



KLEINFELDER

March 10, 1992

File No: 10-1682-08/101

Mr. Dennis Hunt
Industrial Asphalt
52 El Charro Road
Pleasanton, CA 94566

SUBJECT: Ground Water Flow Model, Industrial Asphalt, Pleasanton, California

Dear Mr. Hunt:

Kleinfelder is pleased to present to you the results of the ground water flow model developed by Kleinfelder for the Industrial Asphalt facility. This model was developed to help assess the location and pumping rates for extraction wells which will be installed at the Industrial Asphalt facility. Included in this report is a description of the model and the model results.

If you have any questions regarding the information presented in this report please call us.

Sincerely,

KLEINFELDER, INC.

Susan E. Russell
Staff Hydrogeologist

Krzysztof (Krys) S. Jesionek
Project Manager

Charles Almestad
Senior Hydrogeologist

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SEP 13 AM 11:14

**GROUND WATER FLOW MODEL
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA**

March 10, 1992

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A Report Prepared for:

Industrial Asphalt
Pleasanton, California

Kleinfelder Job No. 10-1682-08/101

by

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March 10, 1992

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1.0 INTRODUCTION

A ground water flow and chemical transport model was developed to simulate the ground water system underlying the Industrial Asphalt facility in Pleasanton, California. The purpose of the model was to assess alternatives related to the number and placement of extraction wells, at the facility. The model chosen for this simulation was the Method of Characteristics (MOC) model developed by Konikow and Bredehoeft (1978) at the U.S. Geological Survey. This model was chosen because the model is well tested and extensively documented and because chemical transport can be simulated in MOC. This capability is important to the assessment of capture and containment of the constituent plume by the extraction wells.

2.0 GROUND WATER FLOW MODEL

2.1 Model Assumptions

The Method of Characteristics (MOC) model was used to model ground water flow and chemical transport at the Industrial Asphalt facility. The model is a computer based finite difference model that represents physical and chemical processes in mathematical terms. In expressing a complex physical and chemical system in mathematical terms many simplifying assumptions have to be made. In the MOC model the following assumptions are made:

- Two dimensional ground water flow and transport
- Darcy's Law is valid and hydraulic head gradients are the only significant driving mechanism for ground water flow (apart from pumping wells imposed on the model).
- Porosity and hydraulic conductivity of the water bearing zone are constant with time, and porosity is uniform in space.
- Vertical variations in head and concentrations are negligible.
- The thickness of the water bearing zone is uniform.
- The water bearing zone is homogeneous and isotropic with respect to the coefficients of longitudinal and transverse dispersivity.
- Ionic and molecular diffusion are negligible contributors to the total dispersive flux.
- No chemical reactions occur that affect the concentration of the solute, the fluid properties, or the water bearing zone properties.

- The hydrologic system can be simulated by a rectangular, uniformly spaced, block-centered, finite-difference grid, in which nodes are defined at the centers of the rectangular cells.

2.2 Conceptual Model

The Industrial Asphalt facility lies in a broad alluvial valley. Plate 1 shows the location of the facility. Soil boring logs indicate that the shallow ground water system at Industrial Asphalt consists of an unconfined water bearing zone with an average thickness of 30 feet (Kleinfelder 1990). The soils of this zone consist of clayey-silty-sandy-gravels (Kleinfelder, 1990). A gravel pit is located on the north side of the site. During mining operations this pit was excavated through the unconfined water bearing zone material to the top clay layer at an approximate depth of 130 feet. The pit is currently used as a water desiltation pond by Jaimeson, Inc., and has a water depth of approximately 30 feet. The local ground water gradient direction at the study site is currently toward the northeast.

The conceptual model for the ground water system consists of a single layer water bearing zone with spatial variations in transmissivity. Storativity of the layer was assumed to be uniform. The gravel pit pond is assumed to be a constant head boundary for this layer. The hydraulic gradient direction was assumed to be northeast.

Ground water flow was simulated in the water bearing zone beneath the study site using a finite difference grid having 40 columns and 40 rows of node points. This grid was centered on the study site and the spacing between the nodes was assumed to be 25 feet. Each node point represents a location where hydraulic head was estimated in the model. The node columns were oriented parallel to the local ground water gradient direction. Chemical transport in the water bearing zone was simulated using a 17 column by 17 row sub-area within the larger ground water flow grid. The subgrid was centered on the study site. Plate 2 shows the configuration of the finite difference grid for this simulation.

Constant head boundaries were set at the northeast and southwest ends of the finite difference grid and at the gravel pit pond. The constant head elevations at the northeast and southeast margins of the grid were estimated from the observed hydraulic gradient at the study site. The constant head elevation for the gravel pit pond was estimated from staff gage measurements in the pond. Plate 3 shows the boundary conditions for this simulation.

Transmissivities for the water bearing zone in this simulation were estimated from: soil boring data collected during monitoring well installation, data derived from a 48 hour pumping test in monitoring well MW-13, and published descriptions of soils located in the vicinity of the site. A low transmissivity zone was placed around the margins of the pond to represent: clay dykes which were commonly used to inhibit flow of water into the gravel pit during excavation (Danskin and Gorelick, 1985); and siltation the bottom of the pit after it was converted to a water desiltation pond. The distribution of transmissivity in the model grid is shown on Plate 4. The remainder of the hydraulic parameters assumed in this model are summarized in Table 1.

Chemical distribution data for this simulation was estimated using concentrations of chemical constituents measured in samples collected from monitoring wells at the study site. The source of the chemical constituents was assumed to have been removed for the purposes of this simulation. The distribution of the chemicals simulated in the model are shown on Plate 5. Table 2 summarizes the remaining parameters used for the chemical transport portion of this simulation.

Ground water extraction wells were simulated in the model by designating specific nodes as points where water was being extracted from the water bearing zone. The rate of extraction for these wells was based on data collected during the 48 hour pumping test conducted in MW-13.

2.3 Model Calibration and Validation

Steady state flow conditions were calibrated in the ground water model by comparing simulated ground water elevations with ground water elevations observed at the study site. Observation points in the model were designated at nodes which correspond to monitoring well locations at the study site. Five monitoring wells were used as observation points during the calibration process. Adjustments were made to the hydraulic parameters until the simulated water levels at the observation points in the model were within one foot of observed water levels in the corresponding monitoring wells. Approximately 10 simulation runs were needed to calibrate the model. The results of this calibration are listed in Table 3. The r^2 value for the calibration data was calculated to be 0.98.

Validation of the steady state simulation consisted of comparing observed water levels on monitoring wells not used for the calibration process with predicted water levels from the

calibrated steady state simulation. The model was considered validated when simulated water levels from the model were estimated within one foot of the observed water levels at the additional observation points. The results of the model validation are listed in Table 3. The estimated r^2 value for this data was estimated to be 0.94. Calibration of chemical transport was not assessed in this model because insufficient data were available to conduct the assessment.

2.4 Sensitivity Analysis

A sensitivity analysis was conducted on the hydraulic parameters used in this model. This analysis included changing the value of the transmissivity, storage coefficient, and boundary conditions while observing the changes which occur in water levels compared to the steady state simulation. This analysis was conducted to assess the relative importance of various model parameters.

The model was found to be sensitive to the value of the constant head boundaries. The sensitivity of the model to the constant head boundary condition was reflected in changes to the hydraulic gradient, simulated ground water velocity and the estimated radius of influence of the extraction wells. A 10 percent increase in the upgradient constant head boundary created an approximate 20 percent change in the hydraulic gradient, the ground water velocity increased by approximately 20 percent. As a result, the size of the capture zones for the wells decreased by approximately 20 percent.

Chemical transport was found to be sensitive to the coefficient of dispersivity. A 10 percent increase in the dispersivity increased the distance of transport approximately 25 percent. The capture zone of the wells however was not influenced by this parameter change.

2.5 Model Results

Plate 6 shows the simulation of steady state ground water elevations from the calibrated model. The direction and relative velocity of ground water flow is represented by the vectors shown on Plate 6. The model predicts that ground water will flow toward the gravel pit pond from the southwest end of the site and away from the pond on the northeast end of the site. The model also predicts ground water velocities in the vicinity of the pond are low in comparison to other regions in the model. The ground water elevations and velocities predicted by the model for each individual node are included in the output file in Appendix A.

The effects of drawdown by extraction wells in the water bearing zone were assessed by simulating transient ground water flow conditions in the model for different extraction well configurations. The location of the final configuration of the wells is shown on Plate 7. The water level elevations estimated by the steady state simulation were used as the initial water levels for the transient flow simulations. Five wells were sufficient to capture and contain the chemical constituent plume on the northeast side of the site (Plate 8). The gradient has been known to change, therefore, it is important to place 5 additional wells on the southwest side of the site (Plate 9). The additional wells appear sufficient to capture and contain the constituent plume at the site in the event ground water flow patterns change. The ground water contours and flow direction estimated during simulation of the 10 extraction wells are shown on Plate 10.

MOC transient flow simulation results were compared to simulation results for a simplified version of the model using the Dream program (Bonn and Rounds, 1990). Dream is an analytical ground water flow model which assumes homogeneous isotropic hydrologic conditions in a uniform regional hydraulic gradient. Dream does not simulate chemical transport. The Dream model was used as a check and to further assess the results from MOC. Estimation of the extraction well capture zones using the Dream model compared reasonably well with the MOC simulation. These results of the dream simulation are presented on Plate 11. The favorable comparison between the two models (MOC and Dream) helps to validate the number and placement of wells around the Industrial Asphalt facility.

2.6 Discussion of Model Limitations

The ground water model developed for the shallow water bearing zone, underlying the Industrial Asphalt facility, has several limitations. These limitations include the following:

- (1) The ground water gradient direction is assumed to be northeast. The model does not allow for changes in gradient direction with time. The gradient direction is known to fluctuate depending on the elevation of water in gravel pits southwest of the site and when offsite ground water wells are pumped. However, it is believed that the configuration of extraction wells is adequate to capture and contain the plume should the ground water gradient change.
- (2) The ground water velocities predicted by the model are dependent upon the value of transmissivity, effective porosity, and hydraulic gradient estimated at each of the nodal points in the model. The possible errors associated with each of these parameters on the ground water velocity is discussed below:

DRAFT

- The transmissivities used in this model are based on values obtained from one pumping test, estimates from soil boring descriptions and published values for typical soils. These estimates therefore, may not reflect the true distribution of transmissivity at the site. If the transmissivity were underestimated then the ground water velocity might be faster than estimated by the model; if the transmissivity were overestimated then the ground water velocity might be slower than estimated by the model.
 - The hydraulic gradient for the model was estimated using water levels from the July 1991 monitoring well measurements. The July data was used because they appear representative of ground water flow over the past year. If the magnitude of the gradient changes when the direction of the gradient changes then the velocity of the ground water would also change. Ground water velocity increases with an increase in hydraulic gradient.
 - Effective porosity for the water bearing zone was estimated based on published values for soils of similar particle composition to the soils observed in the monitoring wells. The value for this parameter was assumed to be uniform because of the assumptions required by the mathematical equations used by MOC. If the distribution of effective porosity is variable, then the estimation of ground water velocity would vary proportionality (the higher the effective porosity the slower the estimated ground water velocity).
- (3) The capture zones estimated for the extraction wells is dependent upon the ground water velocity. If ground water velocity is overestimated then the capture zones would be underestimated; if ground water velocity is underestimated then the capture zones would be overestimated.

Plate 12 shows the locations of the proposed extraction wells at the Industrial Asphalt facility. These wells are offset from the locations modeled to avoid high traffic zones, utilities and gravel stock piles. This offset, however, does not appear to effect the estimated plume capture.

3.0 LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice which exists in Northern California at the time the investigation was performed. It should be recognized that definition and evaluation of environmental conditions is a difficult and inexact art. Judgements leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive studies, including additional environmental investigations, can tend to reduce the inherent uncertainties associated with such studies. If the Client wishes to reduce the uncertainty beyond the level associated with this study, Kleinfelder should be notified for additional consultation.

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4.0 REFERENCES

- 1) Walton, W.C. (1988) Practical Aspects of Ground Water Modeling, 3rd ed.
- 2) Konikow & Bedehoeft (1978, Method of Characteristics Ground Water Model, U.S. Geological Survey, Computer Program.

