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5/22/94



PACIFIC
ENVIRONMENTAL
GROUP, INC.

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January 4, 1995
Project 330-048.2A

Mr. Michael Whelan
ARCO Products Company
P.O. Box 5811
San Mateo, California 94402

Re: Quarterly Report - Third Quarter 1994
ARCO Service Station 2152
22141 Center Street at Grove Way
Castro Valley, California

Dear Mr. Whelan:

This letter, prepared by Pacific Environmental Group, Inc. (PACIFIC) on behalf of ARCO Products Company (ARCO), presents the results of the third quarter 1994 groundwater monitoring at the site referenced above. In addition, a summary of work completed and anticipated at the site is included.

QUARTERLY GROUNDWATER MONITORING RESULTS

Groundwater samples were collected by Integrated Wastestream Management, Inc. (IWM) on August 25, 1994 and analyzed for the presence of total petroleum hydrocarbons calculated as gasoline (TPH-g), benzene, toluene, ethylbenzene, and xylenes (BTEX compounds). IWM's certified analytical reports, chain-of-custody documentation, and field data sheets are presented as Attachment A. IWM's groundwater sampling procedures are presented as Attachment B.

Depth to water data collected on August 25, 1994 indicated that groundwater elevations in site monitoring wells have fallen approximately 0.34 foot since May 17, 1994. Groundwater flow is toward the southwest with a gradient of approximately 0.004. Groundwater elevation data are presented in Table 1. A groundwater elevation contour map based on the August 25, 1994 data is shown on Figure 1.

TPH-g and benzene were not detected in any site well during the August 25, 1994 groundwater sampling event. This is consistent with previous quarterly data. No hydrocarbons have been detected in site groundwater since July 1991. Separate-phase hydrocarbons have never been observed in any site well. Groundwater analytical data

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are presented in Table 2. A TPH-g and benzene concentration map is shown on Figure 2.

SUMMARY OF WORK

Work Completed Third Quarter 1994

- Sampled site wells for third quarter 1994 groundwater monitoring program. Sampling was performed by IWM.

Work Anticipated Fourth Quarter 1994

- Preparation and submittal of third quarter 1994 groundwater monitoring report.
- Sample site wells for fourth quarter 1994 groundwater monitoring program. Sampling to be performed by IWM.
- Preparation of fourth quarter 1994 groundwater monitoring report.
- Pursue site closure with Alameda County Health Care Services Agency.

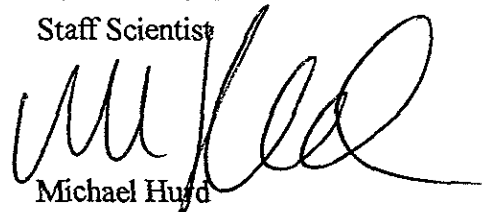
If there are any questions regarding the contents of this letter, please call.

Sincerely,

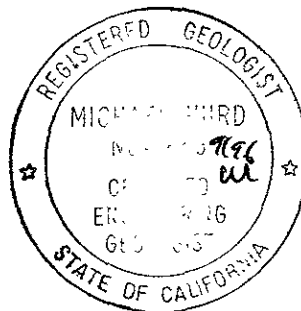
Pacific Environmental Group, Inc.



Edward Buskirk
Staff Scientist



Michael Hurd
Senior Geologist
CEG 1885



Attachments: Table 1 - Groundwater Elevation Data
Table 2 - Groundwater Analytical Data -
Total Petroleum Hydrocarbons
(TPH as Gasoline and BTEX Compounds)
Figure 1 - Groundwater Elevation Contour Map
Figure 2 - TPH-g/Benzene Concentration Map
Attachment A - Certified Analytical Reports,
Chain-of-Custody Documentation, and
Field Data Sheets
Attachment B - Groundwater Sampling Procedures

cc: Mr. Scott Seery, Alameda County Health Care Services Agency
Mr. Kevin Graves, Regional Water Quality Control Board - S.F. Bay Region

Table 1
Groundwater Elevation Data

ARCO Service Station 2152
22141 Center Street at Grove Way
Castro Valley, California

| Well Number | Date Gauged | Well Elevation (feet, MSL) | Depth to Water (feet, TOC) | Groundwater Elevation (feet,MSL) |
|-------------|-------------|----------------------------|----------------------------|----------------------------------|
| MW-1 | 06/25/90 | 217.16 | 49.80 | 167.36 |
| | 09/07/90 | | 50.00 | 167.16 |
| | 09/26/90 | | 50.09 | 167.07 |
| | 12/14/90 | | 50.44 | 166.72 |
| | 01/08/91 | | 50.45 | 166.71 |
| | 02/21/91 | | 50.51 | 166.65 |
| | 03/19/91 | | 50.16 | 167.00 |
| | 04/02/91 | | 50.14 | 167.02 |
| | 05/02/91 | | 49.77 | 167.39 |
| | 06/18/91 | | 49.75 | 167.41 |
| | 07/08/91 | | 49.80 | 167.36 |
| | 08/22/91 | | 50.08 | 167.08 |
| | 09/18/91 | | 50.11 | 167.05 |
| | 10/15/91 | | 50.30 | 166.86 |
| | 11/13/91 | | 50.30 | 166.86 |
| | 12/27/91 | | 50.28 | 166.88 |
| | 01/18/92 | | 50.39 | 166.77 |
| | 02/20/92 | | 50.16 | 167.00 |
| | 03/13/92 | | 49.75 | 167.41 |
| | 04/24/92 | | 49.18 | 167.98 |
| | 05/15/92 | | 49.22 | 167.94 |
| | 06/08/92 | | 49.30 | 167.86 |
| | 07/25/92 | | 49.42 | 167.74 |
| | 08/23/92 | | 49.52 | 167.64 |
| | 09/04/92 | | 49.71 | 167.45 |
| | 10/19/02 | | 49.98 | 167.18 |
| | 11/23/92 | | 50.10 | 167.06 |
| | 12/18/92 | | 50.29 | 166.87 |
| | 01/14/93 | | 49.81 | 167.35 |
| | 02/24/93 | | 48.71 | 168.45 |
| | 03/30/93 | | 48.02 | 169.14 |
| | 04/09/93 | | 47.81 | 169.35 |
| | 07/30/93 | | 47.61 | 169.55 |
| 10/29/93 | 48.00 | 169.16 | | |
| 03/04/94 | 48.34 | 168.82 | | |
| 05/17/94 | 47.51 | 169.65 | | |
| 08/25/94 | 47.86 | 169.30 | | |
| MW-2 | 06/25/90 | 216.50 | 49.04 | 167.46 |
| | 09/07/90 | | 49.22 | 167.28 |
| | 09/26/90 | | 49.32 | 167.18 |
| | 12/14/90 | | 49.66 | 166.84 |
| | 01/08/91 | | 49.72 | 166.78 |
| | 02/21/91 | | 49.77 | 166.73 |
| | 03/19/91 | | 49.44 | 167.06 |
| | 04/02/91 | | 49.43 | 167.07 |
| | 05/02/91 | | 49.03 | 167.47 |
| | 06/18/91 | | 48.98 | 167.52 |
| | 07/08/91 | | 49.03 | 167.47 |
| | 08/22/91 | | 49.30 | 167.20 |
| | 09/18/91 | | 49.34 | 167.16 |
| | 10/15/91 | | 49.51 | 166.99 |
| | 11/13/91 | | 49.53 | 166.97 |
| | 12/27/91 | | 49.49 | 167.01 |
| | 01/18/92 | | 49.60 | 166.90 |
| | 02/20/92 | | 49.39 | 167.11 |
| | 03/13/92 | | 48.97 | 167.53 |
| | 04/24/92 | | 48.47 | 168.03 |
| | 05/15/92 | | 48.47 | 168.03 |
| | 06/08/92 | | 48.50 | 168.00 |
| | 07/25/92 | | 48.52 | 167.98 |

