FEASIBILITY STUDY WORK PLAN
WEST OSBORN COMPLEX WQARF SITE
PHOENIX, ARIZONA

Prepared for
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, AZ 85007

Submitted
on Behalf of
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June 23, 2005

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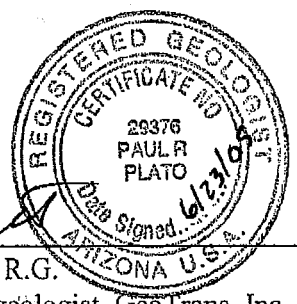
The material and data in this work plan were prepared under the supervision and direction of the undersigned.



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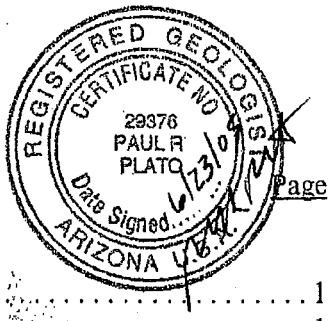

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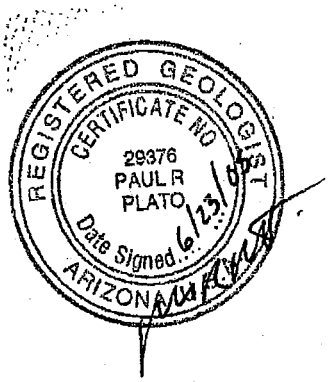

1.0 INTRODUCTION

1.1 FEASIBILITY STUDY WORK PLAN OBJECTIVES

GeoTrans, Inc. (GeoTrans) developed this Feasibility Study (FS) Work Plan for the West Central Phoenix (WCP) West Osborn Complex (WOC) Water Quality Assurance Revolving Fund (WQARF) site (Figure 1) on behalf of United Industrial Corporation (UIC). The FS Work Plan has been prepared in accordance with the requirements of Title 18, Environmental Quality, Chapter 16, Department of Environmental Quality Water Quality Assurance Revolving Fund Program, Article 4, Remedy Selection, R18-16-407, Feasibility Study.

The FS Work Plan incorporates the May 2005 Final Remedial Objectives Report as prepared by the Arizona Department of Environmental Quality (ADEQ), and included in Appendix A. The remedial objectives (ROs) and the contents of this FS Work Plan are consistent with the water management plans of the relevant water providers and well owners. Also included with this document are a proposed reference remedy and two alternative remedies (one more aggressive and one less aggressive than the reference remedy) believed capable of achieving the proposed ROs. GeoTrans will prepare and submit to ADEQ for their review and approval a Proposal for Reference Remedy and Alternative Remedies, which will be developed to comply with the Final ROs. At that point, ADEQ will initiate discussions with water providers and well owners regarding the proposed remedial measures. The Feasibility Study (FS) Report will be developed based on the results of these reviews and discussions with the water providers and well owners, including an agreement regarding the reference and two alternative remedies and will incorporate a completed remedial alternatives evaluation.

1.2 PURPOSE AND SCOPE OF THE FS

The FS is a process to identify and evaluate a reference remedy and alternative remedies that will be capable of achieving defined ROs. The goal of the FS is to identify the best option or options for meeting the ROs. The FS will evaluate the identified remedies based on prescribed comparison criteria to select a remedy that complies with relevant statutes and rules. The FS will evaluate and select a preferred remedy from among the proposed remedies which: 1) assures the protection of public health, welfare, and the environment; 2) to the extent practicable, provides for the control, management, or cleanup of hazardous substances so as to allow for the maximum beneficial use of waters of the state; 3) is reasonable, necessary, cost-effective, and technically feasible; and, 4) addresses any well that either supplies water for municipal, domestic, industrial, irrigation or agricultural uses or is a part of a public water supply system, if the well would now or in the foreseeable future produce water that would not be fit for its current or reasonably foreseeable end use without treatment.

The FS Report will rely upon the data and findings of the Remedial Investigation (RI) activities by UIC and those conducted by previous investigators including Woodward Clyde Consultants (WCC) on behalf of Lansdale Semiconductor in 1987 (WCC, 1987), Brown and Caldwell Consultants (BCC) on behalf of Components Incorporated in 1991 and 1992 (BCC, 1992), and the ADEQ as

early as 1984 (WCC, 1987). RI activities were initiated at the Site by UIC in 1996 and continued into 2004. The FS Report will present and evaluate the proposed remedies, strategies and measures, and select a proposed remedy that satisfies the criteria presented above. The FS will be conducted in accordance with the ADEQ WQARF Remedy Selection Rule, as presented in Title 18, Environmental Quality, Chapter 16, Department of Environmental Quality Water Quality Assurance Revolving Fund Program, Article 4, Remedy Selection, R18-16-407, Feasibility Study.

1.3 PROCESS TO DETERMINE REMEDIAL MEASURES

Pursuant to R18-16-407(G), remedial measures to achieve the ROs will be identified for each remedial alternative in consultation with the water providers. The needs of the water providers and their customers, including the quality and quantity of water, reliability of water supplies, water rights and other legal constraints will be considered. Remedial measures relied upon to achieve ROs may include, but are not limited to, well replacement, well modifications, water treatment, provision of replacement water supplies, and engineering controls. The process of determining appropriate remedial measures will result from both discussions with the water providers and completion of the technical aspects of the FS.

2.0 SITE BACKGROUND

The following description of the Site Background is taken from the *Final Remedial Investigation Report, West Osborn Complex, Phoenix, Arizona* (GeoTrans, 2004).

2.1 SITE DESCRIPTION

The WOC site area is located within the S1/2 of the SE1/4 of the NE1/4 quarter of Section 27, Township 2 North, Range 2 East of the Gila and Salt River Baseline and Meridian. It is bounded by the Grand Canal on the north, Osborn Road on the south, 35th Avenue on the east, and the extension of 37th Avenue on the west (Figure 2). The WOC is approximately 15 acres in size and consists of three parcels: the East Parcel, Middle Parcel, and West Parcel. Figure 2 shows each of the three parcels and the locations of existing buildings, monitor wells, and other pertinent features.

West Parcel - The West Parcel is approximately 8 acres in size. It contains six buildings and an asphalt parking lot. Two of the six buildings are industrial buildings, and four are multi-tenant office buildings. Until 2000, May Industries, Inc., a precision machine shop, occupied an industrial building and about 2.6 acres of land at the northwest portion of the West Parcel. The other industrial building, located at the northeast corner of the parcel, was occupied by Metal Joining, an affiliate of May Industries, Inc. The ownership of the parcel was transferred to Elm Properties, LLC in February 2000.

Middle Parcel - The Middle Parcel is approximately 3.9 acres in size and is partially enclosed with a chain-link fence. Structures on the Middle Parcel include a large main building and a smaller storage shed located north of the main building. There are unpaved dirt areas at the south and east sides of the main building. The remaining exterior areas are paved, primarily with asphalt. A mattress and furniture liquidation business, Capital Liquidation, has been the main tenant at the Middle Parcel since approximately 1992. An unused water-supply well, the WOC Irrigation Well[3] (also referred to as the Pincus Well), was located in the northwest part of the Middle Parcel and was abandoned in July 2004.

East Parcel - The East Parcel is approximately 3.2 acres in size and is completely enclosed by a chain-link fence. One multi-tenant commercial/industrial building is located on the parcel. The driveways and parking areas are paved with asphalt. Formerly, the main tenant at the West Parcel was Western Dynex Corporation. Until September 2002, the main tenant was a machine shop owned by Mr. Eugene Perri. Since September 2002, the property has been owned by Seven Angels, LLC.

[3]This well was designated the WOC Irrigation Well based on its observed use for landscape irrigation in 1987, when environmental investigation was undertaken by Woodward-Clyde Consultants.

2.2 CHRONOLOGY OF SITE ACTIVITIES

The following outlines the chronology of major RI and Early Response Action (ERA) activities at the WOC site:

- The on-site irrigation well (also known as Pincus Well) was sampled by ADEQ in 1984 and 1987 (ADEQ, 1989c) and by WCC in 1987 (WCC, 1987). The concentrations of trichloroethylene (TCE) ranged from 260 to 340 micrograms per liter (µg/L).

- In 1987, WCC completed a preliminary site investigation for Lansdale Semiconductor, Inc. on the Middle Parcel of the WOC. WCC collected 10 soil samples at the Lansdale facility, and analyzed them for VOCs. TCE was detected in two shallow (4 to 6 inch and 13 to 18.5 inches bgs) soil samples in concentrations of 2,050 micrograms per kilogram (µg/kg) and 285 µg/kg, respectively.

- Regional groundwater investigations were completed for the ADEQ by the Earth Technology Corporation (Earth Tech, 1989; Earth Tech, 1994; Earth Tech, 1996).

- In 1989, the ADEQ conducted site inspections of all three WOC parcels (ADEQ, 1989a,b,c). They were conducted after the results of preliminary assessments (also conducted in 1989) recommended further investigations. This recommendation was largely based on conclusions regarding historic TCE usage. Soil-gas surveys were conducted in conjunction with drilling operations as part of the site investigations. A total of 39 soil-gas samples were collected at depths ranging from 18 to 65 feet below ground surface (bgs): 10 samples were collected on the East Parcel, 16 samples were collected on the Middle Parcel, and 13 samples were collected on the West Parcel. The ADEQ also collected seven soil samples at depths ranging from 2 to 25.5 feet bgs: two samples were collected from each of the East and Middle parcels, and three samples were collected from the West Parcel.

- In 1991, Applied Environmental Consultants completed a Phase I RI/FS on the West Parcel of the WOC on behalf of May Industries. The investigation was performed to identify contaminants in soil. A total of nine soil borings were drilled to depths of 30 to 83 feet bgs, with 50 soil samples analyzed by the laboratory. TCE was not detected in any of the samples. 1,1,1-trichloroethane (TCA) was detected in one sample at a concentration of 0.011 milligrams per kilogram (mg/kg).