TABLE 1
ESTIMATED HYDROLOGIC PARAMETERS
METHOD OF CHARACTERISTICS SIMULATION
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

Parameter	Value
Transmissivity	Variable (See Plate 3)
Storage Coefficient	0.0005
Porosity	30%
Gradient	0.003 (ft/ft)
Gradient Direction	NE
Aquifer Thickness	30 ft.
Ratio of Transverse to Longitudinal Transmissivity	1

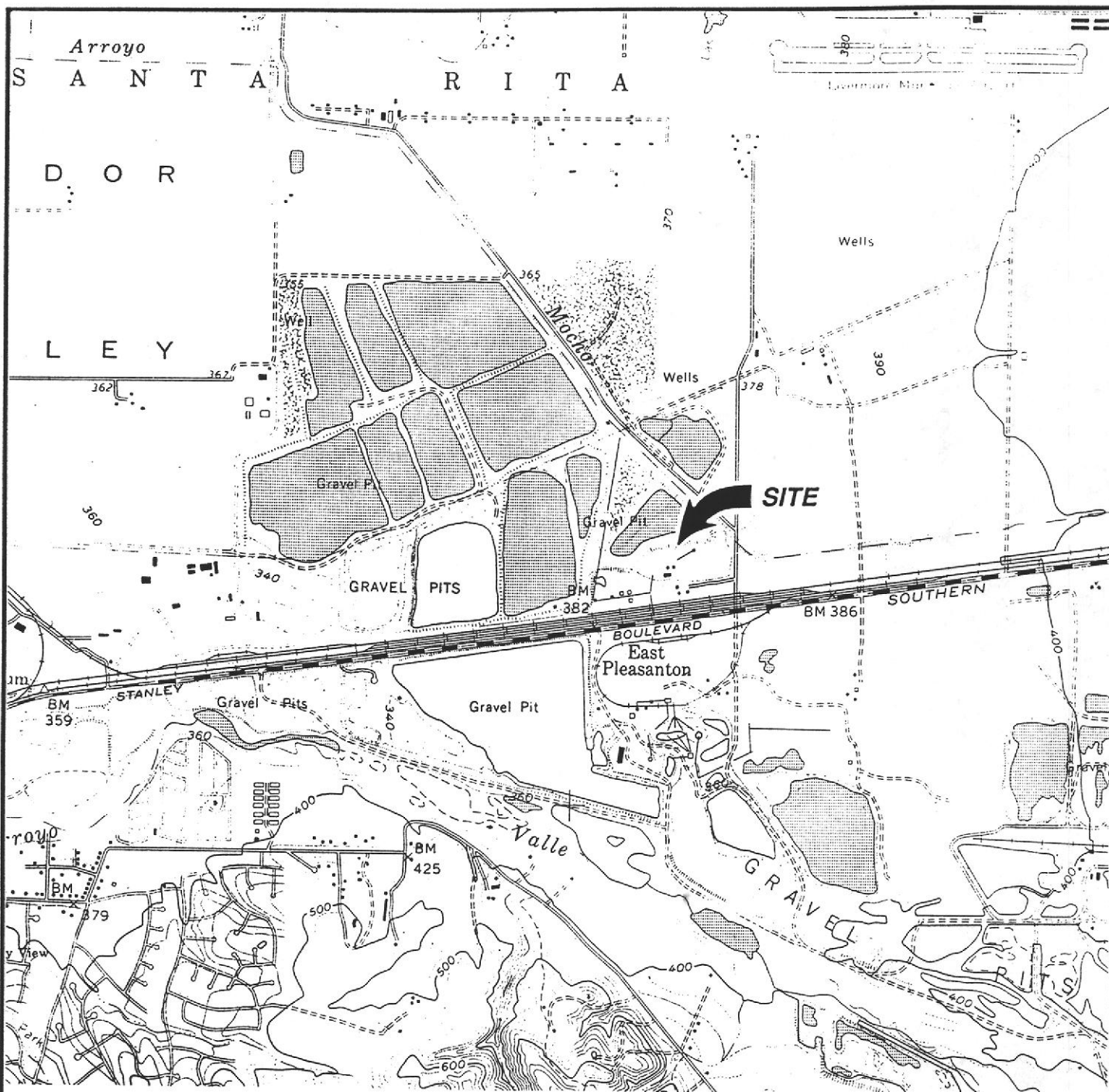
TABLE 2
ESTIMATED CHEMICAL TRANSPORT PARAMETERS
METHOD OF CHARACTERISTICS SIMULATOR
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

Parameter	Value
Dispersivity	0.1 ft. ¹
Ratio of Transverse to Longitudinal Dispersivity	10% ¹
Concentration	Variable (See Plate 4)

¹ from Walton, W.C. (1988)

TABLE 3
MODEL CALIBRATION AND VALIDATION
METHOD OF CHARACTERISTICS SIMULATION
INDUSTRIAL ASPHALT
PLEASANTON, CALIFORNIA

Calibration Results			
	Observed	Simulated	Difference
MW-4	303.57	303.3	+0.27
MW-5	297.34	297.9	-0.56
MW-8	303.92	303.4	+0.52
MW-10	304.32	304.5	-0.18
MW-15	301.99	301.3	-0.69
Validation Results			
	Observed	Simulated	Difference
MW-7	302.52	302.3	+0.22
MW-9	300.20	300.4	-0.20
MW-14	303.66	302.8	+0.86
MW-16	304.57	304.2	+0.37



SOURCE:

U.S.G.S. 7.5' Topographic Series, Livermore Quadrangle, California Quadrangles.



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KLEINFELDER

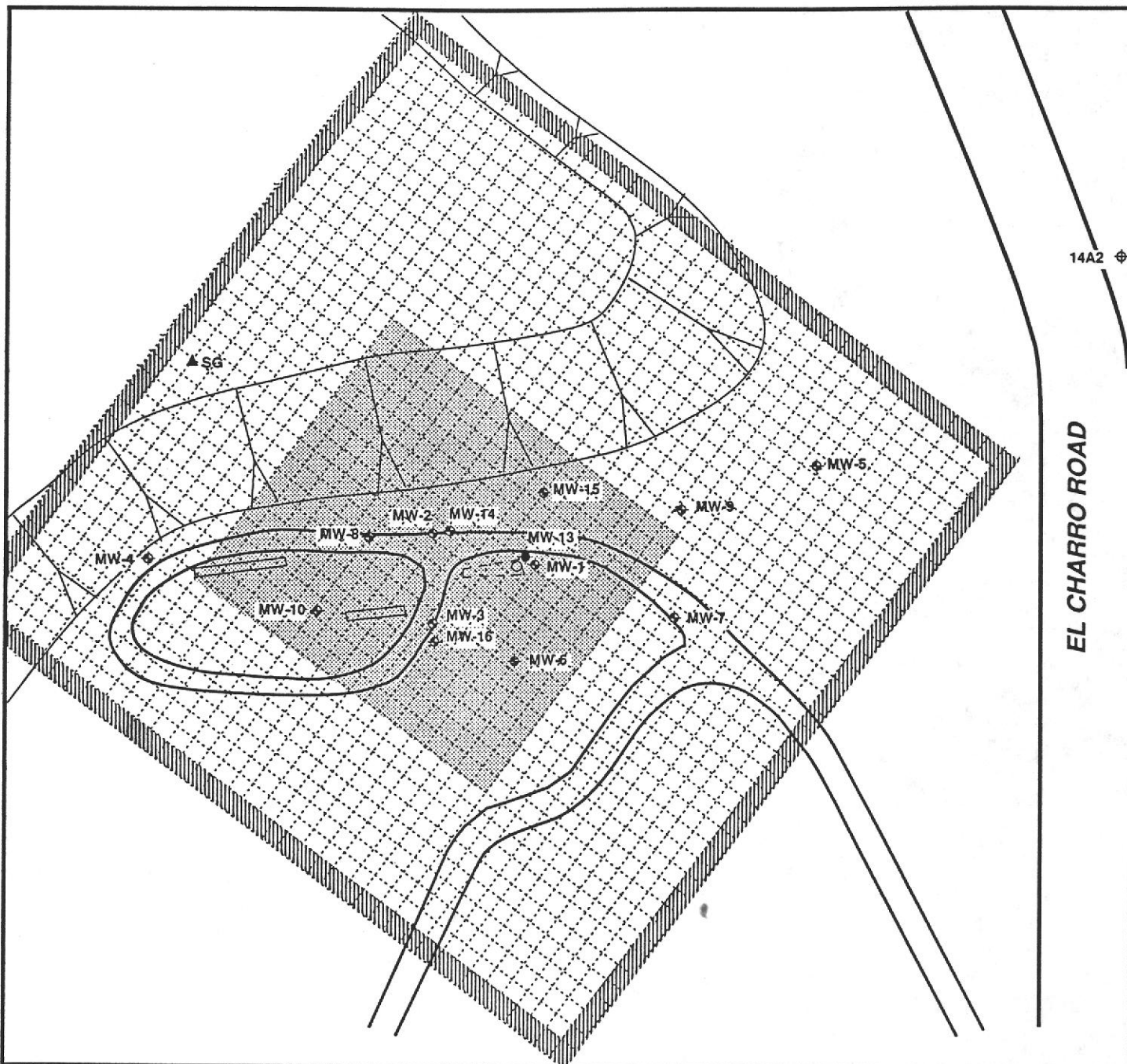
SITE LOCATION MAP

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PLATE

1

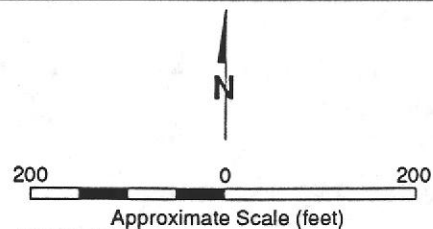
PROJECT NUMBER 10-1682-08



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE

- NO FLOW BOUNDARY
- CHEMICAL TRANSPORT SUBGRID



BASE MAP SOURCE:
Wells surveyed by Associated Professions Inc. and
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FINITE DIFFERENCE GRID CONFIGURATION WITH CHEMICAL TRANSPORT SUBGRID

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

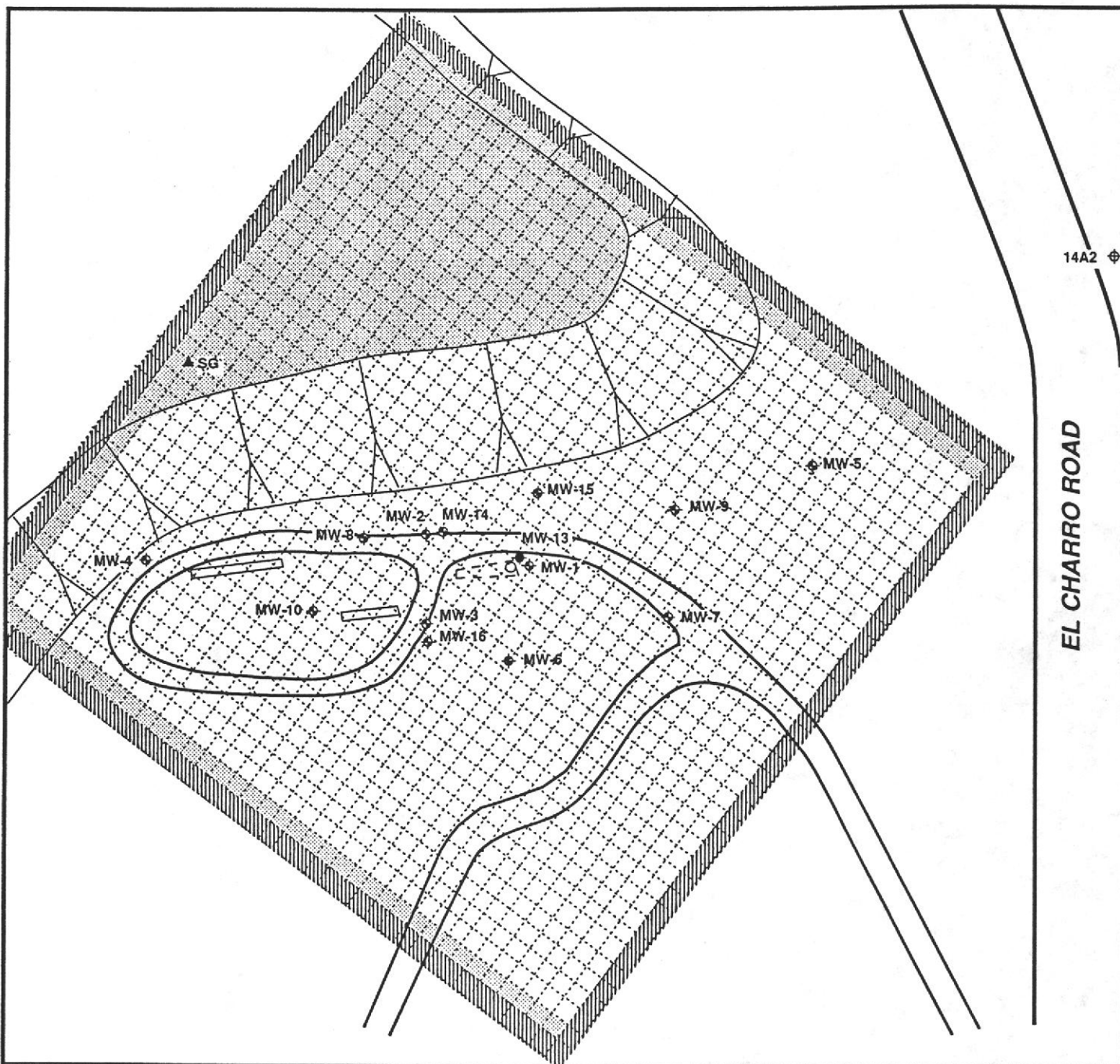
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DATE: 3-2-92