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 2152
22141 Center Street at Grove Way
Castro Valley, California

| Well Number | Date Gauged | Well Elevation (feet, MSL) | Depth to Water (feet, TOC) | Groundwater Elevation (feet,MSL) |
|-----------------|-------------------------------|----------------------------|----------------------------|----------------------------------|
| MW-2 (cont.) | 08/23/92 | | 44.95 | 171.55 |
| | 09/04/92 | | 48.95 | 167.55 |
| | 10/19/02 | | 49.20 | 167.30 |
| | 11/23/92 | | 49.35 | 167.15 |
| | 12/18/92 | | 49.57 | 166.93 |
| | 01/14/93 | | 49.10 | 167.40 |
| | 02/24/93 | | 47.86 | 168.64 |
| | 03/30/93 | | 47.17 | 169.33 |
| | 04/09/93 | | 47.02 | 169.48 |
| | 07/30/93 | | 46.80 | 169.70 |
| | 10/29/93 | | 47.20 | 169.30 |
| | 03/04/94 | | 47.48 | 169.02 |
| | 05/17/94 | | 46.68 | 169.82 |
| | 08/25/94 | | 47.04 | 169.46 |
| | MW-3 | 06/25/90 | 217.57 | 50.55 |
| 09/07/90 | | | 50.73 | 166.84 |
| 09/26/90 | | | 50.81 | 166.76 |
| 12/14/90 | | | 51.15 | 166.42 |
| 01/08/91 | | | 51.16 | 166.41 |
| 02/21/91 | | | 51.21 | 166.36 |
| 03/19/91 | | | 50.93 | 166.64 |
| 04/02/91 | | | 50.92 | 166.65 |
| 05/02/91 | | | 50.51 | 167.06 |
| 06/18/91 | | | 50.47 | 167.10 |
| 07/08/91 | | | 50.54 | 167.03 |
| 08/22/91 | | | 50.80 | 166.77 |
| 09/18/91 | | | 50.82 | 166.75 |
| 10/15/91 | | | 51.02 | 166.55 |
| 11/13/91 | | | 51.03 | 166.54 |
| 12/27/91 | | | 51.01 | 166.56 |
| 01/18/92 | | | 51.15 | 166.42 |
| 02/20/92 | | | 50.84 | 166.73 |
| 03/13/92 | | | 50.39 | 167.18 |
| 04/24/92 | | | 49.82 | 167.75 |
| 05/15/92 | | | 49.90 | 167.67 |
| 07/25/92 | | | 50.14 | 167.43 |
| 08/23/92 | | | 50.12 | 167.45 |
| 09/04/92 | | | 50.38 | 167.19 |
| 10/19/02 | | | 50.71 | 166.86 |
| 11/23/92 | | | 50.81 | 166.76 |
| 12/18/92 | | | 50.50 | 167.07 |
| 01/14/93 | ----- Well Inaccessible ----- | | | |
| 02/24/93 | ----- Well Inaccessible ----- | | | |
| 03/30/93 | | | 48.82 | 168.75 |
| 04/09/93 | | | 48.71 | 168.86 |
| 07/30/93 | | | 48.33 | 169.24 |
| 10/29/93 | | | 48.64 | 168.93 |
| 03/04/94 | | | 49.15 | 168.42 |
| 05/17/94 | | | 48.33 | 169.24 |
| 08/25/94 | | | 48.66 | 168.91 |
| MW-4 | 06/25/90 | 215.18 | 48.06 | 167.12 |
| | 09/07/90 | | 48.25 | 166.93 |
| | 09/26/90 | | 48.35 | 166.83 |
| | 12/14/90 | | 48.68 | 166.50 |
| | 01/08/91 | | 48.70 | 166.48 |
| | 02/21/91 | | 48.76 | 166.42 |
| | 03/19/91 | | 48.44 | 166.74 |
| | 04/02/91 | | 48.43 | 166.75 |
| | 05/02/91 | | 48.04 | 167.14 |

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 2152
22141 Center Street at Grove Way
Castro Valley, California

| Well Number | Date Gauged | Well Elevation (feet, MSL) | Depth to Water (feet, TOC) | Groundwater Elevation (feet,MSL) |
|-----------------|-------------|----------------------------|----------------------------|----------------------------------|
| MW-4 (cont.) | 06/18/91 | | 48.00 | 167.18 |
| | 07/08/91 | | 48.04 | 167.14 |
| | 08/22/91 | | 48.34 | 166.84 |
| | 09/18/91 | | 48.35 | 166.83 |
| | 10/15/91 | | 48.54 | 166.64 |
| | 11/13/91 | | 48.56 | 166.62 |
| | 12/27/91 | | 48.52 | 166.66 |
| | 01/18/92 | | 48.68 | 166.50 |
| | 02/20/92 | | 48.37 | 166.81 |
| | 03/13/92 | | 47.96 | 167.22 |
| | 04/24/92 | | 47.41 | 167.77 |
| | 05/15/92 | | 47.46 | 167.72 |
| | 06/08/92 | | 47.52 | 167.66 |
| | 07/25/92 | | 47.67 | 167.51 |
| | 08/23/92 | | 47.78 | 167.40 |
| | 09/04/92 | | 47.78 | 167.40 |
| | 10/19/02 | | 48.22 | 166.96 |
| | 11/23/92 | | 48.34 | 166.84 |
| | 12/18/92 | | 48.50 | 166.68 |
| | 01/14/93 | | 48.03 | 167.15 |
| 02/24/93 | | 46.95 | 168.23 | |
| 03/30/93 | | 46.25 | 168.93 | |
| 04/09/93 | | 46.18 | 169.00 | |
| 07/30/93 | | 45.96 | 169.22 | |
| 10/29/93 | | 46.12 | 169.06 | |
| 03/04/94 | | 46.60 | 168.58 | |
| 05/17/94 | | 45.78 | 169.40 | |
| 08/25/94 | | 46.11 | 169.07 | |
| VW-2 | 02/24/93 | 216.38 | 38.28 | 178.10 |
| | 03/30/93 | | 38.32 | 178.06 |
| | 04/09/93 | | 38.33 | 178.05 |
| | 07/30/93 | | 38.36 | 178.02 |
| | 10/29/93 | | Well Dry | |
| | 03/04/94 | | 38.34 | 178.04 |
| | 05/17/94 | | NM | NM |
| | 08/25/94 | | NM | NM |
| VW-3 | 02/24/93 | NS | NM | NM |
| | 03/30/93 | | 38.27 | NM |
| | 04/09/93 | | Well Inaccessible | |
| | 07/30/93 | | Well Dry | |
| | 10/29/93 | | Well Dry | |
| | 03/04/94 | | 38.27 | NM |
| | 05/17/94 | | NM | NM |
| | 08/25/94 | | NM | NM |
| VW-4 | 02/24/93 | NS | NM | NM |
| | 03/30/93 | | Well Dry | |
| | 04/09/93 | | Well Dry | |
| | 07/30/93 | | Well Dry | |
| | 10/29/93 | | Well Dry | |
| | 03/04/94 | | Well Dry | |
| | 05/17/94 | | NM | NM |
| | 08/25/94 | | NM | NM |
| VW-5 | 02/24/93 | NS | 35.22 | NM |
| | 03/30/93 | | Well Dry | |
| | 04/09/93 | | Well Inaccessible | |
| | 07/30/93 | | Well Dry | |
| | 10/29/93 | | Well Inaccessible | |

