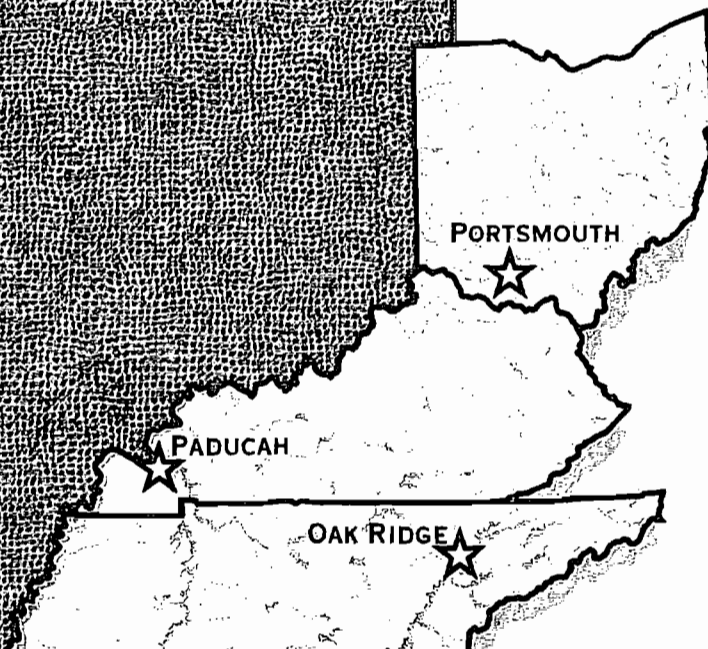




BJC/PAD-169/R1
Final

ENVIRONMENTAL MANAGEMENT
& ENRICHMENT FACILITIES
MANAGEMENT AND INTEGRATION CONTRACT

**Trichloroethene and Technetium-99
Groundwater Contamination in the Regional
Gravel Aquifer for
Calendar Year 2000 at the
Paducah Gaseous Diffusion Plant
Paducah, Kentucky**



MANAGED BY
BECHTEL JACOBS COMPANY, LLC
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

This document has received the appropriate
reviews for release to the public.

FI-00103-0216

**Trichloroethene and Technetium-99 Groundwater
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Calendar Year 2000 at the
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Date Issued—April 2001

Prepared for the
U.S. Department of Energy
Office of Environmental Management

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
Paducah, Kentucky 42001
managed by
Bechtel Jacobs Company LLC
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-98OR22700

EI-00103-0216



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TABLE

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ACRONYMS

amsl	above mean sea level
CY	calendar year
DNAPL	dense nonaqueous-phase liquid
DOE	U.S. Department of Energy
PGDP	Paducah Gaseous Diffusion Plant
RGA	Regional Gravel Aquifer
RI	Remedial Investigation
SWMU	solid waste management unit
⁹⁹ Tc	technetium-99
TCE	trichloroethene
WAG	waste area grouping

1. INTRODUCTION

The U.S. Department of Energy's (DOE's) Paducah Gaseous Diffusion Plant (PGDP) has been the subject of intense environmental monitoring over the last decade. Annual DOE reports present a summary of yearly monitoring results. These yearly monitoring results have been incorporated within the database of site-wide investigations, as they occurred. The previous site-wide investigations have included the following:

- *Results of the Site Investigation, Phase I, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M HILL 1991);
- *Results of the Site Investigation, Phase II, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M HILL 1992);
- *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III* (MMES 1992);
- *Northeast Plume Preliminary Characterization Summary Report, Paducah, Kentucky* (DOE 1995a); and
- *Final Report on Drive-Point Profiling of the Northwest Plume and Analysis of Related Data* (DOE 1995b).

More recently, the DOE has completed several remedial investigations of known or suspected sources to the main off-site groundwater plumes migrating from the PGDP. The investigation reports include the following:

- *Remedial Investigation Report for the Waste Area Grouping 6 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1999a);
- *Remedial Investigation Report for the Waste Area Grouping 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1999b);
- *Remedial Investigation Report for the Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000a);
- *Data Report for the Sitewide Remedial Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000b);
- *Site Evaluation Report for Waste Area Grouping 8 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000c); and
- *Remedial Investigation Report for Waste Area Grouping 3 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000d).

This report is the second of a series of annual interpretations of groundwater data for the PGDP, including revision of the site groundwater plume maps, to assess the extent of trichloroethene (TCE) and technetium-99 (⁹⁹Tc) in the shallow aquifer for the preceding year. The plume maps include data from the above referenced documents in addition to routine groundwater monitoring data collected through the end of calendar year (CY) 2000. These maps are consistent with interpreted groundwater flow directions determined from hydraulic potential trends of the shallow aquifer and conceptual models of the influence of surface-water bodies. Significant revisions to the 1999 edition of the plume maps are discussed in

Sect. 4. These reports provide a basis for timely incorporation of routine groundwater monitoring and characterization data for planned remedial actions.

2. SETTING

The PGDP is located in the Jackson Purchase region of western Kentucky, approximately 16.1 km (10 miles) west of Paducah, Kentucky and 6.5 km (4 miles) south of the Ohio River. Cretaceous marine sediments of the Mississippi Embayment, resting upon a Mississippian-age carbonate bedrock, underlie the PGDP at depth. Buried river deposits of the ancestral Tennessee River unconformably overlie the Cretaceous sediments directly beneath the PGDP. A thick gravel deposit at a general depth of 18.3 m (60 ft) below most of the PGDP forms the shallow aquifer, the Regional Gravel Aquifer (RGA). The RGA is the main conduit for groundwater flow to the north, where groundwater discharges into the Ohio River, and the main pathway for off-site contaminant plume migration. Fig. 1 presents a general cross-section of the site geology, while Fig. 2 illustrates the main features of the groundwater flow systems.

Trichloroethene, a common solvent, and ⁹⁹Tc, a man-made radioisotope, are the most widespread groundwater contaminants associated with the PGDP. TCE occurs as pure phase (free-product) dense nonaqueous-phase liquid (DNAPL) at multiple locations in the silts and clays overlying the RGA and, most probably, in the RGA itself at some locations. Technetium-99 is a widespread soil contaminant at the PGDP and a common contaminant in many PGDP burial grounds. Both dissolved TCE and ⁹⁹Tc migrate with downward percolating water to the RGA. In addition, pools of TCE within the RGA are able to yield much higher dissolved levels in groundwater. These contaminants have resulted in large-scale dissolved-phase plumes that are migrating from the PGDP toward the Ohio River. Table 1 presents a summary of the PGDP groundwater plumes.

Table 1. PGDP groundwater plumes, CY 2000

Plume	Approximate maximum off-site contaminant levels	Off-site plume length
	<i>Trichloroethene</i>	
Northeast	1100 µg/L	3.5 km (2.2 miles)
Northwest	10,000 µg/L	4.6 km (2.8 miles)
Southwest	350 µg/L	0.2 km (0.1 miles)
	<i>Technetium-99</i>	
Northwest	3000 pCi/L	4.1 km (2.5 miles)
Southwest	1670 pCi/L	0.7 km (0.4 miles)
Technetium-99	400 pCi/L	5.3 km (3.3 miles)

DOE has taken three discrete actions to contain the groundwater contamination and mitigate the risk to the public that is associated with groundwater. Two separate interim remedial actions installed pump-and-treat systems in the Northwest and Northeast Plumes. Both pump-and-treat systems consist of well fields at the leading edge of the high concentration core of the plumes. The Northwest Plume treatment system also includes a well field near the PGDP security fence. To minimize risks to residents and businesses north of the PGDP, DOE maintains a Water Policy, whereby DOE provides municipal water to area residents and businesses.

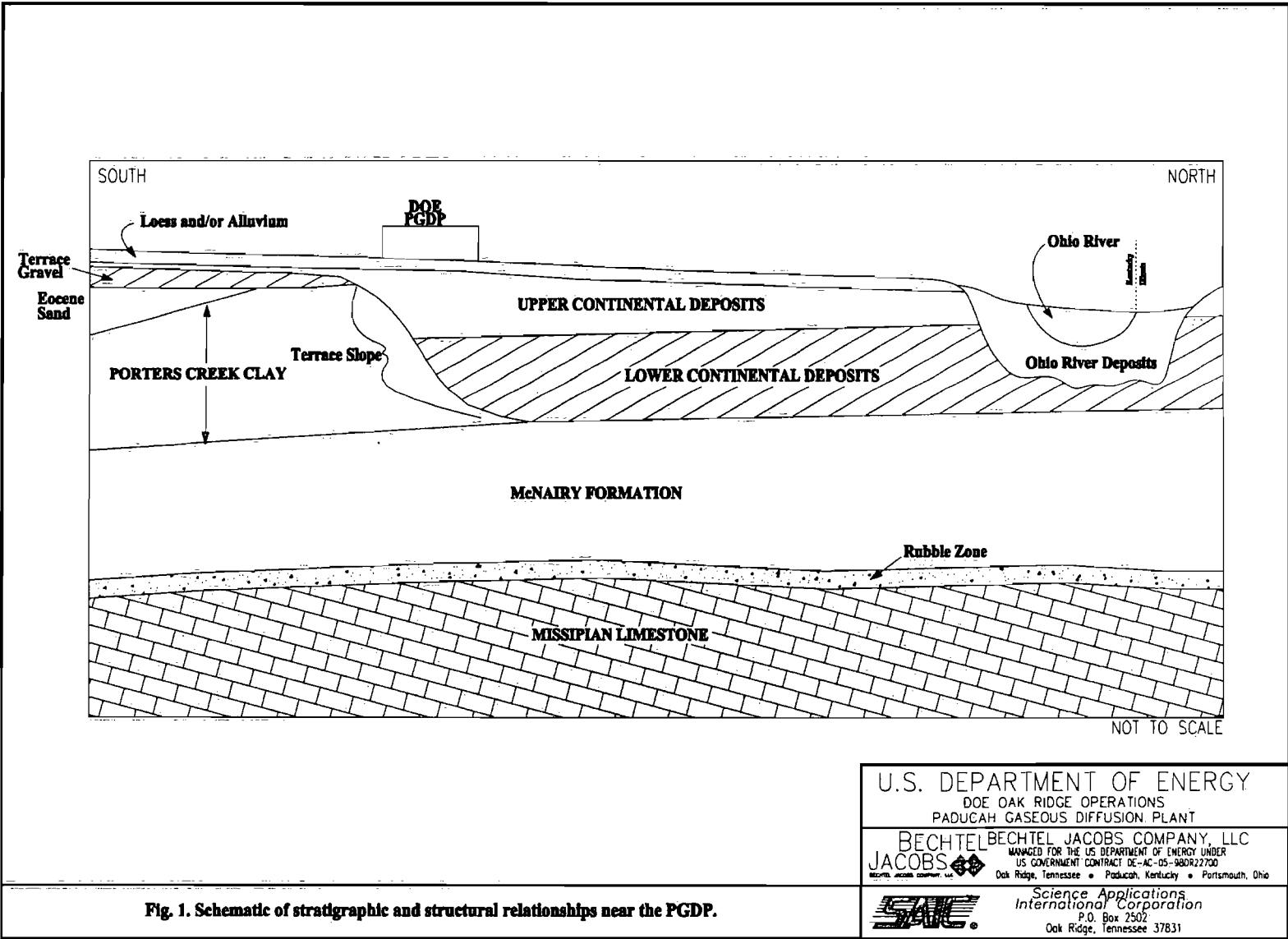


Fig. 1. Schematic of stratigraphic and structural relationships near the PGDP.

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 DOE OAK RIDGE OPERATIONS
 PADUCAH GASEOUS DIFFUSION PLANT

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 MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
 US GOVERNMENT CONTRACT DE-AC-05-98OR22700
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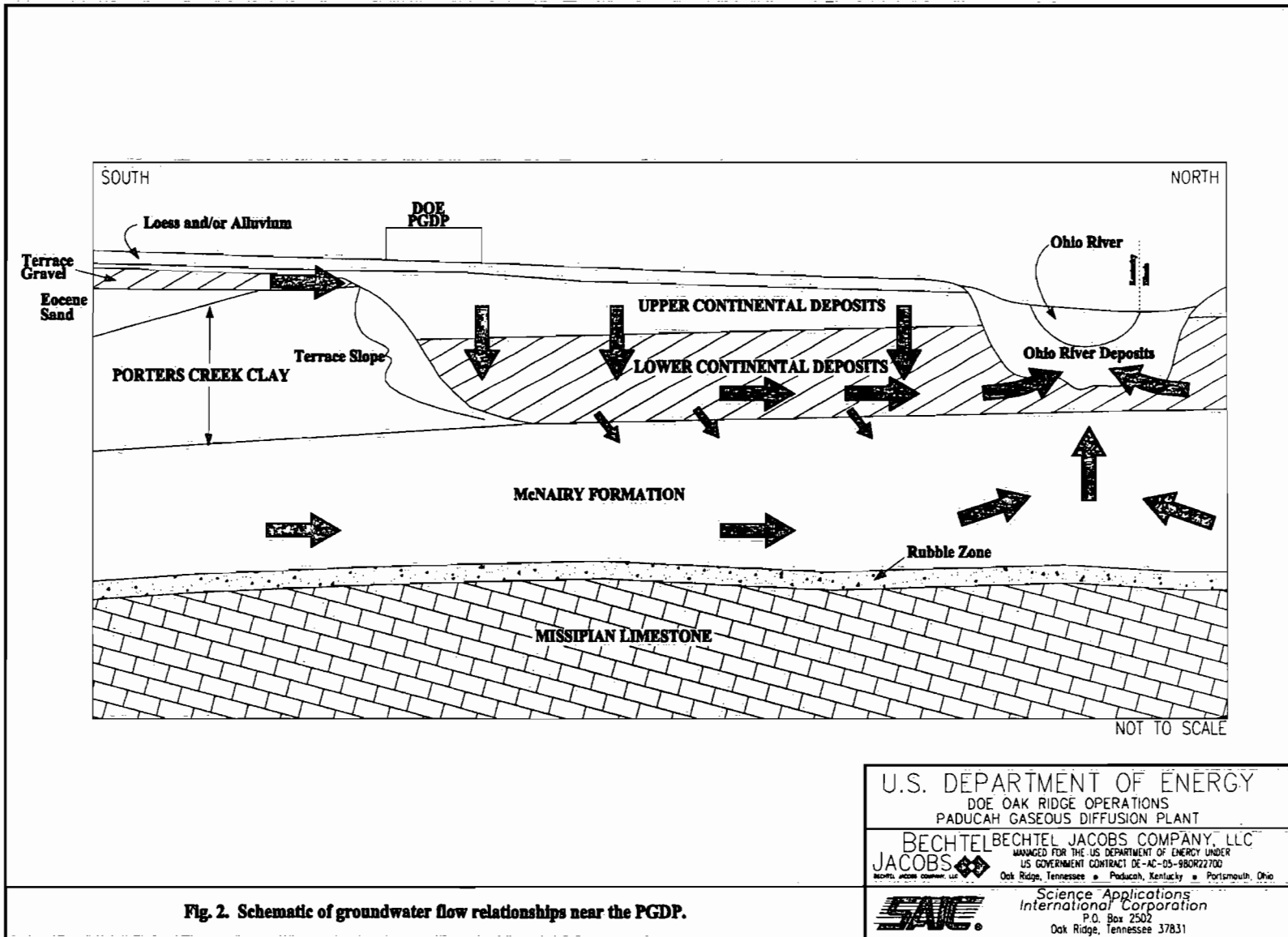


Fig. 2. Schematic of groundwater flow relationships near the PGDP.

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3. REVISED PLUME MAPS

A primary component of the annual groundwater report is a revision of the site maps of TCE and ⁹⁹Tc levels in the RGA. These maps (presented in Appendix A) represent the contaminant extent during the preceding year based upon (1) analysis of groundwater samples collected during the previous year, (2) temporal trends in groundwater samples collected from monitoring wells, and (3) interpreted contaminant levels based on previous analyses and a conceptual model of contaminant trends. Appendix B includes plots of contaminant levels over time for trends cited in this report. The attached maps are based on the available TCE and ⁹⁹Tc analyses of groundwater found in DOE's Oak Ridge Environmental Information System (OREIS) database at the end of CY 2000. These data include records for 132 RGA wells and piezometers and 1279 depth-discrete samples collected from the RGA. The data set (Appendix B) incorporates analyses of the Remedial Investigations (RIs) of Waste Area Groupings (WAGs) 3 (DOE 2000d), 6 (DOE 1999a), 27 (DOE 1999b), and 28 (DOE 2000a), as well as the Sitewide Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination (DOE 2000b) and the Site Evaluation Report for WAG 8 (DOE 2000c).

Maps of TCE and ⁹⁹Tc are presented at two scales to best present the greater available detail for the PGDP plant and to show the larger off-site area impacted by the PGDP. The plant map (1:4800 scale) covers the 303 hectares (748 acres) contained within the PGDP security fence. Metropolis Lake Road and Bethel Church Road conveniently define the east and west boundaries, respectively, of the potential area impacted by the PGDP groundwater contamination. This larger area map (1:12,000 scale) addresses approximately 5950 hectares (14,700 acres) of the DOE reservation and other lands between the plant and the Ohio River. Each map represents contaminant levels observed in or inferred from RGA monitoring wells during CY 2000, plus data from temporary characterization borings. These maps are composites of three sets of working maps of the lower, middle, and upper RGA [elevations 76.2 to 89.9 m (250 to 295 ft), 89.9 to 93.0 m (295 to 305 ft), and 93.0 to 97.5 m (305 to 320 ft) amsl]. Letter-size versions of the working maps are included in Appendix A. Additional discussion of how the maps were developed is presented in Appendix B. The data set and trend plots for key wells used in the interpretation also are included in Appendix B. Figures 3 and 4 show the locations of wells and facilities referenced in the text. Figure 5 shows the areas of SWMUs and WAGs identified in the text.

4. SIGNIFICANT REVISIONS TO PREVIOUS PLUME MAPS

This year's (CY 2000) plume maps incorporate several revisions from the plume maps for CY 1999. These revisions reflect the following: 1) the incorporation of the WAG 3 RI data (DOE 2000d), a significant data set of groundwater quality for the west side of the plant, 2) changing water quality as documented by the continuing monitoring well program, and 3) reinterpretation of spatial trends. The following highlights the most significant revisions to the previous plume maps.

- Redefinition of spatial trends in the Southwest Plume (WAG 3)
 - Addition of WAG 3 RI data supported a reassessment of contaminant levels in the Solid Waste Management Unit (SWMU) 4 area.
- C-746-C area reinterpreted
 - High contaminant levels in the RGA attributed to branch off of the Northwest Plume.
 - Separate source area no longer required for C-746-C.
 - Plume migrates to C-746-S&T Landfill area.

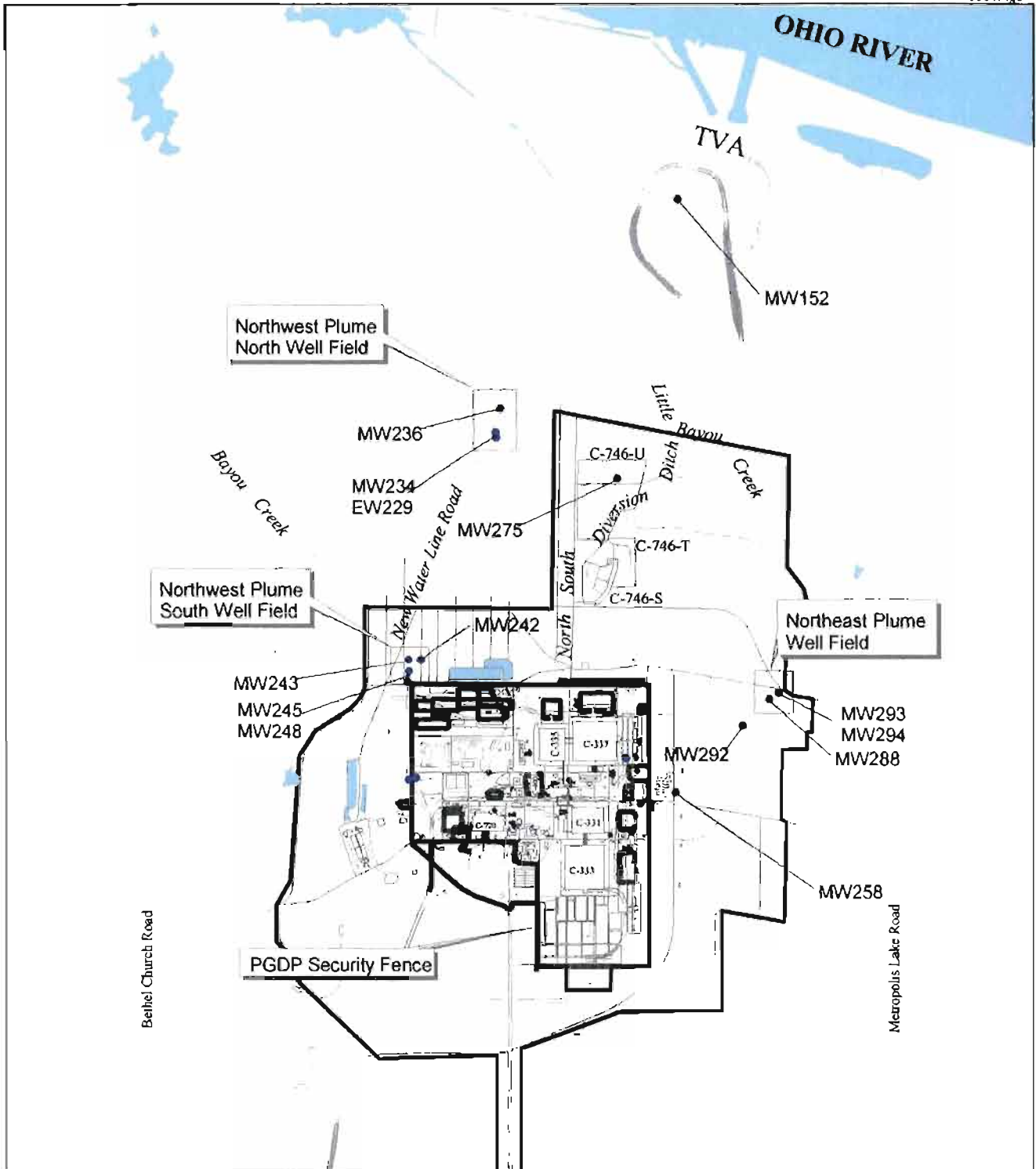


Fig. 3. Location of facilities and groundwater sample points for the PGDP that are referenced in this report.