- Between July 1991 and April 1992, BCC conducted a preliminary site characterization (PSC) on behalf of Components Inc. that included a geophysical survey and a subsurface soil investigation. The results of the geophysical survey were used to identify drain, sewer, and other abandoned utility lines and to select locations for the subsurface soil investigation. A total of 36 soil borings were drilled to depths of 5 to 72 feet bgs, with 82 soil samples selected for analysis. TCE was detected in four samples at concentrations ranging from 6.2 to 20 µg/kg. BCC also sampled the Irrigation Well as part of its PSC. The initial concentration of TCE was 1000 µg/L, but after the well was pumped for 3 hours, the TCE concentration decreased to 17µg/L.

Five on-site monitor wells (MW-1S thru MW-5S) were installed into the shallow groundwater system (SGWS[2]). During the period of August 1991 through March 1992, TCE was detected in these well as follows: 25 µg/L to 55 µg/L in MW-1S; ND to 3.3 µg/L in MW-2S; ND in MW-4S, and 1,600 µg/L in MW-5S.

- In 1996, UIC completed the Phase I Soil Investigation. This work included: the excavation and sampling of test trenches and test pits for the purpose of locating and characterizing waste disposal features such as septic tanks, tile lines, and seepage pits; the removal of contaminated septic tanks as a source control measure; and the drilling of soil borings in potential source areas to measure the vertical extent of contamination.

- Also in 1996, UIC completed a Phase II Soil Investigation that included further delineation of the horizontal and vertical extent of VOCs in soil at the potential source areas, and evaluation of potential releases from piping that had not been investigated during Phase I.

- In 1996, 10 monitor wells (MW-6S, MW-7S, MW-2M, MW-3M, MW-4M, MW-6M, MW-7M, MW-4L, MW-6L and MW-7L) were constructed at locations that were designated in the Consent Decree and Work Plan. Monitoring and sampling of these wells and the original five wells installed by BCC was initiated.

- In 1997, nine additional monitor wells (MW-100S, MW-101S, MW-102S, MW-103S, MW-104S, MW-102M, MW-105M, MW-106M and MW-13M) were constructed at locations that were selected with the approval of the ADEQ. Monitoring and sampling of these wells, in addition to the 15 wells already mentioned was initiated.

- From December 1997 through May 2003, five additional monitor wells (MW-201S, MW-107M, MW-108M, MW-109M and MW-110M) were installed as part of defining the lateral extent of the TCE impacts to the shallow or regional aquifer. These wells were added to the groundwater monitoring and sampling activities.

- In June 1999, a soil vapor extraction (SVE) system was installed as part of an on-site ERA. SVE operations were initiated in August 1999. In September 2002, confirmation soil borings and sampling were completed to evaluate the remediation success by the SVE system. Based on these results, the SVE system was turned off in October 2002. From August through October 2002 a total of approximately 449 pounds of VOCs were removed from the vadose zone.

- In July 2004, the on-site irrigation well (Pincus Well), was abandoned per Arizona Department of Water Resources (ADWR) regulations.

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[2] The SGWS specifically refers to the shallow groundwater monitored by the S-series wells at the WOC site that is separated from the regional aquifer by over 100 feet of fine-grained soil. Based on the groundwater flow direction measured in the SGWS and the lack of response when pumping from regional aquifer wells, there is a very poor to no hydraulic communication between the two groundwater systems. Prior to the lining of the Grand Canal the depth to water in the SGWS was less than 90 feet below ground surface. It is presently over 130 feet below ground surface.

- In May 2005, the location of four additional monitor wells were proposed by UIC and approved by ADEQ for the purpose of completing the definition of the extent of the TCE impacts to the shallow aquifer. One additional monitor well was also proposed by UIC and approved by ADEQ for the purposes of providing a southern lateral extent of TCE and/or tetrachloroethylene (PCE) impacts to the regional aquifer and to act as an early warning or sentry well to the movement of the impacted groundwater towards the City of Phoenix (COP) well COP-68. These five additional groundwater monitor wells were installed in June 2005 and will be sampled as part of work requested by ADEQ for completion of the FS. Procedures for the new well installation and sampling activities were described in the *May 9, 2005 Field Sampling Plan Addendum for Proposed New and Existing Monitor Wells to Support Completion of the FS,* that had been requested by ADEQ.

2.3 SOURCE AREA REMEDIATION

As is presented in the WOC RI report, low levels of VOCs, in particular TCE, were identified in the contents of and in native soil adjacent to various waste/wastewater disposal facilities. However, no obvious location of a release(s) were identified that caused VOC contamination of the vadose zone soils and SGWS. Based on the extensive soils sampling and VOC analysis conducted, an area in the north-northwest portion of the site appeared to have the largest mass of VOCs in the unsaturated zone soils. An ERA using the SVE technology was subsequently implemented in this area.

On behalf of UIC, GeoTrans submitted a technical letter to ADEQ, requesting ADEQ's approval to permanently shut-down the SVE system operation. Confirmatory drilling/sampling was subsequently conducted in September 2002. The results showed that no detectable VOCs were present in 39 subsurface samples collected from the SVE remediation zone. Based on these results, the justification specified in GeoTrans' September 11, 2001 letter has been deemed satisfied, and the SVE system was shut down on October 21, 2002.

The presence of VOCs, in particular TCE, in the Lower Sand and Gravel System (LSGS)[3] in on-site wells at a depth of approximately 245 feet bgs suggests that VOCs may have been transported within the on-site irrigation well. This potential "source area" was removed when the on-site irrigation well was abandoned on July 26 and 27, 2004.

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[3] The alluvial soils at the WOC were previously subdivided by others into three major units: an Upper Alluvial Unit, Middle Alluvial Unit and Lower Alluvial Unit. Based on drilling data collected during the RI the Upper Alluvial Unit is 300 to 350 feet thick and contains two main water-bearing zones that are separated by fine-grained soils: (1) a shallow, coarser-grained zone near the water table at a depth of about 100 feet bgs, and (2) a deeper, 50-foot thick, sand and gravel subunit located at or near the base of the Upper Alluvial Unit. The Middle Alluvial Unit directly underlies the lower sand and gravel subunit (LSGS) and is predominantly clay. The Lower Alluvial Unit occurs at a depth of more than 800 feet bgs.

3.0 FEASIBILITY STUDY SCOPING

3.1 REGULATORY REQUIREMENTS

The Remedy Selection Rules (Article 4, R18-16) have been developed to address implementation of the Remedial Action Selection. The Remedy Selection Rule (R18-16-407 - Feasibility Study) states that an FS is a process to identify a reference remedy and alternative remedies that appear to be capable of achieving ROs and to evaluate them based on the comparison criteria to select a remedy that complies with ARS §49-282.06. The remedial actions required by this Article should also be consistent with the requirements of Title 45, Chapter 2, the Groundwater Code, except as provided in amendments.

This FS will be conducted in accordance with the Remedy Selection Rule R18-16-407, Sections A, B, E, F, G, H, and I.

3.2 DELINEATION OF REMEDIATION AREAS

As a result of activities described in Section 2, it is understood that:

- Based on the success of the on-site SVE system and the results of the subsequent confirmation borings, no areas of unsaturated soil remain that exceed regulatory standards and, therefore, no further remediation is required for the unsaturated zone.

- Based on GeoTrans' review of the historical groundwater quality data and the groundwater quality data from January 2004, as presented in the RI, TCE and/or PCE are the contaminants of concern (COCs).

- The groundwater remediation areas consist of portions of the SGWS and LSGS with concentrations of TCE and/or PCE above the AWQS for groundwater (5 µg/L for TCE and PCE) as of January 2004. The portions of the SGWS and LSGS with concentrations of TCE and/or PCE that exceed 5 µg/L are presented on Figures 3 and 4, respectively, and define the Area of Impacted Groundwater (AoIG). The AoIG for the SGWS plume is referred to as the SGWS-AoIG and the AoIG for the LSGS plumes is referred to as the LSGS-AoIG.

3.2.1 Groundwater

The primary issue of concern at the Site is the TCE groundwater contamination believed to have originated from the Site. Groundwater contamination effects on public wells intersecting the LSGS, in particular the COP and Salt River Project (SRP), have been the primary concern of the investigation since the initial discovery of TCE in the LSGS and the completion of remediation efforts in the on-site vadose zone in October 2002. For this reason, the evaluation of groundwater concentrations and the fate and transport of TCE and/or PCE are key to defining the nature and extent of contamination at the Site, the ROs and the remedial alternatives.

3.2.1.1 Extent of Contamination

The estimated areal extent of the SGWS-AoIG for TCE is presented in Figure 3. Based on available data, TCE is the only COC in the SGWS. The estimated areal extent of the LSGS-AoIG for TCE and PCE are presented on Figure 4. The up-gradient lateral extent of the TCE LSGS-AoIGs have been drawn assuming that the up-gradient (based on groundwater flow gradient) boundary of the plumes are at the WOC Middle Parcel property boundary. Based on communications with the ADEQ, we understand that the current status of RI activities at the adjacent WCP North Canal Plume Area provides information on the delineation of VOCs in both the SGWS and LSGS. Therefore, the degree and extent of TCE and/or PCE impacts upgradient of the WOC property will be evaluated by GeoTrans during the FS. This is planned to enable a semi-quantitative assessment of where, and to what degree, upgradient groundwater impacts from the North Canal Plume Area may affect WOC groundwater remedies.