CHECKED BY: S. Russell

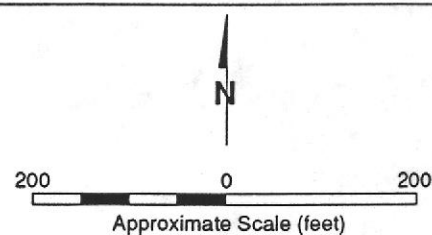
DATE: 3-4-92



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE

-  NO FLOW BOUNDARY
-  CONSTANT HEAD NODES



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CONSTANT HEAD NODES

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

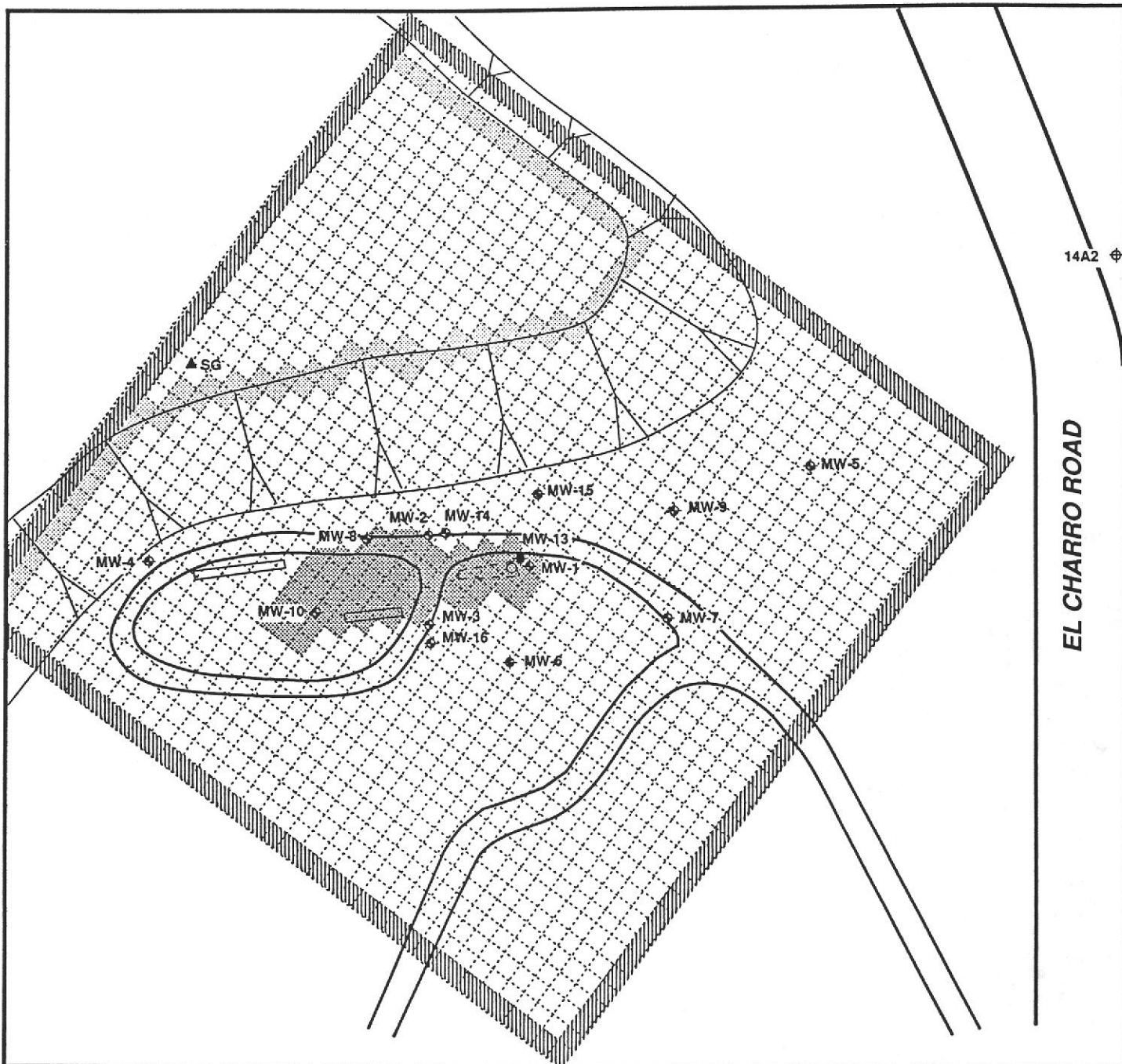
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CHECKED BY: S. Russell

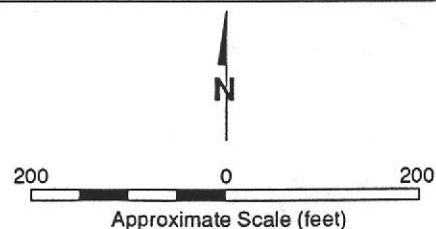
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LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE

-  NO FLOW BOUNDARY
-  (0.001 ft²/sec)
-  (0.002 ft²/sec)
-  (0.006 ft²/sec)



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TRANSMISSIVITY DISTRIBUTION

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

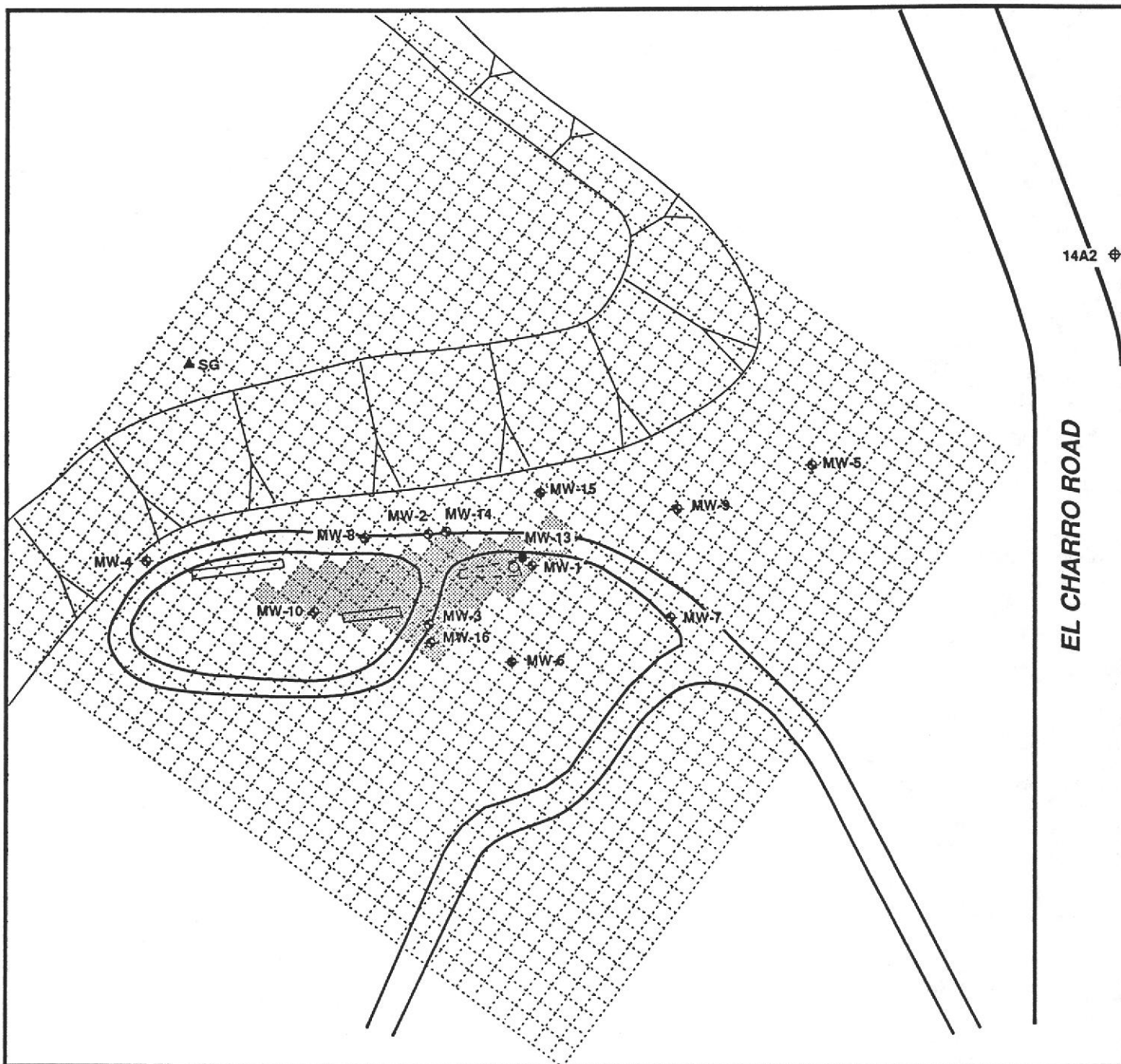
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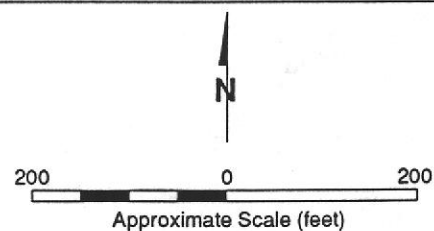
DATE: 3-4-92



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE

- 0 parts per million (ppm)
- 100 ppm



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INITIAL CHEMICAL CONSTITUENT DISTRIBUTION

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

5

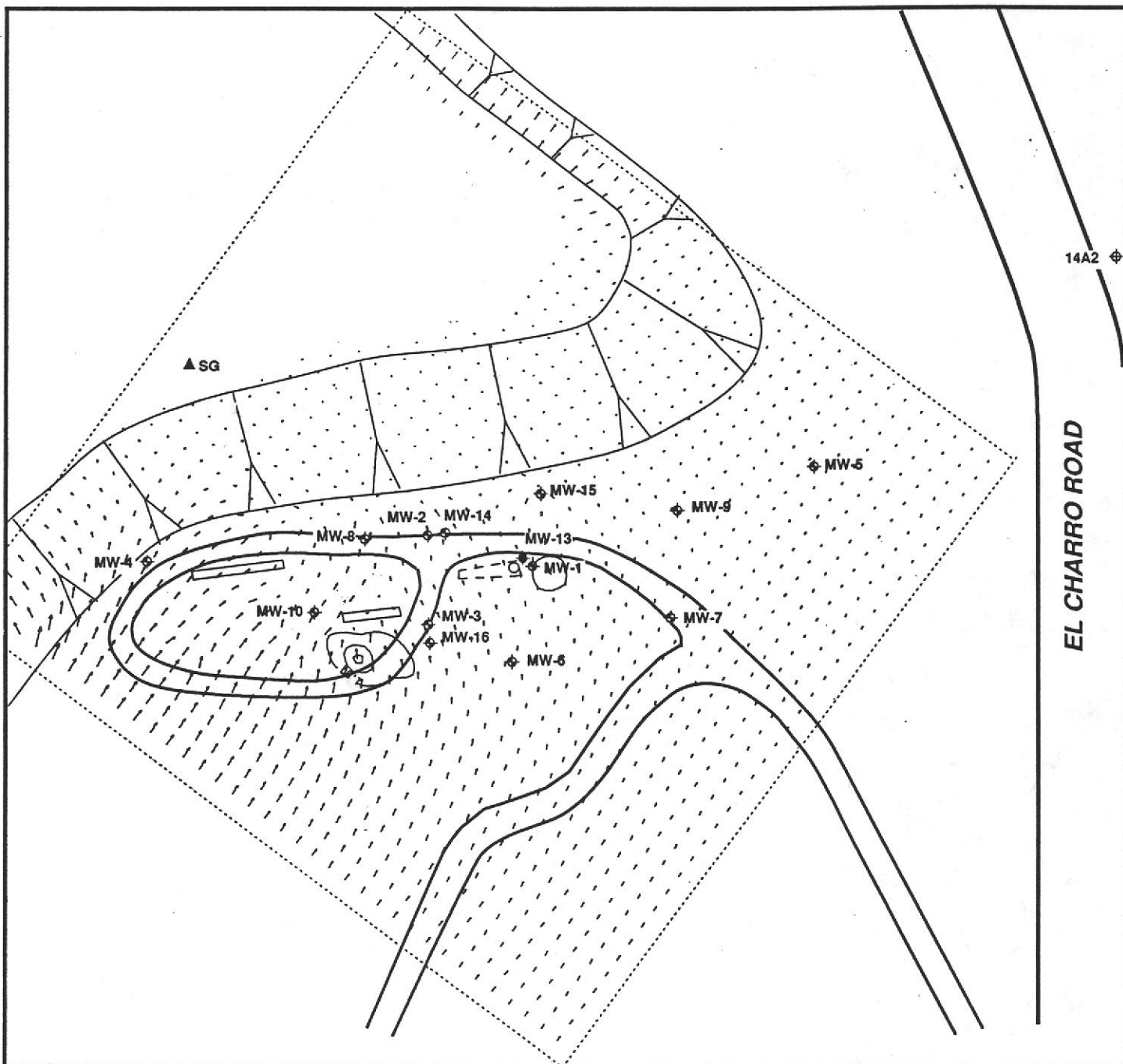
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DATE: 3-2-92

CHECKED BY: S. Russell

DATE: 3-4-92

DATE: 3-4-92



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ◆ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE
- 1.00 CONCENTRATION CONTOUR (ppm)



200 0 200

Approximate Scale (feet)

