 A ONE-LINE SUMMRY OF MASS BALANCE FOR EACH STEP WILL NOT BE SAVED

 MAXIMUM LENGTH ALONG THE X (J) AXIS =    1700.000
 MAXIMUM LENGTH ALONG THE Y (I) AXIS =    1200.000
 MAXIMUM LENGTH ALONG THE Z (K) AXIS =    100.0000


 ADVECTION SOLUTION OPTIONS
 --------------------

 METHOD FOR PARTICLE TRACKING IS [MIXED ORDER]
```

```
CONCENTRATION WEIGHTING FACTOR =    0.500
THE CONCENTRATION GRADIENT CONSIDERED NEGLIGIBLE [DCEPS] = 0.1000000E-04
INITIAL PARTICLES ARE PLACED RANDOMLY WITHIN CELL BLOCK
PARTICLE NUMBER PER CELL IF DCCELL =< DCEPS =   0
PARTICLE NUMBER PER CELL IF DCCELL  > DCEPS =  16
MINIMUM PARTICLE NUMBER ALLOWD PER CELL     =   2
MAXIMUM PARTICLE NUMBER ALLOWD PER CELL     =  32
MULTIPLIER OF PARTICLE NUMBER AT SOURCE     = 1.00
SCHEME FOR CONCENTRATION INTERPOLATION IS [LINEAR]
PARTICLES FOR APPROXIMATING A SINK CELL IN THE [MMOC] SCHEME
ARE PLACED RANDOMLY WITHIN CELL BLOCK
NUMBER OF PARTICLES USED TO APPROXIMATE A SINK CELL IN THE [MMOC] SCHEME =  16
CRITICAL CONCENTRATION GRADIENT USED IN THE "HMOC" SCHEME [DCHMOC] = 0.5000E-02
THE "MOC"  SOLUTION IS USED WHEN DCCELL  > DCHMOC
THE "MMOC" SOLUTION IS USED WHEN DCCELL =< DCHMOC


DISPERSION PARAMETERS
---------------------

                    LONG. DISPERSIVITY (AL) =  10.00000    FOR LAYER  1

              H. TRANS./LONG. DISP.   READ ON UNIT  3 USING FORMAT: "(10E12.4)       "
              -----------------------------------------------------------

              V. TRANS./LONG. DISP.   READ ON UNIT  3 USING FORMAT: "(10E12.4)       "
              -----------------------------------------------------------

              DIFFUSION COEFFICIENT   READ ON UNIT  3 USING FORMAT: "(10E12.4)       "
              -----------------------------------------------------------


SORPTION AND 1ST ORDER RATE REACTION PARAMETERS
-----------------------------------------------


              DISSOLVED RATE CONSTANT  READ ON UNIT  9 USING FORMAT: "(10E12.4)       "
              -----------------------------------------------------------

              SORBED RATE CONSTANT    READ ON UNIT  9 USING FORMAT: "(10E12.4)       "
              -----------------------------------------------------------

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE REACTION TERM
 = 79.37    AT K=   1, I=   1, J=   1


                 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                               STRESS PERIOD NO.  001
                 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++


LENGTH OF CURRENT STRESS PERIOD =   2190.000
NUMBER OF TIME STEPS FOR CURRENT STRESS PERIOD =    1
TIME STEP MULTIPLIER =   1.000000
USER-SPECIFIED TRANSPORT STEPSIZE =  0.0000000    D
MAXIMUM NUMBER OF TRANSPORT STEPS ALLOWED  IN ONE TIME STEP =      1000

NO. OF POINT SINKS/SOURCES OF SPECIFIED CONCONCENTRATIONS =    0 IN STRESS PERIOD  1


                   ================================================
                               TIME STEP NO.  001
                   ================================================

FROM TIME =  0.00000     TO    2190.0

            "HEAD          " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
            ----------------------------------------------------------------

            "QXX           " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
```

```
                 ------------------------------------------------------------
                 "QYY         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
                 ------------------------------------------------------------

 MAXIMUM STEPSIZE DURING WHICH ANY PARTICLE CANNOT MOVE MORE THAN ONE CELL
 = 14.57   (WHEN MIN. R.F.=1)  AT K=   1, I=  20, J=  36

                 "CNH         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
                 ------------------------------------------------------------

                 "WEL         " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
                 ------------------------------------------------------------


 TOTAL NUMBER OF POINT SOURCES/SINKS PRESENT IN THE FLOW MODEL =   156

 MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE SINK & SOURCE TERM
 = 186.7   (WHEN MIN. R.F.=1)  AT K=   1, I=  20, J=  45

 MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE DISPERSION TERM
 = 8.013   (WHEN MIN. R.F.=1)  AT K=   1, I=  20, J=  35


                          ----------------------------
                           TRANSPORT STEP NO.   46
                          ----------------------------

 TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   365.0000    D
 .....................................................................

                 CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP   46, TIME STEP  1, STRESS PERIOD  1
                 ------------------------------------------------------------

        1      2      3      4      5      6      7      8      9     10     11
       12     13     14     15     16     17     18     19     20     21     22
       23     24     25     26     27     28     29     30     31     32     33
       34     35     36     37     38     39     40     41     42     43     44
       45
 ..............................................................................................................
   1 -3.358E-40 -8.277E-41 -3.806E-42 -2.347E-41 -1.645E-39 -7.874E-39 -1.240E-37 -8.641E-37 -2.967E-36  2.178E-35  1.918E-34
     -3.634E-34 -5.768E-33 -1.155E-34  1.524E-32 -3.217E-33 -5.154E-32 -2.738E-32  7.272E-32  1.763E-32 -4.749E-32 -5.158E-32
      4.210E-33  1.027E-32  1.447E-33 -3.818E-33 -2.661E-33 -9.012E-34 -2.731E-34  1.320E-34  3.920E-34 -6.961E-34 -2.235E-33
     -7.850E-34  1.915E-33  2.347E-32  3.799E-31  5.743E-30  7.945E-29  1.399E-27  7.753E-27  6.461E-26  1.066E-24  4.199E-24
      1.622E-23
   2 -2.202E-39  1.024E-42 -7.006E-45  5.970E-43  4.311E-41  1.973E-39  4.233E-38 -1.764E-37 -2.283E-35 -1.613E-34  1.863E-33
      7.468E-33 -3.589E-32 -3.850E-32  1.819E-31  6.688E-32 -5.581E-31 -1.715E-31  6.943E-31  2.637E-31 -6.574E-31 -4.223E-31
      1.446E-31  1.649E-31 -1.467E-32 -6.405E-32 -2.512E-32 -5.021E-33 -1.251E-33  1.404E-33  4.734E-33 -5.870E-35 -1.326E-32
     -8.927E-33  1.141E-32  1.302E-32 -1.017E-33  4.047E-32  6.598E-31  9.707E-30  1.791E-28  3.797E-27  9.864E-26  2.985E-24
      1.819E-22
   3 -2.606E-38  2.035E-42 -3.442E-42 -3.727E-41  7.022E-40 -1.678E-37 -1.079E-35 -2.390E-34 -7.497E-34  4.984E-32  3.167E-31
     -1.613E-30 -8.003E-30  1.918E-29  3.180E-29 -9.679E-29 -9.054E-29  1.713E-28  1.358E-28 -1.978E-28 -1.979E-28  4.228E-29
      8.676E-29  1.136E-30 -3.660E-29 -1.650E-29 -3.091E-30 -3.386E-31  2.846E-31  6.479E-31 -1.389E-31 -2.944E-30 -2.865E-30
      3.297E-30  6.337E-30 -5.747E-31 -5.480E-30 -2.497E-30 -2.226E-30  5.641E-29  2.112E-27  4.532E-26  1.060E-24  4.446E-23
      6.855E-21
   4 -2.465E-37 -1.111E-40 -2.803E-40 -2.890E-38 -2.049E-36 -5.081E-35 -1.878E-34  2.348E-32  5.905E-31  2.545E-30 -6.889E-29
     -3.421E-28  7.109E-28  4.470E-27 -8.435E-27 -1.945E-26  2.376E-26  3.660E-26 -3.839E-26 -5.957E-26  5.648E-27  3.146E-26
      3.521E-27 -1.591E-26 -8.374E-27 -1.638E-27 -1.644E-28  2.546E-29  4.196E-29 -1.084E-28 -4.109E-28 -3.904E-28  7.529E-28
      1.781E-27  9.839E-29 -2.485E-27 -1.714E-27 -7.189E-28 -8.348E-28  1.616E-27  3.061E-26  5.027E-25  1.189E-23  5.477E-22
      4.399E-20
   5 -2.618E-36 -2.018E-39  1.331E-39  8.647E-37  1.901E-34  9.343E-33  2.381E-31  1.978E-30 -5.217E-29 -1.371E-27 -4.743E-27
      3.790E-26  1.837E-25 -2.878E-25 -2.232E-24  1.674E-24  5.959E-24 -4.230E-24 -1.184E-23 -6.247E-25  7.484E-24  2.139E-24
     -5.256E-24 -3.476E-24 -7.424E-25 -8.050E-26 -3.596E-27 -6.355E-28 -1.696E-26 -3.517E-26  3.956E-27  1.421E-25  3.020E-25
     -2.321E-26 -7.655E-25 -7.343E-25 -1.497E-25 -2.043E-26  1.874E-25  6.372E-25  8.313E-25  4.716E-24  1.279E-22  6.173E-21
      3.043E-19
   6 -2.571E-35  5.415E-38  9.198E-36  5.954E-34  1.199E-32 -4.686E-31 -3.385E-29 -9.213E-28 -1.017E-26  1.038E-25  1.539E-24
      3.209E-24 -1.770E-23 -8.598E-23  5.215E-23  6.042E-22 -2.091E-22 -1.441E-21 -1.666E-22  8.926E-22  6.335E-22 -1.180E-21
     -1.087E-21 -2.698E-22 -3.231E-23 -2.127E-24 -3.011E-25 -7.216E-25 -7.900E-25  5.640E-24  1.769E-23  1.740E-23 -3.807E-23
     -1.685E-22 -1.681E-22 -5.262E-25  1.183E-22  1.426E-22  2.364E-22  2.440E-22  1.294E-22  1.313E-22  2.065E-21  6.318E-20
      1.093E-18
   7 -2.955E-34 -2.696E-35 -1.157E-33 -1.049E-31 -4.722E-30 -8.981E-29 -2.880E-28  4.546E-26  1.382E-24  9.149E-24 -2.915E-23
```

```
   -4.527E-22 -1.511E-21  1.335E-21  1.858E-20  6.938E-21 -1.288E-19 -4.865E-20  1.293E-19  6.583E-20 -1.061E-19 -1.675E-19
   -5.676E-20 -8.488E-21 -5.972E-22  7.586E-24  3.712E-23  1.031E-22  3.462E-22  7.164E-22 -1.701E-21 -8.178E-21 -1.592E-20
   -1.030E-20  1.827E-20  4.262E-20  5.307E-20  5.467E-20  5.659E-20  2.767E-20  1.434E-20  1.186E-20  3.163E-20  4.198E-19
    4.856E-18
 8 -3.393E-33 -3.099E-33 -2.461E-32  4.920E-30  2.568E-28  7.118E-27  1.910E-25  1.851E-24 -1.131E-23 -4.197E-22 -3.380E-21
   -7.195E-21  2.771E-20  2.227E-19  3.017E-19 -2.095E-18 -4.933E-18  4.766E-18  8.443E-18 -3.746E-18 -1.096E-17 -6.396E-18
   -1.204E-18 -1.030E-19  4.209E-21  3.851E-21  3.307E-21 -2.879E-21 -3.572E-20 -1.876E-19 -5.760E-19 -8.885E-19 -5.055E-19
    1.356E-18  2.971E-18  3.508E-18  3.130E-18  2.397E-18  1.720E-18  9.463E-19  5.644E-19  3.755E-19  2.657E-19  3.002E-18
    4.987E-17
 9 -4.612E-32 -9.590E-32 -6.590E-30 -3.954E-28 -1.721E-26 -4.583E-25 -8.078E-24 -9.691E-23 -7.910E-22 -2.364E-21  3.266E-20
    3.050E-19  1.250E-18  5.312E-19 -2.083E-17 -7.761E-17  2.245E-17  3.569E-16  4.159E-17 -6.064E-16 -5.027E-16 -1.428E-16
   -1.479E-17  5.444E-19  1.244E-18  2.310E-19 -1.904E-19 -1.463E-18 -1.064E-17 -2.272E-17 -1.827E-17  6.138E-18  5.980E-17
    1.428E-16  1.674E-16  1.440E-16  1.055E-16  6.957E-17  4.400E-17  2.782E-17  1.908E-17  1.002E-17  7.946E-18  2.678E-17
    2.437E-16
10 -8.062E-31  4.349E-32  2.249E-29  2.240E-27  1.133E-25  2.645E-24  5.250E-23  8.970E-22  1.258E-20  1.362E-19  7.296E-19
    3.807E-19 -1.915E-17 -1.383E-16 -4.272E-16  4.852E-17  4.473E-15  5.496E-15 -1.621E-14 -2.592E-14 -1.297E-14 -1.981E-15
    3.688E-17  1.690E-16  2.074E-16  3.382E-17 -4.131E-17 -2.808E-16 -4.929E-16 -3.198E-16  4.958E-16  1.848E-15  4.707E-15
    5.272E-15  4.350E-15  3.085E-15  1.978E-15  1.174E-15  6.677E-16  3.747E-16  2.176E-16  1.222E-16  6.859E-17  1.701E-16
    1.097E-15
11 -5.653E-30 -1.363E-30 -2.322E-28 -1.955E-26 -8.685E-25 -1.904E-23 -3.738E-22 -6.818E-21 -1.160E-19 -1.806E-18 -1.826E-17
   -9.044E-17 -3.207E-16 -4.865E-16  2.511E-15  2.144E-14  5.597E-14 -1.543E-13 -5.565E-13 -4.693E-13 -1.951E-13 -3.588E-14
    1.052E-14  9.718E-15  9.087E-15  4.902E-15 -2.290E-15 -3.784E-15  2.709E-15  1.762E-14  3.859E-14  6.296E-14  9.564E-14
    8.543E-14  6.340E-14  4.224E-14  2.604E-14  1.517E-14  8.581E-15  4.733E-15  2.541E-15  1.327E-15  5.869E-16  8.189E-16
    2.827E-15
12 -3.333E-29  5.495E-29  4.645E-27  2.895E-25  1.025E-23  1.859E-22  2.821E-21  3.565E-20  3.619E-19  3.069E-18  2.601E-17
    1.955E-16  1.488E-15  9.248E-15  4.158E-14  8.949E-14 -4.514E-13 -4.384E-12 -4.651E-12 -2.866E-12 -1.196E-12 -1.595E-13
    2.310E-13  3.145E-13  4.037E-13  3.893E-13  9.775E-14  2.062E-13  5.403E-13  7.500E-13  8.581E-13  8.978E-13  9.177E-13
    8.343E-13  6.179E-13  4.140E-13  2.635E-13  1.620E-13  9.621E-14  5.392E-14  2.813E-14  1.399E-14  5.183E-15  4.030E-15
    9.175E-15
13 -2.968E-28 -2.127E-27 -1.181E-25 -5.766E-24 -1.866E-22 -3.385E-21 -5.639E-20 -8.406E-19 -1.095E-17 -1.153E-16 -6.850E-16
   -1.846E-15 -1.697E-15  3.895E-15 -4.430E-14 -9.350E-13 -7.334E-12 -2.783E-11  1.440E-11  1.929E-12 -2.034E-13  2.009E-12
    3.424E-12  4.950E-12  6.432E-12  6.274E-12  4.810E-12  6.313E-12  8.775E-12  1.047E-11  1.020E-11  9.242E-12  8.005E-12
    6.415E-12  4.688E-12  3.330E-12  2.370E-12  1.623E-12  1.025E-12  5.798E-13  2.929E-13  1.380E-13  4.294E-14  1.925E-14
    4.349E-14
14 -2.594E-27  1.628E-27  1.121E-25  5.995E-24  2.113E-22  4.564E-21  1.018E-19  2.263E-18  4.860E-17  9.372E-16  1.078E-14
    5.874E-14  2.386E-13  6.872E-13  8.745E-13 -4.583E-12 -3.539E-11 -8.018E-11  2.433E-10  6.978E-11  4.595E-11  5.144E-11
    5.580E-11  6.006E-11  6.660E-11  7.319E-11  8.543E-11  9.751E-11  1.026E-10  9.658E-11  8.228E-11  6.692E-11  5.269E-11
    4.007E-11  3.094E-11  2.592E-11  2.191E-11  1.647E-11  1.062E-11  5.878E-12  2.822E-12  1.250E-12  3.494E-13  1.230E-13
    2.841E-13
15 -1.932E-26 -7.078E-26 -2.676E-24 -7.273E-23 -6.571E-22  1.291E-20  5.757E-19  1.394E-17  2.487E-16  2.534E-15 -1.411E-14
   -3.448E-13 -2.999E-12 -1.697E-11 -7.249E-11 -2.375E-10 -5.305E-10 -2.990E-10  1.596E-09  8.095E-10  8.234E-10  9.331E-10
    9.769E-10  1.004E-09  1.037E-09  1.078E-09  1.065E-09  9.584E-10  7.971E-10  6.247E-10  4.759E-10  3.602E-10  2.732E-10
    2.210E-10  2.073E-10  2.225E-10  2.153E-10  1.643E-10  1.041E-10  5.534E-11  2.461E-11  1.010E-11  2.532E-12  6.795E-13
    9.038E-13
16 -6.730E-26  7.256E-25  3.840E-23  1.732E-21  5.034E-20  7.940E-19  1.043E-17  9.444E-17 -2.313E-16 -4.251E-14 -9.025E-13
   -6.315E-12 -3.238E-11 -1.286E-10 -4.069E-10 -9.799E-10 -1.430E-09  3.231E-10  5.107E-09  9.459E-09  1.227E-08  1.256E-08
    1.246E-08  1.155E-08  1.061E-08  9.181E-09  7.399E-09  5.534E-09  4.008E-09  2.876E-09  2.080E-09  1.536E-09  1.255E-09
    1.265E-09  1.590E-09  2.042E-09  2.071E-09  1.532E-09  9.939E-10  4.926E-10  1.896E-10  7.284E-11  1.680E-11  3.609E-12
    3.257E-12
17 -7.925E-25 -1.678E-23 -8.553E-22 -3.865E-20 -1.172E-18 -2.009E-17 -3.190E-16 -4.665E-15 -6.439E-14 -8.580E-13 -8.233E-12
   -3.885E-11 -1.430E-10 -4.386E-10 -1.125E-09 -2.286E-09 -3.175E-09 -1.389E-09  6.810E-09  6.122E-08  9.072E-08  9.462E-08
    9.914E-08  6.146E-08  3.984E-08  3.687E-08  2.788E-08  2.065E-08  1.472E-08  1.026E-08  7.378E-09  5.781E-09  6.187E-09
    7.987E-09  1.324E-08  1.688E-08  1.853E-08  1.380E-08  1.046E-08  3.643E-09  1.308E-09  4.938E-10  1.014E-10  1.863E-11
    1.051E-11
18 -5.131E-25  2.888E-24  1.417E-22  6.187E-21  1.829E-19  3.059E-18  4.721E-17  6.663E-16  8.844E-15  1.160E-13  3.320E-13
    9.970E-12  5.063E-11  2.042E-10  7.273E-10  2.407E-09  7.772E-09  2.491E-08  1.054E-07  4.057E-07  4.685E-07  4.796E-07
    4.102E-07  3.998E-07  2.599E-07  2.090E-07  1.421E-07  7.133E-08  3.639E-08  3.810E-08  2.401E-08  2.138E-08  2.839E-08
    4.271E-08  8.425E-08  8.404E-08  1.393E-07  1.190E-07  5.630E-08  2.166E-08  9.998E-09  3.032E-09  5.265E-10  7.849E-11
    3.726E-11
19 -1.680E-24 -2.786E-23 -1.346E-21 -5.721E-20 -1.622E-18 -2.596E-17 -3.860E-16 -5.339E-15 -7.158E-14 -1.008E-12 -2.424E-11
   -9.186E-11 -2.193E-10 -4.855E-10 -8.112E-10 -3.600E-10  3.219E-09  1.332E-08  1.049E-07  5.378E-07  1.130E-06  1.299E-06
    1.367E-06  1.049E-06  8.626E-07  7.216E-07  4.598E-07  2.168E-07  1.556E-07  9.860E-08  6.000E-08  4.976E-08  4.803E-08
    2.029E-07  5.275E-07  8.890E-07  1.585E-06  1.428E-06  4.646E-07  1.119E-07  3.094E-08  1.403E-08  2.193E-09  2.858E-10
    8.570E-11
20 -3.444E-25  2.485E-24  1.272E-22  5.816E-21  1.662E-19  2.396E-18  2.723E-17  1.637E-16 -2.927E-15 -1.669E-13 -5.618E-12
   -3.402E-11 -1.304E-10 -3.809E-10 -8.686E-10 -1.126E-09  1.232E-09  8.762E-09  3.438E-08  2.406E-07  6.057E-07  9.549E-07
    1.111E-06  1.035E-06  8.912E-07  7.278E-07  5.422E-07  5.124E-07  3.413E-07  3.105E-07  2.295E-07  1.878E-07  1.464E-07
    8.117E-07  3.343E-06  6.793E-06  2.059E-05  2.059E-05  3.890E-06  6.225E-07  1.234E-07  4.577E-08  6.576E-09  7.753E-10
    1.556E-10
21 -5.331E-26 -6.180E-25 -2.232E-23 -5.963E-22 -4.871E-21  1.238E-19  4.857E-18  1.137E-16  2.170E-15  3.299E-14  3.087E-14
   -1.805E-12 -2.393E-11  8.796E-12  1.654E-11  5.199E-11  4.995E-10  3.738E-09  1.864E-08  8.048E-08  1.599E-07  3.315E-07
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    3.833E-07 3.791E-07 2.901E-07 1.397E-07 9.142E-08 7.435E-08 5.434E-08 4.695E-08 3.021E-08 2.470E-08 3.078E-08
    2.157E-07 1.724E-06 5.944E-06 2.059E-05 2.059E-05 3.519E-06 6.259E-07 1.298E-07 4.940E-08 6.607E-09 7.767E-10
    1.344E-10
 22 -2.064E-26 -7.244E-26 -4.112E-24 -2.073E-22 -6.974E-21 -1.226E-19 -1.768E-18 -1.940E-17 -1.226E-16 9.822E-16 2.281E-14
    1.099E-13 -1.071E-13 2.770E-12 1.586E-11 7.545E-11 3.386E-10 1.396E-09 4.743E-09 1.240E-08 2.546E-08 5.495E-08
    7.829E-08 7.198E-08 3.789E-08 1.850E-08 9.246E-09 8.100E-09 7.537E-09 6.143E-09 4.938E-09 3.111E-09 1.027E-09
    7.855E-09 4.458E-08 2.462E-07 1.597E-06 1.494E-06 5.429E-07 1.209E-07 3.029E-08 1.349E-08 2.138E-09 2.986E-10
    9.575E-11
 23 -1.816E-27 3.539E-27 2.623E-25 1.684E-23 6.019E-22 9.691E-21 1.152E-19 8.353E-19 1.102E-18 -1.654E-17 4.296E-16
    5.170E-15 2.591E-14 3.780E-13 3.000E-12 1.881E-11 1.005E-10 4.539E-10 1.622E-09 4.113E-09 6.665E-09 9.100E-09
    1.052E-08 1.013E-08 7.195E-09 3.689E-09 1.947E-09 1.235E-09 7.084E-10 6.381E-10 5.551E-10 7.038E-11 -1.316E-09
   -2.159E-09 -4.065E-10 5.499E-09 1.033E-07 1.095E-07 5.227E-08 1.697E-08 8.291E-09 2.663E-09 4.798E-10 8.310E-11
    5.120E-11
 24 -3.320E-28 -1.006E-27 -6.097E-26 -3.168E-24 -9.423E-23 -1.274E-21 -1.277E-20 -9.241E-20 -6.507E-19 -6.051E-18 -2.518E-17
    6.195E-17 1.900E-15 3.660E-14 3.904E-13 3.115E-12 2.041E-11 1.112E-10 4.789E-10 1.303E-09 1.158E-09 1.166E-09
    1.271E-09 1.256E-09 9.677E-10 5.267E-10 2.760E-10 1.346E-10 4.438E-11 7.977E-11 1.485E-10 2.010E-10 2.352E-10
    3.226E-10 1.069E-09 3.564E-09 9.065E-09 8.848E-09 5.846E-09 2.189E-09 8.657E-10 3.522E-10 8.060E-11 1.898E-11
    1.842E-11
 25 -6.974E-29 -4.361E-29 -1.241E-27 2.823E-26 2.252E-24 3.185E-23 9.541E-23 -5.215E-21 -1.586E-19 -3.527E-18 -5.142E-17
   -3.981E-16 -2.729E-15 -1.539E-14 -6.825E-14 -2.096E-13 -1.415E-13 3.445E-12 3.787E-11 2.432E-10 9.925E-11 8.813E-11
    1.133E-10 1.352E-10 1.090E-10 4.488E-11 1.373E-11 1.858E-12 -1.825E-12 -1.865E-12 4.311E-12 1.492E-11 3.082E-11
    6.423E-11 1.469E-10 3.581E-10 6.203E-10 6.504E-10 4.437E-10 2.194E-10 9.323E-11 3.979E-11 1.104E-11 3.561E-12
    6.454E-12
 26 -2.547E-30 1.282E-31 2.929E-29 8.614E-28 7.792E-27 7.201E-25 4.680E-23 1.534E-21 2.827E-20 4.086E-19 3.927E-18
    1.814E-17 1.838E-17 -5.788E-16 -6.307E-15 -3.978E-14 -1.724E-13 -4.180E-13 1.490E-12 2.311E-11 1.035E-11 5.533E-12
    6.864E-12 9.454E-12 6.496E-12 1.062E-12 2.405E-13 7.875E-14 -6.711E-14 -5.048E-13 -9.506E-13 -1.188E-12 -2.066E-12
   -3.611E-12 1.917E-13 1.534E-11 3.640E-11 4.447E-11 3.522E-11 2.023E-11 9.385E-12 4.045E-12 1.229E-12 6.273E-13
    1.550E-12
 27 -1.613E-31 2.856E-32 5.248E-31 -3.074E-29 -3.129E-27 -1.410E-25 -4.590E-24 -1.126E-22 -1.555E-21 -5.264E-21 1.415E-19
    1.958E-18 1.600E-17 8.385E-17 2.041E-16 -1.163E-15 -1.724E-14 -1.028E-13 -2.526E-13 9.068E-13 6.354E-13 2.239E-13
    1.656E-13 1.964E-13 1.367E-13 6.205E-14 1.163E-14 2.839E-15 3.165E-15 4.001E-15 -7.142E-15 -5.109E-14 -1.920E-13
   -6.131E-13 -8.515E-13 -1.684E-13 1.077E-12 1.929E-12 1.880E-12 1.272E-12 6.678E-13 3.053E-13 1.007E-13 8.727E-14
    5.423E-13
 28 -4.847E-32 7.860E-34 1.903E-32 1.586E-30 9.716E-29 2.280E-27 1.556E-27 -2.955E-24 -1.519E-22 -3.445E-21 -3.706E-20
   -1.707E-19 -2.456E-19 3.370E-18 3.711E-17 2.003E-16 3.877E-16 -2.694E-15 -1.843E-14 1.210E-14 1.866E-14 7.975E-15
    3.331E-15 3.922E-15 3.493E-15 2.058E-15 6.693E-16 1.060E-16 1.550E-18 2.200E-17 2.581E-16 1.903E-15 4.881E-15
   -1.502E-14 -6.667E-14 -7.425E-14 -1.171E-14 4.848E-14 7.127E-14 5.943E-14 3.550E-14 1.675E-14 5.426E-15 7.142E-15
    1.313E-13
 29 -8.176E-33 1.360E-35 4.240E-34 5.448E-32 6.019E-30 3.139E-28 1.339E-26 4.487E-25 1.046E-23 1.119E-22 1.833E-22
   -5.450E-21 -6.116E-20 -3.423E-19 -9.218E-19 1.921E-18 2.654E-17 6.693E-17 -2.466E-16 -1.964E-16 9.802E-17 1.175E-16
    3.278E-17 2.466E-17 4.179E-17 3.358E-17 1.641E-17 4.793E-18 1.061E-18 -2.630E-18 -2.989E-17 -5.877E-17 2.117E-16
    5.358E-16 -2.123E-16 -1.879E-15 -1.979E-15 -6.095E-16 5.295E-16 8.634E-16 6.921E-16 3.753E-16 1.861E-16 1.217E-15
    2.857E-14
 30 -4.408E-34 -2.646E-37 -3.787E-35 -4.647E-33 -3.267E-31 -1.140E-29 -3.066E-28 -6.121E-27 -8.579E-26 8.926E-25 3.413E-23
    2.586E-22 1.015E-21 3.406E-22 -2.268E-20 -1.131E-19 -7.584E-20 1.210E-18 -7.930E-20 -3.419E-18 -1.058E-18 7.686E-19
    4.028E-19 -1.434E-19 6.993E-20 2.533E-19 2.020E-19 8.745E-20 3.799E-20 1.555E-19 8.422E-20 -2.350E-18 -2.969E-18
    5.377E-18 1.150E-17 -1.262E-18 -2.229E-17 -2.234E-17 -7.911E-18 2.980E-18 5.671E-18 4.762E-18 1.455E-17 2.590E-16
    6.873E-15
 31 -3.047E-35 1.934E-37 1.421E-36 3.271E-35 2.141E-33 7.007E-32 1.395E-30 5.588E-30 -9.031E-28 -3.582E-26 -4.697E-25
   -1.991E-24 1.355E-24 5.681E-23 2.444E-22 -1.844E-22 -3.743E-21 1.948E-21 1.039E-20 -3.180E-21 -1.359E-20 -2.341E-21
    3.166E-21 1.407E-22 -2.228E-21 -5.179E-22 6.867E-22 5.872E-22 -2.894E-22 -7.603E-23 7.695E-21 4.660E-21 -3.675E-20
   -4.415E-20 3.639E-20 9.214E-20 2.964E-20 -8.116E-20 -1.019E-19 -4.704E-20 5.248E-21 6.090E-20 1.026E-18 2.931E-17
    1.181E-15
 32 -1.933E-35 -1.824E-34 -2.732E-33 -2.747E-32 -1.217E-30 -7.191E-30 -1.114E-28 -5.170E-28 -2.891E-27 -2.227E-26 -1.009E-25
    2.293E-26 9.386E-25 5.785E-24 2.692E-24 -1.340E-22 -3.338E-22 3.014E-22 4.627E-22 -5.694E-22 -1.536E-21 -4.187E-22
    1.927E-22 -1.107E-23 -2.426E-22 -1.645E-22 4.310E-23 6.352E-23 9.866E-24 3.017E-22 8.654E-22 -1.462E-22 -3.484E-21
   -4.985E-21 4.962E-21 1.015E-20 1.438E-21 -9.115E-21 -9.077E-21 5.209E-21 1.757E-19 9.726E-19 4.521E-18 2.413E-17
    1.118E-16

 TOTAL PARTICLES USED IN THE CURRENT STEP =      1988
 PARTICLES ADDED AT BEGINNING OF THE STEP =        48
 PARTICLES REMOVED AT END OF LAST STEP    =       115

           CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP   46, TIME STEP    1, STRESS PERIOD    1
           ------------------------------------------------------------------------------------------