Table 1 (continued)
Groundwater Elevation Data

ARCO Service Station 2152
 22141 Center Street at Grove Way
 Castro Valley, California

| Well Number | Date Gauged | Well Elevation (feet, MSL) | Depth to Water (feet, TOC) | Groundwater Elevation (feet,MSL) |
|-------------|------------------|----------------------------|----------------------------|----------------------------------|
| VW-5 | 03/04/94 | | Well Dry | |
| (cont.) | 05/17/94 | | NM | NM |
| | 08/25/94 | | NM | NM |
| MSL | = Mean sea level | | | |
| TOC | = Top of casing | | | |
| NS | = Not surveyed | | | |
| NM | = Not measured | | | |

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

ARCO Service Station 2152
 22141 Center Street at Grove Way
 Castro Valley, California

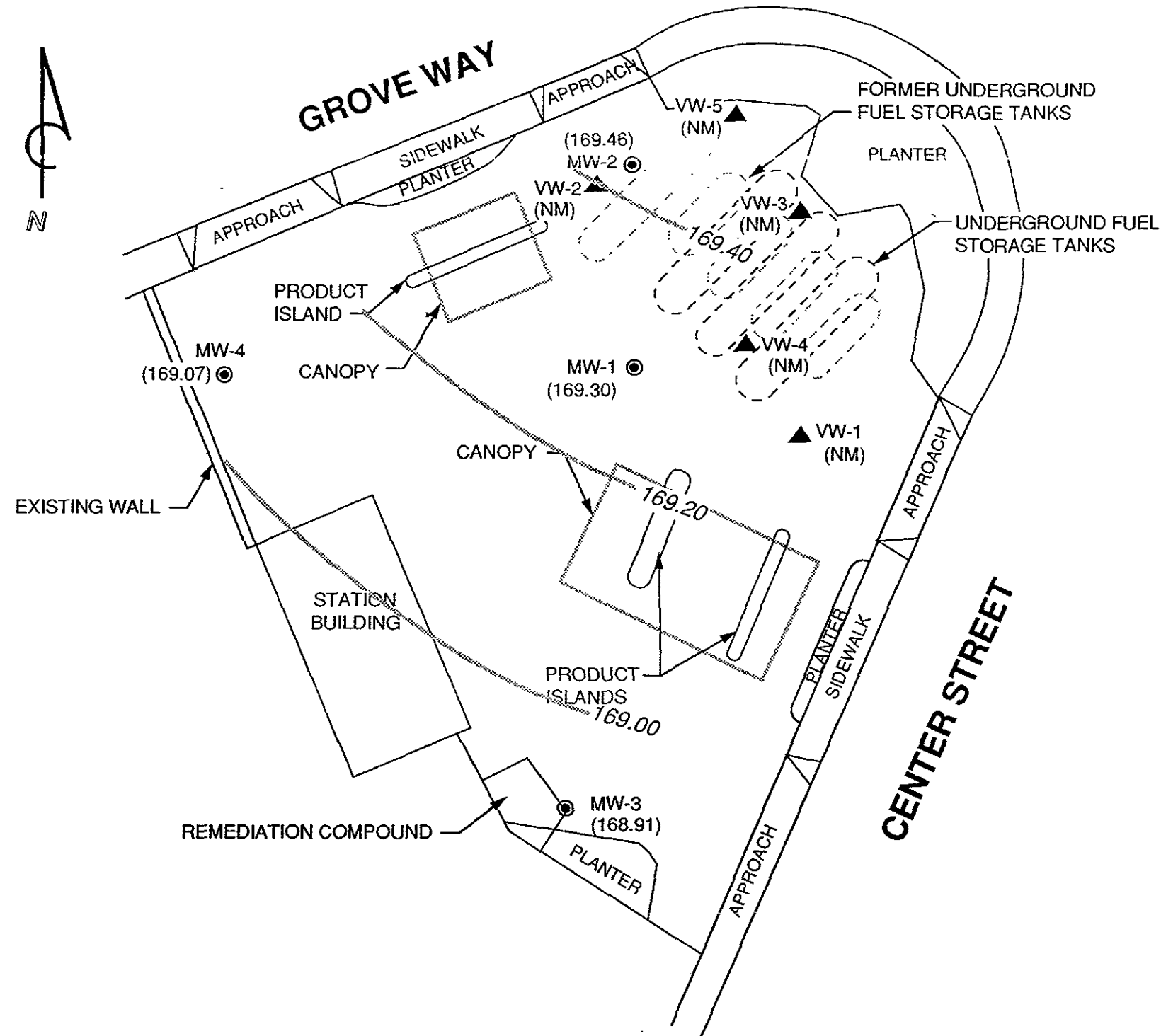
| Well Number | Date Sampled | TPH as Gasoline (ppb) | Benzene (ppb) | Toluene (ppb) | Ethyl-benzene (ppb) | Xylenes (ppb) |
|-------------|--------------|-----------------------|---------------|---------------|---------------------|---------------|
| MW-1 | 06/26/90 | 64 | 0.63 | <0.50 | <0.50 | <0.50 |
| | 09/26/90 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 01/08/91 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/02/91 | <50 | <0.05 | <0.05 | <0.05 | <0.05 |
| | 07/08/91 | 120 | 2.3 | 4.6 | 1.3 | 9.6 |
| | 10/15/91 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 03/13/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 06/08/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 09/04/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 10/19/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 01/14/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/09/93 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 07/30/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 10/29/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 03/04/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 05/17/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| 08/25/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | |
| MW-2 | 06/26/90 | 27 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 09/26/90 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 01/08/91 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/02/91 | <50 | <0.05 | <0.05 | <0.05 | <0.05 |
| | 07/08/91 | 30 | 0.42 | 0.47 | <0.30 | 0.89 |
| | 10/15/91 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 03/13/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 06/08/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 09/04/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 10/19/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 01/14/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/09/93 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 07/30/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 10/29/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 03/04/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 05/17/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| 08/25/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | |
| MW-3 | 06/26/90 | 52 | 0.65 | 1.5 | <0.50 | 2.0 |
| | 09/26/90 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 01/08/91 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/02/91 | <50 | <0.05 | <0.05 | <0.05 | <0.05 |
| | 07/08/91 | 67 | 0.69 | 1.5 | 0.65 | 4.7 |
| | 10/15/91 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 03/13/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 06/08/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 09/04/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 10/19/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 01/14/93 | NS | NS | NS | NS | NS |
| | 04/09/93 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |

