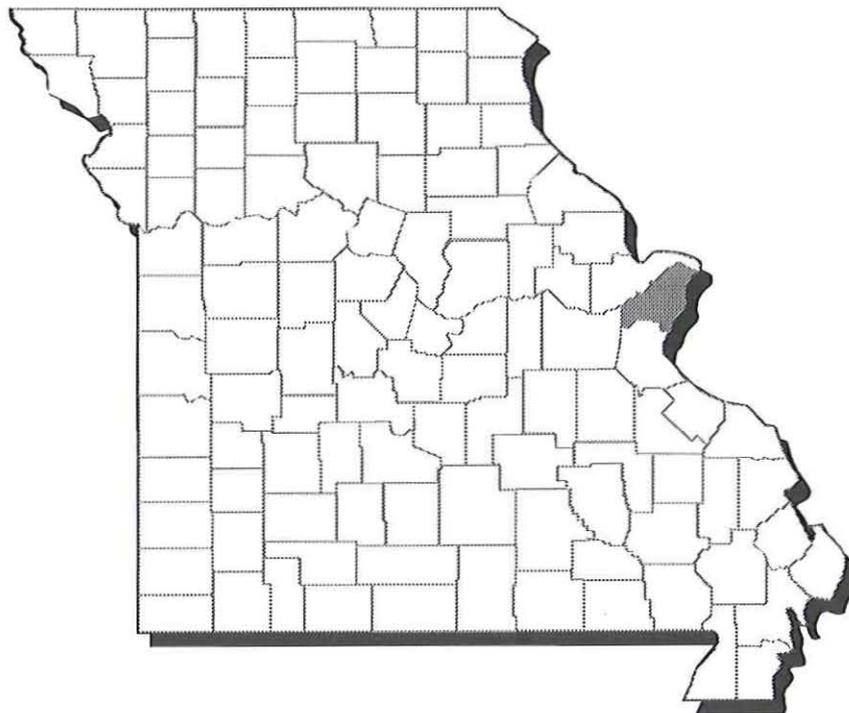


# COMBINED PRELIMINARY ASSESSMENT / SITE INSPECTION REPORT

Chicago Heights Blvd VOC Plume  
Overland, Missouri  
MOD006283808

March 28, 2000



Missouri Department of Natural Resources  
Division of Environmental Quality  
Hazardous Waste Program



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**DATE:** March 28, 2000

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Missouri Department of Natural Resources

**SITE:** Chicago Heights Blvd VOC Plume  
Overland

**EPA ID NUMBER:** MOD006283808

**C.A. NUMBER:** V997381-99

## **1.0 INTRODUCTION**

Under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Missouri Department of Natural Resources (DNR), through a cooperative agreement with the U.S. Environmental Protection Agency (EPA), conducted a Combined Preliminary Assessment/Site Inspection (PA/SI) at the Chicago Heights Blvd VOC Plume site. The Chicago Heights Blvd VOC Plume site is the location of an unidentified groundwater plume of volatile organic compounds (VOCs).

The purpose of this investigation was to collect sufficient information concerning conditions at the site to assess the threat posed to human health and the environment, to determine the need for additional investigation under CERCLA/SARA or other authority and, if appropriate, support ranking the site using the Hazard Ranking System (HRS) for proposal to the National Priorities List (NPL). The PA/SI was initiated on October 5, 1999. The scope of the investigation included reviewing available file information, a hydrogeologic assessment, a comprehensive target survey, and sampling of environmental media. A site visit took place on November 1, 1999 and a neighborhood meeting was held on November 8, 1999. A sampling event occurred on November 29, 30, and December 1, 1999, with additional sample collection on December 7, 1999.

## **2.0 SITE DESCRIPTION**

### **2.1 Location**

The Chicago Heights Blvd VOC Plume site is located in an area between Meeks Boulevard and Chicago Heights Boulevard in Overland, Missouri. The site is located in the Southeast Quarter (SE 1/4) of the Northeast Quarter (NE 1/4) of Section 31, Township 46 North, Range 6 East in St. Louis County (See Figure 1 in Appendix A) (Reference 3). The geographic coordinates for the site are 38°41'5" N latitude and 90°22'48" W longitude, calculated from the northeast corner of the intersection of Chicago Heights Boulevard and Elmridge Place (Reference 4). To reach the site from

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the junction of U.S. Highway 170 and Page Avenue in Overland, travel west on Page Avenue to Dielman, south on Dielman to Meeks Boulevard, west on Meeks Boulevard to Elmridge Place, and south on Elmridge Place to Chicago Heights Boulevard.

The consistent pattern of climate in St. Louis County is cold winters and long, hot summers. The average temperature in winter is 33° Fahrenheit (F) with an average daily minimum temperature of 24 ° F. In summer, the average temperature is 77° F with an average daily maximum temperature of 87° F (Reference 5, p. 2). The prevailing wind is from the south with an average speed of 9 miles per hour (Reference 6, p. 74). The long-term average annual precipitation is approximately 35 to 36 inches. The 2-year, 24-hour rainfall for the area is approximately 2.51 inches (Reference 7, p. 5-6).

**2.2 Site Description**

The Chicago Heights Boulevard VOC Plume lies beneath a residential neighborhood that consists of both single family and multi-family dwellings, within an unincorporated segment of Overland. The surface of the site is relatively flat on the south and east, but gently sloping upward toward the northwest. Approximately 35 individual homes and 12 apartment buildings are located in the area above the suspected location of the groundwater plume. Residential yards are mostly grass-covered (Reference 8).

The site area is approximately 15 acres in size. It is generally bounded on the north by Meeks Boulevard, on the east by Werremeyer Place, on the south by a railroad right-of-way, which lies south of Chicago Heights Boulevard, and on the west by a chain-link fence separating the neighborhood from an adjacent business and an open field. The neighborhood lies within a heavily urbanized area, surrounded by various industrial and commercial businesses. An open field lies north and northeast of the site, north of Meeks Boulevard. A metals fabrication facility is situated on the north side of Meeks Boulevard, north and northwest of the site. A group of rental storage units also lies northwest of the site. West of the site lies a taxi service and an open field. The south side of the site is adjacent to railroad tracks and commercial buildings facing Dielman Rock Island Drive, north of the River Des Peres. Additional residences and a neighborhood park lie east of the site area (Reference 8). Figure 2 in Appendix A is a site sketch. Photos of the site area can be found in Appendix D.

**2.3 Site History and Previous Investigations**

Chlorinated solvents were first discovered in the groundwater beneath the Chicago Heights Boulevard neighborhood in the summer of 1998, during an environmental investigation that was conducted for a nearby hazardous waste site. After additional sampling during the summer of 1999 failed to establish a clear migration route, the Chicago Heights Blvd VOC Plume site was referred to DNR's Hazardous Waste Program (HWP)/Superfund Section's Site Evaluation Unit for further evaluation.

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Although the groundwater in the site area is not used as a drinking water source, the downgradient residences with basements could be subject to vapors from the groundwater that enters the basements or from vapor migration through walls (Reference 9).

Two hazardous waste sites are known to exist in the immediate vicinity of the Chicago Heights Blvd VOC Plume site: the EG&G/Missouri Metals Shaping Company site located north and northwest of the site at 9970 Page Boulevard in Overland, Missouri and the All American Life Insurance Company site located south of the site at 9479 - 9495 Dielman Rock Island Drive in Olivette, Missouri. In addition, area residents have reported that at one time there was an old dump at the south end of Elmridge Place, near the River Des Peres and that an un-named company dumped material in this area (Reference 10).

**2.3.1 All American Life Insurance Company**

The All American Life Insurance Company site is located south of the Chicago Heights Blvd VOC Plume site, at 9479-9495 Dielman Rock Island Industrial Drive in Olivette, Missouri. The site is 1.75 acres in size and contains one single-story multi-tenant office/warehouse building that was constructed in 1985. The building is 24,000 square feet in size. Asphaltic pavement for parking and building access is present on the south and north sides. Historically, the area was occupied by residences until the area was cleared for commercial development in the 1960s. Apparently, small scale dumping occurred on the property in the mid-1960s (Reference 11, pp. 7-8, 15).

Groundwater sampling was first conducted at this site in May 1996, following a Phase I Environmental Assessment for a real estate transaction. The Phase I report, prepared by Environmental Operations, Inc. and dated January 16, 1996, reported five, partially full, 55-gallon drums of uncertain contents present on site. It also reported the potential for groundwater contamination to exist on the subject site, due to the known chlorinated solvent contamination in the groundwater at the EG&G/Missouri Metals site, which was located approximately 1,000 feet upslope (Reference 11, p. 1). Water samples were collected on May 7, 1996 from two monitoring wells installed in the northwest and northeast corners the site. Analysis revealed petroleum related compounds present in the northwest monitoring well, and chlorinated VOCs present in the northeast monitoring well (117 ppb TCE and 38.1 ppb PCE). Figure 6 in Appendix B is a site sketch of the All American Life Insurance Company site (Reference 12).

The All American Life Insurance Company applied to and was accepted into DNR's Hazardous Substance Environmental Remediation Program, by Letter of Agreement dated October 10, 1996, for the remediation of contaminants under the review and oversight of the DNR (Reference 12). This program is more commonly known as the

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Voluntary Cleanup Program (VCP). Numerous site characterization investigations were conducted at the site by Environmental Solutions, Inc., between November 1996 and June 1998. A conclusion in the Phase II Environmental Site Assessment report, dated March 18, 1997, was that the groundwater flow was southward, and that the PCE and TCE contamination was found only in the groundwater, not in the soil, and appeared to be migrating on-site (Reference 14, p.3). Petroleum related compounds and lead contamination in the soil and groundwater were also found at the site during these investigations. In a letter dated April 11, 1997, DNR/VCP personnel agreed with Environmental Solutions conclusion that groundwater and soil data showed that the PCE, TCE, and cis-1,2-dichloroethylene (cis-1,2-DCE) contaminants in the groundwater were originating off-site at an up gradient source (Reference 15). However, investigation and remediation efforts continued in an effort to address the other contamination on the site. On June 8, 1999, the All American Life Insurance Company officially withdrew for the Voluntary Cleanup Program (Reference 16).

**2.3.2 EG&G/Missouri Metals Shaping Company (now Perkin Elmer) (EPA No. MOD006283808) (Reference 17)**

The former EG&G/Missouri Metals Shaping Company (now Perkin Elmer) site is a metals fabrication facility located north of the Chicago Heights Blvd VOC Plume site, at 9970 Page Boulevard in Overland. The facility has been in operation since 1957 under various ownership manufacturing aircraft component parts. The site is approximately 3.5 acres in size. Metals and organics contamination was identified in the soil at the site during a Site Inspection in 1988. Volatile organic compounds (VOCs) were first detected in the groundwater at the site during a property transfer audit at the time EG&G acquired the property in 1988. Comprehensive groundwater sampling conducted for EG&G by Groundwater Technology, Inc. in January 1991 reported TCE present at concentrations up to 32 mg/L, PCE at concentrations up to 30 mg/L, and total VOCs at concentrations up to 210 mg/L in the groundwater beneath the site. The DNR proposed the site for the *Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri* in September 1991. EG&G appealed the proposal and subsequently negotiated a Consent Agreement between EG&G and the DNR for cleanup of the site. The Consent Agreement was finalized in 1994. Various remedial investigations and activities have taken place at the site since 1991; however, until 1998, off-site contamination had not been evaluated.

In January 1998, the DNR expressed concerns over the VOC contaminant levels and the potential for off-site migration. Since the groundwater in the area is not being used for drinking water, the primary concern was the possibility of contaminated groundwater causing vapor migration into nearby homes downgradient of the site. In April 1998, EG&G committed to conducting an off-site investigation to determine if site contaminants had migrated from the EG&G site. Burns and McDonnell Waste

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Consultants, Inc. (BMWCI) conducted off-site soil gas sampling for EG&G in August 1998 and detected chlorinated solvents in the soil south of the site (Reference 18). During that investigation, DNR collected groundwater samples from two of the probe holes. Chlorinated solvents were detected in one of the samples at concentrations as high as 25 ppm TCE (Reference 35). This investigation was followed by indoor air sampling in the basements of four residences in the downgradient neighborhood in November 1998. Although no volatile organic compounds were detected in any of the air samples, TCE was detected at an estimated 4.0 micrograms per liter (ug/L) in one water sample that was collected from a sump in one of the residences (Reference 19).

During July and August 1999, BMWCI conducted an Additional Off-Site Investigation to locate and transect the impacted groundwater plume between the EG&G site and the southern boundary of the residential area located to the south. This investigation included both subsurface soil and groundwater sampling in the residential area that is now the Chicago Heights Blvd VOC Plume site. The sampling report indicated that none of the soil samples from the soil borings contained the VOCs of concern. Piezometric data indicated that the groundwater gradient is generally to the southeast from the EG&G site and across the residential area. Depth to refusal data suggested that the slope of the bedrock surface from the EG&G site and across the residential area is also to the southeast. Groundwater samples from four temporary piezometers located in the southern portion of the residential area contained TCE and PCE; however, the water samples from the other seven piezometers located farther north toward the EG&G site were non-detect for the EG&G site-related contaminants. The report concluded that the contaminants present in the southern portion of the residential area have not migrated from the EG&G site, but have probably come from a separate source. The Figures 1-5 in Appendix B show the sample locations. Tables 1-4 in Appendix B present the sampling results of the Additional Off-Site Investigation (Reference 20).

**2.3.3 Other Nearby Facilities**

The Phase I Environmental Assessment of the All American Life Insurance Company property identified Patent Scaffolding Inc. as a Resource Conservation Recovery Act (RCRA) generator and UST location, 0.12 miles north of the All American site. A review of DNR files shows that Patent Scaffolding Inc. is located at 1492 Kin-Ark Court, which is just west of the County Cab Company at the northwest corner of the Chicago Heights Blvd site. Patent Scaffolding changed its name to Patent Construction Systems (PCS) approximately six years ago and is a construction equipment rental and scaffolding sales company. Historically, PCS used a dip tank to paint equipment. In November 1995, PCS cleaned out and removed the tank from the site, and made a one-time shipment of 916 pounds of Waste Flammable Liquid. The Hazardous Waste Manifest lists the shipment as Waste Flammable Liquids (Aliphatic & Aromatic Hydrocarbons) (Reference 21). An underground storage tank (UST) was present at this facility from

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1980 until its closure in 1992. Before its removal, the tank held xylene containing paint and paint thinners. There are no records of any releases from this UST in DNR files (Reference 22).