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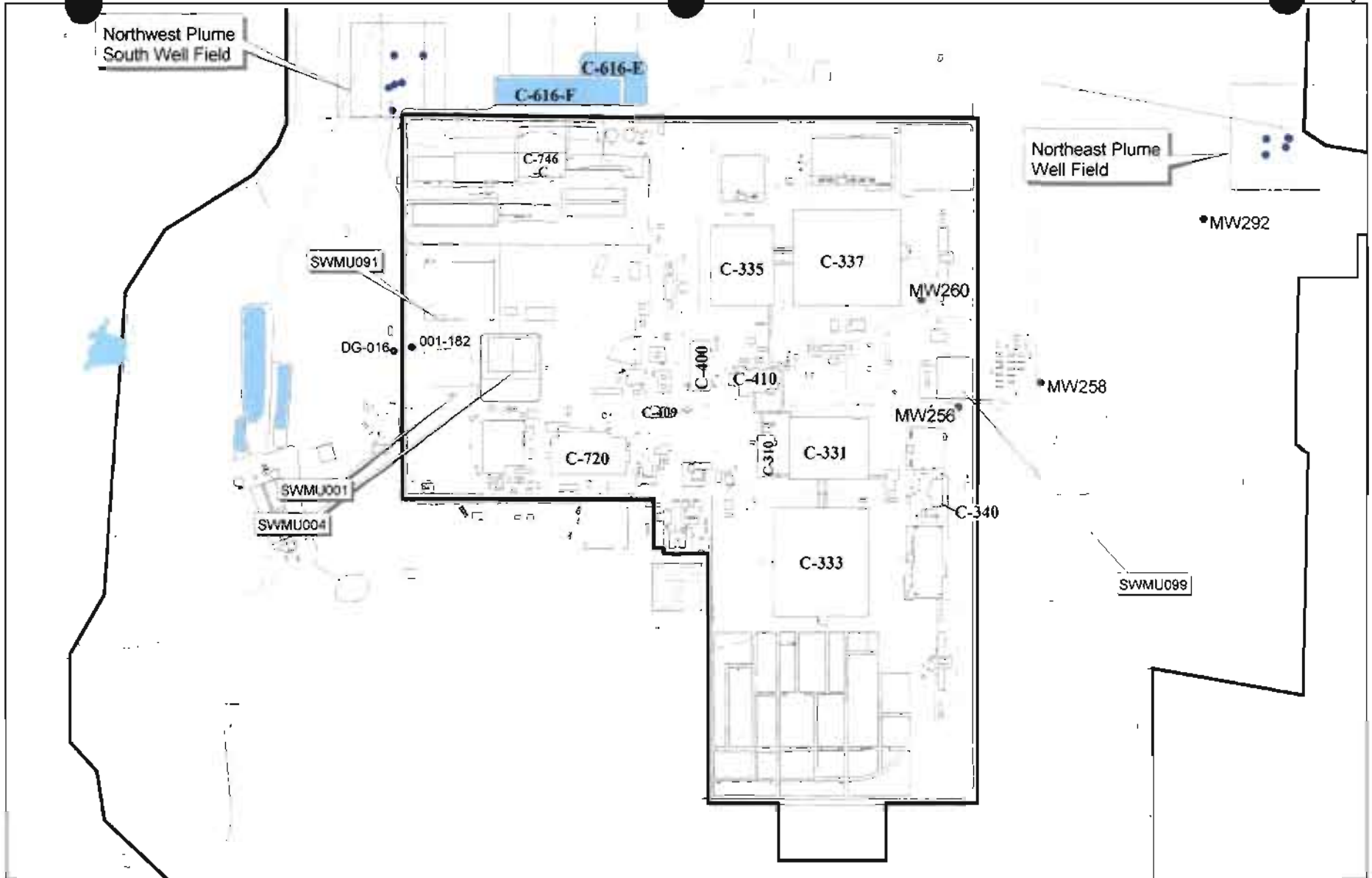


Fig. 4. Location of facilities and groundwater sample points for the PGDP (PGDP area) that are referenced in this report.

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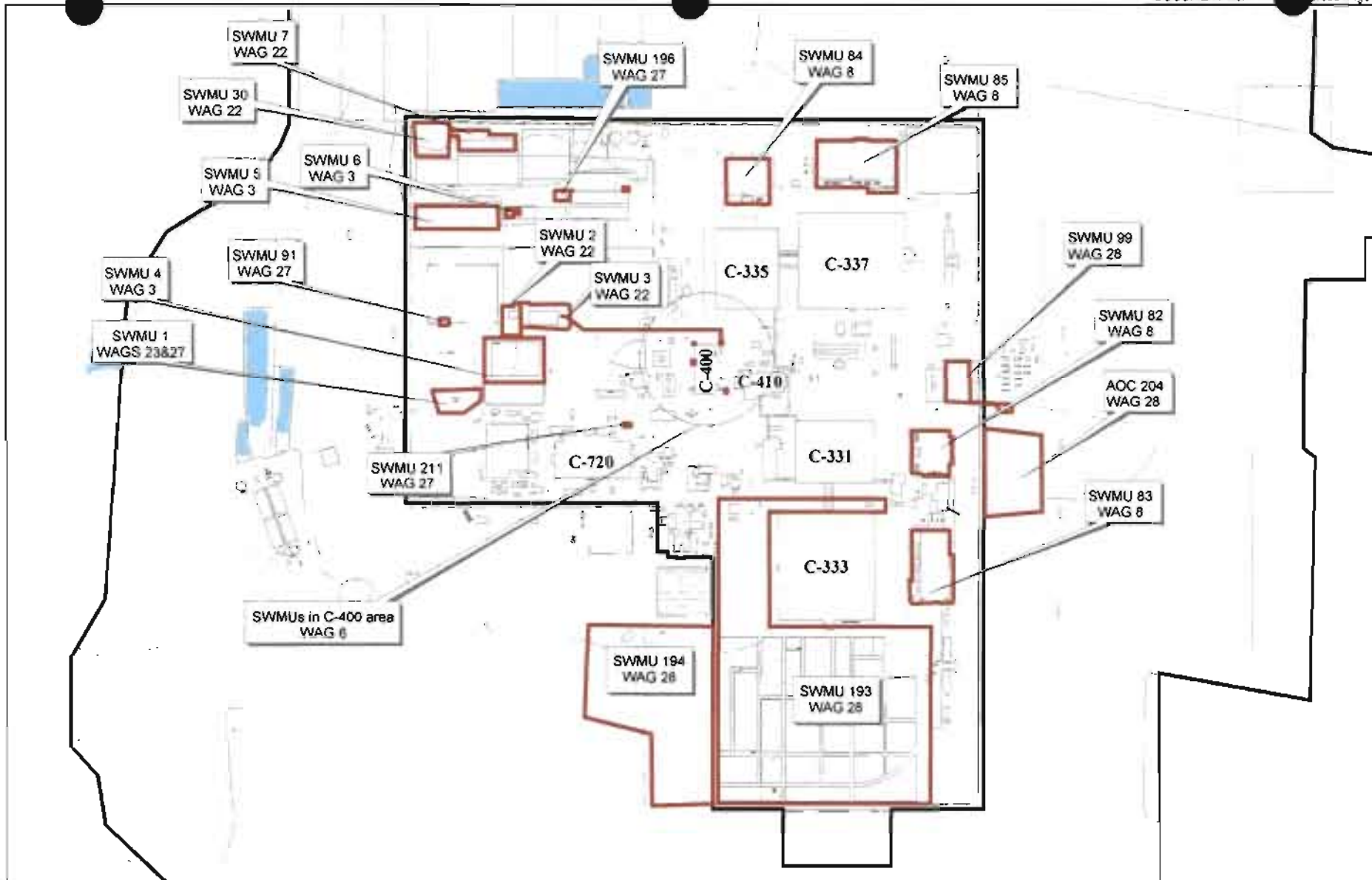


Fig. 5. Location of SWMUs and WAGs for the PGDP that are referenced in this report.

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The main revisions to the groundwater plume maps and contaminant trends for each plume are described in the following subsections.

4.1 NORTHEAST PLUME

4.1.1 Trichloroethene

Within the Northeast Plume, contaminant levels above 5 µg/L cover a large area as a result of several potential source areas. The highest concentrations (as high as 1100 µg/L in MW288—near the Northeast Plume well field) are found in a narrow core along the eastern edge of the plume. The most upgradient source area for this high concentration area appears to be near the northwest corner of the C-333 Process Building. An additional source area contributing to the high concentration area appears to be in the vicinity of the C-340 Metals Reduction Facility (1400 µg/L detected). Nevertheless, the source to the main plume centroid of the Northeast Plume remains undefined. Other areas that appear to be contributing to the Northeast Plume include the northeast corner of the C-400 Building and the C-410 Building. TCE concentrations of 1700 µg/L were measured immediately northeast of the C-400 Building during the WAG 6 RI (DOE 1999a). Further east, samples collected from MW260 contained TCE levels between 560 and 620 µg/L during CY 2000.

Trichloroethene levels in some of the monitoring wells associated with the main high concentration area near and within the plant boundaries have continued to decline through CY 2000. In 1995, samples from MW258, located immediately east of the C-755 Subcontractor Staging Area, had initial TCE concentrations above 2300 µg/L. The most recent samples collected from this well (November 2000) contained only 880 µg/L (down from 1100 µg/L in November 1999). This trend of declining TCE levels near the plant suggests that dissolution may be rapidly depleting the DNAPL source zones to the Northeast Plume.

Moreover, TCE levels in the main core of the Northeast Plume outside the plant boundaries have declined significantly. Values for the downgradient Northeast Plume well field monitoring wells MW293 and MW294 dwindled from 1150 and 1350 µg/L for CY 1999 to 225 and 470 µg/L, respectively, for CY 2000. For the same period, TCE levels for upgradient Northeast Plume well field monitoring well MW292 dropped from 1100 to 860 µg/L. The declining TCE levels downgradient of the Northeast Plume well field indicate that the pump-and-treat system is being effective at containing the core of the off-site plume.

4.1.2 Technetium-99

Contaminant levels are generally less than 25 pCi/L offsite and are only greater than 100 pCi/L at a few discrete sources. The most upgradient source area appears to be the northwest corner of the C-333 Process Building. Lesser source areas downgradient of C-333 are the C-340 Building and a classified materials storage area located on the foundation of the former Kellogg Building (now SWMU 99). The elevated ⁹⁹Tc activity in lower RGA well MW256 (consistently near 80 pCi/L through CY 1999 and CY 2000) is attributed to a Kellogg Building area source.

Both the C-410 Building and the northeast corner of the C-400 Building appear to be source areas of discrete centroids of ⁹⁹Tc contamination moving to the east within the broad boundaries of the Northeast Plume. Technetium-99 activity is interpreted to be greater than 100 pCi/L beneath the C-410 Building. Groundwater analyses of the WAG 6 RI showed that ⁹⁹Tc activity in the upper RGA beneath the northeast corner of the C-400 Building was greater than 900 pCi/L.

4.2 NORTHWEST PLUME

A primary revision of the CY 2000 plume maps is the depiction of an alternative source of RGA dissolved contaminants for the C-746-C area. The CY 1999 plume maps and report attributed elevated levels of both TCE and ⁹⁹Tc to a previously undefined C-746-C (scrap yard) area source. This year's assessment of the groundwater plumes suggests another interpretation—that contaminants may be derived from the Northwest Plume. The available data are consistent with either interpretation of the source of the C-746-C area contamination in the RGA.

The primary evidence for a Northwest Plume origin of the C-746-C area contamination is 1) the presence of TCE and ⁹⁹Tc (both common to the Northwest Plume) and 2) the vertical trend of contaminants within the RGA. Levels of both contaminants are highest in the middle and lower RGA, as in the Northwest Plume. In general, contaminant levels beneath a shallow source area are expected to be highest in the upper RGA.

In this year's interpretation, leakage from the C-616 Lagoons is causing a mound of higher hydraulic potential beneath the lagoons. Thus, the general northward groundwater flow diverges to the east and west. This east plume branch is projected to extend northward to the C-746-S&T Landfill area.

Analyses of groundwater samples collected during the Sitewide Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination (DOE 2000b) provide the only data on contaminant levels in the plume branch in the C-746-C area. The maximum TCE concentration measured in the core of this plume branch was 2200 µg/L (soil boring DG-007) in the middle of the RGA. Concentrations in excess of 100 µg/L are interpreted to extend to near the C-746-S&T Landfill. Technetium-99 activity exceeds 900 pCi/L in the core of the off-site plume branch. The extent of the off-site ⁹⁹Tc plume, as defined by an activity of 25 pCi/L, is primarily limited to the area south of the C-746-S&T Landfill.

4.2.1 Trichloroethene

Compared to the Northeast Plume, TCE contamination in the Northwest Plume covers a smaller geographic area. However, the TCE concentrations in the core of the Northwest Plume are higher than the TCE concentrations in the Northeast Plume. Outside the security fence, TCE concentrations measured in the core of the Northwest Plume during CY 2000 were as high as 7800 µg/L (MW248), as compared to the maximum concentration seen in the Northeast Plume, 1100 µg/L. Immediately downgradient of the north extraction well field, measured TCE concentrations during CY 2000 were as high as 1500 µg/L (MW236). Monitoring well data for the South Well Field continue to show capture of the TCE core of the Northwest Plume. The CY 2000 maps reflect a growing break (based on a conceptual model only) in the Northwest Plume at the South Well Field.

A possible TCE source area upgradient of the C-400 Building was identified in the vicinity of the C-310 Product Building during the WAG 28 RI (DOE 2000a). Alternate interpretations of this area are possible, which may include the TCE being associated with either the Northeast Plume or Southwest Plume contamination areas. Regardless of the direction that the TCE from the C-310 area may be migrating, the TCE sources at the southeast corner of the C-400 Building remain the primary probable sources for the Northwest Plume.

The detection of TCE in surface-water samples from a discrete area of Little Bayou Creek near the Shawnee Steam Plant (5 to 30 µg/L TCE during CY 2000) defines a discharge area of the Northwest Plume. Consequently, the middle and lower RGA TCE plume maps show the plume terminating at Little Bayou Creek, with the exception of an eastern finger that is coincident with the Technetium-99 Plume. The spreading of the plume near its northern end reflects 1) trends in monitoring results for the area and 2) frequent change of groundwater flow directions in the area in response to changes in the Ohio River stage.

4.2.2 Technetium-99

The Northwest Plume includes a ⁹⁹Tc activity near 900 pCi/L at the north well field and near 3790 pCi/L at the south well field. A core of contaminated groundwater with greater than 100 pCi/L ⁹⁹Tc activity extends to Little Bayou Creek, where the groundwater discharges to the creek (detected 9 to 37 pCi/L ⁹⁹Tc during CY 2000). The CY 2000 monitoring well data support the mapping of a "clean" area between the north reaches of the Northwest and Technetium-99 Plumes.

Groundwater data of the WAG 6 RI indicate an upgradient source of ⁹⁹Tc near the southeast corner of the C-400 Cleaning Building. However, the primary source of ⁹⁹Tc remains in the northwest corner of the C-400 Building and the adjacent reach of the North-South Diversion Ditch (10,000 to 40,000 pCi/L in the basal RGA).

4.3 SOUTHWEST PLUME

4.3.1 Trichloroethene

Groundwater sampling conducted as part of the WAG 27 RI (DOE 1999b) confirmed the existence of the Southwest Plume. Additional sampling during the Sitewide Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination (DOE 2000b) and the WAG 3 RI provided detail of the plume's structure and identified a previously unknown source of groundwater contamination at SWMU 4. The maximum measured TCE concentration onsite was 67,000 µg/L in boring 004-027, located immediately west of SWMU 4. Outside the plant fence, the maximum measured TCE concentration was 480 µg/L in boring DG-016.

Like the Northeast Plume, the Southwest Plume appears to collect TCE from multiple sources including the C-720 area, the Oil Landfarm (SWMU 1), and the Cylinder Drop Test Site (SWMU 91), with the major source being SWMU 4. Other potential source areas include the C-310 Building and the southwest corner of C-400.

4.3.2 Technetium-99

The WAG 3 and 27 RIs (DOE 2000d and 1999b) and the Sitewide Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination (DOE 2000b) provide the primary data used to define the extent of contamination in the Southwest Plume. Highest levels (3710 pCi/L, taken from temporary boring 001-182 in the lower RGA) are derived from the burial ground area of SWMU 4. Lesser discrete upgradient sources are found to the east at the C-310 Building, the northeast corner of the C-720 Building, and the north side of the C-409 Building. The off-site plume of ≥ 900 pCi/L is restricted to within approximately 91 m (300 ft) of the PGDP security fence line. Technetium-99 activity of ≥ 25 pCi/L extends to New Water Line Road on the west side of the plant. Groundwater flow directions, as inferred from RGA hydraulic potential maps, indicate that the contamination will migrate northward, potentially merging with the Northwest Plume near the Northwest Plume south extraction well field.

4.4 TECHNETIUM-99 PLUME

Technetium-99

Only limited data are available to define the source and extent of the Technetium-99 Plume. The plume source, which is generating at least several hundred pCi/L of ⁹⁹Tc in the nearby RGA, appears to

be located in the area of the northwest end of the C-616-E Lagoon. The Technetium-99 Plume passes under the northwest corner of the C-746-U Landfill, where MW275 intercepted water with a maximum ⁹⁹Tc activity of 213 pCi/L during CY 2000. The PGDP's North-South Diversion Ditch is a potential alternative source of the ⁹⁹Tc activity observed in the MW275 area. Groundwater analyses of MW152 document up to 219 pCi/L of ⁹⁹Tc in the RGA during CY 2000 (attributed to the Technetium-99 Plume) near the Shawnee Steam Plant.

These maps project the plume to extend to the Shawnee Steam Plant water intake canal, off the Ohio River, where both the PGDP and Shawnee Steam Plant derive their plant process water (a collective withdrawal of 10 to 20 million gal of water per day). The primary lines of evidence that the Technetium-99 Plume extends to the water intake canal are as follows:

- 1) a continuing presence of 150 to 350 pCi/L ⁹⁹Tc in water samples from MW152, located 2200 ft from the canal, since monitoring began in late 1993;
- 2) hydraulic potential gradients that indicate groundwater (with contaminants) flows from the MW152 area to the canal; and
- 3) a conceptual model of the RGA flow system in which the canal is the focus of discharge of groundwater because of the large surface water withdrawals from the canal and because the canal forms a bypass whereby groundwater discharges short of the main Ohio River channel.

Water samples from the intake canal have not contained detectable levels of ⁹⁹Tc contamination. This may be attributed to a high rate of dilution of groundwater discharge with Ohio River water in the canal.

5. TRENDS AT THE PGDP PUMP-AND-TREAT FACILITIES

Monitoring well systems located at the Northeast Plume Containment System and at both well fields of the Northwest Plume Groundwater System provide a means to assess the effectiveness of the interim remedial actions. The following sections summarize the interpretation of trends of groundwater contamination within the well fields over the life of the operations. Pumping has been ongoing in the Northwest Plume well fields since 1995. Operation of the Northeast Plume well field began in 1996. Generally, only minor changes in conditions at the extraction fields have been noted over the past year. These changes have been related both to variations in the concentration of contaminants within the RGA groundwater migrating past the well fields and to the expanding capture radius of the extraction wells.

5.1 NORTHEAST PLUME CONTAINMENT SYSTEM

5.1.1 Trichloroethene

Contaminant trends for the monitoring wells associated with the Northeast Plume Containment System show that TCE levels have decreased significantly since installation of the extraction wells in 1996. During the past year, the maximum concentration of TCE downgradient of the extraction field (as documented in MW294) has decreased by nearly 50% (from 810 to 420 µg/L). This decline follows the general downward trend of the concentration of TCE in groundwater observed upgradient of the well field at MW292 (1400 to 880 µg/L since mid 1999).

5.1.2 Technetium-99

During CY 2000, all analyses of groundwater from the Northeast Plume facility are less than the 25 pCi/L action limit for ⁹⁹Tc.

5.2 NORTHWEST PLUME CONTAINMENT SYSTEM

5.2.1 Trichloroethene

South Well Field

Trichloroethene concentrations in the downgradient monitoring wells of the South Well Field clearly show that the high concentration TCE core is being captured by the two extraction wells. Since 1996 the maximum concentration of TCE at the monitoring wells located at the South Field has fallen steadily from greater than 16,000 µg/L originally to less than 2000 µg/L during June of 2000. This decrease in the TCE concentration was achieved, even though the TCE concentration of groundwater migrating into the well field has risen steadily.

North Well Field

Although the concentration of TCE observed at upgradient MW234 has remained similar to last year's level, most of the monitoring wells adjacent to the extraction wells have shown a decrease in TCE levels during CY 2000. However, during the same time period, downgradient MW236 has shown steady increases in TCE concentrations (from 1200 to over 1500 µg/L). This suggests that the North Well Field is effectively removing TCE in the area immediately surrounding the extraction wells, but that the core of the plume may be moving past the capture zone of the North Field along the east side.

5.2.2 Technetium-99

South Well Field

Groundwater analyses for monitoring wells of the South Well Field demonstrate that the extraction wells are effective in the capture of the ⁹⁹Tc plume core. In general, although groundwater containing increased levels of ⁹⁹Tc has been observed upgradient of the well field, the activity of ⁹⁹Tc has fallen steadily in the monitoring wells located adjacent to the extraction wells and at downgradient MW243 (from 1060 pCi/L in CY 1999 to 169 pCi/L in CY 2000). On the east side of the extraction field, consistent ⁹⁹Tc activities in MW242 (between 130 and 180 pCi/L during CY 1999 and 2000) indicate that some ⁹⁹Tc contaminated groundwater is migrating past the well field along the east margin of the plume.