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

ARCO Service Station 2152
 22141 Center Street at Grove Way
 Castro Valley, California

| Well Number | Date Sampled | TPH as | | | | |
|-----------------|--------------|----------------|---------------|---------------|---------------------|---------------|
| | | Gasoline (ppb) | Benzene (ppb) | Toluene (ppb) | Ethyl-benzene (ppb) | Xylenes (ppb) |
| MW-3 (cont.) | 07/30/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 10/29/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 03/04/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 05/17/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 08/25/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| MW-4 | 06/26/90 | <20 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 09/26/90 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 01/08/91 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/02/91 | <50 | <0.05 | <0.05 | <0.05 | <0.05 |
| | 07/08/91 | 50 | 1.4 | 2.4 | 0.62 | 4.2 |
| | 10/15/91 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 03/13/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 06/08/92 | <30 | <0.30 | <0.30 | <0.30 | <0.30 |
| | 09/04/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 10/19/92 | <50 | <0.5 | <0.5 | <0.5 | <0.5 |
| | 01/14/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 04/09/93 | <50 | <0.05 | <0.5 | <0.5 | <0.5 |
| | 07/30/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 10/29/93 | <50 | <0.50 | <0.50 | <0.50 | <0.50 |
| | 03/04/94 | <50 | <0.05 | <0.5 | <0.5 | <0.5 |
| 05/17/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | |
| 08/25/94 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | |

ppb = Parts per billion



LEGEND

MW-4 ● GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

VW-1 ▲ SOIL VAPOR EXTRACTION WELL LOCATION AND DESIGNATION

(169.46) GROUNDWATER ELEVATION IN FEET - MSL, 8-25-94

169.30 ——— GROUNDWATER ELEVATION CONTOUR IN FEET - MSL, 8-25-94

(NM) WELL NOT MEASURED



APPROXIMATE DIRECTION OF GROUNDWATER FLOW

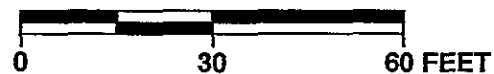
APPROXIMATE GRADIENT = 0.004

SOURCE: MAP BY RESNA



PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE

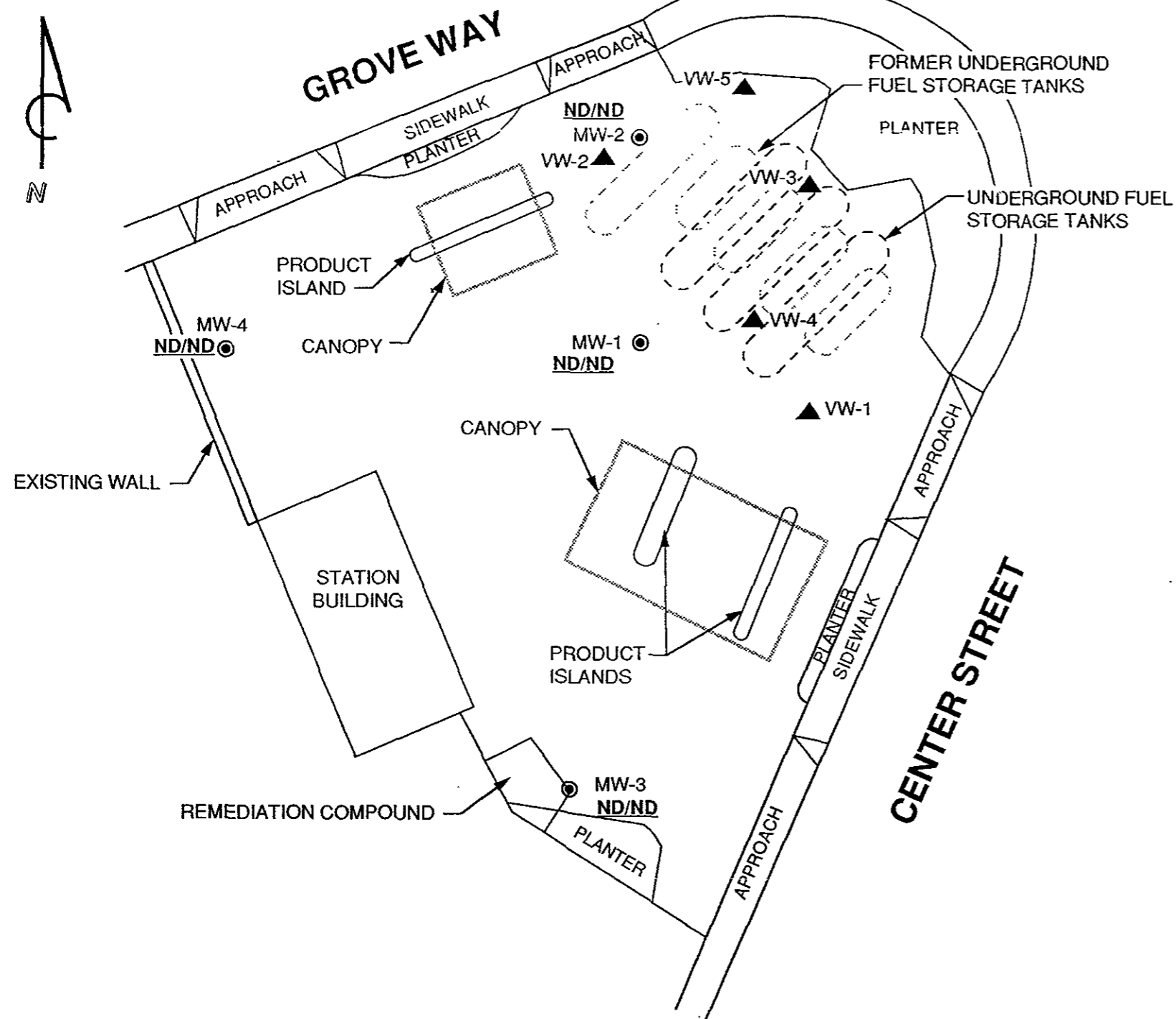


ARCO SERVICE STATION 2152
22141 Center Street at Grove Way
Castro Valley, California

GROUNDWATER ELEVATION CONTOUR MAP

FIGURE: 1

PROJECT: 330-048.2A



LEGEND

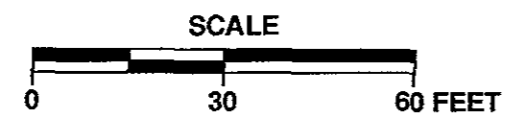
MW-4 ● GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

VW-1 ▲ SOIL VAPOR EXTRACTION WELL LOCATION AND DESIGNATION

ND/ND TPH-g/BENZENE CONCENTRATION IN GROUNDWATER, IN PARTS PER BILLION, 8-25-94

ND NOT DETECTED

SOURCE: MAP BY RESNA



ARCO SERVICE STATION 2152
 22141 Center Street at Grove Way
 Castro Valley, California

TPH-g/BENZENE CONCENTRATION MAP

FIGURE:
2
 PROJECT:
 330-048.2A

ATTACHMENT A

**CERTIFIED ANALYTICAL REPORTS,
CHAIN-OF-CUSTODY DOCUMENTATION,
AND FIELD DATA SHEETS**

I NTEGRATED
W ASTESTREAM
M ANAGEMENT

September 16, 1994

John Young
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

REC'D SEP 20 1994


Dear Mr. Young:

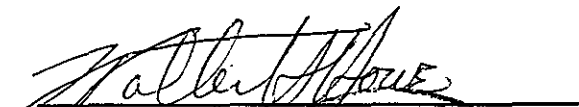
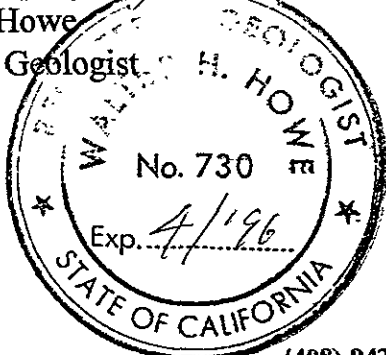
Attached are the field data sheets and analytical results for quarterly ground water sampling at ARCO Facility No. 2152 in Castro Valley, California. Integrated Wastestream Management measured the depth to water and collected samples from wells at this site on August 25, 1994.

Sampling was carried out in accordance with the protocols described in the "Request for Bid for Quarterly Sampling at ARCO Facilities in Northern California".

Please call us if you have any questions.