                              IN              OUT
                          ----------      ----------
           CONSTANT CONCENTRATION:   1.945384              0.0000000
               CONSTANT HEAD:   0.0000000              -0.2891770E-21
                      WELLS:   0.0000000              -0.7399769
```

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                 DECAY OR BIODEGRADATION:  0.0000000             -0.7292976
                  MASS STORAGE (SOLUTE):  0.9418293            -0.4080826
                ------------------------------------------------
                           [TOTAL]:  2.887213    LB        -1.877357    LB

                                NET (IN - OUT):  1.009856
                            DISCREPANCY (PERCENT):  42.39022


                         ----------------------------
                             TRANSPORT STEP NO.  92
                         ----------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =  730.0000    D
.....................................................................

         CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP   92, TIME STEP  1, STRESS PERIOD  1
         ---------------------------------------------------------------

       1      2      3      4      5      6      7      8      9      10      11
      12     13     14     15     16     17     18     19     20     21     22
      23     24     25     26     27     28     29     30     31     32     33
      34     35     36     37     38     39     40     41     42     43     44
      45
.................................................................................................................
 1 -3.798E-31 -1.247E-31 -9.009E-33 -6.291E-34 -1.831E-34 -1.546E-33 -1.433E-32 -6.775E-32 -3.220E-31 -1.241E-30 -2.065E-30
    1.539E-30  1.221E-29 -1.349E-29 -9.431E-29 -1.660E-28  4.200E-29  1.973E-28 -3.780E-29 -4.509E-28 -4.761E-28 -1.590E-28
    1.697E-28  4.806E-29 -1.666E-28 -1.933E-28 -1.060E-28 -3.966E-29 -4.346E-30  4.313E-29  2.651E-28  1.794E-27  8.277E-27
    4.513E-26  1.519E-25  7.310E-25  2.511E-24  1.182E-23  3.626E-23  1.317E-22  4.383E-22  1.795E-21  1.144E-20  5.330E-20
    2.929E-19
 2 -4.004E-30  2.238E-33 -1.624E-35 -1.016E-36 -4.559E-36  3.156E-35  1.961E-33  2.926E-32  1.069E-31 -1.966E-30 -1.397E-29
   -4.645E-30  9.085E-29  1.175E-28 -4.123E-28 -8.860E-28  3.370E-28  1.584E-27  3.067E-28 -2.760E-27 -2.702E-27  1.581E-28
    1.356E-27  4.652E-28 -7.851E-28 -8.436E-28 -3.660E-28 -9.550E-29 -1.499E-29  9.964E-31  5.317E-30  3.459E-29  2.012E-28
    8.734E-28  3.739E-27  1.621E-26  7.026E-26  3.216E-25  1.506E-24  7.430E-24  4.092E-23  2.575E-22  2.557E-21  4.095E-20
    8.342E-19
 3 -6.837E-29  1.111E-32  1.853E-35  2.885E-35  1.022E-33  1.494E-32  6.399E-32 -2.008E-30 -3.838E-29 -2.003E-28  5.262E-28
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   1.643E-15 8.416E-16 4.071E-16 1.968E-16 8.414E-17 2.643E-17 2.244E-17 1.058E-16 3.180E-16 4.785E-16 -1.661E-16
  -3.474E-15 -8.448E-15 -9.316E-15 -4.393E-15 1.138E-15 3.430E-15 3.751E-15 2.936E-15 2.340E-15 4.671E-15 2.774E-14
   2.968E-13
30 -3.853E-26 -2.818E-29 8.628E-30 7.367E-28 2.972E-26 5.556E-25 7.639E-24 7.665E-23 5.043E-22 -6.675E-21 -1.099E-19
  -4.319E-19 -1.113E-18 -1.589E-18 7.885E-19 9.363E-18 2.276E-17 6.488E-18 -1.519E-16 -2.071E-16 -3.973E-17 3.792E-17
   3.639E-17 2.044E-17 1.025E-17 5.149E-18 2.476E-18 6.064E-19 -1.934E-18 -5.355E-18 -4.082E-18 1.150E-17 4.066E-17
   4.129E-17 -8.393E-17 -3.019E-16 -3.337E-16 -1.645E-16 -2.580E-18 5.374E-17 8.910E-17 2.093E-16 1.008E-15 7.108E-15
   7.787E-14
31 -7.986E-27 -2.938E-30 -1.812E-30 -4.098E-29 -1.020E-27 -1.286E-26 -1.089E-25 -2.354E-25 1.026E-23 2.054E-22 1.432E-21
   4.004E-21 3.223E-21 -2.556E-20 -1.185E-19 -1.789E-19 1.611E-19 9.924E-19 5.062E-19 -2.121E-18 -2.442E-18 -6.169E-19
   1.860E-19 2.055E-19 1.130E-19 5.949E-20 3.644E-20 3.074E-20 2.988E-20 -2.626E-20 -2.609E-19 -5.211E-19 -1.964E-19
   9.422E-19 1.822E-18 4.070E-19 -3.118E-18 -4.192E-18 -1.688E-18 2.185E-18 1.085E-17 4.447E-17 2.448E-16 1.771E-15
   2.238E-14
32 -4.704E-28 7.413E-29 1.207E-27 9.987E-27 5.831E-26 2.082E-25 1.128E-24 4.887E-24 2.681E-23 9.933E-23 1.687E-22
  -8.215E-22 -3.542E-21 -1.124E-20 -2.392E-20 -7.462E-21 4.936E-20 9.758E-20 -6.620E-20 -5.117E-19 -5.790E-19 -3.185E-19
  -6.749E-20 2.753E-20 2.721E-20 1.605E-20 1.198E-20 6.299E-21 -2.184E-21 -3.194E-20 -8.284E-20 -1.029E-19 3.631E-20
   2.652E-19 3.284E-19 1.240E-19 2.037E-19 1.308E-18 7.110E-18 2.884E-17 6.060E-17 2.724E-16 7.033E-16 2.273E-15
   5.859E-15

TOTAL PARTICLES USED IN THE CURRENT STEP =      855
PARTICLES ADDED AT BEGINNING OF THE STEP =       32
PARTICLES REMOVED AT END OF LAST STEP    =      100

          CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP   92, TIME STEP    1, STRESS PERIOD    1
          ------------------------------------------------------------------------------------

                                 IN              OUT
                              --------        --------

             CONSTANT CONCENTRATION:   3.895326            0.0000000
                    CONSTANT HEAD:  0.0000000          0.8930167E-15
                           WELLS:  0.0000000          -1.409302
             DECAY OR BIODEGRADATION:  0.0000000             -0.9565832
               MASS STORAGE (SOLUTE):  1.162338           -0.5812837
             ---------------------------------------------------------------
                          [TOTAL]:   5.057664    LB       -2.947169    LB

                               NET (IN - OUT):   2.110495
                         DISCREPANCY (PERCENT):   52.73051


                      ---------------------------------------
                             TRANSPORT STEP NO.  184
                      ---------------------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   1460.000    D
.....................................................................
```

```
          CONCENTRATIONS  IN LAYER  1 AT END OF TRANSPORT STEP  184, TIME STEP  1, STRESS PERIOD  1
          ----------------------------------------------------------------------------------------

      1     2     3     4     5     6     7     8     9    10    11
     12    13    14    15    16    17    18    19    20    21    22
     23    24    25    26    27    28    29    30    31    32    33
     34    35    36    37    38    39    40    41    42    43    44
     45

..............................................................................................
 1 -1.441E-22 -4.135E-23 -6.016E-24 -1.269E-24 -1.876E-25 -4.051E-26 -6.442E-27 -1.294E-27 -7.971E-28 -1.867E-27 -3.046E-27
   -1.936E-27  2.277E-27  4.899E-27 -1.688E-26 -7.670E-26 -1.557E-25 -1.358E-25 -6.501E-26  2.013E-26  5.066E-26 -1.482E-26
   -1.217E-25 -2.226E-25 -1.996E-25 -1.502E-25 -5.957E-26  6.141E-26  2.813E-25  8.389E-25  2.331E-24  7.190E-24  2.207E-23
    5.810E-23  1.441E-22  2.819E-22  7.318E-22  2.190E-21  5.141E-21  1.289E-20  2.792E-20  7.265E-20  1.942E-19  6.719E-19
    1.636E-18
 2 -3.852E-22 -5.782E-25 -3.665E-26 -3.550E-27 -2.730E-28 -6.286E-29 -1.379E-29  2.644E-29  1.846E-29 -1.605E-27 -8.364E-27
   -1.121E-26  7.236E-27  4.314E-26  4.449E-26 -9.704E-26 -3.432E-25 -3.388E-25 -7.850E-26  1.439E-25  2.317E-25  1.167E-25
   -2.587E-25 -5.991E-25 -5.709E-25 -3.502E-25 -1.531E-25 -4.030E-26  1.670E-26  7.177E-26  2.089E-25  6.130E-25  1.814E-24
    5.262E-24  1.478E-23  4.196E-23  1.206E-22  3.447E-22  1.019E-21  3.081E-21  9.234E-21  2.712E-20  1.047E-19  5.260E-19
    3.876E-18
 3 -1.522E-21 -2.668E-24 -9.858E-28 -8.330E-30  3.201E-30  2.757E-29 -1.832E-29 -2.815E-27 -2.676E-26 -9.797E-26  2.860E-26
    5.998E-25  1.301E-24 -5.236E-27 -6.690E-24 -1.366E-23 -9.699E-24  5.060E-24  1.360E-23  1.117E-23 -1.774E-24 -2.580E-23
   -4.254E-23 -3.895E-23 -2.392E-23 -1.095E-23 -3.967E-24 -1.172E-24 -2.715E-25 -2.188E-26  4.612E-26  1.493E-25  5.915E-25
    2.562E-24  1.096E-23  4.546E-23  1.807E-22  6.776E-22  2.418E-21  8.245E-21  2.696E-20  8.477E-20  3.397E-19  1.644E-18
    1.101E-17
 4 -9.616E-21 -2.535E-23 -5.976E-26 -1.961E-28 -5.378E-28 -6.124E-27 -4.462E-26 -1.673E-25  7.829E-26  3.774E-24  1.268E-23
    3.764E-24 -8.489E-23 -2.564E-22 -3.079E-22 -6.450E-24  4.392E-22  6.756E-22  7.515E-23 -1.074E-21 -1.986E-21 -2.382E-21
   -2.037E-21 -1.248E-21 -5.720E-22 -2.086E-22 -6.229E-23 -1.498E-23 -2.519E-24 -4.229E-25 -1.123E-24 -2.131E-24 -4.357E-25
    9.284E-24  4.757E-23  1.986E-22  7.731E-22  2.824E-21  9.768E-21  3.206E-20  9.963E-20  2.938E-19  1.099E-18  5.318E-18
    3.745E-17
 5 -2.820E-20 -1.096E-22 -4.149E-25 -8.530E-27 -6.462E-26 -2.240E-25  1.700E-25  5.259E-24  1.759E-23 -1.222E-22 -1.275E-21
   -3.290E-21 -4.344E-21 -3.285E-22  8.607E-21  1.687E-20  1.037E-20 -2.548E-20 -8.451E-20 -1.005E-19 -9.630E-20 -7.782E-20
   -4.792E-20 -2.231E-20 -8.263E-21 -2.540E-21 -6.654E-22 -1.773E-22 -1.037E-22 -1.349E-22 -1.739E-22 -1.767E-22 -1.101E-22
    3.154E-23  2.083E-22  6.776E-22  2.477E-21  9.279E-21  3.318E-20  1.125E-19  3.576E-19  1.059E-18  3.941E-18  1.897E-17
    1.335E-16
 6 -7.794E-20 -4.353E-22 -1.987E-24  1.183E-26  1.109E-24  8.781E-24  2.778E-23 -3.010E-22 -4.655E-21 -1.966E-20 -1.457E-21
    6.158E-20  1.814E-19  2.806E-19  1.257E-19 -6.304E-19 -1.911E-18 -2.860E-18 -2.977E-18 -2.538E-18 -1.925E-18 -1.214E-18
   -5.712E-19 -2.186E-19 -7.087E-20 -2.083E-20 -7.234E-21 -4.657E-21 -4.475E-21 -4.240E-21 -3.463E-21 -2.386E-21 -1.630E-21
   -2.485E-21 -6.403E-21 -1.172E-20 -7.016E-21  3.546E-20  2.006E-19  7.677E-19  2.451E-18  6.962E-18  2.443E-17  9.876E-17
    3.837E-16
 7 -2.594E-19 -1.487E-21 -1.456E-23 -1.215E-23 -1.563E-22 -1.451E-21 -1.079E-20 -5.655E-20 -1.414E-19  5.849E-21  4.228E-19
    4.691E-19 -2.470E-18 -1.355E-17 -3.460E-17 -5.927E-17 -7.413E-17 -6.921E-17 -4.926E-17 -2.817E-17 -1.399E-17 -6.193E-18
   -2.411E-18 -8.190E-19 -2.462E-19 -7.905E-20 -3.633E-20 -1.761E-20  8.596E-22  1.333E-20  2.285E-20  2.854E-20  3.469E-20
    5.465E-20  1.216E-19  3.194E-19  8.920E-19  2.466E-18  6.202E-18  1.303E-17  2.503E-17  4.790E-17  1.154E-16  3.383E-16
    1.072E-15
 8 -1.077E-18 -3.454E-21 -6.433E-22 -1.324E-21 -8.825E-21 -4.133E-20 -1.519E-19 -2.361E-19  4.514E-19  2.438E-18  6.073E-19
   -2.074E-17 -9.556E-17 -2.409E-16 -4.276E-16 -5.692E-16 -5.735E-16 -4.323E-16 -2.443E-16 -1.058E-16 -3.617E-17 -9.385E-18
   -1.430E-18  3.082E-19  4.101E-19  3.189E-19  2.912E-19  3.092E-19  3.491E-19  4.281E-19  5.369E-19  6.525E-19  9.786E-19
    1.741E-18  3.181E-18  5.465E-18  8.949E-18  1.481E-17  2.605E-17  4.596E-17  7.836E-17  1.401E-16  3.185E-16  9.484E-16
    2.588E-15
 9 -4.205E-18 -2.240E-20 -1.379E-20 -5.194E-20 -1.740E-19 -3.196E-19  5.053E-20  1.877E-18  4.060E-18 -3.264E-17 -2.700E-16
   -7.352E-16 -1.585E-15 -2.681E-15 -3.592E-15 -3.754E-15 -2.938E-15 -1.613E-15 -5.527E-16 -6.484E-17  4.101E-17  3.925E-17
    2.529E-17  1.584E-17  1.012E-17  6.580E-18  5.677E-18  5.439E-18  6.139E-18  7.362E-18  1.013E-17  1.472E-17  2.315E-17
    4.252E-17  6.992E-17  1.024E-16  1.406E-16  1.935E-16  2.839E-16  4.461E-16  7.150E-16  1.082E-15  1.847E-15  3.587E-15
    8.808E-15
10 -1.112E-17 -9.640E-20 -8.222E-20 -2.414E-19 -1.825E-19  5.191E-19  6.313E-19 -2.028E-17 -2.278E-16 -1.361E-15 -4.368E-15
   -8.167E-15 -1.319E-14 -1.772E-14 -1.925E-14 -1.603E-14 -9.119E-15 -2.548E-15  6.494E-16  1.164E-15  8.868E-16  5.629E-16
    3.544E-16  2.595E-16  1.904E-16  9.600E-17  6.321E-17  5.586E-17  6.310E-17  9.552E-17  1.625E-16  2.757E-16  4.984E-16
    8.111E-16  1.145E-15  1.444E-15  1.661E-15  1.804E-15  1.950E-15  2.207E-15  2.730E-15  3.695E-15  5.626E-15  9.483E-15
    1.833E-14
11 -3.066E-17 -3.879E-19 -4.541E-19 -1.802E-18 -8.480E-18 -4.172E-17 -2.165E-16 -9.957E-16 -4.077E-15 -1.438E-14 -3.387E-14
   -5.286E-14 -7.227E-14 -8.277E-14 -7.546E-14 -4.912E-14 -1.576E-14  5.721E-15  1.287E-14  1.097E-14  7.136E-15  4.647E-15
    3.124E-15  1.861E-15  1.209E-15  7.704E-16  4.811E-16  4.524E-16  5.809E-16  8.662E-16  1.356E-15  2.290E-15  4.846E-15
    8.317E-15  1.180E-14  1.468E-14  1.588E-14  1.517E-14  1.344E-14  1.188E-14  1.138E-14  1.233E-14  1.601E-14  2.521E-14
    4.698E-14
12 -1.020E-16 -1.999E-18 -7.160E-18 -4.299E-17 -2.179E-16 -7.617E-16 -2.667E-15 -9.035E-15 -2.962E-14 -8.947E-14 -1.873E-13
   -2.680E-13 -3.305E-13 -3.341E-13 -2.570E-13 -1.207E-13  6.013E-15  7.024E-14  9.008E-14  5.896E-14  3.208E-14  1.886E-14
    1.329E-14  9.968E-15  8.566E-15  7.254E-15  4.653E-15  5.392E-15  7.767E-15  1.075E-14  1.577E-14  2.584E-14  4.697E-14
    8.450E-14  1.271E-13  1.658E-13  1.792E-13  1.607E-13  1.249E-13  8.941E-14  6.429E-14  5.187E-14  5.026E-14  6.809E-14
    1.362E-13
13 -3.441E-16 -1.430E-17 -6.073E-17 -2.930E-16 -1.220E-15 -3.987E-15 -1.465E-14 -5.439E-14 -1.897E-13 -5.707E-13 -1.113E-12
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```
   -1.463E-12 -1.601E-12 -1.390E-12 -8.637E-13 -2.456E-13  1.533E-13  4.123E-13  4.435E-13  2.275E-13  1.079E-13  6.153E-14
    4.445E-14  3.953E-14  3.874E-14  3.645E-14  3.311E-14  3.845E-14  5.265E-14  8.574E-14  1.496E-13  2.710E-13  4.769E-13
    8.303E-13  1.371E-12  1.917E-12  2.076E-12  1.770E-12  1.263E-12  7.962E-13  4.705E-13  2.905E-13  1.886E-13  2.091E-13
    5.091E-13
14 -1.164E-15 -1.475E-16 -8.258E-16 -4.696E-15 -2.180E-14 -7.095E-14 -2.307E-13 -7.025E-13 -1.941E-12 -4.588E-12 -7.221E-12
   -8.058E-12 -7.273E-12 -4.975E-12 -2.130E-12  4.562E-14  8.653E-13  1.710E-12  1.839E-12  6.422E-13  3.143E-13  2.026E-13
    1.603E-13  1.489E-13  1.541E-13  1.693E-13  2.025E-13  2.677E-13  4.087E-13  7.300E-13  1.373E-12  2.432E-12  4.194E-12
    8.234E-12  1.542E-11  2.208E-11  2.297E-11  1.842E-11  1.237E-11  7.222E-12  3.773E-12  1.936E-12  8.563E-13  6.915E-13
    1.801E-12
15 -2.855E-15 -2.157E-15 -1.489E-14 -9.285E-14 -4.028E-13 -1.127E-12 -2.922E-12 -6.815E-12 -1.415E-11 -2.497E-11 -3.021E-11
   -2.707E-11 -1.780E-11 -6.408E-12  1.614E-12  5.127E-12  7.685E-12  8.537E-12  5.135E-12  2.011E-12  1.143E-12  8.484E-13
    7.500E-13  7.553E-13  8.310E-13  9.929E-13  1.321E-12  1.939E-12  3.261E-12  6.070E-12  1.102E-11  1.787E-11  3.612E-11
    8.962E-11  1.699E-10  2.320E-10  2.296E-10  1.780E-10  1.169E-10  6.442E-11  3.006E-11  1.346E-11  4.539E-12  2.554E-12
    4.791E-12
16 -6.879E-15 -1.355E-14 -9.274E-14 -5.559E-13 -2.285E-12 -6.010E-12 -1.434E-11 -3.012E-11 -5.455E-11 -8.023E-11 -7.898E-11
   -5.912E-11 -2.899E-11 -2.610E-12  9.123E-12  1.478E-11  1.747E-11  1.646E-11  1.131E-11  6.843E-12  4.811E-12  3.883E-12
    3.704E-12  4.030E-12  4.757E-12  6.140E-12  9.049E-12  1.455E-11  2.538E-11  4.474E-11  7.187E-11  1.164E-10  3.715E-10
    9.226E-10  1.599E-09  2.162E-09  2.158E-09  1.675E-09  1.088E-09  5.432E-10  2.204E-10  8.979E-11  2.520E-11  9.428E-12
    1.162E-11
17 -1.429E-14 -4.187E-14 -2.800E-13 -1.626E-12 -6.441E-12 -1.624E-11 -3.663E-11 -7.105E-11 -1.137E-10 -1.339E-10 -8.795E-11
   -3.781E-11  7.108E-12  2.914E-11  4.389E-11  5.327E-11  5.524E-11  4.509E-11  3.613E-11  2.793E-11  1.983E-11  1.712E-11
    1.808E-11  2.185E-11  2.862E-11  4.077E-11  6.450E-11  1.040E-10  1.666E-10  2.551E-10  3.881E-10  9.396E-10  3.866E-09
    7.677E-09  1.305E-08  1.693E-08  1.824E-08  1.346E-08  9.899E-09  3.797E-09  1.468E-09  5.845E-10  1.355E-10  3.576E-11
    3.493E-11
18 -1.158E-14 -2.246E-14 -1.528E-13 -8.939E-13 -3.548E-12 -8.990E-12 -2.051E-11 -4.069E-11 -6.708E-11 -7.622E-11 -7.976E-12
    5.300E-11  9.859E-11  1.392E-10  1.752E-10  1.998E-10  2.075E-10  1.931E-10  1.479E-10  8.176E-11  6.362E-11  6.382E-11
    7.583E-11  1.010E-10  1.426E-10  2.087E-10  3.184E-10  4.781E-10  7.260E-10  1.214E-09  2.657E-09  8.044E-09  2.449E-08
    4.192E-08  6.880E-08  8.779E-08  1.103E-07  1.168E-07  6.085E-08  2.206E-08  1.104E-08  3.491E-09  6.414E-10  1.219E-10
    6.591E-11
19 -9.174E-15 -2.067E-14 -1.213E-13 -5.895E-13 -1.845E-12 -3.563E-12 -5.610E-12 -6.312E-12 -2.855E-12  5.685E-12  3.931E-11
    9.999E-11  1.345E-10  1.653E-10  1.928E-10  2.100E-10  2.100E-10  1.901E-10  1.563E-10  1.267E-10  1.296E-10  1.487E-10
    1.884E-10  2.563E-10  3.635E-10  5.255E-10  7.775E-10  1.140E-09  1.709E-09  2.718E-09  4.933E-09  9.639E-09  4.034E-08
    2.268E-07  6.930E-07  8.402E-07  1.482E-06  1.418E-06  5.073E-07  1.297E-07  3.274E-08  1.445E-08  2.410E-09  3.712E-10
    1.386E-10
20 -7.069E-15 -1.447E-14 -8.434E-14 -3.979E-13 -1.183E-12 -2.107E-12 -2.857E-12 -2.149E-12  1.291E-12  7.927E-12  2.970E-11
    6.105E-11  9.214E-11  1.187E-10  1.446E-10  1.640E-10  1.709E-10  1.630E-10  1.463E-10  1.368E-10  1.528E-10  1.925E-10
    2.601E-10  3.644E-10  5.242E-10  7.572E-10  1.089E-09  1.552E-09  2.269E-09  3.462E-09  5.693E-09  1.444E-08  1.328E-07
    8.239E-07  3.275E-06  7.101E-06  2.059E-05  2.059E-05  3.483E-06  7.848E-07  1.280E-07  5.027E-08  6.954E-09  8.978E-10
    1.822E-10
21 -2.944E-15 -2.681E-15 -1.424E-14 -5.355E-14 -1.164E-13 -1.636E-13 -1.228E-13  1.365E-13  9.168E-13  3.895E-12  1.297E-11
    2.729E-11  5.247E-11  6.619E-11  8.583E-11  1.042E-10  1.160E-10  1.169E-10  1.077E-10  9.571E-11  9.196E-11  1.025E-10
    1.272E-10  1.660E-10  2.153E-10  2.530E-10  2.822E-10  4.064E-10  7.082E-10  1.226E-09  2.252E-09  3.937E-09  3.439E-08
    3.031E-07  1.459E-06  4.966E-06  2.059E-05  2.059E-05  3.858E-06  6.981E-07  1.354E-07  4.864E-08  7.001E-09  9.061E-10
    2.343E-10
22 -9.512E-16 -2.812E-16 -1.294E-15 -3.274E-15 -3.051E-15 -7.476E-16  1.001E-14  5.894E-14  2.686E-13  1.184E-12  4.022E-12
    8.599E-12  1.692E-11  2.768E-11  4.008E-11  5.286E-11  6.247E-11  6.326E-11  4.846E-11  8.199E-12 -7.807E-11 -2.033E-10
   -3.391E-10 -4.702E-10 -6.080E-10 -7.954E-10 -1.072E-09 -1.274E-09 -1.185E-09 -9.518E-10 -1.005E-09 -2.188E-09 -3.185E-09
    4.454E-08  1.153E-07  5.815E-07  1.323E-06  1.419E-06  4.857E-07  1.224E-07  3.107E-08  1.382E-08  2.362E-09  3.783E-10
    1.233E-10
23 -3.363E-16 -2.242E-17 -8.246E-17 -1.047E-16  1.216E-16  6.629E-16  3.222E-15  1.551E-14  7.451E-14  3.507E-13  1.233E-12
    2.772E-12  5.758E-12  1.053E-11  1.704E-11  2.459E-11  3.055E-11  2.766E-11 -2.193E-12 -1.046E-10 -2.888E-10 -5.061E-10
   -7.226E-10 -9.063E-10 -1.031E-09 -1.080E-09 -1.033E-09 -8.965E-10 -7.542E-10 -7.054E-10 -7.563E-10 -1.147E-09 -2.339E-09
   -1.360E-09  4.696E-09  8.924E-08  1.083E-07  9.067E-08  5.319E-08  1.661E-08  8.670E-09  2.814E-09  5.498E-10  1.181E-10
    7.483E-11
24 -5.928E-17 -7.631E-18 -4.905E-17 -3.033E-16 -1.316E-15 -3.453E-15 -7.762E-15 -1.375E-14 -1.228E-14  3.730E-14  2.432E-13
    6.580E-13  1.552E-12  3.200E-12  5.880E-12  9.664E-12  1.369E-11  1.341E-11 -9.226E-12 -1.070E-10 -2.330E-10 -3.618E-10
   -4.954E-10 -6.106E-10 -6.738E-10 -6.638E-10 -5.830E-10 -4.314E-10 -2.359E-10 -9.534E-11 -1.120E-12  6.842E-11  1.560E-10
    5.729E-10  1.397E-09  6.461E-09  1.034E-08  8.764E-09  6.350E-09  2.285E-09  9.032E-10  3.782E-10  9.826E-11  3.098E-11
    3.518E-11
25 -2.587E-17 -8.194E-18 -6.410E-17 -4.338E-16 -1.912E-15 -5.091E-15 -1.244E-14 -2.819E-14 -6.235E-14 -1.171E-13 -1.265E-13
   -6.474E-14  6.516E-14  2.639E-13  6.232E-13  1.220E-12  2.071E-12  2.829E-12  5.727E-13 -4.927E-11 -7.444E-11 -1.084E-10
   -1.513E-10 -1.896E-10 -1.942E-10 -1.504E-10 -1.030E-10 -6.797E-11 -5.434E-11 -4.595E-11 -2.571E-11  6.868E-12  3.085E-11
    9.631E-11  2.379E-10  4.886E-10  7.134E-10  6.705E-10  4.557E-10  2.283E-10  9.936E-11  4.550E-11  1.568E-11  7.864E-12
    1.266E-11
26 -7.524E-18 -1.734E-18 -1.044E-17 -3.299E-17 -6.403E-17 -1.987E-16 -1.082E-15 -5.212E-15 -1.720E-14 -4.678E-14 -7.880E-14
   -8.685E-14 -6.664E-14 -1.681E-14  4.772E-14  1.453E-13  3.226E-13  6.380E-13  9.864E-13 -3.849E-12 -7.313E-12 -1.285E-11
   -1.995E-11 -2.644E-11 -2.258E-11 -9.516E-12 -4.982E-12 -4.165E-12 -5.833E-12 -9.663E-12 -1.170E-11 -1.002E-11 -5.070E-12
    8.607E-13  1.008E-11  3.181E-11  5.293E-11  5.537E-11  4.129E-11  2.380E-11  1.171E-11  5.697E-12  2.342E-12  1.848E-12
    4.133E-12
27 -3.452E-18 -2.132E-19 -8.400E-19 -4.993E-19 -3.917E-19 -2.502E-18 -4.350E-17 -4.583E-16 -3.121E-15 -1.277E-14 -2.911E-14
   -4.236E-14 -5.082E-14 -4.684E-14 -2.753E-14  2.324E-15  3.320E-14  9.143E-14  2.201E-13  1.482E-13 -4.031E-14 -3.503E-13
```

```
    -7.082E-13 -9.017E-13 -7.243E-13 -4.739E-13 -2.234E-13 -1.113E-13 -1.028E-13 -3.634E-13 -1.211E-12 -2.268E-12 -2.211E-12
    -1.297E-12 -1.053E-13  1.310E-12  2.860E-12  3.527E-12  3.035E-12  2.014E-12  1.136E-12  6.340E-13  3.684E-13  4.628E-13
     1.135E-12
 28 -9.617E-19 -2.245E-20 -2.986E-20 -3.065E-21  1.462E-20  7.276E-20 -1.330E-18 -3.518E-17 -4.052E-16 -2.369E-15 -6.910E-15
    -1.204E-14 -1.786E-14 -2.157E-14 -2.005E-14 -1.226E-14 -1.435E-15  7.487E-15  1.973E-14  2.684E-14  1.976E-14  7.509E-15
    -7.273E-15 -2.243E-14 -2.478E-14 -2.069E-14 -1.494E-14 -1.163E-14 -7.466E-15 -2.281E-15 -2.595E-14 -1.466E-13 -3.349E-13
    -3.997E-13 -2.657E-13 -4.145E-14  1.142E-13  2.000E-13  2.079E-13  1.591E-13  1.001E-13  6.164E-14  5.109E-14  1.129E-13
     4.800E-13
 29 -3.254E-19 -2.514E-21 -2.408E-22 -1.026E-21 -2.431E-21  2.466E-20  3.404E-19  2.946E-18  1.587E-17  2.421E-17 -1.029E-16
    -5.272E-16 -1.461E-15 -2.829E-15 -4.152E-15 -4.650E-15 -3.842E-15 -2.163E-15 -3.931E-16  7.326E-16  1.032E-15  9.054E-16
     6.167E-16  1.950E-16 -1.170E-16 -1.791E-16 -1.376E-16 -1.793E-16 -3.432E-16 -1.999E-16  7.069E-16  2.900E-16 -8.178E-15
    -2.339E-14 -3.016E-14 -2.081E-14 -6.303E-15  2.397E-15  5.237E-15  5.491E-15  4.744E-15  5.015E-15  1.080E-14  3.998E-14
     1.960E-13
 30 -1.052E-19 -4.061E-22 -8.430E-24 -1.346E-22 -1.601E-21 -9.755E-21 -4.641E-20 -1.499E-19 -1.588E-19  1.639E-18  7.190E-18
     1.326E-17  1.047E-17 -2.514E-17 -1.267E-16 -2.787E-16 -4.223E-16 -4.812E-16 -3.518E-16 -1.126E-16  1.500E-17  3.304E-17
     2.793E-17  1.754E-17  7.629E-18  2.261E-18  1.698E-18  3.542E-18  3.152E-18 -2.649E-18  3.331E-18  3.711E-17 -3.702E-17
    -5.378E-16 -1.226E-15 -1.393E-15 -8.936E-16 -2.781E-16  5.417E-17  1.831E-16  3.638E-16  8.447E-16  2.851E-15  1.251E-14
     6.631E-14
 31 -3.611E-20 -9.012E-23 -1.675E-24 -3.888E-25 -4.731E-25  9.710E-25 -1.533E-22 -2.502E-21 -2.073E-20 -1.087E-19 -2.692E-19
    -2.236E-19  2.831E-19  1.212E-18  2.150E-18  1.388E-18 -3.618E-18 -1.437E-17 -2.214E-17 -1.832E-17 -8.022E-18 -1.416E-18
     2.859E-19  3.847E-19  2.359E-19  6.312E-20 -1.292E-19 -2.835E-19 -1.998E-19  1.107E-19  4.942E-19  1.726E-18  4.236E-18
     3.783E-18 -7.169E-18 -2.348E-17 -2.397E-17 -7.494E-18  1.111E-17  3.564E-17  8.993E-17  2.278E-16  7.764E-16  3.529E-15
     1.956E-14
 32 -1.255E-20 -3.147E-21 -9.927E-22 -7.288E-22 -1.305E-21 -2.855E-21 -6.797E-21 -1.425E-20 -4.043E-20 -8.818E-20 -1.238E-19
    -7.581E-20  7.365E-20  1.470E-19 -2.481E-19 -1.225E-18 -4.089E-18 -7.815E-18 -1.066E-17 -9.798E-18 -6.256E-18 -3.190E-18
    -1.464E-18 -3.923E-19 -7.109E-20 -2.701E-20 -6.551E-20 -9.377E-20 -3.827E-20  1.297E-19  3.185E-19  5.379E-19  6.233E-19
     6.176E-20 -1.955E-18 -2.250E-18  2.120E-18  2.035E-17  5.974E-17  1.263E-16  2.737E-16  5.154E-16  1.374E-15  2.941E-15
     8.238E-15

 TOTAL PARTICLES USED IN THE CURRENT STEP =      867
 PARTICLES ADDED AT BEGINNING OF THE STEP =       48
 PARTICLES REMOVED AT END OF LAST STEP    =       61

          CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  184, TIME STEP    1, STRESS PERIOD    1
          ------------------------------------------------------------------------------

                              IN                OUT
                         ----------        ----------
             CONSTANT CONCENTRATION:   7.792528           0.0000000
                  CONSTANT HEAD:  0.0000000          0.6296901E-10
                       WELLS:  0.0000000          -2.732324
             DECAY OR BIODEGRADATION:  0.0000000           -1.341256
              MASS STORAGE (SOLUTE):   1.502483          -0.9209567
            ---------------------------------------------------------
                      [TOTAL]:   9.295011    LB       -4.994537    LB

                            NET (IN - OUT):   4.300474
                      DISCREPANCY (PERCENT):   60.19048


                       ------------------------------
                           TRANSPORT STEP NO.  276
                       ------------------------------

 TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   2190.000    D
 .................................................................

          CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP  276, TIME STEP  1, STRESS PERIOD  1
          ------------------------------------------------------------------------------

       1      2      3      4      5      6      7      8      9     10     11
      12     13     14     15     16     17     18     19     20     21     22
      23     24     25     26     27     28     29     30     31     32     33
      34     35     36     37     38     39     40     41     42     43     44
      45
 ........................................................................................................................
  1 -4.209E-19 -1.071E-19 -1.760E-20 -2.836E-21 -6.395E-22 -1.692E-22 -4.563E-23 -1.110E-23 -2.587E-24 -6.558E-25 -2.541E-25
    -3.097E-25 -5.690E-25 -7.927E-25 -7.437E-25 -3.741E-25  1.038E-25  3.201E-25 -4.264E-25 -2.746E-24 -4.722E-24 -6.071E-24
    -6.253E-24 -5.189E-24 -4.241E-24 -1.966E-24 -8.989E-25 -1.011E-26  8.915E-25  3.261E-24  6.646E-24  2.294E-23  5.142E-23
     1.116E-22  3.113E-22  5.147E-22  1.228E-21  3.075E-21  7.325E-21  1.519E-20  3.855E-20  8.792E-20  2.562E-19  6.032E-19
     1.186E-18
```

```
2 -9.361E-19 -2.419E-21 -1.359E-22 -1.620E-23 -1.891E-24 -8.787E-25 -3.402E-25 -9.452E-26 -2.675E-26  2.115E-26  4.141E-26
  -1.042E-25 -6.627E-25 -1.405E-24 -1.597E-24 -7.034E-25  8.984E-25  2.101E-24  1.372E-24 -2.553E-24 -7.958E-24 -1.074E-23
  -1.043E-23 -7.998E-24 -4.990E-24 -2.580E-24 -1.065E-24 -2.621E-25  1.248E-25  4.826E-25  1.294E-24  3.349E-24  8.524E-24
   2.153E-23  5.468E-23  1.401E-22  3.623E-22  9.351E-22  2.411E-21  6.211E-21  1.590E-20  3.999E-20  1.303E-19  5.658E-19
   3.801E-18
3 -1.961E-18 -7.604E-21 -2.541E-23 -2.383E-25 -1.519E-26 -9.795E-27  5.254E-27  6.991E-26  2.328E-25 -5.950E-25 -8.340E-24
  -2.025E-23 -2.748E-23 -1.730E-23  1.451E-23  5.259E-23  6.961E-23 -7.733E-25 -2.145E-22 -4.083E-22 -4.587E-22 -3.986E-22
  -2.905E-22 -1.793E-22 -9.390E-23 -4.261E-23 -1.693E-23 -5.875E-24 -1.664E-24 -9.163E-26  7.282E-25  2.526E-24  7.889E-24
   2.424E-23  7.384E-23  2.235E-22  6.694E-22  1.964E-21  5.660E-21  1.594E-20  4.344E-20  1.146E-19  3.864E-19  1.686E-18
   1.042E-17
4 -5.100E-18 -2.987E-20 -1.513E-22 -9.050E-25 -5.395E-28  4.878E-26 -1.752E-25 -5.122E-24 -3.933E-23 -1.635E-22 -2.837E-22
  -1.160E-22  3.290E-22  9.233E-22  1.275E-21  2.409E-22 -4.153E-21 -1.082E-20 -1.546E-20 -1.520E-20 -1.196E-20 -8.223E-21
  -4.950E-21 -2.581E-21 -1.169E-21 -4.703E-22 -1.711E-22 -5.847E-23 -2.049E-23 -7.286E-24  3.881E-25  8.110E-24  2.765E-23
   8.617E-23  2.653E-22  8.112E-22  2.440E-21  7.123E-21  2.023E-20  5.567E-20  1.476E-19  3.783E-19  1.246E-18  5.351E-18
   3.110E-17
5 -1.273E-17 -1.165E-19 -8.064E-22 -6.068E-24 -4.697E-24 -2.890E-23 -1.350E-22 -4.153E-22 -4.610E-22  1.999E-21  8.767E-21
   1.520E-20  1.248E-20 -1.379E-20 -9.298E-20 -2.107E-19 -3.199E-19 -3.691E-19 -3.423E-19 -2.484E-19 -1.629E-19 -9.674E-20
  -5.035E-20 -2.303E-20 -9.418E-21 -3.555E-21 -1.301E-21 -5.129E-22 -2.416E-22 -1.196E-22 -3.419E-23  2.357E-23  7.718E-23
   2.289E-22  7.467E-22  2.437E-21  7.621E-21  2.287E-20  6.702E-20  1.915E-19  5.283E-19  1.407E-18  4.745E-18  1.905E-17
   9.268E-17
6 -4.011E-17 -4.266E-19 -3.506E-21 -6.575E-23 -1.874E-22 -2.687E-22  1.319E-21  1.164E-20  5.312E-20 -9.347E-21 -6.815E-19
  -1.743E-18 -3.285E-18 -4.905E-18 -6.074E-18 -6.384E-18 -5.767E-18 -4.523E-18 -3.162E-18 -2.054E-18 -1.212E-18 -6.287E-19
  -2.857E-19 -1.191E-19 -4.668E-20 -1.810E-20 -7.700E-21 -4.215E-21 -3.262E-21 -3.454E-21 -4.585E-21 -6.712E-21 -9.705E-21
  -1.283E-20 -1.401E-20 -8.453E-21  1.514E-20  9.660E-20  3.572E-19  1.111E-18  3.119E-18  8.212E-18  2.672E-17  9.262E-17
   3.541E-16
7 -1.039E-16 -1.433E-18 -1.399E-20 -2.722E-21 -8.179E-21 -1.728E-20 -7.990E-20 -8.107E-19 -5.733E-18 -2.088E-17 -4.329E-17
  -6.109E-17 -7.701E-17 -8.574E-17 -8.386E-17 -7.162E-17 -5.300E-17 -3.376E-17 -1.849E-17 -8.873E-18 -3.906E-18 -1.620E-18
  -6.372E-19 -2.364E-19 -8.182E-20 -2.560E-20 -6.007E-21 -1.681E-23  8.056E-22  1.156E-21  2.599E-21  6.040E-21  1.515E-20
   5.151E-20  1.761E-19  5.171E-19  1.384E-18  3.430E-18  7.671E-18  1.478E-17  2.661E-17  4.770E-17  1.049E-16  2.777E-16
   7.758E-16
8 -2.813E-16 -3.070E-18 -8.923E-20 -5.964E-20 -1.590E-19 -6.282E-19 -3.373E-18 -1.910E-17 -6.592E-17 -1.719E-16 -2.982E-16
  -3.804E-16 -4.341E-16 -4.387E-16 -3.892E-16 -2.997E-16 -1.975E-16 -1.101E-16 -5.182E-17 -2.088E-17 -7.318E-18 -2.211E-18
  -5.388E-19 -7.750E-20  1.408E-20  2.303E-20  2.744E-20  3.556E-20  4.707E-20  7.653E-20  1.773E-19  3.748E-19  8.593E-19
   1.913E-18  3.834E-18  6.808E-18  1.102E-17  1.728E-17  2.808E-17  4.617E-17  7.446E-17  1.266E-16  2.728E-16  7.645E-16
   2.589E-15
9 -9.550E-16 -1.081E-17 -1.755E-18 -3.318E-18 -1.029E-17 -3.366E-17 -1.041E-16 -2.671E-16 -6.395E-16 -1.297E-15 -1.897E-15
  -2.178E-15 -2.240E-15 -2.040E-15 -1.625E-15 -1.110E-15 -6.349E-16 -2.966E-16 -1.105E-16 -3.183E-17 -6.169E-18  1.143E-19
   8.372E-19  7.719E-19  6.442E-19  5.000E-19  6.013E-19  8.570E-19  1.671E-18  3.590E-18  6.994E-18  1.214E-17  2.102E-17
   4.112E-17  7.003E-17  1.031E-16  1.387E-16  1.832E-16  2.569E-16  3.908E-16  6.150E-16  9.015E-16  1.449E-15  2.740E-15
   9.491E-15
10 -2.469E-15 -3.479E-17 -2.244E-17 -7.287E-17 -1.967E-16 -4.480E-16 -1.057E-15 -2.249E-15 -4.467E-15 -7.696E-15 -9.905E-15
  -1.047E-14 -9.875E-15 -8.219E-15 -5.923E-15 -3.593E-15 -1.755E-15 -6.520E-16 -1.626E-16 -1.214E-17  1.565E-17  2.093E-17
   1.917E-17  1.972E-17  2.043E-17  1.080E-17  9.818E-18  1.565E-17  3.067E-17  6.444E-17  1.294E-16  2.423E-16  4.640E-16
   7.813E-16  1.126E-15  1.432E-15  1.636E-15  1.743E-15  1.837E-15  2.026E-15  2.460E-15  3.331E-15  5.432E-15  1.114E-14
   2.301E-14
11 -7.944E-15 -1.354E-16 -1.951E-16 -6.440E-16 -1.752E-15 -3.661E-15 -7.606E-15 -1.458E-14 -2.579E-14 -3.971E-14 -4.641E-14
  -4.578E-14 -4.000E-14 -3.053E-14 -1.988E-14 -1.058E-14 -4.234E-15 -1.072E-15 -1.424E-17  1.630E-16  2.223E-16  3.028E-16
   3.580E-16  2.872E-16  2.625E-16  2.168E-16  1.586E-16  2.107E-16  3.541E-16  6.311E-16  1.140E-15  2.084E-15  4.481E-15
   8.208E-15  1.232E-14  1.575E-14  1.704E-14  1.603E-14  1.395E-14  1.220E-14  1.185E-14  1.362E-14  2.005E-14  3.521E-14
   7.225E-14
12 -2.829E-14 -7.326E-16 -1.505E-15 -4.756E-15 -1.269E-14 -2.520E-14 -4.873E-14 -8.709E-14 -1.416E-13 -1.975E-13 -2.095E-13
  -1.916E-13 -1.533E-13 -1.057E-13 -6.082E-14 -2.730E-14 -7.951E-15 -4.729E-16  1.206E-15  1.248E-15  1.403E-15  1.950E-15
   2.733E-15  3.189E-15  3.765E-15  3.914E-15  2.746E-15  3.838E-15  6.417E-15  9.815E-15  1.454E-14  2.300E-14  4.413E-14
   9.034E-14  1.456E-13  1.899E-13  1.994E-13  1.740E-13  1.329E-13  9.469E-14  6.962E-14  6.024E-14  6.730E-14  9.833E-14
   1.482E-13
13 -4.929E-14 -4.526E-15 -1.258E-14 -3.912E-14 -9.973E-14 -1.860E-13 -3.301E-13 -5.354E-13 -7.753E-13 -9.444E-13 -8.799E-13
  -7.281E-13 -5.208E-13 -3.154E-13 -1.544E-13 -5.428E-14 -8.161E-15  4.240E-15  9.499E-15  6.799E-15  6.753E-15  9.115E-15
   1.297E-14  1.795E-14  2.294E-14  2.522E-14  2.539E-14  3.263E-14  4.795E-14  7.696E-14  1.272E-13  2.467E-13  5.159E-13
   1.028E-12  1.694E-12  2.205E-12  2.252E-12  1.867E-12  1.319E-12  8.299E-13  4.958E-13  3.193E-13  2.346E-13  2.872E-13
   4.755E-13
14 -1.219E-13 -3.213E-14 -1.076E-13 -3.392E-13 -7.979E-13 -1.356E-12 -2.136E-12 -3.022E-12 -3.741E-12 -3.797E-12 -2.992E-12
  -2.180E-12 -1.352E-12 -6.895E-13 -2.669E-13 -6.171E-14  4.536E-15  2.229E-14  5.076E-14  2.980E-14  3.138E-14  4.225E-14
   5.845E-14  7.850E-14  1.017E-13  1.282E-13  1.689E-13  2.363E-13  3.566E-13  6.170E-13  1.268E-12  2.778E-12  5.477E-12
   1.098E-11  1.864E-11  2.406E-11  2.390E-11  1.902E-11  1.275E-11  7.425E-12  3.896E-12  2.053E-12  1.021E-12  9.365E-13
   1.552E-12
15 -2.955E-13 -1.922E-13 -6.833E-13 -2.132E-12 -4.681E-12 -7.336E-12 -1.038E-11 -1.287E-11 -1.353E-11 -1.113E-11 -7.118E-12
  -4.370E-12 -2.190E-12 -8.103E-13 -1.532E-13  3.622E-14  8.032E-14  1.226E-13  1.774E-13  1.374E-13  1.754E-13  2.519E-13
   3.503E-13  4.697E-13  6.138E-13  8.168E-13  1.161E-12  1.745E-12  2.974E-12  6.014E-12  1.298E-11  2.557E-11  4.686E-11
   1.123E-10  1.996E-10  2.490E-10  2.389E-10  1.830E-10  1.182E-10  6.458E-11  3.030E-11  1.380E-11  4.912E-12  2.872E-12
   3.673E-12
16 -5.200E-13 -7.263E-13 -2.614E-12 -7.998E-12 -1.699E-11 -2.548E-11 -3.379E-11 -3.817E-11 -3.496E-11 -2.311E-11 -1.151E-11
```