North Well Field

Technetium-99 analyses for the North Well Field suggest that the extraction wells (particularly EW229) have remained effective in capturing the core of the ⁹⁹Tc plume. Technetium-99 levels in monitoring wells on the west side of the well field continue a trend begun in 1995 of decreasing ⁹⁹Tc activity (between 130 and 180 pCi/L during CY 1999 and 2000). However, recent analyses continue to show a higher ⁹⁹Tc activity on the east side of the well field (1100 to 1800 pCi/L in MW234). This trend indicates that some migration of contaminated groundwater is occurring past the North Well Field along the east margin of the plume.

6. USES OF THIS REPORT

This evaluation of groundwater contaminant trends for CY 2000 supports several goals of the PGDP environmental program. Foremost, the updated plume maps and definition of trends will be used in remedial action decisions for the Groundwater Operable Unit to provide the following information:

- define additional areas contributing significant contamination to the RGA,
- scope the dimensions of potential remedial actions, and
- refine the extent of off-site areas that will be addressed by temporary or permanent institutional controls.

This same assessment will support the ongoing evaluation of the adequacy of DOE's Water Policy and effectiveness of the PGDP groundwater monitoring program. To this end, this report is being included as an appendix to the 2000 Annual Site Environmental Report. In addition, the trends and extent of contamination defined by this report will help identify areas of groundwater/surface water interaction to be considered in the upcoming RI of the Surface Water Operable Unit.

7. REFERENCES

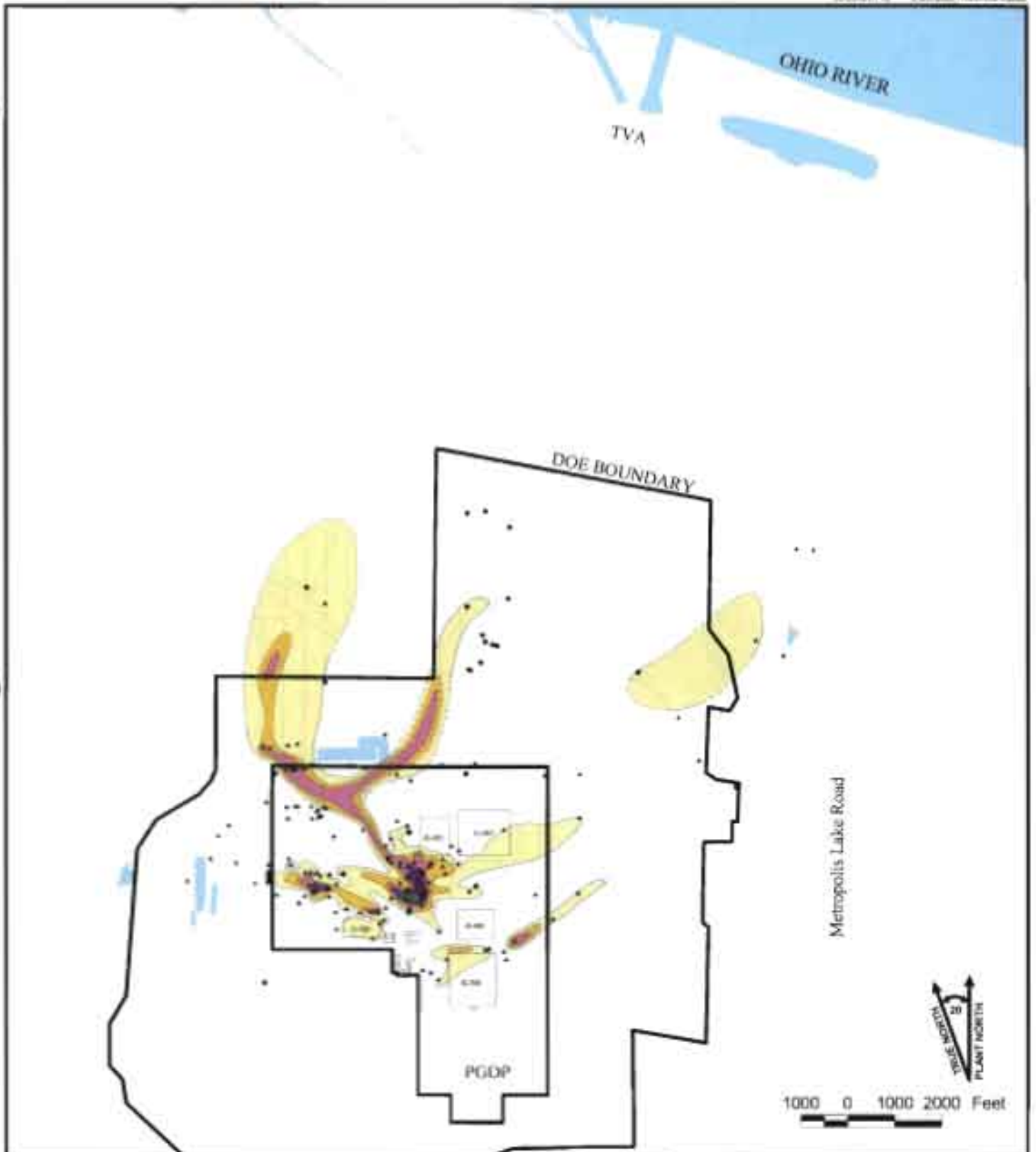
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APPENDIX A
PLUME MAPS

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LEGEND:

- | | | | |
|---|---------------------------|---|---------------------------------------|
|  | TCE - > 100,000 ug/L |  | Interpreted Isoconcentration Boundary |
|  | TCE - 10,000-100,000 ug/L |  | Monitoring Well Sample Location |
|  | TCE - 1,000- 10,000 ug/L |  | Borehole Sample Location |
|  | TCE - 100- 1,000 ug/L |  | Stream |
|  | TCE - 5- 100 ug/L |  | Water Body |

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DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

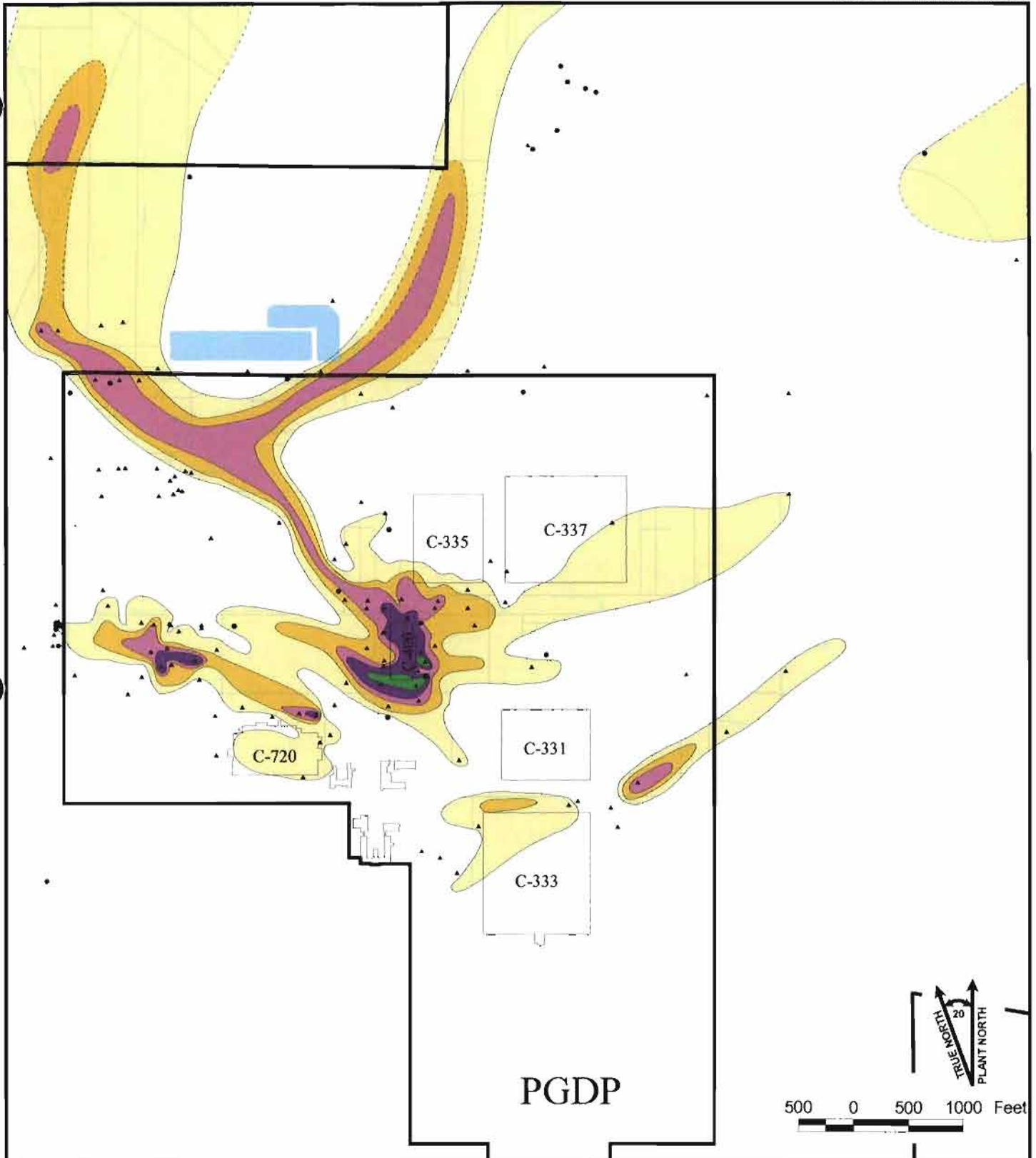


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Fig. A.1. TCE in upper Regional Gravel Aquifer.



LEGEND:

	TCE - > 100,000 ug/L		Interpreted Isoconcentration Boundary
	TCE - 10,000-100,000 ug/L		Monitoring Well Sample Location
	TCE - 1,000- 10,000 ug/L		Borehole Sample Location
	TCE - 100- 1,000 ug/L		Stream
	TCE - 5- 100 ug/L		Water Body

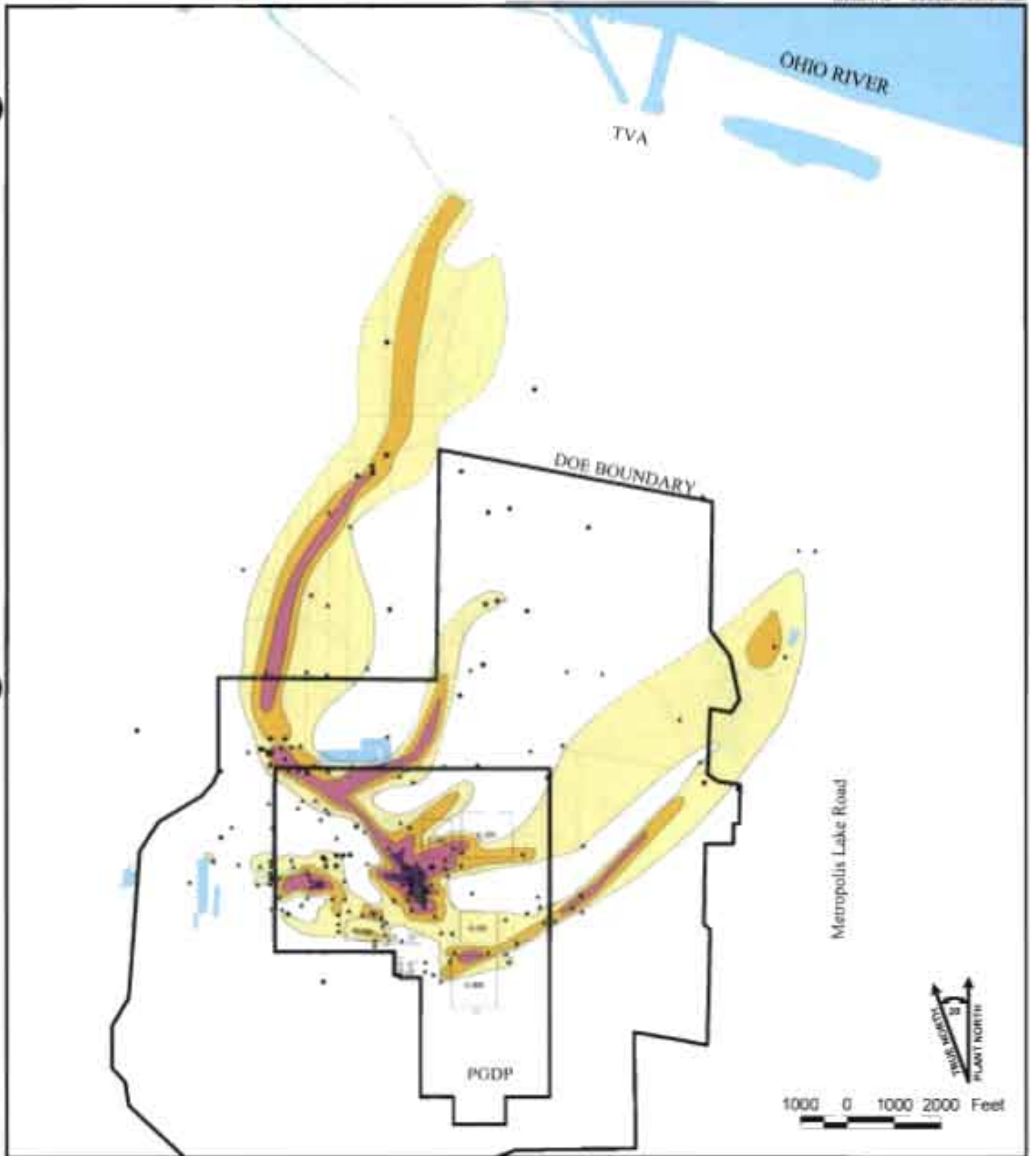
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Fig. A.2. TCE in upper Regional Gravel Aquifer.



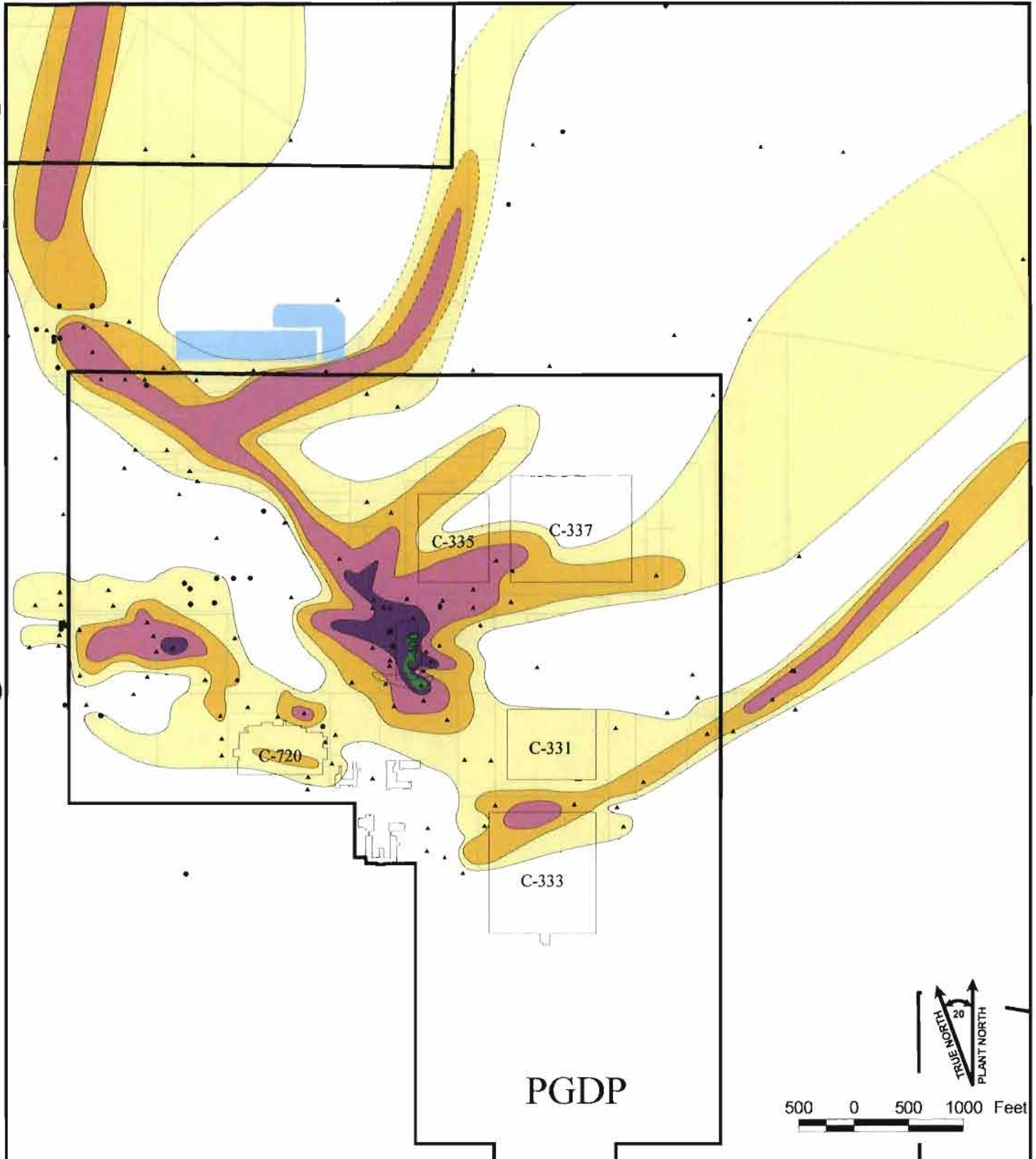
LEGEND:	
	TCE - > 100,000 ug/L
	TCE - 10,000-100,000 ug/L
	TCE - 1,000- 10,000 ug/L
	TCE - 100- 1,000 ug/L
	TCE - 5- 100 ug/L
	Interpreted Isoconcentration Boundary
	Monitoring Well Sample Location
	Borehole Sample Location
	Stream
	Water Body

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Fig. A.3. TCE in middle Regional Gravel Aquifer.



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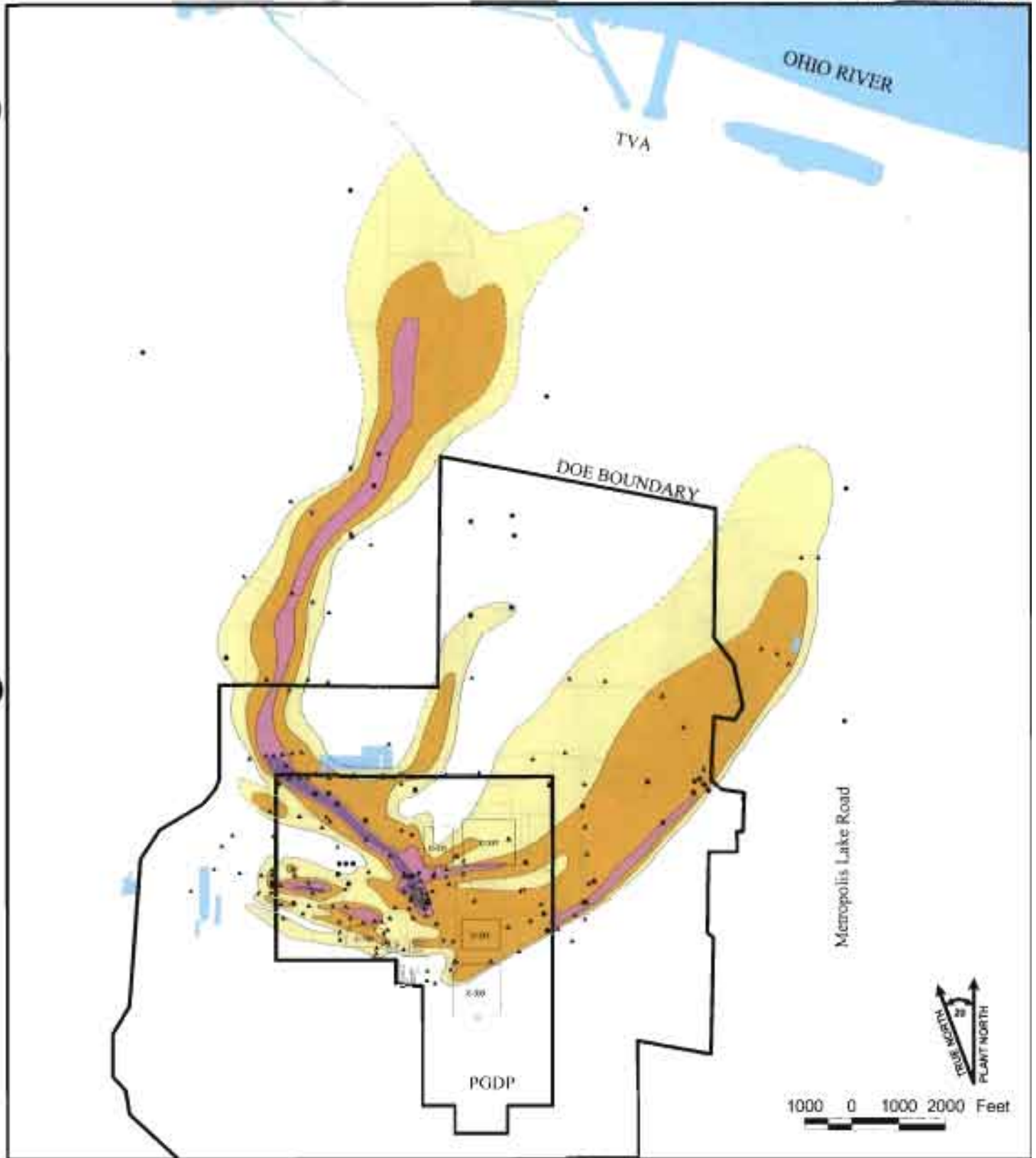
	TCE - > 100,000 ug/L		Interpreted Isoconcentration Boundary
	TCE - 10,000-100,000 ug/L		Monitoring Well Sample Location
	TCE - 1,000- 10,000 ug/L		Borehole Sample Location
	TCE - 100- 1,000 ug/L		Stream
	TCE - 5- 100 ug/L		Water Body