## **2.4 Waste Characteristics**

### Chlorinated Solvents

Chlorinated solvents, such as tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,1,1-trichloroethane, is a class of volatile organic compounds encountered at various hazardous waste sites. Chlorinated solvents are man-made compounds that are often used by industry as chemical intermediates, or solvents in the metal finishing, textile processing, and paint industries. Many chlorinated solvents are considered hazardous because they are mutagenic, carcinogenic, or teratogenic (References 23, p. 2; 24, p. 1; 25, p. 1).

Polychlorinated solvents exist as Dense Nonaqueous Phase Liquid (DNAPL). DNAPLs are separate-phase hydrocarbon liquids that are denser than water. DNAPLs can exist in the soil/aquifer matrix in free-phase form or in residual form. When released on the ground's surface, free-phase DNAPLs move downward through the soil matrix under the force of gravity or laterally along the surface of sloping fine-grained stratigraphic units. DNAPL migrates preferentially through small-scale fractures and heterogeneities in the soil. As free-phase DNAPLs move, residual amounts are trapped in pores and/or fractures by capillary forces. Most DNAPLs undergo only limited degradation in the subsurface and persist for long periods of time, while slowly releasing soluble organic constituents to groundwater through dissolution. Dissolution may continue for hundreds of years under natural conditions before the DNAPL is dissipated (Reference 26, p. 1).

Based on the limited data for humans regarding TCE exposure and cancer, and evidence that high doses of TCE can cause cancer in animals, the International Agency for Research on Cancer has determined that TCE is probably carcinogenic to humans. TCE has been nominated for listing in the National Toxicology Program 9th Report on Carcinogens (References 24, p.6; 25, p. 5).

## **3.0 WASTE/SOURCE SAMPLING**

The waste source at the Chicago Heights Blvd VOC Plume site is the undefined groundwater plume of chlorinated solvents that lies beneath the residential area. The plume has migrated to the site from an off-site source. There are several commercial/industrial sites nearby. The EG&G site is a known source of VOC contamination and is suspected to be a contributor to the Chicago Heights Blvd VOC plume.

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**3.1 Sample Locations (Reference 27)**

In an attempt to determine the location and probable source of the plume of chlorinated solvents in the groundwater, DNR/Environmental Services Program personnel used a track-mounted hydraulic soil probe to install temporary wells at 26 locations throughout the site. Locations were selected based on the results of previous investigation and available access. Previous off-site investigations had detected TCE in the soil and groundwater at the northern border of the Chicago Heights Blvd site. EG&G's Additional Off-Site Investigation had detected PCE and TCE in the groundwater at several locations near the southern border of the Chicago Heights Blvd site; however, no VOCs migration route had been established between these two locations. Previous investigations at both the EG&G and the All American Life Insurance sites had concluded that the groundwater gradient was generally to the southeast. For this investigation, temporary wells were placed on both the north and south sides, and points in between in order to locate the plume. Wells were also placed along the western side of the site in order to intercept potential VOC migration coming from the west. Figure 2 in Appendix A shows the location of all temporary wells. Table 1 in Appendix C presents Temporary Well Information.

Water samples were collected from 12 of the temporary wells during the initial three days of the sampling event, November 29 and 30, and December 1, 1999. The remaining 14 wells did not initially charge enough to collect water samples. The dry wells were left in place until December 7, 1999, when field personnel were able to collect water samples from 10 of the wells. Four of the wells remained dry and could not be sampled. Figure 3 in Appendix A shows the location of all samples collected. Table 2 in Appendix C presents the sample numbers, descriptions and collection locations and collection dates for all samples collected for the PA/SI.

**3.2 Analytical Results (Reference 27)**

All water samples were analyzed for volatile organic compounds, with a 1 ppb detection limit requested.

The chlorinated solvents PCE, TCE and/or their break-down products dichloroethylene (DCE) and vinyl chloride were detected in the water samples from numerous wells. The highest concentration of PCE was detected in Sample Number 997542 from GW-1, located in the northwest corner of the site. PCE was present in that sample at 716 ppb, along with TCE (367 ppb), total DCE (374.9 ppb) and vinyl chloride (10.6 ppb). The highest concentration of TCE was detected in Sample Number 997554 from GW-9, located near the intersection of Meeks Blvd and Wishart Place. TCE was present in that sample at 1,140 ppb, along with PCE (2.5 ppb), total DCE (150.9 ppb) and 1,1,2-trichloroethane (TCA) (1.7 ppb). Chlorinated solvents were detected at various

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concentrations in six additional wells near the north side of the site. Five additional wells in the center and southern part of the site contained lower levels of the chlorinated solvents.

In addition to chlorinated solvents, very low concentrations of two ketones (2-butanone and 4-methyl-2-pentanone) were detected in numerous well samples, located throughout the site. Also, acetone was detected in one sample and naphthalene was detected in one sample on the western edge of the site.

Analytical results are presented in Table 3 in Appendix C. Figure 4 in Appendix A illustrates the locations of the detected contaminants of concern.

**3.3 Hydrogeologic Review (Reference 28)**

The HWP's Site Evaluation Unit requested the assistance of HWP's Groundwater Enforcement Unit (GEU) in evaluating the groundwater impacts at the site. GEU personnel reviewed and evaluated the PA/SI sampling results and the results from the previous investigations. The following conclusions are from that evaluation:

1. The GEU stated that the groundwater contamination detected by the ESP in sampling points GW-1, GW-26, GW-2, GW-7, GW-9, GW-8, GW-19, and GW-10 definitely appears to have originated from the EG&G property to the north-northwest. They reviewed the groundwater contaminant data obtained by EG&G from its property, and observed that their plume is in a relatively tight (not dispersing, or fanning out in a wide area) pattern migrating from the northwest to the southeast. The aforementioned ESP sampling points seemed to indicate a continuation of this migration pattern off site into the northern residential area.
2. The GEU stated that the sampling results from the on-site EG&G shallow groundwater investigation and the off-site ESP investigation have indicated that a significant preferential subsurface pathway exists which is strongly influencing groundwater and contaminant migration. The presence of a drainage ditch, creek, or other influencing feature prior to the development of the area, which is now buried, could be the preferential migration pathway. Typically, with other sites experiencing similar VOC contaminated groundwater, the plume disperses, or "fans out," over a much wider area than the relatively narrow migration pattern seen at the EG&G facility and the Chicago Heights residential area. Other explanations for this migration pattern could be the influence of the buried storm water sewers or other buried utility features. Finding the extent of groundwater contamination that has a migration pattern strongly influenced by these features is a "hit and miss" effort. Since any former natural drainageway would not be oriented in a straight line, evenly spaced groundwater sampling patterns could

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indicate two apparent separate contaminated areas that, in reality, were part of the same plume. This could explain why the ESP sampling detected contaminants at GW-19, GW-8, and GW-10, did not detect any contaminants further downgradient at GW-11, but even further downgradient did detect contaminants at GW-12 and GW-13.

3. The GEU observed that given the "hit and miss" sampling scenario explained above in Comment #2 due to the preferential groundwater migration pathway, it is no surprise that EG&G's sampling results did not detect any contaminants in the northern residential area. In fact, EG&G only obtained three samples from the northern half of the entire three block area of concern. The ESP obtained fourteen groundwater samples from the northern half of the residential area. This could explain why the EG&G sampling only indicated contamination on the extreme southern perimeter of the subject area (G-4, B-10, B-11, and B-12). Though highly unlikely, it could be possible that the contaminants detected by EG&G at these four southern sampling points could have originated from a source other than the EG&G property. ESP did detect contaminants in four sampling points due west of the four contaminated EG&G sampling points. ESP sampling points GW-24, GW-23, GW-22, and GW-5 all had very low detections of VOC contaminants. If just one or two of these sampling points yielded a few VOCs below detection limits, it could be concluded that it was a result of laboratory contamination or poor quality control during Geoprobe drilling and sampling. The fact that all four sampling locations are in the same vicinity (southwest corner of the residential area) and yielded low VOC presence would lead one to believe that the detections were representative of groundwater conditions in the area. If there is a low-level contaminant groundwater plume in the southwestern portion of this area, it could have originated from the EG&G facility as well. Any combination of buried storm sewers, a sanitary sewer, cable and/or electrical lines, etc. could have induced flow from EG&G's property to the south along the fence line. Demonstrating that the southern residential area contamination did not originate from the EG&G facility could only be accomplished through the installation of groundwater monitoring wells along the fence line to confirm contaminant presence near the ESP sampling points, and installation of wells on the properties to the west to find this other assumed source area.
4. The GEU observed that the ESP Geoprobe sampling unit generally was pushed deeper than the EG&G sampling unit was pushed. It was originally thought that this may be the reason that the ESP sampling and analysis detected contaminants in certain areas and the EG&G sampling did not. This is because the dense contaminants would tend to migrate along the soil/bedrock interface

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zone and using too shallow a sampling methodology would tend to "miss" the contaminant presence. However, a review of the Geoprobe sampling depths revealed that both parties obtained samples from nearly identical depths in the area of B-7, B-1, and B-6. The ESP did obtain a significantly deeper sample from GW-11 located in what appears to be the middle of the residential area contaminant plume, but the sample was clean. In the southern portion of the residential area, EG&G sampling points B-5 and B-9 were also much shallower than corresponding ESP sample depths (GW-14 and GW-15), but samples from both parties were clean. In the extreme southern residential area where EG&G had four samples with low VOC detections in the groundwater, there were no corresponding ESP sampling points to corroborate evidence of contaminant presence in this area. Basically, the apparent discrepancies between the two parties sampling results are due to the EG&G consultants not sampling sufficiently in the north-northwestern portion of the residential area that adjoins their contaminated property and the ESP not sampling as far to the southeast as EG&G personnel did.

**3.4 Wastes/Sources Conclusions**

Groundwater contamination from the EG&G site seems to be migrating in a relatively tight pattern off-site into the northern residential area. A significant preferential subsurface pathway exists that is influencing that migration. The VOC plume extends farther to the east than had been found previously.

Contaminants are also present in the southern residential area. It is possible, although highly unlikely, that the contaminants in the southwest corner of the residential area could have originated from a source other than the EG&G site. Any combination of buried storm sewers, a sanitary sewer, cable and/or utility lines could have induced flow from the north to the south. VOC levels along the fence line, on the western border of the site, do not indicate that a significant plume of contaminants is entering the residential area from the west. However, this is not conclusive. Demonstrating that the VOC contamination in the Chicago Heights Boulevard area came from some other source would require installing groundwater monitoring wells in the southwest corner of the site, along the fence line on the west and in the fields west of the site.

One other hazardous waste site nearby with known VOC contamination is the All American Life Insurance Company site on the south; however, the VOC contamination in the groundwater at this site was determined to be migrating to the site from an upgradient source.

## **4.0 GROUNDWATER PATHWAY**

### **4.1 Hydrogeologic Setting (Reference 7, pp. 2-4)**

The Chicago Heights Blvd VOC Plume site is situated within the Dissected Till Plains of the Central Lowland physiographic province. The topography of this area is characterized by a gently rolling surface of hills and plains composed of thick glacial till and loess of Pleistocene age deposited over a surface of consolidated Pennsylvanian- and Mississippian-age bedrock with moderate relief. The bedrock surface generally reflects surface topography.

#### **4.1.1 Stratigraphy (Reference 7, p. 2-3)**

Soils at the site are composed of loess and modified loess deposits 16 to 20 feet thick. In some areas the upper few feet consist of fill material that is composed of silty clay, debris, and gravel. The surface soil and/or fill is underlain by 2 to 7 feet of naturally-modified, clay-rich loess. The clay-rich loess grades downward to a silty, modified loess that extends to bedrock. The upper portion of the loess has been altered by urbanization.

The surficial materials are underlain by Pennsylvanian cyclic deposits of the Marmaton Group at a depth of approximately 16 to 20 feet. The Marmaton Group is predominately composed of layered limestone with shale and occasional thin seams of coal or clay. Thickness of the remaining eroded Marmaton Group deposits is approximately 40 feet. Underlying the Marmaton Group is the Pennsylvanian-age Cherokee Group. The Cherokee Group is composed of thinly-bedded shales and unconsolidated clay with minor amounts of sandstone, coal, and limestone. Thickness of the Cherokee Group is approximately 55 feet. The total thickness of all the Pennsylvanian deposits in this area ranges between 95 and 115 feet. The Pennsylvanian bedrock has a hydraulic conductivity between  $10^{-5}$  and  $10^{-7}$ .

The Pennsylvanian cyclic deposits unconformably overlie rocks of the Upper Mississippian System. The shallowest Mississippian unit present is the St. Genevieve Limestone. Beneath the St. Genevieve Limestone lies the St. Louis Limestone and Salem Formations. All three of these formations are predominantly composed of thickly-bedded limestone with small amounts of chert and dolomite. Beneath the Salem Formation lies the Warsaw Formation. The Warsaw Formation is composed primarily of shale with lesser amounts of limestone and dolomite. The oldest Mississippian-age unit beneath the site is probably the Chouteau Group (Undifferentiated), a unit distinguished by thin, wavy shale partings. A thin, undifferentiated basal Mississippian sequence may be present, consisting of shale, sandstone, or cherty dolomitic limestone.

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Beneath the Chouteau Group are Devonian, Silurian, Ordovician and Cambrian-age strata that are composed predominately of dolomite, but are divided by several sandstone and shale units. These units extend approximately 3,800 feet below the site to the igneous rocks of the Pre-Cambrian basement.