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   -5.697E-12 -2.148E-12 -4.594E-13 6.118E-14 1.516E-13 1.926E-13 2.754E-13 4.269E-13 6.650E-13 1.108E-12 1.609E-12
   2.221E-12 3.011E-12 4.051E-12 5.687E-12 8.835E-12 1.470E-11 2.704E-11 5.297E-11 1.022E-10 1.866E-10 3.766E-10
   1.140E-09 2.081E-09 2.387E-09 2.210E-09 1.651E-09 1.080E-09 5.392E-10 2.173E-10 9.013E-11 2.585E-11 1.033E-11
   1.124E-11
17 -6.290E-13 -1.558E-12 -5.562E-12 -1.674E-11 -3.482E-11 -5.085E-11 -6.484E-11 -6.905E-11 -5.722E-11 -3.062E-11 -1.063E-11
   -3.442E-12 -4.020E-13 3.332E-13 4.706E-13 5.082E-13 5.783E-13 7.892E-13 1.538E-12 4.869E-12 7.350E-12 1.012E-11
   1.406E-11 1.987E-11 2.845E-11 4.269E-11 7.027E-11 1.190E-10 2.085E-10 3.757E-10 6.854E-10 1.235E-09 2.983E-09
   1.101E-08 1.733E-08 1.816E-08 1.880E-08 1.405E-08 1.079E-08 3.822E-09 1.455E-09 5.827E-10 1.370E-10 3.701E-11
   2.984E-11
18 -5.424E-13 -1.082E-12 -3.875E-12 -1.162E-11 -2.410E-11 -3.546E-11 -4.624E-11 -5.156E-11 -4.591E-11 -2.558E-11 -5.064E-12
   -1.917E-14 1.084E-12 1.360E-12 1.443E-12 1.508E-12 1.801E-12 2.840E-12 6.302E-12 2.405E-11 3.651E-11 4.938E-11
   7.039E-11 1.052E-10 1.613E-10 2.526E-10 4.140E-10 6.710E-10 1.084E-09 1.743E-09 2.746E-09 4.868E-09 1.589E-08
   5.999E-08 7.386E-08 7.471E-08 1.115E-07 1.292E-07 6.235E-08 2.496E-08 1.131E-08 3.481E-09 6.420E-10 1.285E-10
   6.737E-11
19 -3.918E-13 -5.106E-13 -1.559E-12 -3.727E-12 -5.783E-12 -6.593E-12 -6.447E-12 -5.154E-12 -3.077E-12 -1.176E-12 -1.465E-12
   7.508E-13 1.152E-12 9.890E-13 5.175E-13 -1.682E-13 -5.345E-13 1.438E-12 1.056E-11 3.624E-11 6.795E-11 1.015E-10
   1.515E-10 2.336E-10 3.684E-10 5.846E-10 9.347E-10 1.454E-09 2.233E-09 3.411E-09 5.490E-09 1.283E-08 3.345E-08
   2.161E-07 5.414E-07 6.826E-07 1.506E-06 1.362E-06 5.301E-07 1.310E-07 3.139E-08 1.332E-08 2.252E-09 3.811E-10
   1.582E-10
20 -2.293E-13 -2.690E-13 -7.244E-13 -1.424E-12 -1.659E-12 -1.366E-12 -7.752E-13 -2.006E-13 5.250E-14 1.083E-13 -4.954E-13
   -6.032E-13 -1.409E-12 -4.709E-12 -1.013E-11 -1.753E-11 -2.429E-11 -2.411E-11 -8.858E-12 2.377E-11 7.296E-11 1.312E-10
   2.088E-10 3.194E-10 4.871E-10 7.344E-10 1.094E-09 1.639E-09 2.484E-09 3.745E-09 5.528E-09 8.860E-09 1.343E-07
   7.206E-07 3.113E-06 6.944E-06 2.059E-05 2.059E-05 4.123E-06 6.706E-07 1.171E-07 3.747E-08 5.217E-09 8.511E-10
   2.568E-10
21 -1.168E-13 -7.550E-14 -1.805E-13 -2.736E-13 -2.129E-13 -1.280E-13 -3.116E-14 2.292E-14 4.419E-14 -1.692E-13 -1.986E-12
   -6.221E-12 -1.443E-11 -2.798E-11 -4.693E-11 -7.190E-11 -9.677E-11 -1.098E-10 -9.877E-11 -6.033E-11 -5.325E-12 4.051E-11
   8.082E-11 1.162E-10 1.302E-10 5.387E-11 -2.101E-10 -5.813E-10 -9.493E-10 -1.414E-09 -9.922E-10 2.948E-09 2.318E-08
   2.180E-07 1.769E-06 4.560E-06 2.059E-05 2.059E-05 3.611E-06 6.734E-07 1.181E-07 2.607E-08 5.717E-09 9.040E-10
   2.210E-10
22 -5.725E-14 -1.470E-14 -3.054E-14 -3.300E-14 -1.217E-14 -2.349E-15 3.730E-15 7.276E-15 -3.425E-14 -5.618E-13 -3.452E-12
   -1.040E-11 -2.612E-11 -5.431E-11 -9.750E-11 -1.562E-10 -2.234E-10 -2.845E-10 -3.282E-10 -3.601E-10 -3.997E-10 -4.716E-10
   -6.166E-10 -8.881E-10 -1.356E-09 -2.127E-09 -3.294E-09 -4.433E-09 -4.933E-09 -4.864E-09 -4.283E-09 -3.648E-09 -5.969E-09
   1.232E-08 1.229E-07 5.526E-07 1.646E-06 1.354E-06 5.166E-07 1.262E-07 3.217E-08 1.394E-08 2.336E-09 3.806E-10
   1.502E-10
23 -2.555E-14 -2.471E-15 -4.351E-15 -3.651E-15 -1.453E-15 -1.573E-15 -1.873E-15 -6.684E-15 -6.513E-14 -5.742E-13 -3.131E-12
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   -7.625E-10 -9.482E-10 -1.238E-09 -1.615E-09 -1.976E-09 -2.133E-09 -2.038E-09 -1.932E-09 -1.730E-09 -1.336E-09 -1.090E-09
   -1.858E-10 -1.647E-08 3.367E-08 1.181E-07 9.253E-08 4.814E-08 1.868E-08 8.914E-09 2.883E-09 5.560E-10 1.131E-10
   6.142E-11
24 -8.978E-15 -7.313E-16 -1.842E-15 -4.864E-15 -1.032E-14 -1.500E-14 -1.854E-14 -2.029E-14 -3.328E-14 -1.919E-13 -1.130E-12
   -3.701E-12 -1.082E-11 -2.752E-11 -6.144E-11 -1.221E-10 -2.169E-10 -3.393E-10 -4.414E-10 -4.749E-10 -4.981E-10 -5.015E-10
   -5.042E-10 -5.212E-10 -5.529E-10 -5.782E-10 -5.683E-10 -4.547E-10 -2.617E-10 -3.122E-10 -3.298E-10 -1.380E-10 2.224E-10
   9.812E-10 1.401E-09 7.867E-09 9.926E-09 8.446E-09 6.775E-09 2.456E-09 9.454E-10 3.917E-10 9.950E-11 2.890E-11
   2.289E-11
25 -4.160E-15 -5.704E-16 -2.006E-15 -6.342E-15 -1.327E-14 -1.862E-14 -2.358E-14 -2.635E-14 -2.284E-14 5.603E-16 2.562E-14
   -1.346E-14 -4.655E-13 -2.195E-12 -6.855E-12 -1.710E-11 -3.650E-11 -6.948E-11 -1.302E-10 -2.312E-10 -2.326E-10 -2.291E-10
   -2.197E-10 -2.017E-10 -1.696E-10 -1.175E-10 -6.927E-11 -3.156E-11 -1.691E-11 -2.265E-11 -4.453E-11 -5.553E-11 -5.720E-12
   1.074E-10 2.567E-10 4.953E-10 7.261E-10 6.835E-10 4.902E-10 2.503E-10 1.068E-10 4.799E-11 1.568E-11 7.021E-12
   9.480E-12
26 -1.306E-15 -2.070E-16 -6.333E-16 -1.304E-15 -2.191E-15 -4.351E-15 -9.347E-15 -1.598E-14 -2.117E-14 -2.222E-14 -1.159E-14
   -1.803E-15 -2.041E-14 -1.835E-13 -7.972E-13 -2.507E-12 -6.501E-12 -1.487E-11 -3.248E-11 -6.196E-11 -6.396E-11 -6.266E-11
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   -5.450E-12 8.047E-12 3.041E-11 5.316E-11 5.737E-11 4.407E-11 2.590E-11 1.273E-11 6.079E-12 2.388E-12 1.648E-12
   3.498E-12
27 -6.338E-16 -4.576E-17 -9.779E-17 -7.024E-17 -1.998E-16 -6.782E-16 -2.103E-15 -5.342E-15 -1.035E-14 -1.492E-14 -1.293E-14
   -7.050E-15 2.410E-15 1.040E-14 1.513E-15 -1.131E-13 -5.671E-13 -1.796E-12 -4.536E-12 -8.845E-12 -9.327E-12 -8.281E-12
   -6.981E-12 -5.409E-12 -3.727E-12 -2.524E-12 -1.730E-12 -1.407E-12 -1.294E-12 -1.128E-12 -7.307E-13 -5.755E-13 -1.071E-12
   -1.269E-12 -4.628E-13 1.020E-12 2.657E-12 3.474E-12 3.101E-12 2.112E-12 1.204E-12 6.672E-13 3.851E-13 4.961E-13
   1.173E-12
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   -7.351E-15 -4.967E-15 -1.304E-15 2.444E-15 2.367E-15 -2.507E-14 -1.461E-13 -4.469E-13 -8.893E-13 -9.887E-13 -8.597E-13
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   -1.739E-13 -1.303E-13 -1.104E-14 1.032E-13 1.879E-13 2.022E-13 1.589E-13 1.018E-13 6.287E-14 5.217E-14 1.198E-13
   5.001E-13
29 -1.076E-16 -1.430E-18 -5.766E-20 1.047E-20 1.773E-20 -1.324E-18 -1.675E-17 -1.065E-16 -4.473E-16 -1.202E-15 -1.958E-15
   -2.290E-15 -2.300E-15 -1.869E-15 -8.804E-16 7.246E-16 2.956E-15 5.379E-15 3.201E-15 -1.154E-14 -2.697E-14 -3.437E-14
   -3.682E-14 -3.540E-14 -2.512E-14 -1.471E-14 -7.407E-15 -3.463E-15 -3.446E-15 -8.548E-15 -1.888E-14 -3.060E-14 -3.570E-14
   -3.147E-14 -2.246E-14 -1.167E-14 -2.337E-15 2.769E-15 5.149E-15 5.425E-15 4.765E-15 5.057E-15 1.053E-14 3.907E-14
   2.356E-13
30 -5.354E-17 -3.320E-19 -3.577E-21 -5.199E-21 -8.940E-21 1.662E-20 8.758E-20 1.541E-21 -3.662E-18 -4.407E-17 -1.357E-16
   -2.181E-16 -2.997E-16 -3.592E-16 -3.798E-16 -3.474E-16 -2.443E-16 -1.702E-17 2.313E-16 2.131E-16 -1.146E-16 -5.288E-16
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  -8.550E-16 -1.082E-15 -9.963E-16 -6.932E-16 -3.835E-16 -1.334E-16  2.844E-17  4.649E-17 -2.304E-16 -1.105E-15 -2.272E-15
  -2.961E-15 -2.734E-15 -1.842E-15 -8.556E-16 -2.013E-16  7.575E-17  2.020E-16  4.014E-16  9.265E-16  2.981E-15  1.168E-14
   7.405E-14
31  -1.603E-17 -9.191E-20 -2.993E-21 -7.300E-22 -2.586E-21 -8.412E-21 -2.059E-20 -2.206E-20  7.063E-20  4.109E-19  8.383E-19
   6.896E-19 -1.072E-18 -6.845E-18 -1.639E-17 -2.654E-17 -3.169E-17 -2.917E-17 -1.711E-17 -2.694E-18  3.623E-18  3.451E-18
   8.963E-19 -4.730E-18 -1.072E-17 -1.216E-17 -1.005E-17 -6.506E-18 -1.792E-18  3.482E-18  9.532E-18  1.107E-17 -4.045E-18
  -4.704E-17 -8.410E-17 -8.502E-17 -5.297E-17 -1.338E-17  1.297E-17  3.973E-17  9.802E-17  2.481E-16  8.255E-16  3.445E-15
   2.532E-14
32  -7.642E-18 -2.784E-18 -6.043E-19 -1.993E-19 -4.105E-20 -2.137E-20 -1.662E-20 -1.075E-20 -1.358E-20 -1.178E-19 -8.043E-19
  -2.207E-18 -4.329E-18 -7.665E-18 -1.272E-17 -1.771E-17 -1.942E-17 -1.696E-17 -1.333E-17 -8.182E-18 -3.840E-18 -1.988E-18
  -1.252E-18 -2.437E-18 -3.897E-18 -4.250E-18 -3.713E-18 -2.370E-18 -8.725E-19  8.828E-19  1.092E-18 -1.821E-18 -8.941E-18
  -2.504E-17 -3.370E-17 -2.695E-17 -8.599E-18  1.818E-17  5.969E-17  1.144E-16  2.393E-16  5.806E-16  1.528E-15  3.664E-15
   8.796E-15

TOTAL PARTICLES USED IN THE CURRENT STEP =      887
PARTICLES ADDED AT BEGINNING OF THE STEP =       48
PARTICLES REMOVED AT END OF LAST STEP    =      53

          CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  276, TIME STEP    1, STRESS PERIOD    1
          ------------------------------------------------------------------------------------------

                              IN              OUT
                           --------        --------

            CONSTANT CONCENTRATION:   11.68979            0.0000000
                   CONSTANT HEAD:  0.0000000          0.6846069E-08
                          WELLS:  0.0000000         -4.045130
            DECAY OR BIODEGRADATION:  0.0000000            -1.723264
             MASS STORAGE (SOLUTE):  1.826596          -1.243769
            ---------------------------------------------------------------

                        [TOTAL]:   13.51639    LB      -7.012163    LB

                             NET (IN - OUT):   6.504225
                      DISCREPANCY (PERCENT):   63.36760

----
| M T |
| 3 D | End of Model Output
----
```

```
1                U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER MODEL
0Sensitivity Study; 250 day half life, source control/crit wells 3x          (633, 642, 17349, 17371, 17372)
   1 LAYERS       32 ROWS      45 COLUMNS
  1 STRESS PERIOD(S) IN SIMULATION
 MODEL TIME UNIT IS DAYS
0I/O UNITS:
 ELEMENT OF IUNIT:  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
       I/O UNIT: 11 12  0  0  0  0  0  0 19  0  0 22  0  0  0  0  0  0  0  0  0 24  0  0
0BAS1 -- BASIC MODEL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT  1
 ARRAYS RHS AND BUFF WILL SHARE MEMORY.
 START HEAD WILL NOT BE SAVED -- DRAWDOWN CANNOT BE CALCULATED
   11601 ELEMENTS IN X ARRAY ARE USED BY BAS
   11601 ELEMENTS OF X ARRAY USED OUT OF 9999999
0BCF2 -- BLOCK-CENTERED FLOW PACKAGE, VERSION 2, 7/1/91 INPUT READ FROM UNIT 11
 STEADY-STATE SIMULATION
 HEAD AT CELLS THAT CONVERT TO DRY=  999.99
 WETTING CAPABILITY IS ACTIVE
 WETTING FACTOR=  1.00000    WETTING ITERATION INTERVAL=  5
 FLAG THAT SPECIFIES THE EQUATION TO USE FOR HEAD AT WETTED CELLS=  0
    LAYER  AQUIFER TYPE
    ---------------
      1        1
    4321 ELEMENTS IN X ARRAY ARE USED BY BCF
   15922 ELEMENTS OF X ARRAY USED OUT OF 9999999
0WEL1 -- WELL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM 12
 MAXIMUM OF   11 WELLS
      44 ELEMENTS IN X ARRAY ARE USED FOR WELLS
   15966 ELEMENTS OF X ARRAY USED OUT OF 9999999
0SIP1 -- STRONGLY IMPLICIT PROCEDURE SOLUTION PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 19
 MAXIMUM OF 100 ITERATIONS ALLOWED FOR CLOSURE
  5 ITERATION PARAMETERS
    6165 ELEMENTS IN X ARRAY ARE USED BY SIP
   22131 ELEMENTS OF X ARRAY USED OUT OF 9999999
1Sensitivity Study; 250 day half life, source control/crit wells 3x          (633, 642, 17349, 17371, 17372)
0


                     BOUNDARY ARRAY FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT: (25I3)
                     ------------------------------------------------------------------------
0AQUIFER HEAD WILL BE SET TO  999.99    AT ALL NO-FLOW NODES (IBOUND=0).
0


                     INITIAL HEAD FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT: (10e12.4)
                     ------------------------------------------------------------------------
0HEAD PRINT FORMAT IS FORMAT NUMBER   0    DRAWDOWN PRINT FORMAT IS FORMAT NUMBER   0
0HEADS WILL BE SAVED ON UNIT 30    DRAWDOWNS WILL BE SAVED ON UNIT  0
0OUTPUT CONTROL IS SPECIFIED EVERY TIME STEP
0                              COLUMN TO ROW ANISOTROPY =   1.000000
0


                           DELR WILL BE READ ON UNIT 11 USING FORMAT: (10E12.4)
                           ----------------------------------------------------

   100.00      100.00      100.00      100.00      50.000      50.000      50.000      50.000      50.000      50.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      50.000      50.000      100.00
0


                           DELC WILL BE READ ON UNIT 11 USING FORMAT: (10E12.4)
                           ----------------------------------------------------

   100.00      50.000      50.000      50.000      50.000      50.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000
   25.000      25.000      25.000      25.000      25.000      25.000      25.000      25.000      50.000      50.000
   100.00      100.00
0
```

```
                          HYD. COND. ALONG ROWS FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT: (10e12.4)
                         ---------------------------------------------------------------------------------
0


                               BOTTOM FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT: (10e12.4)
                         ---------------------------------------------------------------------------------
0                                   WETDRY PARAMETER = 0.1000000     FOR LAYER  1
0


                                  SOLUTION BY THE STRONGLY IMPLICIT PROCEDURE
                                  ----------------------------
0                              MAXIMUM ITERATIONS ALLOWED FOR CLOSURE =     100
                                    ACCELERATION PARAMETER =     1.0000
                                HEAD CHANGE CRITERION FOR CLOSURE =    0.10000E-02
                                SIP HEAD CHANGE PRINTOUT INTERVAL =       5
0                                CALCULATE ITERATION PARAMETERS FROM MODEL CALCULATED WSEED
1                               STRESS PERIOD NO.   1, LENGTH =   3650.000
                                ---------------------------------

                               NUMBER OF TIME STEPS =     1

                                MULTIPLIER FOR DELT =     1.000

                              INITIAL TIME STEP SIZE =   3650.000
0        11 WELLS
                              LAYER   ROW    COL   STRESS RATE   WELL NO.
                              -----------------------------------------
                               1     20     35     -577.54        1
                               1      7      5     0.00000        2
                               1      9      5     0.00000        3
                               1      8     14     0.00000        4
                               1     12     11     0.00000        5
                               1     19     11     -51.300        6
                               1     21     13     -9.6000        7
                               1     14     19     -103.00        8
                               1     25     20     -77.000        9
                               1     23     32     0.00000       10
                               1     18     20     -103.00       11
0AVERAGE SEED = 0.00091951
 MINIMUM SEED = 0.00008685
0
  5 ITERATION PARAMETERS CALCULATED FROM AVERAGE SEED:

     0.0000000E+00  0.8258637E+00  0.9696766E+00  0.9947196E+00  0.9990805E+00
0
  21 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
0 HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL HEAD
CHANGE LAYER,ROW,COL HEAD CHANGE LAYER,ROW,COL
 ----------------------------------------------------------------------------------------
 -1.868    ( 1, 31,  2) -0.8410    ( 1,  5,  3) -0.7086    ( 1, 27,  4) -0.7585    ( 1, 11,  6) -0.5936    ( 1, 23, 13)
  0.6925E-01 ( 1, 31, 27)  0.6695E-01 ( 1, 30, 24) -0.5723E-01 ( 1,  6, 20)  0.1823    ( 1, 21, 13)  0.8007E-01 ( 1,  6, 16)
  0.1072E-01 ( 1, 27, 28) -0.1004E-01 ( 1, 13,  9) -0.2107E-01 ( 1, 17, 11) -0.1395E-01 ( 1, 15,  6) -0.1891E-01 ( 1, 23,  8)
  0.2554E-02 ( 1, 31, 17) -0.4455E-02 ( 1, 17, 13) -0.3133E-02 ( 1, 16, 14)  0.6503E-02 ( 1, 25,  8) -0.3449E-02 ( 1, 29, 12)
 -0.6664E-03 ( 1, 24,  9)
0
0HEAD/DRAWDOWN PRINTOUT FLAG = 1    TOTAL BUDGET PRINTOUT FLAG = 0    CELL-BY-CELL FLOW TERM
FLAG = 0
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
  HEAD    DRAWDOWN  HEAD   DRAWDOWN
 PRINTOUT  PRINTOUT  SAVE    SAVE
 ----------------------------------
    1        0        1       0

 HEADS AND FLOW TERMS SAVED ON UNIT 24 FOR USE BY MT3D TRANSPORT MODEL
1              HEAD IN LAYER  1 AT END OF TIME STEP  1 IN STRESS PERIOD  1
       -----------------------------------------------------------------
```

```
        1      2      3      4      5      6      7      8      9      10
        11     12     13     14     15     16     17     18     19     20
        21     22     23     24     25     26     27     28     29     30
        31     32     33     34     35     36     37     38     39     40
        41     42     43     44     45
...................................................................................
0 1   18.00  18.08  18.32  18.62  18.84  18.99  19.14  19.29  19.44  19.59
      19.71  19.78  19.86  19.93  20.01  20.08  20.16  20.23  20.31  20.38
      20.46  20.53  20.61  20.68  20.76  20.84  20.91  20.99  21.06  21.14
      21.21  21.29  21.36  21.44  21.51  21.59  21.66  21.74  21.81  21.89
      21.97  22.04  22.15  22.26  22.50
0 2   18.00  18.15  18.36  18.63  18.84  18.98  19.12  19.27  19.41  19.55
      19.65  19.72  19.79  19.87  19.94  20.01  20.08  20.15  20.23  20.30
      20.38  20.45  20.53  20.61  20.69  20.76  20.84  20.92  21.00  21.07
      21.15  21.23  21.30  21.38  21.46  21.53  21.61  21.69  21.77  21.84
      21.92  22.00  22.11  22.26  22.50
0 3   18.00  18.17  18.39  18.64  18.84  18.98  19.11  19.25  19.38  19.52
      19.62  19.68  19.75  19.82  19.89  19.95  20.02  20.09  20.17  20.24
      20.32  20.40  20.47  20.55  20.63  20.71  20.79  20.87  20.95  21.03
      21.11  21.19  21.26  21.34  21.42  21.50  21.58  21.65  21.73  21.81
      21.89  21.97  22.09  22.26  22.50
0 4   18.00  18.18  18.40  18.64  18.84  18.97  19.10  19.23  19.36  19.49
      19.58  19.64  19.70  19.77  19.83  19.90  19.96  20.03  20.10  20.18
      20.26  20.33  20.42  20.50  20.58  20.67  20.75  20.83  20.91  20.99
      21.07  21.15  21.23  21.30  21.38  21.46  21.54  21.62  21.70  21.78
      21.86  21.94  22.07  22.24  22.50
0 5   18.00  18.18  18.40  18.64  18.84  18.96  19.09  19.22  19.34  19.46
      19.54  19.60  19.65  19.71  19.77  19.83  19.89  19.95  20.02  20.10
      20.18  20.27  20.35  20.44  20.53  20.62  20.70  20.79  20.87  20.95
      21.03  21.11  21.19  21.26  21.34  21.42  21.50  21.58  21.66  21.74
      21.83  21.91  22.05  22.23  22.50
0 6   18.00  18.18  18.40  18.64  18.83  18.95  19.08  19.21  19.34  19.44
      19.51  19.56  19.62  19.67  19.72  19.78  19.83  19.89  19.94  20.01
      20.10  20.19  20.28  20.38  20.48  20.57  20.67  20.75  20.84  20.92
      21.00  21.07  21.15  21.23  21.30  21.38  21.46  21.54  21.62  21.70
      21.78  21.87  22.02  22.22  22.50
0 7   18.00  18.18  18.40  18.64  18.82  18.95  19.07  19.20  19.31  19.42
      19.49  19.54  19.59  19.65  19.70  19.75  19.81  19.87  19.93  19.99
      20.06  20.12  20.22  20.34  20.45  20.55  20.65  20.74  20.82  20.90
      20.98  21.05  21.13  21.19  21.26  21.34  21.42  21.51  21.59  21.67
      21.74  21.83  21.96  22.16  22.50
0 8   18.00  18.18  18.40  18.63  18.82  18.94  19.07  19.19  19.30  19.40
      19.48  19.53  19.58  19.63  19.68  19.74  19.79  19.85  19.91  19.98
      20.04  20.10  20.20  20.32  20.44  20.54  20.64  20.73  20.81  20.89
      20.96  21.05  21.12  21.18  21.24  21.31  21.39  21.48  21.56  21.65
      21.73  21.80  21.93  22.11  22.50
0 9   18.00  18.19  18.41  18.63  18.81  18.94  19.06  19.17  19.28  19.38
      19.46  19.51  19.56  19.61  19.67  19.72  19.77  19.83  19.89  19.96
      20.03  20.09  20.19  20.31  20.43  20.54  20.64  20.74  20.81  20.88
      20.95  21.03  21.10  21.16  21.22  21.29  21.37  21.45  21.54  21.63
      21.72  21.79  21.90  22.07  22.50
0 10  18.00  18.19  18.41  18.63  18.81  18.93  19.05  19.16  19.27  19.37
      19.44  19.50  19.55  19.60  19.65  19.70  19.75  19.81  19.87  19.94
      20.02  20.09  20.18  20.31  20.43  20.54  20.64  20.73  20.80  20.86
      20.94  21.02  21.09  21.14  21.21  21.28  21.35  21.43  21.51  21.60
      21.69  21.77  21.89  22.05  22.50
0 11  18.00  18.20  18.41  18.63  18.81  18.93  19.04  19.15  19.26  19.36
      19.43  19.48  19.53  19.58  19.63  19.68  19.73  19.78  19.85  19.92
      20.00  20.09  20.19  20.32  20.45  20.54  20.63  20.71  20.78  20.85
      20.92  21.00  21.07  21.13  21.19  21.26  21.34  21.42  21.50  21.58
      21.67  21.75  21.87  22.03  22.50
0 12  18.00  18.20  18.41  18.64  18.81  18.92  19.03  19.14  19.24  19.34
      19.42  19.46  19.51  19.56  19.61  19.65  19.70  19.75  19.81  19.89
      19.99  20.09  20.20  20.32  20.45  20.55  20.63  20.71  20.78  20.83
      20.89  20.96  21.04  21.10  21.17  21.24  21.32  21.40  21.48  21.56
      21.65  21.73  21.86  22.02  22.50
0 13  18.00  18.20  18.42  18.64  18.81  18.92  19.03  19.13  19.23  19.33
      19.40  19.45  19.50  19.54  19.59  19.63  19.67  19.70  19.74  19.85
      19.97  20.09  20.20  20.33  20.46  20.56  20.62  20.69  20.75  20.81
      20.88  20.94  21.01  21.08  21.14  21.22  21.29  21.38  21.46  21.55
```