Sincerely,
Integrated Wastestream Management


Tom DeLon
Project Manager


Walter H. Howe
Registered Geologist


Summary of Ground Water Sample Analyses for ARCO Facility A-2152, Castro Valley, California

| WELL NUMBER | MW-1 | MW-2 | MW-3 | MW-4 | |
|-------------------|---------|---------|---------|---------|--|
| DATE SAMPLED | 8/25/94 | 8/25/94 | 8/25/94 | 8/25/94 | |
| DEPTH TO WATER | 47.86 | 47.04 | 48.66 | 46.11 | |
| SHEEN | NONE | NONE | NONE | NONE | |
| PRODUCT THICKNESS | NA | NA | NA | NA | |
| TPHg | ND | ND | ND | ND | |
| BTEX | | | | | |
| BENZENE | ND | ND | ND | ND | |
| TOLUENE | ND | ND | ND | ND | |
| ETHLYBENZENE | ND | ND | ND | ND | |
| XYLENES | ND | ND | ND | ND | |

FOOTNOTES:

Concentrations reported in ug/L (ppb)

TPHg = Total Purgeable Petroleum Hydrocarbons (USEPA Method 8015 Modified)

BTEX Distinction (USEPA Method 8020)

PCE = Tetrachloroethene (USEPA Method 8010)

* = Well inaccessible

** = Not sampled per consultant request

DCE = cis-1, 2-Dichloroethene (USEPA Method 8010)

TCE = Trichloroethene (USEAP Method 8010)

ND = Not Detected

NA = Not applicable

FP = Floating product

= See laboratory analytical report

WELL ID: MW-3 TD 100.30 DTW 48.66 X Gal. 0.66 X Casing 3 - Calculated 23.04
 Linear Ft. Volume Purge

DATE PURGED: 8-25-94 START (2400 HR): 1117 END (2400 HR) 1734
 DATE SAMPLED: 8-25-94 TIME (2400 HR): 1737 DTW: 49.1

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|------------|--------------------------------|-----------|----------------|
| 1721 | 5 | 6.98 | 1.16 | 71.0 | clear |
| 1725 | 12 | 7.09 | 0.89 | 69.7 | clear |
| 1730 | 19 | 7.03 | 0.88 | 68.8 | clear |
| 1734 | 24 | 7.04 | 0.87 | 68.5 | clear |

Total purge: 24

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS:

WELL ID: MW-4 TD 60.60 DTW 46.11 X Gal. 0.66 X Casing 3 - Calculated 28.69
 Linear Ft. Volume Purge

DATE PURGED: 8-25-94 START (2400 HR): 1743 END (2400 HR) 1808
 DATE SAMPLED: 8-25-94 TIME (2400 HR): 1814 DTW: 46.8

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|------------|--------------------------------|-----------|----------------|
| 1748 | 5 | 6.85 | 0.72 | 69.5 | cloudy |
| 1754 | 16 | 6.74 | 0.70 | 67.7 | cloudy |
| 1803 | 24 | 6.70 | 0.71 | 67.0 | cloudy |
| 1808 | 29 | 6.75 | 0.71 | 67.4 | cloudy |

Total purge: 29

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS:

WELL ID: _____ TD _____ DTW _____ X Gal. _____ X Casing _____ - Calculated _____
 Linear Ft. Volume Purge

DATE PURGED: _____ START (2400 HR): _____ END (2400 HR) _____
 DATE SAMPLED: _____ TIME (2400 HR): _____ DTW: _____

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|------------|--------------------------------|-----------|----------------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Total purge: _____

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS:

WELL ID: _____ TD _____ DTW _____ X Gal. _____ X Casing _____ - Calculated _____
 Linear Ft. Volume Purge

DATE PURGED: _____ START (2400 HR): _____ END (2400 HR) _____
 DATE SAMPLED: _____ TIME (2400 HR): _____ DTW: _____

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|------------|--------------------------------|-----------|----------------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Total purge: _____

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS:

PRINT NAME:

Vince Valdes

SIGNATURE:

Shirley Valdes

CASING DIAMETER (inches): 2 3 4 6 8 12 Other: _____

GALLON/LINEAR FOOT: 0.17 0.38 0.66 1.5 2.6 5.8 Other: _____

WELL ID: MW-2 TD 59.53 DTW 47.04 X 0.66 X 3 = 24.73
Linear Ft. Volume Purge

DATE PURGED: 8-25-94 START (2400 HR): 1724 END (2400 HR): 1840
 DATE SAMPLED: 8-25-94 TIME (2400 HR): 1743 DTW: 48.8

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|-------------|--------------------------------|-------------|----------------|
| <u>1727</u> | <u>3</u> | <u>7.02</u> | <u>1.57</u> | <u>72.8</u> | <u>cloudy</u> |
| <u>1730</u> | <u>8</u> | <u>7.04</u> | <u>1.18</u> | <u>71.7</u> | <u>cloudy</u> |
| <u>1735</u> | <u>16</u> | <u>7.01</u> | <u>1.17</u> | <u>70.1</u> | <u>cloudy</u> |
| <u>1740</u> | <u>25</u> | <u>7.02</u> | <u>1.26</u> | <u>69.3</u> | <u>cloudy</u> |

Total purge: 25

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS: _____

WELL ID: MW-1 TD 58.41 DTW 47.86 X 0.66 X 3 = 20.88
Linear Ft. Volume Purge

DATE PURGED: 8-25-94 START (2400 HR): 1806 END (2400 HR): 1819
 DATE SAMPLED: 8-25-94 TIME (2400 HR): 1825 DTW: 49.2

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|-------------|--------------------------------|-------------|----------------|
| <u>1810</u> | <u>5</u> | <u>6.97</u> | <u>1.01</u> | <u>71.7</u> | <u>cloudy</u> |
| <u>1813</u> | <u>10</u> | <u>6.95</u> | <u>1.05</u> | <u>70.1</u> | <u>cloudy</u> |
| <u>1817</u> | <u>15</u> | <u>6.96</u> | <u>1.04</u> | <u>69.8</u> | <u>cloudy</u> |
| <u>1819</u> | <u>17</u> | <u>6.97</u> | <u>1.04</u> | <u>69.4</u> | <u>cloudy</u> |

Total purge: 17

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS: WELL PUMPED DRY AT 17 GALLONS

WELL ID: _____ TD _____ DTW _____ X _____ Gal. X _____ Casing = _____ Calculated
Linear Ft. Volume Purge

DATE PURGED: _____ START (2400 HR): _____ END (2400 HR): _____
 DATE SAMPLED: _____ TIME (2400 HR): _____ DTW: _____

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|------------|--------------------------------|-----------|----------------|
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |

Total purge: _____

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS: _____

WELL ID: _____ TD _____ DTW _____ X _____ Gal. X _____ Casing = _____ Calculated
Linear Ft. Volume Purge

DATE PURGED: _____ START (2400 HR): _____ END (2400 HR): _____
 DATE SAMPLED: _____ TIME (2400 HR): _____ DTW: _____

| TIME (2400 HR) | VOLUME (GAL) | pH (UNITS) | (E.C. X 1,000) (UMHOS/CM@25 C) | TEMP. (F) | COLOR (VISUAL) |
|----------------|--------------|------------|--------------------------------|-----------|----------------|
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |

Total purge: _____

PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.