**4.1.2 Aquifers (Reference 7, p. 3)**

Perched Aquifer

The surficial layer of mixed soils may experience seasonal saturation. The permeability of the altered loess is moderate. The increased permeability due to the presence of fill material is tempered somewhat by the increased clay content in the upper portion of the loess. The deeper, natural loess soils actually have a slightly higher permeability because of a greater silt composition. The estimated permeability of the loess is  $10^{-6}$  to  $10^{-5}$  cm/sec. The permeability of the fill (if present) is expected to be in the range of  $10^{-3}$  to  $10^{-5}$  cm/sec. Preliminary pump tests at the EG&G site have determined a hydraulic conductivity of  $5.52 \times 10^{-3}$  cm/sec to  $5.92 \times 10^{-4}$  cm/sec for the mixed soils.

Mississippian Aquifer

The main aquifer of concern at this site is the Upper Mississippian regional aquifer. In the St. Louis area, this aquifer consists primarily of the St. Genevieve Limestone, the St. Louis Limestone, and the Salem Formation. The Upper Mississippian aquifer extends from approximately 170 feet to 400-500 feet below the surface. There are no confining beds in the Upper Mississippian aquifer above the Warsaw Formation, and the entire sequence is considered hydrologically interconnected. Wells completed in the Upper Mississippian aquifer are able to produce 12 gallons per minute (GPM). Immediately below the Upper Mississippian units is a relatively thick layer of shale and shaley limestone of the Upper Warsaw Formation that acts as an aquitard. The Lower Mississippian aquifers, and others below it, yield greater amounts of mineralized water with increasing depth. These units are, therefore not used as a drinking water source in the area.

Pennsylvanian Aquifer

The Pennsylvanian cyclic deposits yield very small quantities of highly- mineralized, poor-quality water and are considered to be insignificant as aquifers. There is evidence suggesting that there are (perched) water horizons in or on top of the Pennsylvanian bedrock. These perched water horizons have a higher piezometric head than the water within the Upper Mississippian aquifer, implying a downward vertical gradient. However, significant recharge from the Pennsylvanian to the Mississippian bedrock is not expected. In fact, only minor recharge of the Pennsylvanian units from precipitation at the site is expected. Most precipitation is evapotranspired or becomes surface runoff.

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**4.1.3 Groundwater Flow Direction and Seepage to surface Water Bodies**  
(Reference 7, p. 3)

The groundwater surface in both the Pennsylvanian and Upper Mississippian aquifers generally mimics surface topography. After percolating through soils, water resulting from precipitation, follows shallow preferential pathways in the weathered bedrock surface. Shallow, discontinuous fractures also allow water to move vertically to the water table. Once it enters the saturated zone, groundwater moves southeast towards the River des Peres along a hydraulic gradient of approximately 0.023 ft./ft.

A small amount of precipitation is expected to seep through the soils, flow across the top of the Pennsylvanian bedrock surface, and discharge at the River Des Peres.

**4.1.4 Karst Features and Aquifer Discontinuities** (Reference 7, p. 4)

The bedrock beneath the Chicago Heights site is not considered karst. Karst features are absent, since most of the site is covered with a thin veneer of Pennsylvanian-age siltstone, sandstone and shale. This cover has reduced extensive solution weathering of the upper portion of the Mississippian carbonates.

There are no major groundwater discharge zones within four miles of the site. No aquifer discontinuities affect groundwater flow within four miles of the site.

**4.2 Groundwater Targets**

Drinking Water

The majority of the population within four miles of the site relies on drinking water supplied by the St. Louis County Water Company, which obtains all its water from surface water intakes on the Missouri and the Meramec Rivers. There are no public water supply wells within four miles of the site (Reference 29).

The Missouri Division of Geology and Land Survey (DGLS) has on record one community well, four non-community public wells and 30 private wells within four miles of the site (Reference 7). Most of these wells are old wells, drilled prior to the county water service starting service in their areas. It is unlikely that many of these wells are still in use. It is known that the one community well at the Maryland Heights School is no longer in use (Reference 29). No information could be found for the five non-community public wells on record and none of them are included in the recent inventories of non-community water systems in St. Louis County (Reference 30, p183). Since verifying the current usage of private drinking water wells is difficult, all 30 private wells are reported here, even though few are expected to be in use. Of these wells, one is located between one-half and one mile, seven are located between one to two miles, 13 are located between two to three miles, and 9 are located between three to four

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miles from the site (Reference 7). At 2.57 persons per household (the average for St. Louis County) (Reference 31, p. 143), this equates to an estimated 77 people possibly using private wells. It appears that these wells were completed in the Upper Mississippian regional aquifer (Reference 7). Table 1, below, presents the estimated population potentially using groundwater for drinking water purposes within distance categories.

The nearest drinking water well on record was drilled in 1936 and is located approximately 0.6 miles northwest (upgradient) of the site. The nearest well downgradient of the site is located approximately 1.7 miles south of the site and was drilled in 1961 (Reference 7).

<b>Table 1. Estimated Population Potentially Served by Wells Within Distance Categories</b>				
<b>Distance Category (in miles)</b>	<b>People Served by Public Wells</b>	<b>Number of Private Wells</b>	<b>People Served By Private Wells</b>	<b>Total People Served</b>
0 to ¼	0	0	0	0
> 1/4 to ½	0	0	0	0
> ½ to 1	0	1	3	3
> 1 to 2	0	7	18	18
> 2 to 3	0	13	33	33
> 3 to 4	0	9	23	23
<b>Total</b>	<b>0</b>	<b>30</b>	<b>77</b>	<b>77</b>

Vapor From Contaminated Groundwater

A major concern in the Chicago Heights residential neighborhood is the potential for vapors from the VOC contaminated groundwater to enter residences. Although the groundwater is not used as a drinking source in the site area, many residences in the neighborhood have basements that are often wet from seepage. Vapors may also migrate into homes through basement walls. As stated in the site description, Section 2.2 of this report, approximately 35 individual homes and 12 apartment buildings are located in the area above the suspected location of the groundwater plume.

**4.3 Sample Locations**

No air or water samples were collected from residences during the PA/SI investigation. Air samples had been collected in four residences during off-site investigations by EG&G contractors on November 20, 1998; however, the location and extent of the plume was unknown at that time. DNR personnel originally planned to collect additional

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in-door air and water samples from homes that were determined to be in the path of the plume, as determined during PA/SI investigation. Drought conditions during the summer and autumn prior to PA/SI sampling made collecting those samples impractical. Drought conditions continued through the winter. No target samples were collected.

**4.4 Groundwater Conclusions**

The threat to human health from drinking water appears minimal. No drinking water wells were sampled. The perched groundwater in the surficial soils at the site is known to contain VOCs; however, this water is not used as a source of drinking water. Any private drinking water wells that may still be in use within four miles of the site appear to draw water from the Mississippian aquifer. There could be some recharge from the contaminated perched water to the Pennsylvanian aquifer; however, recharge from the Pennsylvanian aquifer to the Mississippian aquifer below is not expected. Thirty wells are on record within four miles of the site; however, it is unlikely that many of them are still in use. The nearest downgradient drinking water well on record is located approximately 1.7 miles south of the site.

Residences with basements in the path of the VOC plume are subject to a potential threat from vapors from the contaminated water that enters the basements or from vapor migration through walls. Air and water sampling should be conducted within those basements in the path of the plume, where concentrations are at levels of concern as determined by the Missouri Department of Health.

**5.0 SURFACE WATER PATHWAY**

**5.1 Hydrologic Setting**

The Chicago Heights Blvd VOC Plume site is located in a heavily-urbanized area. The natural surface drainage has been substantially altered by development, and drainage is now controlled by an artificial drainage system. Surface water drainage is collected by storm sewers, then discharged to the River des Peres. The average annual run-off in the vicinity of the site is 10.5 inches (Reference 7, pp. 5-6).

The nearest down-slope surface water consists of the upper reaches of the channelized River des Peres. The River des Peres is an intermittent stream that is located 0.1 miles south of the Chicago Heights residential area. The stream flows eastward for approximately 18 miles and is channelized all the way to the Mississippi River. Under most conditions, the River des Peres has a low flow; however, during moderate to heavy precipitation, the flow increases dramatically, due to the heavily-urbanized watershed (Reference 7, p. 5). The portion of the River des Peres that flows south of the site appears to be a drainage ditch. No water was visible in the drainage ditch at the time of the PA/SI site sampling event (Reference 8). USGS Topographic maps indicate

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that flow in the River des Peres is intermittent at least to 2.8 miles downstream from the site (Reference 3). The probable point of entry (PPE) for run-off from the site would be located at this point on the River des Peres, approximately 2.8 miles downstream from the site.

The Federal Emergency Management Flood Insurance Rate Map indicates Chicago Heights Blvd VOC Plume site is in an area of minimal flood hazard (Reference 32).

### **5.2 Surface Water Targets**

Since the PPE is more than two miles from the site, surface water targets were not evaluated for this site.

### **5.3 Surface Water Conclusions**

The threat to human health and the environment from run-off to surface water appears minimal. The site consists of a contaminated groundwater plume that is migrating from off-site. The contaminants are not known to be present in the shallow surface soils. Although seepage of contaminated groundwater may discharge into the intermittent River des Peres south of the site, the PPE is more than two miles downstream from the site.

## **6.0 SOIL EXPOSURE AND AIR PATHWAYS**

### **6.1 Physical Conditions**

Soils at the site have been mapped as the Urban Land Harvester Complex with 2 to 9% slopes. Slope across the site is approximately 1.1%. The Harvester Complex is described as a dark, grayish-brown silt loam with a surface layer about 4 inches thick. Below the surface layer is a 25-inch-thick, multi-colored silt loam. Harvester Complex soils have a moderately-slow permeability, high water capacity, low organic content, and moderate shrink-swell potential. However, the natural surface of the site has been extensively modified by urbanization. The upper 2 to 11-foot-thick layer consists of fill material that is composed of silty clay, debris, and gravel (Reference 7, pp. 2, 6).

The source of contamination at the site is a groundwater plume of VOCs. No waste sources are known to exist on the surface of the site. The areas above the suspected location of the plume include paved streets and sidewalks, homes and apartment buildings, and residential yards. Most yards are grass covered, and include shrubs, trees and some flower gardens that are usual in residential neighborhoods. Many of the yards are fenced. No soil conditions that would be unusual for a residential area are apparent (Reference 8).

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**6.2 Soil and Air Targets**

1990 Census figures indicate an estimated 690 people live within 0.25 miles of the site. The estimated total population within four miles of the site is 159,545 people. A breakdown of population by distance ring is presented in Table 2, below (Reference 33). There are no sensitive environments on or within 200 feet of the site (Reference 3, 34).

Distance From Site	Population
0 - 1/4 Mile	690
>1/4 - 1/2 Mile	2324
>1/2 - 1 Mile	8,490
>1 Mile - 2 Miles	30,213
>2 Miles - 3 Miles	53,108
>3 Miles - 4 Miles	64,720
Total	159,545

The major concern at this site is that vapors from the VOC contamination in the shallow groundwater might be entering some residences from the subsurface. This exposure route has been discussed within the groundwater pathway Sections 4.2 and 4.5 of this report.

**6.3 Soil Sample Locations**

No soil samples or outside air samples were collected since surface soil contamination is not a concern at this site.

**6.4 Soil Exposure and Air Pathway Conclusions**

Soil exposure at the Chicago Heights site appears to pose a negligible threat at this time. Also, the risk from airborne soil particles appears negligible. The site consists of a groundwater plume. There is no known source of contamination in the surface soils to which residents and the nearby population could be exposed. There is a potential threat to some residents from inhaling VOC vapors within residences. That potential was discussed in the groundwater pathway information, within Section 4.0 of this report.

**7.0 SUMMARY AND CONCLUSIONS**

The Chicago Heights Blvd VOC Plume site consists of a groundwater plume of VOCs beneath a residential neighborhood in St. Louis County, Missouri. Approximately 35 individual homes and 12 apartment buildings are located in the area above plume of VOCs. The neighborhood is in an unincorporated area within the city of Overland. It is a heavily urbanized area, surrounded by various industrial and commercial businesses.

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The site was first identified during an off-site environmental investigation that was conducted for a nearby hazardous waste site. In August 1998, the EG&G/Missouri Metals Shaping Company site (now Perkin Elmer), located northwest of the Chicago Heights Blvd site, conducted off-site sampling under a consent agreement between EG&G and DNR. TCE was discovered in the soil and groundwater south of Meeks Boulevard, at the northern edge of the residential area. TCE was not found in in-door air samples from several homes; however, TCE was present in a water sample collected from a sump in one residential basement. An additional off-site investigation in August 1999 found TCE and PCE present in groundwater in the southern portion of the residential area, along Chicago Heights Boulevard. Those contaminants were not detected in groundwater samples farther north, between the Chicago Heights Blvd location and the VOC plume that had been detected previously. The investigation also found that the groundwater gradient is generally to the southeast from the EG&G site and across the residential area. However, a clear migration route had not been established and the EG&G investigation report concluded that the contaminants present in the Chicago Heights Boulevard location had not migrated from the EG&G site, but had probably come from another source. The Chicago Heights Blvd VOC Plume site was then referred to DNR/HWP's Site Evaluation Unit for further evaluation. Although the groundwater in the area is not used as a source of drinking water, there is concern that the residences with basements could be subject to vapors from groundwater entering the basements or from vapor migration through walls.

PA/SI sampling was designed to determine the probable source and the location of the VOC plume; however, sample collection was complicated by dry conditions. Several of the wells were dry and could not be sampled. Analytical results showed a high concentration of TCE and PCE in wells on the north and low concentrations in wells on the south and in several wells in between; however a number of wells between both areas were non-detect for chlorinated solvents. A hydrogeologic review of the analytical data from PA/SI sampling and previous investigations concluded that groundwater contamination from the EG&G site seems to be migrating in a relatively tight pattern off-site into the northern residential area, and that a significant preferential subsurface pathway exists that is influencing that migration.