Based on completion of the WOC RI, the following summarizes our understanding of the extent of groundwater contamination:

- Groundwater contamination in the SGWS by TCE at concentrations greater than 5 µg/L has historically been defined by the following monitor wells: MW-2S, WCP-3 and MW-6S to the southwest, and ARCO MW-2 to the southeast. To the east, the easternmost monitor well sampled, WCP-10 had concentration of TCE which exceeded 5 µg/L, however, it is uncertain if this originated from the WOC site or from other WQARF sites, such as the Layke site, located north of WCP-10. To the south, TCE concentrations in MW-201S have been consistently above 5 µg/L, but the saturated thickness of the shallow saturated zone has decreased as the water table has declined to underlying low permeability material.
- Groundwater contamination in the LSGS by TCE at concentrations greater than 5 µg/L is defined by the following monitor wells: MW-106M to the northwest, MW-102M to the south-southeast, MW-108M and MW109M to the southwest, and MW-110 to the west.
- Groundwater contamination in the LSGS by PCE at concentrations greater than 5 µg/L is defined by the following monitor wells: MW-106M to the northwest, MW-102M to the south-southeast, MW-107M to the southwest, and MW-6M to the south-southwest.
- The definition of the AoIG in the LSGS is dependent on the continued cessation of pumping by the SRP Well 9.5E-7.7N. As was discussed in the RI Report, the operation of the SRP well causes the LSGS groundwater plume to migrate to the northwest, towards the hydrologic cone of depression caused by the well.

3.2.2 Areas of Uncertainty

Existing uncertainties in our understanding of the extent and fate and transport of the COCs in groundwater are listed below. Steps being taken to address each uncertainty are provided at the end of each bullet.

- The down-gradient extent of the dissolved phase TCE plume in the SGWS is not defined. The continuing decline of the SGWS water table and the loss of sufficiently deep wells makes monitoring the SGWS plume difficult. However, the continuing decline of the SGWS water table into low permeability material suggests that the continued movement of the plume is not likely.

The installation of the four additional shallow system monitor wells (Figure 5) will provide both a down-gradient delineation of the dissolved phase TCE plume and additional data on the vertical extent and aquifer properties within the SGWS-AoIG.

- PCE-impacted shallow groundwater from the WCP North Canal Plume Site (North Canal Plume Site) has been migrating to the south-southeast, commingling with shallow groundwater previously impacted by releases from the WOC site. Prior to December 1998, a groundwater divide, located along the Grand Canal due to seepage losses from the canal, resulted in impacted groundwater within the North Canal Plume Site to migrating to the north. Sometime since December 1998, the shallow groundwater flow direction north of the canal shifted to the south. The impact of shallow groundwater contamination from the North Canal Plume Site has been tentatively defined by ADEQ and is presented on Figure 6.

The installation of new shallow system monitor wells immediately south and east of the WOC site have been completed or will be completed by ADEQ to monitor the migration of the plume originating at the North Canal Plume Site to the south of the Grand Canal. Water level measurement and groundwater sampling programs are being developed by ADEQ and UIC that will provide monitoring of both the North Canal Plume Site and WOC SGWS plumes.

- Continued migration of the dissolved phase TCE and/or PCE plume in the LSGS will likely continue to occur to some degree, however the lateral extent of the 5 µg/L contour is not expected to migrate beyond the existing monitor well network.

The June 2005 round of groundwater monitoring and sampling will provide an updated snapshot of the fate and transport of the dissolved phase TCE and/or PCE plumes in the LSGS. An assessment of long-term fate and transport will be conducted as part of the FS.

- The past and present shut-down of SRP Well 9.5E-7.7N and COP wells COP-70/71 has greatly enhanced UIC's ability to define the LSGS plumes. Resumption of pumping from any of these wells will affect the current definition and understanding of the plume and may cause the spatial extent of the LSGS-AoIG to change.

3.3 REMEDIAL OBJECTIVES

The final ROs for the WOC site (attached as Appendix A) have been developed by ADEQ based on the Land and Water Use Report (ADEQ 2004) and with input from landowners, local governments,

water providers, and the public. The ROs are consistent with the COP Land Use Plan, and the COP and SRP's Water Management Plans. The ROs were developed based upon the current and reasonably foreseeable uses of land and reasonably foreseeable beneficial uses of water.

3.3.1 Remedial Objectives for Land Use

The current zoning designation for the WOC properties, as defined by the West, Middle and East parcels, is A-2 Industrial (ADEQ, 2004). Land uses adjacent to the WOC properties, but within the WOC site area, are expected to remain predominantly industrial (A-2) or light industrial (A-1). Based on the Land and Water Use Report, there are no foreseeable plans to alter the current zoning districts in the WOC site vicinity. Based on the completion of remediation activities on the Middle Parcel, no residual soil contamination above the Soil Remediation Levels (SRLs) is present. Therefore, no restrictions or limitations to the current or foreseeable future land uses are present. As a result, no ROs for land use are required.

3.3.2 Remedial Objectives for Groundwater Use

As can be observed when looking at the spatial extent and characteristics of the SGWS-AoIG versus the LSGS-AoIG, there are two distinct plumes within the WOC site. As described in the RI report this results from the presence of a thick and apparently laterally extensive series of fine-grained deposits underlying the WOC site area from approximately 120 feet bgs to over 200 feet bgs and the former presence of a consistent sources of recharge (the former unlined Grand Canal) to the subsurface. Despite this hydrogeologic conceptual model, the ROs for groundwater treat the groundwater as a single hydrologic system. The actual potential for impacted groundwater to reach an existing, not already impacted water supply well, will be discussed in the FS Report.

The final ROs (Appendix A) were developed by ADEQ for the two current and two potential future groundwater uses identified within the WCP WOC site as follows:

1) *"To restore, replace, or otherwise provide for the COP groundwater supply that has currently been lost due to PCE and/or TCE contamination associated with the WCP WOC site. This action is needed as soon as possible. This action is needed for as long as the need for the water exists, the resource remains available, and PCE and/or TCE concentrations in the water prohibits or limits its use."*

2) *"To protect for the use of the COP municipal groundwater supply threatened by the PCE and/or TCE contamination emanating from the WCP WOC site. According to the COP, this use may be needed by the year 2010. This action would be needed for as long as the level of contamination in the identified groundwater resource threatens or prohibits its use."*

3) *"To protect for the use of the SRP groundwater supply threatened by the PCE and/or TCE contamination emanating from the WCP WOC site. According to the SRP, this use may be needed as soon as is technically feasible. This action would be needed for as long as the level of contamination in the identified groundwater resource threatens or prohibits its use."*

Although the ROs refer to addressing TCE and/or PCE contamination emanating from the WOC Site, it is UIC's position that the historical activities at the WOC Site are not a source of PCE. Therefore, any PCE detected in the COP or SRP ground water supply wells within the WOC area is believed to have originated from other sources. Nonetheless, since most remedial technologies that address TCE contamination also address PCE contamination, remedial measures for both contaminants will be considered in the development of the reference and alternative remedies.

Due to prior or current groundwater impacts in the affected COP wells that are not attributed to historical activities at the WOC (i.e., the existence of high nitrates, total dissolved solids, and/or other constituents), the FS will not address water treatment requirements for constituents other than TCE and/or PCE. Treating to attain drinking water quality for other constituents present in groundwater at the WCP WOC site will be the responsibility of the COP. Additionally, due to the age of the COP wells, it is likely that refurbishing the well casings, screens, and/or replacing well pumps will be required to restore the production wells up to performance standards desired by the COP. Assuming that wellhead treatment at a COP well(s) is a selected remedial measure, the scope of cost estimating to be included in the FS will be to treat the TCE and/or PCE to drinking water standards, but will not include refurbishing or installation of new well(s) for the COP.

Similar to the COP, it will be the financial responsibility of SRP to address any water treatment requirements it may need for constituents other than TCE and/or PCE associated with the WCP WOC site.

The water use within the WOC site area is summarized below to provide additional background on the selection of potential remedial alternatives.

3.3.2.1 SGWS-AoIG

There is currently no use of shallow groundwater within the SGWS-AoIG. As shown on Figure 2 the only production wells either within or close to the SGWS-AoIG are the COP well COP-68 and the Danone Water of North America well (also referred to as the Sparkletts Well). COP-68 was shut-down in 1986 due to high TDS and nitrates (ADEQ, 2004). The Sparkletts Well is screened from 905 to 930 feet bgs and therefore can reasonably be assumed to be incapable of withdrawing groundwater from either the SGWS or the LSGS. No direct extraction and use of the SGWS groundwater are anticipated based on the low permeability of the SGWS, the high TDS (>1,000 mg/L at MW-201S and ARCO MW-2), and the continuing decline of the SGWS water table following the lining of the Grand Canal in December 1998.

While it is possible that a private property owner could install an exempt (less than 35 gallons per minute) groundwater well into the groundwater system within the SGWS-AoIG, it does not appear to be reasonably foreseeable based on the following:

- Groundwater within the SGWS-AoIG is poor quality, generally containing high TDS; and,
- The area encompassed by the SWGS-AoIG is serviced by city water and the cost to install a groundwater well would far exceed the cost to connect to city water.

Although use of the SGWS-AoIG as drinking water source is not believed to be reasonably foreseeable, remedial strategies for this aquifer will be evaluated as part of the FS.

3.3.2.2 LSGS-AoIG

Due to the existing VOC impacts from the WOC site and nitrates and TDS from another source(s), there is currently no extraction of groundwater within the LSGS-AoIG. Previous use was municipal water supply for the COP and agricultural water supply for the SRP. Potential future uses include:

- The resumption of pumping for municipal water supply by the COP;
- Pumping by an exempt (< 35 gpm) well(s); or,
- Pumping for agricultural or municipal use by the SRP.

3.3.2.3 City of Phoenix Water Provider Use

The WOC site lies within the Phoenix Active Management Area (AMA) administered by the ADWR. All groundwater legally withdrawn from the AMA must occur under a groundwater right or permit, unless groundwater is being withdrawn from an exempt well. However, even an exempt well requires an ADWR Notice of Intent to Drill form. In the WOC area this process would alert the ADWR and the well owner of their presence in a WQARF area.