REMARKS: _____

PRINT NAME: Josueo Abuyar

SIGNATURE: Josueo Abuyar

CASING DIAMETER (inches): 2 3 4 6 8 12 Other: _____

GALLON/LINEAR FOOT: 0.17 0.38 0.66 1.5 2.6 5.8 Other: _____



September 9, 1994

Service Request No. S940964

Gina Austin
Tom DeLon
IWM
950 Ames Avenue
Milpitas, CA 95035

Re: **ARCO Facility No. 2152**

Dear Ms. Austin/Mr. DeLon:

Attached are the results of the water samples submitted to our lab on August 26, 1994. For your reference, these analyses have been assigned our service request number S940964.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

A handwritten signature in black ink, appearing to read "Keoni A. Murphy".

Keoni A. Murphy
Laboratory Manager

A handwritten signature in black ink, appearing to read "Annelise J. Bazar".

Annelise J. Bazar
Regional QA Coordinator

KAM/ajb



Acronyms

| | |
|------------|--|
| ASTM | American Society for Testing and Materials |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LUFT | Leaking Underground Fuel Tank |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NAN | Not Analyzed |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected at or above the MRL |
| NR | Not Requested |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| VPH | Volatile Petroleum Hydrocarbons |

COLUMBIA ANALYTICAL SERVICES, INC.



Analytical Report

Client: IWM
Project: ARCO Facility No. 2152
Sample Matrix: Water

Service Request: S940964
Date Collected: 8/25/94
Date Received: 8/26/94
Date Extracted: NA
Date Analyzed: 8/31/94

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

| | | | | | |
|-------------------------|------------------------|----------------|----------------|---------------------|-----------------------|
| Analyte: | TPH as Gasoline | Benzene | Toluene | Ethylbenzene | Xylenes, Total |
| Units: | ug/L (ppb) | ug/L (ppb) | ug/L (ppb) | ug/L (ppb) | ug/L (ppb) |
| Method Reporting Limit: | 50 | 0.5 | 0.5 | 0.5 | 0.5 |

| Sample Name | Lab Code | TPH as Gasoline | Benzene | Toluene | Ethylbenzene | Xylenes, Total |
|--------------|-------------|-----------------|---------|---------|--------------|----------------|
| MW-1 (49.2) | S940964-002 | ND | ND | ND | ND | ND |
| MW-2 (48.8) | S940964-003 | ND | ND | ND | ND | ND |
| MW-3 (49.1) | S940964-004 | ND | ND | ND | ND | ND |
| MW-4 (46.8) | S940964-005 | ND | ND | ND | ND | ND |
| Method Blank | S940831-WB | ND | ND | ND | ND | ND |

Approved By: _____
5ABTXGAS/061694

Date: September 9, 1994



APPENDIX A
LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.



QA/QC Report

Client: IWM
Project: ARCO Facility No. 2152
Sample Matrix: Water

Service Request: S940964
Date Collected: 8/25/94
Date Received: 8/26/94
Date Extracted: NA
Date Analyzed: 8/31/94

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

| Sample Name | Lab Code | Percent Recovery α, α, α -Trifluorotoluene |
|--------------|---------------|--|
| MW-1 (49.2) | S940964-002 | 99 |
| MW-2 (48.8) | S940964-003 | 99 |
| MW-3 (49.1) | S940964-004 | 99 |
| MW-4 (46.8) | S940964-005 | 99 |
| MS | S94063-010MS | 99 * |
| DMS | S94063-010DMS | 99 * |
| Method Blank | S940831-WB | 113 |

CAS Acceptance Limits: 69-116

* The surrogate used for this sample was 4-Bromofluorobenzene.

Approved By: _____

K. O. Murphy

Date: _____

September 9, 1999

SUR1/062994

COLUMBIA ANALYTICAL SERVICES, INC.



QA/QC Report

Client: IWM
Project: ARCO Facility No. 2152

Service Request: S940964
Date Analyzed: 8/31/94

Initial Calibration Verification (ICV) Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

| Analyte | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits |
|----------------|------------|--------|------------------|--|
| Benzene | 25 | 27.5 | 110 | 85-115 |
| Toluene | 25 | 24.9 | 100 | 85-115 |
| Ethylbenzene | 25 | 25.3 | 101 | 85-115 |
| Xylenes, Total | 75 | 70.3 | 94 | 85-115 |
| Gasoline | 250 | 275 | 110 | 90-110 |

Approved By:

Date:

September 9, 1994

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.



QA/QC Report

Client: IWM
 Project: ARCO Facility No. 2152
 Sample Matrix: Water

Service Request: S940964
 Date Collected: 8/25/94
 Date Received: 8/26/94
 Date Extracted: NA
 Date Analyzed: 8/31/94

Matrix Spike/Duplicate Matrix Spike Summary
 BTE
 EPA Methods 5030/8020
 Units: ug/L (ppb)

Sample Name: Batch QC
 Lab Code: S940963-010

| Analyte | Spike Level | | Sample Result | Spike Result | | Percent Recovery | | | |
|--------------|-------------|-------|---------------|--------------|-------|------------------|-----|------------|----------|
| | MS | DMS | | MS | DMS | MS | DMS | CAS | Relative |
| | | | | | | | | Acceptance | Percent |
| | | | | | | Limits | | Difference | |
| Benzene | 2,500 | 2,500 | 73.1 | 2,840 | 2,810 | 111 | 109 | 75-135 | 1 |
| Toluene | 2,500 | 2,500 | 63.8 | 2,580 | 2,660 | 101 | 104 | 73-136 | 3 |
| Ethylbenzene | 2,500 | 2,500 | ND | 2,590 | 2,540 | 104 | 102 | 69-142 | 2 |

Approved By: *K. O. Murphy*

Date: September 9, 1999

DMSIS/060194



APPENDIX B
CHAIN OF CUSTODY

ARCO Facility no. **A2152** City (Facility) **Castro Valley** Project manager (Consultant) **Tom De Sen / A. Young**
 ARCO engineer **K.C.** Telephone no. (ARCO) **415 571 2434** Telephone no. (Consultant) **408/942 8955** Fax no. (Consultant) **408/942 1499**
 Consultant name **IWM/emcon** Address (Consultant) **1921 Ringwood S.J.**

Laboratory name **C.A.S.**
Contract number **07077**

| Sample I.D. | Lab no. | Container no. | Matrix | | | Preservation | | Sampling date | Sampling time | BTEX EPA 802 | BTEX/TPH EPA 1602/8020/8015 | TPH Modified 8015 Gas <input checked="" type="checkbox"/> Diesel <input type="checkbox"/> | Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/> | TPH EPA 418.1/SM503E | EPA 601/8010 | EPA 624/8240 | EPA 625/8270 | TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> | CAN Metals EPA 6010/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/> | Lead Org./DHS Lead EPA 7420/7421 <input type="checkbox"/> | | |
|-------------|---------|---------------|--------|-------|-------|--------------|------|---------------|---------------|-----------------|--------------------------------|--|---|-------------------------|--------------|--------------|--------------|--|--|---|--|--|
| | | | Soil | Water | Other | Ice | Acid | | | | | | | | | | | | | | | |
| FB 1 | 1 | 2 | | ✓ | | ✓ | ✓ | 8-25-94 | 1638 | ✓ | ✓ | | | | | | | | | | | |
| 9.2 MW-1 | 2 | 2 | | ✓ | | ✓ | ✓ | }} | 1825 | ✓ | ✓ | | | | | | | | | | | |
| 188 MW-2 | 3 | 2 | | ✓ | | ✓ | ✓ | | 1743 | ✓ | ✓ | | | | | | | | | | | |
| 9.1 MW-3 | 4 | 2 | | ✓ | | ✓ | ✓ | | 1737 | ✓ | ✓ | | | | | | | | | | | |
| 68 MW-4 | 5 | 2 | | ✓ | | ✓ | ✓ | | 1814 | ✓ | ✓ | | | | | | | | | | | |

Method of shipment **sampler deliver**

Special detection Limit/reporting

Special QA/QC

Remarks **Hold on FB-1**

Lab number **5940964**

Turnaround time
 Priority Rush 1 Business Day
 Rush 2 Business Days
 Expedited 5 Business Days
 Standard 10 Business Days

Condition of sample: **okay** Temperature received: **cool**
 Relinquished by sampler **Steve Valde** Date **8/26/94** Time **4:59** Received by **Tom De Sen** Date **8/26/94** Time **4:59**
 Relinquished by _____ Date _____ Time _____ Received by _____ Date _____ Time _____
 Relinquished by _____ Date _____ Time _____ Received by laboratory _____ Date _____ Time _____

ATTACHMENT B
GROUNDWATER SAMPLING PROCEDURES

Attachment A
Groundwater Sampling Protocol

This attachment documents the procedures followed by Groundwater Technology Inc. during the groundwater monitoring and sampling program for Arco Products Company. As requested by Arco, this attachment will be included with the first set of data delivered to the lead consultant.