```
      21.63   21.72   21.84   22.01   22.50
0 14  18.00   18.20   18.42   18.63   18.80   18.91   19.02   19.12   19.22   19.32
      19.39   19.44   19.48   19.53   19.57   19.61   19.64   19.65   19.59   19.80
      19.95   20.08   20.20   20.33   20.47   20.56   20.62   20.68   20.74   20.80
      20.85   20.92   20.98   21.05   21.11   21.19   21.27   21.35   21.44   21.53
      21.61   21.70   21.83   22.00   22.50
0 15  18.00   18.20   18.42   18.63   18.80   18.91   19.01   19.12   19.21   19.31
      19.37   19.42   19.47   19.52   19.56   19.60   19.64   19.66   19.70   19.81
      19.94   20.07   20.20   20.33   20.46   20.56   20.61   20.67   20.72   20.78
      20.83   20.89   20.95   21.01   21.08   21.16   21.24   21.33   21.42   21.51
      21.60   21.68   21.82   21.99   22.50
0 16  18.00   18.20   18.42   18.63   18.80   18.91   19.01   19.11   19.21   19.29
      19.36   19.41   19.46   19.51   19.55   19.60   19.64   19.68   19.73   19.81
      19.93   20.06   20.19   20.32   20.46   20.55   20.60   20.66   20.71   20.76
      20.81   20.86   20.91   20.97   21.04   21.12   21.20   21.30   21.39   21.49
      21.58   21.67   21.81   21.98   22.50
0 17  18.00   18.20   18.42   18.63   18.80   18.90   19.01   19.11   19.20   19.28
      19.34   19.39   19.45   19.50   19.55   19.59   19.64   19.68   19.72   19.77
      19.91   20.05   20.18   20.32   20.45   20.55   20.60   20.65   20.69   20.74
      20.79   20.83   20.87   20.92   20.98   21.07   21.16   21.27   21.37   21.47
      21.56   21.66   21.80   21.98   22.50
0 18  18.00   18.20   18.41   18.63   18.80   18.90   19.01   19.11   19.20   19.27
      19.31   19.37   19.44   19.49   19.55   19.60   19.64   19.68   19.70   19.66
      19.88   20.04   20.18   20.31   20.45   20.54   20.59   20.64   20.68   20.72
      20.76   20.80   20.83   20.86   20.91   21.01   21.12   21.24   21.35   21.45
      21.55   21.65   21.79   21.97   22.50
0 19  18.00   18.20   18.41   18.63   18.80   18.90   19.01   19.11   19.20   19.26
      19.25   19.36   19.43   19.49   19.55   19.60   19.65   19.70   19.74   19.79
      19.92   20.05   20.18   20.31   20.44   20.53   20.58   20.63   20.67   20.71
      20.75   20.77   20.79   20.78   20.78   20.93   21.07   21.21   21.33   21.44
      21.54   21.64   21.79   21.97   22.50
0 20  18.00   18.20   18.41   18.63   18.80   18.91   19.01   19.11   19.20   19.27
      19.32   19.38   19.44   19.50   19.56   19.61   19.66   19.72   19.77   19.85
      19.95   20.06   20.18   20.30   20.43   20.52   20.58   20.62   20.67   20.71
      20.74   20.76   20.76   20.70   20.50   20.85   21.05   21.19   21.32   21.43
      21.54   21.64   21.78   21.97   22.50
0 21  18.00   18.20   18.41   18.63   18.80   18.91   19.02   19.12   19.21   19.29
      19.35   19.40   19.44   19.51   19.57   19.62   19.68   19.73   19.80   19.87
      19.96   20.07   20.17   20.28   20.40   20.50   20.58   20.62   20.67   20.71
      20.74   20.76   20.78   20.77   20.77   20.92   21.07   21.20   21.32   21.43
      21.54   21.64   21.78   21.97   22.50
0 22  18.00   18.20   18.41   18.63   18.80   18.91   19.02   19.13   19.22   19.31
      19.38   19.42   19.47   19.53   19.58   19.64   19.69   19.75   19.81   19.88
      19.97   20.06   20.17   20.27   20.38   20.48   20.57   20.63   20.67   20.71
      20.75   20.78   20.81   20.84   20.89   20.99   21.10   21.22   21.33   21.44
      21.54   21.64   21.79   21.97   22.50
0 23  18.00   18.20   18.40   18.62   18.80   18.91   19.03   19.14   19.24   19.33
      19.40   19.45   19.50   19.55   19.60   19.65   19.70   19.75   19.81   19.87
      19.96   20.06   20.16   20.26   20.36   20.46   20.56   20.63   20.67   20.72
      20.77   20.81   20.85   20.90   20.96   21.04   21.13   21.24   21.34   21.45
      21.55   21.65   21.79   21.98   22.50
0 24  18.00   18.19   18.40   18.62   18.80   18.92   19.04   19.15   19.26   19.35
      19.42   19.47   19.52   19.57   19.61   19.66   19.71   19.76   19.80   19.84
      19.95   20.05   20.15   20.25   20.35   20.44   20.53   20.61   20.68   20.74
      20.79   20.83   20.88   20.94   21.00   21.07   21.16   21.26   21.36   21.46
      21.56   21.65   21.80   21.99   22.50
0 25  18.00   18.19   18.39   18.62   18.80   18.92   19.04   19.17   19.28   19.37
      19.44   19.49   19.54   19.58   19.63   19.68   19.72   19.76   19.79   19.76
      19.93   20.05   20.14   20.24   20.33   20.43   20.52   20.61   20.68   20.75
      20.80   20.86   20.91   20.96   21.03   21.10   21.18   21.28   21.37   21.47
      21.57   21.66   21.81   22.00   22.50
0 26  18.00   18.19   18.39   18.61   18.79   18.93   19.06   19.19   19.30   19.39
      19.46   19.51   19.55   19.60   19.65   19.70   19.74   19.78   19.82   19.86
      19.96   20.06   20.15   20.23   20.31   20.42   20.52   20.61   20.70   20.77
      20.82   20.88   20.94   20.99   21.05   21.13   21.21   21.30   21.39   21.49
      21.58   21.68   21.83   22.04   22.50
0 27  18.00   18.18   18.38   18.61   18.80   18.94   19.07   19.21   19.32   19.41
      19.48   19.53   19.57   19.62   19.67   19.72   19.76   19.81   19.86   19.91
      19.99   20.07   20.15   20.23   20.32   20.43   20.53   20.62   20.71   20.78
      20.85   20.91   20.96   21.02   21.09   21.16   21.24   21.33   21.42   21.51
      21.61   21.70   21.86   22.08   22.50
```

```
0 28   18.00    18.18    18.37    18.61    18.81    18.94    19.08    19.23    19.34    19.43
      19.50    19.54    19.59    19.64    19.69    19.73    19.78    19.83    19.89    19.94
      20.01    20.09    20.17    20.24    20.34    20.45    20.55    20.65    20.73    20.80
      20.87    20.94    21.00    21.06    21.13    21.20    21.28    21.37    21.46    21.55
      21.64    21.74    21.89    22.11    22.50
0 29   18.00    18.17    18.37    18.62    18.82    18.96    19.10    19.25    19.37    19.46
      19.53    19.57    19.62    19.67    19.71    19.76    19.81    19.87    19.92    19.97
      20.05    20.14    20.23    20.32    20.41    20.51    20.60    20.69    20.77    20.85
      20.92    20.99    21.06    21.14    21.21    21.28    21.36    21.45    21.53    21.62
      21.71    21.81    21.95    22.16    22.50
0 30   18.00    18.16    18.38    18.63    18.83    18.97    19.11    19.25    19.39    19.49
      19.56    19.61    19.65    19.70    19.75    19.79    19.86    19.93    20.00    20.08
      20.16    20.25    20.33    20.42    20.50    20.59    20.68    20.76    20.84    20.92
      21.00    21.07    21.15    21.23    21.30    21.38    21.46    21.54    21.62    21.71
      21.80    21.88    22.02    22.21    22.50
0 31   18.00    18.15    18.37    18.63    18.84    18.99    19.13    19.27    19.41    19.54
      19.63    19.69    19.75    19.82    19.88    19.95    20.02    20.09    20.17    20.24
      20.32    20.40    20.48    20.56    20.64    20.72    20.80    20.88    20.96    21.04
      21.12    21.20    21.27    21.35    21.43    21.51    21.59    21.67    21.75    21.83
      21.91    21.99    22.11    22.27    22.50
0 32   18.00    18.08    18.31    18.62    18.85    19.01    19.16    19.32    19.47    19.62
      19.74    19.82    19.89    19.97    20.05    20.13    20.20    20.28    20.36    20.43
      20.51    20.59    20.67    20.74    20.82    20.90    20.98    21.05    21.13    21.21
      21.28    21.36    21.44    21.52    21.59    21.67    21.75    21.82    21.90    21.98
      22.06    22.13    22.25    22.36    22.50
0HEAD WILL BE SAVED ON UNIT 30 AT END OF TIME STEP  1, STRESS PERIOD  1
0


             VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  1
             ------------------------------------------------------------------------------

0        CUMULATIVE VOLUMES      L**3              RATES FOR THIS TIME STEP      L**3/T
         ------------------                        ------------------------

           IN:                                  IN:
           ---                                  ---
             STORAGE =  0.00000                       STORAGE =  0.00000
         CONSTANT HEAD =  0.45828E+07              CONSTANT HEAD =    1255.6
               WELLS =  0.00000                         WELLS =  0.00000
0            TOTAL IN =  0.45828E+07                  TOTAL IN =    1255.6
0          OUT:                                  OUT:
           ----                                  ----
             STORAGE =  0.00000                       STORAGE =  0.00000
         CONSTANT HEAD =  0.12220E+07              CONSTANT HEAD =   334.80
               WELLS =  0.33633E+07                     WELLS =   921.44
0           TOTAL OUT =  0.45853E+07                 TOTAL OUT =    1256.2
0            IN - OUT =  -2515.5                     IN - OUT =  -0.68921
0      PERCENT DISCREPANCY =          -0.05        PERCENT DISCREPANCY =          -0.05


0


    TIME SUMMARY AT END OF TIME STEP  1 IN STRESS PERIOD  1
              SECONDS        MINUTES        HOURS        DAYS        YEARS
              ------------------------------------------------------------
   TIME STEP LENGTH    0.315360E+09  0.525600E+07  87600.0    3650.00    9.99316
  STRESS PERIOD TIME   0.315360E+09  0.525600E+07  87600.0    3650.00    9.99316
TOTAL SIMULATION TIME  0.315360E+09  0.525600E+07  87600.0    3650.00    9.99316
1
```

```
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+                                     +
+                  M T 3 D                +
+        A Modular Three-Dimensional Transport Model         +
+   For Simulation of Advection, Dispersion and Chemical Reactions  +
+          of Contaminants in Groundwater Systems            +
+                  (V. 1.80)                 +
+                                     +
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

----
| M T | Sensitivity 1; Source Control/Critical Offsite Wells 3x Intermittent
| 3 D | Half life 250 days for benzene
----

THE TRANSPORT MODEL CONSISTS OF    1 LAYER(S)  32 ROW(S)   45 COLUMN(S)
NUMBER OF STRESS PERIOD(S) IN SIMULATION =   1
UNIT FOR TIME IS D  ; UNIT FOR LENGTH IS FT  ; UNIT FOR MASS IS LB
MAJOR TRANSPORT COMPONENTS TO BE SIMULATED:
 1  ADVECTION
 2  DISPERSION
 3  SINK AND SOURCE MIXING
 4  CHEMICAL REACTIONS (DECAY AND/OR SORPTION)

BTN1 -- BASIC TRANSPORT PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  1
  15994 ELEMENTS OF THE  X ARRAY USED BY THE BTN PACKAGE
   1441 ELEMENTS OF THE IX ARRAY USED BY THE BTN PACKAGE

ADV1 -- ADVECTION PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  2
ADVECTION IS SOLVED WITH THE HYBRID [MOC]/[MMOC] SCHEME
COURANT NUMBER ALLOWED IN SOLVING THE ADVECTION TERM =  1.00
MAXIMUM NUMBER OF MOVING PARTICLES ALLOWED =   80000
 320000 ELEMENTS OF THE  X ARRAY USED BY THE ADV PACKAGE
   1440 ELEMENTS OF THE IX ARRAY USED BY THE ADV PACKAGE

DSP1 -- DISPERSION PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  3
   7203 ELEMENTS OF THE  X ARRAY USED BY THE DSP PACKAGE
      0 ELEMENTS OF THE IX ARRAY USED BY THE DSP PACKAGE

SSM1 -- SINK & SOURCE MIXING PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  4
MAJOR STRESS COMPONENTS PRESENT IN THE FLOW MODEL:
 1  WELL
MAXIMUM NUMBER OF POINT SINKS/SOURCES =     165
    990 ELEMENTS OF THE  X ARRAY USED BY THE SSM PACKAGE
      0 ELEMENTS OF THE IX ARRAY BY THE SSM PACKAGE

RCT1 -- CHEMICAL REACTIONS PACKAGE, VER 1.8, OCTOBER 1992, INPUT READ FROM UNIT  9
NO SORPTION ISOTHERM IS SIMULATED
FIRST-ORDER RATE REACTION [DECAY OR BIODEGRADATION] IS SIMULATED
      2 ELEMENTS OF THE  X ARRAY USED BY THE RCT PACKAGE
      0 ELEMENTS OF THE IX ARRAY USED BY THE RCT PACKAGE

..........................................................
 344190 ELEMENTS OF THE  X ARRAY USED OUT OF  9999999
   2882 ELEMENTS OF THE IX ARRAY USED OUT OF  9999999
..........................................................

LAYER NUMBER  AQUIFER TYPE
------------  ------------
     1           1

                  WIDTH ALONG ROWS (DELR)  READ ON UNIT  1 USING FORMAT: "(10E12.4)         "
                  ---------------------------------------------------------

                  WIDTH ALONG COLS (DELC)  READ ON UNIT  1 USING FORMAT: "(10E12.4)         "
                  ---------------------------------------------------------

                  TOP ELEV. OF 1ST LAYER   READ ON UNIT  1 USING FORMAT: "(10E12.4)         "
                  ---------------------------------------------------------

                         CELL THICKNESS (DZ)    =   100.0000    FOR LAYER  1
                         EFFECTIVE POROSITY     =  0.2500000    FOR LAYER  1
```

```
          CONCN. BOUNDARY ARRAY   FOR LAYER  1 READ ON UNIT  1 USING FORMAT: "(25I3)                 "
          ------------------------------------------------------------

          1    2    3    4    5    6    7    8    9   10
         11   12   13   14   15   16   17   18   19   20
         21   22   23   24   25   26   27   28   29   30
         31   32   33   34   35   36   37   38   39   40
         41   42   43   44   45
 ...........................................................................
   1      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   2      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   3      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   4      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   5      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   6      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   7      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   8      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
   9      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  10      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  11      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  12      1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1    1    1    1    1    1
          1    1    1    1    1
  13      1    1    1    1    1    1    1    1    1    1
```

```
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
14    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
15    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
16    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
17    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
18    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
19    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
20    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1   -1   -1    1    1
     1    1    1    1    1
21    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1   -1   -1    1    1
     1    1    1    1    1
22    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
23    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
24    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
25    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
26    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1
27    1    1    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
```

```
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1
  28       1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1
  29       1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1
  30       1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1
  31       1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1
  32       1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1

      INITIAL CONCENTRATION    FOR LAYER  1 READ ON UNIT  1 USING FORMAT: "(10E12.4)        "
      ------------------------------------------------------------------------

 VALUE INDICATING INACTIVE CONCENTRATION CELLS =   999.9900

 OUTPUT CONTROL OPTIONS
 ----------------------

 PRINT CELL CONCENTRATION USING FORMAT CODE:    1
 DO NOT PRINT PARTICLE NUMBER IN EACH CELL
 DO NOT PRINT RETARDATION FACTOR
 DO NOT PRINT DISPERSION COEFFICIENT
 SAVE CONCENTRATION IN UNFORMATTED FILE [MT3D.UCN] ON UNIT 18

 NUMBER OF TIMES AT WHICH SIMULATION RESULTS ARE SAVED =    4
 TOTAL ELAPSED TIMES AT WHICH SIMULATION RESULTS ARE SAVED:
   365.00      730.00      1460.0      2190.0

 NUMBER OF OBSERVATION POINTS =    6
 CONCENTRATION AT OBSERVATION POINTS SAVED IN FILE [MT3D.OBS] ON UNIT 17
 LOCATION OF OBSERVATION POINTS
 ..............................
 NUMBER  LAYER   ROW   COLUMN
   1       1     14     19
   2       1     19     11
   3       1     21     13
   4       1     25     30
   5       1     12     11
   6       1     18     20

 A ONE-LINE SUMMRY OF MASS BALANCE FOR EACH STEP WILL NOT BE SAVED

 MAXIMUM LENGTH ALONG THE X (J) AXIS =   1700.000
 MAXIMUM LENGTH ALONG THE Y (I) AXIS =   1200.000
 MAXIMUM LENGTH ALONG THE Z (K) AXIS =   100.0000

 ADVECTION SOLUTION OPTIONS
 --------------------------

 METHOD FOR PARTICLE TRACKING IS [MIXED ORDER]
```

```
CONCENTRATION WEIGHTING FACTOR =    0.500
THE CONCENTRATION GRADIENT CONSIDERED NEGLIGIBLE [DCEPS] =  0.1000000E-04
INITIAL PARTICLES ARE PLACED RANDOMLY WITHIN CELL BLOCK
PARTICLE NUMBER PER CELL IF DCCELL =< DCEPS =    0
PARTICLE NUMBER PER CELL IF DCCELL  > DCEPS =   16
MINIMUM PARTICLE NUMBER ALLOWD PER CELL      =    2
MAXIMUM PARTICLE NUMBER ALLOWD PER CELL      =   32
MULTIPLIER OF PARTICLE NUMBER AT SOURCE      = 1.00
SCHEME FOR CONCENTRATION INTERPOLATION IS [LINEAR]
PARTICLES FOR APPROXIMATING A SINK CELL IN THE [MMOC] SCHEME
ARE PLACED RANDOMLY WITHIN CELL BLOCK
NUMBER OF PARTICLES USED TO APPROXIMATE A SINK CELL IN THE [MMOC] SCHEME =  16
CRITICAL CONCENTRATION GRADIENT USED IN THE "HMOC" SCHEME [DCHMOC] = 0.5000E-02
THE "MOC"  SOLUTION IS USED WHEN DCCELL  > DCHMOC
THE "MMOC" SOLUTION IS USED WHEN DCCELL =< DCHMOC


DISPERSION PARAMETERS
---------------------

                    LONG. DISPERSIVITY (AL) =   10.00000     FOR LAYER  1

              H. TRANS./LONG. DISP.    READ ON UNIT  3 USING FORMAT: "(10E12.4)         "
              -------------------------------------------------------

              V. TRANS./LONG. DISP.    READ ON UNIT  3 USING FORMAT: "(10E12.4)         "
              -------------------------------------------------------

              DIFFUSION COEFFICIENT    READ ON UNIT  3 USING FORMAT: "(10E12.4)         "
              -------------------------------------------------------


SORPTION AND 1ST ORDER RATE REACTION PARAMETERS
-----------------------------------------------


              DISSOLVED RATE CONSTANT  READ ON UNIT  9 USING FORMAT: "(10E12.4)         "
              -------------------------------------------------------

              SORBED RATE CONSTANT     READ ON UNIT  9 USING FORMAT: "(10E12.4)         "
              -------------------------------------------------------

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE REACTION TERM
= 180.5    AT K=   1, I=   1, J=   1


                    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                              STRESS PERIOD NO.  001
                    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++


LENGTH OF CURRENT STRESS PERIOD =   2190.000
NUMBER OF TIME STEPS FOR CURRENT STRESS PERIOD =    1
TIME STEP MULTIPLIER =   1.000000
USER-SPECIFIED TRANSPORT STEPSIZE =  0.0000000    D
MAXIMUM NUMBER OF TRANSPORT STEPS ALLOWED  IN ONE TIME STEP =       1000

NO. OF POINT SINKS/SOURCES OF SPECIFIED CONCONCENTRATIONS =    0 IN STRESS PERIOD  1


                      ==================================================
                               TIME STEP NO.  001
                      ==================================================

FROM TIME =  0.00000     TO    2190.0

          "HEAD          " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------

          "QXX           " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
```

```
          ------------------------------------------------------------
          "QYY        " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------------

MAXIMUM STEPSIZE DURING WHICH ANY PARTICLE CANNOT MOVE MORE THAN ONE CELL
= 14.57  (WHEN MIN. R.F.=1)  AT K=  1, I= 20, J= 36

          "CNH        " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------------

          "WEL        " FLOW TERMS FOR TIME STEP  1, STRESS PERIOD  1 READ UNFORMATTED ON UNIT 10
          ------------------------------------------------------------

TOTAL NUMBER OF POINT SOURCES/SINKS PRESENT IN THE FLOW MODEL =  156

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE SINK & SOURCE TERM
= 186.7  (WHEN MIN. R.F.=1)  AT K=  1, I= 20, J= 45

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE DISPERSION TERM
= 8.013  (WHEN MIN. R.F.=1)  AT K=  1, I= 20, J= 35

                    ----------------------------
                      TRANSPORT STEP NO.  46
                    ----------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =  365.0000   D
.................................................................

          CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP   46, TIME STEP  1, STRESS PERIOD  1
          ------------------------------------------------------------

     1      2      3      4      5      6      7      8      9      10     11
    12     13     14     15     16     17     18     19     20     21     22
    23     24     25     26     27     28     29     30     31     32     33
    34     35     36     37     38     39     40     41     42     43     44
    45
........................................................................................................................
 1 -6.094E-41 -1.156E-41 -1.011E-41 -1.839E-40 -1.804E-39 -1.852E-38 -1.012E-37 -1.318E-36 -4.538E-36  2.387E-35  1.875E-34
   -2.275E-34 -7.241E-33  1.730E-34  2.700E-32 -9.312E-34 -7.864E-32 -1.943E-32  8.386E-32  4.887E-32 -6.717E-32 -6.675E-32
    4.151E-33  1.267E-32  3.497E-33 -4.632E-33 -3.487E-33 -1.775E-33 -6.295E-34  4.407E-34  9.886E-34 -7.309E-34 -1.934E-33
   -1.750E-33  6.195E-33  6.019E-32  5.547E-31  7.078E-30  8.968E-29  1.496E-27  1.102E-26  1.013E-25  8.186E-25  8.932E-24
    9.032E-23
 2 -8.892E-40  4.414E-43  0.000      1.298E-42  9.445E-41  3.813E-39  6.756E-38 -6.415E-37 -4.014E-35 -2.141E-34  3.416E-33
    1.132E-32 -5.810E-32 -5.385E-32  3.052E-31  9.698E-32 -8.610E-31 -2.265E-31  1.135E-30  4.476E-31 -9.061E-31 -5.990E-31
    2.138E-31  2.575E-31  4.513E-33 -6.658E-32 -2.747E-32 -6.361E-33 -2.553E-33  3.224E-33  1.207E-32  1.330E-33 -3.071E-32
   -2.329E-32  2.871E-32  3.531E-32  7.683E-35  6.969E-32  1.431E-30  2.014E-29  2.762E-28  5.501E-27  2.106E-25  9.874E-24
    3.376E-22
 3 -7.059E-39  2.578E-42 -6.585E-42 -9.080E-41 -9.909E-40 -3.833E-37 -1.952E-35 -3.745E-34 -2.200E-34  8.942E-32  4.639E-31
   -2.734E-30 -1.143E-29  3.156E-29  4.824E-29 -1.457E-28 -1.258E-28  2.736E-28  2.110E-28 -2.654E-28 -2.691E-28  5.822E-29
    1.272E-28  1.247E-29 -3.667E-29 -1.745E-29 -3.403E-30 -4.333E-31  6.590E-31  1.685E-30  3.272E-32 -6.885E-30 -7.673E-30
    7.972E-30  1.755E-29  9.269E-31 -1.139E-29 -5.492E-30 -6.129E-30  9.656E-29  3.526E-27  9.030E-26  2.493E-24  7.011E-23
    2.948E-21
 4 -2.140E-37 -4.782E-41 -4.479E-40 -5.250E-38 -3.542E-36 -7.735E-35  6.859E-35  4.546E-32  9.617E-31  2.559E-30 -1.126E-28
   -4.789E-28  1.258E-27  6.579E-27 -1.242E-26 -2.681E-26  3.747E-26  5.455E-26 -5.132E-26 -7.828E-26  7.540E-27  4.385E-26
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    4.292E-13
 29 -3.528E-34 4.010E-35 2.624E-33 3.071E-31 2.630E-29 1.154E-27 4.286E-26 1.286E-24 2.704E-23 2.466E-22 -2.669E-22
   -1.834E-20 -1.698E-19 -8.798E-19 -2.153E-18 6.189E-18 7.673E-17 2.011E-16 -7.307E-16 -5.371E-16 3.900E-16 4.561E-16
    1.550E-16 9.869E-17 1.302E-16 1.010E-16 4.935E-17 9.375E-18 -1.380E-17 2.375E-17 1.878E-16 -1.074E-17 -8.742E-16
    4.047E-17 1.226E-15 -7.721E-16 -2.972E-15 -1.571E-15 1.188E-15 2.427E-15 2.126E-15 1.217E-15 6.170E-16 4.744E-15
    1.294E-13
 30 -4.832E-35 -6.709E-37 -1.173E-34 -1.387E-32 -9.222E-31 -3.015E-29 -7.386E-28 -1.262E-26 -1.079E-25 5.064E-24 1.173E-22
    7.738E-22 2.651E-21 -8.985E-22 -6.450E-20 -2.949E-19 -1.438E-19 3.689E-18 -4.433E-19 -9.504E-18 -2.620E-18 2.933E-18
    1.796E-18 5.852E-20 3.852E-19 8.242E-19 6.709E-19 3.524E-19 -1.996E-19 -1.265E-18 8.972E-19 7.247E-18 -3.763E-18
   -2.129E-17 4.218E-18 2.622E-17 -1.942E-18 -3.540E-17 -2.540E-17 2.302E-18 1.505E-17 1.533E-17 5.046E-17 8.215E-16
    2.336E-14
 31 -3.965E-36 1.312E-36 1.786E-35 4.899E-35 3.063E-33 1.413E-31 2.281E-30 -3.823E-29 -3.745E-27 -1.162E-25 -1.340E-24
   -4.860E-24 9.427E-24 1.787E-22 6.640E-22 -7.966E-22 -1.042E-20 7.157E-21 3.107E-20 -9.864E-21 -3.760E-20 -6.234E-21
    1.063E-20 2.315E-21 -4.086E-21 -7.435E-22 2.105E-21 3.222E-21 5.316E-21 -5.583E-21 -3.591E-20 1.941E-20 1.111E-19
   -3.705E-20 -2.205E-19 -5.494E-21 2.137E-19 7.768E-20 -1.453E-19 -1.477E-19 -7.645E-21 3.154E-19 5.322E-18 1.197E-16
    2.701E-15
 32 -4.121E-36 -1.397E-33 -1.923E-32 -5.578E-31 -3.760E-30 -2.808E-29 -2.454E-28 -1.320E-27 -5.870E-27 -5.199E-26 -8.018E-26
    1.007E-24 6.340E-24 1.950E-23 2.597E-23 -1.893E-22 -1.193E-21 6.904E-22 3.033E-21 -1.385E-21 -3.069E-21 -1.040E-21
    7.176E-22 3.133E-22 -5.362E-22 -2.441E-22 2.509E-22 4.736E-22 2.308E-22 -1.575E-21 -4.157E-21 5.267E-21 9.887E-21
   -1.371E-20 -2.531E-20 -9.932E-21 1.630E-20 1.989E-20 -1.208E-21 3.297E-20 3.778E-19 1.664E-18 1.081E-17 9.409E-17
    5.211E-16

 TOTAL PARTICLES USED IN THE CURRENT STEP =    2473
 PARTICLES ADDED AT BEGINNING OF THE STEP =     160
 PARTICLES REMOVED AT END OF LAST STEP   =      52

            CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  46, TIME STEP    1, STRESS PERIOD    1
            -------------------------------------------------------------------------------------

                                 IN                OUT
                           ----------        ----------

                 CONSTANT CONCENTRATION:  1.910913          0.0000000
                       CONSTANT HEAD:  0.0000000          -0.5143504E-21
                              WELLS:  0.0000000          -0.8425676
```

```
                    DECAY OR BIODEGRADATION:  0.0000000            -0.4643708
                     MASS STORAGE (SOLUTE):  0.9936529            -0.6009140
                    ----------------------------------------------------------
                              [TOTAL]:   2.904566    LB       -1.907852    LB

                                       NET (IN - OUT):  0.9967139
                                DISCREPANCY (PERCENT):   41.42258


                                ----------------------------------
                                     TRANSPORT STEP NO.  92
                                ----------------------------------

 TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =  730.0000    D
 ....................................................................

          CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP   92, TIME STEP  1, STRESS PERIOD  1
          --------------------------------------------------------------------------------