The COP owns and maintains two wells within the LSGS-AoIG , COP-70 and COP-71(Figure 4). A third well, COP-68, is located down-gradient of the SGWS-AoIG (Figure 4). COP-70 and COP-71 were removed from service in 1982 due to impacts from TCE. COP-68 was removed from service in 1986 due to high TDS and nitrates. Previous pumping rates for COP-70 and COP-71 were approximately 750 gpm each, for a total of 1,500 gpm. At this time it is unknown if there were any non-VOC water quality problems in COP-70/71. Historic or maximum possible pumping rates from COP-68 have been estimated 650 gpm based on information from the COP.

According to the 2000 Phoenix Water Resources Plan, within the next 15 to 20 years, new groundwater wells will be drilled and used, but that additional well capacity is not needed until about the year 2030, when 30,000 acre-feet/year will be needed. Further correspondence from the COP stated that by 2010, an additional 18,000 acre-feet/year will be needed. More recent correspondence from the COP indicates that they are pursuing a revised assessment of their water resource needs that will include system redundancy. Although the actual timing of their need to access the groundwater within the WOC area is unknown, it has been assumed based on their recent comments that immediate access will be necessary to the groundwater resource within the WOC.

COP-68 is located approximately 3,500 feet cross-gradient of the LSGS-AoIG, but if pumped could potentially capture a portion of the LSGS plume. This problem will be addressed as part of the FS. Although the existing lateral extent of the two plumes and work conducted as part of the RI indicate very poor to no hydraulic communication between the SGWS and the LSGS, for purposes of completing the FS, the potential for pumping from COP-68 to be impacted by the SGWS TCE plume will be considered. If this was to occur, it is believed to most likely be attributable to short-circuiting

down a poor well seal and not from actual transport through the fine-grained material between the SGWS and the top of the LSGS.

3.3.2.4 SRP Groundwater Use

The SRP wells 9.5E-7.7N and 8.5E-7.5N are not presently intersecting the area defined by the LSGS-AoIG. Their present condition outside of the LSGS-AoIG is largely based on the absence of pumping by the SRP wells. Previous water level measurements collected when SRP Well 9.5E-7.7N was pumping indicated that there would be a shift in LSGS groundwater flow from the southwest (under no-pumping conditions) to the northwest, toward 9.5E-7.7N (under pumping conditions), and the well would extract TCE and/or PCE impacted groundwater of a uncertain concentrations. The proximity of well 8.5E-7.5N to the northern extent of LSGS-AoIG indicates that pumping of this well would have a similar effect on the existing spatial extent of the LSGS-AoIG. Based on these observations, it was recommended that the SRP wells 9.5E-7.7N and 8.5E-7.5N not pump during the completion of the RI. This should continue at least until the selection of the preferred remedy has been made and implemented.

3.3.2.5 Private Groundwater Use

Presently no groundwater extraction from a non-water provider entity occurs within the WOC area. While it is possible that a private property owner could install an exempt (less than 35 gallons per minute [gal/min]) groundwater well in the future, it does not appear to be reasonably foreseeable based on the following:

- The area encompassed by the LSGS-AoIG is serviced by city water. The cost to install a groundwater well would far exceed the cost to connect to city water; and,
- According to the ADWR, there are no Type I irrigation, Type I grand fathered, or Type II water rights in the LSGS-AoIG that would allow for the installation of a non-exempt well producing over 35 gal/min.

One other private regional well within the study area, the Danone Water of North America well (also referred to as the Sparkletts Well) is located approximately 3,000 feet cross-gradient of the LSGS-AoIG and is screened approximately 500 feet below the base of the LSGS. As a result, it is not considered threatened by the existing groundwater impacts under any future contaminant migration scenario.

4.0 IDENTIFICATION AND SCREENING OF REMEDIATION TECHNOLOGIES

During the FS, appropriate remedial technologies for the impacted matrix (groundwater) will be identified and screened according to the following criteria:

- Contaminant treatment effectiveness;
- Compatibility with drinking water systems;
- Constructability;
- Flexibility/expandability;
- Operation and maintenance requirements;
- Management of residual waste products;
- Chemical use/operational hazards; and,
- Cost/effectiveness.

The following site assumptions and system requirements will be used during the identification and screening of remedial technologies:

- Flowrate: To be estimated from a well capture zone analysis;
- Contaminants: TCE, maximum concentration of 55 µg/L, PCE, maximum concentration of 30 µg/L;
- Remedial Efficiency: Must achieve drinking water standards (AWQS) for the contaminants of concern (TCE and/or PCE)
- End Use: Domestic consumption;
- Pre-Treatment: To be determined; and,
- Cost: Compared, assuming 30-year design life.

The remediation technologies that pass the technology screening will be retained for use in development of the reference remedy and alternative remedies.

4.1 UNSATURATED SOIL TECHNOLOGIES

Since no soils remaining at the site have been identified which exceed SRLs or GPLs and the SVE system has addressed remaining soil vapor contamination, no technologies will be identified and screened for soil remediation.

4.2 GROUNDWATER TREATMENT TECHNOLOGY

Based on similar work at other sites, technologies that have been identified and may be screened for groundwater will include, but may not be limited to:

- Air stripping;
- Granular activated carbon (GAC);
- UV oxidation/peroxide; and,
- Membrane filtration.

Treatment technologies that will not be considered are those that would either result in adding chemical or biological agents to the water (such as chemical oxidation or bio-augmentation) or those not applicable for the removal of VOCs (such as ion exchange). The actual treatment technologies that remain feasible will be dictated by regulations and requirements associated with the proposed end use(s) and user restrictions. Based on the ROs the proposed uses currently include: COP potable water system; SRP irrigation use; and SRP municipal use. Additional issues that may affect the selection of a treatment technology are other compounds present in the groundwater, such as nitrate or high TDS, and restrictions associated with the National Pollutant Discharge Elimination System (NPDES) permit regulating discharges to the Grand Canal.

4.3 RETAINED TECHNOLOGIES

Following screening, the treatment technologies which have been retained for further consideration will be evaluated as to their compatibility with drinking water treatment, their effectiveness at treating the target contaminants, their operational and maintenance requirements, and their overall costs.

Selected retained technologies will then be assembled with selected strategies and measures to develop the reference remedy and alternative remedies.

5.0 DEVELOPMENT OF REFERENCE REMEDY AND ALTERNATIVE REMEDIES

Based upon the retained remedial technology(ies), selection of remedial measures and the prescribed remedial strategies, a reference remedy will be developed along with a minimum of two alternative remedies for comparison with the reference remedy. The reference remedy and the alternative remedies will each be capable of achieving the ROs. The reference remedy and each alternative remedy will consist of a remedial strategy and all remedial measures to be employed.

The reference remedy and each alternative remedy also may include contingent remedial strategies or remedial measures to address reasonable uncertainties regarding the achievement of ROs or uncertain time frames in which ROs will be achieved. The reference remedy and other alternative remedies will be developed and described in the FS report in sufficient detail to allow evaluation using the comparison criteria, but plans at construction level detail are not required. Where appropriate, the reference remedy and an alternative remedy may incorporate different strategies for different portions of aquifers.

The remedial strategies to be developed are listed below. Source control in soil has already been achieved through the SVE ERA and therefore will not be an element of the reference remedy nor the alternative remedies. A strategy may incorporate more than one remediation technology or methodology. As provided in A.A.C. R18-16-407F:

- Plume remediation is a strategy to achieve water quality standards for contaminants of concern in waters of the state throughout the site;
- Physical containment is a strategy to contain contaminants within definite boundaries;
- Controlled migration is a strategy to control the direction or rate of migration, but not necessarily to contain migration of contaminants;
- Source control is a strategy to eliminate or mitigate a continuing source of contamination;
- Monitoring is a strategy to observe and evaluate the contamination at the Site through the collection of data; and,
- No action is a strategy that consists of no action at a site.

Remedial measures necessary for each alternative remedy will be identified with consideration of the needs of the well owners and the water providers and their customers, including the quantity and quality of water, water rights, and other legal constraints on water supplies, reliability of water suppliers and any operational implications. Such remedial measures may include, but are not limited to, well replacement, well modification, water treatment, provision of replacement water supplies, and engineering controls. Where remedial measures are relied upon to achieve ROs, such remedial measures will remain in effect as long as required to ensure the continued achievement of those objectives.

5.1 REFERENCE REMEDY-STRATEGY AND MEASURES

The reference remedy will be developed based upon best engineering, geological, or hydrogeological judgment following engineering, geological, or hydrogeological standards of practice, considering the following:

- The information in the RI;
- Information to be collected following the installation of the additional monitor wells being completed as part of the FS process;
- The best available scientific information concerning available remedial technologies; and,
- Preliminary analysis of the comparison criteria and the ability of the reference remedy to comply with ARS §49-282.06.

5.2 MORE AGGRESSIVE ALTERNATIVE REMEDY-STRATEGY AND MEASURES

At least one of the alternative remedies must employ a remedial strategy or combination of strategies that is more aggressive than the reference remedy. A more aggressive strategy is a strategy that requires fewer remedial measures to achieve ROs, a strategy that achieves ROs in a shorter period of time or a strategy that is more certain in the long term and requires fewer contingencies. One of the minimum required alternative remedies may use the same strategy as the reference remedy, but use different viable technologies or a more intensive use of the same technology utilized in the reference remedy.

5.3 LESS AGGRESSIVE ALTERNATIVE REMEDY-STRATEGY AND MEASURES

At least one of the alternative remedies must employ a remedial strategy or combination of strategies that is less aggressive than the reference remedy. This alternative will still be capable of achieving the define ROs, but may use less intensive or fewer remedial measures than the reference remedy.