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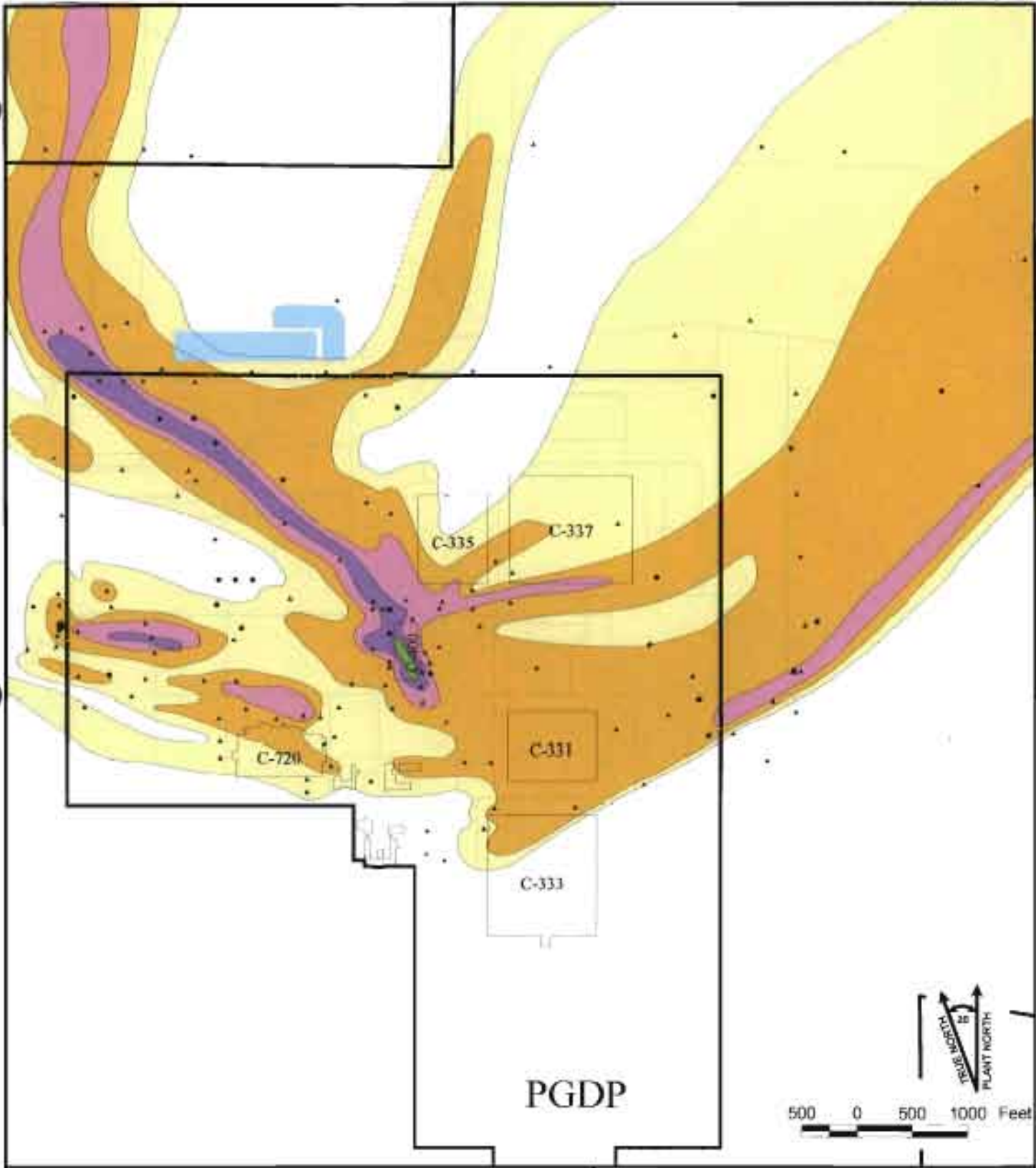
Fig. A.4. TCE in middle Regional Gravel Aquifer.



LEGEND:	
	TCE - > 100,000 ug/L
	TCE - 10,000-100,000 ug/L
	TCE - 1,000- 10,000 ug/L
	TCE - 100- 1,000 ug/L
	TCE - 5- 100 ug/L
	Interpreted Isoconcentration Boundary
	Monitoring Well Sample Location
	Borehole Sample Location
	Stream
	Water Body

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Fig. A.5. TCE in lower Regional Gravel Aquifer.



LEGEND:

	TCE - > 100,000 ug/l.		Interpreted Isoconcentration Boundary
	TCE - 10,000-100,000 ug/l.		Monitoring Well Sample Location
	TCE - 1,000- 10,000 ug/l.		Borehole Sample Location
	TCE - 100- 1,000 ug/l.		Stream
	TCE - 5- 100 ug/l.		Water Body

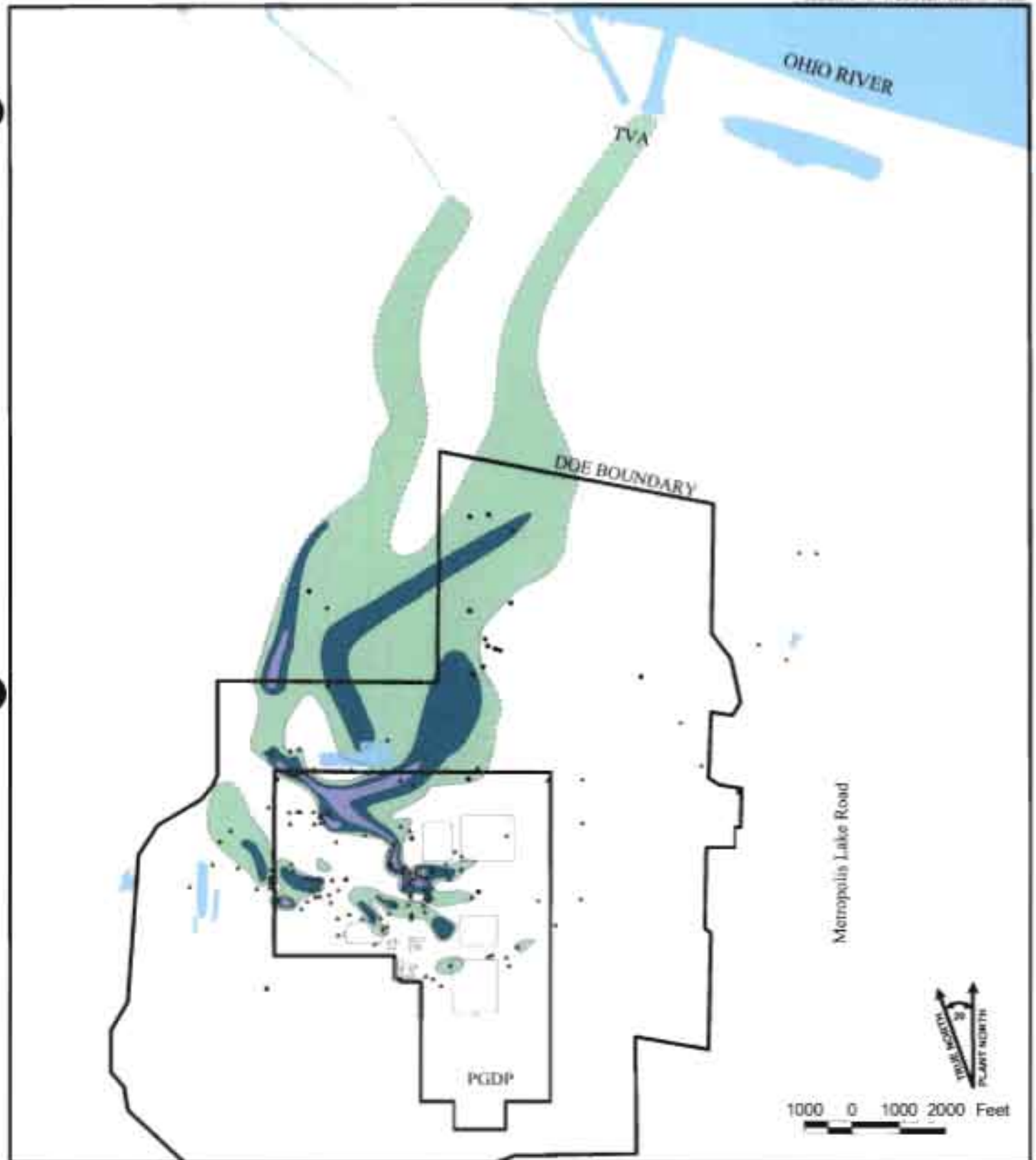
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Fig. A.6. TCE in lower Regional Gravel Aquifer.

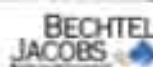


LEGEND:

- | | |
|---------------------------------------|---------------------------------|
| Interpreted Isoconcentration Boundary | |
| | Tc-99 - > 3,790 pCi/L |
| | Tc-99 - 900-3,790 pCi/L |
| | Tc-99 - 100- 900 pCi/L |
| | Tc-99 - 25- 100 pCi/L |
| | Monitoring Well Sample Location |
| | Borehole Sample Location |
| | Stream |
| | Water Body |

Fig. A.7. Tc-99 in upper Regional Gravel Aquifer.

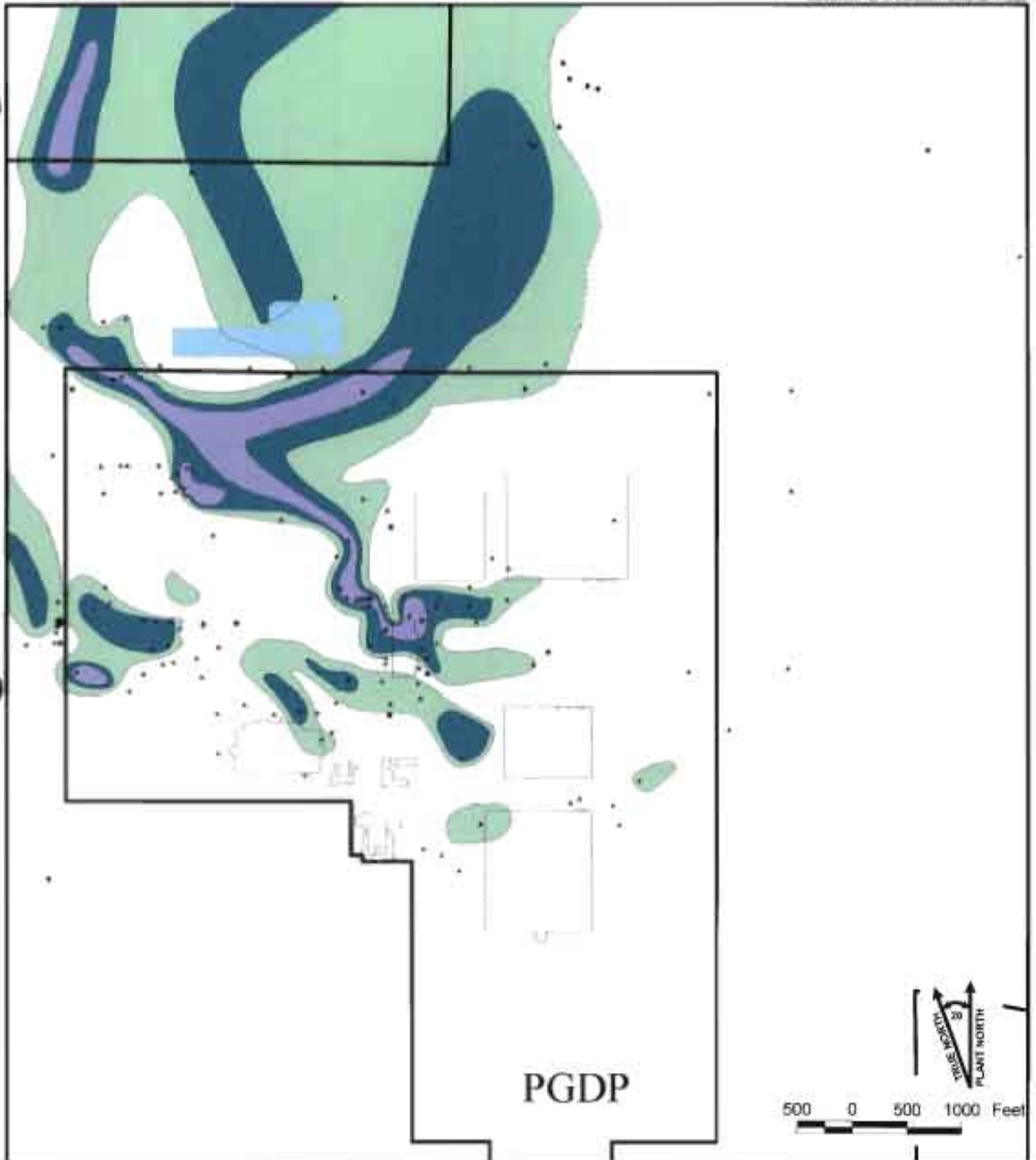
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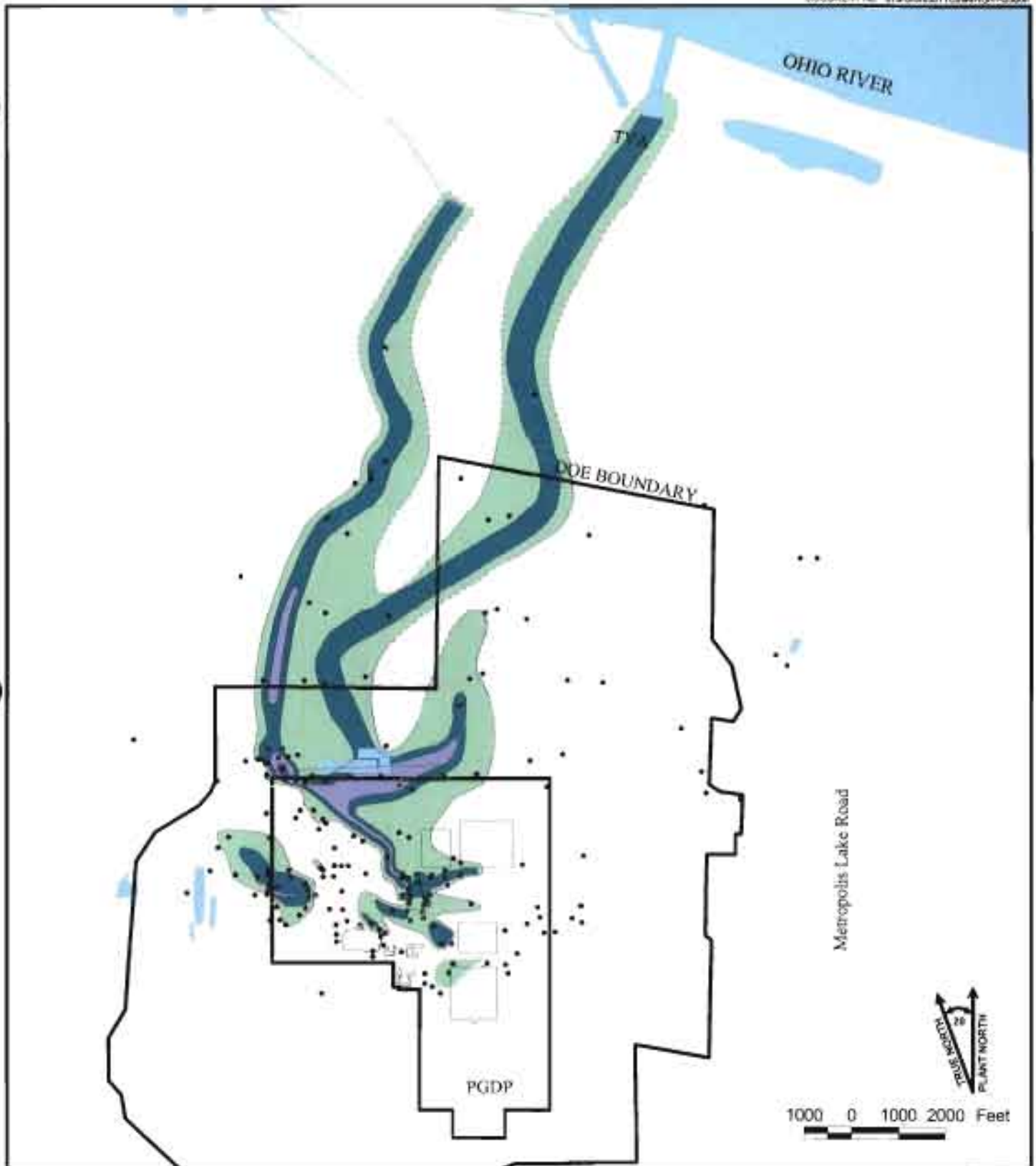
Interpreted Isoconcentration Boundary	Monitoring Well Sample Location
Tc-99 - > 3,790 pCi/L	Borehole Sample Location
Tc-99 - 900-3,790 pCi/L	Stream
Tc-99 - 100- 900 pCi/L	Water Body
Tc-99 - 25- 100 pCi/L	

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Fig. A.8. Tc-99 in upper Regional Gravel Aquifer.



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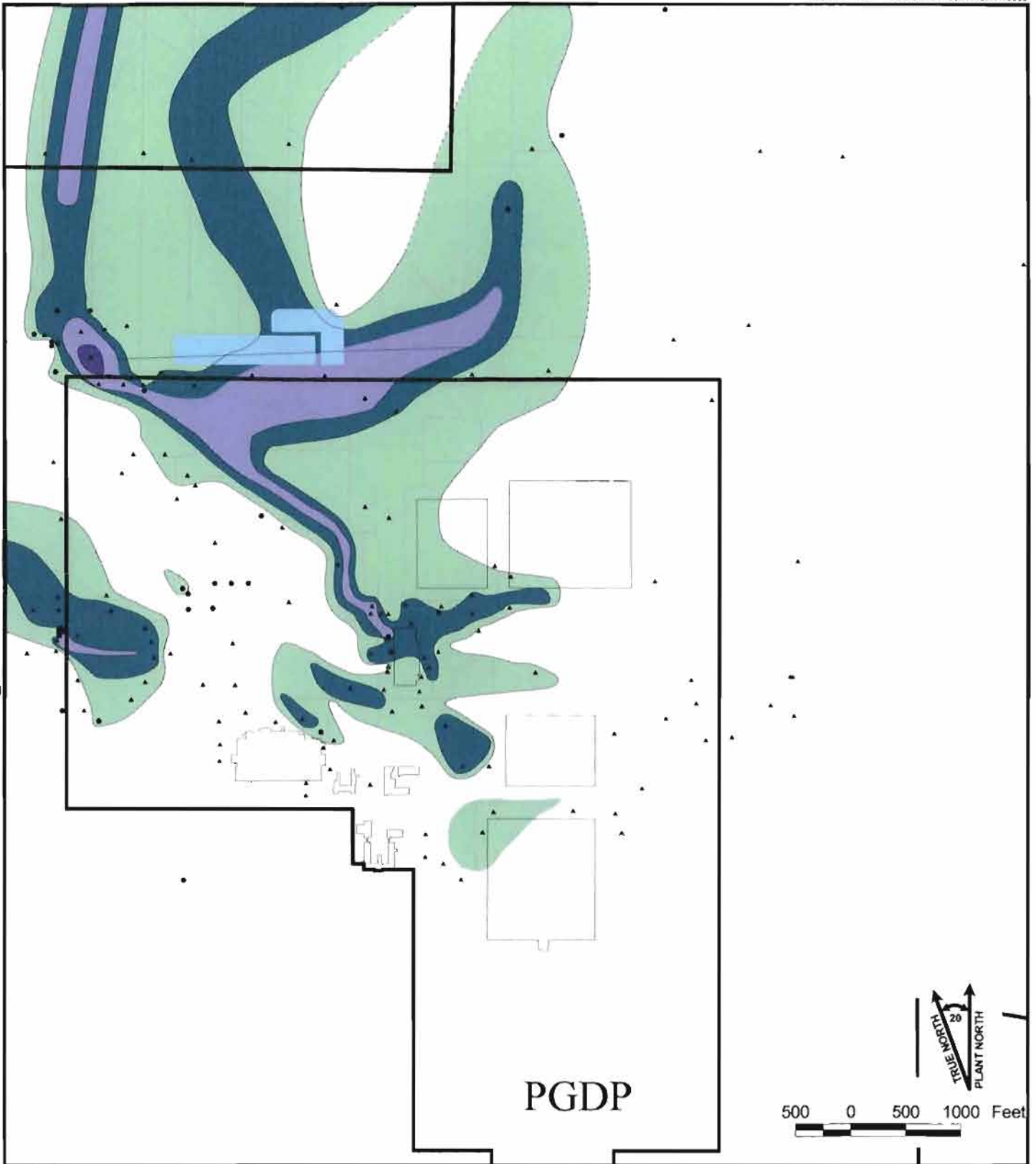
Interpreted Isoconcentration Boundary	Monitoring Well Sample Location
Tc-99 - > 3,790 pCi/L	Borehole Sample Location
Tc-99 - 900-3,790 pCi/L	Stream
Tc-99 - 100- 900 pCi/L	Water Body
Tc-99 - 25- 100 pCi/L	

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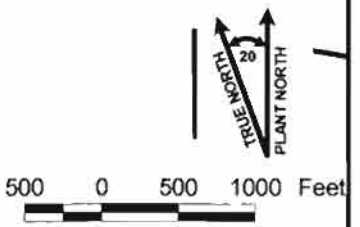
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Fig. A.9. Tc-99 in middle Regional Gravel Aquifer.