      1       2       3       4       5       6       7       8       9      10      11
     12      13      14      15      16      17      18      19      20      21      22
     23      24      25      26      27      28      29      30      31      32      33
     34      35      36      37      38      39      40      41      42      43      44
     45
 ............................................................................................................................................................
 1 -5.557E-31 -1.060E-31 -1.494E-32 -2.091E-33 -3.061E-34 -2.313E-33 -2.105E-32 -8.810E-32 -5.586E-31 -2.437E-30 -4.539E-30
   8.870E-30  3.807E-29  5.804E-32 -1.371E-28 -1.132E-28  2.216E-28  4.989E-28 -1.956E-29 -7.344E-28 -8.540E-28 -1.287E-28
   2.120E-28  1.881E-28 -2.191E-30 -1.397E-28 -9.490E-29 -4.188E-29  2.728E-29  2.175E-28  1.722E-27  8.022E-27  3.614E-26
   2.902E-25  1.561E-24  4.944E-24  1.717E-23  7.676E-23  2.446E-22  1.434E-21  4.454E-21  1.989E-20  7.454E-20  2.258E-19
   8.773E-19
 2 -4.353E-30  2.010E-33 -2.802E-35 -1.556E-36 -6.165E-36  1.229E-34  5.338E-33  7.352E-32  2.418E-31 -4.436E-30 -2.825E-29
   1.515E-30  2.171E-28  2.269E-28 -8.311E-28 -1.491E-27  9.317E-28  3.023E-27  4.262E-28 -3.907E-27 -3.430E-27  4.708E-28
   2.050E-27  7.957E-28 -6.145E-28 -7.334E-28 -3.246E-28 -8.240E-29 -2.023E-30  2.115E-29  3.075E-29  1.308E-28  9.939E-28
   5.938E-27  2.969E-26  1.387E-25  6.482E-25  2.985E-24  1.572E-23  9.227E-23  5.446E-22  3.092E-21  2.241E-20  2.046E-19
   3.673E-18
 3 -2.804E-29 -1.237E-32  2.994E-35  9.760E-35  3.020E-33  4.076E-32  1.727E-31 -4.425E-30 -8.161E-29 -3.797E-28  1.536E-27
   9.323E-27  5.454E-27 -5.163E-26 -8.295E-26  8.852E-26  2.461E-25 -2.133E-26 -4.208E-25 -3.318E-25  8.900E-26  2.887E-25
   1.217E-25 -1.097E-25 -1.387E-25 -6.432E-26 -1.724E-26 -2.488E-27 -2.329E-29 -1.837E-27 -5.864E-27 -6.485E-27  5.548E-27
   2.204E-26  2.002E-26  3.616E-26  5.040E-25  5.088E-24  4.396E-23  3.362E-22  2.265E-21  1.337E-20  9.622E-20  8.309E-19
   9.687E-18
 4 -1.751E-28 -1.931E-31 -3.769E-34 -1.919E-33 -1.336E-31 -4.137E-30 -6.208E-29 -3.876E-28  1.709E-27  4.685E-26  1.743E-25
  -2.703E-25 -2.282E-24 -2.353E-24  6.410E-24  1.254E-23 -7.809E-24 -3.419E-23 -1.648E-23  1.596E-23  2.789E-23  1.060E-23
  -1.614E-23 -2.018E-23 -9.691E-24 -2.717E-24 -4.957E-25 -1.038E-25 -1.633E-25 -2.429E-25 -2.642E-26  8.404E-25  2.024E-24
   1.086E-24 -2.888E-24 -4.993E-24  2.187E-25  2.743E-23  2.267E-22  1.660E-21  1.100E-20  6.505E-20  4.760E-19  4.143E-18
   4.664E-17
 5 -1.273E-27 -1.638E-30 -3.598E-32 -1.316E-30 -2.582E-29 -1.221E-28  2.202E-27  4.626E-26  2.843E-25 -1.219E-24 -2.186E-23
  -5.581E-23  2.322E-23  3.347E-22  3.902E-22 -7.690E-22 -1.831E-21 -1.795E-22  1.984E-21  1.669E-21  1.973E-22 -1.892E-21
  -2.221E-21 -1.109E-21 -3.217E-22 -5.826E-23 -5.457E-24 -7.823E-25  5.583E-24  2.761E-23  6.426E-23  8.307E-23 -3.702E-23
  -4.061E-22 -6.154E-22 -3.014E-22  1.957E-22  5.356E-22  1.828E-21  1.050E-20  6.710E-20  3.874E-19  2.695E-18  2.148E-17
   1.768E-16
 6 -1.186E-26 -1.530E-29 -1.587E-31  5.046E-29  2.116E-27  3.069E-26  2.046E-25 -1.744E-24 -5.312E-23 -3.166E-22  4.624E-22
   4.129E-21  8.709E-21 -2.796E-21 -4.809E-20 -6.510E-20  3.884E-20  1.229E-19  4.156E-20 -7.623E-20 -1.598E-19 -1.658E-19
  -8.107E-20 -2.409E-20 -3.779E-21  4.621E-22  5.849E-22  4.913E-22  7.338E-22 -1.808E-22 -4.776E-21 -1.515E-20 -3.217E-20
  -3.709E-20  7.387E-22  5.141E-20  7.680E-20  6.961E-20  6.940E-20  1.164E-19  5.997E-19  3.313E-18  2.069E-17  1.323E-16
   7.524E-16
 7 -8.728E-26 -1.056E-28  3.366E-29  1.957E-27 -3.755E-26 -1.660E-24 -2.977E-23 -2.761E-22 -2.426E-22  1.123E-20  4.809E-20
   3.465E-20 -2.975E-19 -1.110E-18 -1.167E-18  1.926E-18  5.325E-18 -6.490E-19 -9.993E-18 -9.937E-18 -5.428E-18 -1.691E-18
  -3.099E-19  1.024E-19  1.690E-19  8.510E-20 -4.016E-21 -7.835E-20 -1.674E-19 -3.618E-19 -4.161E-19 -9.187E-20  9.365E-19
   3.481E-18  6.530E-18  7.926E-18  7.621E-18  6.817E-18  6.710E-18  7.574E-18  1.509E-17  3.719E-17  1.232E-16  5.180E-16
   2.664E-15
 8 -7.451E-25  1.850E-28 -8.344E-27 -3.319E-25 -6.611E-24 -5.350E-23 -1.334E-22  4.916E-21  4.715E-20  1.477E-19 -4.007E-19
  -3.246E-18 -9.279E-18 -8.947E-18  2.401E-17  8.882E-17  3.902E-17 -2.639E-16 -3.573E-16 -1.316E-16  2.624E-17  4.601E-17
   2.484E-17  1.572E-17  1.085E-17  3.577E-18 -9.342E-19 -3.545E-18 -4.169E-18 -7.622E-19  2.242E-17  6.009E-17  1.294E-16
   1.825E-16  1.983E-16  1.738E-16  1.335E-16  9.731E-17  7.524E-17  6.517E-17  8.236E-17  1.580E-16  4.667E-16  2.005E-15
   1.072E-14
 9 -4.157E-24  1.544E-26  4.088E-25  9.505E-24  2.007E-22  2.472E-21  1.770E-20  6.209E-20 -1.525E-19 -3.944E-18 -2.053E-17
  -3.842E-17  6.869E-19  2.442E-16  7.488E-16  5.112E-16 -3.315E-15 -8.574E-15 -3.780E-15  3.195E-15  3.702E-15  2.048E-15
   1.169E-15  8.858E-16  6.508E-16  2.130E-16  8.810E-17  6.721E-17  3.404E-16  1.021E-15  1,866E-15  2.500E-15  3.144E-15
   3.651E-15  3.175E-15  2.413E-15  1.752E-15  1.289E-15  1.051E-15  1.063E-15  1.431E-15  2.139E-15  4.140E-15  1.112E-14
   4.486E-14
10 -1.841E-23 -2.120E-25  4.238E-24  1.145E-22  7.334E-22 -8.824E-21 -1.706E-19 -1.546E-18 -9.358E-18 -3.368E-17  9.105E-19
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   3.318E-16 1.446E-15 3.163E-15 1.084E-16 -2.649E-14 -8.991E-14 -9.892E-14 8.783E-14 1.752E-13 1.167E-13 6.656E-14
   4.772E-14 4.500E-14 4.357E-14 1.497E-14 8.205E-15 1.033E-14 1.753E-14 2.952E-14 4.035E-14 4.538E-14 4.760E-14
   3.867E-14 2.892E-14 2.127E-14 1.569E-14 1.162E-14 8.858E-15 7.361E-15 7.401E-15 9.410E-15 1.673E-14 4.613E-14
   1.690E-13
11 -6.297E-23 -2.116E-23 -4.088E-22 -6.735E-21 -6.884E-20 -3.693E-19 -1.572E-18 -3.731E-18 1.308E-17 2.365E-16 1.350E-15
   3.203E-15 1.781E-15 -2.689E-14 -1.510E-13 -4.529E-13 -7.551E-13 3.021E-13 3.795E-12 3.790E-12 2.175E-12 1.550E-12
   1.441E-12 9.408E-13 7.078E-13 4.516E-13 2.540E-13 2.595E-13 3.263E-13 3.888E-13 4.023E-13 3.754E-13 3.473E-13
   2.816E-13 2.222E-13 1.778E-13 1.404E-13 1.062E-13 7.761E-14 5.759E-14 4.805E-14 5.022E-14 7.469E-14 1.657E-13
   5.294E-13
12 -2.034E-22 -6.325E-24 4.387E-22 1.443E-20 1.875E-19 1.200E-18 6.222E-18 2.625E-17 8.060E-17 -9.153E-17 -4.914E-15
  -3.048E-14 -1.357E-13 -4.562E-13 -1.147E-12 -1.866E-12 3.693E-13 1.957E-11 6.241E-11 4.215E-11 2.000E-11 1.298E-11
   1.257E-11 1.098E-11 9.892E-12 7.706E-12 3.978E-12 3.585E-12 3.571E-12 3.029E-12 2.485E-12 2.043E-12 1.791E-12
   1.693E-12 1.568E-12 1.444E-12 1.238E-12 9.552E-13 6.742E-13 4.529E-13 3.132E-13 2.535E-13 2.747E-13 4.928E-13
   1.222E-12
13 -7.683E-22 -1.604E-21 -3.077E-20 -5.064E-19 -5.319E-18 -3.157E-17 -1.605E-16 -6.477E-16 -1.777E-15 -2.142E-15 -7.839E-15
  -6.797E-14 -3.435E-13 -9.576E-13 -1.073E-12 4.342E-12 3.838E-11 2.259E-10 5.644E-10 2.736E-10 1.190E-10 7.768E-11
   6.880E-11 6.568E-11 5.790E-11 4.219E-11 2.725E-11 2.199E-11 1.946E-11 1.723E-11 1.413E-11 1.171E-11 1.048E-11
   1.057E-11 1.148E-11 1.197E-11 1.081E-11 8.320E-12 5.668E-12 3.549E-12 2.162E-12 1.444E-12 1.167E-12 1.811E-12
   4.804E-12
14 -1.190E-20 4.937E-21 1.041E-19 1.952E-18 2.497E-17 1.874E-16 1.281E-15 7.605E-15 3.655E-14 1.056E-13 -1.081E-13
  -1.418E-12 -5.103E-12 -1.052E-11 -9.253E-12 3.064E-11 2.299E-10 1.259E-09 2.790E-09 1.094E-09 6.004E-10 4.698E-10
   4.012E-10 3.353E-10 2.701E-10 2.090E-10 1.642E-10 1.320E-10 1.074E-10 8.722E-11 7.051E-11 6.001E-11 5.847E-11
   6.920E-11 8.972E-11 1.017E-10 9.223E-11 6.919E-11 4.567E-11 2.722E-11 1.505E-11 8.585E-12 4.946E-12 5.336E-12
   1.100E-11
15 -7.394E-20 6.071E-21 1.132E-19 1.280E-18 -1.318E-18 -1.955E-16 -3.166E-15 -3.400E-14 -2.927E-13 -2.107E-12 -8.880E-12
  -1.678E-11 -1.178E-11 5.858E-11 3.289E-10 1.156E-09 3.352E-09 7.931E-09 1.119E-08 5.126E-09 3.810E-09 3.332E-09
   2.759E-09 2.164E-09 1.627E-09 1.211E-09 9.066E-10 6.754E-10 5.071E-10 3.887E-10 3.123E-10 2.838E-10 3.276E-10
   4.846E-10 7.352E-10 8.451E-10 7.417E-10 5.420E-10 3.556E-10 2.037E-10 1.014E-10 5.027E-11 2.163E-11 1.661E-11
   2.334E-11
16 -3.493E-19 -4.168E-19 -8.668E-18 -1.612E-16 -2.022E-15 -1.475E-14 -9.897E-14 -6.009E-13 -3.351E-12 -1.715E-11 -5.741E-11
  -9.373E-11 -6.051E-11 2.198E-10 1.105E-09 3.425E-09 8.567E-09 1.696E-08 2.744E-08 2.940E-08 2.525E-08 2.134E-08
   1.491E-08 1.083E-08 7.792E-09 5.559E-09 3.991E-09 2.824E-09 2.024E-09 1.519E-09 1.271E-09 1.340E-09 1.907E-09
   3.342E-09 5.718E-09 6.357E-09 5.488E-09 4.039E-09 2.794E-09 1.471E-09 6.207E-10 2.765E-10 9.471E-11 4.736E-11
   5.153E-11
17 -7.491E-19 -5.036E-18 -9.062E-17 -1.450E-15 -1.579E-14 -1.020E-13 -6.107E-13 -3.333E-12 -1.671E-11 -7.613E-11 -2.324E-10
  -4.055E-10 -4.695E-10 -8.054E-11 1.655E-09 7.024E-09 1.715E-08 4.273E-08 1.254E-07 1.467E-07 9.857E-08 6.971E-08
   4.972E-08 3.791E-08 2.828E-08 1.991E-08 1.402E-08 9.818E-09 7.019E-09 5.422E-09 4.995E-09 5.960E-09 9.299E-09
   1.919E-08 3.807E-08 3.978E-08 3.709E-08 2.877E-08 2.299E-08 8.367E-09 3.343E-09 1.469E-09 4.195E-10 1.465E-10
   1.366E-10
18 -3.607E-19 8.956E-19 1.732E-17 3.036E-16 3.656E-15 2.599E-14 1.722E-13 1.059E-12 6.347E-12 4.209E-11 3.332E-10
   1.445E-09 3.785E-09 8.776E-09 1.839E-08 3.355E-08 1.074E-07 3.389E-07 4.478E-07 5.478E-07 3.328E-07 2.284E-07
   1.450E-07 8.719E-08 7.659E-08 5.145E-08 4.224E-08 2.873E-08 1.992E-08 1.481E-08 1.256E-08 1.243E-08 1.927E-08
   6.502E-08 9.172E-08 1.334E-07 1.437E-07 1.481E-07 7.983E-08 3.465E-08 2.062E-08 7.490E-09 1.725E-09 4.658E-10
   2.710E-10
19 -7.065E-19 -4.839E-18 -8.256E-17 -1.234E-15 -1.219E-14 -6.884E-14 -3.410E-13 -1.400E-12 -4.140E-12 1.711E-13 2.874E-10
   8.750E-10 2.179E-09 5.671E-09 1.416E-08 3.207E-08 1.504E-07 4.304E-07 7.017E-07 1.125E-06 9.901E-07 6.028E-07
   4.547E-07 2.822E-07 1.647E-07 1.012E-07 7.946E-08 6.434E-08 4.544E-08 4.200E-08 3.355E-08 3.477E-08 5.627E-08
   2.844E-07 6.425E-07 8.813E-07 1.874E-06 1.443E-06 6.127E-07 1.657E-07 4.857E-08 2.809E-08 5.530E-09 1.156E-09
   4.547E-10
20 -4.097E-19 -1.560E-18 -3.342E-17 -6.216E-16 -7.742E-15 -5.575E-14 -3.640E-13 -2.111E-12 -1.081E-11 -4.636E-11 -8.077E-11
   6.741E-11 9.546E-10 3.578E-09 9.886E-09 2.271E-08 8.569E-08 2.291E-07 5.694E-07 8.422E-07 8.804E-07 8.151E-07
   6.549E-07 5.172E-07 3.840E-07 2.668E-07 2.472E-07 1.351E-07 1.310E-07 9.557E-08 6.703E-08 4.738E-08 1.877E-07
   8.776E-07 3.539E-06 7.366E-06 2.059E-05 2.059E-05 4.491E-06 7.523E-07 1.588E-07 7.463E-08 1.184E-08 2.044E-09
   6.124E-10
21 -9.188E-20 2.728E-20 5.360E-19 1.334E-17 1.752E-16 7.926E-16 6.028E-16 -3.407E-14 -3.810E-13 -1.766E-12 1.422E-11
   1.620E-10 8.103E-10 2.733E-09 7.799E-09 2.012E-08 4.468E-08 1.464E-07 2.437E-07 4.582E-07 4.719E-07 4.666E-07
   4.060E-07 3.422E-07 1.967E-07 1.080E-07 5.834E-08 4.640E-08 3.282E-08 2.609E-08 2.495E-08 2.945E-08 4.369E-08
   4.062E-07 2.431E-06 5.497E-06 2.059E-05 2.059E-05 4.460E-06 8.202E-07 1.497E-07 7.078E-08 1.104E-08 1.890E-09
   5.997E-10
22 -1.689E-20 1.901E-20 5.005E-19 1.102E-17 1.586E-16 1.292E-15 9.509E-15 6.242E-14 3.731E-13 2.124E-12 1.107E-11
   4.745E-11 2.095E-10 7.548E-10 2.292E-09 6.204E-09 1.406E-08 4.110E-08 7.559E-08 1.543E-07 1.456E-07 1.415E-07
   9.982E-08 6.631E-08 3.815E-08 2.586E-08 1.534E-08 1.050E-08 7.123E-09 4.664E-09 3.320E-09 2.764E-09 1.104E-09
   5.985E-08 2.338E-07 5.976E-07 1.820E-06 1.624E-06 6.182E-07 1.668E-07 5.232E-08 2.583E-08 5.061E-09 1.065E-09
   4.924E-10
23 -3.116E-21 -2.962E-21 -6.897E-20 -1.451E-18 -1.742E-17 -8.652E-17 -1.423E-16 2.966E-15 4.969E-14 5.570E-13 4.048E-12
   1.684E-11 6.616E-11 2.298E-10 7.049E-10 1.983E-09 5.070E-09 1.171E-08 2.227E-08 2.185E-08 2.285E-08 1.958E-08
   2.819E-08 2.755E-08 1.621E-08 9.572E-09 5.436E-09 3.195E-09 1.925E-09 1.573E-09 1.566E-09 1.610E-09 8.203E-10
   1.920E-09 3.065E-08 1.048E-07 1.517E-07 1.362E-07 7.766E-08 3.171E-08 1.753E-08 6.346E-09 1.482E-09 4.092E-10
   2.439E-10
24 -6.132E-22 -5.463E-22 -1.184E-20 -2.138E-19 -2.827E-18 -2.443E-17 -1.917E-16 -1.231E-15 -5.472E-15 3.576E-15 3.140E-13
   2.117E-12 1.126E-11 4.790E-11 1.716E-10 5.408E-10 1.530E-09 3.825E-09 7.752E-09 9.495E-09 6.555E-09 5.639E-09
```

```
    5.649E-09 5.459E-09 4.002E-09 2.459E-09 1.509E-09 8.880E-10 5.687E-10 6.949E-10 1.050E-09 1.721E-09 2.710E-09
    4.508E-09 9.156E-09 2.202E-08 2.421E-08 2.012E-08 1.594E-08 5.894E-09 2.389E-09 1.067E-09 3.263E-10 1.302E-10
    1.028E-10
 25 -1.228E-22 -2.077E-22 -5.181E-21 -1.112E-19 -1.602E-18 -1.332E-17 -1.058E-16 -8.095E-16 -6.351E-15 -4.883E-14 -2.613E-13
   -8.044E-13 -2.021E-12 -3.755E-12 -3.253E-12 1.015E-11 7.043E-11 2.787E-10 9.870E-10 3.055E-09 1.178E-09 8.590E-10
    8.915E-10 9.308E-10 7.221E-10 3.612E-10 1.605E-10 6.626E-11 4.741E-11 6.858E-11 1.301E-10 2.592E-10 5.472E-10
    9.350E-10 1.412E-09 2.148E-09 2.402E-09 2.010E-09 1.432E-09 7.616E-10 3.439E-10 1.658E-10 6.468E-11 3.732E-11
    4.237E-11
 26 -2.825E-23 -1.606E-23 -2.515E-22 -3.119E-22 3.572E-20 6.176E-19 8.580E-18 8.286E-17 4.699E-16 1.683E-15 8.654E-17
   -2.350E-14 -1.347E-13 -4.427E-13 -9.595E-13 -9.555E-13 3.040E-12 2.491E-11 1.254E-10 4.128E-10 2.131E-10 1.123E-10
    9.815E-11 1.034E-10 6.933E-11 1.897E-11 6.107E-12 1.917E-12 -5.316E-13 -1.418E-12 5.079E-13 7.378E-12 2.573E-11
    6.491E-11 1.306E-10 2.132E-10 2.565E-10 2.313E-10 1.700E-10 1.025E-10 5.285E-11 2.695E-11 1.203E-11 1.003E-11
    1.506E-11
 27 -7.437E-24 -8.549E-25 -1.085E-23 -1.468E-22 -3.325E-21 -3.963E-20 -3.591E-19 -1.884E-18 5.289E-18 8.335E-17 1.541E-16
   -1.603E-15 -1.537E-14 -7.390E-14 -2.512E-13 -6.450E-13 -1.178E-12 -6.888E-13 6.645E-12 3.242E-11 2.317E-11 1.031E-11
    5.560E-12 4.044E-12 2.563E-12 1.307E-12 4.135E-13 1.012E-13 -8.942E-14 -3.594E-13 -7.919E-13 -9.257E-13 9.432E-14
    2.670E-12 7.708E-12 1.499E-11 2.028E-11 2.020E-11 1.605E-11 1.064E-11 6.183E-12 3.587E-12 2.251E-12 3.157E-12
    6.474E-12
 28 -1.742E-24 -3.000E-26 -1.372E-25 1.477E-24 2.342E-23 -1.113E-24 -3.158E-21 -2.254E-20 8.077E-19 1.906E-17 1.479E-16
    5.086E-16 1.059E-15 -1.420E-16 -1.246E-14 -5.898E-14 -1.681E-13 -2.919E-13 4.052E-15 1.499E-12 1.521E-12 7.983E-13
    3.657E-13 2.108E-13 1.285E-13 7.232E-14 3.067E-14 1.105E-14 4.070E-15 -3.903E-15 -3.012E-14 -1.004E-13 -1.934E-13
   -1.867E-13 8.366E-14 6.440E-13 1.250E-12 1.522E-12 1.383E-12 1.009E-12 6.236E-13 3.684E-13 2.809E-13 7.352E-13
    3.515E-12
 29 -2.358E-25 -5.501E-28 -3.901E-28 -6.286E-26 -3.618E-24 -9.463E-23 -1.951E-21 -3.091E-20 -3.497E-19 -2.209E-18 -5.076E-18
    6.891E-18 8.893E-17 3.644E-16 8.517E-16 6.215E-16 -3.878E-15 -1.787E-14 -3.220E-14 -1.162E-15 2.751E-14 2.754E-14
    1.567E-14 8.490E-15 4.487E-15 2.362E-15 1.127E-15 4.749E-16 3.127E-16 4.875E-16 9.131E-16 9.302E-16 -2.387E-15
   -1.275E-14 -2.356E-14 -1.761E-14 6.940E-15 2.959E-14 3.992E-14 3.675E-14 2.755E-14 2.296E-14 4.545E-14 2.144E-13
    1.286E-12
 30 -4.720E-26 -5.279E-29 8.562E-29 5.550E-27 1.976E-25 3.461E-24 4.658E-23 4.643E-22 2.991E-21 -2.971E-20 -5.004E-19
   -1.969E-18 -4.802E-18 -5.162E-18 1.155E-17 6.563E-17 1.391E-16 2.978E-17 -7.977E-16 -9.817E-16 -2.090E-17 4.363E-16
    3.796E-16 2.126E-16 1.084E-16 5.604E-17 2.792E-17 1.115E-17 3.119E-18 1.547E-18 5.390E-18 3.476E-17 1.140E-16
    1.093E-16 -2.472E-16 -7.720E-16 -7.669E-16 -2.051E-16 3.575E-16 6.643E-16 9.808E-16 2.372E-15 1.076E-14 5.962E-14
    3.984E-13
 31 -7.610E-27 -7.115E-30 -8.688E-30 -1.315E-28 -3.472E-27 -4.798E-26 -4.253E-25 -4.540E-25 5.966E-23 1.144E-21 7.945E-21
    2.110E-20 9.430E-21 -1.607E-19 -6.394E-19 -8.379E-19 1.294E-18 6.228E-18 2.704E-18 -1.095E-17 -1.171E-17 -1.846E-18
    2.616E-18 2.391E-18 1.288E-18 6.608E-19 3.636E-19 1.725E-19 3.486E-20 -8.377E-21 -1.121E-19 -6.668E-19 -6.218E-19
    2.265E-18 5.260E-18 1.878E-18 -6.598E-18 -9.414E-18 -9.493E-19 2.067E-17 9.402E-17 4.004E-16 2.236E-15 1.449E-14
    1.201E-13
 32 -1.014E-27 1.930E-27 1.176E-26 7.249E-26 3.994E-25 3.505E-24 1.248E-23 7.752E-23 2.307E-22 8.514E-22 2.019E-21
   -1.566E-21 -2.109E-20 -8.601E-20 -1.564E-19 2.541E-20 4.676E-19 5.503E-19 -5.115E-20 -1.928E-18 -2.272E-18 -9.616E-19
    8.140E-20 5.093E-19 3.804E-19 1.816E-19 1.074E-19 5.873E-20 1.328E-20 -1.965E-20 -6.931E-20 -1.282E-19 8.623E-20
    6.170E-19 1.131E-18 2.010E-18 6.700E-18 1.486E-17 5.067E-17 1.951E-16 6.678E-16 1.530E-15 6.394E-15 1.630E-14
    4.378E-14

TOTAL PARTICLES USED IN THE CURRENT STEP =     2217
PARTICLES ADDED AT BEGINNING OF THE STEP =       32
PARTICLES REMOVED AT END OF LAST STEP    =       95

          CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  92, TIME STEP    1, STRESS PERIOD    1
          -------------------------------------------------------------------------

                                  IN               OUT
                              ----------       ----------
                CONSTANT CONCENTRATION:   3.823842            0.0000000
                     CONSTANT HEAD:  0.0000000            0.9086443E-15
                           WELLS:  0.0000000           -1.603931
               DECAY OR BIODEGRADATION:  0.0000000            -0.6535938
                 MASS STORAGE (SOLUTE):   1.376730          -0.8485123
               ---------------------------------------------------------------
                         [TOTAL]:   5.200572    LB         -3.106038    LB

                               NET (IN - OUT):   2.094534
                         DISCREPANCY (PERCENT):   50.43055


                         -----------------------------------
                              TRANSPORT STEP NO.  184
                         -----------------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   1460.000    D
.................................................................
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          CONCENTRATIONS  IN LAYER  1 AT END OF TRANSPORT STEP  184, TIME STEP  1, STRESS PERIOD  1
          -----------------------------------------------------------------------

     1     2     3     4     5     6     7     8     9    10    11
    12    13    14    15    16    17    18    19    20    21    22
    23    24    25    26    27    28    29    30    31    32    33
    34    35    36    37    38    39    40    41    42    43    44
    45
.......................................................................................................
 1 -2.955E-22 -6.832E-23 -7.591E-24 -1.148E-24 -2.328E-25 -3.813E-26 -1.144E-26 -2.759E-27 -2.677E-27 -7.174E-27 -8.280E-27
    1.002E-27  2.334E-26  2.508E-26 -7.976E-26 -2.309E-25 -3.261E-25 -1.613E-25  9.324E-26  1.638E-25  3.472E-26 -2.758E-25
   -3.276E-25 -1.985E-25  1.393E-25  6.068E-25  3.346E-24  9.119E-24  2.288E-23  6.797E-23  2.075E-22  3.991E-22  1.257E-21
    3.447E-21  9.952E-21  2.306E-20  6.566E-20  1.157E-19  2.761E-19  8.208E-19  1.791E-18  3.941E-18  1.134E-17  3.214E-17
    8.113E-17
 2 -7.187E-22 -7.123E-25 -4.507E-26 -4.433E-27 -3.724E-28 -8.675E-29  8.383E-30  1.719E-28  1.417E-29 -7.412E-27 -3.090E-26
   -2.441E-26  7.997E-26  2.249E-25  7.714E-26 -6.281E-25 -1.104E-24 -3.372E-25  8.020E-25  9.997E-25  1.775E-25 -8.243E-25
   -1.087E-24 -6.852E-25 -2.380E-25  4.096E-27  1.622E-25  5.084E-25  1.545E-24  4.588E-24  1.329E-23  3.764E-23  1.092E-22
    3.137E-22  8.978E-22  2.635E-21  7.941E-21  2.453E-20  7.870E-20  2.533E-19  7.771E-19  2.224E-18  7.728E-18  3.237E-17
    1.818E-16
 3 -3.440E-21 -4.473E-24 -4.062E-27 -1.175E-29  2.873E-29  1.695E-28 -1.838E-28 -1.337E-26 -1.104E-25 -3.186E-25  6.025E-25
    3.540E-24  5.512E-24 -3.913E-24 -2.993E-23 -3.991E-23  2.281E-24  5.910E-23  5.674E-23 -1.167E-23 -7.938E-23 -8.541E-23
   -4.805E-23 -1.321E-23  2.943E-25  1.601E-24  7.861E-25  3.022E-25  3.256E-25  9.310E-25  2.909E-24  9.932E-24  3.862E-23
    1.640E-22  7.231E-22  3.209E-21  1.390E-20  5.687E-20  2.174E-19  7.656E-19  2.445E-18  7.005E-18  2.347E-17  8.900E-17
    4.921E-16
 4 -1.361E-20 -2.808E-23 -6.811E-26 -3.297E-28 -2.257E-27 -2.442E-26 -1.616E-25 -4.795E-25  1.520E-24  2.169E-23  6.216E-23
   -2.305E-24 -3.811E-22 -9.032E-22 -6.873E-22  9.069E-22  2.587E-21  1.799E-21 -2.396E-21 -5.452E-21 -4.875E-21 -2.439E-21
   -3.308E-22  3.342E-22  2.633E-22  1.163E-22  4.350E-23  2.113E-23  1.842E-23  1.656E-23  8.361E-24  7.979E-24  1.135E-22
    7.810E-22  3.929E-21  1.751E-20  7.249E-20  2.776E-19  9.850E-19  3.216E-18  9.545E-18  2.559E-17  8.058E-17  2.969E-16
    1.717E-15
 5 -4.557E-20 -1.538E-22 -4.742E-25 -1.984E-26 -1.489E-25 -2.372E-25  3.663E-24  3.385E-23  9.704E-23 -5.173E-22 -4.964E-21
   -1.178E-20 -1.218E-20  8.658E-21  4.722E-20  6.779E-20  6.745E-21 -1.477E-19 -2.568E-19 -1.891E-19 -8.285E-20  8.678E-21
    3.720E-20  2.616E-20  1.140E-20  4.120E-21  1.463E-21  4.997E-22 -2.439E-22 -1.367E-21 -2.512E-21 -2.978E-21 -1.427E-21
    4.819E-21  2.254E-20  7.930E-20  2.889E-19  1.066E-18  3.737E-18  1.205E-17  3.501E-17  9.117E-17  2.783E-16  9.913E-16
    4.484E-15
 6 -1.789E-19 -7.256E-22 -2.564E-24  3.065E-25  6.560E-24  4.383E-23  9.185E-23 -1.616E-21 -1.886E-20 -6.474E-20  3.165E-20
    3.175E-19  8.109E-19  1.101E-18  2.708E-19 -2.453E-18 -5.816E-18 -6.746E-18 -4.343E-18 -1.162E-18  1.172E-18  2.514E-18
    1.883E-18  8.679E-19  3.249E-19  1.108E-19  3.105E-20 -6.721E-21 -3.527E-20 -4.613E-20 -2.718E-20  7.891E-21  4.154E-20
    5.962E-20 -4.214E-20 -3.449E-19 -1.400E-19  3.250E-18  1.706E-17  6.060E-17  1.753E-16  4.393E-16  1.273E-15  3.930E-15
    1.200E-14
 7 -4.393E-19 -2.753E-21 -2.039E-23 -1.829E-23 -3.612E-22 -3.781E-21 -2.868E-20 -1.398E-19 -2.187E-19  8.719E-19  3.532E-18
    4.855E-18 -2.891E-18 -3.446E-17 -9.281E-17 -1.512E-16 -1.584E-16 -8.667E-17  1.325E-17  6.729E-17  8.130E-17  7.130E-17
    3.980E-17  1.833E-17  8.031E-18  3.929E-18  2.589E-18  2.395E-18  2.814E-18  4.077E-18  5.990E-18  7.492E-18  9.082E-18
    1.168E-17  1.654E-17  3.154E-17  7.849E-17  2.021E-16  4.605E-16  8.635E-16  1.462E-15  2.414E-15  4.776E-15  1.096E-14
    2.583E-14
 8 -1.007E-18 -5.688E-21 -9.335E-22 -2.573E-21 -1.976E-20 -9.347E-20 -3.076E-19  1.329E-19  4.638E-18  1.781E-17  1.817E-17
   -4.685E-17 -2.827E-16 -7.303E-16 -1.256E-15 -1.495E-15 -1.040E-15  8.451E-17  1.169E-15  1.636E-15  1.423E-15  9.643E-16
    5.042E-16  2.474E-16  1.344E-16  8.561E-17  7.353E-17  7.629E-17  8.562E-17  1.061E-16  1.294E-16  1.426E-16  1.638E-16
    1.996E-16  2.771E-16  4.151E-16  6.418E-16  1.000E-15  1.578E-15  2.463E-15  3.668E-15  5.624E-15  1.043E-14  2.287E-14
    5.288E-14
 9 -3.180E-18 -3.153E-20 -1.686E-20 -6.802E-20 -1.669E-19  2.504E-19  3.765E-18  1.663E-17  3.753E-17 -7.566E-17 -8.733E-16
   -2.425E-15 -5.139E-15 -8.299E-15 -9.953E-15 -7.396E-15  1.070E-15  1.382E-14  2.583E-14  2.749E-14  2.007E-14  1.187E-14
    6.574E-15  3.847E-15  2.383E-15  1.541E-15  1.333E-15  1.287E-15  1.419E-15  1.456E-15  1.510E-15  1.603E-15  1.878E-15
    2.533E-15  3.277E-15  4.136E-15  5.232E-15  6.821E-15  9.416E-15  1.371E-14  2.013E-14  2.800E-14  4.168E-14  6.390E-14
    1.039E-13
10  -7.624E-18 -1.037E-19 -3.203E-20  1.944E-19  2.222E-18  8.145E-18  1.483E-17 -6.264E-17 -8.456E-16 -4.865E-15 -1.481E-14
   -2.630E-14 -3.873E-14 -4.363E-14 -2.896E-14  1.682E-14  1.044E-13  2.450E-13  3.625E-13  3.356E-13  2.277E-13  1.370E-13
    8.367E-14  5.994E-14  4.305E-14  2.185E-14  1.442E-14  1.207E-14  1.112E-14  1.177E-14  1.349E-14  1.645E-14  2.158E-14
    2.616E-14  3.004E-14  3.330E-14  3.621E-14  3.945E-14  4.420E-14  5.164E-14  6.373E-14  8.288E-14  1.137E-13  1.578E-13
    2.868E-13
11  -2.016E-17 -3.968E-19 -6.483E-19 -4.012E-18 -2.886E-17 -1.625E-16 -8.464E-16 -3.723E-15 -1.409E-14 -4.419E-14 -8.953E-14
   -1.171E-13 -1.125E-13 -3.722E-14  1.507E-13  5.457E-13  1.329E-12  2.611E-12  3.518E-12  2.821E-12  1.760E-12  1.097E-12
    7.031E-13  4.046E-13  2.482E-13  1.497E-13  9.138E-14  7.124E-14  6.655E-14  6.979E-14  8.106E-14  1.008E-13  1.391E-13
    1.732E-13  1.972E-13  2.100E-13  2.082E-13  1.974E-13  1.889E-13  1.914E-13  2.098E-13  2.441E-13  3.089E-13  4.057E-13
    7.926E-13
12  -9.721E-17 -2.509E-18 -1.381E-17 -1.094E-16 -6.228E-16 -2.248E-15 -7.706E-15 -2.406E-14 -6.681E-14 -1.507E-13 -1.950E-13
   -1.155E-13  1.591E-13  7.712E-13  2.097E-12  4.801E-12  1.010E-11  1.960E-11  2.429E-11  1.555E-11  8.006E-12  4.332E-12
    2.719E-12  1.772E-12  1.270E-12  8.938E-13  5.198E-13  4.208E-13  4.365E-13  4.758E-13  5.407E-13  6.487E-13  8.624E-13
    1.217E-12  1.500E-12  1.633E-12  1.544E-12  1.300E-12  1.040E-12  8.493E-13  7.560E-13  7.511E-13  8.472E-13  1.130E-12
    1.939E-12
13  -3.510E-16 -1.082E-17 -4.340E-17 -2.273E-16 -1.214E-15 -4.785E-15 -1.853E-14 -6.212E-14 -1.669E-13 -2.843E-13 -2.535E-15
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    7.417E-13 2.548E-12 6.377E-12 1.388E-11 2.812E-11 5.593E-11 1.111E-10 1.201E-10 6.136E-11 2.719E-11 1.355E-11
    8.038E-12 5.502E-12 4.019E-12 2.877E-12 2.088E-12 1.943E-12 2.151E-12 2.678E-12 3.371E-12 4.513E-12 6.472E-12
    9.381E-12 1.231E-11 1.370E-11 1.258E-11 9.826E-12 6.948E-12 4.744E-12 3.388E-12 2.760E-12 2.597E-12 3.088E-12
    6.345E-12
 14 -7.721E-16 -1.370E-16 -8.950E-16 -6.120E-15 -3.167E-14 -1.043E-13 -3.111E-13 -7.921E-13 -1.612E-12 -1.975E-12 8.118E-13
    6.271E-12 1.833E-11 4.098E-11 7.981E-11 1.432E-10 2.497E-10 4.593E-10 3.795E-10 1.670E-10 7.593E-11 4.092E-11
    2.532E-11 1.732E-11 1.291E-11 1.047E-11 9.600E-12 9.990E-12 1.168E-11 1.514E-11 2.103E-11 3.123E-11 4.836E-11
    7.294E-11 1.001E-10 1.131E-10 1.016E-10 7.588E-11 5.037E-11 3.089E-11 1.839E-11 1.197E-11 8.678E-12 9.595E-12
    1.259E-11
 15 -2.605E-15 -1.733E-15 -1.070E-14 -5.720E-14 -1.976E-13 -3.974E-13 -5.295E-13 2.046E-13 4.230E-12 2.173E-11 7.275E-11
    1.547E-10 3.049E-10 5.495E-10 9.157E-10 1.418E-09 2.005E-09 2.289E-09 1.413E-09 5.118E-10 2.507E-10 1.472E-10
    9.524E-11 6.711E-11 5.176E-11 4.479E-11 4.447E-11 4.948E-11 6.173E-11 8.570E-11 1.292E-10 2.057E-10 3.289E-10
    5.125E-10 7.783E-10 9.032E-10 7.928E-10 5.753E-10 3.760E-10 2.167E-10 1.110E-10 5.881E-11 3.032E-11 2.538E-11
    2.915E-11
 16 -6.124E-15 -1.189E-14 -7.445E-14 -3.917E-13 -1.322E-12 -2.610E-12 -3.545E-12 -9.404E-14 1.753E-11 8.503E-11 2.802E-10
    5.886E-10 1.108E-09 1.857E-09 2.812E-09 3.827E-09 4.579E-09 4.551E-09 3.149E-09 1.718E-09 9.576E-10 5.502E-10
    3.459E-10 2.452E-10 1.967E-10 1.815E-10 1.961E-10 2.362E-10 3.148E-10 4.591E-10 7.136E-10 1.143E-09 1.841E-09
    3.304E-09 6.093E-09 6.888E-09 5.827E-09 4.219E-09 2.928E-09 1.545E-09 6.550E-10 3.003E-10 1.162E-10 6.992E-11
    6.632E-11
 17 -1.182E-14 -4.144E-14 -2.659E-13 -1.446E-12 -5.169E-12 -1.120E-11 -1.906E-11 -1.788E-11 2.685E-11 2.299E-10 1.043E-09
    2.400E-09 4.525E-09 7.372E-09 1.063E-08 1.335E-08 1.448E-08 1.288E-08 1.014E-08 5.872E-09 2.987E-09 1.648E-09
    1.048E-09 7.841E-10 6.836E-10 6.896E-10 8.089E-10 1.033E-09 1.414E-09 2.057E-09 3.142E-09 5.005E-09 9.084E-09
    2.004E-08 4.126E-08 4.275E-08 3.902E-08 3.095E-08 2.449E-08 8.810E-09 3.492E-09 1.548E-09 4.655E-10 1.872E-10
    1.698E-10
 18 -5.846E-15 2.679E-17 1.178E-14 1.872E-13 1.521E-12 6.849E-12 2.818E-11 1.076E-10 3.979E-10 1.523E-09 6.005E-09
    1.415E-08 2.420E-08 3.650E-08 4.936E-08 5.824E-08 5.852E-08 4.966E-08 3.729E-08 1.181E-08 5.921E-09 3.477E-09
    2.419E-09 1.940E-09 1.766E-09 1.818E-09 2.128E-09 2.662E-09 3.522E-09 4.897E-09 7.098E-09 1.085E-08 2.406E-08
    5.120E-08 1.146E-07 1.518E-07 1.742E-07 1.670E-07 9.261E-08 3.498E-08 2.157E-08 7.923E-09 1.875E-09 5.345E-10
    3.431E-10
 19 -4.917E-15 -6.885E-15 -1.255E-14 1.300E-13 1.420E-12 6.744E-12 2.831E-11 1.093E-10 4.054E-10 1.531E-09 8.915E-09
    1.858E-08 2.622E-08 3.490E-08 4.436E-08 5.183E-08 5.321E-08 4.605E-08 3.291E-08 1.801E-08 1.076E-08 7.030E-09
    5.111E-09 4.245E-09 4.038E-09 4.379E-09 5.338E-09 6.812E-09 9.010E-09 1.210E-08 1.618E-08 2.256E-08 6.373E-08
    2.729E-07 7.100E-07 5.965E-07 1.609E-06 1.505E-06 5.876E-07 1.669E-07 5.331E-08 3.107E-08 6.448E-09 1.399E-09
    5.492E-10
 20 -5.446E-15 -1.727E-14 -8.226E-14 -2.247E-13 2.777E-13 3.583E-12 1.807E-11 7.528E-11 2.962E-10 1.201E-09 4.878E-09
    1.036E-08 1.658E-08 2.292E-08 2.989E-08 3.587E-08 3.852E-08 3.591E-08 2.886E-08 2.085E-08 1.514E-08 1.127E-08
    8.830E-09 7.554E-09 7.333E-09 8.051E-09 9.575E-09 1.157E-08 1.450E-08 1.870E-08 2.468E-08 3.395E-08 2.176E-07
    9.263E-07 3.066E-06 6.930E-06 2.059E-05 2.059E-05 4.689E-06 7.325E-07 1.741E-07 9.058E-08 1.606E-08 2.914E-09
    9.063E-10
 21 -2.424E-15 -1.996E-15 -3.386E-15 4.776E-14 4.721E-13 2.111E-12 8.644E-12 3.376E-11 1.325E-10 5.524E-10 2.028E-09
    4.550E-09 9.424E-09 1.213E-08 1.651E-08 2.071E-08 2.321E-08 2.307E-08 2.078E-08 1.747E-08 1.413E-08 1.111E-08
    8.630E-09 6.923E-09 5.952E-09 5.434E-09 5.241E-09 5.823E-09 6.985E-09 8.003E-09 9.174E-09 1.469E-08 4.391E-08
    3.637E-07 2.024E-06 5.171E-06 2.059E-05 2.059E-05 3.782E-06 7.510E-07 1.911E-07 9.336E-08 1.640E-08 2.893E-09
    7.622E-10
 22 -9.780E-16 1.115E-16 2.171E-15 2.339E-14 1.480E-13 5.963E-13 2.371E-12 9.359E-12 3.794E-11 1.621E-10 5.718E-10
    1.303E-09 2.735E-09 4.699E-09 7.106E-09 9.686E-09 1.171E-08 1.241E-08 1.164E-08 9.961E-09 8.112E-09 6.493E-09
    5.117E-09 3.984E-09 3.055E-09 2.222E-09 1.377E-09 8.065E-10 7.245E-10 7.419E-10 6.696E-10 2.791E-10 2.243E-10
    4.567E-08 2.000E-07 3.960E-07 1.780E-06 1.513E-06 6.240E-07 1.695E-07 5.318E-08 3.043E-08 6.377E-09 1.398E-09
    5.874E-10
 23 -2.120E-16 8.922E-17 9.068E-16 7.429E-15 4.171E-14 1.574E-13 5.992E-13 2.341E-12 9.763E-12 4.327E-11 1.523E-10
    3.535E-10 7.751E-10 1.497E-09 2.563E-09 3.936E-09 5.375E-09 6.377E-09 6.459E-09 5.499E-09 4.076E-09 3.072E-09
    2.363E-09 1.797E-09 1.316E-09 9.231E-10 6.660E-10 6.015E-10 6.915E-10 8.583E-10 1.062E-09 1.159E-09 4.307E-10
    2.213E-09 2.866E-08 7.083E-08 1.451E-07 1.413E-07 6.159E-08 2.646E-08 1.842E-08 6.881E-09 1.693E-09 4.913E-10
    2.741E-10
 24 -1.009E-16 -1.298E-18 1.422E-17 6.611E-17 6.024E-16 6.056E-15 4.278E-14 2.608E-13 1.516E-12 8.324E-12 3.261E-11
    8.061E-11 1.903E-10 4.076E-10 7.911E-10 1.401E-09 2.251E-09 3.197E-09 3.712E-09 2.937E-09 1.745E-09 1.198E-09
    9.139E-10 7.147E-10 5.488E-10 4.248E-10 3.650E-10 3.654E-10 4.351E-10 6.493E-10 1.068E-09 1.762E-09 2.847E-09
    4.867E-09 9.294E-09 2.025E-08 2.359E-08 1.986E-08 1.604E-08 6.075E-09 2.529E-09 1.150E-09 3.721E-10 1.583E-10
    1.320E-10
 25 -4.211E-17 -4.364E-17 -3.810E-16 -2.901E-15 -1.431E-14 -4.174E-14 -1.108E-13 -2.705E-13 -6.298E-13 -1.114E-12 -4.218E-13
    2.317E-12 1.078E-11 3.133E-11 7.417E-11 1.536E-10 2.863E-10 4.882E-10 8.285E-10 1.051E-09 5.122E-10 3.312E-10
    2.646E-10 2.211E-10 1.686E-10 1.127E-10 8.023E-11 6.585E-11 6.931E-11 9.707E-11 1.671E-10 3.169E-10 6.042E-10
    1.003E-09 1.507E-09 2.195E-09 2.462E-09 2.079E-09 1.496E-09 8.066E-10 3.721E-10 1.858E-10 8.020E-11 5.366E-11
    7.199E-11
 26 -1.622E-17 -9.108E-18 -5.977E-17 -1.934E-16 -3.156E-16 -7.743E-16 -4.831E-15 -2.936E-14 -1.121E-13 -3.299E-13 -5.515E-13
   -4.988E-13 1.702E-13 2.084E-12 6.877E-12 1.753E-11 3.932E-11 8.135E-11 1.644E-10 2.418E-10 1.392E-10 7.807E-11
    5.493E-11 4.380E-11 2.828E-11 1.200E-11 6.114E-12 4.445E-12 4.769E-12 7.164E-12 1.135E-11 2.143E-11 4.672E-11
    9.143E-11 1.591E-10 2.388E-10 2.774E-10 2.488E-10 1.842E-10 1.130E-10 6.047E-11 3.315E-11 1.776E-11 1.687E-11
    2.427E-11
 27 -5.249E-18 -1.039E-18 -4.590E-18 -2.833E-18 -1.133E-18 5.907E-18 -5.510E-17 -1.521E-15 -1.461E-14 -6.943E-14 -1.742E-13
   -2.675E-13 -3.161E-13 -2.094E-13 2.222E-13 1.303E-12 3.941E-12 9.825E-12 2.172E-11 3.427E-11 2.374E-11 1.235E-11
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   6.602E-12 3.833E-12 2.162E-12 1.128E-12 4.524E-13 1.474E-13 5.464E-14 1.894E-13 6.909E-13 1.891E-12 4.133E-12
   8.185E-12 1.435E-11 2.164E-11 2.594E-11 2.457E-11 1.934E-11 1.319E-11 8.346E-12 5.698E-12 4.701E-12 6.556E-12
   1.213E-11
28 -1.862E-18 -8.646E-20 -1.535E-19 4.253E-21 2.964E-19 2.125E-18 7.836E-18 -5.533E-17 -1.392E-15 -1.026E-14 -3.351E-14
  -6.235E-14 -9.653E-14 -1.142E-13 -7.867E-14 5.193E-14 3.462E-13 1.003E-12 2.264E-12 3.550E-12 2.850E-12 1.620E-12
   8.430E-13 4.537E-13 2.404E-13 1.208E-13 4.326E-14 -1.264E-14 -6.533E-14 -1.024E-13 -1.006E-13 -9.950E-15 1.975E-13
   5.763E-13 1.179E-12 1.950E-12 2.535E-12 2.602E-12 2.204E-12 1.620E-12 1.128E-12 8.944E-13 1.049E-12 2.222E-12
   5.485E-12
29 -7.830E-19 -5.420E-21 -1.114E-21 -3.937E-21 8.386E-21 3.223E-19 5.450E-18 2.547E-17 1.205E-16 1.541E-16 -9.220E-16
  -4.178E-15 -1.166E-14 -2.416E-14 -3.989E-14 -5.346E-14 -5.676E-14 -3.779E-14 1.877E-14 1.013E-13 1.331E-13 1.107E-13
   7.114E-14 4.177E-14 2.099E-14 1.012E-14 4.914E-15 1.878E-15 -1.927E-15 -9.453E-15 -2.096E-14 -3.259E-14 -3.542E-14
  -2.116E-14 1.051E-14 5.110E-14 9.320E-14 1.180E-13 1.192E-13 1.079E-13 1.061E-13 1.401E-13 2.944E-13 8.372E-13
   3.208E-12
30 -2.186E-19 -7.866E-22 -3.770E-23 -6.911E-22 -8.093E-21 -4.723E-20 -1.972E-19 -3.684E-19 2.177E-18 2.898E-17 1.089E-16
   1.992E-16 2.325E-16 3.726E-17 -6.818E-16 -2.093E-15 -3.983E-15 -5.744E-15 -4.871E-15 2.607E-16 3.628E-15 4.375E-15
   3.448E-15 2.200E-15 1.196E-15 5.828E-16 2.945E-16 2.030E-16 2.082E-16 1.648E-16 -1.906E-16 -1.189E-15 -2.589E-15
  -3.479E-15 -2.914E-15 -9.306E-16 1.430E-15 3.559E-15 5.826E-15 9.620E-15 1.836E-14 3.852E-14 1.034E-13 3.184E-13
   1.065E-12
31 -7.861E-20 -1.818E-22 -3.190E-24 -1.715E-24 -1.692E-23 -2.163E-22 -3.266E-21 -3.240E-20 -2.277E-19 -1.130E-18 -2.725E-18
  -2.369E-18 2.997E-18 1.518E-17 3.218E-17 3.659E-17 -4.701E-19 -1.116E-16 -2.363E-16 -2.135E-16 -6.967E-17 3.387E-17
   6.005E-17 5.048E-17 3.211E-17 1.688E-17 7.365E-18 2.849E-18 3.126E-18 9.310E-18 2.047E-17 2.727E-17 1.447E-17
  -2.322E-17 -5.528E-17 -1.574E-17 1.215E-16 3.996E-16 9.920E-16 2.325E-15 5.332E-15 1.191E-14 3.260E-14 1.063E-13
   3.893E-13
32 -1.810E-20 -5.705E-21 -2.249E-21 -3.105E-21 -8.209E-21 -1.792E-20 -4.644E-20 -1.586E-19 -4.201E-19 -7.591E-19 -7.350E-19
   3.630E-20 2.366E-18 5.821E-18 7.111E-18 -3.759E-18 -2.515E-17 -6.696E-17 -9.877E-17 -8.458E-17 -4.565E-17 -6.087E-19
   1.768E-17 1.810E-17 1.397E-17 8.691E-18 5.530E-18 3.866E-18 4.559E-18 7.016E-18 1.223E-17 1.592E-17 2.010E-17
   3.659E-17 8.731E-17 2.534E-16 6.515E-16 1.391E-15 3.014E-15 5.575E-15 9.520E-15 1.760E-14 3.757E-14 9.688E-14
   1.817E-13