6.0 DETAILED COMPARISON OF THE REFERENCE REMEDY AND ALTERNATIVE REMEDIES

The reference remedy and the alternative remedies will undergo a comparative evaluation. The following sections outline the basis upon which the comparisons will be made.

6.1 ACHIEVEMENT OF ROs

This section will describe how each remedy will achieve the ROs.

6.2 CONSISTENCY WITH WATER MANAGEMENT PLANS AND GENERAL LAND USE PLAN

This section will describe how each remedy will be consistent with local water management plans and general land use plans.

6.3 COMPARISON CRITERIA: PRACTICABILITY, COST, RISK, AND BENEFIT

Each remedy will be compared to the following criteria: practicability, cost, risk and benefit. For each remedy, an evaluation will be conducted on the practicability of the alternative, including its feasibility, short and long-term effectiveness and reliability, considering site-specific conditions, characteristics of the contamination resulting from the release, performance capabilities of available technologies and institutional controls.

For each remedy, an evaluation will be conducted on the risk, including the overall protectiveness of public health under reasonably foreseeable use scenarios and end uses of water. The evaluation will address:

- Fate and transport of contaminants and concentrations and toxicity over the life of the remediation;
- Current and future land and resource use;
- Exposure pathways, duration of exposure, and changes in risk over the life of the remediation;
- Protection of public health and aquatic and terrestrial biota while implementing the remedial action and after the remedial action; and,
- Residual risk in the aquifer at the end of remediation.

For each remedy, an evaluation will be conducted on the cost of the remedial alternative, including the expenses and losses including capital, operating, maintenance, and life cycle costs. The cost

analysis may include the analysis of uncertainties that may impact the cost of a remedial alternatives analysis of projected water uses and costs associated with use-based treatment, other use impairment costs of water not remediated to water quality standards, and the cost of measures such as alternative water supply or treatment. Transactional costs necessary to implement the remedial alternative, including the transactional costs of establishing long-term financial mechanisms, such as trust funds, for funding of an alternative remedy, will be included in the cost estimate.

For each remedy, an evaluation will be conducted on the benefit, or value of the remediation. This analysis includes factors such as:

- Lowered risk to humans;
- Reduced concentration and reduced volume of contaminated water;
- Decreased liability, acceptance by the public;
- Aesthetics, preservation of existing uses;
- Enhancement of future uses; and,
- Improvements to local economies.

6.4 DETAILED COMPARISON OF REMEDIES

A detailed comparison of the remedies will be made and a proposed remedy will be selected.

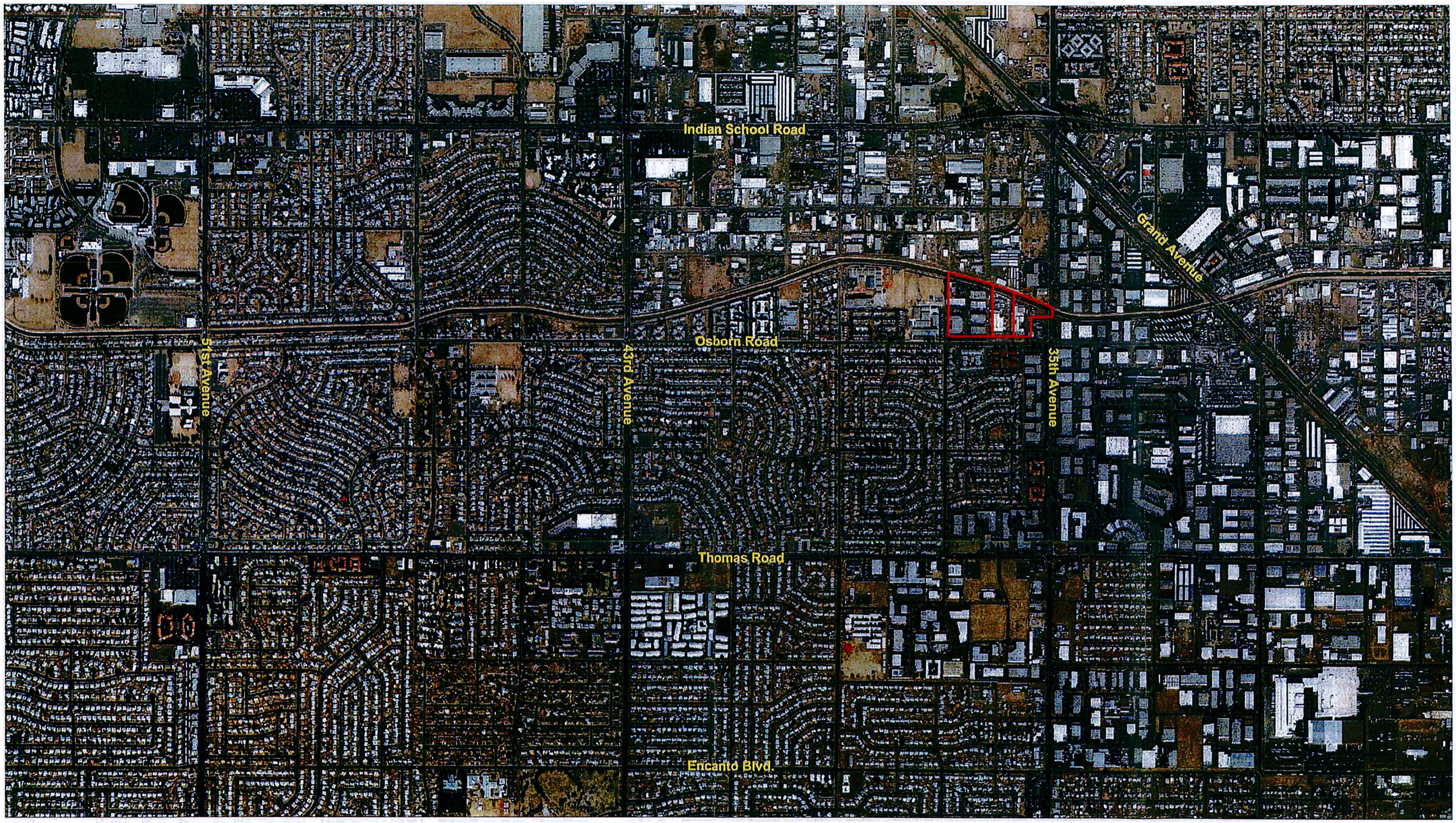
6.5 UNCERTAINTIES

Any uncertainties associated with the comparisons will be presented and their potential impact on the various comparison criteria will be discussed.

7.0 PROPOSED REMEDY

Based upon the evaluation and comparison of the reference remedy and the other alternative remedies developed, a proposed remedy will be selected. The proposed remedy may be the reference remedy, any of the other alternative remedies evaluated in the FS, or a different consideration of remedial strategies and remedial measures that were included in the alternative remedies evaluated in the FS. The FS remedy will describe the following for the proposed remedy:

- Process and reason for selection;
- Comparison criteria;
- Achievement of ROs;
- Achievement of Remedial Action Criteria Pursuant to ARS 49-282.06;
- Consistency with water management plans;
- Consistency with General Land Use Planning; and,
- Contingencies.



Site Boundary

0 1000 2000

APPROXIMATE SCALE IN FEET

TITLE: FS WORKPLAN
VICINITY MAP

LOCATION: UNITED INDUSTRIAL CORPORATION

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	SB
DRAFTED	JLB
PROJECT	2209.002
DATE	01/23/04