PGDP



LEGEND:

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|---------------------------------------|---------------------------------|
| Interpreted Isoconcentration Boundary | Monitoring Well Sample Location |
| Tc-99 - > 3,790 pCi/L | Borehole Sample Location |
| Tc-99 - 900-3,790 pCi/L | Stream |
| Tc-99 - 100- 900 pCi/L | Water Body |
| Tc-99 - 25- 100 pCi/L | |

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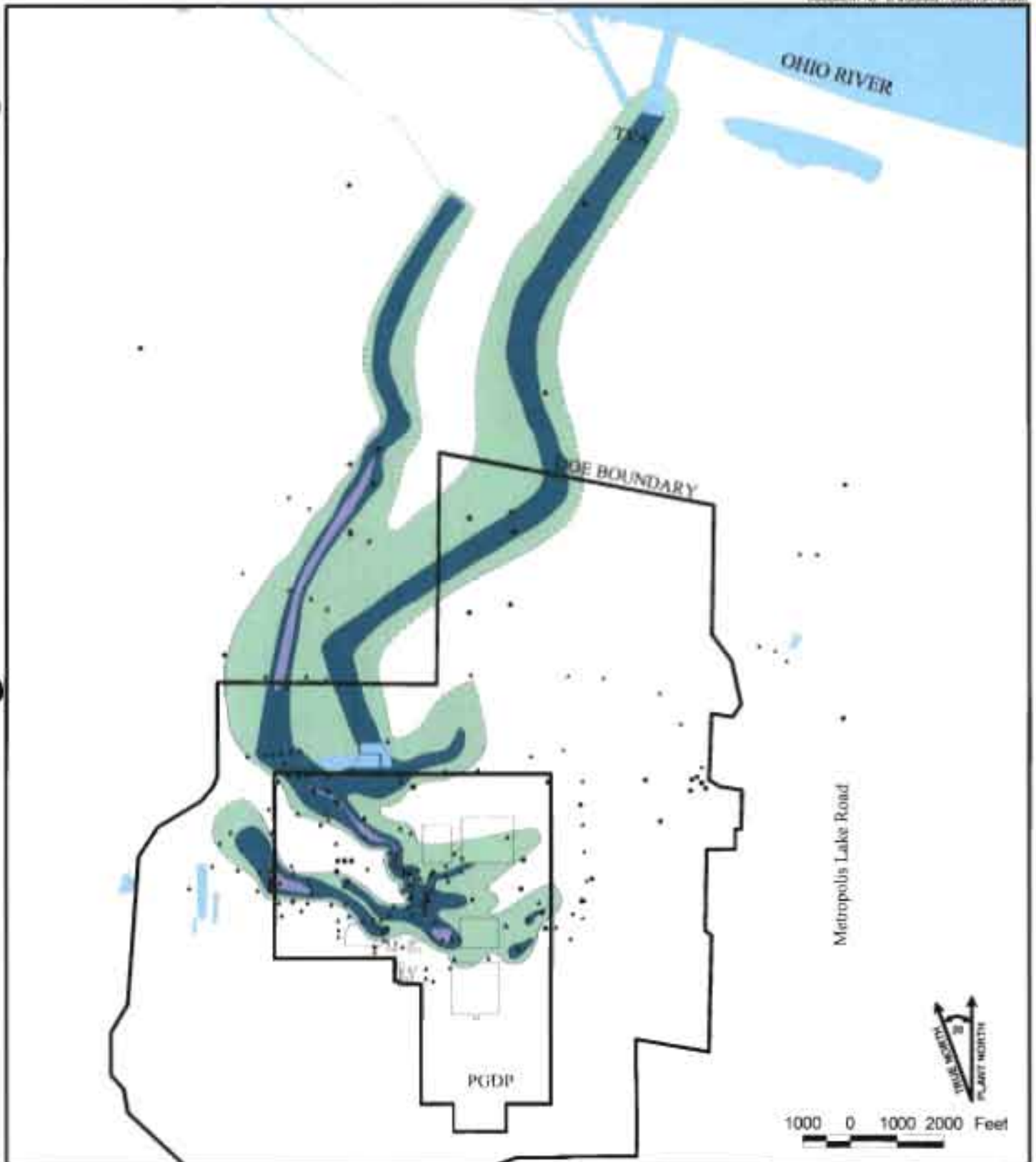


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Fig. A.10. Tc-99 in middle Regional Gravel Aquifer.



LEGEND:

- | | |
|---------------------------------------|---------------------------------|
| Interpreted Isoconcentration Boundary | Monitoring Well Sample Location |
| Tc-99 - > 3,790 pCi/L | Borehole Sample Location |
| Tc-99 - 900-3,790 pCi/L | Stream |
| Tc-99 - 100- 900 pCi/L | Water Body |
| Tc-99 - 25- 100 pCi/L | |

Fig. A.11. Tc-99 in lower Regional Gravel Aquifer.

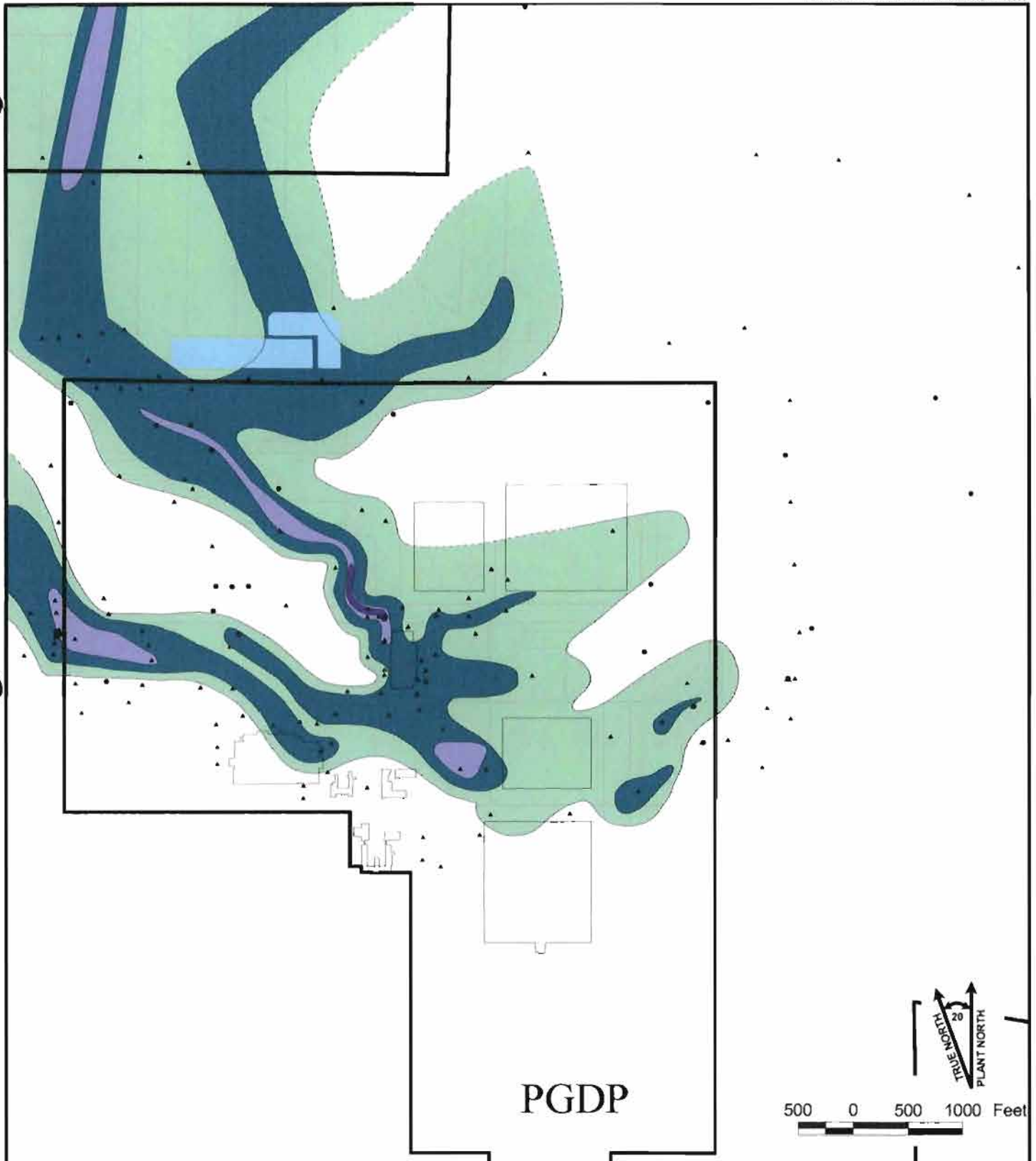
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LEGEND:

	Interpreted Isoconcentration Boundary		Monitoring Well Sample Location
	Tc-99 - > 3,790 pCi/L		Borehole Sample Location
	Tc-99 - 900-3,790 pCi/L		Stream
	Tc-99 - 100- 900 pCi/L		Water Body
	Tc-99 - 25- 100 pCi/L		

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Fig. A.12. Tc-99 in lower Regional Gravel Aquifer.

APPENDIX B

DATA SET

B.1 DEVELOPMENT OF DATA SET

B.1.1 DESCRIPTION OF MAPS

The maps generated for this report graphically portray trichloroethene (TCE) and technetium-99 (⁹⁹Tc) concentrations in the Regional Gravel Aquifer (RGA). For purposes of this report, the RGA is defined as those sediments found between the elevations of 76.2 m (250 ft) and 97.5 m (320 ft) amsl and bounded by the Porters Creek terrace to the south and the Ohio River to the north. The east and west boundaries of the study area are defined by Metropolis Lake Road and Bethel Church Road, respectively. The upper and lower boundaries were selected so that the shallowest and deepest portions of the RGA would be included. As a result, some of the groundwater samples in the data set actually may be from the Upper Continental Recharge System or from the McNairy Formation. However, it is appropriate to include these samples since they serve as boundaries to the plumes and help define the lateral and vertical extents of contamination.

B.1.2 DESCRIPTION OF DATA SET

The data set used for this plume map revision contains groundwater data from two types of sample locations: monitoring wells whose screen mid-point is between elevations 76.2 m (250 ft) and 97.5 m (320 ft) amsl and temporary borings in which a groundwater sample was collected from between the same two elevations. Only those wells and borings for which location coordinates, surface elevations, and screen or sample depths were available were included in the data set. As a result, data from the following projects are not included in this interpretation:

- monitoring wells belonging to the Tennessee Valley Authority's Shawnee Steam Plant,
- residential water wells within the study area,
- temporary borings from the WAG 22 RI, and
- temporary borings from the Northeast Plume Interim Remedial Action.

B.1.3 SELECTION OF DATA POINTS

To identify those wells and borings that fit the depth criteria, the Oak Ridge Environmental Information System (OREIS) database was queried for all water samples analyzed for TCE, ⁹⁹Tc, or beta activity. The sample interval for each collected sample was converted to elevation and filtered to exclude those samples outside the elevations used to define the RGA. For monitoring wells, the elevation of the mid-point of the well screen was used as the sample depth. The samples then were segregated into lower, middle, and upper RGA intervals, defined as elevations 76.2 to 89.9 m (250 to 295 ft), 89.9 to 93.0 m (295 to 305 ft), and 93.0 to 97.5 m (305 to 320 ft) amsl, respectively. The interval for the lower RGA is larger than the upper or middle, so that data from "channels" identified in various portions of the plant would be included in the interpretation. Once the sample points were assigned to one of the three intervals, base maps were printed for each interval that showed only those wells and borings that collected a sample from that interval.

B.1.4 SELECTION OF GROUNDWATER DATA

The groundwater data set consists of TCE concentrations, ⁹⁹Tc activities, or beta activities for those data points defined as RGA in this report. The data were selected from all groundwater data collected on or before December 31, 2000, and entered in the Oak Ridge Environmental Information System by

February 1, 2001. For monitoring well data, time versus concentration plots were created and trend lines developed. To normalize the data, these trend lines were used to determine the probable concentration of the well as of June 30, 2000. This value then was plotted on the base maps. For temporary borings, the actual analytical value was used. For borings with multiple samples within one interval, the highest concentration within the interval was selected and plotted on the base maps. Data from CY 2000 were given the highest priority, while data from earlier years were used in trending and identifying approximate boundaries with the oldest data being of least value in the interpretation.

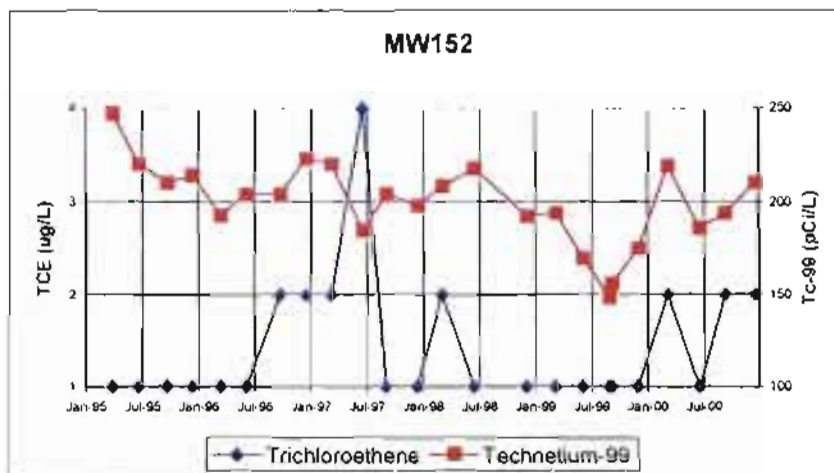
B.1.5 MAPPING OF DATA

After all data were plotted on the base maps, the data were hand-contoured. Separate maps were made for both TCE and ⁹⁹Tc in the upper, middle, and lower RGA intervals. The contour intervals for TCE and ⁹⁹Tc were as follows.

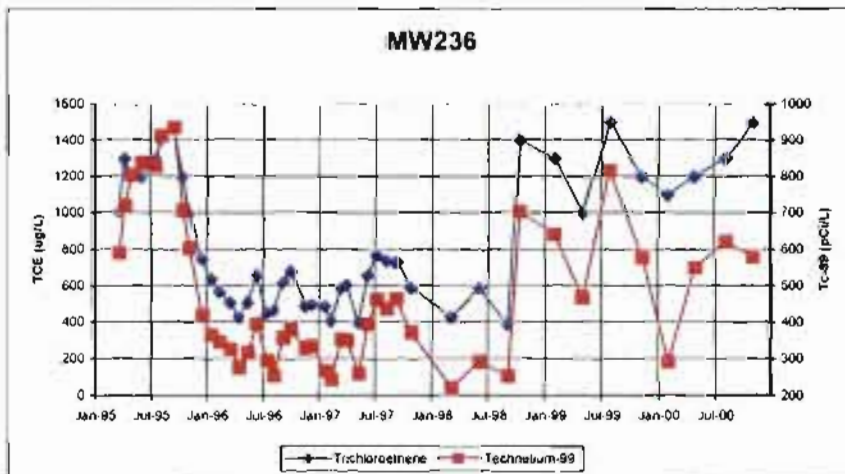
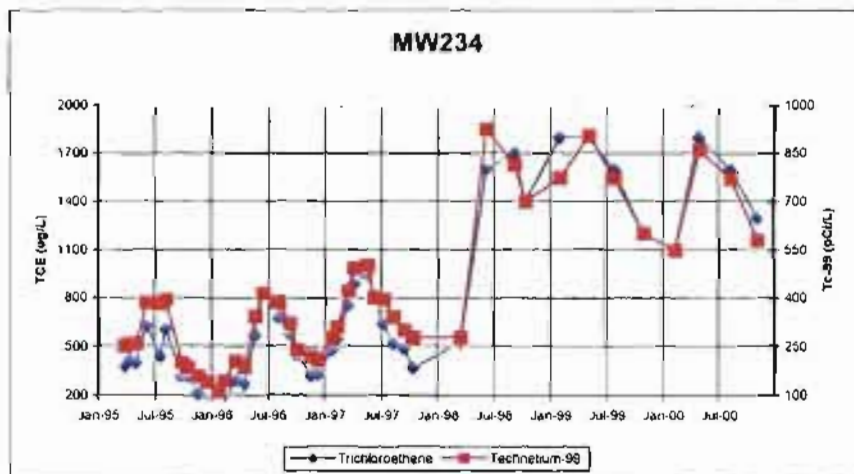
Trichloroethene	Technetium-99
5 µg/L	25 pCi/L
100 µg/L	100 pCi/L
1000 µg/L	900 pCi/L
10,000 µg/L	3790 pCi/L
100,000 µg/L	10,000 pCi/L

The contour intervals for ⁹⁹Tc reflect in part detection limits (25 pCi/L) or regulatory benchmarks (900 and 3790 pCi/L). After contouring was completed, the maps were digitized and a composite map was created by combining the three interval maps for TCE and ⁹⁹Tc.

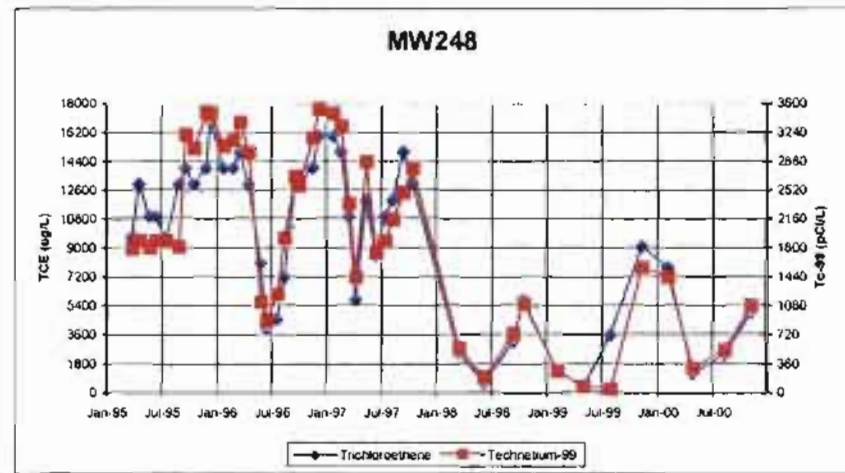
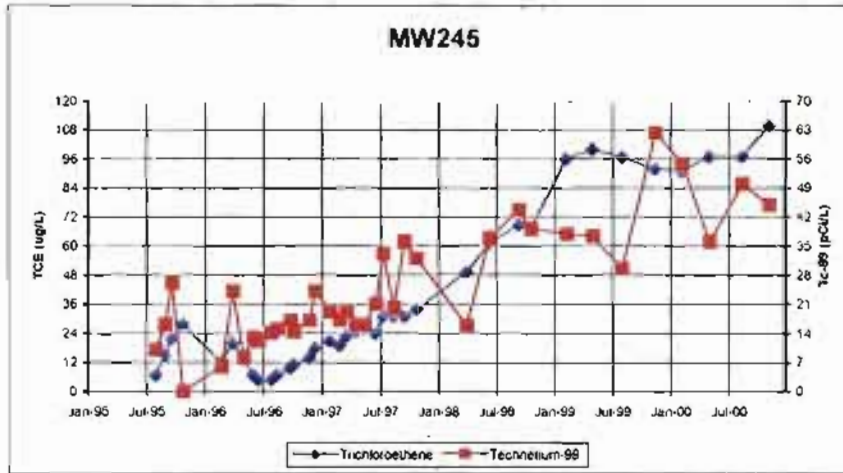
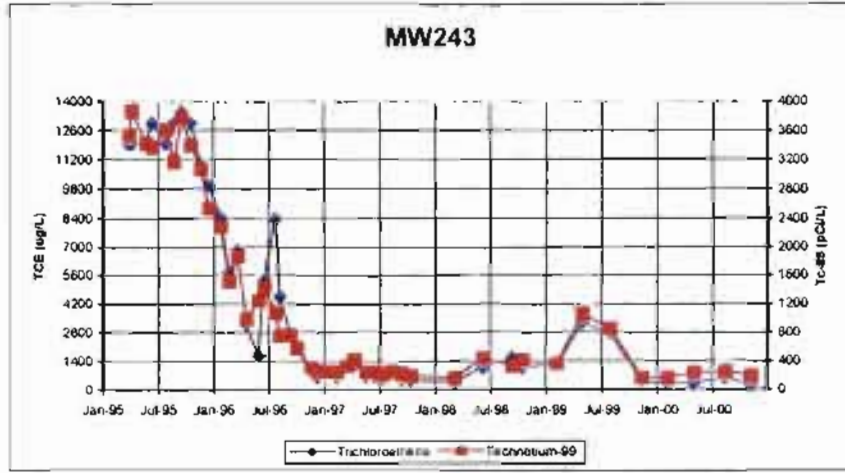
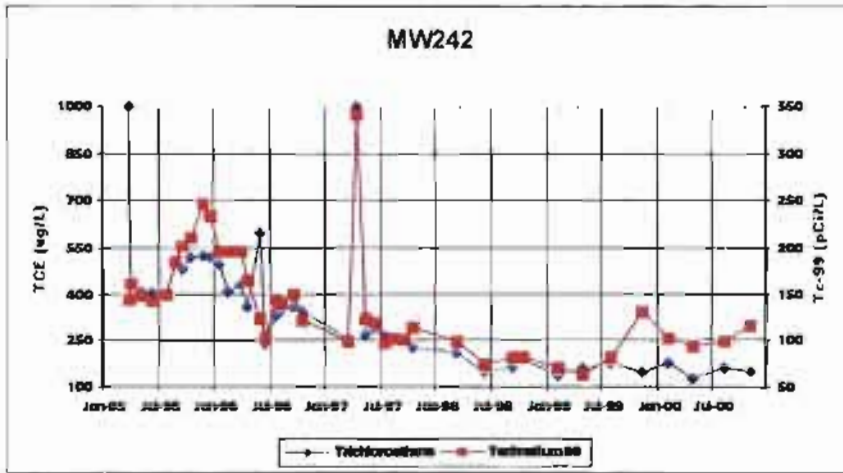
Technetium-99 Plume near Shawnee Steam Plant