TOTAL PARTICLES USED IN THE CURRENT STEP =      969
PARTICLES ADDED AT BEGINNING OF THE STEP =       32
PARTICLES REMOVED AT END OF LAST STEP    =      52

         CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  184, TIME STEP    1, STRESS PERIOD    1
         ------------------------------------------------------------------------

                                    IN                OUT
                                 ----------        ----------
              CONSTANT CONCENTRATION:  7.639085              0.0000000
                   CONSTANT HEAD:  0.0000000            0.4979149E-10
                          WELLS:  0.0000000           -3.050441
             DECAY OR BIODEGRADATION:  0.0000000              -0.8716675
               MASS STORAGE (SOLUTE):  1.764683              -1.194424
           ----------------------------------------------------------------
                         [TOTAL]:   9.403769    LB       -5.116533    LB

                                  NET (IN - OUT):   4.287236
                           DISCREPANCY (PERCENT):   59.05161


                             ------------------------------
                                TRANSPORT STEP NO.  276
                             ------------------------------

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION =   2190.000    D
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         CONCENTRATIONS   IN LAYER  1 AT END OF TRANSPORT STEP  276, TIME STEP  1, STRESS PERIOD  1
         ------------------------------------------------------------------------

      1      2      3      4      5      6      7      8      9     10     11
     12     13     14     15     16     17     18     19     20     21     22
     23     24     25     26     27     28     29     30     31     32     33
     34     35     36     37     38     39     40     41     42     43     44
     45
................................................................................................
 1 -3.471E-19 -1.137E-19 -2.087E-20 -3.874E-21 -6.162E-22 -1.149E-22 -3.078E-23 -7.228E-24 -1.495E-24 -5.210E-25 -4.963E-25
  -1.060E-24 -2.148E-24 -2.278E-24 -1.588E-24 7.757E-25 2.566E-24 4.715E-25 -5.578E-24 -1.084E-23 -1.176E-23 -8.078E-24
   1.286E-24 1.034E-23 4.784E-23 9.779E-23 2.128E-22 5.611E-22 1.003E-21 2.087E-21 4.144E-21 1.024E-20 2.272E-20
   5.022E-20 1.264E-19 2.649E-19 5.042E-19 8.322E-19 1.912E-18 4.693E-18 1.167E-17 1.867E-17 4.086E-17 9.050E-17
   1.634E-16
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2 -7.020E-19 -2.306E-21 -1.351E-22 -1.578E-23 -1.828E-24 -7.838E-25 -2.786E-25 -1.199E-25 3.059E-27 2.100E-25 1.938E-25
 -9.532E-25 -3.779E-24 -6.001E-24 -3.836E-24 3.560E-24 1.052E-23 9.053E-24 -5.445E-24 -2.434E-23 -3.024E-23 -2.258E-23
 -1.042E-23 -7.676E-25 5.579E-24 1.475E-23 3.488E-23 8.297E-23 1.978E-22 4.729E-22 1.143E-21 2.786E-21 6.765E-21
  1.648E-20 4.016E-20 9.694E-20 2.300E-19 5.321E-19 1.202E-18 2.650E-18 5.696E-18 1.193E-17 3.011E-17 8.720E-17
  2.929E-16
3 -1.627E-18 -8.521E-21 -2.775E-23 -2.133E-25 -1.830E-26 -7.344E-27 9.555E-26 6.153E-25 1.624E-24 -4.835E-24 -4.560E-23
 -9.342E-23 -9.376E-23 1.694E-23 2.018E-22 3.344E-22 1.489E-22 -4.644E-22 -1.087E-21 -1.177E-21 -8.168E-22 -3.732E-22
 -8.327E-23 2.202E-23 3.177E-23 2.201E-23 1.822E-23 3.197E-23 8.897E-23 2.777E-22 8.803E-22 2.727E-21 8.222E-21
  2.404E-20 6.789E-20 1.848E-19 4.826E-19 1.200E-18 2.865E-18 6.594E-18 1.461E-17 3.103E-17 7.904E-17 2.388E-16
  9.455E-16
4 -5.145E-18 -3.443E-20 -1.785E-22 -9.828E-25 1.351E-25 6.267E-25 -1.765E-25 -2.506E-23 -1.881E-22 -7.152E-22 -9.223E-22
  4.207E-22 3.087E-21 5.711E-21 4.477E-21 -5.247E-21 -2.342E-20 -3.634E-20 -3.376E-20 -2.050E-20 -7.765E-21 -2.580E-22
  2.048E-21 1.919E-21 1.107E-21 4.992E-22 2.070E-22 1.326E-22 2.831E-22 9.738E-22 3.287E-21 1.033E-20 3.083E-20
  8.844E-20 2.445E-19 6.513E-19 1.664E-18 4.051E-18 9.488E-18 2.146E-17 4.669E-17 9.697E-17 2.374E-16 6.591E-16
  3.014E-15
5 -1.273E-17 -1.121E-19 -7.688E-22 -6.552E-24 -1.883E-23 -1.231E-22 -5.772E-22 -1.647E-21 -8.389E-22 1.380E-20 5.111E-20
  7.428E-20 3.636E-20 -1.198E-19 -4.097E-19 -6.943E-19 -7.896E-19 -6.189E-19 -2.996E-19 -5.338E-20 6.188E-20 1.037E-19
  9.203E-20 5.428E-20 2.458E-20 9.633E-21 3.597E-21 1.781E-21 2.454E-21 6.169E-21 1.593E-20 4.038E-20 1.053E-19
  2.854E-19 7.791E-19 2.078E-18 5.312E-18 1.284E-17 2.965E-17 6.595E-17 1.413E-16 2.896E-16 7.021E-16 1.973E-15
  7.567E-15
6 -4.392E-17 -3.961E-19 -3.206E-21 -1.543E-22 -6.307E-22 -4.703E-22 9.380E-21 7.259E-20 2.844E-19 -3.289E-20 -2.591E-18
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  3.375E-17 7.520E-17 1.661E-16 3.620E-16 7.630E-16 1.491E-15 2.543E-15 3.982E-15 6.037E-15 1.039E-14 1.924E-14
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8 -2.942E-16 -2.803E-18 -1.863E-19 -1.199E-19 -3.287E-19 -1.724E-18 -1.086E-17 -6.429E-17 -2.133E-16 -5.114E-16 -7.818E-16
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  1.082E-13 7.248E-14 5.455E-14 4.092E-14 3.104E-14 3.349E-14 4.322E-14 5.953E-14 8.373E-14 1.167E-13 1.700E-13
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    1.435E-11 1.474E-11 1.213E-11 6.680E-12 4.668E-12 4.499E-12 4.941E-12 6.377E-12 2.608E-11 2.795E-11 4.233E-12
    4.368E-11 1.365E-10 2.309E-10 2.765E-10 2.505E-10 1.862E-10 1.142E-10 6.106E-11 3.348E-11 1.794E-11 1.643E-11
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27 -1.814E-16 -2.462E-16 -6.454E-16 -4.291E-16 -1.083E-15 -3.829E-15 -1.276E-14 -3.389E-14 -6.123E-14 -6.105E-14 1.034E-14
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    1.507E-12 1.106E-12 7.413E-13 4.806E-13 2.963E-13 2.373E-13 2.922E-13 4.694E-13 1.182E-12 2.900E-12 3.982E-12
    6.809E-12 1.318E-11 2.106E-11 2.573E-11 2.461E-11 1.953E-11 1.344E-11 8.599E-12 5.921E-12 4.817E-12 6.226E-12
    7.491E-12
28 -1.081E-16 -3.575E-17 -4.455E-17 -2.401E-17 -1.429E-16 -6.973E-16 -2.899E-15 -9.614E-15 -2.379E-14 -3.792E-14 -3.115E-14
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    2.023E-13 1.247E-13 7.296E-14 3.718E-14 1.070E-14 -7.531E-15 -1.370E-14 -2.596E-15 3.250E-14 1.335E-13 3.272E-13
    6.620E-13 1.239E-12 2.005E-12 2.584E-12 2.653E-12 2.272E-12 1.715E-12 1.255E-12 1.050E-12 1.214E-12 2.286E-12
    4.637E-12
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    5.365E-15 3.043E-14 6.983E-14 1.114E-13 1.372E-13 1.431E-13 1.426E-13 1.590E-13 2.167E-13 3.995E-13 9.139E-13
    2.889E-12
30 -2.212E-17 -2.650E-19 -5.437E-21 5.624E-21 1.542E-19 9.478E-19 4.035E-18 1.155E-17 1.002E-17 -2.674E-16 -1.108E-15
   -2.034E-15 -3.131E-15 -4.129E-15 -4.700E-15 -4.528E-15 -3.451E-15 -1.334E-15 1.240E-15 3.141E-15 3.419E-15 2.888E-15
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    -2.168E-15 -4.092E-16  1.709E-15  4.476E-15  8.083E-15  1.323E-14  2.212E-14  3.911E-14  7.084E-14  1.536E-13  3.757E-13
     1.215E-12
 31 -8.081E-18 -7.076E-20 -2.866E-21 -5.278E-21 -3.207E-20 -1.109E-19 -2.917E-19 -4.063E-19  8.292E-19  7.132E-18  1.914E-17
     2.593E-17  1.731E-17 -2.778E-17 -1.375E-16 -2.889E-16 -3.950E-16 -3.973E-16 -2.684E-16 -7.953E-17  4.254E-17  7.663E-17
     7.233E-17  5.377E-17  3.512E-17  2.346E-17  2.067E-17  2.424E-17  2.712E-17  2.155E-17  4.099E-18 -2.181E-17 -2.755E-17
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     4.219E-13
 32 -3.714E-18 -1.593E-18 -3.270E-19 -1.097E-19 -5.137E-20 -3.727E-20  3.338E-20  4.112E-19  1.748E-18  3.610E-18  3.728E-18
    -1.388E-18 -1.668E-17 -6.078E-17 -1.098E-16 -1.788E-16 -2.255E-16 -2.226E-16 -1.582E-16 -8.887E-17 -2.453E-17  1.816E-17
     2.983E-17  2.732E-17  2.400E-17  1.843E-17  1.596E-17  1.654E-17  1.744E-17  1.834E-17  2.260E-17  4.334E-17  9.431E-17
     2.510E-16  5.489E-16  9.222E-16  1.829E-15  3.305E-15  5.538E-15  1.011E-14  1.751E-14  3.221E-14  6.251E-14  1.195E-13
     2.139E-13

TOTAL PARTICLES USED IN THE CURRENT STEP =     1250
PARTICLES ADDED AT BEGINNING OF THE STEP =       64
PARTICLES REMOVED AT END OF LAST STEP    =      111

         CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP  276, TIME STEP    1, STRESS PERIOD    1
         ------------------------------------------------------------------------------

                                  IN               OUT
                            ----------        ----------
          CONSTANT CONCENTRATION:  11.45672            0.0000000
               CONSTANT HEAD:  0.0000000            0.2017284E-08
                      WELLS:  0.0000000           -4.494132
          DECAY OR BIODEGRADATION:  0.0000000           -1.064738
           MASS STORAGE (SOLUTE):  2.144673            -1.571699
          ---------------------------------------------------------------
                     [TOTAL]:  13.60140    LB      -7.130569    LB