Included in this attachment are:

- 1) Groundwater Technology, Inc. Standard Operating Procedure No. 8, Groundwater Monitoring
- 2) Groundwater Technology, Inc. Standard Operating Procedure No. 9, Water Sampling Methodology
- 3) Groundwater Technology, Inc. Standard Operating Procedure No. 10, Sampling for Volatiles In Water (Dissolved Gasoline, Solvents, Etc.)
- 4) Groundwater Technology, Inc. Standard Operating Procedure No. 11, Chain-of-Custody Protocol

The data delivered to the lead consultant each quarter will include:

- 1) Arco Products Company Chain-of-Custody
- 2) Field Report (depth to water/floating product survey)
- 3) Groundwater Sample Field Data Sheet
- 4) Laboratory Reports
- 5) Summary of Groundwater Monitoring Data

OVERVIEW

This section presents a brief summary of practices requested by Arco Products Company that are not normally included in the Groundwater Technology Inc. Standard Operating procedures referenced above. The practices were compiled from the Request for Bid for Groundwater Sampling at ARCO Retail Facilities in Northern California letter dated November 11, 1993, by Mr. Kyle Christie. These practices are included for Arco sites for which Groundwater Technology performs the monitoring and sampling activities.

- a) Use only Arco Products Chain-of-Custody Forms. For groundwater sample identification the depth the sample was collected is placed next to the well identification (i.e. MW10-5, means the sample for monitoring well MW-10 was collected at 5 feet below grade). The laboratory will be notified in advance of the arrival of groundwater samples.
- b) Measure depth to bottom of the monitoring wells for the first event only.
- c) Be consistent with the type of equipment used during the purging of groundwater monitoring wells. For example, if a monitoring well is consistently hand bailed during purging do not switch to pumping to purge the well.
- d) Use four 4-foot orange cones when accessing monitoring wells in driveways or parking lots.
- e) Field personnel must have station manager approval before disposing of trash generated during field activities in on-site containers.
- f) Fill out field reports, groundwater sample field data sheets, and summary of groundwater monitoring sheet (to be stamped by a California registered geologist or engineer) for each site for documentation of field activities. Copies of these forms are included with this attachment for reference.
- g) Maintain well identification symbols and clear well boxes of debris as necessary.
- h) Purge three (3) well volumes of groundwater from the monitoring wells prior to groundwater sample collection.

**GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE NO. 8
GROUNDWATER MONITORING**

Groundwater monitoring of wells at the site shall be conducted using an ORS Environmental Equipment (ORS) INTERFACE PROBE™ or SURFACE SAMPLER™. The INTERFACE PROBE™ is a hand-held, battery-operated device for measuring depth to petroleum product and depth to water as measured from an established datum (i.e., top of the well casing which has been surveyed). Floating separate-phase hydrocarbon (product) thickness is then calculated by subtracting the depth to product from the depth to water. In addition, water elevations are adjusted for the presence of floating product with the following calculation:

$$(\text{Product Thickness}) \times (0.8) + (\text{Water Elevation}) = \text{Corrected Water Elevation}$$

Note: The factor of 0.8 accounts for the density difference between water and petroleum hydrocarbons.

The thickness of dense non-aqueous phase liquids (DNAPLs) is calculated by subtracting the depth at which the DNAPL is encountered from the total depth of the well. Water-level elevations are not typically corrected for the presence of DNAPLs.

The INTERFACE PROBE™ consists of a dual-sensing probe which utilizes an optical liquid sensor and electrical conductivity to distinguish between water and petroleum products. A coated steel measuring tape transmits the sensor's signals to the reel assembly where an audible alarm sounds a continuous tone when the sensor is immersed in petroleum product and an oscillating tone when immersed in water. The INTERFACE PROBE™ is accurate to 0.01 inch.

A SURFACE SAMPLER™ shall be used for visual inspection of the groundwater to note sheens (difficult to detect with the INTERFACE PROBE™), odors, microbial action, etc.

The SURFACE SAMPLER™ used consists of a 12-inch-long case acrylic tube with a Delrin ball which closes onto a conical surface creating a seal as the sampler is pulled up. The sampler is calibrated in inches and centimeters for visual inspection of product thickness.

To reduce the potential for cross contamination between wells, the monitoring shall take place in order from the least to the most contaminated wells. Wells containing separate-phase hydrocarbons (free product) should be monitored last. Between each monitoring the equipment shall be washed with laboratory-grade detergent and double rinsed with distilled water.

**GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE NO. 9
WATER SAMPLING METHODOLOGY**

Before water sampling, each well shall be purged by pumping a minimum of four well volumes or until the discharge water indicates stabilization of temperature conductivity and pH. If the well is evacuated before four well volumes are removed or stabilization is achieved, the sample should be taken when the water level in the well recovers to 80 percent of its initial level.

Retrieval of the water sample, sample handling and sample preservation shall be conducted according to Standard Operating Procedure 10 concerning "Sampling for Volatiles in Water." The sampling equipment used shall consist of a Teflon® and/or stainless steel samplers which meet U.S. Environmental Protection Agency (EPA) regulations. Glass vials with Teflon® lids should be used to store the collected samples.

To ensure sample integrity, each vial shall be filled with the sampled water in such a way that the water stands above the lip of the vial. The cap should then be quickly placed on the vial and tightened securely. The vial should then be checked to ensure that air bubbles are not present prior to labeling of the sample. Label information should include a sample identification number, job identification, date, time, type of analysis requested, and sampler's name. Chain-of-custody records shall be completed according to Standard Operating Procedure (SOP) 11 concerning chain of custody.

The vials should be immediately placed in high quality coolers for shipment to the laboratory. The coolers should be packed with sufficient ice or freezer packs to ensure that the samples are kept below 4° Celsius (C). To minimize sample degradation the prescribed analysis shall take place within seven days of sample collection unless specially prepared acidified vials are used.

To minimize the potential for cross contamination between wells, all the well development and water sampling equipment which contacts the groundwater shall be cleaned between each sampling. As a second precautionary measure, the wells shall be sampled in order of increasing contaminant concentrations (the least contaminated well first, the most contaminated well last) as established by previous analysis.

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE NO. 10
SAMPLING FOR VOLATILES IN WATER (DISSOLVED GASOLINE, SOLVENTS, ETC.)

1. Use only vials properly washed and oven dried (prepared by the laboratory).
2. Use clean sampling equipment. Scrub with Alconox or equivalent laboratory detergent and water followed by a thorough water rinse. Complete with a distilled water rinse.