It is possible, although highly unlikely, that the contaminants in the southwest corner of the residential area could have originated from a source other than the EG&G site. Any combination of buried storm sewers, a sanitary sewer, cable and/or utility lines could have induced flow from the north to the south. VOC levels along the fence line on the western border of the site do not indicate that a significant plume of contaminants is entering the residential area from the west; however, this is not conclusive. Demonstrating that the VOC contamination in the Chicago Heights Boulevard area

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came from some other source would require installation of monitoring wells in the southwest corner of the site, along the fence line on the west, and in the fields west of the site.

One other nearby hazardous waste site with known VOCs present is the All American Life Insurance Company site, located south and downgradient of the Chicago Heights Blvd site. However, environmental investigations for that site concluded that the groundwater flow was southward, and that the chlorinated solvents in the groundwater at that site were originating off-site, from an upgradient source.

The threat to human health and the environment from surface water, soil exposure and from airborne soil particles appears minimal. Although the groundwater is not known to be used as a source of drinking water in the vicinity of the site, residences with basements in the path of the VOC plume are subject to a potential threat from vapors from the contaminated water that enters the basements or from vapor migration through walls.

## **8.0 Recommendations**

Based on current site conditions and available information, additional investigation under CERCLA authority is warranted. No further investigation of the source of the plume is necessary; however, additional sampling of in-door air in residential basements is warranted for the protection of human health.

Air and water sampling is recommended for residential basements that are in the vicinity of the plume, where VOC concentrations are present at levels of concern, as determined by the Missouri Department of Health. This sampling should take place during a time of the year when wetter conditions prevail.

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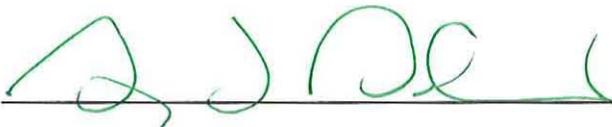
Prepared by:

  
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Chief  
Superfund Section

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March 28, 2000**

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## APPENDIX A

- Figure 1. Site Location Map
- Figure 2. Site Sketch / Well Location Map
- Figure 3. PA/SI Sample Location Map
- Figure 4. PA/SI Sampling Results

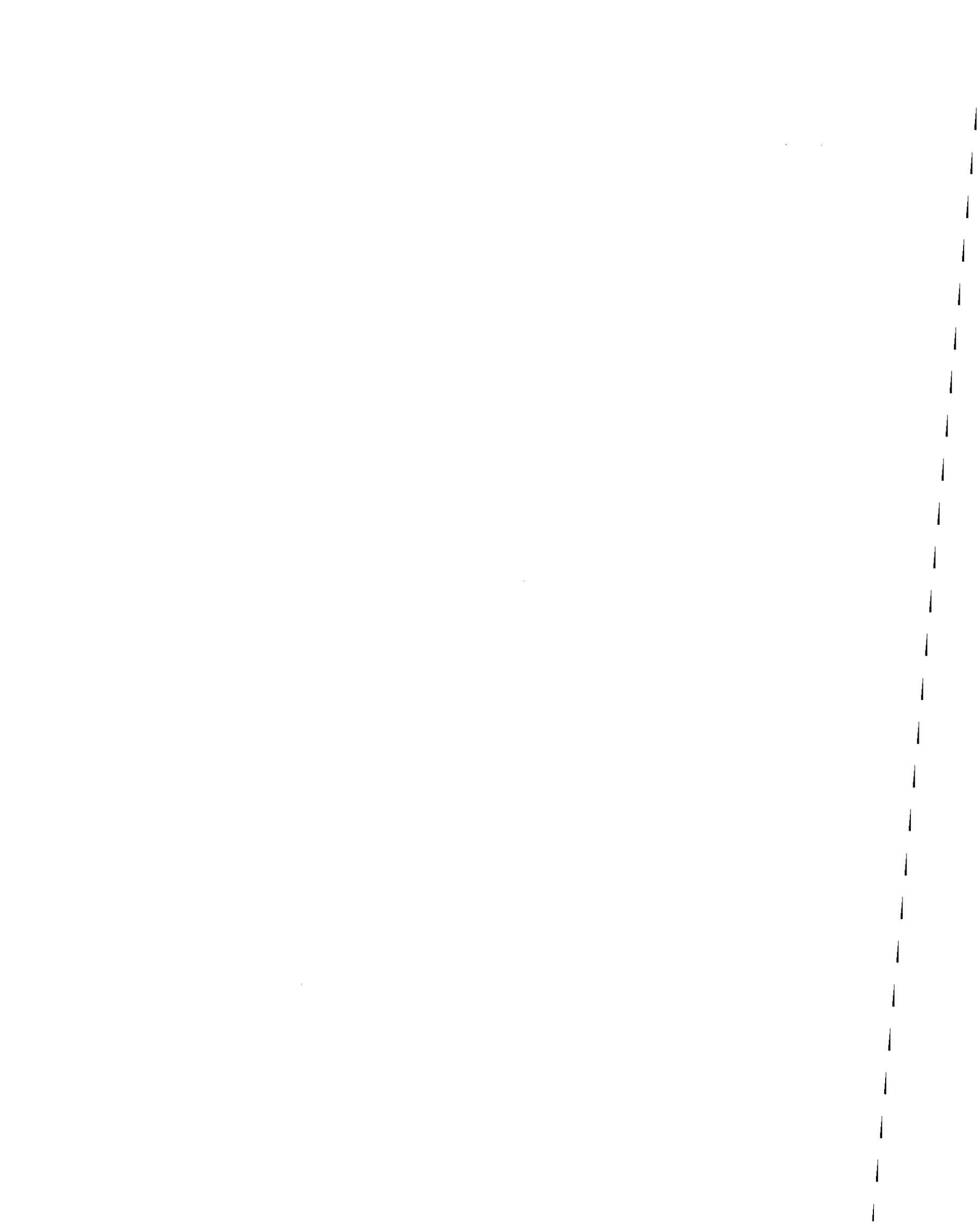
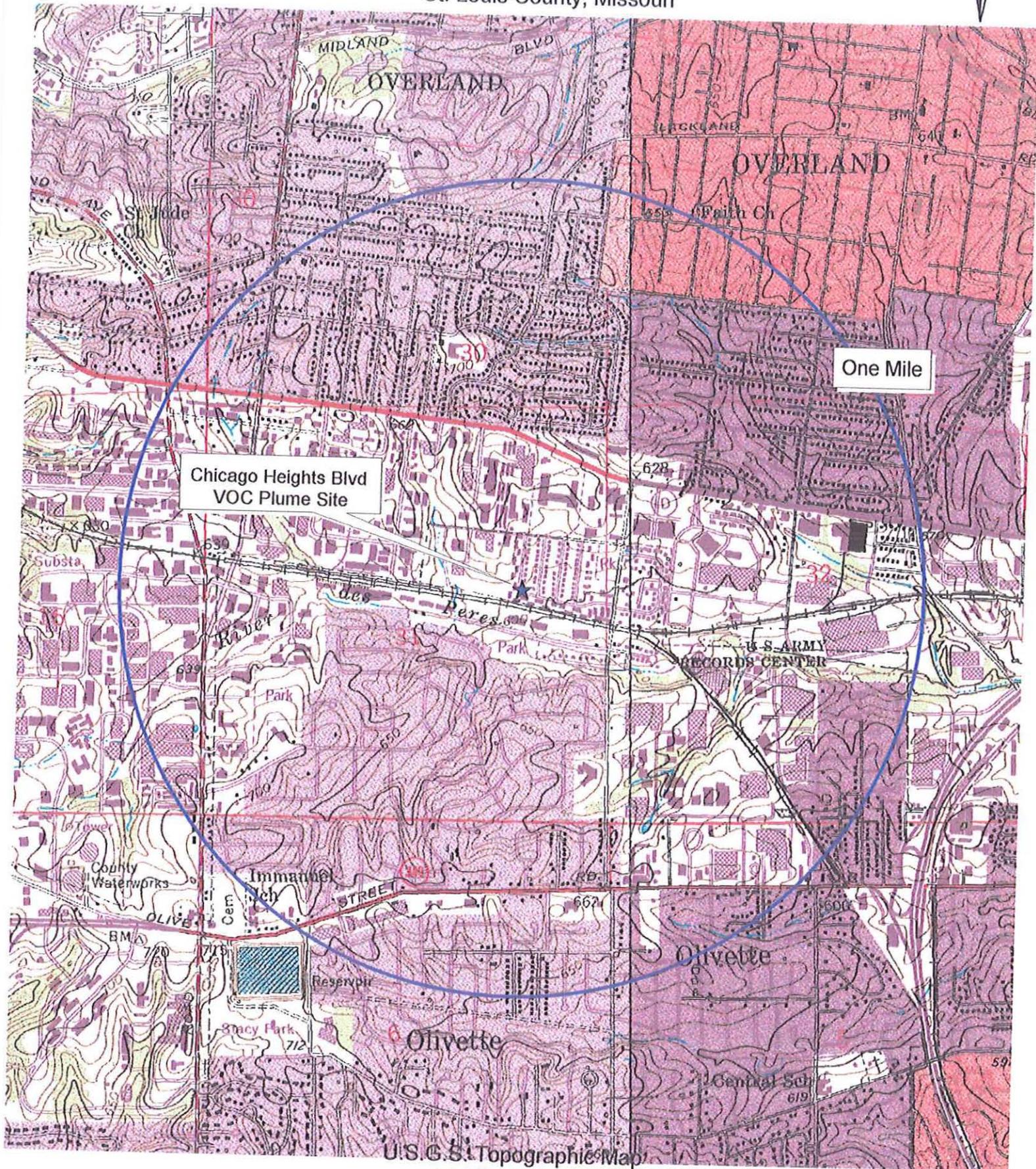


Figure 1  
Site Location Map  
Chicago Heights Blvd VOC Plume  
St. Louis County, Missouri