FIGURE 1

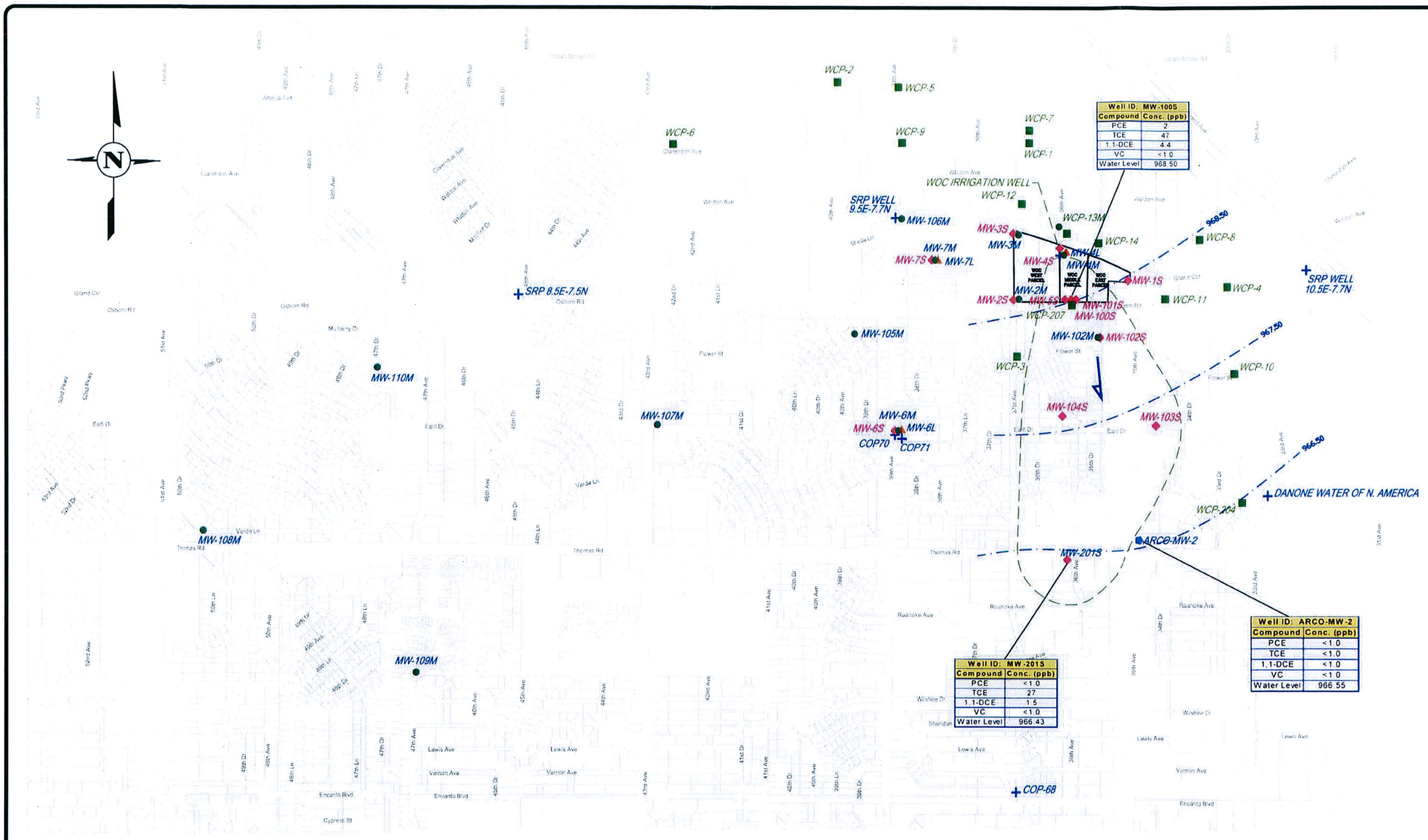
TITLE: **FS Workplan SITE MAP**

LOCATION: **UNITED INDUSTRIAL CORPORATION**

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JR
DRAFTED	CG
PROJECT	2209.002
DATE	06/20/05

FIGURE **2**



Explanation

- Deep Groundwater Monitoring Wells
- Intermediate Groundwater Monitoring Wells
- Shallow Groundwater Monitoring Wells
- 966.50 — Groundwater Elevation Isopleth
- WCP Wells
- ARCO Well
- Prodution Well
- Estimated Location of 5 ug/l TCE Concentration Contour
- Approximate Direction of Groundwater Gradient

PCE = Tetrachloroethylene
TCE = Trichloroethylene
DCE = Dichloroethylene
VC = Vinyl Chloride
GW Elev. = Groundwater Elevation (Feet Above Sea Level)

0 1000 2000
APPROXIMATE SCALE IN FEET

TITLE: **FS WORKPLAN**
SGWS TCE 5 ug/l Concentration Contour - Jan 2004

LOCATION: **UNITED INDUSTRIAL CORPORATION**

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	SB
DRAFTED	JLB
PROJECT	2209.002
DATE	02/11/04

FIGURE **3**

Well ID	MW-106M
Compound	Conc. (ppb)
PCE	3
TCE	<1.0
1,1-DCE	<1.0
VC	<1.0
GW Elev.	956.84

Well ID	MW-3M
Compound	Conc. (ppb)
PCE	9.6
TCE	<1.0
1,1-DCE	<1.0
VC	<1.0
GW Elev.	959.18

Well ID	MW-2M
Compound	Conc. (ppb)
PCE	11
TCE	45
1,1-DCE	<1.0
VC	<1.0
GW Elev.	N.M.

Well ID	MW-4M
Compound	Conc. (ppb)
PCE	27
TCE	14
1,1-DCE	<1.0
VC	<1.0
GW Elev.	960.17

Well ID	MW-7M
Compound	Conc. (ppb)
PCE	20
TCE	22
1,1-DCE	1.9
VC	<1.0
GW Elev.	957.22

Well ID	MW-105M
Compound	Conc. (ppb)
PCE	8.9
TCE	36
1,1-DCE	<1.0
VC	<1.0
GW Elev.	953.91

Well ID	MW-110M
Compound	Conc. (ppb)
PCE	<1.0
TCE	1.1
1,1-DCE	<1.0
VC	<1.0
GW Elev.	940.49

Well ID	MW-108M
Compound	Conc. (ppb)
PCE	<1.0
TCE	1.6
DCE	<1.0
VC	<1.0
GW Elev.	933.48

Well ID	MW-102M
Compound	Conc. (ppb)
PCE	<1.0
TCE	1.1
1,1-DCE	<1.0
VC	<1.0
GW Elev.	959.31

Well ID	MW-107M
Compound	Conc. (ppb)
PCE	<1.0
TCE	54
1,1-DCE	1.5
VC	<1.0
GW Elev.	947.92

Well ID	MW-6M
Compound	Conc. (ppb)
PCE	<1.0
TCE	19
1,1-DCE	<1.0
VC	<1.0
GW Elev.	954.61

Well ID	MW-109M
Compound	Conc. (ppb)
PCE	<1.0
TCE	<1.0
1,1-DCE	<1.0
VC	<1.0
GW Elev.	939.29

WCP-2 WCP-5 WCP-6 WCP-9 WCP-7 WCP-1 WCP-15 WCP-13M WCP-14 WCP-8 WCP-4 WCP-3 WCP-10 WCP-204

WCC IRRIGATION WELL

SRP WELL 9.5E-7.7N

SRP WELL 10.5E-7.7N

SRP 8.5E-7.5N

MW-106M MW-3S MW-3M MW-3L MW-4S MW-4M MW-4L MW-7M MW-7S MW-7L MW-1S MW-2M MW-2S MW-5S MW-101S MW-102S MW-105M MW-102M MW-110M MW-107M MW-6M MW-6S MW-6L MW-104S MW-105S MW-108M MW-109M MW-201S

WCP-201

COP-70 COP-71 COP-68

ARCO-MW-2

DANONE WATER OF N. AMERICA

Osborn Rd Mulberry Dr Flower St Earll Dr Verde Ln Thomas Rd Roanoke Ave Wilshire Dr Sheridan St Lewis Ave Vernon Ave Encanto Blvd Cypress St Grand Ctr Virginia Ave Combs Ave

Explanation

- Deep Groundwater Monitoring Wells
- Intermediate Groundwater Monitoring Wells
- Shallow Groundwater Monitoring Wells
- 934 — — Groundwater Elevation Isopleth
- WCP Wells
- ARCO Well
- Production Well
- Estimated PCE 5 ug/l Concentration
- Estimated TCE 5 ug/l Concentration
- Approximate Direction of Groundwater Gradient

PCE = Tetrachloroethylene TCE = Trichloroethylene
DCE = Dichloroethylene VC = Vinyl Chloride
GW Elev. = Groundwater Elevation (Feet Above Mean Sea Level)

0 1000 2000
APPROXIMATE SCALE IN FEET

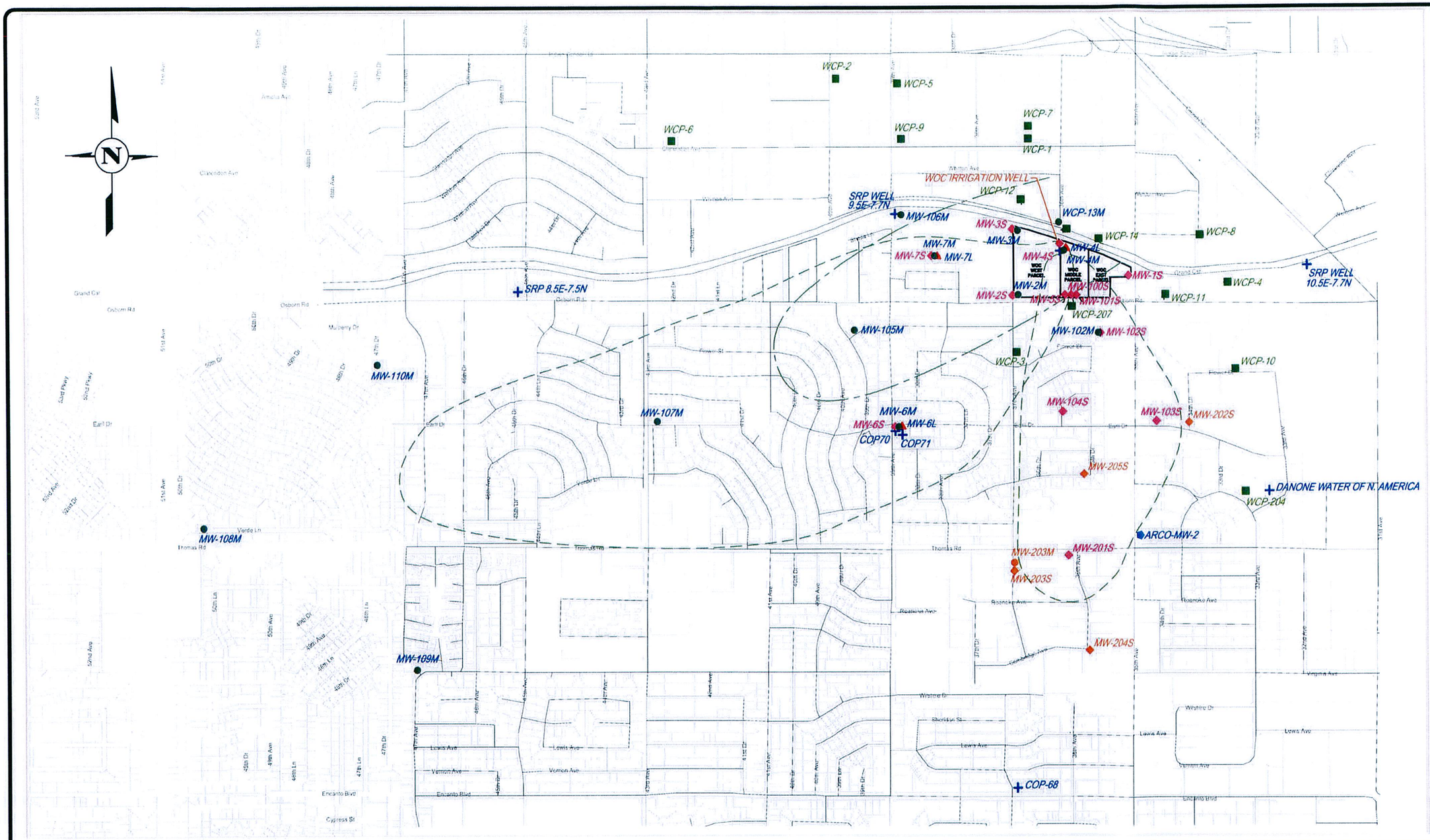
TITLE: **FS Workplan**
LSGS TCE 5 ug/l Concentration Contours - Jan 2004