Sampling equipment which has come into contact with liquid hydrocarbons (free product) should be regarded with suspicion. Such equipment should have tubing and cables replaced and all resilient parts washed with laboratory detergent solution as indicated above. Visible deposits may have to be removed with hexane. Solvent washing should be followed by detergent washing, as indicated above.

This procedure is valid for volatile organic analysis only. For extractable organics (for example, pesticides, or base neutrals for U.S. Environmental Protection Agency [EPA] Method 625 a final rinse with pesticide-grade isopropyl alcohol), followed by overnight or oven drying will be necessary.

3. Take duplicate samples. Mark on forms as a single sample with two containers to avoid duplication of analyses.
4. Take a site blank using distilled water or known uncontaminated source. This sample will be run at the discretion of the project manager.
5. Fill out labels and forms as much as possible ahead of time. Use an indelible marker.
6. Preservatives are required for some types of samples. Use specially prepared vials marked as indicated below, or use the appropriate field procedure (SOP 12 for acidification). Make note on forms that samples were preserved. Always have extra vials in case of problems. Samples for volatile analyses should be acidified below pH 2. Eye protection, foot protection, and disposable vinyl gloves are required for handling. Samples designated for expedited service and analyzed within seven (7) days of sampling will be acceptable without preservation. Glasses or goggles (not contact lenses) are necessary for protection of the eyes. Flush eyes with water for 15 minutes if contact occurs and seek medical attention. Rinse off hands frequently with water during handling.

For sampling chlorinated drinking water supplies for chlorinated volatiles, samples shall be preserved with sodium thiosulfate. Use vials labeled "CONTAINS THIOSULFATE." No particular cautions are necessary.

7. Fill vial to overflowing with water, avoiding turbulence and bubbling as much as possible. Water should stand above lip of vial.
8. Carefully, but quickly, slip cap onto vial. Avoid dropping the Teflon® septum from cap by not inverting cap until it is in contact with the vial. Disc should have Teflon® face toward the water. Also avoid touching white Teflon® face with dirty fingers.
9. Tighten cap securely, invert vial, and tap against hand to see there are not bubbles inside.
10. Label vial, using indelible ink, as follows:
 - A. Sample I.D. No.
 - B. Job I.D. No.
 - C. Date and Time
 - D. Type of analysis required
 - E. Your name
11. Unless the fabric-type label is used, place Scotch™ tape over the label to preserve its integrity.
12. For chain-of-custody reasons, sample vial should be wrapped end-for-end with Scotch™ tape or evidence tape and signed with indelible ink where the end of the tape seals on itself. The septum needs to be covered.
13. Chill samples immediately. Samples to be stored should be kept at 4° Celsius (C) (39.2° Fahrenheit (F)). Samples received at the laboratory above 10° C (as measured at glass surface by a thermocouple probe), after overnight shipping, will be considered substandard, so use a high quality cooler with sufficient ice or freezer packs.
14. Fill out Chain-of-Custody Manifest and Analysis Request Form (see Chain of Custody Procedures, SOP 11).

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE NO. 11
CHAIN-OF-CUSTODY PROTOCOL

1. Samples must be maintained under custody until shipped or delivered to the laboratory. The laboratory will then maintain custody. A sample is under custody if:
 - a) It is in your possession
 - b) It is in your view after being in your possession
 - c) You locked it up after it was in your possession
 - d) It is in a designated secure area

2. Custody of samples may be transferred from one person to another. Each transferrer and recipient must date, sign and note the time on the chain-of-custody form.

3. In shipping, the container must be sealed with tape, and bear the sender's signature across the area of bonding at the ends of the tape to prevent undetected tampering. Each sampling jar should be taped and signed as well. Scotch tape works well.

4. Write "sealed by" and sign in the "Remarks" box at the bottom of the form before sealing the box. Place form in a plastic bag and seal it inside the box.

5. The "REMARKS" section of the form is for documenting details such as:
 - a) Correlation of sample numbers if samples are split between labs.
 - b) QC numbers when lab is logging in the samples.
 - c) Sample temperature and condition when received by lab.
 - d) Preservation notation.
 - e) pH of samples when opened for analysis (if acidified).
 - f) Sampling observation or sampling problem.

6. The chain-of-custody form should be included inside the shipping container. A copy should be sent to the project manager.

7. When the samples are received by the lab, the chain-of-custody form will be dated, signed, and the time noted by a laboratory representative. The form will be retained in the laboratory files along with shipping bills and receipts.

8. At the time of receipt of samples by the laboratory, the shipping container will be inspected and the sealing signature will be checked. The samples will be inspected for condition and bubbles, and the temperature of a representative sample container will be



measured externally by a thermocouple probe (held tightly between two samples) and recorded. The laboratory QC numbers will be placed on the labels, in the accession log, and on the chain-of-custody form. If samples are acidified, their pH will be measured by narrow range pH paper at the time of opening for analysis. All comments concerning procedures requiring handling of the samples will be dated and initialed on the form by the laboratory person performing the procedure. A copy of the completed chain-of-custody form with the comments on sample integrity will be returned to the sampler.

GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____

WELL ID: _____

CLIENT/STATION #: _____

ADDRESS: _____

DATE: _____

CASING DIAMETER (inches): 2 3 4 4.5 5 6 8 12 Other _____

(CIRCLE ONE)
GALLONS/LINEAR FOOT: 0.17 0.38 0.66 0.83 1.02 1.5 2.6 5.8 Other _____

TD _____ - DTW _____ X WATER COLUMN _____ X GALLONS = _____ X CASING = _____ CALCULATED _____ ACTUAL _____
LINEAR FT. 1 CASING VOLUMES PURGE PURGE
VOLUME

DATE PURGED: _____ START (2400 Hr) _____ END (2400 Hr) _____

DATE SAMPLED: _____ START (2400 Hr) _____ END (2400 Hr) _____

| TIME (2400 Hr) | DEPTH (FEET) | DEPTH (FEET) | DEPTH (FEET) | DEPTH (FEET) | DEPTH (FEET) | DEPTH (FEET) |
|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | | | | | | |
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| | | | | | | |

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): _____

| 2" Bladder Pump | | Baker (Teflon®) | | 2" Bladder Pump | Baker (Teflon®) |
|------------------|--|--------------------------|--|-------------------|--------------------------|
| Centrifugal Pump | | Bailer (PVC) | | DDL Sampler | Bailer (Stainless Steel) |
| Submersible Pump | | Bailer (Stainless Steel) | | Dipper | Submersible Pump |
| Vac Truck | | | | | |
| Dedicated | | | | Bailer Disposable | Dedicated |
| Other: | | | | Other: | |

WATER COLUMN _____ X .80 = 80% RECHARGE _____ (TD - 80% RECHARGE = _____) SAMPLE DEPTH _____

REMARKS: _____

COMPLETED BY (PRINT NAME): _____ SIGNATURE: _____

REVIEWED BY _____ DATE: _____

PAGE _____ OF _____

03/10/84 13:53 0510 885 9148 GROUNDWATER TECH 013/013

SUMMARY OF GROUND WATER MONITORING DATA

| | MW # | DTW | *Free Product | TPHg | B | E | T | X | TPHd | TOG |
|----|------|-----|---------------|------|---|---|---|---|------|-----|
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
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| 14 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |

REPORT ANALYTICAL RESULTS IN PARTS PER BILLION (PPB).
 SEE CERTIFIED ANALYTICAL REPORTS FOR ADDITIONAL RESULTS OF ANALYSES.
 * REPORT TO HUNDREDTHS OF A FOOT.