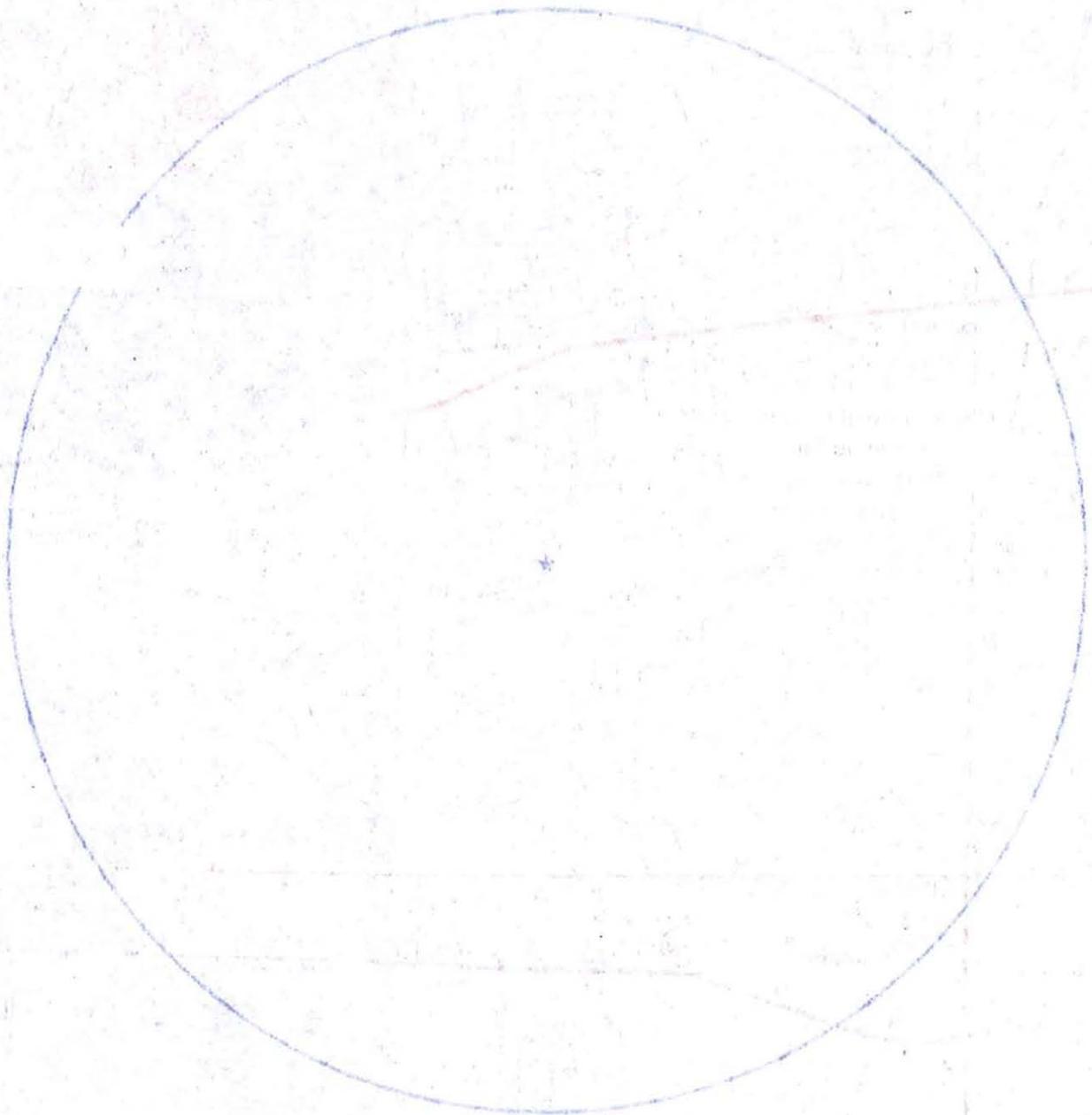


Chicago Heights Blvd  
VOC Plume Site

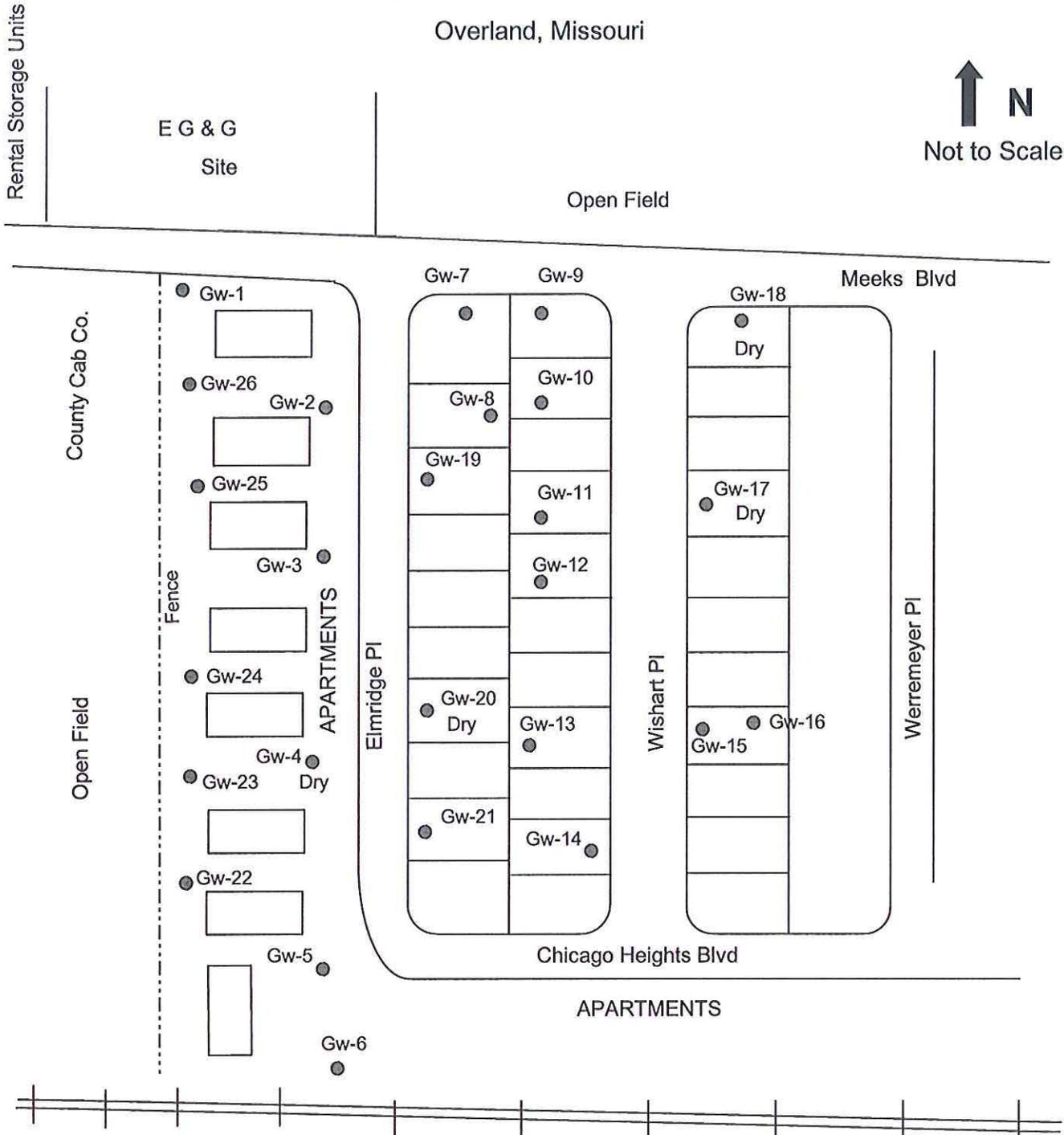
One Mile

U.S.G.S. Topographic Map  
7.5 Minute Series  
Creve Coeur and Clayton, Missouri □ Quadrangles, 1993

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Site Sketch / Well Location Map  
 Chicago Heights Blvd VOC Plume Site  
 Overland, Missouri



**LEGEND**

GW - 1 Groundwater well location

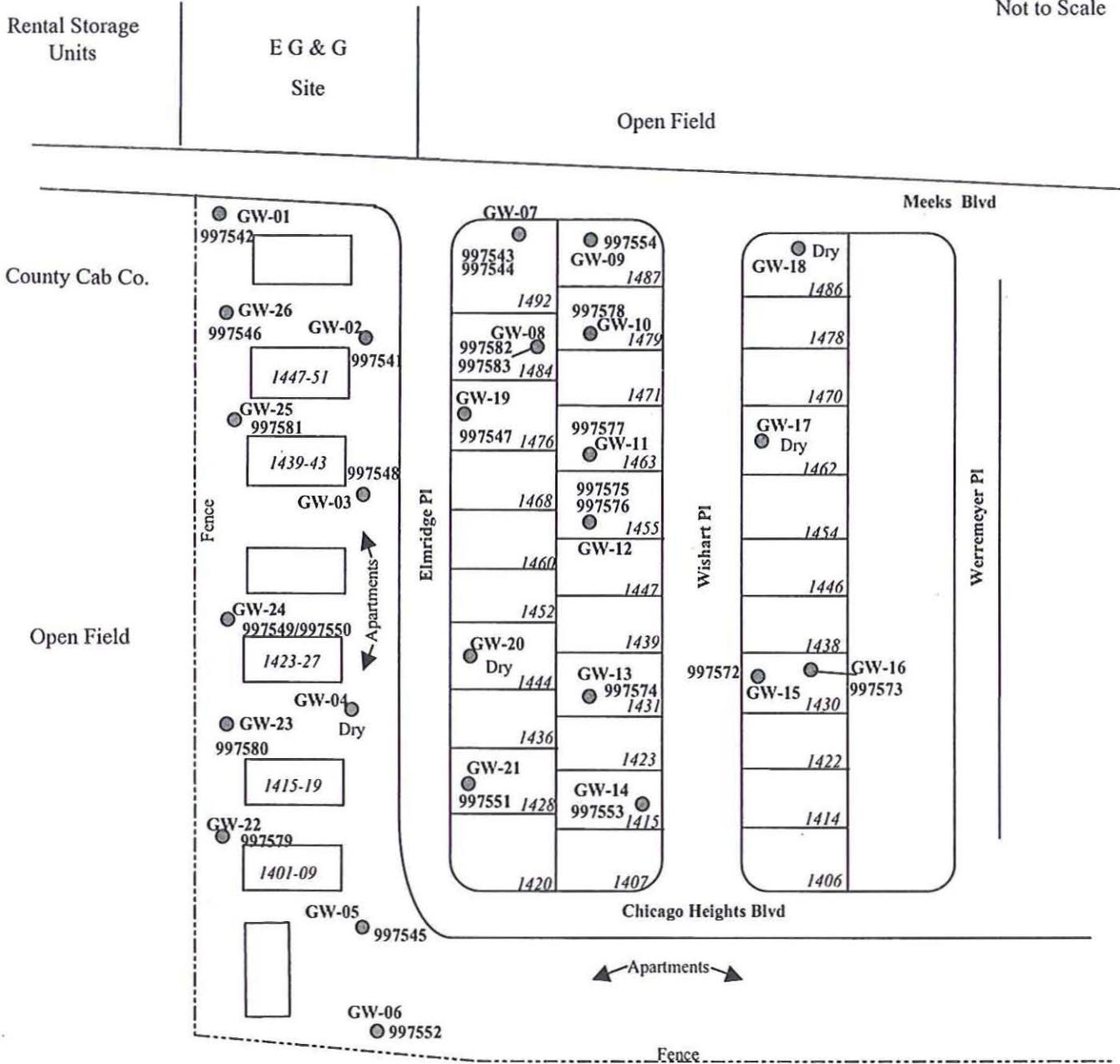
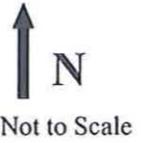
All American Life Insurance Site



# Site Map

## Chicago Heights Blvd VOC Plume Site

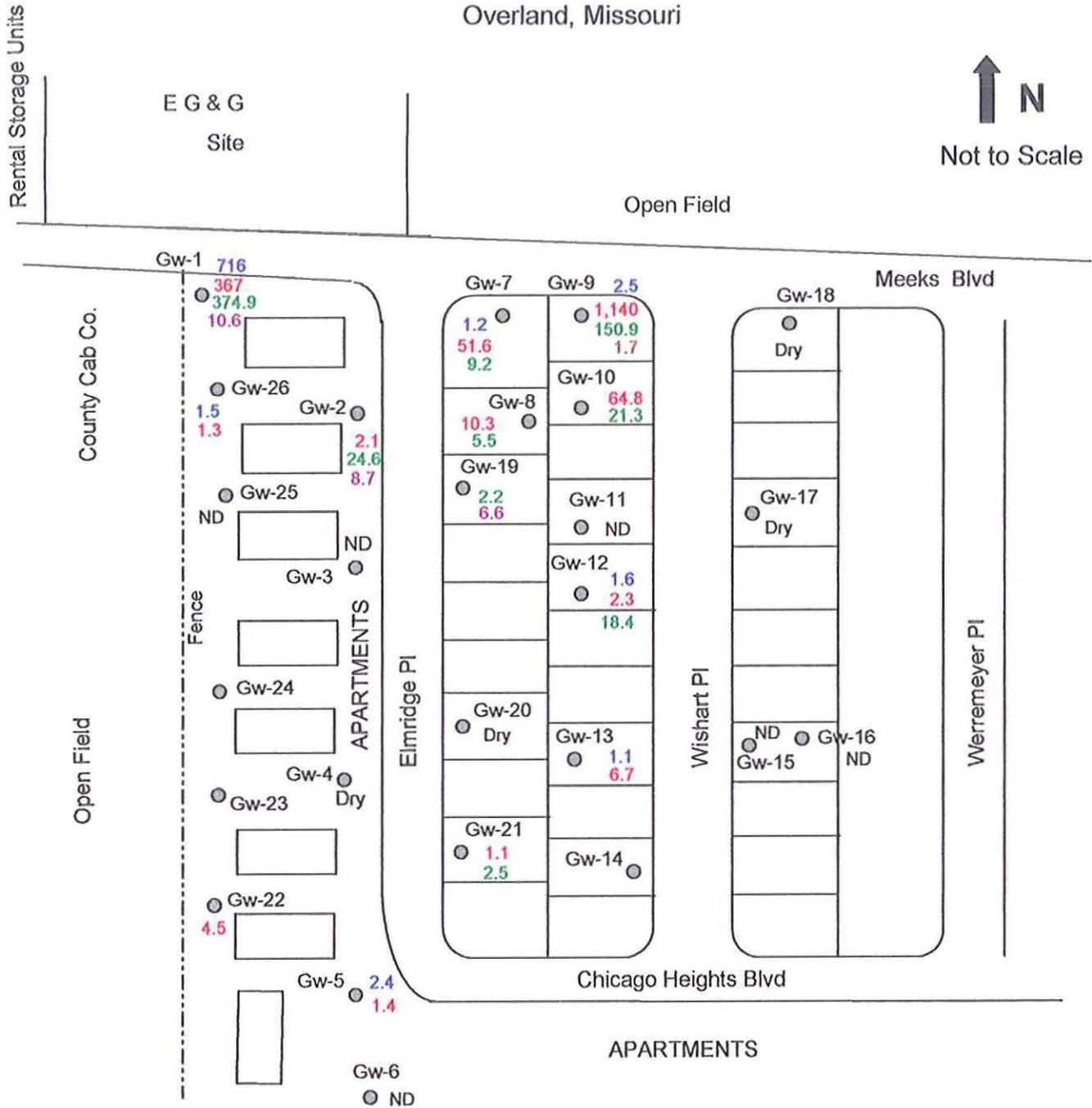
Chicago Heights Blvd VOC Plume  
 Overland, Missouri  
 PA/SI  
 FIGURE 3



LEGEND	
GW-XX ●	Temporary well location/identification
1415	Property/building address
99XXXX	Sample collected at location indicated



PA/SI Sampling Results  
 Chicago Heights Blvd VOC Plume Site  
 Overland, Missouri



LEGEND

All American Life Insurance Site

- GW-1 Groundwater well
- location
- 376 Concentration in ug/L
- ND Not Detected

- PCE
- TCE
- DCE - includes cis-1,2-, trans-1,2-, and 1,1-DCE
- Vinyl Chloride
- TCA