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SIMULATED CHEMICAL CONSTITUENT CAPTURE BY EXTRACTION WELLS

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

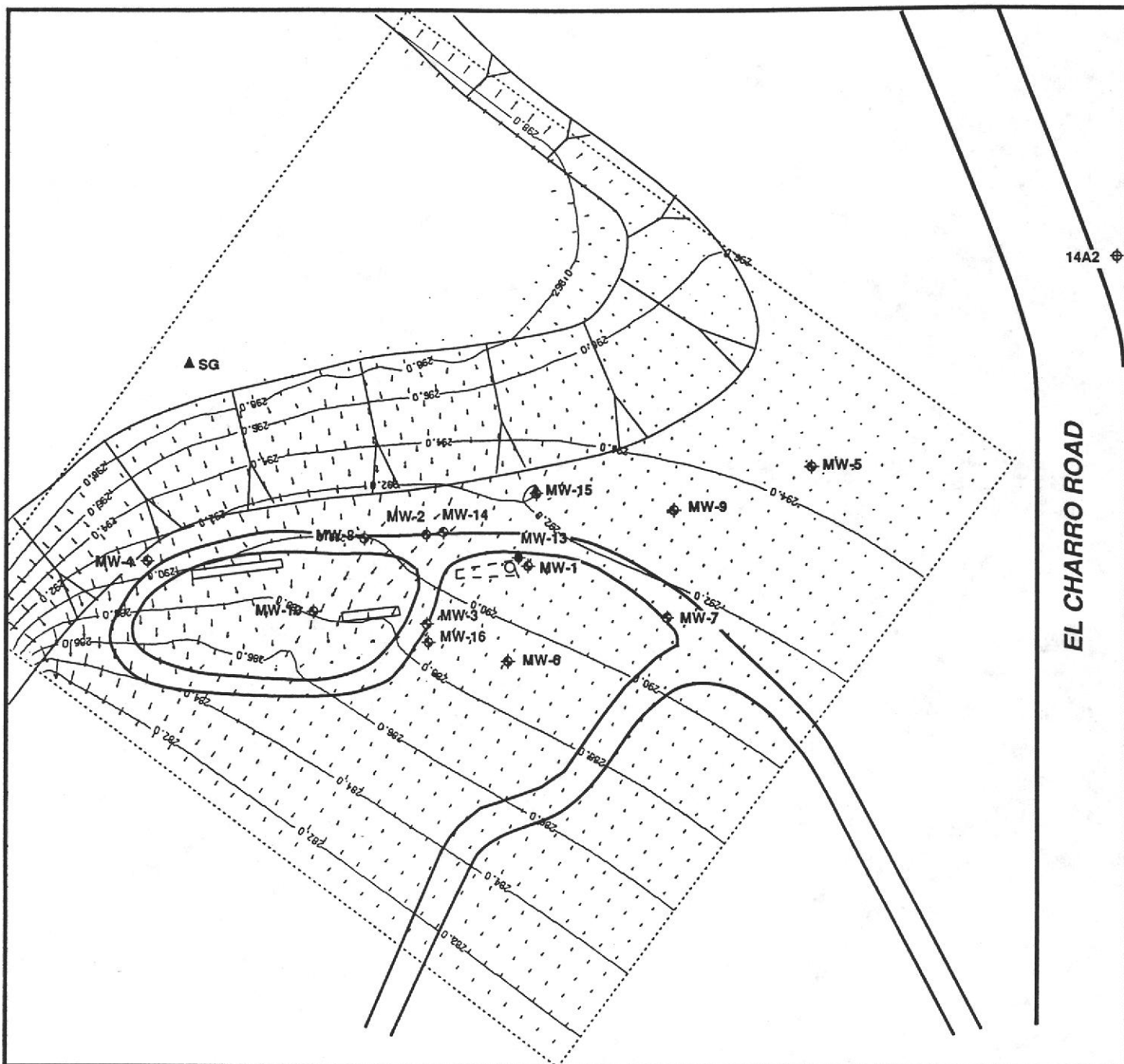
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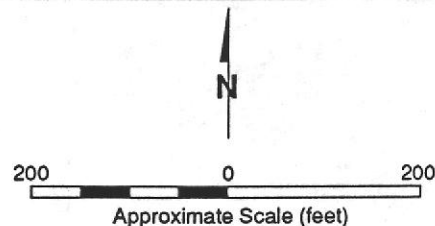
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DATE: 3-4-92



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE
- 282.0 GROUND WATER CONTOUR (feet above mean sea level)



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ESTIMATED GROUND WATER CAPTURE WITH GRADIENT REVERSED

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

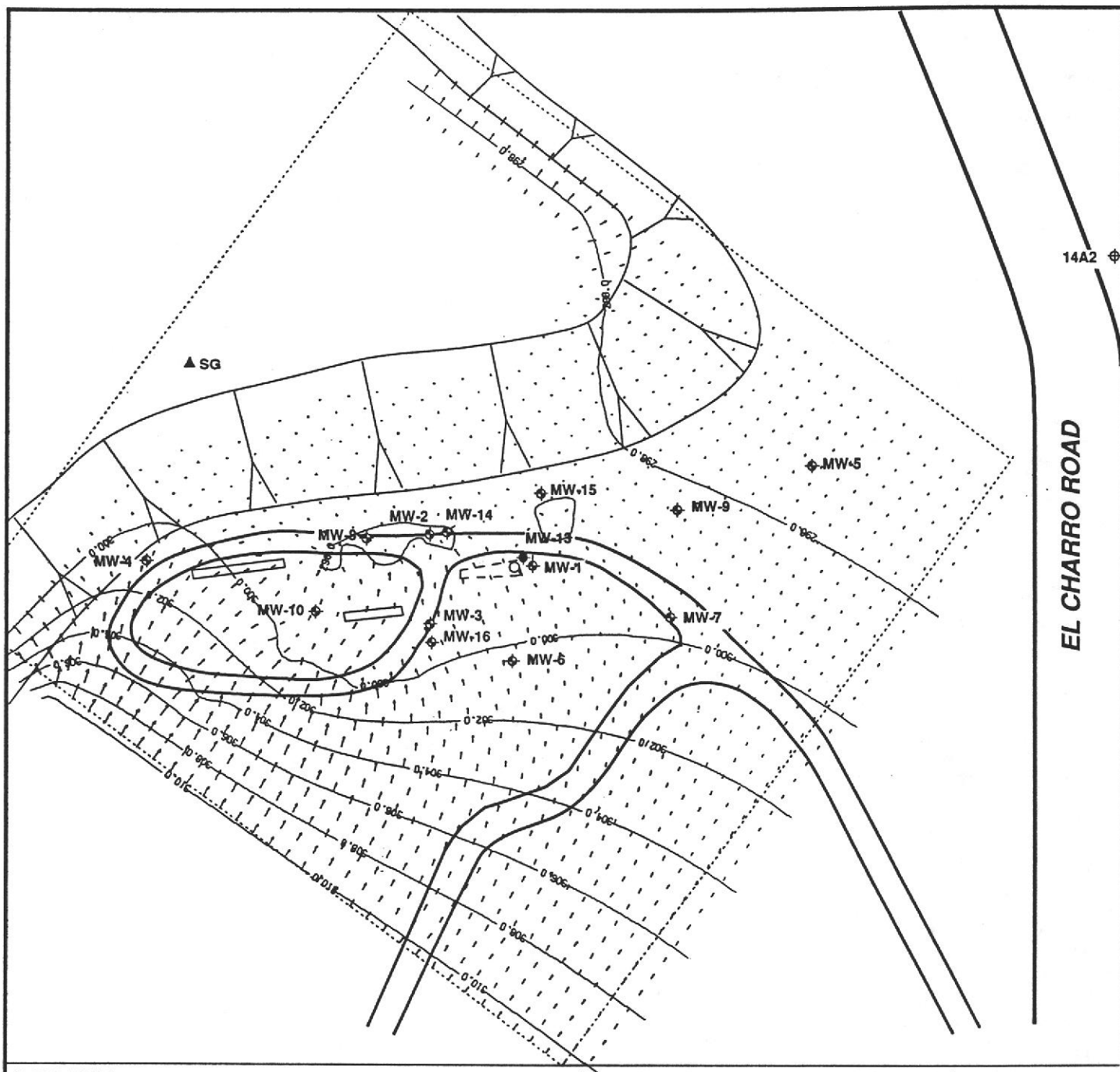
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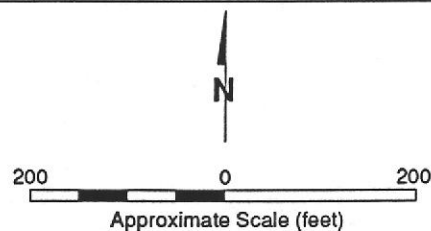
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DATE: 3-4-92



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE
- 310.0 — GROUND WATER CONTOUR (feet above mean sea level)



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SIMULATED GROUND WATER CAPTURE WITH EXTRACTION WELLS PUMPING AT 2.4 GPM

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

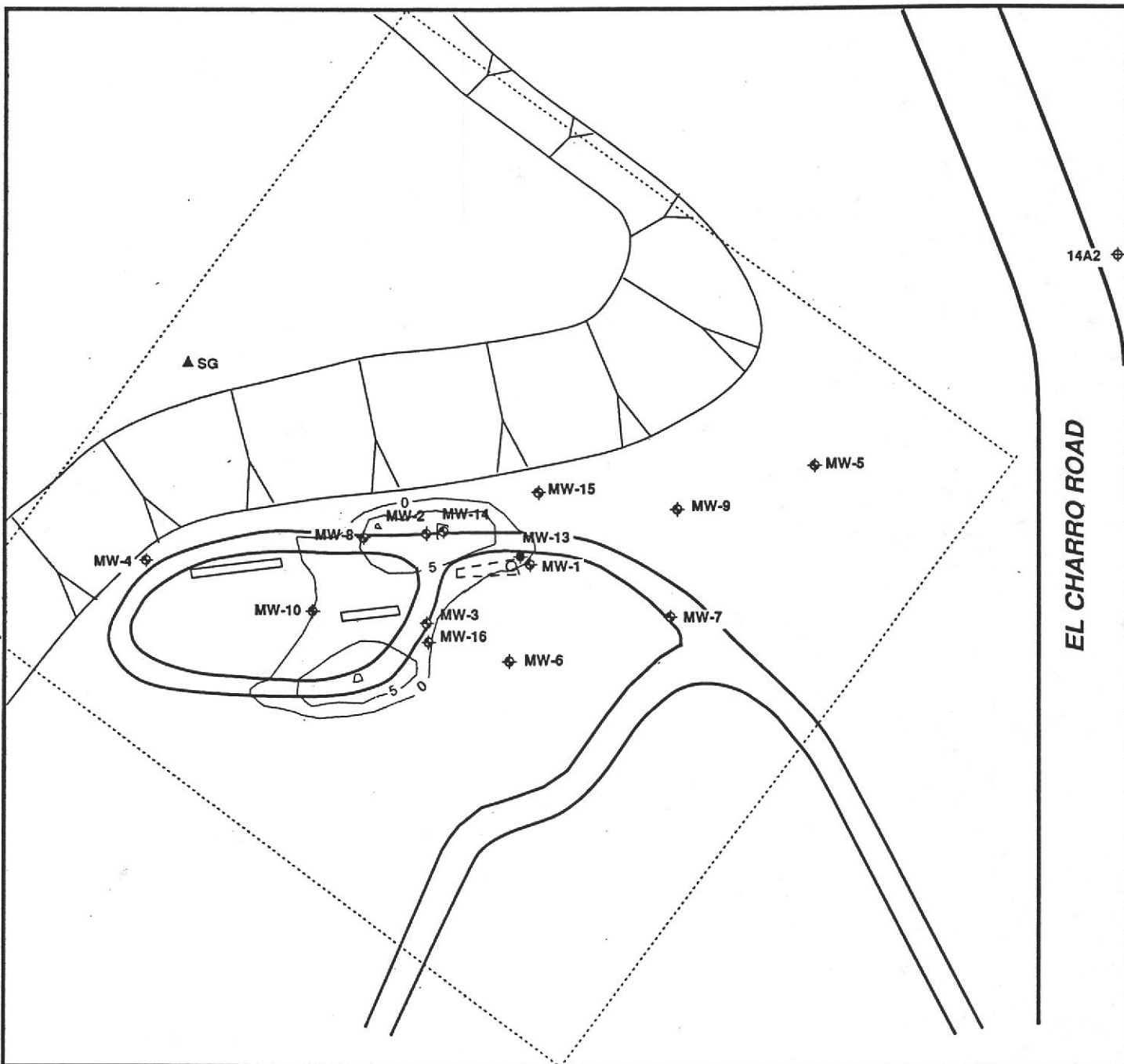
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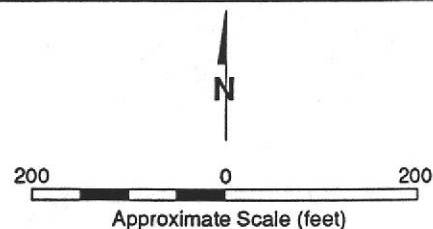
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DATE: 3-4-92



LEGEND

- ⊕ 14A2 OFFSITE WATER SUPPLY WELL
- ⊕ MW-1 MONITORING WELL
- ⊕ MW-13 EXTRACTION WELL
- ▲ SG STAFF GAGE
- 0 CONCENTRATION CONTOUR (ppm)



BASE MAP SOURCE:
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RADIUS OF INFLUENCE OF EXTRACTION WELLS
SIMULATED BY DREAM CAPTURE ZONE PROGRAM