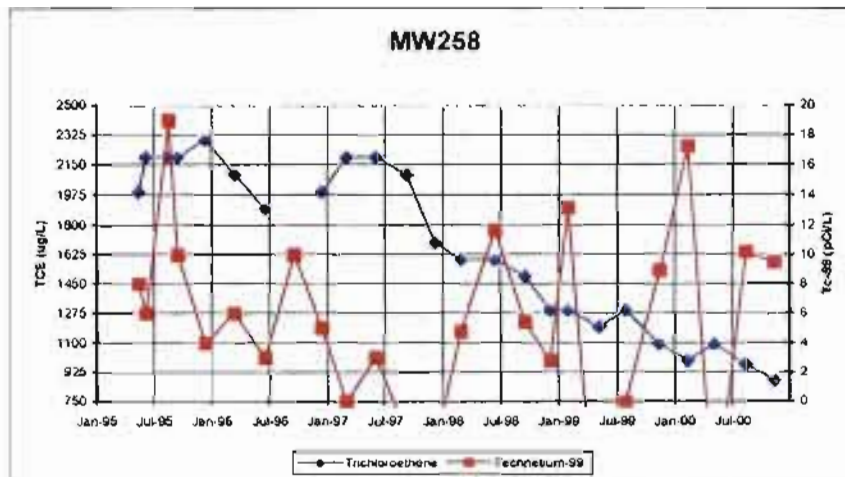
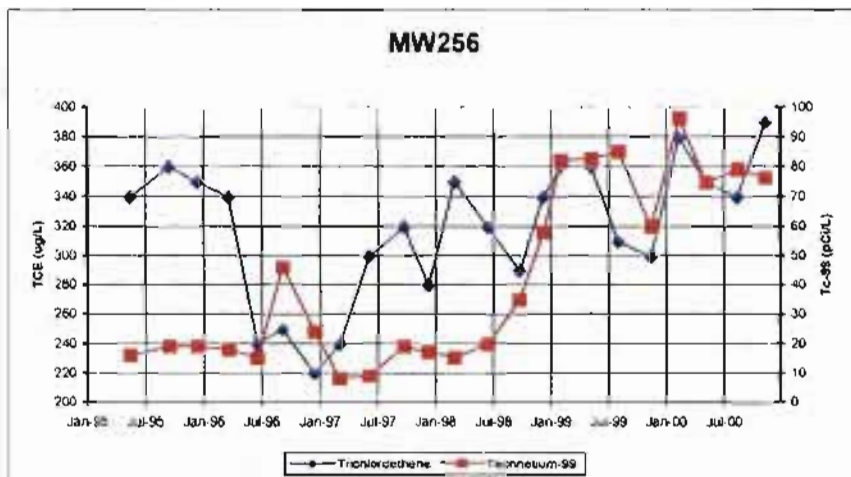
Northwest Plume North Well Field



Northwest Plume South Well Field

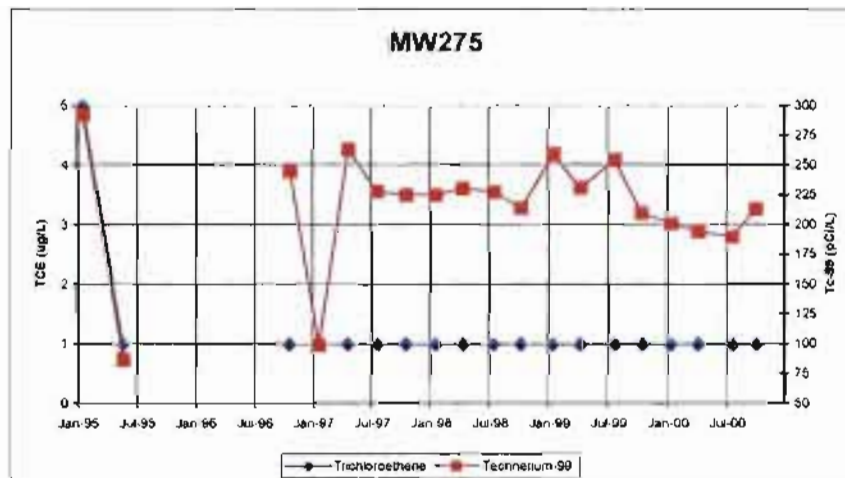
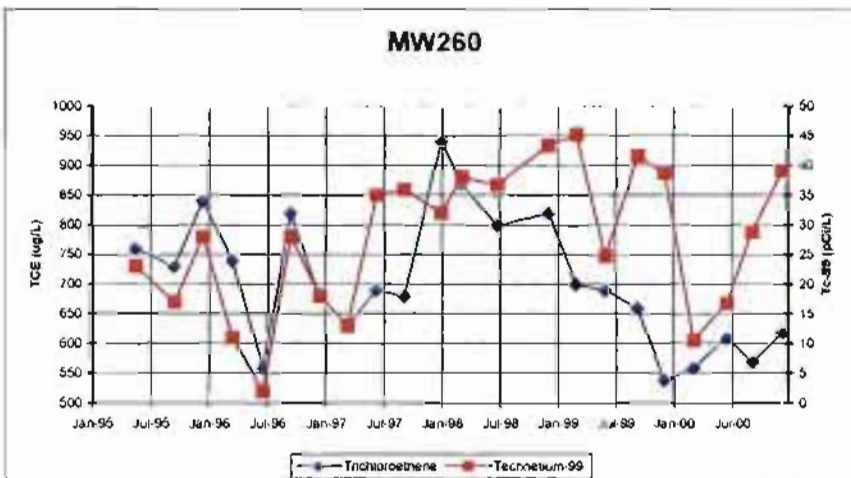


Northeast Plume, East Side PGDP

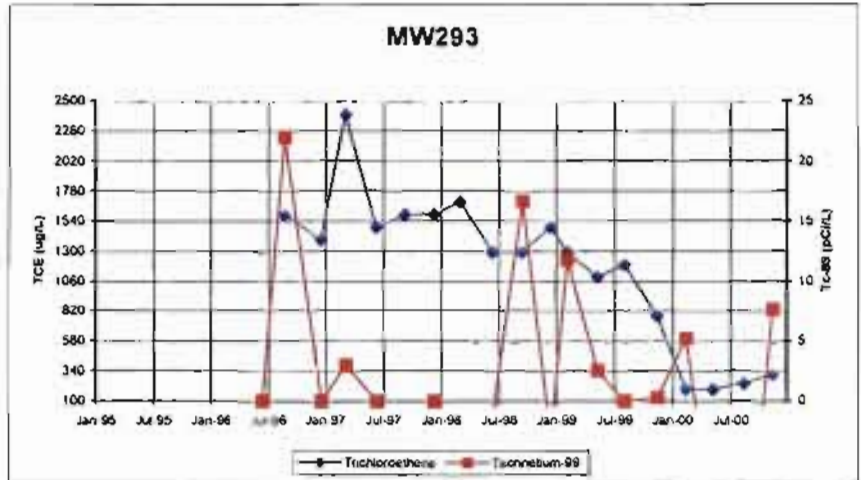
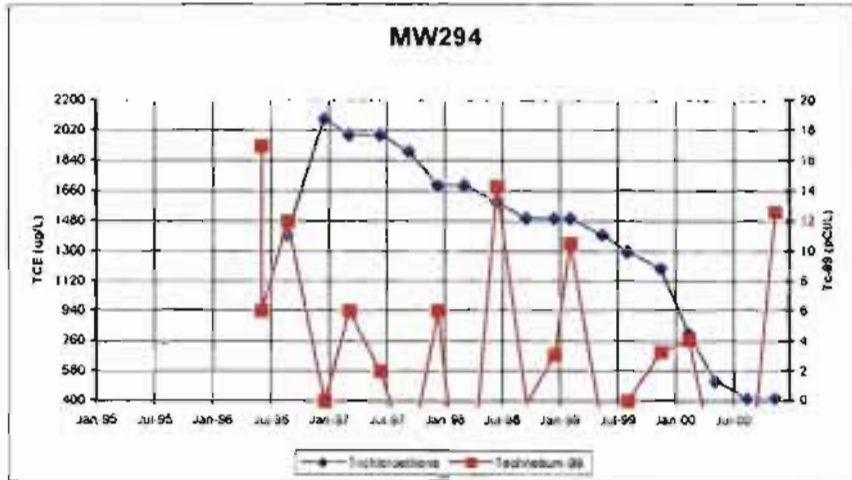
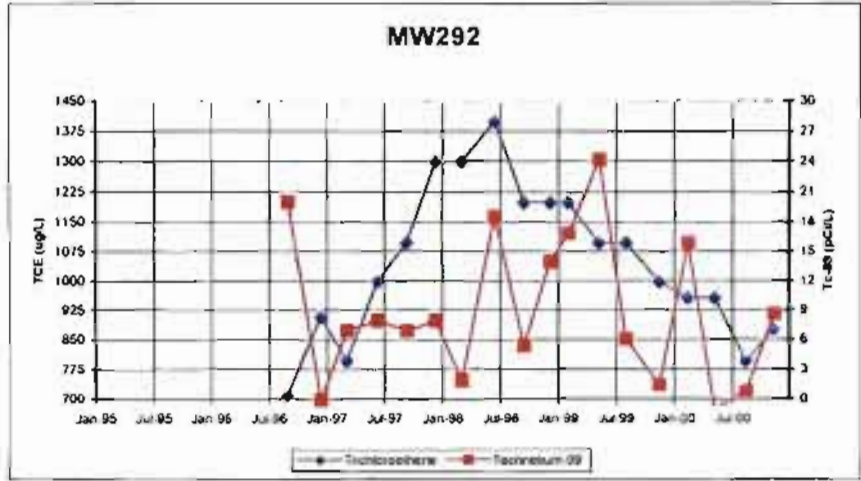
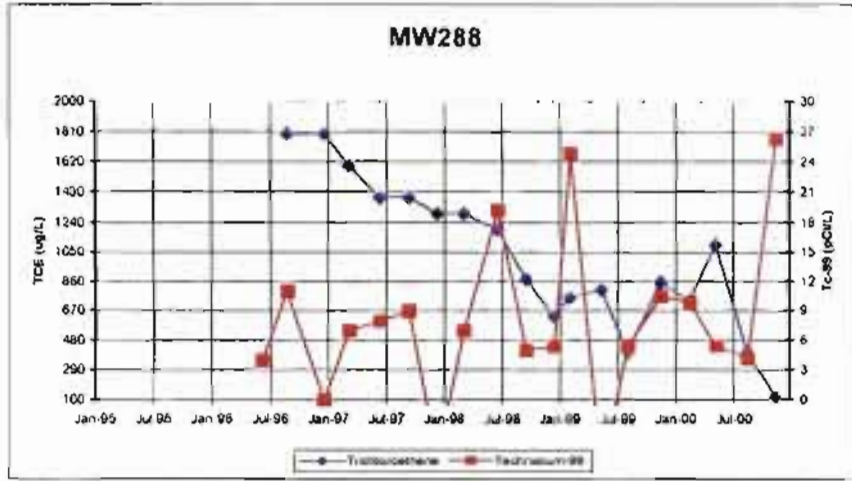


Northeast Plume, East of C-400 Building

Technetium-99 Plume, C-746-U Landfill



Northeast Plume



Monitoring well data set for upper RGA plume map

Horizon	Station name	TCE ~ µg/L				Tc-99 ~ pCi/L			
		2000 value*	Max results*	Result qualifier	Date collected	2000 value*	Max results*	Result qualifier	Date collected
URGA	MW12		7		10/26/1989		188		10/26/1989
URGA	MW138		5	U	04/22/1990		2760	J	04/22/1990
URGA	MW149		5	U	08/29/1990		17		09/21/1993
URGA	MW153		5	U	03/21/1991		4		09/20/1990
URGA	MW156	240000	550000		07/19/1991	0	211		08/09/1994
URGA	MW159		120		03/14/1991		101		05/14/1997
URGA	MW159		120	Y	08/05/1999		101		05/14/1997
URGA	MW165	1	5		12/13/1996	29	98.85		03/04/1999
URGA	MW168	290	450		05/07/1996	2650	3154.3		05/11/1998
URGA	MW173	1	4		12/11/1996	0	1401.7		06/24/1998
URGA	MW178	1200	11363		12/10/1997	436	1734.8	J	05/01/1991
URGA	MW181	1	5	U	12/02/1996	198	233		11/07/1994
URGA	MW192	1	1	!	10/18/1991	0	22		09/20/1994
URGA	MW192	1	1	U	03/15/2000	0	22		09/20/1994
URGA	MW192	1	1	UJ	06/22/1993	0	22		09/20/1994
URGA	MW192	1	1	UX	06/06/1994	0	22		09/20/1994
URGA	MW193	16	102		12/19/1994	0	17		09/20/1994
URGA	MW197	4	16		09/23/1996	24	283		12/08/1993
URGA	MW20	7	4100		08/26/1994	0	1474		08/26/1994
URGA	MW205	1	100	!	05/13/1991	17	89		06/29/1993
URGA	MW206	1	2	!	05/15/1991	6	55		09/16/1993
URGA	MW21		5	U	03/26/1991		71		08/20/1988
URGA	MW22		77		12/01/1992		82		12/01/1992
URGA	MW220	1	1	!	05/09/1993	16	29		07/11/1994
URGA	MW220	1	1	U	10/04/2000	16	29		07/11/1994
URGA	MW220	1	1	UY	10/12/1999	16	29		07/11/1994
URGA	MW221	3	8		04/12/1994	9	30.3		07/12/1999
URGA	MW222	1	1	!	04/19/1993	8	28		04/12/1994
URGA	MW222	1	1	U	10/03/2000	8	28		04/12/1994
URGA	MW222	1	1	UX	07/19/2000	8	28		04/12/1994
URGA	MW223	1	2		10/03/2000	7	21.2		01/05/1999
URGA	MW224	2	9		10/03/2000	10	15		07/11/1995
URGA	MW225		1	!	04/21/1993		29		04/12/1994
URGA	MW225		1	U	07/12/1994		29		04/12/1994
URGA	MW227	6	8		07/20/1999	4	367		04/14/1997
URGA	MW264	3	6		10/04/2000	4	121		11/08/1994
URGA	MW268	1	5	!	01/18/1995	30	63		05/22/1995
URGA	MW270	1	5	!	01/18/1995	31	42		01/21/1997
URGA	MW270	1	5	U	10/10/2000	31	42		01/21/1997
URGA	MW274	1	5	!	01/17/1995	146	329		05/22/1995
URGA	MW276	18	29		10/23/1996	33	85.1		01/19/1999
URGA	MW329	1	11		12/20/2000	0	19		09/10/1999
URGA	MW344	1	1	U	10/16/2000	9	10.4	U	07/27/2000
URGA	MW344	1	1	UY	04/27/2000	9	10.4	U	07/27/2000
URGA	MW38		14		10/24/1989		54		06/08/1989
URGA	MW39		10	!	05/09/1993		38		05/03/1989
URGA	MW41		25		04/20/1993		39		07/11/1989

Monitoring well data set for upper RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L				Tc-99 ~ pCi/L			
		2000 value*	Max results*	Result qualifier	Date collected	2000 value*	Max results*	Result qualifier	Date collected
URGA	MW42		5	U				83	04/03/1990
URGA	MW44		120					99	12/18/1989
URGA	MW50		5	U				36	10/07/1992
URGA	MW51		2					53.2	07/23/1992
URGA	MW52		5	U				27	04/27/1989
URGA	MW53		5	U				25	! 10/13/1988
URGA	MW54		5	U				25	! 08/23/1988
URGA	MW63	5	41			11		25	! 08/20/1988
URGA	MW66	1200	13000			649		3670	04/19/1989
URGA	MW71	4	107			19		37	04/26/1989
URGA	PZ107		6					38	09/19/1994

*2000 value = inferred contaminant level on June 30, 2000. Max results = maximum contaminant level observed in water samples.

Qualifiers used in monitoring well data set for upper RGA plume map

- ! Additional qualifier field contains an "<" or an ">"
- J Indicates an estimated value
- U ORGANIC: Compound analyzed for but not detected at or below the lowest concentration reported.
RADS: Indicates analyte/nuclide was analyzed for, but not detected.
- X Other specific flags and footnotes may be required to properly define the results
- Y MS,MSD recovery and/or RPD failed acceptance criteria

Monitoring well data set for middle RGA plume map

Horizon	Station name	TCE ~ µg/L				Tc-99 ~ pCi/L			
		2000 value*	Max results*	Result qualifier	Date collected	2000 value*	Max results*	Result qualifier	Date collected
MRGA	MW103	1	5	!	05/26/1993	0	20		07/27/1994
MRGA	MW106	1	20	!	02/14/1992	7	29		06/07/1993
MRGA	MW123		5	U	03/20/1991		59		12/17/1996
MRGA	MW126	30	600		05/19/1993	8	57.5		05/19/1993
MRGA	MW137	3	5	U	08/19/1990	125	227		09/13/1993
MRGA	MW139	4	5		03/10/2000	7	22		09/07/1993
MRGA	MW139	4	5	U	08/16/1990	7	22		09/07/1993
MRGA	MW142		5	!	05/26/1993		16		02/06/1995
MRGA	MW142		5	U	08/16/1990		16		02/06/1995
MRGA	MW147		5	J	06/23/1993		16		12/07/1993
MRGA	MW148		59		12/15/1994		15		09/12/1994
MRGA	MW169	2	10		04/29/1991	0	3400	R	03/25/1991
MRGA	MW175	13000	18000		05/12/1998	399	824		01/27/1998
MRGA	MW179	6	6		01/06/2000	23	800	J	03/27/1991
MRGA	MW179	6	6	X	07/18/2000	23	800	J	03/27/1991
MRGA	MW179	6	6	Y	10/12/1999	23	800	J	03/27/1991
MRGA	MW185	3900	4600		09/10/1999	1047	1260		12/20/2000
MRGA	MW188	10	25		12/15/1994	31	31		03/16/2000
MRGA	MW191	1	130		04/01/1991	7	34		09/20/1993
MRGA	MW194	1	5	U	03/19/1991	0	17		09/21/1993
MRGA	MW200	1	5	U	04/02/1991	125	287		08/05/1997
MRGA	MW201	66	390		08/28/1995	39	283		12/13/1993
MRGA	MW203	40	48		08/28/1995	40	48		08/28/1995
MRGA	MW233	40	940		02/13/1996	32	599		02/13/1996
MRGA	MW235	780	1300		08/02/1999	430	597		08/02/1999
MRGA	MW238	800	1500		08/09/1995	408	997		06/05/1995
MRGA	MW240	400	1800		04/16/1996	194	1106		03/30/1995
MRGA	MW241	120	1800		03/20/1996	96	1120		03/29/1995
MRGA	MW242	150	1000		04/16/1997	97	341		04/16/1997
MRGA	MW242	150	1000	UX	03/28/1995	97	341		04/16/1997
MRGA	MW243	500	13500		09/18/1995	245	3860		04/06/1995
MRGA	MW244	3	4400		03/28/1995	27	1280		04/06/1995
MRGA	MW245	97	110		11/09/2000	46	62.3	D	11/16/1999
MRGA	MW248	1880	17000		12/13/1995	476	3528.3		12/09/1996
MRGA	MW249	14	2900		08/22/1995	23	187		09/21/1995
MRGA	MW250	20	13300		09/18/1995	20	3358		09/18/1995
MRGA	MW257		7500		12/12/1995		1545		12/17/1996
MRGA	MW263	16	18		07/13/1999	24	58.9		04/07/1999
MRGA	MW265	4	28		10/10/2000	2	15		01/09/1995
MRGA	MW267	1	1	U	10/04/2000	14	32.6		07/12/1999
MRGA	MW267	1	1	UX	07/17/2000	14	32.6		07/12/1999
MRGA	MW267	1	1	UY	10/12/1999	14	32.6		07/12/1999
MRGA	MW271	1	5	!	01/18/1995	39	55.4		10/06/2000
MRGA	MW272	1	5	!	01/18/1995	59	99.6		01/20/1999
MRGA	MW328	1	6		12/04/1999	12	23		09/10/1996
MRGA	MW328	1	6	J	09/13/1999	12	23		09/10/1996
MRGA	MW330		5	U	06/23/1994		9		08/13/1996

Monitoring well data set for middle RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L				Tc-99 ~ pCi/L			
		2000 value*	Max results*	Result qualifier	Date collected	2000 value*	Max results*	Result qualifier	Date collected
MRGA	MW333	110	140	D	09/12/2000	3	19.27		03/03/1999
MRGA	MW337	75	110		03/03/1999	122	129		09/12/2000
MRGA	MW338	24	24		06/14/2000	2	19.04		03/03/1999
MRGA	MW341	1040	1200	D	09/11/2000	283	358		12/12/2000
MRGA	MW341	1040	1200	J	12/03/1998	283	358		12/12/2000
MRGA	MW342	11000	18000	J	12/08/1998	1300	5020		12/06/1999
MRGA	MW353	1	1	U	10/04/2000	33	310		07/08/1999
MRGA	MW354	2	3		12/19/2000	3	48.9		12/07/1999
MRGA	MW43		5	U	08/22/1990		28		06/08/1989
MRGA	MW46		1	!	03/09/1993		18		11/21/1989
MRGA	MW48		5	U	10/13/1989		33		08/01/1989
MRGA	MW67		5	U	10/19/1989		27		10/31/1989
MRGA	MW79		1	!	08/25/1988		25	!	08/25/1988
MRGA	MW84	16	71		10/19/1989	6	1000		03/22/1989
MRGA	MW87	2	5	U	03/20/1991	5	27		04/15/1997
MRGA	MW90	3	5	U	08/10/1994	18	26		11/02/1993
MRGA	MW93	24	24	X	07/10/2000	13	33		04/16/1997
MRGA	MW98	4	4		06/12/2000	20	68		09/13/1993
MRGA	MW99	8	10		12/21/2000	6	24.9		12/03/1999
MRGA	PZ110		1	!	04/22/1992		-0.3	U	06/14/1999
MRGA	PZ110		1	U	06/14/1999		-0.3	U	06/14/1999
MRGA	PZ117		97		09/19/1994		87		06/14/1999
MRGA	PZ118		6700		09/19/1994		68		06/14/1999

*2000 value = inferred contaminant level on June 30, 2000. Max results = maximum contaminant level observed in water samples.