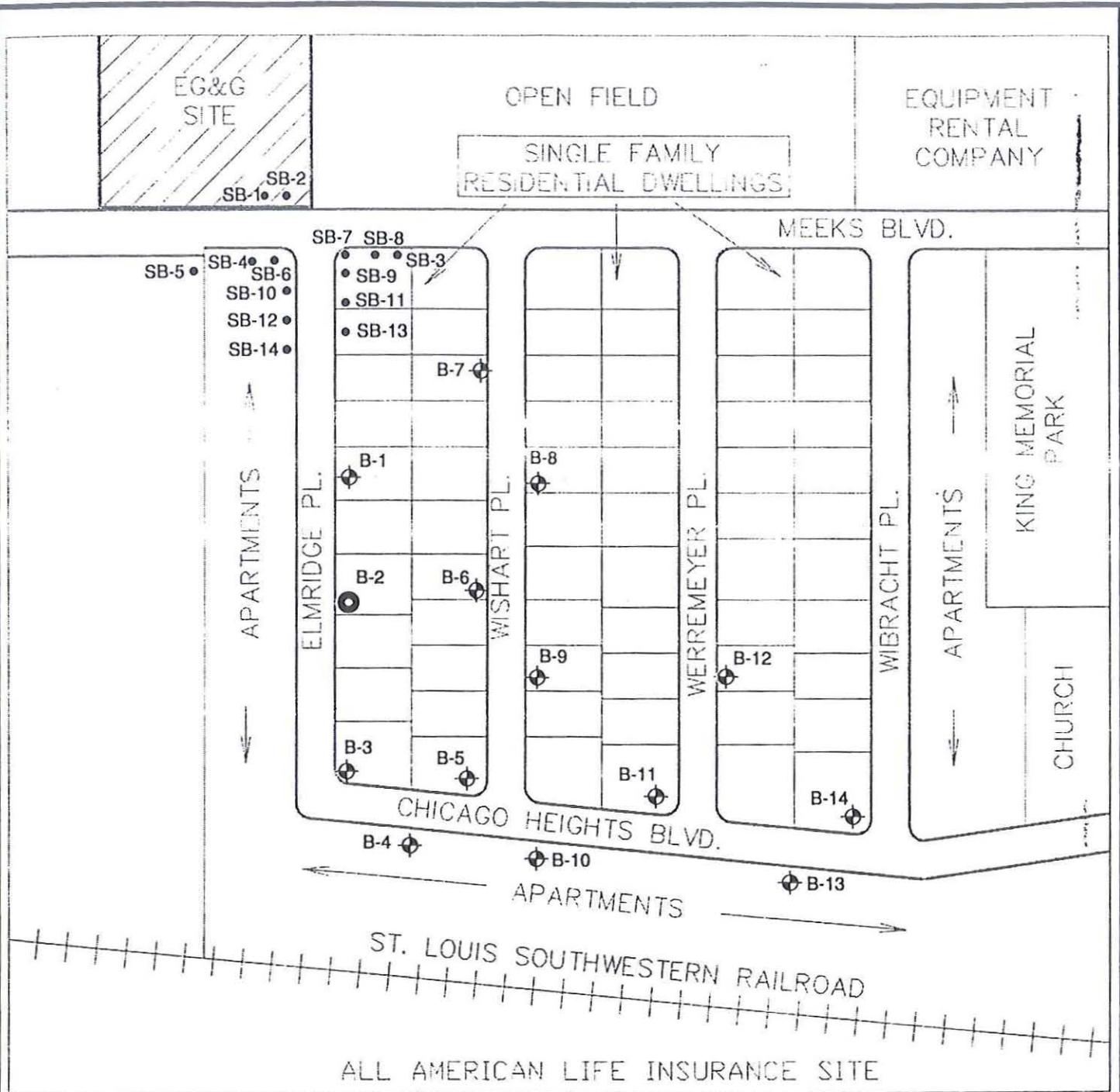


## APPENDIX B

### Previous Investigations

- Figure 1. Additional Off-Site Investigation for EG&G Missouri Metals Site
- Figure 2. Refusal Depth Contour Map
- Figure 3. Groundwater Contour Map
- Figure 4. TCE in Groundwater - August 1999
- Figure 5. PCE in Groundwater - August 1999
- Table 1. Summary of Depth to Refusal Data
- Table 2. Summary of Water Level Data
- Table 3. Subsurface Soil Sampling Results
- Table 4. Groundwater Sampling Results
- Figure 6. All American Life Insurance Company Site Map





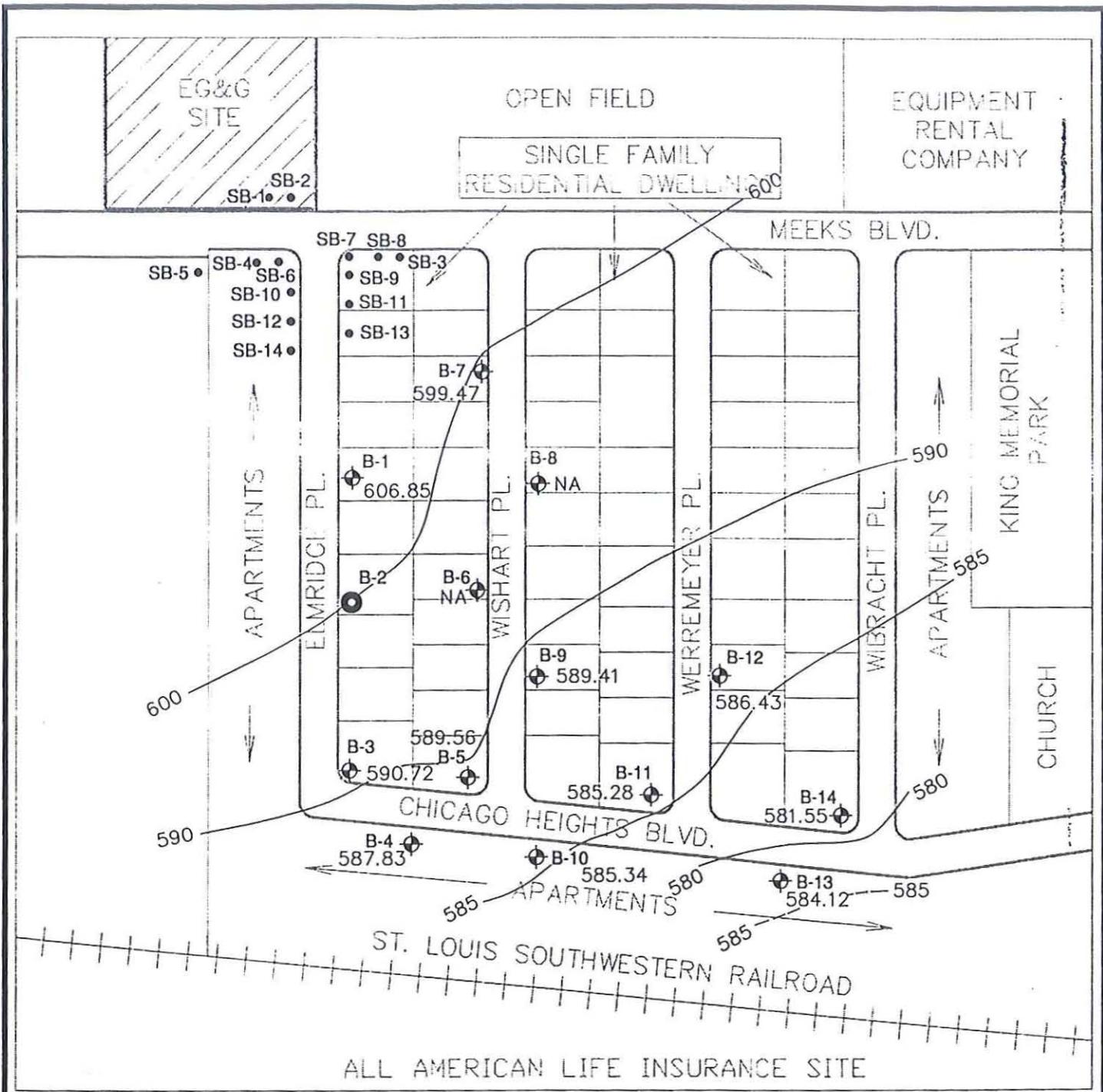
**LEGEND**

- B-1  FINAL PIEZOMETER LOCATION
- B-2  FINAL BORING LOCATION (No Piezometer Installed)
- SB-2  PREVIOUS BORING LOCATION (August 1998)

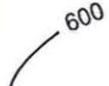


**Burns  
&  
McDonnell  
Waste  
Consultants,  
Inc**

Figure 1  
ADDITIONAL OFF-SITE  
INVESTIGATION  
EG&G MISSOURI METALS SITE  
OVERLAND, MISSOURI



**LEGEND**

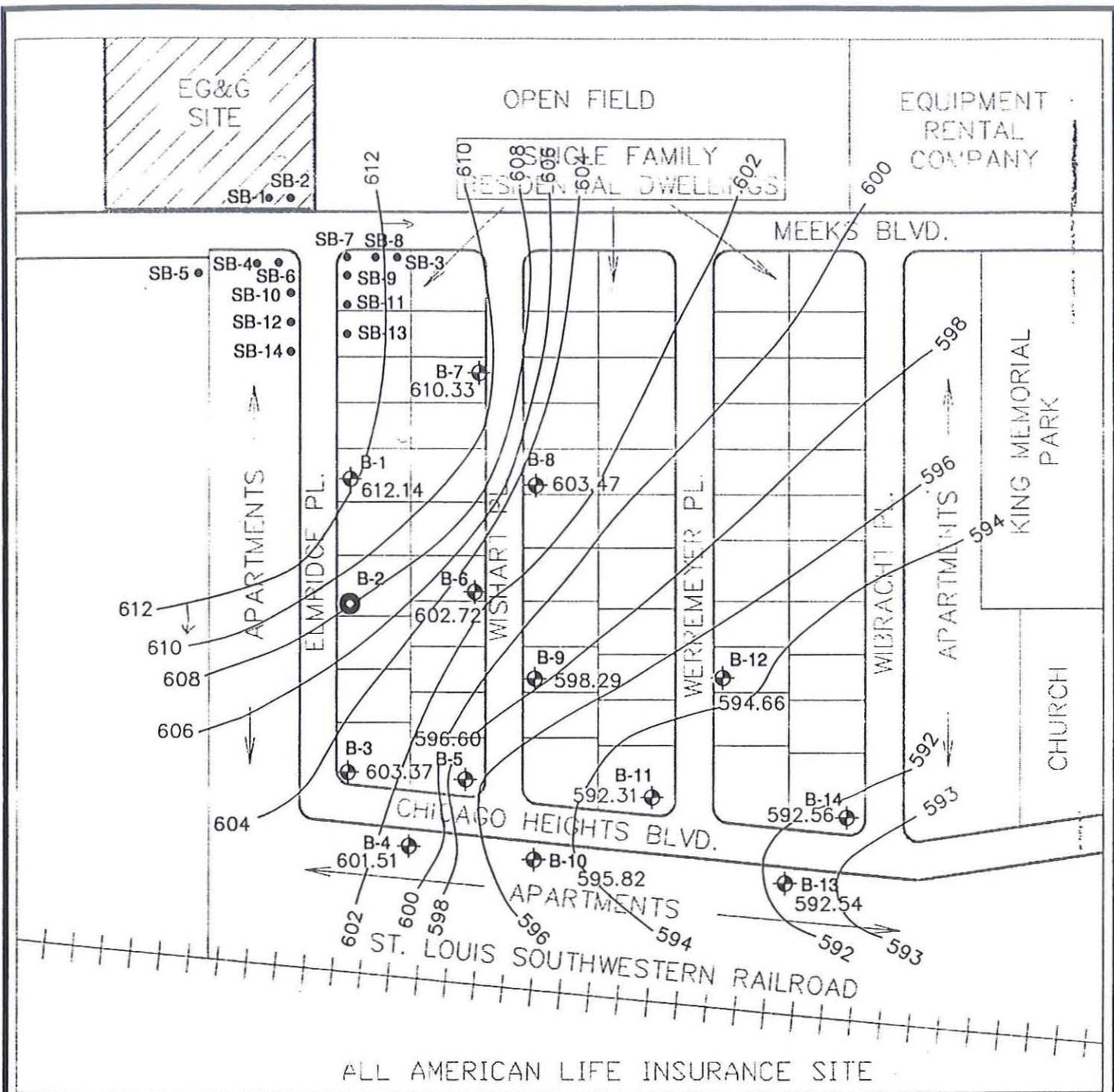
-  B-1 FINAL PIEZOMETER LOCATION
-  606.85 REFUSAL DEPTH ELEVATION (Feet Above Sea Level)
-  B-2 FINAL BORING LOCATION (No Piezometer Installed)
-  SB-2 PREVIOUS BORING LOCATION (August 1998)
-  600 REFUSAL DEPTH CONTOUR



**Burns  
&  
McDonnell  
Waste  
Consultants,  
Inc**

Figure 2  
REFUSAL DEPTH  
CONTOUR MAP  
AUGUST 1999  
EG&G MISSOURI METALS SITE  
OVERLAND, MISSOURI

TTAN:19131914006\CADD\EG&G.DWG



**LEGEND**

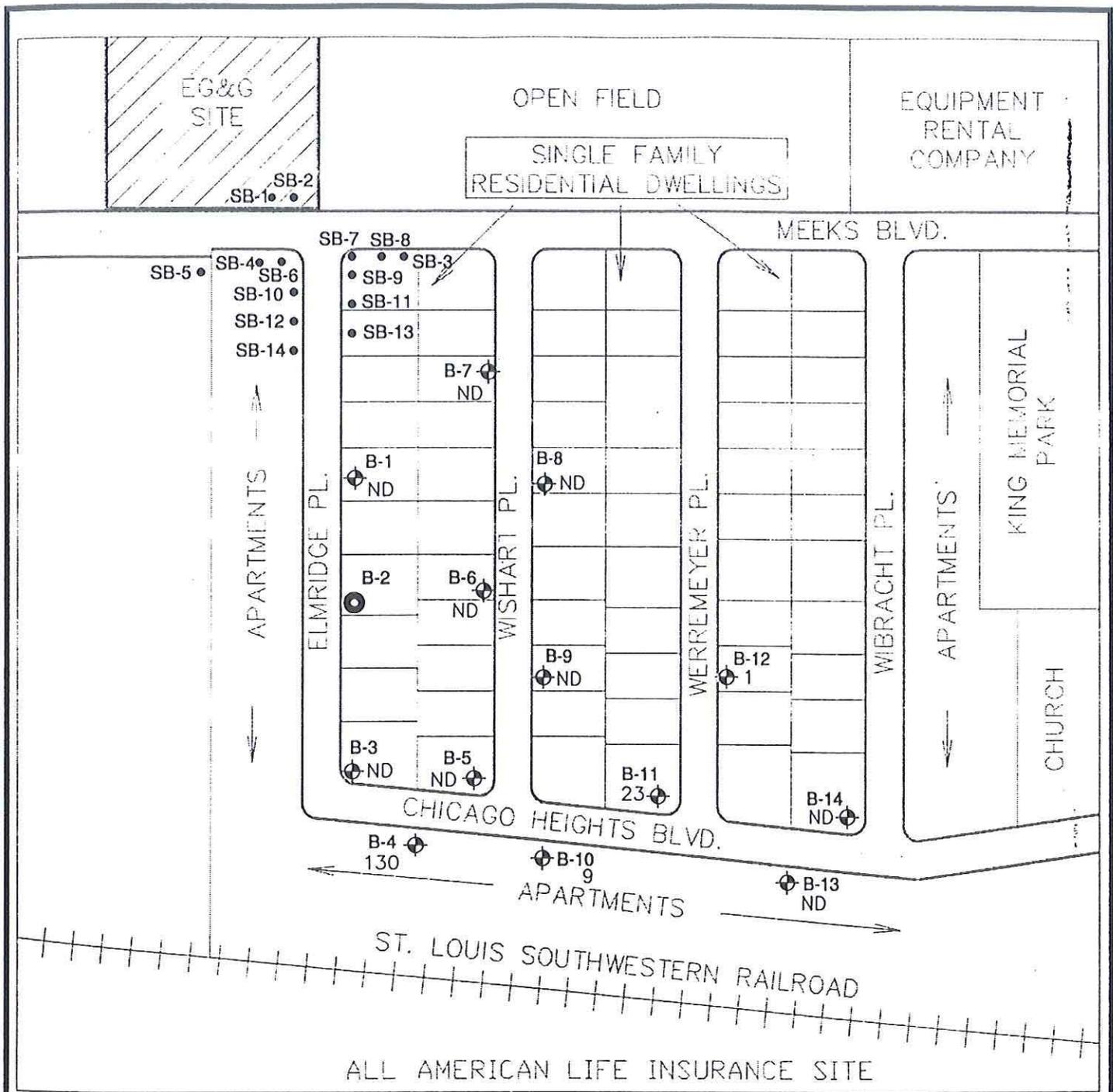
- B-1  
 FINAL PIEZOMETER LOCATION
- 612.14  
 PIEZOMETRIC SURFACE ELEVATION (Feet Above Sea Level)
- B-2  
 FINAL BORING LOCATION (No Piezometer Installed)
- SB-2  
 PREVIOUS BORING LOCATION (August 1998)
- 612  
 PIEZOMETRIC SURFACE CONTOUR