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

PROJECT NUMBER 10-1682-08

PLATE

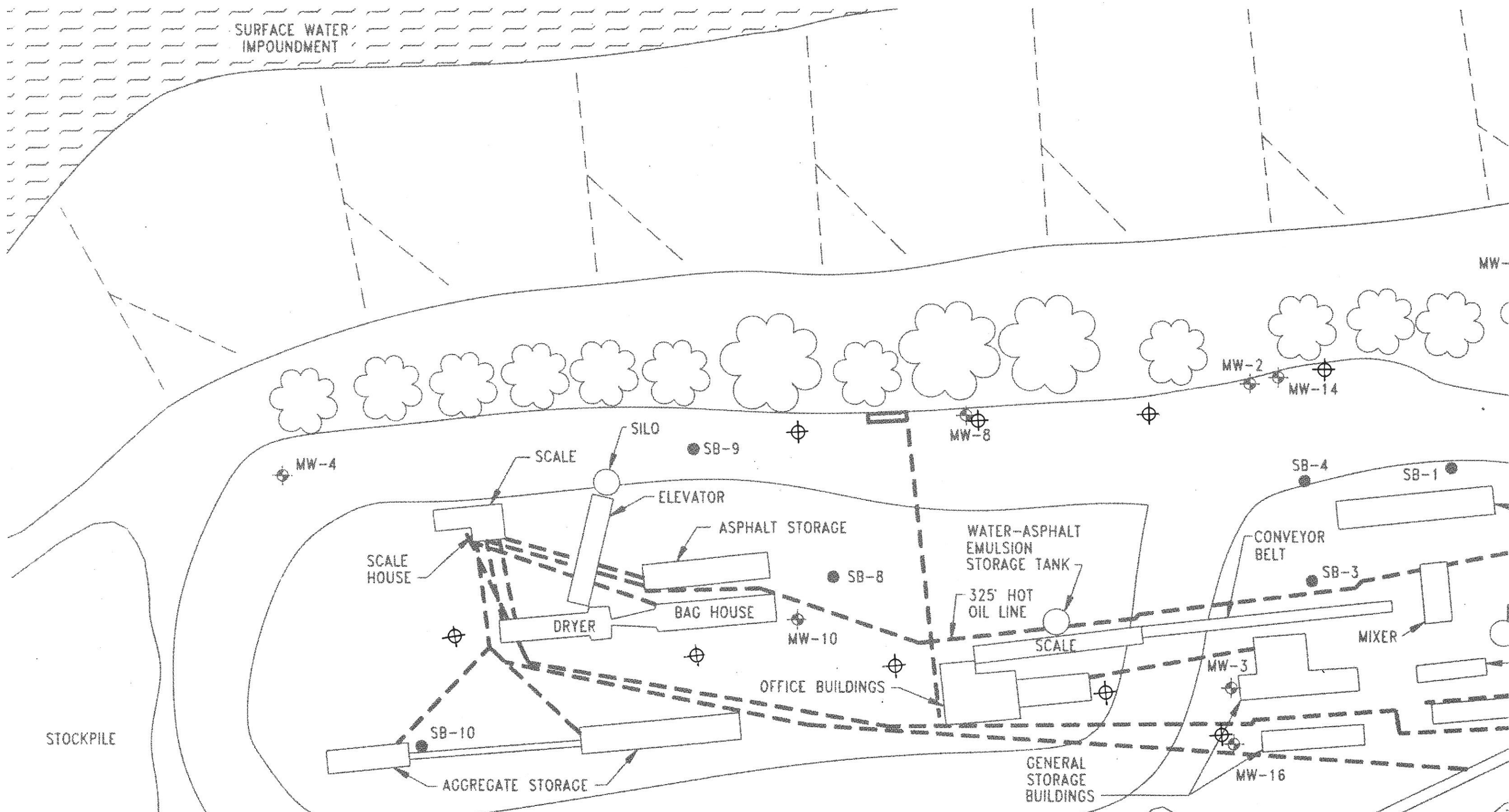
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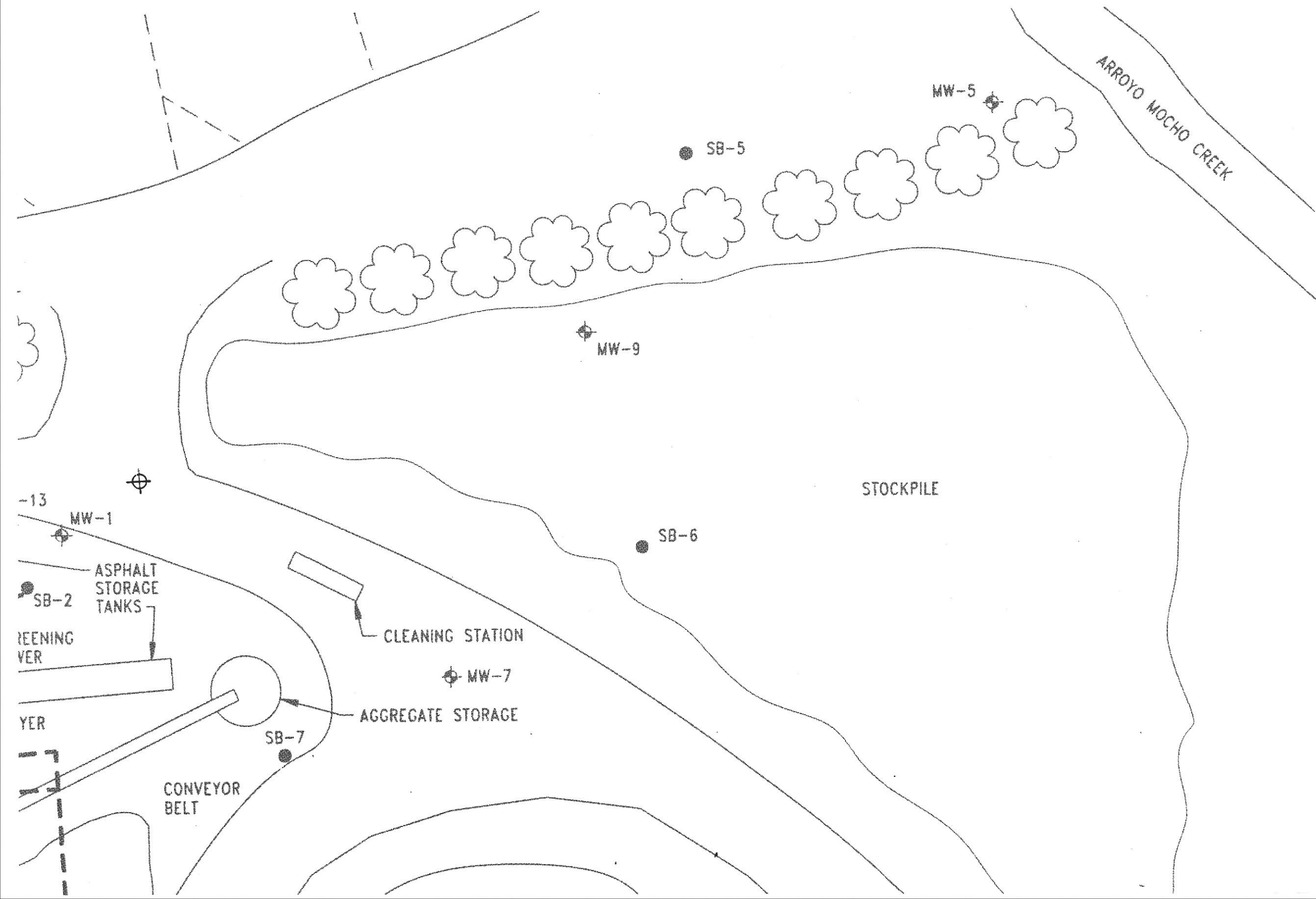
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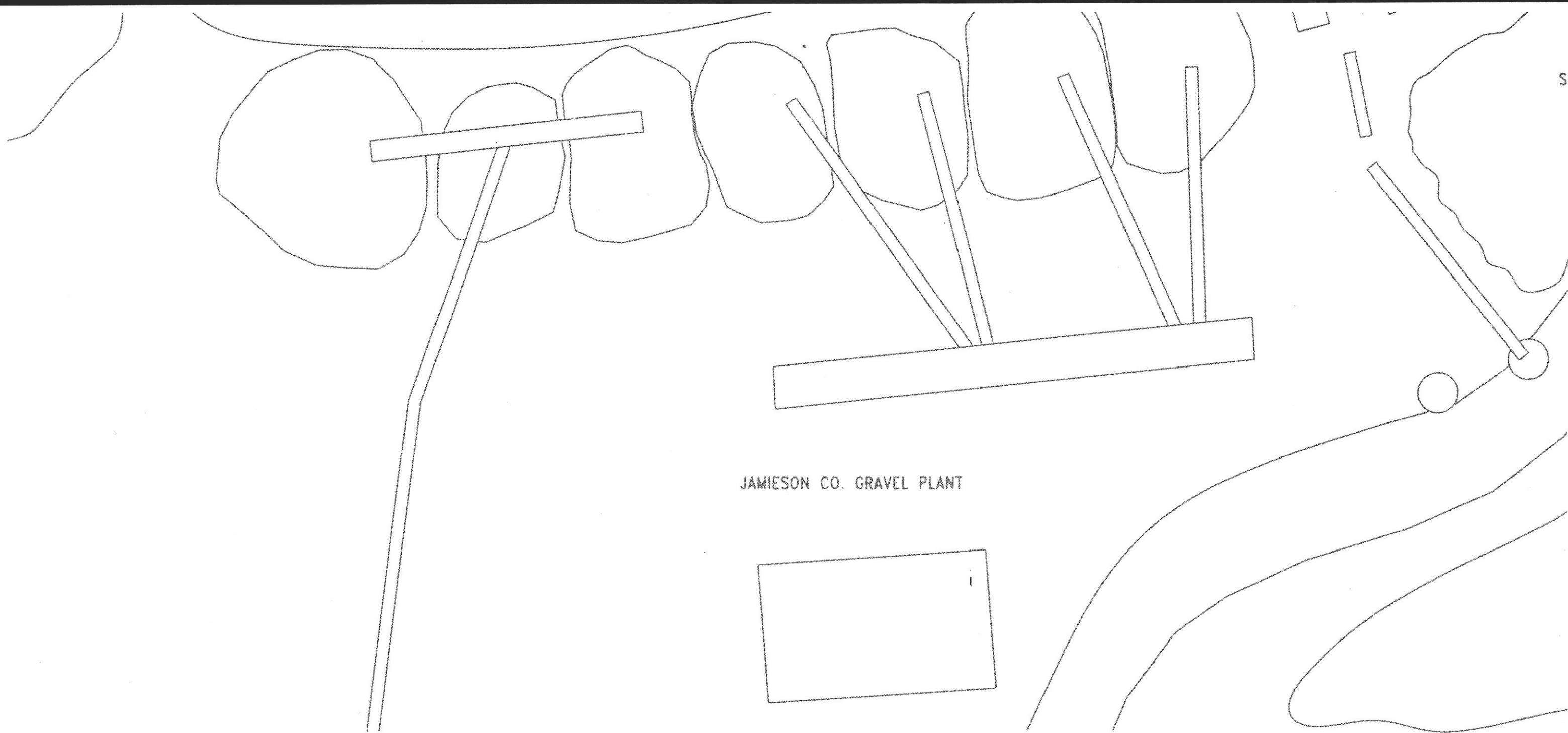
DATE: 3-2-92

CHECKED BY: S. Russell

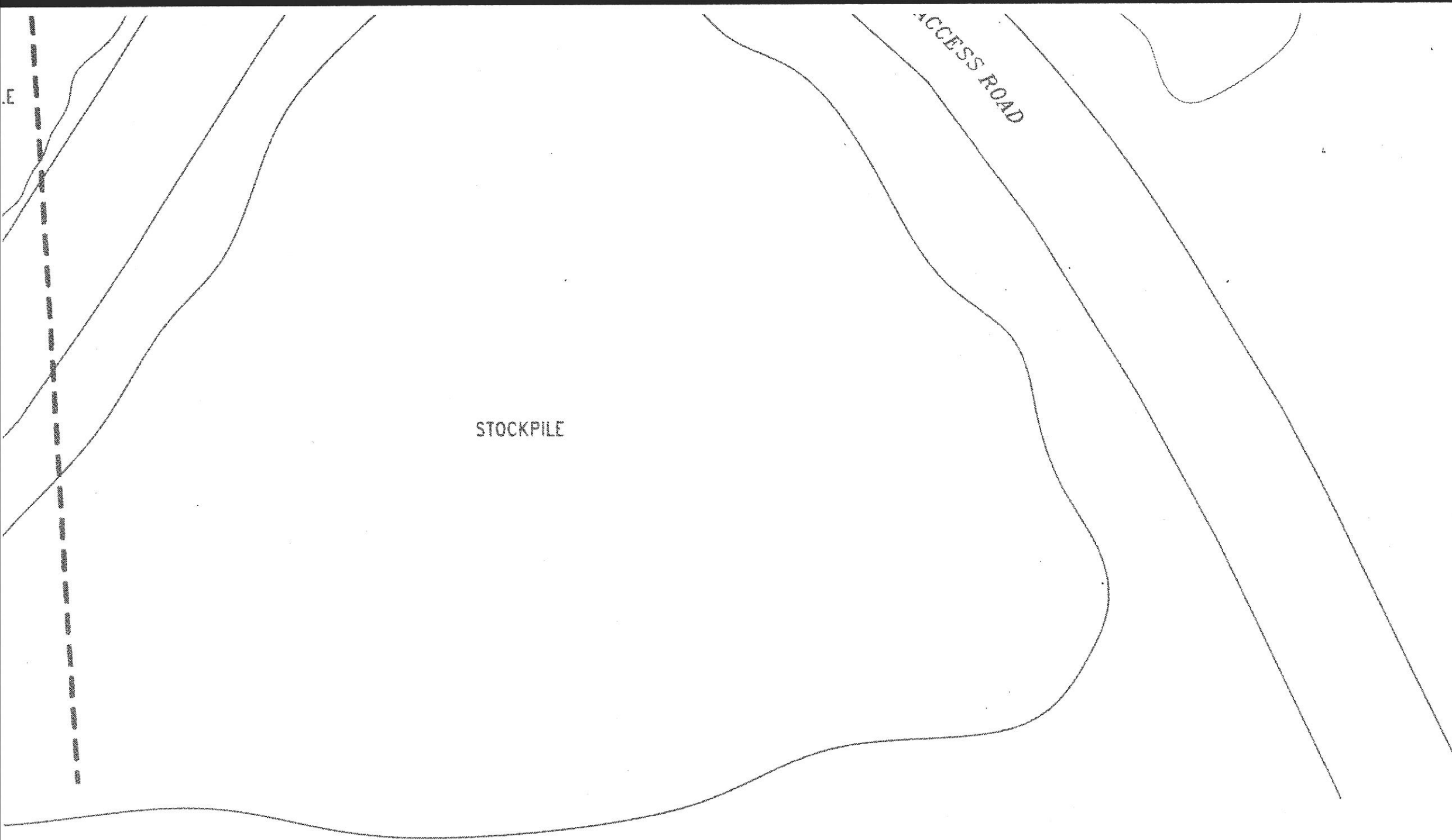
DATE: 3-4-92







JAMIESON CO. GRAVEL PLANT



LEGEND

 MW-4

MONITORING WELL

 SB-8

RI SOIL BORING



TREE



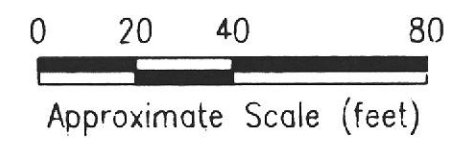
UNDERGROUND UTILITIES
(PER INDUSTRIAL ASPHALT)



ROCK STOCKPILES



PROPOSED WELL
LOCATION



BASE MAP SOURCE:
Site details from 1988 photo (No. AV 3368-27-44),
Pacific Aerial Surveys, Oakland, California.