LOCATION: **UNITED INDUSTRIAL CORPORATION**

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	SB
DRAFTED	JLB
PROJECT	2009.002
DATE	02/11/04

FIGURE **4**



Explanation

- Deep Groundwater Monitoring Wells
- Intermediate Groundwater Monitoring Wells
- Shallow Groundwater Monitoring Wells
- Location of New Monitoring Well
- WCP Wells
- ARCO Well
- Production Well
- Estimated PCE 5 ug/l Concentration – June 2004
- Estimated TCE 5 ug/l Concentration – June 2004

PCE = Tetrachloroethylene
DCE = Dichloroethylene
TCE = Trichloroethylene
VC = Vinyl Chloride

0 1000 2000
APPROXIMATE SCALE IN FEET

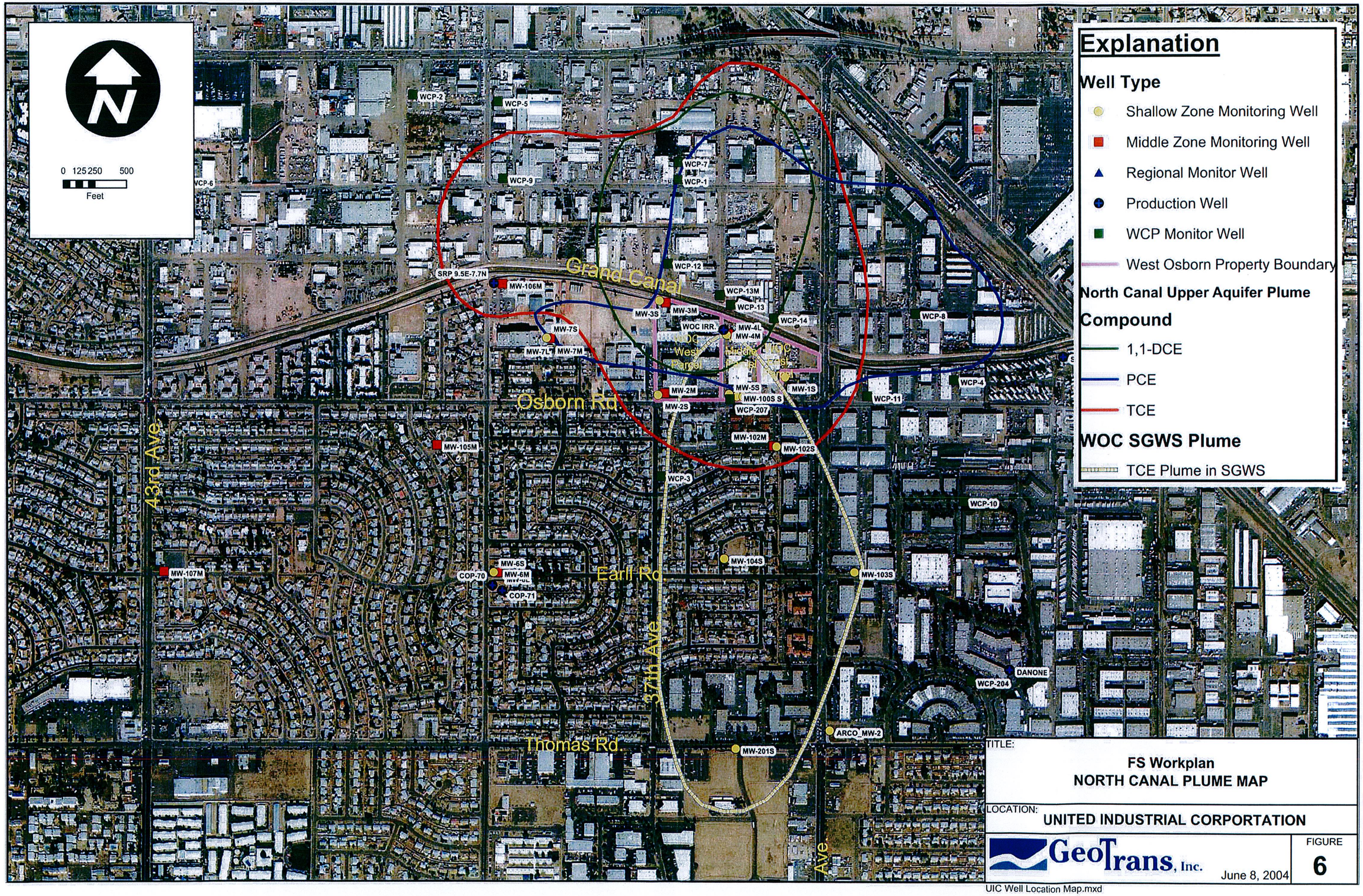
TITLE: **FS WORKPLAN**
LOCATION OF NEW AND EXISTING MONITORING WELLS

LOCATION: **UNITED INDUSTRIAL CORPORATION**

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JR
DRAFTED	JB
PROJECT	2203.003
DATE	617/05

FIGURE **5**



TITLE:
FS Workplan
NORTH CANAL PLUME MAP

LOCATION:
UNITED INDUSTRIAL CORPORTATION

GeoTrans, Inc.

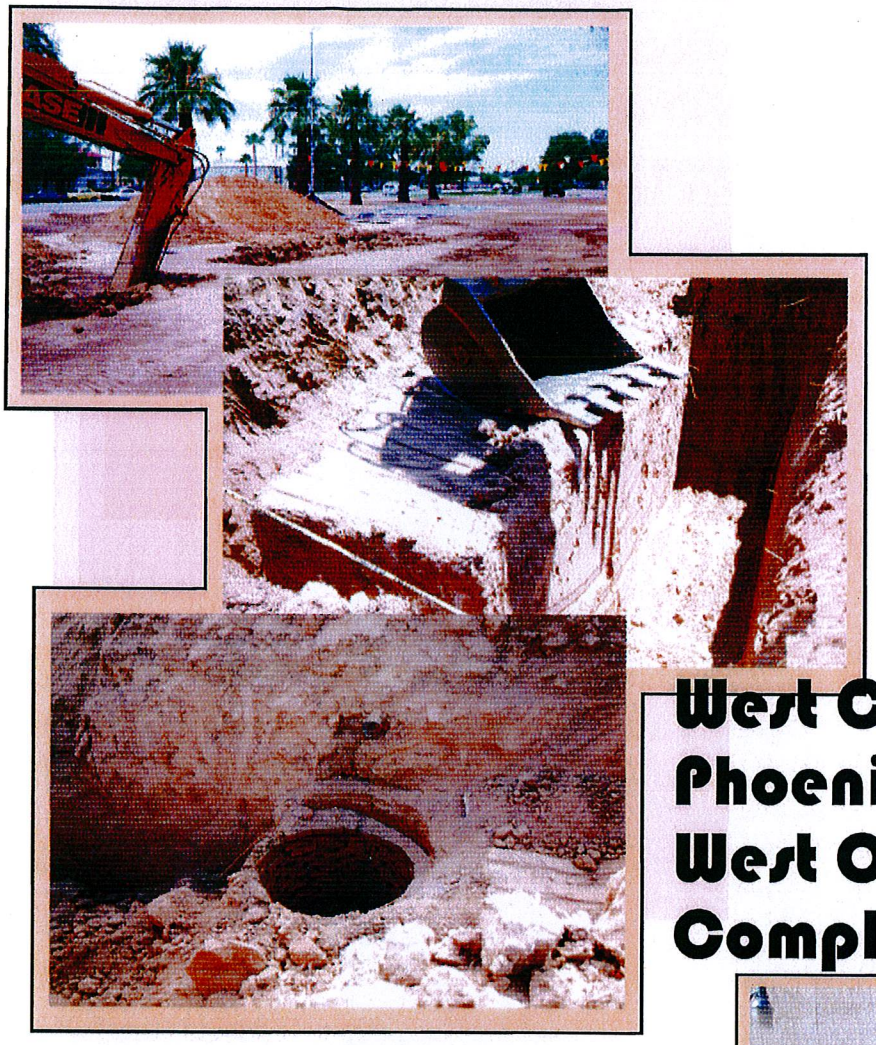
June 8, 2004

FIGURE
6

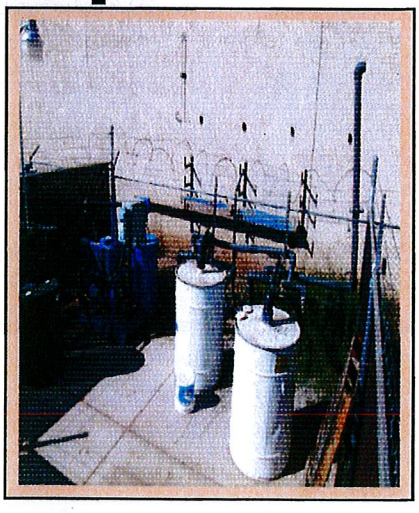
UIC Well Location Map.mxd

APPENDIX A

Remedial Objectives Report



West Central Phoenix - West Osborn Complex Site



Phoenix, Arizona
May 2005

Prepared by
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, AZ 85007
(602) 771-2300 • http://azdeq.gov

Remedial Objectives Report

West Central Phoenix
West Osborn Complex Site
Phoenix, Arizona

May 2005

Prepared by
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, AZ 85007
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TABLE OF CONTENTS

ACRONYMS

A.A.C.	Arizona Administrative Code
A.R.S.	Arizona Revised Statutes
ADEQ	Arizona Department of Environmental Quality
CAP	Central Arizona Project
COP	City of Phoenix
FS	feasibility study
GPL	groundwater protection level
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
PCE	tetrachloroethylene, tetrachloroethene, Perc
RI	remedial investigation
RO	remedial objective
SRL	soil remediation level
SRP	Salt River Project
SVE	soil vapor extraction
TCE	trichloroethylene, trichloroethene
WCP	West Central Phoenix
WOC	West Osborn Complex
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

The Arizona Department of Environmental Quality (ADEQ) has prepared this Remedial Objectives (RO) report for the West Central Phoenix (WCP) West Osborn Complex (WOC) Water Quality Assurance Revolving Fund (WQARF) Registry site to meet the requirements established under Arizona Administrative Code (A.A.C.) R18-16-406. This report relies upon the Land and Water Use Report (Use Report) prepared by ADEQ for the site dated July 2004 and the comments received on the Proposed RO report dated March 2005.