                        NET (IN - OUT):  6.470827
                   DISCREPANCY (PERCENT):  62.42368

 -----
 | M T |
 | 3 D | End of Model Output
 -----
```

ATTACHMENT 2

MODEL BENZENE CONCENTRATIONS IN OBSERVATION WELLS

SCENARIO 1 - BENZENE CONCENTRATIONS IN LBS/FT**3; TIME IN DAYS

STEP	TOTAL TIME	LOCATION OF OBSERVATION POINTS (K,I,J)					
		1 14 19	1 19 11	1 21 13	1 25 30	1 12 11	1 18 20
		WELL 17372	WELL 17349	WELL 17371	WELL 642	WELL 17302	WELL 633
1	70.650	0.00000	0.00000	0.00000	0.00000	0.00000	5.10272E-07
2	141.30	8.97964E-13	0.00000	0.00000	0.00000	0.00000	9.66610E-07
3	211.95	1.37719E-11	0.00000	0.00000	-2.87803E-13	0.00000	7.94010E-07
4	282.60	6.36123E-11	0.00000	4.04713E-16	-5.25650E-13	0.00000	3.40667E-07
5	353.25	1.40819E-10	3.67427E-15	1.47520E-13	-1.46812E-14	1.52749E-22	2.30242E-07
6	365.00	1.56707E-10	4.90588E-14	5.72792E-13	2.12615E-13	5.09761E-20	2.17350E-07
7	435.65	1.86188E-10	1.11920E-12	6.15777E-12	9.67037E-13	3.72979E-18	1.28458E-07
8	506.30	1.79097E-10	8.62132E-12	3.19733E-11	3.66314E-12	7.10551E-17	8.54221E-08
9	576.95	1.55096E-10	3.54630E-11	9.86247E-11	9.31755E-12	6.33692E-16	5.10161E-08
10	647.60	1.22302E-10	9.63685E-11	1.99893E-10	1.62718E-11	3.33658E-15	2.92563E-08
11	718.25	9.01259E-11	1.90954E-10	3.09434E-10	2.12207E-11	1.15646E-14	1.59539E-08
12	730.00	8.69628E-11	2.23066E-10	3.49700E-10	2.29497E-11	1.55881E-14	1.45082E-08
13	800.65	5.97204E-11	3.07936E-10	4.54622E-10	2.45233E-11	3.45977E-14	7.23464E-09
14	871.30	3.90256E-11	3.42441E-10	5.09610E-10	2.51283E-11	5.91844E-14	3.60501E-09
15	941.95	2.46707E-11	3.30302E-10	4.91087E-10	2.48466E-11	8.23691E-14	1.73724E-09
16	1012.6	1.50716E-11	2.89074E-10	4.17962E-10	2.37025E-11	9.78706E-14	8.15801E-10
17	1083.2	8.86226E-12	2.34064E-10	3.21044E-10	2.36327E-11	1.03134E-13	3.91904E-10
18	1153.9	5.04231E-12	1.77042E-10	2.26905E-10	2.42250E-11	9.89976E-14	1.84158E-10
19	1224.5	2.78714E-12	1.25726E-10	1.50410E-10	2.46086E-11	8.81426E-14	9.23036E-11
20	1295.2	1.50569E-12	8.44494E-11	9.48858E-11	2.42813E-11	7.37131E-14	4.72612E-11
21	1365.8	8.00785E-13	5.41553E-11	5.76387E-11	2.32386E-11	5.84385E-14	2.70015E-11
22	1436.5	4.22998E-13	3.34056E-11	3.40450E-11	2.24581E-11	4.42364E-14	1.71624E-11
23	1460.0	3.56309E-13	2.91937E-11	2.94409E-11	2.42248E-11	4.14944E-14	1.60440E-11
24	1530.6	1.90857E-13	1.72556E-11	1.70277E-11	2.43254E-11	2.97620E-14	1.21575E-11
25	1601.3	1.05764E-13	9.94138E-12	9.81991E-12	2.46819E-11	2.06250E-14	1.03341E-11
26	1671.9	6.24844E-14	5.60839E-12	5.73478E-12	2.45890E-11	1.38567E-14	9.43947E-12
27	1742.6	4.06994E-14	3.11350E-12	3.46292E-12	2.42121E-11	9.04991E-15	8.88968E-12
28	1813.2	2.98300E-14	1.71058E-12	2.21644E-12	2.39461E-11	5.76014E-15	8.59053E-12
29	1883.9	2.43895E-14	9.37130E-13	1.53842E-12	2.40525E-11	3.58151E-15	8.36124E-12
30	1954.5	2.16207E-14	5.17624E-13	1.17233E-12	2.43437E-11	2.18072E-15	8.30458E-12
31	2025.2	2.02165E-14	2.93075E-13	9.75878E-13	2.45684E-11	1.30370E-15	8.47255E-12
32	2095.8	1.95575E-14	1.74150E-13	8.69032E-13	2.44161E-11	7.67582E-16	8.45388E-12
33	2166.5	1.92608E-14	1.11676E-13	8.08246E-13	2.39789E-11	4.46838E-16	8.32781E-12
34	2190.0	2.02501E-14	1.03395E-13	8.49568E-13	2.57085E-11	3.86140E-16	8.94693E-12

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SENSITIVTY STUDY - BENZENE CONCENTRATION IN LBS/FT**3; TIME IN DAYS

 STEP  TOTAL TIME        LOCATION OF OBSERVATION POINTS (K,I,J)
           1 14 19    1 19 11    1 21 13    1 25 30    1 12 11    1 18 20

              WELL 17372 WELL 17349 WELL 17371 WELL 642 WELL 17302   WELL 633

  1  8.0128     0.00000      0.00000      0.00000      0.00000      0.00000     1.33746E-07
  2  16.026   -6.56699E-15   0.00000      0.00000      0.00000      0.00000     2.64835E-07
  3  24.038   -1.60700E-13   0.00000      0.00000    -1.32115E-18   0.00000     3.47032E-07
  4  32.051   -5.11883E-13   0.00000    -1.67490E-22  4.78895E-16   0.00000     5.27098E-07
  5  40.064   -1.65797E-12 -8.66146E-24 -5.88699E-21  3.40945E-15  1.04312E-31  6.74769E-07
  6  48.077   -6.30630E-12 -9.31596E-22 -9.82118E-20  1.28185E-14  7.06584E-29  7.73811E-07
  7  56.090   -1.53220E-11 -2.10061E-20 -7.18348E-19  3.62411E-14  2.10082E-27  8.38968E-07
  8  64.103   -2.18355E-11 -2.50880E-19 -1.40038E-18  9.41741E-14  2.37041E-26  9.86480E-07
  9  72.115   -2.97112E-11 -1.86404E-18 -1.88205E-17  2.13447E-13  1.57149E-25  1.28045E-06
 10   80.128  -4.83347E-11 -7.79387E-18 -4.18852E-17  4.04163E-13  7.24891E-25  1.48433E-06
 11   88.141  -6.45131E-11 -2.47954E-17 -3.39073E-17  6.48937E-13  2.43958E-24  1.52383E-06
 12   96.154  -8.13406E-11 -6.53590E-17  2.83237E-16  8.95458E-13  5.65125E-24  1.50350E-06
 13   104.17  -1.03368E-10 -3.32187E-16  1.89758E-16  1.05974E-12  6.05620E-24  1.52115E-06
 14   112.18  -1.67208E-10 -9.21373E-16  8.79102E-16  1.03565E-12 -1.73929E-23  1.61555E-06
 15   120.19  -2.41464E-10 -1.59630E-15  2.50144E-15  7.36971E-13 -1.25917E-22  1.56359E-06
 16   128.21  -2.51453E-10 -3.80209E-15  4.23575E-15  1.43131E-13 -4.55595E-22  1.51124E-06
 17   136.22  -2.49778E-10 -6.58603E-15  8.19996E-15 -7.25894E-13 -1.26169E-21  1.39475E-06
 18   144.23  -3.43534E-10 -1.37376E-14  1.12839E-14 -1.81012E-12 -2.96202E-21  1.36931E-06
 19   152.24  -3.64270E-10 -2.53957E-14  1.65786E-14 -3.03655E-12 -6.16478E-21  1.68436E-06
 20   160.26  -3.54642E-10 -5.00528E-14  2.75518E-14 -4.33721E-12 -1.16728E-20  1.77119E-06
 21   168.27  -4.03715E-10 -6.76912E-14  2.67550E-14 -5.65258E-12 -2.04737E-20  1.61949E-06
 22   176.28  -4.09742E-10 -1.10820E-13  4.27233E-14 -6.94405E-12 -3.37277E-20  1.60583E-06
 23   184.30  -4.81206E-10 -1.98228E-13  8.30841E-14 -8.19947E-12 -5.27395E-20  1.53245E-06
 24   192.31  -3.88493E-10 -3.25519E-13  7.94226E-14 -9.42277E-12 -7.88748E-20  1.60891E-06
 25   200.32  -3.83185E-10 -4.08185E-13  1.76334E-13 -1.06222E-11 -1.13376E-19  1.65076E-06
 26   208.33  -3.83487E-10 -4.24137E-13  3.34875E-13 -1.17937E-11 -1.57028E-19  1.67978E-06
 27   216.35  -3.46400E-10 -8.81417E-13  2.90156E-13 -1.29100E-11 -2.09604E-19  1.59489E-06
 28   224.36  -2.58585E-10 -1.11571E-12  3.81992E-13 -1.39289E-11 -2.69019E-19  1.57554E-06
 29   232.37  -2.12542E-10 -1.22226E-12 -1.18632E-13 -1.48068E-11 -3.30150E-19  1.72643E-06
 30   240.38  -1.51488E-10 -1.80919E-12 -5.15234E-13 -1.55075E-11 -3.83356E-19  1.56388E-06
 31   248.40  -1.05316E-10 -2.10453E-12 -2.88699E-13 -1.60060E-11 -4.12656E-19  1.72254E-06
 32   256.41  -2.50171E-11 -3.06991E-12 -2.69989E-12 -1.62852E-11 -3.93490E-19  1.55928E-06
 33   264.42   9.54656E-11 -4.55870E-12 -2.35231E-12 -1.63277E-11 -2.90158E-19  1.67946E-06
 34   272.44   2.28714E-10 -5.32331E-12 -2.68885E-12 -1.61192E-11 -5.37788E-20  1.68251E-06
 35   280.45   2.68519E-10 -6.11061E-12 -2.04292E-12 -1.56569E-11  3.72162E-19  1.69929E-06
 36   288.46   3.51398E-10 -6.41397E-12 -2.87301E-12 -1.49524E-11  1.06073E-18  1.71040E-06
 37   296.47   3.92873E-10 -8.14261E-12 -2.88830E-12 -1.40316E-11  2.10581E-18  1.77638E-06
 38   304.49   3.70265E-10 -8.64108E-12 -4.20873E-12 -1.29237E-11  3.62328E-18  1.79734E-06
 39   312.50   6.48864E-10 -1.05743E-11 -6.38783E-12 -1.16576E-11  5.75328E-18  1.79695E-06
 40   320.51   7.87334E-10 -1.24298E-11 -9.12576E-12 -1.02588E-11  8.66193E-18  1.71400E-06
 41   328.53   8.72176E-10 -1.46509E-11 -1.14458E-11 -8.75035E-12  1.25425E-17  1.52917E-06
 42   336.54   7.79813E-10 -1.82305E-11 -2.08830E-11 -7.15364E-12  1.76158E-17  1.53802E-06
 43   344.55   9.18491E-10 -2.21602E-11 -1.53352E-11 -5.48883E-12  2.41295E-17  1.58730E-06
 44   352.56   1.09978E-09 -2.47979E-11 -1.40464E-11 -3.77504E-12  3.23567E-17  1.53083E-06
 45   360.58   1.06808E-09 -2.80171E-11 -1.99059E-11 -2.02892E-12  4.25929E-17  1.46726E-06
 46   365.00   9.63135E-10 -3.25456E-11 -2.79410E-11 -1.05179E-12  4.95848E-17  1.53514E-06
 47   373.01   1.20956E-09 -3.74506E-11 -3.94023E-11  7.04309E-13  6.36239E-17  1.63244E-06
 48   381.03   1.31108E-09 -3.60030E-11 -4.44282E-11  2.42719E-12  8.05005E-17  1.56993E-06
 49   389.04   1.33648E-09 -3.89839E-11 -4.83249E-11  4.11170E-12  1.00547E-16  1.64763E-06
 50   397.05   1.52281E-09 -4.54520E-11 -6.38611E-11  5.75179E-12  1.24093E-16  1.47377E-06
 51   405.06   1.67197E-09 -4.74123E-11 -6.87545E-11  7.34260E-12  1.51451E-16  1.51837E-06
 52   413.08   1.59011E-09 -4.97440E-11 -7.11078E-11  8.88252E-12  1.82912E-16  1.46936E-06
 53   421.09   1.61868E-09 -5.74296E-11 -6.59496E-11  1.03742E-11  2.18736E-16  1.49276E-06
 54   429.10   1.85637E-09 -5.60887E-11 -9.31945E-11  1.18244E-11  2.59137E-16  1.57907E-06
 55   437.12   1.67313E-09 -6.51873E-11 -1.01342E-10  1.32432E-11  3.04278E-16  1.67057E-06
 56   445.13   1.84097E-09 -6.60258E-11 -1.12029E-10  1.46441E-11  3.54259E-16  1.63449E-06
 57   453.14   2.11225E-09 -6.66701E-11 -1.03607E-10  1.60421E-11  4.09105E-16  1.34962E-06
 58   461.15   1.93682E-09 -6.57675E-11 -8.15557E-11  1.74514E-11  4.68757E-16  1.31653E-06
 59   469.17   1.70874E-09 -7.91960E-11 -1.53111E-10  1.88822E-11  5.33060E-16  1.42091E-06
 60   477.18   2.24821E-09 -7.41588E-11 -1.62890E-10  2.03387E-11  6.01750E-16  1.61317E-06
 61   485.19   2.31572E-09 -6.67384E-11 -1.75093E-10  2.18189E-11  6.74451E-16  1.54563E-06
 62   493.21   2.29119E-09 -7.16262E-11 -1.32499E-10  2.33166E-11  7.50658E-16  1.50398E-06
 63   501.22   2.11338E-09 -7.76271E-11 -1.56754E-10  2.48246E-11  8.29734E-16  1.50477E-06
 64   509.23   2.22268E-09 -6.87688E-11 -1.38538E-10  2.63387E-11  9.10899E-16  1.33302E-06
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65	517.24	2.27005E-09	-7.27057E-11	-1.51083E-10	2.78566E-11	9.93221E-16	1.32840E-06
66	525.26	2.90689E-09	-6.34602E-11	-1.23452E-10	2.93767E-11	1.07561E-15	1.25476E-06
67	533.27	2.39723E-09	-6.70015E-11	-1.27577E-10	3.08977E-11	1.15682E-15	1.15659E-06
68	541.28	2.19417E-09	-6.37266E-11	-1.29518E-10	3.24173E-11	1.23543E-15	1.17232E-06
69	549.29	2.10489E-09	-7.09691E-11	-8.48404E-11	3.39333E-11	1.30983E-15	1.29984E-06
70	557.31	2.45132E-09	-5.49616E-11	-8.39661E-11	3.54445E-11	1.37824E-15	1.11240E-06
71	565.32	2.73774E-09	-4.62998E-11	-5.34452E-11	3.69532E-11	1.43868E-15	1.26447E-06
72	573.33	2.55587E-09	-4.87844E-11	-6.56766E-11	3.84665E-11	1.48898E-15	1.22592E-06
73	581.35	3.18525E-09	-3.84757E-11	-2.29393E-11	3.99935E-11	1.52679E-15	1.19868E-06
74	589.36	3.27518E-09	-3.04390E-11	-1.56296E-11	4.15437E-11	1.54956E-15	1.22436E-06
75	597.37	3.12500E-09	-2.54912E-11	-3.61655E-11	4.31238E-11	1.55445E-15	1.15231E-06
76	605.38	2.95361E-09	-1.64320E-11	-9.17014E-12	4.47375E-11	1.53836E-15	1.14153E-06
77	613.40	2.80530E-09	6.58692E-12	5.67980E-11	4.63845E-11	1.49797E-15	1.14767E-06
78	621.41	2.52282E-09	1.06657E-11	9.24414E-11	4.80618E-11	1.42976E-15	1.03626E-06
79	629.42	2.73513E-09	3.02083E-11	1.56749E-10	4.97629E-11	1.33006E-15	9.43670E-07
80	637.44	2.94898E-09	3.67405E-11	1.80307E-10	5.14791E-11	1.19459E-15	8.84425E-07
81	645.45	2.85010E-09	5.42079E-11	2.86231E-10	5.32013E-11	1.01832E-15	9.13683E-07
82	653.46	2.59504E-09	4.41794E-11	2.91002E-10	5.49208E-11	7.96208E-16	8.18369E-07
83	661.47	2.55640E-09	5.84892E-11	3.26250E-10	5.66249E-11	5.23236E-16	8.16783E-07
84	669.49	2.42615E-09	9.27604E-11	3.89372E-10	5.82974E-11	1.94417E-16	7.42569E-07
85	677.50	3.04891E-09	1.14833E-10	4.29331E-10	5.99208E-11	-1.99587E-16	7.80539E-07
86	685.51	2.67695E-09	1.46280E-10	5.11070E-10	6.14794E-11	-6.69157E-16	7.99724E-07
87	693.53	3.18414E-09	1.62026E-10	5.40252E-10	6.29614E-11	-1.21984E-15	7.74130E-07
88	701.54	2.70156E-09	1.86646E-10	6.32870E-10	6.43584E-11	-1.85710E-15	6.76093E-07
89	709.55	2.77673E-09	1.91561E-10	6.59465E-10	6.56638E-11	-2.58632E-15	6.54238E-07
90	717.56	2.93895E-09	2.33149E-10	8.08081E-10	6.68725E-11	-3.41278E-15	6.17140E-07
91	725.58	2.80040E-09	2.58551E-10	7.80752E-10	6.79847E-11	-4.34161E-15	5.71669E-07
92	730.00	2.79016E-09	2.87414E-10	8.10285E-10	6.85754E-11	-4.91435E-15	5.47842E-07
93	738.01	2.63361E-09	2.73176E-10	1.07660E-09	6.95624E-11	-6.01278E-15	5.25417E-07
94	746.03	2.47447E-09	3.54878E-10	1.06093E-09	7.04956E-11	-7.22598E-15	4.54438E-07
95	754.04	2.55721E-09	4.19649E-10	1.27817E-09	7.13987E-11	-8.55844E-15	5.13830E-07
96	762.05	2.74407E-09	4.11360E-10	1.29867E-09	7.22932E-11	-1.00144E-14	4.68716E-07
97	770.06	2.56475E-09	5.03974E-10	1.49240E-09	7.31962E-11	-1.15980E-14	4.34908E-07
98	778.08	2.44760E-09	5.46401E-10	1.46354E-09	7.41168E-11	-1.33128E-14	4.00173E-07
99	786.09	2.26573E-09	5.73883E-10	1.50669E-09	7.50573E-11	-1.51623E-14	4.09946E-07
100	794.10	2.80800E-09	6.09255E-10	1.49507E-09	7.60163E-11	-1.71495E-14	3.94319E-07
101	802.12	2.45884E-09	6.26440E-10	1.51663E-09	7.69913E-11	-1.92771E-14	4.03834E-07
102	810.13	2.71360E-09	7.34543E-10	1.71516E-09	7.79798E-11	-2.15474E-14	3.94848E-07
103	818.14	2.57475E-09	8.34927E-10	2.00220E-09	7.89767E-11	-2.39623E-14	3.47384E-07
104	826.15	2.36870E-09	9.79815E-10	2.05959E-09	7.99727E-11	-2.65232E-14	3.24590E-07
105	834.17	2.33510E-09	1.01934E-09	2.07848E-09	8.09562E-11	-2.92312E-14	3.19308E-07
106	842.18	2.19680E-09	1.10211E-09	2.11958E-09	8.19125E-11	-3.20866E-14	2.96728E-07
107	850.19	2.33677E-09	1.10343E-09	2.35801E-09	8.28254E-11	-3.50895E-14	3.05126E-07
108	858.21	2.65998E-09	1.20591E-09	2.42451E-09	8.36806E-11	-3.82395E-14	2.94558E-07
109	866.22	2.51172E-09	1.15286E-09	2.60178E-09	8.44667E-11	-4.15353E-14	2.96452E-07
110	874.23	2.40039E-09	1.21156E-09	2.70401E-09	8.51774E-11	-4.49755E-14	2.49642E-07
111	882.24	2.88774E-09	1.22200E-09	2.90000E-09	8.58134E-11	-4.85578E-14	2.54582E-07
112	890.26	2.78679E-09	1.35555E-09	2.93069E-09	8.63808E-11	-5.22796E-14	2.04357E-07
113	898.27	2.77254E-09	1.31101E-09	2.76993E-09	8.68880E-11	-5.61375E-14	1.94774E-07
114	906.28	2.56967E-09	1.58089E-09	3.17185E-09	8.73448E-11	-6.01277E-14	1.84692E-07
115	914.29	2.48108E-09	1.72799E-09	2.94470E-09	8.77610E-11	-6.42458E-14	1.92748E-07
116	922.31	2.65045E-09	1.74584E-09	2.82495E-09	8.81452E-11	-6.84869E-14	1.72695E-07
117	930.32	2.40146E-09	1.84659E-09	2.92428E-09	8.85042E-11	-7.28456E-14	1.68083E-07
118	938.33	2.26430E-09	2.13273E-09	3.15207E-09	8.88430E-11	-7.73158E-14	1.69929E-07
119	946.35	2.42797E-09	2.01874E-09	3.37454E-09	8.91646E-11	-8.18909E-14	1.59952E-07
120	954.36	2.20153E-09	2.10445E-09	3.73709E-09	8.94711E-11	-8.65639E-14	1.55765E-07
121	962.37	1.99394E-09	2.06826E-09	3.86370E-09	8.97661E-11	-9.13272E-14	1.55677E-07
122	970.38	1.81209E-09	1.92949E-09	3.53777E-09	9.00555E-11	-9.61727E-14	1.44893E-07
123	978.40	1.66238E-09	2.13913E-09	4.19217E-09	9.03490E-11	-1.01092E-13	1.42227E-07
124	986.41	1.73992E-09	2.45941E-09	3.94771E-09	9.06582E-11	-1.06075E-13	1.24710E-07
125	994.42	1.72796E-09	2.38340E-09	4.15720E-09	9.09936E-11	-1.11114E-13	1.16756E-07
126	1002.4	1.95531E-09	2.55811E-09	4.17092E-09	9.13623E-11	-1.16198E-13	1.14948E-07
127	1010.4	1.81896E-09	2.85209E-09	4.82965E-09	9.17666E-11	-1.21318E-13	1.13391E-07
128	1018.5	1.58585E-09	3.16040E-09	4.98475E-09	9.22049E-11	-1.26462E-13	1.02309E-07
129	1026.5	1.80276E-09	3.23995E-09	5.24278E-09	9.26712E-11	-1.31621E-13	9.64219E-08
130	1034.5	1.60921E-09	3.05494E-09	5.45213E-09	9.31561E-11	-1.36783E-13	8.68959E-08
131	1042.5	1.66786E-09	3.58063E-09	5.41434E-09	9.36525E-11	-1.41939E-13	8.42906E-08
132	1050.5	1.76877E-09	3.93136E-09	5.10576E-09	9.41577E-11	-1.47076E-13	9.28662E-08
133	1058.5	1.61714E-09	4.01363E-09	4.78770E-09	9.46664E-11	-1.52185E-13	9.08229E-08
134	1066.5	1.49394E-09	4.44643E-09	5.29044E-09	9.51683E-11	-1.57255E-13	8.03768E-08
135	1074.6	1.49153E-09	4.00124E-09	5.31434E-09	9.56502E-11	-1.62274E-13	7.28589E-08

136	1082.6	1.37535E-09	4.18105E-09	5.58396E-09	9.61001E-11	-1.67232E-13	7.87087E-08
137	1090.6	1.22780E-09	4.33294E-09	5.86680E-09	9.65087E-11	-1.72120E-13	6.86794E-08
138	1098.6	1.48841E-09	4.61511E-09	6.21799E-09	9.68703E-11	-1.76925E-13	6.38880E-08
139	1106.6	1.40908E-09	4.35649E-09	6.32253E-09	9.71823E-11	-1.81638E-13	6.58319E-08
140	1114.6	1.23518E-09	4.83565E-09	6.15535E-09	9.74453E-11	-1.86250E-13	6.00733E-08
141	1122.6	1.30440E-09	4.91625E-09	6.09066E-09	9.76621E-11	-1.90749E-13	5.69223E-08
142	1130.6	1.07289E-09	5.92924E-09	6.37981E-09	9.78378E-11	-1.95126E-13	5.08010E-08
143	1138.7	1.06774E-09	5.64284E-09	6.32986E-09	9.79787E-11	-1.99371E-13	6.10623E-08
144	1146.7	1.11567E-09	5.83580E-09	6.95508E-09	9.80915E-11	-2.03476E-13	5.58914E-08
145	1154.7	1.06566E-09	6.29520E-09	6.99792E-09	9.81839E-11	-2.07430E-13	4.93951E-08
146	1162.7	9.70897E-10	5.83184E-09	7.46017E-09	9.82638E-11	-2.11224E-13	4.87861E-08
147	1170.7	1.09969E-09	5.63912E-09	7.43709E-09	9.83377E-11	-2.14852E-13	4.84833E-08
148	1178.7	1.01445E-09	5.77312E-09	7.90058E-09	9.84101E-11	-2.18303E-13	4.46831E-08
149	1186.7	1.00094E-09	5.82499E-09	7.55263E-09	9.84846E-11	-2.21572E-13	4.35985E-08
150	1194.7	1.03606E-09	5.76921E-09	7.82507E-09	9.85648E-11	-2.24650E-13	4.04125E-08
151	1202.8	9.49016E-10	6.05544E-09	7.58940E-09	9.86549E-11	-2.27530E-13	3.83089E-08
152	1210.8	8.10617E-10	6.29598E-09	7.78180E-09	9.87604E-11	-2.30206E-13	3.65683E-08
153	1218.8	9.73097E-10	6.41337E-09	8.31669E-09	9.88848E-11	-2.32672E-13	3.48768E-08
154	1226.8	1.05663E-09	6.69804E-09	8.50414E-09	9.90275E-11	-2.34922E-13	3.34936E-08
155	1234.8	9.56715E-10	7.32069E-09	8.32133E-09	9.91833E-11	-2.36949E-13	3.95935E-08
156	1242.8	7.78726E-10	7.68244E-09	7.66767E-09	9.93442E-11	-2.38750E-13	3.84282E-08
157	1250.8	8.12077E-10	7.76593E-09	7.48164E-09	9.95034E-11	-2.40318E-13	3.77093E-08
158	1258.8	7.90320E-10	7.34560E-09	7.72952E-09	9.96553E-11	-2.41651E-13	3.41007E-08
159	1266.9	7.15359E-10	7.12113E-09	8.35685E-09	9.97935E-11	-2.42744E-13	3.33993E-08
160	1274.9	6.51563E-10	7.24009E-09	8.85637E-09	9.99102E-11	-2.43594E-13	3.34856E-08
161	1282.9	8.35349E-10	6.92016E-09	8.81515E-09	9.99967E-11	-2.44199E-13	3.41728E-08
162	1290.9	7.82870E-10	6.82314E-09	8.79531E-09	1.00043E-10	-2.44556E-13	3.04583E-08
163	1298.9	9.04796E-10	7.06718E-09	8.61592E-09	1.00041E-10	-2.44664E-13	3.28342E-08
164	1306.9	7.92375E-10	7.24502E-09	9.01034E-09	9.99820E-11	-2.44519E-13	3.05340E-08
165	1314.9	8.57162E-10	8.08599E-09	8.96770E-09	9.98620E-11	-2.44120E-13	2.77378E-08
166	1322.9	8.44702E-10	9.28374E-09	8.98510E-09	9.96804E-11	-2.43468E-13	2.53486E-08
167	1331.0	7.25516E-10	9.35582E-09	9.66375E-09	9.94423E-11	-2.42563E-13	2.37493E-08
168	1339.0	7.31284E-10	9.56322E-09	9.73413E-09	9.91594E-11	-2.41404E-13	2.18597E-08
169	1347.0	6.95256E-10	9.21347E-09	9.47700E-09	9.88466E-11	-2.39993E-13	2.34971E-08
170	1355.0	5.72152E-10	8.87201E-09	9.75603E-09	9.85195E-11	-2.38331E-13	2.24967E-08
171	1363.0	5.48276E-10	8.85011E-09	9.60490E-09	9.81933E-11	-2.36421E-13	2.13606E-08
172	1371.0	5.53615E-10	8.86477E-09	1.04899E-08	9.78831E-11	-2.34265E-13	1.88562E-08
173	1379.0	5.93205E-10	9.39009E-09	1.05958E-08	9.76016E-11	-2.31865E-13	1.82336E-08
174	1387.1	5.24769E-10	8.94133E-09	9.67179E-09	9.73569E-11	-2.29224E-13	1.68318E-08
175	1395.1	6.59002E-10	8.41048E-09	8.71621E-09	9.71532E-11	-2.26346E-13	1.66772E-08
176	1403.1	5.74825E-10	8.51445E-09	8.05614E-09	9.69932E-11	-2.23235E-13	1.46680E-08
177	1411.1	5.21543E-10	9.21793E-09	8.68182E-09	9.68803E-11	-2.19896E-13	1.35423E-08
178	1419.1	4.72731E-10	9.24529E-09	8.97394E-09	9.68178E-11	-2.16337E-13	1.35955E-08
179	1427.1	4.96944E-10	8.91927E-09	8.85855E-09	9.68033E-11	-2.12564E-13	1.32152E-08
180	1435.1	4.51310E-10	7.87964E-09	9.22721E-09	9.68293E-11	-2.08583E-13	1.36271E-08
181	1443.1	4.04004E-10	8.03121E-09	9.34675E-09	9.68856E-11	-2.04404E-13	1.22347E-08
182	1451.2	4.16887E-10	9.05248E-09	8.86708E-09	9.69626E-11	-2.00033E-13	1.24924E-08
183	1459.2	4.20879E-10	9.15876E-09	9.13722E-09	9.70530E-11	-1.95479E-13	1.11803E-08
184	1460.0	3.79471E-10	8.91466E-09	9.42382E-09	9.70716E-11	-1.94984E-13	1.18083E-08
185	1468.0	3.91276E-10	9.08226E-09	8.98454E-09	9.71717E-11	-1.90236E-13	1.21206E-08
186	1476.0	4.24909E-10	9.54619E-09	8.94800E-09	9.72789E-11	-1.85323E-13	1.31419E-08
187	1484.0	3.33055E-10	1.00537E-08	9.27421E-09	9.73958E-11	-1.80253E-13	1.11703E-08
188	1492.1	3.87151E-10	9.85960E-09	9.35697E-09	9.75300E-11	-1.75036E-13	1.17763E-08
189	1500.1	3.79651E-10	9.94617E-09	9.08681E-09	9.76914E-11	-1.69679E-13	1.06292E-08
190	1508.1	3.80014E-10	1.00969E-08	9.03048E-09	9.78891E-11	-1.64193E-13	9.64813E-09
191	1516.1	3.95814E-10	9.70472E-09	8.40093E-09	9.81274E-11	-1.58584E-13	8.80251E-09
192	1524.1	3.90951E-10	1.00259E-08	7.70611E-09	9.84017E-11	-1.52861E-13	7.95143E-09
193	1532.1	3.38128E-10	9.19189E-09	7.46190E-09	9.87003E-11	-1.47032E-13	8.18357E-09
194	1540.1	2.85464E-10	8.89884E-09	7.95860E-09	9.90061E-11	-1.41104E-13	9.17106E-09
195	1548.1	2.83333E-10	9.16045E-09	7.97509E-09	9.93013E-11	-1.35085E-13	8.58329E-09
196	1556.2	3.46695E-10	9.63456E-09	7.76910E-09	9.95727E-11	-1.28982E-13	8.61954E-09
197	1564.2	2.95023E-10	1.02451E-08	7.75287E-09	9.98138E-11	-1.22807E-13	8.14462E-09
198	1572.2	2.35946E-10	1.01921E-08	7.29026E-09	1.00025E-10	-1.16578E-13	7.29436E-09
199	1580.2	3.00253E-10	1.06075E-08	7.58415E-09	1.00212E-10	-1.10310E-13	7.00167E-09
200	1588.2	2.97943E-10	9.82891E-09	7.28468E-09	1.00374E-10	-1.04015E-13	6.79063E-09
201	1596.2	2.87340E-10	9.69250E-09	6.99012E-09	1.00509E-10	-9.77038E-14	6.27187E-09
202	1604.2	2.69874E-10	9.10807E-09	7.11381E-09	1.00612E-10	-9.13874E-14	6.22149E-09
203	1612.2	3.06935E-10	8.56402E-09	7.39699E-09	1.00677E-10	-8.50740E-14	5.89743E-09
204	1620.3	2.83137E-10	8.79996E-09	7.36257E-09	1.00703E-10	-7.87715E-14	5.57755E-09
205	1628.3	2.68569E-10	9.19343E-09	6.90064E-09	1.00695E-10	-7.24865E-14	5.33350E-09
206	1636.3	2.37671E-10	9.03808E-09	6.83126E-09	1.00662E-10	-6.62251E-14	5.47595E-09

207	1644.3	2.63301E-10	8.90582E-09	6.36444E-09	1.00616E-10	-5.99927E-14	5.35874E-09
208	1652.3	2.42074E-10	9.13357E-09	6.72111E-09	1.00569E-10	-5.37943E-14	4.73742E-09
209	1660.3	2.18667E-10	9.29133E-09	6.71404E-09	1.00528E-10	-4.76340E-14	4.89496E-09
210	1668.3	2.02722E-10	9.18447E-09	6.55134E-09	1.00496E-10	-4.15160E-14	4.68536E-09
211	1676.3	1.85984E-10	8.69824E-09	6.40208E-09	1.00476E-10	-3.54437E-14	4.25018E-09
212	1684.4	1.95702E-10	8.85292E-09	6.39155E-09	1.00467E-10	-2.94204E-14	3.78117E-09
213	1692.4	2.14869E-10	8.26697E-09	6.56845E-09	1.00467E-10	-2.34491E-14	4.08904E-09
214	1700.4	1.90344E-10	8.53503E-09	6.31849E-09	1.00477E-10	-1.75324E-14	3.84143E-09
215	1708.4	1.82869E-10	8.67326E-09	6.31872E-09	1.00498E-10	-1.16729E-14	3.98961E-09
216	1716.4	1.83769E-10	8.61634E-09	6.37748E-09	1.00534E-10	-5.87299E-15	3.85614E-09
217	1724.4	1.58312E-10	8.57010E-09	6.03646E-09	1.00587E-10	-1.34906E-16	3.50539E-09
218	1732.4	1.56661E-10	8.22384E-09	5.91198E-09	1.00660E-10	5.41598E-15	3.37695E-09
219	1740.4	1.44882E-10	8.34419E-09	5.97977E-09	1.00753E-10	1.07880E-14	3.11050E-09
220	1748.5	1.41373E-10	8.53091E-09	5.85699E-09	1.00867E-10	1.59913E-14	3.39458E-09
221	1756.5	1.44090E-10	8.61630E-09	5.68670E-09	1.01000E-10	2.10353E-14	3.02511E-09
222	1764.5	1.59540E-10	8.11050E-09	5.39753E-09	1.01149E-10	2.59279E-14	2.73450E-09
223	1772.5	1.52216E-10	8.15080E-09	5.34951E-09	1.01306E-10	3.06764E-14	2.83491E-09
224	1780.5	1.51519E-10	7.90452E-09	5.19290E-09	1.01465E-10	3.52873E-14	2.81780E-09
225	1788.5	1.40468E-10	7.01606E-09	5.14634E-09	1.01619E-10	3.97663E-14	2.63865E-09
226	1796.5	1.29843E-10	7.02352E-09	4.87974E-09	1.01766E-10	4.41184E-14	2.45285E-09
227	1804.6	1.25758E-10	7.09182E-09	4.97283E-09	1.01904E-10	4.83484E-14	2.46038E-09
228	1812.6	1.31916E-10	6.46798E-09	4.90012E-09	1.02063E-10	5.24603E-14	2.38679E-09
229	1820.6	1.23341E-10	6.55382E-09	4.59345E-09	1.02193E-10	5.64577E-14	2.20882E-09
230	1828.6	1.07450E-10	6.88629E-09	4.42933E-09	1.02096E-10	6.03441E-14	2.22704E-09
231	1836.6	9.95985E-11	6.63883E-09	4.43108E-09	1.01680E-10	6.41223E-14	2.03615E-09
232	1844.6	9.57537E-11	6.57292E-09	4.57890E-09	1.01058E-10	6.77951E-14	1.86779E-09
233	1852.6	9.94007E-11	6.67028E-09	4.34897E-09	1.00462E-10	7.13650E-14	1.85005E-09
234	1860.6	8.94672E-11	6.70073E-09	4.35429E-09	1.00119E-10	7.48341E-14	1.80512E-09
235	1868.7	8.61410E-11	6.49476E-09	4.29008E-09	1.00143E-10	7.82047E-14	1.68333E-09
236	1876.7	8.31166E-11	6.39748E-09	3.86890E-09	1.00549E-10	8.14785E-14	1.82160E-09
237	1884.7	7.08146E-11	6.11464E-09	3.72733E-09	1.01284E-10	8.46573E-14	1.91142E-09
238	1892.7	8.20868E-11	6.00390E-09	3.99146E-09	1.02264E-10	8.77428E-14	1.79074E-09
239	1900.7	7.65734E-11	6.24801E-09	3.80504E-09	1.03376E-10	9.07365E-14	2.05743E-09
240	1908.7	6.71265E-11	5.74455E-09	3.69742E-09	1.04546E-10	9.36397E-14	1.72342E-09
241	1916.7	5.99772E-11	5.62350E-09	3.78681E-09	1.05765E-10	9.64538E-14	1.72150E-09
242	1924.7	6.09131E-11	5.51604E-09	3.83320E-09	1.06996E-10	9.91798E-14	1.72871E-09
243	1932.8	6.02081E-11	5.63541E-09	3.69306E-09	1.08166E-10	1.01819E-13	1.55811E-09
244	1940.8	6.08846E-11	5.42081E-09	3.53954E-09	1.09218E-10	1.04372E-13	1.48665E-09
245	1948.8	6.04389E-11	5.26292E-09	3.17692E-09	1.10114E-10	1.06840E-13	1.51914E-09
246	1956.8	6.28501E-11	5.56088E-09	3.13943E-09	1.10828E-10	1.09225E-13	1.57443E-09
247	1964.8	6.10130E-11	5.53495E-09	3.07957E-09	1.11349E-10	1.11526E-13	1.56420E-09
248	1972.8	5.88330E-11	4.86768E-09	3.10882E-09	1.11703E-10	1.13746E-13	1.51274E-09
249	1980.8	5.24544E-11	4.86047E-09	2.86173E-09	1.11917E-10	1.15884E-13	1.48550E-09
250	1988.8	5.04164E-11	4.80838E-09	2.79104E-09	1.11985E-10	1.17943E-13	1.38168E-09
251	1996.9	5.82985E-11	4.68151E-09	2.82974E-09	1.11878E-10	1.19923E-13	1.46407E-09
252	2004.9	5.93985E-11	4.65311E-09	2.87648E-09	1.11566E-10	1.21824E-13	1.36171E-09
253	2012.9	5.71126E-11	4.59786E-09	2.87297E-09	1.11025E-10	1.23647E-13	1.36401E-09
254	2020.9	4.19361E-11	4.45141E-09	2.73735E-09	1.10241E-10	1.25394E-13	1.39268E-09
255	2028.9	4.24515E-11	4.43237E-09	2.71275E-09	1.09229E-10	1.27063E-13	1.33223E-09
256	2036.9	4.50056E-11	4.30316E-09	2.50412E-09	1.08023E-10	1.28657E-13	1.37369E-09
257	2044.9	4.48943E-11	4.08786E-09	2.57593E-09	1.06665E-10	1.30176E-13	1.30242E-09
258	2052.9	4.54101E-11	3.90758E-09	2.37886E-09	1.05195E-10	1.31621E-13	1.22955E-09
259	2061.0	4.55786E-11	3.95947E-09	2.47949E-09	1.03659E-10	1.32993E-13	1.21442E-09
260	2069.0	4.46082E-11	3.77066E-09	2.25445E-09	1.02062E-10	1.34292E-13	1.09629E-09
261	2077.0	4.38191E-11	3.72786E-09	2.19520E-09	1.00302E-10	1.35520E-13	1.04994E-09
262	2085.0	4.26946E-11	3.47376E-09	2.15391E-09	9.77233E-11	1.36679E-13	1.00013E-09
263	2093.0	4.02723E-11	3.52852E-09	2.14591E-09	9.37393E-11	1.37768E-13	9.48696E-10
264	2101.0	4.56951E-11	3.53285E-09	2.03677E-09	8.86302E-11	1.38789E-13	1.10253E-09
265	2109.0	3.84186E-11	3.43574E-09	1.97705E-09	8.19974E-11	1.39744E-13	1.09868E-09
266	2117.1	3.35861E-11	3.37203E-09	2.01930E-09	7.40607E-11	1.40632E-13	1.12987E-09
267	2125.1	3.88043E-11	3.44687E-09	1.98178E-09	6.42380E-11	1.41455E-13	1.08169E-09
268	2133.1	3.46981E-11	3.23125E-09	1.94879E-09	5.48914E-11	1.42214E-13	1.04490E-09
269	2141.1	3.03680E-11	3.13423E-09	1.92845E-09	5.72323E-11	1.42910E-13	9.99309E-10
270	2149.1	2.83764E-11	3.19972E-09	1.81268E-09	7.37808E-11	1.43545E-13	9.93611E-10
271	2157.1	2.82766E-11	3.17414E-09	1.88936E-09	9.66067E-11	1.44119E-13	9.92739E-10
272	2165.1	2.71145E-11	3.00086E-09	1.82010E-09	1.20631E-10	1.44634E-13	9.44843E-10
273	2173.1	2.86400E-11	2.83445E-09	1.78481E-09	1.42765E-10	1.45090E-13	9.91758E-10
274	2181.2	3.04491E-11	2.84184E-09	1.70985E-09	1.61369E-10	1.45490E-13	9.16854E-10
275	2189.2	3.22446E-11	2.69354E-09	1.64423E-09	1.75777E-10	1.45834E-13	8.84095E-10
276	2190.0	3.05933E-11	2.65305E-09	1.54003E-09	1.76891E-10	1.45875E-13	9.31022E-10

APPENDIX B

MODIFIED HEALTH RISK ASSESSMENT RESULTS

Table A–1

Dermal Contact with Groundwater: Children Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$RISK = \frac{CW \times SA \times DP \times ED \times EF \times ET \times CF \times SF \times PC}{BW \times AT}$$

WHERE:

CW = Benzene Concentration in Water (Historical Maximum) [milligrams/liter]
SA = Skin Surface Area Available for Contact [square centimeters]
DP = Dermal Permeability Constant [centimeters/hour]
ED = Exposure Duration [years]
EF = Exposure Frequency [days/year]
ET = Exposure Time [hours/day]
CF = Volumetric Conversion Factor for Water [1 liter/1,000 cubic centimeters]
SF = Slope Factor [kilograms–day/milligram]
PC = Partitioning Coefficient [fraction]
BW = Body Weight [kilograms]
AT = Averaging Time [days]

APPROVED VALUES:

CW = See Below
SA = 4,970 sq.cm
DP = 0.410 cm/hr
ED = 9 yr
EF = See Below
ET = See Below
CF = 0.001 L/cu.cm
SF = 0.029 kg–day/mg
BW = 25 kg
AT = 25,550 day
PC = 0.10

WELL SPECIFIC VARIABLES:

WELL I.D.	CW (mg/L)	ET (hr/day)	EF (day/yr)	RISK
590	ND	6.5	52	**NA**
633	ND	NA	NA	**NA**
634	NS	NA	NA	**NA**
642	ND	1.3	260	**NA**
675	NS	NA	NA	**NA**
17197	ND	NA	52	**NA**
17200	0.0027	NA	NA	**NA**
17203	ND	1.5	24	**NA**
17302	0.00064	5.0	156	**4.2E–08**
17348	ND	NA	NA	**NA**
17349	0.0160	1.0	260	**3.5E–07**
17371	0.0090	2.0	24	**3.6E–08**
17372	0.0055	2.0	260	**2.4E–07**
17393	ND	NA	NA	**NA**

ND = Not detected above method detection limit
NA = Not available or not applicable
NS = Not sampled

Table A–2
Ingestion of Groundwater: Children Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$RISK = \frac{CW \times IR \times ED \times EF \times SF \times PC}{BW \times AT}$$

WHERE:

CW = Benzene Concentration in Water (Historical Maximum) [milligrams/liter]
IR = Ingestion Rate (liters/day)
ED = Exposure Duration [years]
EF = Exposure Frequency [days/year]
SF = Slope Factor [kilograms–day/milligram]
PC = Partitioning Coefficient [fraction]
BW = Body Weight [kilograms]
AT = Averaging Time [days]

APPROVED VALUES:

CW = See Below
IR = 0.35 L/day
ED = 9 yr
EF = See Below
SF = 0.029 kg–day/mg
PC = 0.10
BW = 25 kg
AT = 25,550 day

WELL SPECIFIC VARIABLES:

WELL I.D.	CW (mg/L)	EF (day/yr)	RISK
590	ND	52	**NA**
633	ND	NA	**NA**
634	NS	NA	**NA**
642	ND	260	**NA**
675	NS	NA	**NA**
17197	ND	52	**NA**
17200	0.0027	NA	**NA**
17203	ND	24	**NA**
17302	0.00064	156	**1.4E–09**
17348	ND	NA	**NA**
17349	0.0160	260	**5.9E–08**
17371	0.0090	24	**3.1E–09**
17372	0.0055	260	**2.0E–08**
17393	ND	NA	**NA**

ND = Not detected above method detection limit
NA = Not available or not applicable
NS = Not sampled

Table A–3

Inhalation of Volatilized Groundwater: Children Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$CA = \frac{CW \times Q \times T \times PC}{V + (v \times H \times W \times T)}$$

WHERE:

CA = Benzene Concentration in Air [milligrams/cubic meter]
CW = Benzene Concentration in Water [milligrams/Liter]
Q = Flow Rate of Extracted Groundwater [liters/second]
T = Time (Normalized to Hourly–basis) [seconds]
PC = Partitioning Coefficient [fraction]
V = Volume of Air Surrounding the Irrigation Well [cubic meters]
v = Wind Velocity [meters/second]
H = Dispersion Height [meters]