SITE PLAN

INDUSTRIAL ASPHALT
52 EL CHARRO ROAD
PLEASANTON, CALIFORNIA

 **KLEINFELDE**

© 1992, by Kleinfelder, Inc.

WALNUT CREEK CALIFOR

DRAWN BY: K. Kinn

DESIGN BY: D. Behrens

U.S.G.S. METHOD-OF-CHARACTERISTICS MODEL FOR SOLUTE TRANSPORT IN GROUND WATER
Industrial Asphalt Remediation Strategy

INPUT DATA
GRID DESCRIPTORS

NX (NUMBER OF COLUMNS) = 40
NY (NUMBER OF ROWS) = 40
XDEL (X-DISTANCE IN FEET) = 25.0
YDEL (Y-DISTANCE IN FEET) = 25.0
SECONDARY SUBGRID FOR TRANSPORT

NMX (NUMBER OF COLUMNS) = 19
NMY (NUMBER OF ROWS) = 16

CROSS-REF. TO PRIMARY GRID IX IY

--

FIRST NODE (UPPER LEFT) AT: 13 10
LAST NODE (LOWER RIGHT) AT: 31 25
TIME PARAMETERS

NTIM (MAX. NO. OF TIME STEPS) = 1
NPMP (NO. OF PUMPING PERIODS) = 1
PINT (PUMPING PERIOD IN YEARS) = .001
TIMX (TIME INCREMENT MULTIPLIER) = .00
TINIT (INITIAL TIME STEP IN SEC.) = 0.

HYDROLOGIC AND CHEMICAL PARAMETERS

S (STORAGE COEFFICIENT) = .000000
POROS (EFFECTIVE POROSITY) = .300
BETA (LONGITUDINAL DISPERSIVITY) = .0
DLTRAT (RATIO OF TRANSVERSE TO
LONGITUDINAL DISPERSIVITY) = 1.00
ANFCTR (RATIO OF T-YY TO T-XX) = 1.000000

EXECUTION PARAMETERS

NITP (NO. OF ITERATION PARAMETERS) = 10
TOL (CONVERGENCE CRITERIA - ADIP) = .10E-01
ITMAX (MAX.NO.OF ITERATIONS - ADIP) = 100
CELDIS (MAX.CELL DISTANCE PER MOVE
OF PARTICLES - M.O.C.) = 1.000
NPMAX (MAX. NO. OF PARTICLES) = 3200
NPTPND (NO. PARTICLES PER NODE) = 16

PROGRAM OPTIONS

NPNT (TIME STEP INTERVAL FOR
COMPLETE PRINTOUT) = 1
NPNTMV (MOVE INTERVAL FOR CHEM.
CONCENTRATION PRINTOUT) = 0
NPNTVL (TIME STEP INTERVAL FOR
VELOCITY PRINTOUT; 0=NEVER;
-1=FIRST TIME STEP;
-2=LAST TIME STEP) = -2
NPNTD (PRINT OPTION-DISP.COEF.
0=NO; 1=FIRST TIME STEP;
2=ALL TIME STEPS) = 0
NUMOBS (NO. OF OBSERVATION WELLS
FOR HYDROGRAPH PRINTOUT) = 5
NREC (NO. OF PUMPING WELLS) = 10
NCODES (FOR NODE IDENT.) = 2

REACTION - NONE

STEADY-STATE FLOW

LOCATION OF OBSERVATION WELLS

NO.	X	Y
-----	---	---

1	34	9
2	25	12
3	25	16
4	19	24
5	9	34

LOCATION OF PUMPING WELLS

X	Y	RATE(IN CFS)	CONC.
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

18 21	.0000	.00
16 24	.0000	.00
21 21	.0000	.00
23 19	.0000	.00
25 17	.0000	.00
28 14	.0000	.00
21 10	.0000	.00
21 8	.0000	.00
35 6	.0000	.00
28 5	.0000	.00

AREA OF ONE CELL = 625.0

X-Y SPACING:

25,000

25.000

TRANSMISSIVITY MAP (FT*FT/SEC)

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

PERMEABILITY MAP (FT/SEC)

[illegible]

[illegible]

AREA OF AQUIFER IN MODEL = .90250E+06 SQ. FT.

TRANSPORT SUBGRID:

NO. OF FINITE-DIFFERENCE CELLS IN AQUIFER = 304

AREA OF AQUIFER IN MODEL = .19000E+06 SQ. FT.

NZCRIT (MAX. NO. OF CELLS THAT CAN BE VOID OF PARTICLES; IF EXCEEDED, PARTICLES ARE REGENERATED) = 6

NODE IDENTIFICATION MAP

[illegible]

NO. OF NODE IDENT. CODES SPECIFIED = 2

THE FOLLOWING ASSIGNMENTS HAVE BEEN MADE:

CODE NO.	LEAKANCE	SOURCE CONC.	RECHARGE
----------	----------	--------------	----------

1	.100E+01	.00
---	----------	-----

2 .100E+01 .00

VERTICAL PERMEABILITY/THICKNESS (FT/(FT*SEC))

[illegible]

[illegible]

WATER TABLE

[illegible]

.00000000 .00000000 .00000000 .00000000 .00000000 .00000000 .00000000 .00000000 .00000000 .00000000

[illegible]

[illegible]

[illegible]

0
0
0
0
0
0
0
0
0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

BETA= 1.00

10 ITERATION PARAMETERS:

.000000E+00 .841886E+00 .975000E+00 .996047E+00 .999375E+00 .000000E+00
.841886E+00 .975000E+00 .996047E+00 .999375E+00

N = 1

NUMBER OF ITERATIONS= 36

MAXIMUM HEAD CHANGE FOR EACH ITERATION:

238.57794 131.93335 175.41867 135.72711 265.85199 27.67017 41.84158 30.68044 109.31104 21.85411
3.51552 4.19034 10.52350 3.25004 5.90312 .72808 1.54033 1.44649 3.04094 1.75081
.21492 .28361 .77549 .32888 .49308 .10419 .18503 .09036 .34726 .13461
.02081 .02443 .05975 .02664 .03704 .00798

HEAD DISTRIBUTION - ROW

NUMBER OF TIME STEPS = 1

TIME(SECONDS) = 31558.

TIME(DAYS) = .36525E+00

TIME(YEARS) = .10000E-02

.0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000
.0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000
.0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000
.0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000 .0000000
.0000000 310.9999986 310.9999986 310.9999986 310.9999985 310.9999985 310.9999985 310.9999985 310.9999985 310.9999985
310.9999985 310.9999985 310.9999984 310.9999984 310.9999984 310.9999983 310.9999983 310.9999983 310.9999982 310.9999982
310.9999981 310.9999980 310.9999979 310.9999979 310.9999978 310.9999976 310.9999975 310.9999973 310.9999971 310.9999969
310.9999965 310.9999960 310.9999952 310.9999938 310.9999817 307.9999949 304.9999975 302.0000031 299.0000064 .0000000
.0000000 310.5488072 310.5482340 310.5472451 310.5457433 310.5436971 310.5410750 310.5378403 310.5339485 310.5293458
310.5239676 310.5177377 310.5105679 310.5023568 310.4929907 310.4823431 310.4702767 310.4566444 310.4412906 310.4240500
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309.8116971 309.7686429 309.7205571 309.6666353 309.6055478 309.5351269 309.4519710 309.3509844 309.2248471 309.0629925
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.0000000 309.6487240 309.6470773 309.6441997 309.6398422 309.6339119 309.6263133 309.6169321 309.6056292 309.5922370
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.0000000 301.6875397 301.6849192 301.6796982 301.6718609 301.6614079 301.6483568 301.6327492 301.6146581 301.5941919
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NUMBER OF TIME STEPS = 1

TIME(SECONDS) = 31558.

TIME(DAYS) = .36525E+00

TIME(YEARS) = .10000E-02

[illegible]

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CUMULATIVE MASS BALANCE - (IN FT**3)

RECHARGE AND INJECTION = .00000E+00
 PUMPAGE AND E-T WITHDRAWAL = .00000E+00
 CUMULATIVE NET PUMPAGE = .00000E+00
 WATER RELEASE FROM STORAGE = .00000E+00
 LEAKAGE INTO AQUIFER = .40805E+04
 LEAKAGE OUT OF AQUIFER = -.40881E+04
 CUMULATIVE NET LEAKAGE = -.75980E+01
 MASS BALANCE RESIDUAL = -7.5980
 ERROR (AS PERCENT) = -.18603

RATE MASS BALANCE - (IN C.F.S.)

LEAKAGE INTO AQUIFER = .12930E+00
 LEAKAGE OUT OF AQUIFER = -.12955E+00
 NET LEAKAGE (QNET) = -.24077E-03
 RECHARGE AND INJECTION = .00000E+00