Remedial Objectives (ROs) are established for the current and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be affected by a release of a hazardous substance. The rule specifies that the reasonably foreseeable uses of land are those likely to occur at the site, and the reasonably foreseeable uses of water are those likely to occur within one hundred years unless site-specific information suggests a longer time period is more appropriate [R18-16-406(D)]. Reasonably foreseeable uses are those likely to occur, based on information provided by water providers, well owners, land owners, government agencies, and others. Not every use identified in the Use Report will have a corresponding RO. Uses identified in the Use Report may or may not be addressed based on information gathered during the public involvement process, limitations of WQARF, and whether the use is reasonably foreseeable.

The ROs chosen for the site will be evaluated in the feasibility study (FS). The FS will evaluate specific remedial measures and strategies required to meet the ROs and propose a reference remedy and at least two alternative remedies, all capable of meeting the ROs. The proposed remedies will also be generally compatible with the future land use specified by the land owner. Because the future land and water uses at the site are generally not specific, the mechanism to achieve the ROs may be an insurance policy or environmental protection fund that could be drawn on in the future. Possible mechanisms to achieve the ROs will be evaluated in the FS and presented in the FS report.

Definitions

Remedial Strategy: One or a combination of the six general strategies identified in Paragraph B.4 of A.R.S. §49-282.06 and further defined in rules promulgated in accordance with this statute. In general, these strategies are as follows: *plume remediation, physical containment, controlled migration, source control, monitoring, and no action.*

Remedial Measure: A specific action taken in conjunction with remedial strategies as part of the remedy to achieve one or more of the remedial objectives. For example, remedial measures may include well replacement, well modification, water treatment, provision of replacement water supplies, and engineering controls.

Reference Remedy: A combination of remedial strategies and remedial measures which, as a whole, is capable of achieving remedial objectives. The reference remedy is compared with the alternative remedies for purposes of selecting a proposed remedy at the conclusion of the feasibility study.

Alternative Remedy: A combination of remedial strategies and remedial measures different from the reference remedy that is capable of achieving remedial objectives. The alternative remedies are compared with the reference remedy for purposes of selecting a proposed remedy at the conclusion of the feasibility study.

This report has been prepared with stakeholder input gathered during the November 8, 2004 WCP community advisory board meeting and public meeting, as well as written comments received on the Proposed RO report 30-day public comment period. This final report includes a responsiveness summary to written comments received from the public during the comment period. Upon completion of the final RO Report, the final remedial investigation (RI) report will be available to the public.

The ROs must be stated in the following terms: 1) protecting against the loss or impairment of each use; 2) restoring, replacing, or otherwise providing for each use; 3) when action is needed to protect against or provide for the use; and 4) how long action is needed to protect or provide for the use.

2.0 REMEDIAL OBJECTIVES FOR LAND USE

The zoning pattern in the area has been long established and there are no foreseeable changes for the future. Land uses for the WOC facility property and within the WCP WOC site area are expected to remain predominantly industrial (A-2) or light industrial (A-1).

Soil remediation conducted at the WOC facility through the use of a soil vapor extraction (SVE) system meets soil remediation standards established in Arizona Revised Statutes (A.R.S.) §49-152 and A.A.C. R18-7-2. The soil analytical results presented in a letter report dated January 23, 2004 indicate no detections of trichloroethylene (TCE). The residential soil remediation level (SRL) of TCE is 27 milligrams per kilogram (mg/kg). The minimum groundwater protection level (GPL) of TCE is 0.61 mg/kg. Based on this information, ADEQ granted a permanent shutdown of the SVE system at the WOC facility on March 1, 2004.

Based on the above information, no remedial objectives are needed for this use.

3.0 REMEDIAL OBJECTIVES FOR GROUNDWATER USE

Four current and/or potential groundwater uses were identified within the WCP WOC site: 1) the current and future use of groundwater in the WCP WOC site for drinking water purposes by the City of Phoenix (COP); and 2) the current and future use of SRP irrigation wells. The chemicals of concern in the groundwater at the WCP WOC site are tetrachloroethylene (PCE) and TCE.

City of Phoenix Municipal Use

The COP is not currently operating any wells within a one-mile radius of the WCP WOC site boundary. Two municipal wells (COP wells 70 and 71) were removed from service in 1982 due to TCE groundwater contamination at the WCP WOC site. According to COP, loss of these wells has reduced Phoenix's overall well system capacity and ability to meet service area water demands, especially during droughts or temporary water system outages. COP-68 is located downgradient and approximately 600 feet south from the edge of the shallow TCE plume. This well has been inactive (but not capped) since 1986 due to high TDS and nitrates. COP-157 is located downgradient and approximately one mile southwest from the edge of the WCP WOC deep TCE plume. This well has been inactive (but not capped) since 1989 due to high nitrates.

In August 2000, COP requested funding for an interim remedial action (IRA) pursuant to A.R.S. §49-282.03 for four municipal supply wells affected by the release of hazardous substances in the WCP area. Two of the wells, COP wells 70 and 71, are located in the WCP WOC site. The other two wells, COP wells 151 and 152, are located near the WCP North Plume site. The IRA is requesting funding to recover the 1,500 gallons per minute well capacity lost due to the TCE contamination associated with the WCP WOC site.

The RO for the COP current municipal use is:

> **To restore, replace, or otherwise provide for the COP groundwater supply that has currently been lost due to PCE and/or TCE contamination associated with the WCP WOC site. This action is needed as soon as possible. This action is needed for as**

long as the need for the water exists, the resource remains available, and PCE and/or TCE concentrations in the water prohibits or limits its use.

COP's continued interest in future well development in the Central Phoenix wellfields led COP to the development of computerized tools that would assist the City in evaluating the suitability of groundwater resources in the Central Phoenix area. The primary goal of the project was to aid the City in evaluating the general location and timing of future groundwater resources development for the COP public water supply. As part of the project, COP evaluated the entire water service area for future well development and assigned numerical scores, based on established criteria. Based strictly on the statistical evaluation of the scores, COP indicates that areas with scores in at least the 75th percentile (scores • 81) may warrant consideration for future well development. The area where the WCP WOC site shallow contamination is located scores 80-85, therefore, it may be considered for future well development for drought protection. The area immediately downgradient of the WCP WOC site deep contamination is located scores 78-80, therefore, it is currently not considered for future well development (after year 2010). However, in a letter received from COP dated May 12, 2005, COP indicates that site-specific considerations and operational/service needs may require the location of wells in lower scoring areas. COP's current analysis is that scores in the 78-80 range, or perhaps lower in certain circumstances, may indicate generally favorable well development conditions.

The RO for the COP future municipal supply use is:

To protect for the use of the COP municipal groundwater supply threatened by the PCE and/or TCE contamination emanating from WCP WOC site. According to the COP, this use may be needed by the year 2010. This action would be needed for as long as the level of contamination in the identified groundwater resource threatens or prohibits its use.

SRP Municipal and Irrigation Use

SRP owns several irrigation wells in the area and will continue to need operational wells to supplement surface water supplies. SRP wells 9.5E-7.7N and 8.5E-7.5N are located crossgradient and upgradient, respectively, from the contamination in the WCP WOC site.

However, pumping of SRP well 9.5E-7.7N causes the lower sand and gravel system (LSGS) groundwater contamination at the base of the Lower Alluvial Unit to migrate to the northwest, towards a hydrologic cone of depression caused by the well. Due to this problem, the wells are currently not being pumped in accordance with an agreement between ADEQ and SRP. The agreement may remain in place until a remedy selection has been made.

A water treatment plant may be built on the Grand Canal sometime in the future, which would change the use of the groundwater from irrigation to drinking water.

The RO for the SRP current and future municipal and irrigation use of the wells is:

> **To protect for the use of the SRP groundwater supply threatened by the PCE and/or TCE contamination emanating from WCP WOC site. According to SRP, this use may be needed as soon as is technically feasible. This action would be needed for as long as the level of contamination in the identified groundwater resource threatens or prohibits its use.**

APPENDIX A

PROPOSED RO REPORT COMMENTS

Response to City of Phoenix (COP) Comments:

ADEQ has included the following statement in the final RO report addressing COP's comment and clarification regarding the statistical evaluation scores presented in the Carollo Report:

"However, in a letter received from COP dated May 12, 2005, COP indicates that site-specific considerations and operational/service needs may require the location of wells in lower scoring areas. COP's current analysis is that scores in the 78-80 range, or perhaps lower in certain circumstances, may indicate generally favorable well development conditions."

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