**Burns  
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McDonnell  
Waste  
Consultants,  
Inc**

Figure 3  
**GROUNDWATER  
 CONTOUR MAP  
 AUGUST 1999**  
 EG&G MISSOURI METALS SITE  
 OVERLAND, MISSOURI

TITAN:9131914006\CADD\EG&G.DWG



**LEGEND**

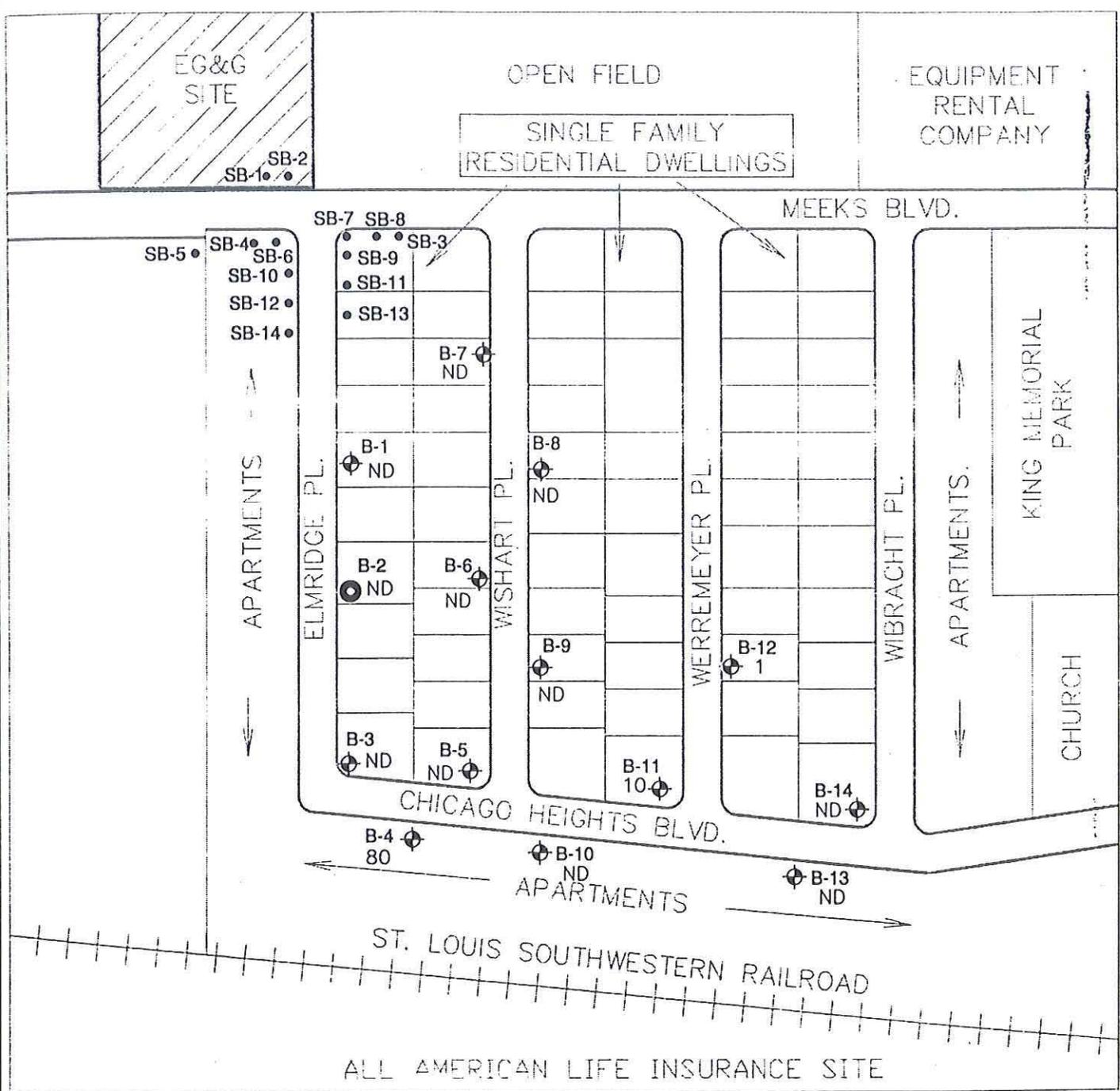
- B-1 FINAL PIEZOMETER LOCATION
- 130 TCE IN GROUNDWATER CONCENTRATION (ug/L)
- B-2 FINAL BORING LOCATION (No Piezometer Installed)
- SB-2 PREVIOUS BORING LOCATION (August 1998)
- ND NOT DETECTED (Reporting Limit = 1 ug/L)



**Burns & McDonnell Waste Consultants, Inc.**

Figure 4  
TCE IN GROUNDWATER  
AUGUST 1999  
EG&G MISSOURI METALS SITE  
OVERLAND, MISSOURI

TITAN:19131914006\CADD\EG&G.DWG



**LEGEND**

- B-1 FINAL PIEZOMETER LOCATION
- 80 PCE IN GROUNDWATER CONCENTRATION (ug/L)
- B-2 FINAL BORING LOCATION (No Piezometer Installed)
- SB-2 PREVIOUS BORING LOCATION (August 1998)
- ND NOT DETECTED (Reporting Limit = 1 ug/L)



**Burns & McDonnell Waste Consultants, Inc**

Figure 5  
 PCE IN GROUNDWATER  
 AUGUST 1999  
 EG&G MISSOURI METALS SITE  
 OVERLAND, MISSOURI

TITAN:9131914006\CADD\EG&G.DWG

Table 1  
 Summary of Depth to Refusal Data  
 EG&G Missouri Metals Additional Off-Site Investigation  
 August 1999

Temporary Piezometer	Date	(A)	Depth to Top of Screen (feet)	(B)	(A)-(B)	Refusal Depth Elevation* (feet)
		Casing Rim Elevation (feet)		Total Depth (feet)	Casing Base Elevation (feet)	
B-1	8/13/99	624.88	2.5	18.25	606.63	606.85
B-3	8/13/99	611.37	2.1	20.87	590.50	590.72
B-4	8/13/99	608.83	1.5	21.22	587.61	587.83
B-5	8/13/99	607.59	4.5	18.25	589.34	589.56
B-6	8/13/99	610.22	2.0	NA	NA	NA
B-7	8/13/99	620.43	1.0	21.18	599.25	599.47
B-8	8/13/99	615.47	2.0	NA	NA	NA
B-9	8/13/99	607.34	2.0	18.15	589.19	589.41
B-10	8/13/99	606.37	3.5	21.25	585.12	585.34
B-11	8/13/99	603.31	2.0	18.25	585.06	585.28
B-12	8/13/99	605.78	1.5	19.57	586.21	586.43
B-13	8/13/99	602.15	3.0	18.25	583.9	584.12
B-14	8/13/99	602.58	1.0	21.25	581.33	581.55

Notes

NA - Not Applicable - Refusal was not encountered during boring installation

\* - Refusal surface elevation = Casing base elevation + 0.22 feet.

Stainless steel drive points attached to base of casing are 0.22 feet in vertical length.

**Table 2**  
**Summary of Water Level Data**  
**EG&G Missouri Metals Additional Off-Site Investigation**  
**August 1999**

Temporary Piezometer	Date	(A)		(B)	(A)-(B)	Piezometric
		Casing Rim Elevation (feet)	Depth to Top of Screen (feet)	Depth to Water (feet)	Water Surface Elevation (feet)	Surface Elevation (feet)
B-1	8/13/99	624.88	2.5	12.74	612.14	612.14
B-3	8/13/99	611.37	2.1	8.00	603.37	603.37
B-4	8/13/99	608.83	1.5	7.32	601.51	601.51
B-5	8/13/99	607.59	4.5	10.99	596.60	596.60
B-6	8/13/99	610.22	2.0	7.50	602.72	602.72
B-7	8/13/99	620.43	1.0	10.10	610.33	610.33
B-8	8/13/99	615.47	2.0	12.00	603.47	603.47
B-9	8/13/99	607.34	2.0	9.05	598.29	598.29
B-10	8/13/99	606.37	3.5	10.55	595.82	595.82
B-11	8/13/99	603.31	2.0	11.00	592.31	592.31
B-12	8/13/99	605.78	1.5	11.12	594.66	594.66
B-13	8/13/99	602.15	3.0	9.61	592.54	592.54
B-14	8/13/99	602.58	1.0	10.02	592.56	592.56

Table 3  
Subsurface Soil Sampling Results  
EG&G Additional Off-Site Investigation  
August 1999

Analyte	Units	ASL*	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	B-11	B-12	B-13	B-14
Acetone	ug/Kg		10	ND(10)	52	30	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	14	ND(10)	ND(10)	ND(10)	ND(10)
Vinyl Chloride	ug/Kg		ND(10)													
Methylene Chloride	ug/Kg	670,000	18	19 B	16	15	13	12	21 B	38 B	44 B	28 B	24 B	20 B	21 B	12 B
1,1-Dichloroethylene	ug/Kg	8,300	ND(5)													
1,2 Dichloroethylene (total)	ug/Kg	560,000	ND(5)													
Trans 1,2-Dichloroethylene	ug/Kg	1,100,000	ND(5)													
Chloroform	ug/Kg	820,000	ND(5)													
Trichloroethylene (TCE)	ug/Kg	260,000	ND(5)													
Tetrachloroethylene (PCE)	ug/Kg		ND(5)													
Toluene	ug/Kg	11,000,000	ND(5)													
1,1-Dichloroethane	ug/Kg		ND(5)													
1,2-Dichloroethane	ug/Kg		ND(5)													
1,1,2-Trichloroethane	ug/Kg		ND(5)													
1,1,1-Trichloroethane	ug/Kg	2,000,000	ND(5)													
Benzene	ug/Kg	170,000	ND(5)													
Chlorobenzene	ug/Kg		ND(5)													
1,4-Dichlorobenzene	ug/Kg	2,800,000	ND(5)													

Notes

ASL\* - Any-Soil-Use Soil Level

B - Analyte detected in method blank possibly below the reporting limit

ND(5) - Not detected(analyte reporting limit of 5 ug/K)

Table 4  
Groundwater Sampling Results  
EG&G Additional Off-Site Investigation  
August 1999

Contaminant	Units	MCL*	B-1	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	B-11	B-12	B-13	B-14
Acetone	ug/L		ND(1)												
Vinyl Chloride	ug/L	2	ND(1)												
Methylene Chloride	ug/L	5	22 B	21 B	6 B	8 B	9 B	9 B	8 B	9 B	9 B	9 B	8 B	8 B	ND(1)
1,1-Dichloroethylene	ug/L	7	ND(1)												
1,2 Dichloroethylene (total)	ug/L	70	ND(1)												
Trans 1,2-Dichloroethylene	ug/L	100	ND(1)												
Chloroform	ug/L	100**	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2	ND(1)	ND(1)	1	ND(1)	ND(1)	ND(1)
Trichloroethylene (TCE)	ug/L	5	ND(1)	ND(1)	130	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	9	23	1	ND(1)	ND(1)
Tetrachloroethylene (PCE)	ug/L		ND(1)	ND(1)	80	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	10	1	ND(1)	ND(1)
Toluene	ug/L	1,000	ND(1)												
1,1-Dichloroethane	ug/L		ND(1)												
1,2-Dichloroethane	ug/L	5	ND(1)												
1,1,2-Trichloroethane	ug/L	5	ND(1)												
1,1,1-Trichloroethane	ug/L	200	ND(1)												
Benzene	ug/L	5	ND(1)												
Chlorobenzene	ug/L		ND(1)												
1,4-Dichlorobenzene	ug/L	75	ND(1)												