PUMPAGE AND E-T WITHDRAWAL = .00000E+00

NET WITHDRAWAL (TPUM) = .00000E+00

X VELOCITIES

AT NODES

0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	8.151E-15	2.222E-14	3.542E-14	5.046E-14	6.639E-14	8.330E-14	1.014E-13	1.208E-13	1.420E-13	
1.651E-13	1.906E-13	2.188E-13	2.500E-13	2.846E-13	3.230E-13	3.655E-13	4.122E-13	4.636E-13	5.198E-13	
5.819E-13	6.516E-13	7.325E-13	8.310E-13	9.572E-13	1.126E-12	1.359E-12	1.689E-12	2.164E-12	2.870E-12	
3.977E-12	5.858E-12	9.442E-12	6.000E-11	1.333E-05	2.667E-05	2.667E-05	2.222E-05	8.889E-06	0.000E+00	
0.000E+00	2.547E-09	6.943E-09	1.107E-08	1.577E-08	2.075E-08	2.603E-08	3.167E-08	3.775E-08	4.436E-08	
5.159E-08	5.955E-08	6.836E-08	7.812E-08	8.895E-08	1.010E-07	1.142E-07	1.288E-07	1.449E-07	1.624E-07	
1.818E-07	2.036E-07	2.289E-07	2.597E-07	2.991E-07	3.519E-07	4.248E-07	5.278E-07	6.762E-07	8.970E-07	
1.243E-06	1.831E-06	2.951E-06	5.418E-06	1.183E-05	1.805E-05	1.978E-05	1.876E-05	8.777E-06	0.000E+00	
0.000E+00	5.039E-09	1.375E-08	2.191E-08	3.116E-08	4.097E-08	5.140E-08	6.256E-08	7.461E-08	8.772E-08	
1.021E-07	1.180E-07	1.356E-07	1.551E-07	1.768E-07	2.009E-07	2.275E-07	2.569E-07	2.891E-07	3.243E-07	
3.626E-07	4.051E-07	4.534E-07	5.112E-07	5.845E-07	6.826E-07	8.184E-07	1.009E-06	1.280E-06	1.669E-06	
2.244E-06	3.129E-06	4.553E-06	6.894E-06	1.051E-05	1.393E-05	1.563E-05	1.589E-05	7.860E-06	0.000E+00	
0.000E+00	7.319E-09	2.011E-08	3.216E-08	4.572E-08	6.013E-08	7.547E-08	9.193E-08	1.098E-07	1.292E-07	
1.506E-07	1.743E-07	2.006E-07	2.300E-07	2.627E-07	2.991E-07	3.394E-07	3.840E-07	4.327E-07	4.854E-07	
5.420E-07	6.027E-07	6.692E-07	7.461E-07	8.426E-07	9.729E-07	1.156E-06	1.411E-06	1.766E-06	2.254E-06	
2.934E-06	3.889E-06	5.239E-06	7.092E-06	9.390E-06	1.153E-05	1.291E-05	1.352E-05	6.830E-06	0.000E+00	
0.000E+00	9.303E-09	2.584E-08	4.161E-08	5.919E-08	7.787E-08	9.782E-08	1.193E-07	1.427E-07	1.683E-07	
1.965E-07	2.279E-07	2.629E-07	3.021E-07	3.459E-07	3.949E-07	4.494E-07	5.097E-07	5.754E-07	6.459E-07	
7.197E-07	7.955E-07	8.732E-07	9.579E-07	1.063E-06	1.209E-06	1.419E-06	1.715E-06	2.117E-06	2.650E-06	
3.347E-06	4.256E-06	5.420E-06	6.845E-06	8.428E-06	9.889E-06	1.096E-05	1.158E-05	5.891E-06	0.000E+00	
0.000E+00	1.096E-08	3.088E-08	5.016E-08	7.142E-08	9.404E-08	1.183E-07	1.444E-07	1.730E-07	2.045E-07	
2.393E-07	2.782E-07	3.218E-07	3.707E-07	4.257E-07	4.875E-07	5.565E-07	6.331E-07	7.166E-07	8.055E-07	
8.965E-07	9.848E-07	1.066E-06	1.144E-06	1.237E-06	1.380E-06	1.599E-06	1.915E-06	2.339E-06	2.880E-06	
3.550E-06	4.367E-06	5.338E-06	6.440E-06	7.589E-06	8.640E-06	9.458E-06	9.986E-06	5.088E-06	0.000E+00	
0.000E+00	1.228E-08	3.521E-08	5.779E-08	8.237E-08	1.086E-07	1.367E-07	1.672E-07	2.006E-07	2.375E-07	
2.787E-07	3.247E-07	3.765E-07	4.350E-07	5.010E-07	5.755E-07	6.592E-07	7.525E-07	8.549E-07	9.640E-07	
1.075E-06	1.176E-06	1.256E-06	1.308E-06	1.363E-06	1.476E-06	1.685E-06	2.010E-06	2.446E-06	2.980E-06	
3.605E-06	4.322E-06	5.125E-06	5.986E-06	6.847E-06	7.626E-06	8.247E-06	8.668E-06	4.412E-06	0.000E+00	
0.000E+00	1.330E-08	3.887E-08	6.450E-08	9.204E-08	1.214E-07	1.530E-07	1.874E-07	2.252E-07	2.672E-07	
3.141E-07	3.669E-07	4.264E-07	4.939E-07	5.704E-07	6.570E-07	7.549E-07	8.649E-07	9.869E-07	1.119E-06	
1.256E-06	1.383E-06	1.467E-06	1.465E-06	1.433E-06	1.480E-06	1.657E-06	1.993E-06	2.458E-06	2.988E-06	
3.567E-06	4.192E-06	4.853E-06	5.531E-06	6.186E-06	6.770E-06	7.239E-06	7.561E-06	3.841E-06	0.000E+00	
0.000E+00	1.406E-08	4.191E-08	7.031E-08	1.004E-07	1.325E-07	1.672E-07	2.050E-07	2.468E-07	2.932E-07	
3.453E-07	4.040E-07	4.706E-07	5.461E-07	6.319E-07	7.295E-07	8.401E-07	9.652E-07	1.106E-06	1.265E-06	
1.442E-06	1.624E-06	1.759E-06	1.654E-06	1.427E-06	1.360E-06	1.473E-06	1.850E-06	2.403E-06	2.948E-06	
3.483E-06	4.022E-06	4.565E-06	5.097E-06	5.596E-06	6.032E-06	6.378E-06	6.614E-06	3.352E-06	0.000E+00	
0.000E+00	1.463E-08	4.439E-08	7.523E-08	1.075E-07	1.420E-07	1.792E-07	2.200E-07	2.650E-07	3.153E-07	
3.717E-07	4.355E-07	5.079E-07	5.902E-07	6.837E-07	7.899E-07	9.104E-07	1.047E-06	1.204E-06	1.387E-06	
1.613E-06	1.908E-06	2.290E-06	1.972E-06	1.267E-06	1.062E-06	1.024E-06	1.532E-06	2.356E-06	2.916E-06	
3.395E-06	3.848E-06	4.285E-06	4.697E-06	5.070E-06	5.386E-06	5.628E-06	5.785E-06	2.921E-06	0.000E+00	
0.000E+00	1.505E-08	4.639E-08	7.927E-08	1.134E-07	1.497E-07	1.890E-07	2.321E-07	2.798E-07	3.331E-07	
3.930E-07	4.607E-07	5.374E-07	6.246E-07	7.234E-07	8.354E-07	9.620E-07	1.105E-06	1.268E-06	1.460E-06	
1.707E-06	2.102E-06	2.963E-06	3.175E-06	2.491E-06	2.255E-06	2.034E-06	2.065E-06	2.573E-06	2.965E-06	
3.332E-06	3.687E-06	4.027E-06	4.337E-06	4.604E-06	4.814E-06	4.966E-06	5.039E-06	2.526E-06	0.000E+00	
0.000E+00	1.536E-08	4.793E-08	8.241E-08	1.179E-07	1.557E-07	1.965E-07	2.413E-07	2.909E-07	3.462E-07	
4.084E-07	4.786E-07	5.580E-07	6.479E-07	7.495E-07	8.641E-07	9.928E-07	1.137E-06	1.297E-06	1.471E-06	
1.652E-06	1.831E-06	2.037E-06	1.967E-06	1.390E-06	1.777E-06	3.000E-06	3.163E-06	2.905E-06	3.037E-06	
3.277E-06	3.540E-06	3.796E-06	4.022E-06	4.197E-06	4.306E-06	4.382E-06	4.349E-06	2.138E-06	0.000E+00	
0.000E+00	1.558E-08	4.904E-08	8.465E-08	1.211E-07	1.598E-07	2.016E-07	2.474E-07	2.981E-07	3.545E-07	
4.177E-07	4.888E-07	5.689E-07	6.591E-07	7.606E-07	8.748E-07	1.003E-06	1.146E-06	1.305E-06	1.470E-06	
1.599E-06	1.540E-06	1.356E-06	1.237E-06	9.580E-07	1.092E-06	2.057E-06	2.714E-06	2.843E-06	3.000E-06	
3.193E-06	3.399E-06	3.596E-06	3.760E-06	3.860E-06	3.837E-06	3.457E-06	2.676E-06	1.112E-06	0.000E+00	
0.000E+00	1.573E-08	4.971E-08	8.595E-08	1.228E-07	1.620E-07	2.042E-07	2.504E-07	3.011E-07	3.575E-07	

0.000E+00 3.783E-09 1.035E-08 1.578E-08 2.034E-08 2.314E-08 2.362E-08 2.131E-08 1.579E-08 6.715E-09
 -6.203E-09 -2.320E-08 -4.442E-08 -6.987E-08 -9.927E-08 -1.317E-07 -1.655E-07 -1.972E-07 -2.209E-07 -2.266E-07
 -1.979E-07 -1.115E-07 5.393E-08 4.994E-07 4.202E-07 1.705E-12 8.590E-18 0.000E+00 0.000E+00 0.000E+00
 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 0.000E+00 2.747E-09 7.413E-09 1.097E-08 1.346E-08 1.406E-08 1.224E-08 7.531E-09 -4.957E-10 -1.227E-08
 -2.825E-08 -4.900E-08 -7.520E-08 -1.077E-07 -1.472E-07 -1.947E-07 -2.505E-07 -3.138E-07 -3.814E-07 -4.446E-07
 -4.845E-07 -4.612E-07 -2.858E-07 -7.231E-08 5.556E-13 4.716E-18 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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 0.000E+00 1.827E-09 4.850E-09 6.846E-09 7.629E-09 6.511E-09 3.004E-09 -3.330E-09 -1.293E-08 -2.632E-08
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 -8.361E-07 -9.671E-07 -1.038E-06 -5.264E-07 -1.126E-12 -3.790E-18 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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 0.000E+00 1.064E-09 2.751E-09 3.530E-09 3.061E-09 7.995E-10 -3.671E-09 -1.074E-08 -2.087E-08 -3.462E-08
 -5.284E-08 -7.673E-08 -1.081E-07 -1.494E-07 -2.043E-07 -2.779E-07 -3.771E-07 -5.108E-07 -6.893E-07 -9.221E-07
 -1.211E-06 -1.538E-06 -1.843E-06 -9.894E-07 -2.114E-12 -6.821E-18 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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 -1.766E-06 -2.672E-06 -3.910E-06 -2.302E-06 -4.913E-12 -1.566E-17 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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 -1.672E-06 -2.878E-06 -5.359E-06 -3.524E-06 -1.272E-11 -3.217E-17 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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 -1.021E-06 -1.807E-06 -3.327E-06 -6.594E-06 -4.428E-06 -7.085E-12 -1.124E-17 0.000E+00 0.000E+00 0.000E+00
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 -3.267E-12 -5.784E-12 -1.065E-11 -1.396E-11 -7.033E-12 -5.280E-17 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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Y VELOCITIES

AT NODES

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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 2.116E-06 2.143E-06 2.175E-06 2.212E-06 2.253E-06 2.301E-06 2.354E-06 2.415E-06 2.483E-06 2.560E-06
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 4.886E-06 5.614E-06 6.716E-06 8.564E-06 1.213E-05 7.059E-06 3.518E-06 1.680E-07 1.794E-13 0.000E+00
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 9.558E-06 1.085E-05 1.269E-05 1.541E-05 1.958E-05 1.258E-05 6.844E-06 1.543E-06 1.646E-12 0.000E+00
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 9.001E-06 9.938E-06 1.106E-05 1.223E-05 1.273E-05 9.788E-06 6.213E-06 2.921E-06 3.116E-12 0.000E+00
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7.470E-06	7.765E-06	7.948E-06	7.865E-06	7.295E-06	6.063E-06	4.406E-06	2.612E-06	2.786E-12	0.000E+00
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4.995E-06	5.187E-06	5.394E-06	5.588E-06	5.715E-06	5.783E-06	5.816E-06	5.841E-06	5.893E-06	5.959E-06
6.002E-06	5.976E-06	5.827E-06	5.492E-06	4.918E-06	4.089E-06	3.048E-06	1.870E-06	1.994E-12	0.000E+00
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4.719E-06	4.925E-06	5.243E-06	5.748E-06	5.750E-06	5.583E-06	5.332E-06	4.950E-06	4.870E-06	4.849E-06
4.798E-06	4.677E-06	4.455E-06	4.108E-06	3.621E-06	2.992E-06	2.236E-06	1.381E-06	1.473E-12	0.000E+00
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3.919E-06	3.945E-06	3.975E-06	4.012E-06	4.054E-06	4.103E-06	4.160E-06	4.225E-06	4.300E-06	4.387E-06
4.494E-06	4.652E-06	4.972E-06	6.419E-06	6.000E-06	5.603E-06	5.236E-06	4.163E-06	4.284E-06	4.333E-06
4.301E-06	4.182E-06	3.966E-06	3.644E-06	3.206E-06	2.651E-06	1.988E-06	1.239E-06	1.320E-12	0.000E+00
0.000E+00	3.792E-06	3.793E-06	3.796E-06	3.800E-06	3.806E-06	3.814E-06	3.824E-06	3.835E-06	3.850E-06
3.866E-06	3.886E-06	3.909E-06	3.936E-06	3.967E-06	4.002E-06	4.041E-06	4.085E-06	4.131E-06	4.178E-06
4.214E-06	4.217E-06	4.138E-06	7.341E-06	6.457E-06	5.585E-06	5.514E-06	3.351E-06	3.769E-06	3.900E-06
3.890E-06	3.781E-06	3.582E-06	3.293E-06	2.907E-06	2.419E-06	1.828E-06	1.173E-06	1.251E-12	0.000E+00
0.000E+00	3.761E-06	3.761E-06	3.764E-06	3.767E-06	3.771E-06	3.777E-06	3.784E-06	3.792E-06	3.802E-06
3.814E-06	3.827E-06	3.842E-06	3.858E-06	3.876E-06	3.896E-06	3.916E-06	3.936E-06	3.957E-06	3.973E-06
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3.575E-06	3.466E-06	3.287E-06	3.036E-06	2.710E-06	2.292E-06	1.733E-06	1.238E-06	2.265E-12	0.000E+00
0.000E+00	3.730E-06	3.731E-06	3.732E-06	3.734E-06	3.737E-06	3.741E-06	3.745E-06	3.750E-06	3.755E-06
3.761E-06	3.767E-06	3.773E-06	3.778E-06	3.782E-06	3.785E-06	3.785E-06	3.784E-06	3.783E-06	3.790E-06
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3.333E-06	3.218E-06	3.059E-06	2.855E-06	2.607E-06	2.312E-06	2.031E-06	1.768E-06	4.017E-12	0.000E+00
0.000E+00	3.701E-06	3.701E-06	3.702E-06	3.703E-06	3.704E-06	3.705E-06	3.707E-06	3.708E-06	3.709E-06
3.709E-06	3.707E-06	3.704E-06	3.697E-06	3.687E-06	3.672E-06	3.652E-06	3.627E-06	3.600E-06	3.585E-06
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3.128E-06	3.011E-06	2.874E-06	2.723E-06	2.558E-06	2.323E-06	2.006E-06	1.112E-06	2.371E-12	0.000E+00
0.000E+00	3.673E-06	3.673E-06	3.673E-06	3.672E-06	3.672E-06	3.671E-06	3.670E-06	3.667E-06	3.663E-06
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3.147E-06	5.569E-06	4.947E-06	6.605E-06	6.875E-06	2.817E-06	3.138E-06	3.178E-06	3.129E-06	3.046E-06
2.941E-06	2.824E-06	2.706E-06	2.612E-06	2.586E-06	2.674E-06	1.899E-06	5.969E-12	3.057E-17	0.000E+00
0.000E+00	3.645E-06	3.645E-06	3.644E-06	3.643E-06	3.641E-06	3.638E-06	3.633E-06	3.627E-06	3.618E-06
3.606E-06	3.590E-06	3.568E-06	3.539E-06	3.501E-06	3.453E-06	3.396E-06	3.328E-06	3.243E-06	3.104E-06
2.733E-06	6.561E-06	6.300E-06	4.852E-06	5.518E-06	3.044E-06	3.085E-06	3.058E-06	2.986E-06	2.885E-06
2.768E-06	2.643E-06	2.525E-06	2.442E-06	2.508E-06	3.271E-06	1.076E-06	2.295E-12	7.326E-18	0.000E+00
0.000E+00	3.618E-06	3.618E-06	3.616E-06	3.614E-06	3.610E-06	3.605E-06	3.598E-06	3.588E-06	3.575E-06
3.558E-06	3.535E-06	3.505E-06	3.466E-06	3.416E-06	3.355E-06	3.282E-06	3.203E-06	3.139E-06	3.132E-06
2.768E-06	6.996E-06	7.024E-06	3.455E-06	4.112E-06	3.282E-06	3.089E-06	2.974E-06	2.864E-06	2.742E-06
2.608E-06	2.466E-06	2.319E-06	2.135E-06	1.983E-06	1.736E-06	4.499E-12	2.653E-17	0.000E+00	0.000E+00
0.000E+00	3.592E-06	3.591E-06	3.589E-06	3.586E-06	3.580E-06	3.573E-06	3.564E-06	3.551E-06	3.534E-06
3.512E-06	3.484E-06	3.447E-06	3.401E-06	3.341E-06	3.267E-06	3.174E-06	3.066E-06	2.979E-06	3.518E-06
3.094E-06	6.748E-06	6.969E-06	2.861E-06	3.272E-06	3.136E-06	3.001E-06	2.878E-06	2.754E-06	2.619E-06
2.468E-06	2.307E-06	2.163E-06	2.085E-06	1.869E-06	6.922E-12	2.552E-17	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.566E-06	3.565E-06	3.563E-06	3.558E-06	3.551E-06	3.542E-06	3.531E-06	3.515E-06	3.495E-06
3.470E-06	3.438E-06	3.397E-06	3.346E-06	3.281E-06	3.196E-06	3.081E-06	2.908E-06	2.613E-06	4.125E-06
3.784E-06	5.808E-06	6.324E-06	2.656E-06	2.969E-06	2.977E-06	2.894E-06	2.786E-06	2.666E-06	2.527E-06
2.355E-06	2.143E-06	2.088E-06	2.370E-06	1.076E-06	2.296E-12	7.326E-18	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.541E-06	3.540E-06	3.536E-06	3.531E-06	3.523E-06	3.513E-06	3.499E-06	3.482E-06	3.459E-06
3.432E-06	3.397E-06	3.355E-06	3.303E-06	3.239E-06	3.157E-06	3.045E-06	2.873E-06	2.553E-06	4.142E-06