W = Width of Backyard [meters]

APPROVED VALUES:

CW = See Below
Q = 0.63 L/s
T = 3,600 s
PC = 0.9
V = See Below
v = 2.0 m/s
H = 1.5 m
W = See Below

WELL SPECIFIC VARIABLES:

WELL I.D.	CW (mg/L)	V (cu.m)	W (m)	CA (mg/cu.m)
590	ND	NA	NA	NA
633	ND	NA	NA	NA
634	NS	NA	NA	NA
642	ND	NA	NA	NA
675	NS	NA	NA	NA
17197	ND	NA	NA	NA
17200	0.0027	3,554	48.7	1.0E–05
17203	ND	NA	NA	NA
17302	0.00064	153	10.1	1.2E–05
17348	ND	NA	NA	NA
17349	0.0160	293	14.0	2.2E–04
17371	0.0090	167	10.5	1.6E–04
17372	0.0055	669	21.1	4.9E–05
17393	ND	NA	NA	NA

Table A-3 (continued)
Inhalation of Volatilized Groundwater: Children Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$\text{RISK} = \frac{CA \times IR \times ED \times EF \times SF}{BW \times AT}$$

WHERE:

CA = Benzene Concentration in Air (Calculated Above) [milligrams/cubic meter]
IR = Inhaltion Rate [cubic meters/hour]
ED = Exposure Duration [years]
EF = Exposure Frequency [days/year]
SF = Slope Factor [kilograms-day/milligram]
BW = Body Weight [kilograms]
AT = Averaging Time [days]

APPROVED VALUES:

CA = See Below
IR = 0.60 cu.m/hr
ED = 9 yr
EF = See Below
SF = 0.029 kg-day/mg
BW = 25 kg
AT = 25,550 day

WELL SPECIFIC VARIABLES:

WELL I.D.	CA (mg/cu.m)	EF (day/yr)	RISK
590	NA	52	**NA**
633	NA	NA	**NA**
634	NA	NA	**NA**
642	NA	260	**NA**
675	NA	NA	**NA**
17197	NA	52	**NA**
17200	1.04E-05	NA	**NA**
17203	NA	24	**NA**
17302	1.20E-05	156	**4.6E-10**
17348	NA	NA	**NA**
17349	2.16E-04	260	**1.4E-08**
17371	1.61E-04	24	**9.5E-10**
17372	4.91E-05	260	**3.1E-09**
17393	NA	NA	**NA**

ND = Not detected above method detection limit
NA = Not available or not applicable
NS = Not sampled

Table B–1
Inhalation of Volatilized Groundwater: Adult Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$CA = \frac{CW \times Q \times T \times PC}{V + (v \times H \times W \times T)}$$

WHERE:

CA = Benzene Concentration in Air [milligrams/cubic meter]
CW = Benzene Concentration in Water [milligrams/Liter]
Q = Flow Rate of Extracted Groundwater [liters/second]
T = Time (Normalized to Hourly–basis) [seconds]
PC = Partitioning Coefficient [fraction]
V = Volume of Air Surrounding the Irrigation Well [cubic meters]
v = Wind Velocity [meters/second]
H = Dispersion Height [meters]
W = Width of Backyard [meters]

APPROVED VALUES:

CW = See Below
Q = 0.63 L/s
T = 3,600 s
PC = 0.9
V = See Below
v = 2.0 m/s
H = 2.0 m
W = See Below

WELL SPECIFIC VARIABLES:

WELL I.D.	CW (mg/L)	V (cu.m)	W (m)	CA (mg/cu.m)
590	ND	NA	NA	NA
633	ND	NA	NA	NA
634	NS	NA	NA	NA
642	ND	NA	NA	NA
675	NS	NA	NA	NA
17197	ND	NA	NA	NA
17200	0.0027	4,738	48.7	7.8E–06
17203	ND	NA	NA	NA
17302	0.00064	204	10.1	9.0E–06
17348	ND	NA	NA	NA
17349	0.0160	390	14.0	1.6E–04
17371	0.0090	222	10.5	1.2E–04
17372	0.0055	892	21.1	3.7E–05
17393	ND	NA	NA	NA

Table B–1 (continued)
Inhalation of Volatilized Groundwater: Adult Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$\text{RISK} = \frac{\text{CA x IR x ED x EF x SF}}{\text{BW x AT}}$$

WHERE:

CA = Benzene Concentration in Air (Calculated Above) [milligrams/cubic meter]
IR = Inhaltion Rate [cubic meters/hour]
ED = Exposure Duration [years]
EF = Exposure Frequency [days/year]
SF = Slope Factor [kilograms–day/milligram]
BW = Body Weight [kilograms]
AT = Averaging Time [days]

APPROVED VALUES:

CA = See Below
IR = 0.83 cu.m/hr
ED = 70 yr
EF = See Below
SF = 0.029 kg–day/mg
BW = 70 kg
AT = 25,550 day

WELL SPECIFIC VARIABLES:

WELL I.D.	CA (mg/cu.m)	EF (day/yr)	RISK
590	NA	52	**NA**
633	NA	NA	**NA**
634	NA	NA	**NA**
642	NA	260	**NA**
675	NA	NA	**NA**
17197	NA	52	**NA**
17200	7.82E–06	NA	**NA**
17203	NA	24	**NA**
17302	8.98E–06	156	**1.3E–09**
17348	NA	NA	**NA**
17349	1.62E–04	260	**4.0E–08**
17371	1.21E–04	24	**2.7E–09**
17372	3.69E–05	260	**9.0E–09**
17393	NA	NA	**NA**

ND = Not detected above method detection limit
NA = Not available or not applicable
NS = Not sampled

Table C-1
Inhalation of Soil Vapor: Children Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

Determine Benzene Concentration in Air At Groundwater-Air Interface Based on Groundwater Concentration

Using Henry's Law:

$$CSV = \frac{[\, HB \times ((CWB / MWB) / (CWW / MWW)) / PT \,] \times D \times MWB \times CF}{MWA}$$

Where:
CSV = Benzene Concentration in Air at the Water-Air Interface [micrograms/milliliter]
HB = Henry's Law Coefficient (Benzene) [atmospheres]
CWB = Benzene Concentration in Water (Site-Wide Historical Maximum) [milligrams/liter]
MWB = Molecular Weight of Benzene [grams/mole]
CWW = Water Concentration in Water [milligrams/liter]
MWW = Molecular Weight of Water [grams/mole]
PT = Total Pressure [atmospheres]
D = Density of Subsurface Air (50 degrees F) [grams/liter]
CF = Conversion Factor [1,000 micrograms-milliliter/gram-liter]
MWA = Molecular Weight of Air [grams/liter]

Values:
HB = 240.0 atm
CWB = 3.40E-04 g/L
MWB = 78.12 g/mole
CWW = 1,000.0 g/L
MWW = 18.00 g/mole
PT = 1.0 atm
D = 1.2 g/L
CF = 1,000.0 ug/g
MWA = 29.0 g/mole

Solution: CSV = 6.08E-02 ug/mL

Determine Benzene Concentration in Air at Groundsurface Based on Diffusion

Using SEASOIL and Farmer's Equations:

$$CA = \frac{-\,[\, DA \times (((n - ms) ^{10/3}) / n^{2}) \,] \times [\, (CATM - CSV) / L \,] \times T \,] \times CF}{H}$$

Where:
CA = Benzene Concentration in Air at Groundsurface [milligrams/cubic meter]
DA = Steady State Diffusion Coefficient in Air (Benzene) [square centimeters/second]
n = Soil Porosity [fraction]
ms = Soil Moisture [fraction]
CATM = Benzene Concentration in Background Surface Air [micrograms/milliliter]
CSV = Benzene Concentration in Air at the Water-Air Interface [micrograms/milliliter]
L = Depth of Soil Cover [centimeters]
T = Time (Normalized to Hour-basis) [seconds]
CF = Conversion Factor [10 square centimeters-milligrams/square meter-microgram]
H = Dispersion Height [meters]

Values:
DA = 0.077 sq.cm/s
n = 0.25
ms = 0.20
CATM = 1.98E-03 ug/mL
CSV = 6.08E-02 ug/mL
L = 357.2 cm
T = 3,600 s
CF = 10.0 sq.cm-mg/sq.m-ug
H = 1.5 m

Solution: CA = 2.24E-04 mg/cu.m

Table C-1 (continued)

Inhalation of Soil Vapor: Children Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$\text{RISK} = \frac{\text{CA} \times \text{IR} \times \text{ET} \times \text{ED} \times \text{EF} \times \text{SF}}{\text{BW} \times \text{AT}}$$

WHERE:

CA = Benzene Concentration in Air (Calculated Above) [milligrams/cubic meter]
IR = Inhalation Rate [cubic meters/hour]
ET = Exposure Time [hours/day]
ED = Exposure Duration [years]
EF = Exposure Frequency [days/year]
SF = Slope Factor [kilograms-day/milligram]
BW = Body Weight [kilograms]
AT = Averaging Time [days]

APPROVED VALUES:

CA = 2.24E-04 mg/cu.m
IR = 0.83 cu.m/hr
ET = 15.36 hr/day
EF = 365 day/yr
ED = 9 yr
SF = 0.029 kg-day/mg
BW = 25 kg
AT = 25,550 day

SOLUTION:

RISK = 4.3E-07

Table C−2
Inhalation of Soil Vapor: Adult Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

Determine Benzene Concentration in Air At Groundwater−Air Interface Based on Groundwater Concentration

Using Henry's Law:

$$CSV = \frac{[\ HB\ x\ (\ (\ CWB\ /\ MWB\ )\ /\ (CWW\ /\ MWW\ )\ )\ /\ PT\ ]\ x\ D\ x\ MWB\ x\ CF}{MWA}$$

Where:

CSV = Benzene Concentration in Air at the Water−Air Interface [micrograms/milliliter]
HB = Henry's Law Coefficient (Benzene) [atmospheres]
CWB = Benzene Concentration in Water (Site−Wide Historical Maximum) [milligrams/liter]
MWB = Molecular Weight of Benzene [grams/mole]
CWW = Water Concentration in Water [milligrams/liter]
MWW = Molecular Weight of Water [grams/mole]
PT = Total Pressure [atmospheres]
D = Density of Subsurface Air (50 degrees F) [grams/liter]
CF = Conversion Factor [1,000 micrograms−milliliter/gram−liter]
MWA = Molecular Weight of Air [grams/liter]

Values:

HB = 240.0 atm
CWB = 3.40E−04 g/L
MWB = 78.12 g/mole
CWW = 1,000.0 g/L
MWW = 18.00 g/mole
PT = 1.0 atm
D = 1.2 g/L
CF = 1,000.0 ug/g
MWA = 29.0 g/mole

Solution: CSV = 6.08E−02 ug/mL

Determine Benzene Concentration in Air at Groundsurface Based on Diffusion

Using SEASOIL and Farmer's Equations:

$$CA = \frac{-\ [\ DA\ x\ (\ (\ (\ n - ms\ )\text{\textasciicircum}10/3\ )\ /\ n\text{\textasciicircum}2\ )\ ]\ x\ [\ (\ CATM - CSV)\ /\ L\ ]\ x\ T\ ]\ x\ CF}{H}$$

Where:

CA = Benzene Concentration in Air at Groundsurface [micrograms/cubic meter]
DA = Steady State Diffusion Coefficient in Air (Benzene) [square centimeters/second]
n = Soil Porosity [fraction]
ms = Soil Moisture [fraction]
CATM = Benzene Concentration in Background Surface Air [micrograms/milliliter]
CSV = Benzene Concentration in Air at the Water−Air Interface [micrograms/milliliter]
L = Depth of Soil Cover [centimeters]
T = Time (Normalized to Hour−basis) [seconds]
CF = Conversion Factor [10 square centimeters−milligrams/sqaure meter−microgram]
H = Dispersion Height [meters]

Values:

DA = 0.077 sq.cm/s
n = 0.25
ms = 0.20
CATM = 1.98E−03 ug/mL
CSV = 6.08E−02 ug/mL
L = 357.2 cm
T = 3,600 s
CF = 10.0 sq.cm−mg/sq.m−ug
H = 2.0 m

Solution: CA = 1.68E−04 mg/cu.m

Table C-2 (continued)

Inhalation of Soil Vapor: Adult Exposure

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$RISK = \frac{CA \times IR \times ET \times ED \times EF \times SF}{BW \times AT}$$

WHERE:

CA = Benzene Concentration in Air (Calculated Above) [milligrams/cubic meter]
IR = Inhalation Rate (cubic meters/hour)
ET = Exposure Time [hours/day]
EF = Exposure Frequency [days/year]
ED = Exposure Duration [years]
SF = Slope Facter [kilograms-day/milligram]
BW = Body Weight [kilograms]
AT = Averaging Time [days]

APPROVED VALUES:

CA = 1.68E-04 mg/cu.m
IR = 0.83 cu.m/hr
ET = 15.36 hr/day
EF = 365 day/yr
ED = 70 yr
SF = 0.029 kg-day/mg
BW = 70 kg
AT = 25,550 day

SOLUTION:

RISK = 8.9E-07

Table D–1

Ingestion of Groundwater: Children Exposure

Non–Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$RISK = \frac{\frac{CW \times IR \times PC}{BW}}{RfD}$$

WHERE:

CW = Compound–Specific Concentration in Water (Historical Maximum) [milligrams/liter]
IR = Ingestion Rate (liters/day)
PC = Partitioning Coefficient [fraction]
BW = Body Weight [kilograms]
RfD = Reference Dose [milligram/kilogram/day]

APPROVED VALUES:

CW = See Below
IR = 0.35 L/day
PC = 0.10
BW = 25 kg
RfD = 0.10 mg/kg/day (Ethylbenzene)
0.20 mg/kg/day (Toluene)
2.00 mg/kg/day (Xylene)

Table D-1 (continued)

Ingestion of Groundwater: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

WELL SPECIFIC VARIABLES:

WELL I.D.	CW Ethylbenzene (mg/L)	CW Toluene (mg/L)	CW Xylene (mg/L)	RISK Ethlybenzene	RISK Toluene	RISK Xylene
590	ND	ND	ND	NA	NA	NA
633	ND	ND	ND	NA	NA	NA
634	NS	NS	NS	NA	NA	NA
642	ND	ND	ND	NA	NA	NA
675	NS	NS	NS	NA	NA	NA
17197	ND	ND	ND	NA	NA	NA
17200	ND	ND	0.0120	NA	NA	8.4E-06
17203	ND	ND	0.0013	NA	NA	9.1E-07
17302	0.00044	ND	ND	6.2E-06	NA	NA
17348	ND	ND	ND	NA	NA	NA
17349	0.0071	0.0042	0.1100	9.9E-05	2.9E-05	7.7E-05
17371	0.0039	0.0010	0.0045	5.5E-05	7.0E-06	3.1E-06
17372	0.0013	0.0009	0.0012	1.8E-05	6.3E-06	8.4E-07
17393	ND	ND	ND	NA	NA	NA

ND = Not detected above method detection limit
NA = Not available or not applicable
NS = Not sampled

Table D-2

Dermal Contact with Groundwater: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$\text{RISK} = \frac{\dfrac{CW \times SA \times DP \times ET \times PC}{BW \times CF}}{RfD}$$

WHERE:

CW = Compound-Specific Concentration in Water (Historical Maximum) [milligrams/liter]
SA = Skin Surface Area Available for Contact [square centimeters]
DP = Dermal Permeability Constant [centimeters/hour]
ET = Exposure Time [hours/day]
PC = Partitioning Coefficient [fraction]
BW = Body Weight [kilograms]
CF = Conversion Factor [1,000 cubic centimeters/liter]
RfD = Compound-Specific Reference Dosage [milligrams/kilogram/day]

APPROVED VALUES:

CW = See Below
SA = 4,970 sq.cm
DP = 0.001 cm/hr (Ethylbenzene)
0.0009 cm/hr (Toluene)
0.25 cm/hr (Xylene)
ET = See Below
PC = 0.10
BW = 25 kg
CF = 1,000 cu.cm/L
RfD = 0.10 mg/kg/d (Ethylbenzene)
0.20 mg/kg/d (Toluene)
2.00 mg/kg/d (Xylene)

Table D-2 (continued)

Dermal Contact with Groundwater: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

WELL SPECIFIC VARIABLES:

WELL I.D.	CW Ethylbenzene (mg/L)	CW Toluene (mg/L)	CW Xylene (mg/L)	ET (hr/day)	**RISK Ethylbenzene**	**RISK Toluene**	**RISK Xylene**
590	ND	ND	ND	6.5	**NA**	**NA**	**NA**
633	ND	ND	ND	NA	**NA**	**NA**	**NA**
634	NS	NS	NS	NA	**NA**	**NA**	**NA**
642	ND	ND	ND	1.3	**NA**	**NA**	**NA**
675	NS	NS	NS	NA	**NA**	**NA**	**NA**
17197	ND	ND	ND	NA	**NA**	**NA**	**NA**
17200	ND	ND	0.0120	NA	**NA**	**NA**	**NA**
17203	ND	ND	0.0013	1.5	**NA**	**NA**	**4.8E-06**
17302	0.0004	ND	ND	5.0	**4.4E-07**	**NA**	**NA**
17348	ND	ND	ND	NA	**NA**	**NA**	**NA**
17349	0.0071	0.0042	0.1100	1.0	**1.4E-06**	**3.8E-07**	**2.7E-04**
17371	0.0039	0.0010	0.0045	2.0	**1.6E-06**	**1.8E-07**	**2.2E-05**
17372	0.0013	0.0009	0.0012	2.0	**5.2E-07**	**1.6E-07**	**6.0E-06**
17393	ND	ND	ND	NA	**NA**	**NA**	**NA**

ND = Not detected above method detection limit
NA = Not available or not applicable
NS = Not sampled

Table D-3
Inhalation of Volatilized Groundwater: Children Exposure
Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$CA = \frac{CW \times Q \times T \times PC}{V + (v \times H \times W \times T)}$$

WHERE:

CA = Compound-Specific Concentration in Air [milligrams/cubic meter]
CW = Compound-Specific Concentration in Water [milligrams/Liter]
Q = Flow Rate of Extracted Groundwater [liters/second]
T = Time (Normalized to Hourly-basis) [seconds]
PC = Partitioning Coefficient [fraction]
V = Volume of Air Surrounding the Irrigation Well [cubic meters]
v = Wind Velocity [meters/second]
H = Dispersion Height [meters]
W = Width of Backyard [meters]

APPROVED VALUES:

CW = See Below
Q = 0.63 L/s
T = 3,600 s
PC = 0.9
V = See Below
v = 2.0 m/s
H = 1.5 m
W = See Below

Table D–3 (continued)

Inhalation of Volatilized Groundwater: Children Exposure

Non–Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

WELL SPECIFIC VARIABLES:

WELL I.D.	CW Ethylbenzene (mg/L)	CW Toluene (mg/L)	CW Xylene (mg/L)	V (cu.m)	W (m)	**CA Ethlybenzene (mg/cu.m)**	**CA Toluene (mg/cu.m)**	**CA Xylene (mg/cu.m)**
590	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
633	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
634	NS	NS	NS	NA	NA	**NA**	**NA**	**NA**
642	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
675	NS	NS	NS	NA	NA	**NA**	**NA**	**NA**
17197	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
17200	ND	ND	0.0120	3,554	48.7	**NA**	**NA**	**4.6E–05**
17203	ND	ND	0.0013	NA	NA	**NA**	**NA**	**NA**
17302	0.00044	ND	ND	153	10.1	**8.2E–06**	**NA**	**NA**
17348	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
17349	0.0071	0.0042	0.1100	293	14.0	**9.6E–05**	**5.7E–05**	**1.5E–03**
17371	0.0039	0.0010	0.0045	167	10.5	**7.0E–05**	**1.8E–05**	**8.1E–05**
17372	0.0013	0.0009	0.0012	669	21.1	**1.2E–05**	**7.9E–06**	**1.1E–05**
17393	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**

Table D-3 (continued)

Inhalation of Volatilized Groundwater: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$\text{RISK} = \frac{CA}{RfC}$$

WHERE:

CA = Compound-Specific Concentration in Air (Calculated Above) [milligrams/cubic meter]
RfC = Reference Concentration [milligrams/cubic meter]

APPROVED VALUES:

CA = See Below
RfC = 1.0 mg/cu.m (Ethylbenzene)
0.2 mg/cu.m (Toluene)
0.3 mg/cu.m (Xylene)

WELL SPECIFIC VARIABLES:

WELL I.D.	CA Ethylbenzene (mg/cu.m)	CA Toluene (mg/cu.m)	CA Xylene (mg/cu.m)	**RISK Ethylbenzene**	**RISK Toluene**	**RISK Xylene**
590	NA	NA	NA	**NA**	**NA**	**NA**
633	NA	NA	NA	**NA**	**NA**	**NA**
634	NA	NA	NA	**NA**	**NA**	**NA**
642	NA	NA	NA	**NA**	**NA**	**NA**
675	NA	NA	NA	**NA**	**NA**	**NA**
17197	NA	NA	NA	**NA**	**NA**	**NA**
17200	NA	NA	4.67E-05	**NA**	**NA**	**1.6E-04**
17203	NA	NA	NA	**NA**	**NA**	**NA**
17302	8.23E-06	NA	NA	**8.2E-06**	**NA**	**NA**
17348	NA	NA	NA	**NA**	**NA**	**NA**
17349	9.60E-05	5.69E-05	1.49E-03	**9.6E-05**	**2.8E-04**	**5.0E-03**
17371	7.00E-05	1.80E-05	8.08E-05	**7.0E-05**	**9.0E-05**	**2.7E-04**
17372	1.16E-05	7.89E-06	1.08E-05	**1.2E-05**	**3.9E-05**	**3.6E-05**
17393	NA	NA	NA	**NA**	**NA**	**NA**

ND = Not detected above method detection limit
NS = Not sampled
NA = Not available or not applicable

Table D-4

Inhalation of Soil Vapor: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

Determine Benzene Concentration in Air At Groundwater-Air Interface Based on Groundwater Concentration

Using Henry's Law:

$$CSV = \frac{[H \times ((CW / MW) / (CWW / MWW)) / PT] \times D \times MW \times CF}{MWA}$$

Where:
CSV = Compound-Specific Concentration in Air at the Water-Air Interface [micrograms/milliliter]
H = Henry's Law Coefficient (Compound-Specific, Approximate) [atmospheres]
CW = Compound-Specific Concentration in Water (Site-Wide Historical Maximum) [milligrams/liter]
MW = Molecular Weight (Compound-Specific) [grams/mole]
CWW = Water Concentration in Water [milligrams/liter]
MWW = Molecular Weight of Water [grams/mole]
PT = Total Pressure [atmospheres]
D = Density of Subsurface Air (50 degrees F) [grams/liter]
CF = Conversion Factor [1,000 micrograms-milliliter/gram-liter]
MWA = Molecular Weight of Air [grams/liter]

Values:
H = 376.0 atm (Ethylbenzene)
291.0 atm (Toluene)
225.0 atm (Xylene)
CW = 0.2800 g/L (Ethylbenzene)
0.0082 g/L (Toluene)
0.2100 g/L (Xylene)
MW = 106.17 g/mole (Ethylbenzene)
92.15 g/mole (Toluene)
106.17 g/mole (Xylene)
CWW = 1,000.0 g/L
MWW = 18.00 g/mole
PT = 1.0 atm
D = 1.2 g/L
CF = 1,000.0 ug/g
MWA = 29.0 g/mole

Solution: **CSV = 78.42 ug/mL (Ethylbenzene)**
1.78 ug/mL (Toluene)
35.19 ug/mL (Xylene)

Table D-4 (continued)

Inhalation of Soil Vapor: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

Determine Benzene Concentration in Air at Groundsurface Based on Diffusion

Using SEASOIL and Farmer's Equations:

$$CA = \frac{-[DA \times (((n - ms)^{(10/3)})/n^{2})] \times [(CATM - CSV)/L] \times T] \times CF}{H}$$

Where:

CA = Compound-Specific Concentration in Air at Groundsurface [milligrams/cubic meter]
DA = Steady State Diffusion Coefficient in Air (Compound-Specific) [sqaure centimeters/second]
n = Soil Porosity [fraction]
ms = Soil Moisture [fraction]
CATM = Compound-Specific Concentration In Background Surface Air [micrograms/milliliter]
CSV = Compound-Specific Concentration In Air at the Water-Air Interface [micrograms/milliliter]
L = Depth of Soil Cover [centimeters]
T = Time (Normalized to Hour-basis) [seconds]
CF = Conversion Factor [10 square centimeters-milligrams/square meter-microgram]
H = Dispersion Height [meters]

Values:

DA = 0.0658 sq.cm/s (Ethylbenzene)
0.0770 sq.cm/s (Toluene, Data Not Available - Assumed to Equal Benzene)
0.0770 sq.cm/s (Xylene, Data Not Available - Assumed to Equal Benzene)
n = 0.25
ms = 0.20
CATM = (Data Not Available - Assumed to Equal Zero for Ethylbenzene, Toluene, and Xylene)
CSV = 78.42 ug/mL (Ethylbenzene)
1.78 ug/mL (Toluene)
35.19 ug/mL (Xylene)
L = 357.2 cm
T = 3,600 s
CF = 10.0 sq.cm-mg/sq.m-ug
H = 1.5 m

Solution: CA = **2.55E-01 mg/cu.m**
6.77E-03 mg/cu.m
1.34E-01 mg/cu.m

Table D-4 (continued)

Inhalation of Soil Vapor: Children Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$\text{RISK} = \frac{\text{CA}}{\text{RfC}}$$

WHERE:

CA = Compound-Specific Concentration in Air (Calculated Above) [milligrams/cubic meter]
RfC = Reference Concentration (Compound-Specific) [milligrams/cubic meter]

APPROVED VALUES:

CA = 2.55E-01 mg/cu.m (Ethylbenzene)
6.77E-03 mg/cu.m (Toluene)
1.34E-01 mg/cu.m (Xylene)
RfC = 1.0 mg/cu.m (Ethylbenzene)
0.2 mg/cu.m (Toluene)
0.3 mg/cu.m (Xylene)

SOLUTION:

RISK = **2.6E-01 Ethylbenzene**
3.4E-02 Toluene
4.5E-01 Xylene

Table D-5

Inhalation of Volatilized Groundwater: Adult Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$CA = \frac{CW \times Q \times T \times PC}{V + (v \times H \times W \times T)}$$

WHERE:

CA = Compound-Specific Concentration in Air [milligrams/cubic meter]
CW = Compound-Specific Concentration in Water [milligrams/Liter]
Q = Flow Rate of Extracted Groundwater [liters/second]
T = Time (Normalized to Hourly-basis) [seconds]
PC = Partitioning Coefficient [fraction]
V = Volume of Air Surrounding the Irrigation Well [cubic meters]
v = Wind Velocity [meters/second]
H = Dispersion Height [meters]
W = Width of Backyard [meters]

APPROVED VALUES:

CW = See Below
Q = 0.63 L/s
T = 3,600 s
PC = 0.9
V = See Below
v = 2.0 m/s
H = 2.0 m
W = See Below

Table D-5 (continued)

Inhalation of Volatilized Groundwater: Adult Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

WELL SPECIFIC VARIABLES:

WELL I.D.	CW Ethylbenzene (mg/L)	CW Toluene (mg/L)	CW Xylene (mg/L)	V (cu.m)	W (m)	**CA Ethlybenzene (mg/cu.m)**	**CA Toluene (mg/cu.m)**	**CA Xylene (mg/cu.m)**
590	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
633	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
634	NS	NS	NS	NA	NA	**NA**	**NA**	**NA**
642	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
675	NS	NS	NS	NA	NA	**NA**	**NA**	**NA**
17197	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
17200	ND	ND	0.0120	4,738	48.7	**NA**	**NA**	**3.5E-05**
17203	ND	ND	0.0013	NA	NA	**NA**	**NA**	**NA**
17302	0.00044	ND	ND	204	10.1	**6.2E-06**	**NA**	**NA**
17348	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**
17349	0.0071	0.0042	0.1100	390	14.0	**7.2E-05**	**4.3E-05**	**1.1E-03**
17371	0.0039	0.0010	0.0045	222	10.5	**5.2E-05**	**1.3E-05**	**6.1E-05**
17372	0.0013	0.0009	0.0012	892	21.1	**8.7E-06**	**5.9E-06**	**8.0E-06**
17393	ND	ND	ND	NA	NA	**NA**	**NA**	**NA**

Table D–5 (continued)

Inhalation of Volatilized Groundwater: Adult Exposure

Non–Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

EQUATION:

$$RISK = \frac{CA}{RfC}$$

WHERE:

CA = Compound–Specific Concentration in Air (Calculated Above) [milligrams/cubic meter]
RfC = Reference Concentration [milligrams/cubic meter]

APPROVED VALUES:

CA = See Below
RfC = 1.0 mg/cu.m (Ethylbenzene)\
0.2 mg/cu.m (Toluene)
0.3 mg/cu.m (Xylene)

WELL SPECIFIC VARIABLES:

WELL I.D.	CA Ethylbenzene (mg/cu.m)	CA Toluene (mg/cu.m)	CA Xylene (mg/cu.m)	RISK Ethylbenzene	RISK Toluene	RISK Xylene
590	NA	NA	NA	NA	NA	NA
633	NA	NA	NA	NA	NA	NA
634	NA	NA	NA	NA	NA	NA
642	NA	NA	NA	NA	NA	NA
675	NA	NA	NA	NA	NA	NA
17197	NA	NA	NA	NA	NA	NA
17200	NA	NA	3.48E–05	NA	NA	1.2E–04
17203	NA	NA	NA	NA	NA	NA
17302	6.18E–06	NA	NA	6.2E–06	NA	NA
17348	NA	NA	NA	NA	NA	NA
17349	7.20E–05	4.26E–05	1.12E–03	7.2E–05	2.1E–04	3.7E–03
17371	5.25E–05	1.35E–05	6.05E–05	5.2E–05	6.7E–05	2.0E–04
17372	8.71E–06	5.90E–06	8.04E–06	8.7E–06	2.9E–05	2.7E–05
17393	NA	NA	NA	NA	NA	NA

ND = Not detected above method detection limit
NS = Not sampled
NA = Not available or not applicable

Table D-6

Inhalation of Soil Vapor: Adult Exposure

Non-Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

Determine Benzene Concentration in Air At Groundwater-Air Interface Based on Groundwater Concentration

Using Henry's Law:

$$CSV = \frac{[H \times ((CW / MW) / (CWW / MWW)) / PT] \times D \times MW \times CF}{MWA}$$

Where:

CSV = Compound-Specific Concentration in Air at the Water-Air Interface [micrograms/milliliter]
H = Henry's Law Coefficient (Compound-Specific, Approximate) [atmospheres]
CW = Compound-Specific Concentration in Water (Site-Wide Historical Maximum) [milligrams/liter]
MW = Molecular Weight (Compound-Specific) [grams/mole]
CWW = Water Concentration in Water [milligrams/liter]
MWW = Molecular Weight of Water [grams/mole]
PT = Total Pressure [atmospheres]
D = Density of Subsurface Air (50 degrees F) [grams/liter]
CF = Conversion Factor [1,000 micrograms-milliliter/gram-liter]
MWA = Molecular Weight of Air [grams/liter]

Values:

H =	376.0	atm (Ethylbenzene)
	291.0	atm (Toluene)
	225.0	atm (Xylene)
CW =	0.2800	g/L (Ethylbenzene)
	0.0082	g/L (Toluene)
	0.2100	g/L (Xylene)
MW =	106.17	g/mole (Ethylbenzene)
	92.15	g/mole (Toluene)
	106.17	g/mole (Xylene)
CWW =	1,000.0	g/L
MWW =	18.00	g/mole
PT =	1.0	atm
D =	1.2	g/L
CF =	1,000.0	ug/g
MWA =	29.0	g/mole

Solution:

CSV =	**78.42**	**ug/mL (Ethylbenzene)**
	1.78	**ug/mL (Toluene)**
	35.19	**ug/mL (Xylene)**

Table D–6 (continued)

Inhalation of Soil Vapor: Adult Exposure

Non–Carcinogenic Risk

ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

Determine Benzene Concentration in Air at Groundsurface Based on Diffusion

Using SEASOIL and Farmer's Equations:

$$CA = \frac{-[DA \times (((n - ms)^{(10/3)})/n^{2})] \times [(CATM - CSV)/L] \times T] \times CF}{H}$$

Where:
CA = Compound–Specific Concentration in Air at Groundsurface [milligrams/cubic meter]
DA = Steady State Diffusion Coefficient in Air (Compound–Specific) [sqaure centimeters/second]
n = Soil Porosity [fraction]
ms = Soil Moisture [fraction]
CATM = Compound–Specific Concentration in Background Surface Air [micrograms/milliliter]
CSV = Compound–Specific Concentration in Air at the Water–Air Interface [micrograms/milliliter]
L = Depth of Soil Cover [centimeters]
T = Time (Normalized to Hour–basis) [seconds]
CF = Conversion Factor [10 square centimeters–milligrams/square meter–microgram]
H = Dispersion Height [meters]

Values:
DA = 0.0658 sq.cm/s (Ethylbenzene)
0.0770 sq.cm/s (Toluene, Data Not Available – Assumed to Equal Benzene)
0.0770 sq.cm/s (Xylene, Data Not Available – Assumed to Equal Benzene)
n = 0.25
ms = 0.20
CATM = (Data Not Available – Assumed to Equal Zero for Ethylbenzene, Toluene, and Xylene)
CSV = 78.42 ug/mL (Ethylbenzene)
1.78 ug/mL (Toluene)
35.19 ug/mL (Xylene)
L = 357.2 cm
T = 3,600 s
CF = 10.0 sq.cm–mg/sq.m–ug
H = 2.0 m

Solution: CA = **1.92E–01 mg/cu.m**
5.08E–03 mg/cu.m
1.01E–01 mg/cu.m

APPENDIX C

JULY 8, 1994 MEETING MINUTES

PACIFIC
ENVIRONMENTAL
GROUP INC.

July 26, 1994
Project 330-006.3B

MEMORANDUM

To: Mr. Mike Whelan, ARCO Products Company

cc: Ms. Juliet Shin, Alameda County Health Care Services Agency
Mr. Kevin Graves, Regional Water Quality Control Board
Dr. Ravi Arulanantham, Regional Water Quality Control Board
Dr. Charles Lapin, ARCO Products Company

From: Ms. Debra Moser, Pacific Environmental Group, Inc.

Subject: Meeting Minutes, July 8, 1994
ARCO Service Station 0608
17601 Hesperian Boulevard
San Lorenzo, California

This memorandum summarizes the main topics of the meeting conducted between the Alameda County Health Care Services Agency (ACHCSA), San Francisco Bay Regional Water Quality Control Board (RWQCB), ARCO Products Company (ARCO), and Pacific Environmental Group, Inc. (PACIFIC) on July 8, 1994. The purpose of the meeting was to (1) provide a project update, and (2) seek agreement on the approach and contents of the upcoming remedial investigation/feasibility study (RI/FS) report, particularly the proposal to manage the off-site plume using institutional controls consisting of a groundwater management plan. Those present at the meeting included Ms. Juliet Shin of the ACHCSA, Mr. Mike Whelan and Dr. Charles Lapin of ARCO, Dr. Ravi Arulanantham and Mr. Kevin Graves of the RWQCB, and Mr. Keith Winemiller, Dr. Cleve Solomon, and Ms. Debra Moser of PACIFIC. The main topics discussed and subsequent action items (*in italics*) are summarized below. A copy of the meeting agenda is attached.

PROJECT UPDATE

Mr. Winemiller presented the current status of the investigation, including soils and groundwater data, a summary of the liaison with the local domestic irrigation well owners, discussion of the feasibility studies completed to date, and a summary of the risk assessment methodology and results. The existing remedial action (on-site groundwater extraction) was also described, and discussion of migration control followed.

Action Items:

- o *The feasibility studies described in the RI/FS should include documentation of the feasibility of bioremediation of groundwater. This could include microbiological testing, or review of dissolved oxygen levels, eH, pH, or redox potential of the groundwater. Also, comparison of historic to present plume configuration could support progress of bioremediation.*
- o *Send copies of Risk Assessment documents (Methodology, Results, Addendum) to Kevin Graves, Juliet Shin, and Ravi Arulanantham.*

MODELING RESULTS

Dr. Solomon described the groundwater modeling performed to date. The modeling was designed to examine groundwater flow, and fate and transport of benzene in groundwater, assuming a constant on-site source. The models used were MODFLOW and MT3D; hydrogeologic conditions input to the model were obtained from site investigation results; benzene concentrations from the March 1994 sampling event were used; and a biodegradation rate of 110 days, per published literature, was used. Four scenarios were modeled: (1) no on-site migration control and no off-site pumping, (2) on-site source control and no off-site pumping, (3) on-site source control and selected off-site wells pumping at maximum rates, and (4) on-site source control and all off-site wells pumping at maximum rates. The following conclusions were reached.

- o Biodegradation effectively limits benzene plume size.
- o Source control keeps the benzene plume at the site.
- o Off-site Well 633H lies within the 1 part per billion benzene isoconcentration contour during Year 1 in all scenarios modeled.
- o Other off-site wells show little to no benzene impact.

The input assumptions and results of the modeling are attached to these minutes.

- Implementation Schedule.

The definition of institutional controls was discussed, and consists of an overall groundwater management plan. The groundwater management plan should incorporate an appropriate monitoring network to include wells at the toe of the plume as well as hot spots. Also, the plan will include ongoing sampling of off-site wells and review of current well sampling frequency.

The RI/FS will be submitted on November 22, 1994.

Action Items:

- *Ms. Moser will contact the well owner at 633 Hacienda to solicit permission to sample the well. Since this well owner has not responded to any letters, the face-to-face meeting will also identify any issues that this well owner has with the ongoing investigation. At ARCO's request, Ms. Shin could assist in contacting the well owner, possibly by writing a letter.*
- *In justifying the institutional controls, include a discussion of TPH-g as well as benzene. Show that the plume is stable and shrinking. Address source reduction on-site, possibly by biodegradation.*

SUMMARY

The action items listed above were confirmed. Also, the agreement to consideration of passive remediation of the off-site plume was confirmed. Dr. Arulanantham noted that perceived risk on the part of the community may affect acceptance of the passive remedial approach off-site.

Enclosures