Notes

MCL\* - Maximum Contaminant Level

\*\* - Total THMs

B - Analyte detected in method blank possibly below the reporting limit

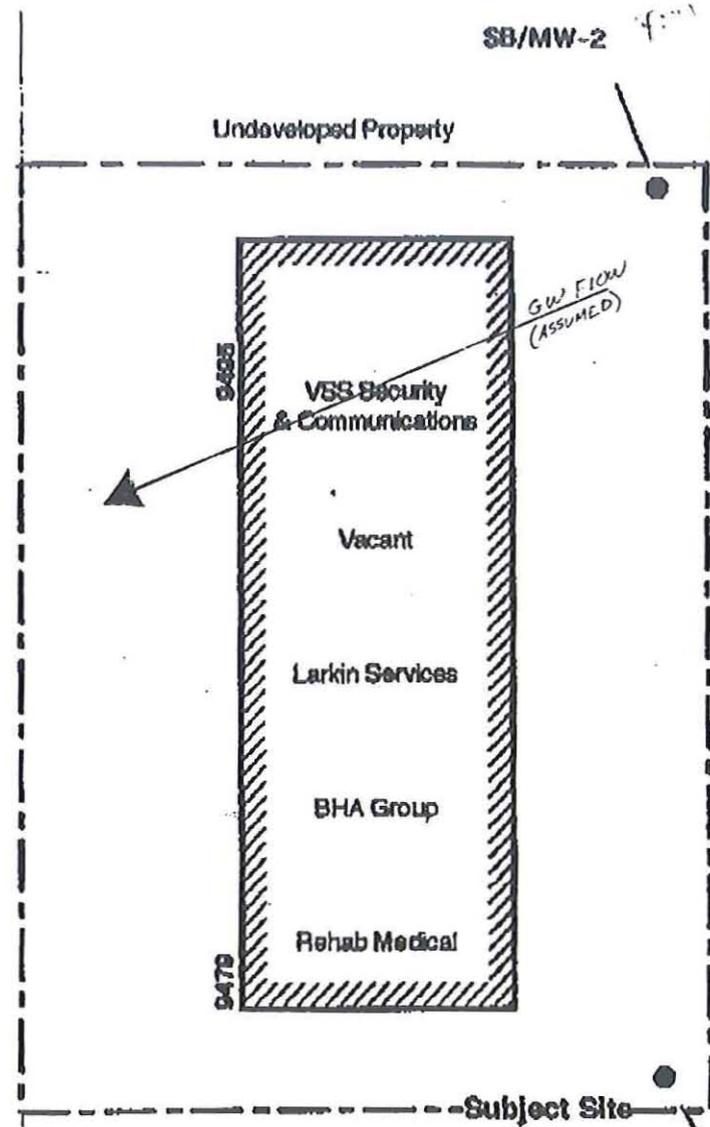
ND(1) - Not detected(analyte reporting limit)



Undeveloped Park Area

River Des Peres

Dielman Rock Island Drive



Chicago, Rock Island & Pacific Railroad

Abandoned Apartment Complex

**LEGEND**

- Soil Boring/Monitoring Well Location

**SITE LOCATION**  
 9479-9495 Dielman Rock Island Drive  
 Olivette, Missouri

## APPENDIX C

### PS/SI Investigations:

Table 1. Temporary Well Information

Table 2. Sample Listing/Descriptions

Table 3. Analytical Results for Groundwater Samples

Chicago Heights Blvd VOC Plume  
 Overland, Missouri  
 PA/SI  
 TABLE 1

Temporary Well Information

Well Identity	Total Depth – ft (below ground surface)	Depth to Water – ft (below ground surface)	Water Column – ft
GW-01	27.5	25.0	2.5
GW-02	29.2	25.2	4.0
GW-03	25.0	16.2	8.8
GW-04	27.0	Dry	-
GW-05	26.0	16.0	10.0
GW-06	24.0	22.5	1.5
GW-07	25.0	15.0	10.0
GW-08	23.1	10.2	12.9
GW-09	19.5	9.81	9.69
GW-10	18.1	7.4	10.7
GW-11	23.1	8.25	14.85
GW-12	17.0	7.8	9.2
GW-13	20.8	8.0	12.8
GW-14	20.3	9.3	11.0
GW-15	22.2	15.15	7.05
GW-16	20.3	13.0	7.3
GW-17	19.0	Dry	-
GW-18	18.2	Dry	-
GW-19	24.4	8.2	16.2
GW-20	22.0	Dry	-
GW-21	20.7	13.0	6.3
GW-22	17.6	7.7	9.9
GW-23	20.6	16.0	4.6
GW-24	22.7	16.3	6.4
GW-25	17.1	13.4	3.7
GW-26	23.0	20.4	2.6

Chicago Heights Blvd VOC Plume  
 Overland, Missouri  
 PA/SI  
 TABLE 2

Sample Listing/Descriptions

Sample #	Sample Media/Type	Location Collected/Description	Date/Time Collected
990049	QA/QC sample (trip blank)	Analyte-free water prepared at ESP laboratory.	11/28/99
997541	Water grab	Temporary well GW-02 located 6 ft west of the west edge of Elmridge Place and 9 ft south of the south edge of the first (northernmost) parking lot entrance. Sample was heavily turbid and medium brown.	11/29/99 @ 1355
997542	Water grab	Temporary well GW-01, located 125 ft west of the west edge of Elmridge Place and 12 ft south of the south edge of Meeks Blvd. Sample was moderately turbid and colorless.	11/30/99 @ 0740
997543	Water grab	Temporary well GW-07, located 30 ft south of the south edge of Meeks Blvd and 57 ft east of the east edge of Elmridge Place. Sample was heavily turbid and medium brown.	11/30/99 @ 0755
997544	QA/QC sample (duplicate)	Duplicate sample of 997543, entered onto chain-of-custody as "Blind duplicate". Same description as above.	11/30/99 @ 0755
997545	Water grab	Temporary well GW-05, located 12 ft west of the west edge of Elmridge Place and 10 ft south of the south edge of Chicago Heights Blvd. Sample was moderately turbid and light brown.	11/30/99 @ 0815
997546	Water grab	Temporary well GW-26, located 100 ft west of the west edge of Elmridge Place and 50 ft north of the north edge of the building representing 1447-51 Elmridge Place. Sample was clear and colorless.	12/1/99 @ 0826
997547	Water grab	Temporary well GW-19, located at the east edge of Elmridge Place, 10 ft south of the south edge of the driveway at 1476 Elmridge Place. Sample was slightly turbid and light brown.	12/1/99 @ 0845
997548	Water grab	Temporary well GW-03, located 6 ft west of the west edge of Elmridge Place and 6 ft north of the north edge of the second parking lot entrance. Sample was slightly turbid and light brown.	12/1/99 @ 0855
997549	Water grab	Temporary well GW-24, located 105 ft west of the west edge of Elmridge Place and 22 ft north of the building representing 1423-27 Elmridge Place. Sample was slightly turbid and light brown.	12/1/99 @ 0910
997550	QA/QC sample (duplicate)	Duplicate sample of 997549, entered onto chain-of-custody as "Blind duplicate". Same description as above.	12/1/99 @ 0910
997551	Water grab	Temporary well GW-21, located 22 ft west and 12 ft south of the southwest corner of the house at 1428 Elmridge Place. Sample was clear and colorless.	12/1/99 @ 0920
997552	Water grab	Temporary well GW-06, located 125 ft south of the south edge of Chicago Heights Blvd and 27 ft west of the west edge of Elmridge Place. Sample was clear and colorless.	12/1/99 @ 0925
997553	Water grab	Temporary well GW-14, located 12 ft south and 20 ft east of the northeast corner of the carport at 1415 Wishart Place (immediately south of the driveway). Sample was slightly turbid and light brown.	12/1/99 @ 0940
997554	Water grab	Temporary well GW-09, located 12 ft west and 7 ft north of the northwest corner of the house at 1487 Wishart Place. Sample was slightly turbid and light brown.	12/1/99 @ 0950

Chicago Heights Blvd VOC Plume  
 Overland, Missouri  
 PA/SI  
 TABLE 2 (Continued)

Sample Listing/Descriptions

Sample #	Sample Media/Type	Location Collected/Description	Date/Time Collected
997571	QA/QC sample (trip blank)	Analyte-free water prepared at ESP laboratory.	12/7/99
997572	Water grab	Temporary well GW-15, located 20 ft west of the northwest corner of the house at 1430 Wishart Place. Sample was clear and colorless.	12/7/99 @ 0950
997573	Water grab	Temporary well GW-16, located 25 ft east of the northeast corner of the house at 1430 Wishart Place. Sample was clear and colorless.	12/7/99 @ 1000
997574	Water grab	Temporary well GW-13, located 20 ft west and 14 ft south of the southwest corner of the house at 1431 Wishart Place. Sample was initially clear and colorless, but became moderately turbid and light brown during collection.	12/7/99 @ 1015
997575	Water grab	Temporary well GW-12, located 30 ft south and 25 ft west of the southwest corner of the house located at 1455 Wishart Place. Sample was clear and colorless.	12/7/99 @ 1035
997576	QA/QC sample (duplicate)	Duplicate sample of 997575, entered onto chain-of-custody as "Blind duplicate". Same description as above.	12/7/99 @ 1035
997577	Water grab	Temporary well GW-11, located 22 ft west and 7 ft north of the northwest corner of the house at 1463 Wishart Place. Sample was clear and colorless.	12/7/99 @ 1050
997578	Water grab	Temporary well GW-10, located 12 ft north and 1 ft east of the northwest corner of the house at 1479 Wishart Place. Sample was clear and colorless.	12/7/99 @ 1115
997579	Water grab	Temporary well GW-22, located 105 ft west of the west edge of Elmridge Place and 25 ft north of the north side of the building representing 1401-09 Elmridge Place. Sample was clear and colorless.	12/7/99 @ 1135
997580	Water grab	Temporary well GW-23, located 100 ft west of the west edge of Elmridge Place and 55 ft north of the north side of the building representing 1415-19 Elmridge Place. Sample was moderately turbid and light brown.	12/7/99 @ 1145
997581	Water grab	Temporary well GW-25, located 105 ft west of the west edge of Elmridge Place and 28 ft north of the north side of the building representing 1439-43 Elmridge Place. Sample was clear and colorless.	12/7/99 @ 1200
997582	Water grab	Temporary well GW-08, located approximately 25 ft east of the southeast corner of the house at 1484 Elmridge Place. Sample was clear and colorless.	12/7/99 @ 1210
997583	QA/QC sample (duplicate)	Duplicate sample of 997582, entered onto chain-of-custody as "Blind duplicate". Same description as above.	12/7/99 @ 1210

**Table 3. Selected Analytical Results for Groundwater Samples  
Chicago Heights Blvd VOC Plume PA/SI  
November 29- December 1, 1999, December 7, 1999**

- All values are in parts per billion (ug/L or ppb) unless otherwise noted.
- Shaded values are those above detection limits.
- Bold values are those above the lowest SCDM health-based benchmarks for drinking water.
- SCDM health-based benchmarks for drinking water are included as a basis for comparison, even though the groundwater is not used for a drinking water supply at this site.

Sample # Well #	ANALYTE (And lowest SCDM Benchmark Values)						
	PCE ( 1.6 )	TCE ( 5.0 )	1, 1-DCE ( 0.14 )	Cis-1, 2- DCE ( 70 )	Trans-1, 2-DCE ( 100 )	1, 1, 2- TCA ( 1.5 )	Vinyl Chloride ( 0.04 )
997541 GW-02	<1.0	2.1	<1.0	24.6	<1.0	<1.0	8.7
997542 GW-01	716	367	1.6	369	4.3	<1.0	10.6
997543 GW-7	1.2	51.6	<1.0	9.2	<1.0	<1.0	<2.0
997545 GW-05	2.4	1.4	<1.0	<1.0	<1.0	<1.0	<2.0
997546 GW-26	1.5	1.3	<1.0	<1.0	<1.0	<1.0	<2.0
997547 GW-19	<1.0	<1.0	<1.0	2.2	<1.0	<1.0	3.4
997548 GW-03	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997549 GW-24	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997551 GW-21	<1.0	1.1	<1.0	2.4	<1.0	<1.0	<2.0
997552 GW-06	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997553 GW-14	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997554 GW-09	2.5	1,140	1.9	149	<1.0	1.7	<2.0
997572 GW-15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997573 GW-16	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997574 GW-13	1.1	6.7	<1.0	<1.0	<1.0	<1.0	<2.0
997575 GW-12	1.6	2.3	<1.0	18.4	<1.0	<1.0	<2.0
997577 GW-11	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997578 GW-10	<1.0	64.8	<1.0	21.3	<1.0	<1.0	<2.0
997579 GW-22	<1.0	4.5	<1.0	<1.0	<1.0	<1.0	<2.0
997580 GW-23	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997581 GW-25	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
997582 GW-08	<1.0	10.3	<1.0	5.5	<1.0	<1.0	<2.0

APPENDIX D

Chicago Heights Blvd VOC Plume Site  
Photographs 1 - 10



Photo 1. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on November 31, 1999 by Nancy Priddy, Superfund, DNR. View of site area taken from intersection of Chicago Heights Blvd and Elmridge Place, looking north, up Elmridge toward Meeks Boulevard.



Photo 2. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on November 31, 1999 by Nancy Priddy, Superfund, DNR. View of site area from intersection of Chicago Heights Boulevard and Elmridge Place, looking east along Chicago Heights Blvd.



Photo 3. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on November 31, 1999 by Nancy Priddy, Superfund, DNR. View of site area from Chicago Heights Boulevard, looking north, up Wishart Place.



Photo 4. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on November 31, 1999 by Nancy Priddy, Superfund, DNR. Taken from southwest corner of site, looking north along western border of residential area. Apartments are on right.



Photo 5. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on December 1, 1999 by Nancy Priddy, Superfund, DNR. Northwest corner of site, looking south along western border. Fence is on right, obscured by vegetation.



Photo 6. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on December 1, 1999 by Nancy Priddy, Superfund, DNR. Meeks Boulevard along northern border of site. Taken from northwest looking east.



Photo 7. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on December 1, 1999 by Nancy Priddy, Superfund, DNR. Adjacent commercial businesses west of northwest corner of site. Taken from north side of Meeks Boulevard looking southwest.



Photo 8. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on December 1, 1999 by Nancy Priddy, Superfund, DNR. View of industry north of site. Taken from Elmridge Place looking north.



Photo 9. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on December 1, 1999 by Nancy Priddy, Superfund, DNR. View of industry northwest of site. Taken from northwest corner of site looking northwest.



Photo 10. Chicago Heights Blvd VOC Plume site, Overland, MO. Photo taken on December 1, 1999 by Nancy Priddy, Superfund, DNR. Photo taken from south side of Meeks Boulevard looking south along fence line separating residential back yards between Elmridge Place and Wishart Place.