Qualifiers used in monitoring well data set for middle RGA plume map

- ! Additional qualifier field contains an "<" or an ">"
- D ORGANIC: Compounds identified in an analysis at a secondary dilution factor.
RADS: Sample is statistically different from duplicate at 95% level of confidence.
- J Indicates an estimated value
- R QC indicates that data are not usable. Resampling and reanalysis are necessary for verification.
- U ORGANIC: Compound analyzed for but not detected at or below the lowest concentration reported.
RADS: Indicates analyte/nuclide was analyzed for, but not detected.
- X Other specific flags and footnotes may be required to properly define the results
- Y MS,MSD recovery and/or RPD failed acceptance criteria

Monitoring well data set for lower RGA plume map

Horizon	Station name	TCE ~µg/L				Tc-99 ~ pCi/L			
		2000 value*	Max results*	Result qualifier	Date collected	2000 value*	Max results*	Result qualifier	Date collected
LRGA	MW124	700	1100		06/05/1997	7	119		05/20/1993
LRGA	MW125	13	26		09/10/1999	85	122		09/10/1999
LRGA	MW132		5	U	08/16/1990		11		09/07/1993
LRGA	MW134	8	1600		10/19/1992	13	870		10/19/1992
LRGA	MW135	4	5	U	08/18/1990	77	196		04/23/1990
LRGA	MW141		5	!	05/26/1993		15		01/11/1994
LRGA	MW141		5	U	08/16/1990		15		01/11/1994
LRGA	MW144		380		03/03/1994		168		05/20/1993
LRGA	MW145	120	530		12/01/1994	9	24		09/22/1993
LRGA	MW146	1	3.3	J	05/02/1991	7	15		12/07/1993
LRGA	MW150	1	1		08/11/1999	6	22		02/08/1995
LRGA	MW150	1	1	!	06/06/1990	6	22		02/08/1995
LRGA	MW150	1	1	U	03/14/2000	6	22		02/08/1995
LRGA	MW150	1	1	UJ	06/23/1993	6	22		02/08/1995
LRGA	MW152	1	4		06/20/1997	187	343		12/06/1993
LRGA	MW155	1700	7500	Y	08/09/1999	468	682		05/12/1997
LRGA	MW158		50		03/06/1998		25		09/13/1993
LRGA	MW161	100	23000		05/08/1995	8	24.8		09/12/2000
LRGA	MW163	100	860		03/20/1991	16	60		08/11/1994
LRGA	MW199	1	5	!	05/27/1993	0	24		07/27/1994
LRGA	MW202	7	170		12/06/1994	8	126		03/27/1995
LRGA	MW226	60	71	X	01/11/2000	148	148		07/12/2000
LRGA	MW234	1630	1800		05/10/1999	799	924.1		06/09/1998
LRGA	MW234	1630	1800	X	05/03/2000	799	924.1		06/09/1998
LRGA	MW236	1280	1500		11/07/2000	617	936		09/18/1995
LRGA	MW255	720	1500		08/17/1995	7	25		12/13/1996
LRGA	MW256	345	390		11/13/2000	76	96.2		02/14/2000
LRGA	MW258	1000	2300		12/12/1995	6	19		08/17/1995
LRGA	MW260	600	940		12/29/1997	18	45.12		03/02/1999
LRGA	MW261	20500	30000		09/14/1995	2625	5804		09/14/1995
LRGA	MW262	4800	16000		05/13/1997	904	4178		05/13/1997
LRGA	MW266	5	6		07/13/1999	2	19.6		04/06/1998
LRGA	MW269	2	5	!	01/17/1995	79	126		05/22/1995
LRGA	MW273	1	5	!	01/18/1995	96	128.8		01/20/1999
LRGA	MW275	1	5	!	01/17/1995	191	292		01/17/1995
LRGA	MW277	15	33		10/22/1996	2	21.2		10/03/2000
LRGA	MW283	185	1300		03/04/1997	8	25.43		02/03/1999
LRGA	MW284	240	1500		03/04/1997	6	25		08/22/1996
LRGA	MW288	600	1800		12/16/1996	5	26.3		11/15/2000
LRGA	MW291	220	1400		03/04/1997	0	16		08/22/1996
LRGA	MW292	860	1400		06/15/1998	0	24.2		05/12/1999
LRGA	MW293	225	2400		03/04/1997	0	22		08/22/1996
LRGA	MW294	470	2100		12/16/1996	0	17		05/31/1996
LRGA	MW325		150		12/17/1996		11		12/17/1996
LRGA	MW326		34		12/17/1996		35		08/21/1996
LRGA	MW327		5	U	06/03/1994		11		12/17/1996
LRGA	MW339	23000	25000		08/10/1998	3411	5116.9		11/17/1998
LRGA	MW340	970	1100		05/05/1998	623	728		09/15/1999
LRGA	MW343	100000	100000		06/20/2000	11750	16741.5		12/03/1998
LRGA	MW352	210	820		06/22/1999	5	19.9		06/22/1999
LRGA	MW355	12	14		09/13/2000	14	33.5		12/19/2000

Monitoring well data set for lower RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L				Tc-99 ~ pCi/L			
		2000 value*	Max results*	Result qualifier	Date collected	2000 value*	Max results*	Result qualifier	Date collected
LRGA	MW356	30	160		12/07/1999	2	16.9	U	09/14/2000
LRGA	MW40		4		04/23/1990		29		05/17/1989
LRGA	MW65	12	17		12/11/2000	11	37.11		03/01/1999
LRGA	MW68		45		11/15/1988		177		10/11/1989
LRGA	MW86	6	98		10/19/1989	3	45		07/21/1993
LRGA	MW89	1	7		10/17/1989	9	39		09/22/1989
LRGA	MW92	1	5	U	03/21/1991	13	28		12/04/1991
LRGA	MW95	13	49		09/29/1992	20	847		09/29/1992
LRGA	PZ114		71		06/14/1999		2.8	U	06/14/1999

*2000 value = inferred contaminant level on June 30, 2000. Max results = maximum contaminant level observed in water samples.

Qualifiers used in monitoring well data set for lower RGA plume map

- ! Additional qualifier field contains an "<" or an ">"
- A Analyzed but not detected at the analyte quantitation limit.
- J Indicates an estimated value
- U ORGANIC: Compound analyzed for but not detected at or below the lowest concentration reported.
RADS: Indicates analyte/nuclide was analyzed for, but not detected.
- X Other specific flags and footnotes may be required to properly define the results
- Y MS,MSD recovery and/or RPD failed acceptance criteria

Temporary boring data set for upper RGA plume map

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
URGA	001-175	0.6	J	05/12/1998	2420		05/12/1998
URGA	001-176	0.2	J	05/28/1998			
URGA	001-177	2.1	J	05/21/1998	18		05/21/1998
URGA	001-180	0.08	J	06/02/1998			
URGA	001-181	4	U	06/17/1998	7.3	A	06/17/1998
URGA	001-184	0.2	J	06/23/1998	12.1	A	06/23/1998
URGA	004-017	260		07/15/1999	720		07/15/1999
URGA	004-019	16		07/10/1999			
URGA	004-020	1700		09/11/1999	375		09/11/1999
URGA	004-021	1		09/21/1999	7		09/21/1999
URGA	004-022	35000		12/02/1999	6.33		12/02/1999
URGA	004-023	46		09/22/1999	16.3		09/22/1999
URGA	004-024	9100		09/24/1999	157		09/24/1999
URGA	004-025	1		11/22/1999	6.22		11/22/1999
URGA	004-026	650		11/16/1999	8.26		11/16/1999
URGA	004-027	67000		11/11/1999	12.1		11/11/1999
URGA	004-028	63		09/03/1999	106		09/03/1999
URGA	004-029	1400		09/10/1999	607		09/10/1999
URGA	004-032	1	U	07/20/1999			07/20/1999
URGA	005-013	1		09/27/1999	-4.3		09/27/1999
URGA	005-015	1		07/26/1999	3.2		07/26/1999
URGA	005-018	1		12/16/1999	3.3		12/16/1999
URGA	005-019	1		12/14/1999	-0.712		12/14/1999
URGA	005-020	1		12/09/1999			
URGA	005-021	1		12/20/1999	2.98		12/20/1999
URGA	005-026	1		09/23/1999	4		09/23/1999
URGA	006-019	1		02/01/2000	983		02/01/2000
URGA	006-020	1		01/26/2000	255		01/26/2000
URGA	006-021	1		01/24/2000	956		01/24/2000
URGA	006-022	1		01/19/2000	46.8		01/19/2000
URGA	006-023	1		01/14/2000	823		01/14/2000
URGA	026-001	5331		10/22/1997	217 b		10/22/1997
URGA	084-018	3.3		07/22/1999	303		07/22/1999
URGA	085-016	0.2	J	08/05/1999	2	U	08/05/1999
URGA	091-001	6.5		03/25/1998			
URGA	091-002	2.7	J	04/14/1998			
URGA	099-035	1	U	06/19/1999	16	A	06/19/1999
URGA	099-037	0.1	J	07/14/1999	16.4		07/14/1999
URGA	193-023	1		04/10/1999	7	A	04/10/1999
URGA	193-025	30		06/08/1999	10.2	A	06/08/1999
URGA	193-031	1	U	06/02/1999	3.4	A	06/02/1999
URGA	193-032	16		05/25/1999	41		05/25/1999
URGA	193-041	72		06/30/1999	108		06/30/1999
URGA	204-031	19		06/29/1999	-4.5	A	06/29/1999
URGA	400-034	16550		11/04/1997	14 b		11/04/1997
URGA	400-035	8795		11/14/1997	1522 b		11/14/1997
URGA	400-036	10300		10/06/1997	14 b		10/06/1997

Temporary boring data set for upper RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
URGA	400-037	701184		12/06/1997	64 b		12/06/1997
URGA	400-038	4464		01/16/1998	17 b		01/16/1998
URGA	400-039	1063		11/20/1997	255 b		11/20/1997
URGA	400-040	28000		01/01/1998	840 b		01/01/1998
URGA	400-041	898		11/12/1997	9 b		11/12/1997
URGA	400-042	26900		10/23/1997	1165 b		10/23/1997
URGA	400-044	633		09/16/1997	261 b		09/16/1997
URGA	400-045	24473		10/28/1997	42 b		10/28/1997
URGA	400-046	143034		11/01/1997	166 b		11/01/1997
URGA	400-047	18563		10/20/1997	447 b		10/20/1997
URGA	400-048	539		09/29/1997	67 b		09/29/1997
URGA	400-049	149		08/19/1997	50 b		08/19/1997
URGA	400-052	410		10/15/1997	319 b		10/15/1997
URGA	400-053	44		07/31/1997	25 b		07/31/1997
URGA	400-206	4881		12/01/1997	762 b		12/01/1997
URGA	400-213	97		12/15/1997	169 b		12/15/1997
URGA	400-214	524		12/18/1997	71 b		12/18/1997
URGA	400-215	4131		12/11/1997	67 b		12/11/1997
URGA	720-010	73		05/11/1998	23.1		05/11/1998
URGA	720-011	22		05/15/1998	35.2		05/15/1998
URGA	720-013	4	U	04/29/1998			
URGA	720-015	3.3	J	04/20/1998			
URGA	720-016	8.4		03/24/1998			
URGA	720-017	0.1	J	05/02/1998			
URGA	720-018	1197		04/20/1998	551.9		04/20/1998
URGA	720-029	0.06	J	05/28/1998	3.8	A	05/28/1998
URGA	DG-003	0.8	J	05/12/1999	43		05/12/1999
URGA	DG-004	1	U	04/21/1999	5.3	U	04/21/1999
URGA	DG-005	1.4		04/23/1999	2.9	U	04/23/1999
URGA	DG-006	1	U	04/28/1999	16.2		04/28/1999
URGA	DG-007	610		05/04/1999	95		05/04/1999
URGA	DG-008	1.3		05/18/1999	58		05/18/1999
URGA	DG-009	1	U	05/08/1999	51		05/08/1999
URGA	DG-014	0.5	J	05/21/1999	621		05/21/1999
URGA	DG-015	20		08/21/1999	3.8	U	08/21/1999
URGA	DG-016	0.2	J	08/18/1999	9.2	U	08/18/1999
URGA	DG-017	1.2		06/24/1999	11.1	U	06/24/1999
URGA	DG-018	0.5	J	08/31/1999	4.7	U	08/31/1999
URGA	DG-019	0.8	J	07/12/1999	49		07/12/1999
URGA	DG-020	0.4	J	08/16/1999	64		08/16/1999
URGA	DG-021	0.2	J	08/25/1999	53		08/25/1999
URGA	DG-022	1	U	10/04/1999	27		10/04/1999
URGA	DG-025	120		06/17/1999	1870		06/17/1999
URGA	DG-026	19		06/17/1999	1410		06/17/1999
URGA	DG-031	1	U	10/06/1999	8	A	10/06/1999
URGA	J12			09/24/1992	78		09/24/1992
URGA	J28	11	J	10/14/1992	25		10/14/1992
URGA	J29	20	!	10/09/1992	8		10/09/1992
URGA	J33	530		10/17/1992	423		10/17/1992
URGA	J34	2600		10/22/1992	1504		10/22/1992
URGA	J42	140		03/19/1994	44		03/19/1994

Temporary boring data set for upper RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
URGA	J43	5000		03/12/1994	1235		03/12/1994
URGA	J44	1700		03/16/1994	748		03/16/1994
URGA	P4-A2	1	U	07/26/1994			
URGA	P4-A3	5	U	08/04/1994	16		08/04/1994
URGA	P4-B3	61		08/06/1994	4		08/06/1994
URGA	P4-B5	1	U	08/17/1994	0		08/17/1994
URGA	P4-C7	2.3	J	07/14/1994	4		07/14/1994
URGA	P4-C9	5	U	07/13/1994	0		07/13/1994
URGA	P4-D12A	6	JX	07/23/1994	11		07/23/1994
URGA	P4-D6	3	J	06/24/1994	0		06/24/1994
URGA	P4-D7	5	U	06/22/1994	14		06/22/1994
URGA	P4-E1	2		10/22/1994	0		10/22/1994
URGA	P4-E2	5	U	08/04/1994			
URGA	P4-F1	2.2	J	10/18/1994	19		10/18/1994
URGA	P4-F2	1	J	10/11/1994	32		10/11/1994
URGA	P4-F3	9.4	J	09/21/1994			
URGA	P4-F5	1400		10/08/1994	27		10/08/1994
URGA	P4-F6	5	U	09/07/1994			
URGA	P4-F7	2.2	J	09/14/1994	49		09/14/1994
URGA	P4-F8	14		09/27/1994	1113		09/27/1994
URGA	P4-G1	3900		08/22/1994	4133		08/22/1994
URGA	P4-G11	3.2	J	09/15/1994	1		09/15/1994
URGA	P4-G12	9.2		10/05/1994			
URGA	P4-G2	1800		08/11/1994	155		08/11/1994
URGA	P4-G7	1.3	J	09/14/1994			
URGA	P4-G8	0.8	J	09/10/1994	18		09/10/1994
URGA	P4-H5	1.6	J	09/24/1994	17		09/24/1994
URGA	P4-H6	2.2	J	09/12/1994			
URGA	P4-H7	12000		09/22/1994			

Max results = maximum contaminant level in samples retrieved from interval.

Qualifiers used in temporary boring data set for upper RGA plume map

- ! Additional qualifier field contains an "<" or an ">"
- A Analyzed but not detected at the analyte quantitation limit.
- J Indicates an estimated value
- U ORGANIC: Compound analyzed for but not detected at or below the lowest concentration reported.
RADS: Indicates analyte/nuclide was analyzed for, but not detected.
- X Other specific flags and footnotes may be required to properly define the results

Temporary boring data set for middle RGA plume map

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
MRGA	001-175	77		05/12/1998			
MRGA	001-176	0.2	J	05/29/1998	33.3		05/29/1998
MRGA	001-177	0.6	J	05/21/1998			
MRGA	001-178	0.5	J	05/18/1998	-4.4	A	05/18/1998
MRGA	001-180	0.2	J	06/02/1998	7.4	A	06/02/1998
MRGA	001-181	11		06/17/1998	14.4	A	06/17/1998
MRGA	001-182	419		06/11/1998	597.2		06/11/1998
MRGA	001-183	12		06/15/1998	613.7		06/15/1998
MRGA	001-184	24		06/23/1998			
MRGA	004-024	48000		10/14/1999	14		10/14/1999
MRGA	004-028	1500		09/03/1999	165		09/03/1999
MRGA	004-029	3800		09/10/1999	635		09/10/1999
MRGA	004-058	6		09/14/1999	10.3	A	09/14/1999
MRGA	005-013	10		09/27/1999	16.5		09/27/1999
MRGA	005-026	1		09/23/1999	12.7		09/23/1999
MRGA	006-024	6		09/21/1999	16.9		09/21/1999
MRGA	006-025	10		09/16/1999	25.1		09/16/1999
MRGA	026-001	2871		10/22/1997	259 b		10/22/1997
MRGA	084-018	8.4		07/23/1999	118		07/23/1999
MRGA	085-016	0.5	J	08/05/1999	6.9	U	08/05/1999
MRGA	091-001	12		03/26/1998	568.1		03/26/1998
MRGA	091-002	17		04/15/1998	37.4		04/15/1998
MRGA	099-034	0.2	J	06/17/1999	14.5		06/17/1999
MRGA	099-035	0.2	J	06/19/1999	4.6	A	06/19/1999
MRGA	099-037	2		07/14/1999	18		07/14/1999
MRGA	099-038	9		07/19/1999	18.7		07/19/1999
MRGA	193-025	180		06/08/1999	16.8		06/08/1999
MRGA	193-028	1	U	06/05/1999	17	A	06/05/1999
MRGA	193-031	0.4	J	06/02/1999	19.8		06/02/1999
MRGA	193-032	40		05/26/1999	43		05/26/1999
MRGA	193-041	58		06/30/1999	579		06/30/1999
MRGA	204-031	590		06/29/1999	6.2	A	06/29/1999
MRGA	400-034	40766		11/05/1997	34 b		11/05/1997
MRGA	400-035	26905		11/14/1997	4762 b		11/14/1997
MRGA	400-036	4300		10/07/1997	49 b		10/07/1997
MRGA	400-037	638576		12/06/1997	76 b		12/06/1997
MRGA	400-038	1010		01/19/1998	28 b		01/19/1998
MRGA	400-039	1256		11/20/1997	251 b		11/20/1997
MRGA	400-040	57639		01/01/1998	75 b		01/01/1998
MRGA	400-041	20386		11/13/1997	24 b		11/13/1997
MRGA	400-042	24625		10/23/1997	379 b		10/23/1997
MRGA	400-043	187		09/05/1997	154 b		09/05/1997
MRGA	400-044	9031		09/17/1997	139 b		09/17/1997
MRGA	400-045	630		10/29/1997	92 b		10/29/1997
MRGA	400-046	54052		11/01/1997	407 b		11/01/1997
MRGA	400-047	8678		10/20/1997	421 b		10/20/1997
MRGA	400-048	172		09/30/1997	81 b		09/30/1997

Temporary boring data set for middle RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
MRGA	400-049	12		08/20/1997	16 b		08/20/1997
MRGA	400-052	1229		10/16/1997	638 b		10/16/1997
MRGA	400-053	1889		08/05/1997	118 b		08/05/1997
MRGA	400-206	7536		12/02/1997	1061 b		12/02/1997
MRGA	400-213	208		12/15/1997	202 b		12/15/1997
MRGA	400-214	1007		12/18/1997	97 b		12/18/1997
MRGA	400-215	6252		12/11/1997	81 b		12/11/1997
MRGA	720-010	52		05/11/1998			
MRGA	720-011	36		05/15/1998	5.3	A	05/15/1998
MRGA	720-012	0.2	J	04/30/1998			
MRGA	720-013	9.6		04/30/1998			
MRGA	720-014	6.5		04/15/1998	4	A	04/15/1998
MRGA	720-015	97		04/20/1998	10.1	A	04/20/1998
MRGA	720-016	25		04/06/1998	-4.8	A	04/06/1998
MRGA	720-017	95		05/02/1998	2.6	A	05/02/1998
MRGA	720-018	1262		04/20/1998	285.8		04/20/1998
MRGA	720-019	75		05/05/1998	-0.5	A	05/05/1998
MRGA	720-026	100		05/19/1998	-9.7	A	05/19/1998
MRGA	720-028	4	U	06/02/1998	14	A	06/02/1998
MRGA	DG-001	11		04/14/1999	208		04/14/1999
MRGA	DG-002	1	U	04/10/1999	33.4		04/10/1999
MRGA	DG-003	0.4	J	05/12/1999	37		05/12/1999
MRGA	DG-004	1	U	04/21/1999	3.4	U	04/21/1999
MRGA	DG-005	120		04/23/1999	127		04/23/1999
MRGA	DG-006	51		04/29/1999	930		04/29/1999
MRGA	DG-007	2200		05/05/1999	1470		05/05/1999
MRGA	DG-008	1		05/19/1999	60		05/19/1999
MRGA	DG-009	1	U	05/10/1999	63		05/10/1999
MRGA	DG-014	1	U	05/22/1999	40		05/22/1999
MRGA	DG-015	69		08/21/1999	14.7		08/21/1999
MRGA	DG-016	43		08/18/1999	1010		08/18/1999
MRGA	DG-017	0.7	J	06/24/1999	27		06/24/1999
MRGA	DG-018	5		08/31/1999	2.3	U	08/31/1999
MRGA	DG-019	1		07/12/1999	55		07/12/1999
MRGA	DG-020	7		08/16/1999	121		08/16/1999
MRGA	DG-021	1	U	08/25/1999	16.7		08/25/1999
MRGA	DG-022	0.2	J	10/04/1999	16		10/04/1999
MRGA	DG-030	1600		08/10/1999	254		08/10/1999
MRGA	DG-031	0.1	J	10/07/1999	0.5	A	10/07/1999
MRGA	J12			09/26/1992	60		09/26/1992
MRGA	J13	48		10/01/1992	40		10/01/1992
MRGA	J16			09/27/1992	0		09/27/1992
MRGA	J19	5	!	09/23/1993	63		09/23/1993
MRGA	J21	11		09/17/1993	425		09/17/1993
MRGA	J22	54		09/16/1993	97		09/16/1993
MRGA	J24	210		10/25/1992	95		10/25/1992
MRGA	J28	110		10/13/1992	54		10/13/1992