4.071E-06	4.726E-06	5.365E-06	2.952E-06	2.961E-06	2.904E-06	2.818E-06	2.721E-06	2.616E-06	2.485E-06
2.294E-06	1.938E-06	1.796E-06	1.258E-06	4.979E-12	2.324E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.517E-06	3.515E-06	3.511E-06	3.505E-06	3.496E-06	3.485E-06	3.470E-06	3.451E-06	3.427E-06
3.398E-06	3.363E-06	3.321E-06	3.271E-06	3.213E-06	3.145E-06	3.068E-06	2.983E-06	2.919E-06	3.664E-06
3.772E-06	4.008E-06	4.309E-06	3.287E-06	3.019E-06	2.873E-06	2.770E-06	2.686E-06	2.608E-06	2.517E-06
2.396E-06	1.719E-06	1.529E-06	7.040E-12	3.486E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.493E-06	3.491E-06	3.487E-06	3.480E-06	3.471E-06	3.458E-06	3.442E-06	3.422E-06	3.398E-06
3.368E-06	3.333E-06	3.292E-06	3.246E-06	3.196E-06	3.143E-06	3.095E-06	3.069E-06	3.115E-06	3.364E-06
3.487E-06	3.576E-06	3.565E-06	3.202E-06	2.965E-06	2.817E-06	2.721E-06	2.661E-06	2.622E-06	2.587E-06
2.360E-06	1.781E-06	7.647E-07	3.263E-12	1.061E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.471E-06	3.469E-06	3.464E-06	3.457E-06	3.447E-06	3.434E-06	3.417E-06	3.396E-06	3.371E-06
3.342E-06	3.307E-06	3.268E-06	3.224E-06	3.178E-06	3.133E-06	3.095E-06	3.079E-06	3.104E-06	3.185E-06
3.236E-06	3.244E-06	3.179E-06	3.003E-06	2.842E-06	2.726E-06	2.653E-06	2.622E-06	2.640E-06	2.736E-06
2.103E-06	9.750E-07	3.711E-12	2.248E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.450E-06	3.448E-06	3.443E-06	3.435E-06	3.425E-06	3.411E-06	3.394E-06	3.373E-06	3.348E-06
3.318E-06	3.284E-06	3.245E-06	3.202E-06	3.157E-06	3.112E-06	3.072E-06	3.043E-06	3.033E-06	3.038E-06
3.029E-06	2.993E-06	2.917E-06	2.802E-06	2.689E-06	2.603E-06	2.551E-06	2.539E-06	2.582E-06	2.685E-06
9.976E-07	3.156E-12	2.526E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.430E-06	3.428E-06	3.423E-06	3.415E-06	3.405E-06	3.391E-06	3.374E-06	3.353E-06	3.327E-06
3.297E-06	3.263E-06	3.224E-06	3.180E-06	3.133E-06	3.084E-06	3.035E-06	2.989E-06	2.948E-06	2.908E-06
2.858E-06	2.791E-06	2.706E-06	2.609E-06	2.519E-06	2.450E-06	2.410E-06	2.401E-06	2.397E-06	1.259E-06
3.610E-12	1.448E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.412E-06	3.410E-06	3.405E-06	3.397E-06	3.387E-06	3.373E-06	3.356E-06	3.335E-06	3.309E-06
3.280E-06	3.245E-06	3.205E-06	3.160E-06	3.110E-06	3.055E-06	2.997E-06	2.934E-06	2.868E-06	2.796E-06
2.713E-06	2.619E-06	2.517E-06	2.416E-06	2.331E-06	2.270E-06	2.236E-06	2.201E-06	1.140E-06	3.838E-12
1.583E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.396E-06	3.393E-06	3.389E-06	3.381E-06	3.371E-06	3.357E-06	3.340E-06	3.320E-06	3.295E-06
3.265E-06	3.231E-06	3.191E-06	3.145E-06	3.093E-06	3.033E-06	2.966E-06	2.889E-06	2.802E-06	2.702E-06
2.589E-06	2.463E-06	2.332E-06	2.211E-06	2.118E-06	2.060E-06	2.003E-06	1.040E-06	3.489E-12	1.566E-17
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.381E-06	3.379E-06	3.374E-06	3.367E-06	3.357E-06	3.344E-06	3.328E-06	3.308E-06	3.284E-06
3.256E-06	3.223E-06	3.184E-06	3.138E-06	3.085E-06	3.023E-06	2.949E-06	2.861E-06	2.756E-06	2.630E-06
2.483E-06	2.316E-06	2.140E-06	1.975E-06	1.867E-06	1.778E-06	9.321E-07	3.156E-12	1.415E-17	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.369E-06	3.366E-06	3.362E-06	3.355E-06	3.346E-06	3.334E-06	3.319E-06	3.300E-06	3.278E-06
3.252E-06	3.221E-06	3.185E-06	3.143E-06	3.092E-06	3.030E-06	2.954E-06	2.858E-06	2.738E-06	2.586E-06
2.399E-06	2.179E-06	1.934E-06	1.679E-06	1.511E-06	8.048E-07	2.779E-12	1.263E-17	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.358E-06	3.356E-06	3.352E-06	3.346E-06	3.337E-06	3.326E-06	3.313E-06	3.296E-06	3.277E-06
3.255E-06	3.228E-06	3.197E-06	3.160E-06	3.115E-06	3.057E-06	2.983E-06	2.885E-06	2.754E-06	2.579E-06
2.350E-06	2.063E-06	1.732E-06	1.176E-06	6.457E-07	2.321E-12	1.078E-17	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.349E-06	3.347E-06	3.344E-06	3.338E-06	3.331E-06	3.322E-06	3.310E-06	3.297E-06	3.282E-06
3.264E-06	3.244E-06	3.220E-06	3.191E-06	3.155E-06	3.107E-06	3.041E-06	2.947E-06	2.814E-06	2.624E-06
2.355E-06	1.985E-06	1.499E-06	4.202E-07	1.705E-12	8.590E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.343E-06	3.341E-06	3.338E-06	3.334E-06	3.328E-06	3.320E-06	3.312E-06	3.302E-06	3.291E-06
3.280E-06	3.267E-06	3.252E-06	3.234E-06	3.210E-06	3.177E-06	3.127E-06	3.050E-06	2.930E-06	2.742E-06
2.452E-06	2.015E-06	1.376E-06	2.141E-12	1.027E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.338E-06	3.337E-06	3.334E-06	3.331E-06	3.327E-06	3.321E-06	3.316E-06	3.310E-06	3.305E-06
3.300E-06	3.295E-06	3.290E-06	3.285E-06	3.278E-06	3.264E-06	3.240E-06	3.194E-06	3.109E-06	2.956E-06
2.689E-06	2.239E-06	1.523E-06	1.624E-12	6.569E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.335E-06	3.334E-06	3.332E-06	3.330E-06	3.328E-06	3.325E-06	3.323E-06	3.321E-06	3.321E-06
3.322E-06	3.326E-06	3.332E-06	3.340E-06	3.351E-06	3.362E-06	3.371E-06	3.372E-06	3.350E-06	3.278E-06
3.103E-06	2.723E-06	1.969E-06	2.099E-12	8.842E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0.000E+00	3.333E-06	3.333E-06	3.332E-06	3.331E-06	3.330E-06	3.330E-06	3.330E-06	3.332E-06	3.337E-06
3.344E-06	3.355E-06	3.371E-06	3.393E-06	3.422E-06	3.460E-06	3.509E-06	3.569E-06	3.636E-06	3.699E-06
3.718E-06	3.581E-06	2.974E-06	1.026E-11	6.745E-17	6.063E-17	6.063E-17	6.063E-17	6.063E-17	6.063E-17
6.063E-17	6.063E-17	6.063E-17	6.063E-17	6.063E-17	6.063E-17	6.063E-17	6.063E-17	6.089E-17	0.000E+00
0.000E+00	3.333E-06	3.333E-06	3.332E-06	3.332E-06	3.333E-06	3.334E-06	3.337E-06	3.343E-06	3.351E-06

MASS IN BOUNDARIES = .00000E+00
 MASS OUT BOUNDARIES = .00000E+00
 MASS PUMPED IN = .00000E+00
 MASS PUMPED OUT = .00000E+00
 MASS LOST BY DECAY = .00000E+00
 MASS ADSORBED ON SOLIDS = .00000E+00
 INITIAL MASS ADSORBED = .00000E+00
 INFLOW MINUS OUTFLOW = .00000E+00
 INITIAL MASS DISSOLVED = .00000E+00
 PRESENT MASS DISSOLVED = .00000E+00
 CHANGE MASS DISSOLVED = .00000E+00
 CHANGE TOTL.MASS STORED = .00000E+00
 COMPARE RESIDUAL WITH NET FLUX AND MASS ACCUMULATION:
 MASS BALANCE RESIDUAL = .00000E+00
 ERROR (AS PERCENT) = .00000E+00

Industrial Asphalt Remediation Strategy

TIME VERSUS HEAD AND CONCENTRATION AT SELECTED OBSERVATION POINTS

PUMPING PERIOD NO. 1

STEADY-STATE SOLUTION

OBS.WELL NO.	X	Y	N	HEAD (FT)	CONC.(MG/L)	TIME (YEARS)
1	34	9				

** NOTE ** THIS OBS. WELL IS LOCATED OUTSIDE
OF THE TRANSPORT SUBGRID

	0		.0	.0	.000	
	1		303.3	.0	.001	

OBS.WELL NO.	X	Y	N	HEAD (FT)	CONC.(MG/L)	TIME (YEARS)
2	25	12				

	0		.0	.0	.000	
	1		304.5	.0	.001	

OBS.WELL NO.	X	Y	N	HEAD (FT)	CONC.(MG/L)	TIME (YEARS)
3	25	16				

	0		.0	.0	.000	
	1		303.4	.0	.001	

OBS.WELL NO.	X	Y	N	HEAD (FT)	CONC.(MG/L)	TIME (YEARS)
4	19	24				

	0		.0	.0	.000	
	1		301.3	.0	.001	

OBS.WELL NO.	X	Y	N	HEAD (FT)	CONC.(MG/L)	TIME (YEARS)
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