Temporary boring data set for middle RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
MRGA	J29	440		10/10/1992	17		10/10/1992
MRGA	J30	3400		10/04/1992	1454		10/04/1992
MRGA	J34	5400		10/23/1992	1884		10/23/1992
MRGA	J36			10/27/199	4616		10/27/1992
MRGA	J38	3		10/25/1992	26		10/25/1992
MRGA	J4			09/10/1993	49		09/10/1993
MRGA	J40	90		03/02/1994	34		03/02/1994
MRGA	J42	160		03/19/1994	60		03/19/1994
MRGA	J43	7300		03/12/1994	1954		03/12/1994
MRGA	J44	4800		03/16/1994	1163		03/16/1994
MRGA	J49	40		02/14/1994	42		02/14/1994
MRGA	J5			09/09/1993	113		09/09/1993
MRGA	J50	5	!	02/11/1994	5		02/11/1994
MRGA	P4-A2	1		07/26/1994	23		07/26/1994
MRGA	P4-A3	3.8	J	08/04/1994	14		08/04/1994
MRGA	P4-B4	240		08/10/1994	4		08/10/1994
MRGA	P4-B5	70		08/17/1994	9		08/17/1994
MRGA	P4-C10	5	U	08/20/1994	4		08/20/1994
MRGA	P4-C2	2.4	J	08/24/1994	13		08/24/1994
MRGA	P4-C4	5	U	07/15/1994	14		07/15/1994
MRGA	P4-C7	29.2		07/15/1994	6		07/15/1994
MRGA	P4-C9	5	U	07/13/1994	0		07/13/1994
MRGA	P4-D10	104		07/07/1994	57		07/07/1994
MRGA	P4-D11	1.6	J	07/07/1994	19		07/07/1994
MRGA	P4-D12A	2161		07/21/1994	0		07/21/1994
MRGA	P4-D4	1	UX	07/09/1994	11		07/09/1994
MRGA	P4-D5	7.2		07/28/1994	19		07/28/1994
MRGA	P4-D8	5	U	06/27/1994	10		06/27/1994
MRGA	P4-E1	65		10/22/1994	27		10/22/1994
MRGA	P4-E4	320		07/28/1994	10		07/28/1994
MRGA	P4-E6	5	U	07/25/1994			
MRGA	P4-E7	1331		09/08/1994			
MRGA	P4-E8	641		10/13/1994	20		10/13/1994
MRGA	P4-F1	2553		10/19/1994	25		10/19/1994
MRGA	P4-F2	148		10/11/1994	65		10/11/1994
MRGA	P4-F3	0.3	J	09/21/1994	55		09/21/1994
MRGA	P4-F4	28		10/20/1994			
MRGA	P4-F5	560		10/08/1994			
MRGA	P4-F6	744		09/07/1994	71		09/07/1994
MRGA	P4-F7	28.8		09/14/1994	46		09/14/1994
MRGA	P4-F8	43		09/27/1994	2681		09/27/1994
MRGA	P4-G1	13000		08/22/1994	3728		08/22/1994
MRGA	P4-G11	3.9	J	09/15/1994	0		09/15/1994
MRGA	P4-G12	2028		10/05/1994	616		10/05/1994
MRGA	P4-G2	2300		08/11/1994	186		08/11/1994
MRGA	P4-G3	138.8		08/18/1994	269		08/18/1994
MRGA	P4-G5	430		08/24/1994	56		08/24/1994

Temporary boring data set for middle RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
MRGA	P4-G7	7.2		09/14/1994	19		09/14/1994
MRGA	P4-G8	3035		09/10/1994	427		09/10/1994
MRGA	P4-G9	2.3		09/12/1994			
MRGA	P4-H5	1	J	09/26/1994	8		09/26/1994
MRGA	P4-H6	1	J	09/13/1994			

* Max results = maximum contaminant level in samples retrieved from interval

Qualifiers used in temporary boring data set for middle RGA plume map

- ! Additional qualifier field contains an "<" or an ">"
- A Analyzed but not detected at the analyte quantitation limit.
- J Indicates an estimated value
- U ORGANIC: Compound analyzed for but not detected at or below the lowest concentration reported.
RADS: Indicates analyte/nuclide was analyzed for, but not detected.
- X Other specific flags and footnotes may be required to properly define the results

Temporary boring data set for lower RGA plume map

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
LRGA	001-175	110		05/12/1998	5.5	A	05/12/1998
LRGA	001-176	66		06/16/1998	10.1	A	06/16/1998
LRGA	001-177	10		06/10/1998	20		06/10/1998
LRGA	001-178	15		05/18/1998	4.6	A	05/18/1998
LRGA	001-180	29		06/03/1998	288.9		06/03/1998
LRGA	001-181	143		06/18/1998	8.9	A	06/18/1998
LRGA	001-182	1578		06/11/1998	3709.6		06/11/1998
LRGA	001-183	9		06/15/1998	334.7		06/15/1998
LRGA	001-184	240		06/23/1998	2470.3		06/23/1998
LRGA	004-028	3700		09/03/1999	171		09/03/1999
LRGA	004-029	400		09/11/1999	52		09/11/1999
LRGA	004-058	80		09/14/1999	152		09/14/1999
LRGA	005-013	33		09/27/1999	31		09/27/1999
LRGA	005-022	29		01/06/2000	4.29		01/06/2000
LRGA	005-026	8		09/24/1999	22.4		09/24/1999
LRGA	006-024	270		09/22/1999	50		09/22/1999
LRGA	006-025	740		09/16/1999	119		09/16/1999
LRGA	026-001	6214		10/23/1997	119 b		10/23/1997
LRGA	084-018	19		07/23/1999	21.1		07/23/1999
LRGA	085-016	150		08/06/1999	19.5		08/06/1999
LRGA	091-001	73		04/06/1998	41.2		04/06/1998
LRGA	091-002	112		04/15/1998	18.5		04/15/1998
LRGA	099-034	520		06/17/1999	139		06/17/1999
LRGA	099-035	350		06/19/1999	71		06/19/1999
LRGA	099-038	160		07/19/1999	820		07/19/1999
LRGA	193-025	110		06/09/1999	15.3		06/09/1999
LRGA	193-028	0.29	J	06/05/1999	11	A	06/05/1999
LRGA	193-031	2		06/02/1999	14.8		06/02/1999
LRGA	193-032	23	E	05/26/1999	13.9		05/26/1999
LRGA	193-041	330		07/01/1999	1390		07/01/1999
LRGA	204-029	1	U	06/16/1999	2.5	A	06/16/1999
LRGA	204-031	770		06/29/1999	7	A	06/29/1999
LRGA	400-034	91736		11/05/1997	13000 b		11/05/1997
LRGA	400-035	12510		11/15/1997	4556 b		11/15/1997
LRGA	400-036	840		10/08/1997	2 b		10/08/1997
LRGA	400-037	85597		12/09/1997	309 b		12/09/1997
LRGA	400-038	19736		01/19/1998	104 b		01/19/1998
LRGA	400-039	1000	D	11/21/1997	205 b		11/21/1997
LRGA	400-040	620		01/09/1998	8 b		01/09/1998
LRGA	400-041	126012		11/15/1997	99 b		11/15/1997
LRGA	400-042	7885		10/23/1997	57 b		10/23/1997
LRGA	400-043	14580		09/05/1997	2534 b		09/05/1997
LRGA	400-044	10694		09/18/1997	84 b		09/18/1997
LRGA	400-045	137		10/29/1997	124 b		10/29/1997
LRGA	400-046	843		11/03/1997	535 b		11/03/1997
LRGA	400-047	1019		10/21/1997	489 b		10/21/1997
LRGA	400-048	548		09/30/1997	109 b		09/30/1997

Temporary boring data set for lower RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
LRGA	400-049	127		08/21/1997	39 b		08/21/1997
LRGA	400-052	764		10/17/1997	487 b		10/17/1997
LRGA	400-053	88		08/06/1997	9 b		08/06/1997
LRGA	400-206	9752		12/02/1997	2499 b		12/02/1997
LRGA	400-207	1.2	J	01/12/1998	39 b		01/12/1998
LRGA	400-208	99000		01/30/1998	17220 b		01/30/1998
LRGA	400-210	29000		01/28/1998	4556 b		01/28/1998
LRGA	400-212	1400		01/28/1998	196 b		01/28/1998
LRGA	400-213	145		12/16/1997	97 b		12/16/1997
LRGA	400-214	196		12/18/1997	160 b		12/18/1997
LRGA	400-215	2306		12/12/1997	497 b		12/12/1997
LRGA	720-010	16		05/12/1998	151.1		05/12/1998
LRGA	720-011	37		05/16/1998	243.3		05/16/1998
LRGA	720-012	12		04/30/1998	-0.6	A	04/30/1998
LRGA	720-013	57		04/30/1998	51.7		04/30/1998
LRGA	720-014	14		04/16/1998	27.6		04/16/1998
LRGA	720-015	496		04/20/1998			
LRGA	720-016	810		04/07/1998	7.9	A	04/07/1998
LRGA	720-017	1013		05/04/1998	109.7		05/04/1998
LRGA	720-018	1118		04/20/1998	98.8		04/20/1998
LRGA	720-019	103		05/05/1998	12.3	A	05/05/1998
LRGA	720-026	903		05/20/1998	92.2		05/20/1998
LRGA	720-028	78		06/03/1998	11.2	A	06/03/1998
LRGA	720-029	39		05/28/1998	525.3		05/28/1998
LRGA	DG-001	96		04/15/1999	1300		04/15/1999
LRGA	DG-002	1	U	04/10/1999	15.3		04/10/1999
LRGA	DG-003	0.8	J	05/13/1999	68		05/13/1999
LRGA	DG-004	125		04/22/1999	15.7		04/22/1999
LRGA	DG-005	420		04/24/1999	187		04/24/1999
LRGA	DG-006	82		04/29/1999	898		04/29/1999
LRGA	DG-007	99		05/05/1999	1550		05/05/1999
LRGA	DG-008	3		05/19/1999	62		05/19/1999
LRGA	DG-009	0.3	J	05/10/1999	15.4		05/10/1999
LRGA	DG-014	1	U	05/22/1999	8.7	U	05/22/1999
LRGA	DG-015	26		08/23/1999	12.8	U	08/23/1999
LRGA	DG-016	480		08/19/1999	1300		08/19/1999
LRGA	DG-017	2.5		06/25/1999	19		06/25/1999
LRGA	DG-018	2		08/31/1999	15	U	08/31/1999
LRGA	DG-019	0.8	J	07/13/1999	33.6		07/13/1999
LRGA	DG-020	150		08/16/1999	1530		08/16/1999
LRGA	DG-021	1	U	08/25/1999	44		08/25/1999
LRGA	DG-022	0.1	J	10/04/1999	20		10/04/1999
LRGA	DG-030	10000		08/11/1999	274		08/11/1999
LRGA	DG-031	6		10/07/1999	6.9	A	10/07/1999
LRGA	J12	2		09/25/1992	69		09/25/1992
LRGA	J13	42		10/01/1992	24		10/01/1992
LRGA	J14			09/23/1992	890		09/23/1992

Temporary boring data set for lower RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
LRGA	J16	3		09/27/1992	0		09/27/1992
LRGA	J21	0.7		09/17/1993	31		09/17/1993
LRGA	J22	5	!	09/16/1993	29		09/16/1993
LRGA	J23			09/20/1992	42		09/20/1992
LRGA	J24	130		01/11/1994	66		01/11/1994
LRGA	J28	330		10/13/1992	129		10/13/1992
LRGA	J29	750		10/10/1992	347		10/10/1992
LRGA	J3	5	!	09/13/1993	221		09/13/1993
LRGA	J30	3700		10/05/1992	326		10/05/1992
LRGA	J33	8600		10/17/1992	3952		10/17/1992
LRGA	J34	8100		10/23/1992	2134		10/23/1992
LRGA	J36	15000		10/27/1992	4800		10/27/1992
LRGA	J38	2		10/24/1992	38		10/24/1992
LRGA	J4			09/10/1993	30		09/10/1993
LRGA	J40	420		03/02/1994	143		03/02/1994
LRGA	J42	590		03/19/1994	305		03/19/1994
LRGA	J43	10000		03/12/1994	2988		03/12/1994
LRGA	J44	11000		03/16/1994	3034		03/16/1994
LRGA	J6	360		09/13/1993	294		09/13/1993
LRGA	J7	3		09/13/1993	13		09/13/1993
LRGA	P4-A2	50.6		07/27/1994	26		07/27/1994
LRGA	P4-A3	2.9	J	08/04/1994	10		08/04/1994
LRGA	P4-B3	183.9		08/08/1994	16		08/08/1994
LRGA	P4-B4	438.6		08/10/1994	14		08/10/1994
LRGA	P4-B5	200		08/17/1994	3		08/17/1994
LRGA	P4-C10	5	U	08/20/1994	0		08/20/1994
LRGA	P4-C2	5.5		08/24/1994	16		08/24/1994
LRGA	P4-C4	26.2		07/15/1994	0		07/15/1994
LRGA	P4-C5	280		07/11/1994	17		07/11/1994
LRGA	P4-C7	462		07/15/1994	19		07/15/1994
LRGA	P4-C9	1765.2		07/13/1994	0		07/13/1994
LRGA	P4-D10	1722		07/07/1994	58		07/07/1994
LRGA	P4-D11	1.4	J	07/07/1994	17		07/07/1994
LRGA	P4-D12	1		07/14/1994			
LRGA	P4-D12A	3100		07/22/1994	19		07/22/1994
LRGA	P4-D4	60.7		07/11/1994	21		07/11/1994
LRGA	P4-D5	61		08/03/1994	17		08/03/1994
LRGA	P4-D6	98		06/24/1994	10		06/24/1994
LRGA	P4-D7	190		06/23/1994	41		06/23/1994
LRGA	P4-D8	139		06/27/1994	34		06/27/1994
LRGA	P4-D9	800		06/29/1994	53		06/29/1994
LRGA	P4-E1	11		10/22/1994	1		10/22/1994
LRGA	P4-E2	53.7		08/05/1994	29		08/05/1994
LRGA	P4-E4	812		07/29/1994	25		07/29/1994
LRGA	P4-E6	519		07/26/1994	34		07/26/1994
LRGA	P4-E7	2365		09/08/1994	12		09/08/1994
LRGA	P4-E8	1480		10/13/1994	19		10/13/1994

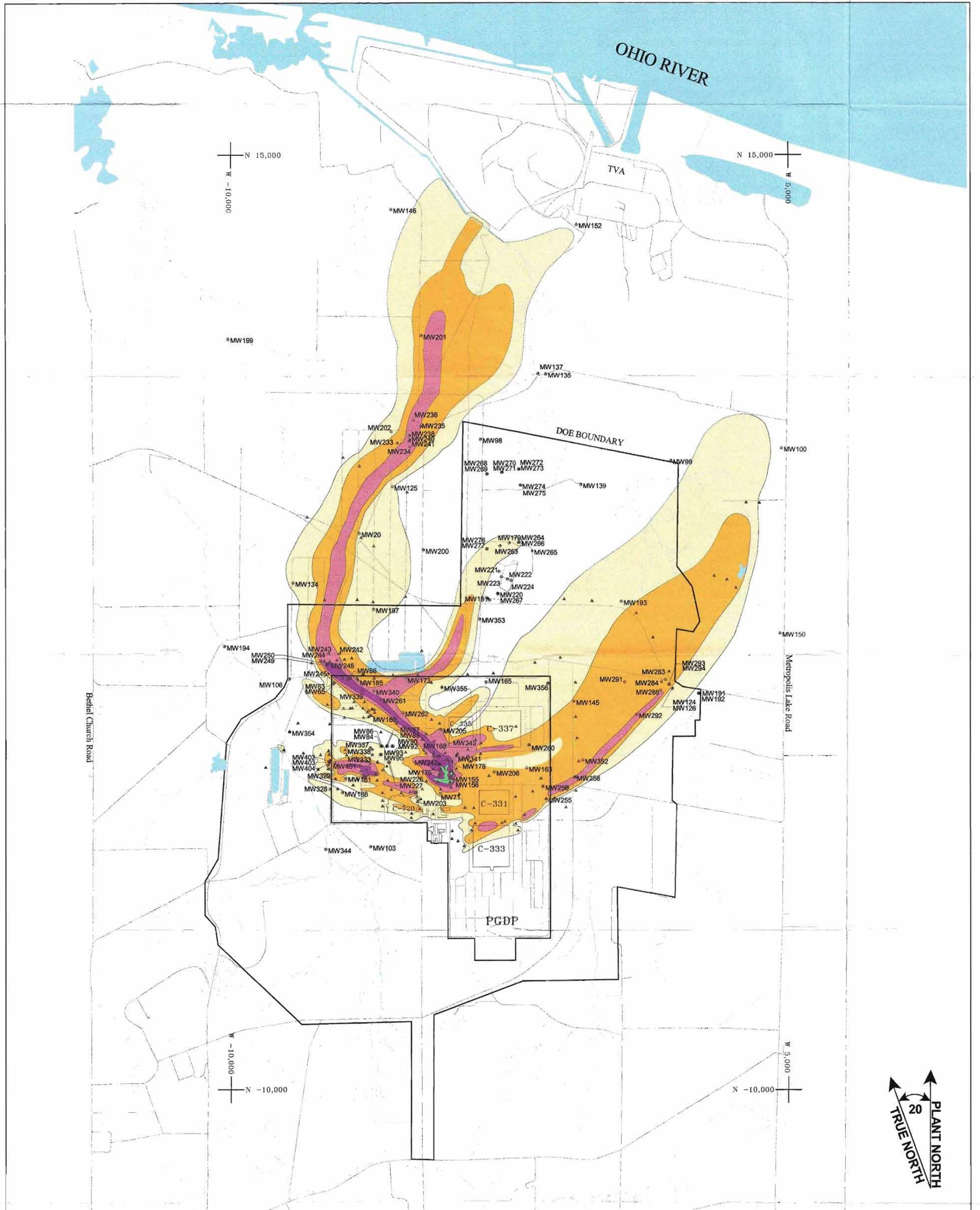
Temporary boring data set for lower RGA plume map (continued)

Horizon	Station name	TCE ~ µg/L			Tc-99 ~ pCi/L		
		Max results*	Result qualifier	Date collected	Max results*	Result qualifier	Date collected
LRGA	P4-F1	421		10/19/1994	46		10/19/1994
LRGA	P4-F2	656		10/11/1994	100		10/11/1994
LRGA	P4-F3	330		09/21/1994	73		09/21/1994
LRGA	P4-F4	540		10/21/1994	27		10/21/1994
LRGA	P4-F5	37		10/08/1994	382		10/08/1994
LRGA	P4-F6	578		09/08/1994	55		09/08/1994
LRGA	P4-F7	279.4		09/15/1994	43		09/15/1994
LRGA	P4-F8	37		09/27/1994	880		09/27/1994
LRGA	P4-G1	44661.5		08/22/1994	43922		08/22/1994
LRGA	P4-G11	10443		09/20/1994	2209		09/20/1994
LRGA	P4-G12	27186		10/06/1994	4490		10/06/1994
LRGA	P4-G2	1700		08/11/1994	78		08/11/1994
LRGA	P4-G3	243.3		08/18/1994	712		08/18/1994
LRGA	P4-G5	500		08/24/1994	61		08/24/1994
LRGA	P4-G8	6826		09/10/1994	50		09/10/1994
LRGA	P4-G9	58.4		09/13/1994	36		09/13/1994
LRGA	P4-H5	3	J	09/26/1994	20		09/26/1994
LRGA	P4-H7	99		09/23/1994	78		09/23/1994

*Max results = maximum contaminant level in samples retrieved from interval

Qualifiers used in temporary boring data set for lower RGA plume map

- A Analyzed but not detected at the analyte quantitation limit.
- D Compounds identified in an analysis at a secondary dilution factor.
- E Result exceeds calibration range. (GC/MS flag)
- J Indicates an estimated value
- U ORGANIC: Compound analyzed for but not detected at or below the lowest concentration reported.
RADS: Indicates analyte/nuclide was analyzed for, but not detected.



LEGEND:

- DOE Property Boundary
- Road
- Building
- Stream
- Water Body

Monitoring Well Sample Location (labeled for identification)

- Sample from Upper RGA
- Sample from Middle RGA
- Sample from Lower RGA

Sample Location

- Sample from Upper RGA
- Sample from Middle RGA
- Sample from Lower RGA

TCE Concentration Legend:

- > 100,000 ug/L
- 10,000-100,000 ug/L
- 1,000 - 10,000 ug/L
- 100 - 1,000 ug/L
- 5 - 100 ug/L

0	04/03	2000	Plume Update	JIG	RED
NO.	DATE	REVISION	DESCRIPTION	BY	CHKD
0	11/03/09				
<p>U.S. DEPARTMENT OF ENERGY DOE OAK RIDGE OPERATIONS ENVIRONMENTAL MANAGEMENT SYSTEMS DIVISION BECHTEL JACOBS COMPANY LLC OAK RIDGE, TENNESSEE PADDY CREEK GASOLINE DECONTAMINATION PLANT REGIONAL GRAVEL ACQUIFER 2000 MAXIMUM TRICHLOROETHYLENE CONTOURS</p>					
<p>JOB NO. 23960 DOE CONTRACT NO. DE-AC05-98OR22701 O&M NO. 0531-2000TCE_APR</p>					
<p>CLIENT: U.S. DEPARTMENT OF ENERGY PROJECT: PADDY CREEK GASOLINE DECONTAMINATION PLANT DRAWING NO. C95C90000149 REV. NO. 0</p>					

