

FEASIBILITY STUDY WORK PLAN

7TH STREET AND ARIZONA AVENUE WQARF SITE
TUCSON, ARIZONA



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March 28, 2014

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ACRONYMS

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ARAR	Applicable or Relevant and Appropriate Requirement
AWQS	Aquifer Water Quality Standards
bgs	below ground surface
BTEX	benzene, toluene, ethyl-benzene and xylenes
CAB	Community Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of Concern
COPC	Chemical of Potential Concern
DCE	dichloroethene
EPA	United States Environmental Protection Agency
ERA	Early Response Action
FS	Feasibility Study
HGC	Hydro Geo Chem, Inc.
LNAPL	Light Nonaqueous Phase Liquid
MCL	Maximum Contaminant Level
NAPL	Nonaqueous Phase Liquid
OSHA	Occupational Safety and Health Administration
PA/SI	Preliminary Assessment/Site Investigation
PCE	tetrachloroethene
PEL	Permissible Exposure Limit
PRAP	Proposed Remedial Action Plan
RI	Remedial Investigation
RO	Remedial Objective
ROD	Record of Decision
RSL	Regional Screening Level
SRL	Soil Remediation Levels
TCE	trichloroethene
TPH	Total Petroleum Hydrocarbons
UPRR	Union Pacific Railroad
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WP	Work Plan
WQARF	Water Quality Assurance Revolving Fund

1. INTRODUCTION

1.1 Purpose

This Work Plan (WP) presents the methodology that will be followed for completion of the feasibility study (FS) for the 7th Street and Arizona Avenue Water Quality Assurance Revolving Fund (WQARF) site (Site) in Tucson, Arizona (Figure 1), and is required as part of the FS process, pursuant to Arizona Administrative Code (A.A.C.) R18-16-407(B). This work is being conducted for Arizona Department of Environmental Quality (ADEQ) under ADEQ Task Assignment 12-011179.

The purpose of the FS is to develop and evaluate a reference remedy and alternative remedies that are capable of achieving the Site Remedial Objectives (ROs). An FS report will be developed that relies on data and information from the Remedial Investigation and will evaluate the reference remedy and at least two alternative remedies to ensure that each remedy:

- 1) Achieves remedial objectives;
- 2) Is consistent with water management plans and general land use plans; and
- 3) Is evaluated with comparison criteria including practicability, risk, cost, and benefit.

One of the alternative remedies will be less aggressive than the reference remedy and one will be more aggressive [A.A.C. R18-16-407(H)]. The FS report will also develop a recommended remedial alternative for the site.

1.2 Site Description

The former Oliver's Laundry and Dry Cleaners Co. (Oliver's Cleaners) property is the primary source of contamination at the Site and is located at 300 E. 7th Street, Tucson, Arizona 85705 (NE-NW-SE-Sec 12-T14S-R13E, Tucson 7½' topographic quadrangle). The former Oliver's Cleaners property is bounded by 7th Street to the north, Herbert Avenue to the east and 5th Avenue to the west. Downtown Auto Center and Towing is located on the parcel to the south. The property currently consists of an asphalt-paved parking lot. The location of the Site and the surrounding features are shown on Figure 2.

The approximate WQARF Site boundaries are based on the extent of a plume of PCE-affected groundwater in the perched aquifer underlying the Site (Figure 2). The solute plume begins at the former Oliver's Cleaner's facility, and extends at least 4,500 feet to the northwest. A large body

of light non-aqueous phase liquid (LNAPL) consisting of petroleum hydrocarbons floating on the perched water table is associated with releases from the Union Pacific Railroad (UPRR) passenger depot located approximately 1,000 feet to the south of the Site. This LNAPL body exists at the southern, upgradient fringe of the PCE solute plume. Two leaking underground storage tank sites, the Yellow Cab and the former Bridgestone-Firestone facilities, are located northwest of the former Oliver's Cleaners location within the extent of the PCE solute plume.

Soil and perched groundwater have been impacted by volatile organic compounds (VOCs) associated with the former Oliver's Cleaners facility. Concentrations of tetrachloroethene (PCE) up to 17 milligrams per kilogram (mg/kg) were detected in soil samples from beneath the facility during the site investigation (HGC, 2014). PCE and its breakdown products, trichloroethene (TCE), *cis*-1,2-dichloroethene (*cis*-DCE), and *trans*-1,2-dichloroethene (*trans*-DCE), have been detected in groundwater samples from beneath and northwest of the facility at concentrations up to 3,200 micrograms per liter (µg/L).

1.3 Site History

A review of the historical information available for the Site has been performed with the results summarized in a report prepared by Kleinfelder, Inc. and HGC titled "*Early Response Action Evaluation Report, 7th Street and Arizona Avenue, Water Quality Assurance Revolving Fund (WQARF) Site, Tucson, Arizona*" (Kleinfelder and HGC, 2003).

A building was constructed at the former Oliver's Cleaners property as early as 1928 and dry cleaning may have been performed on the property since 1935. Dry cleaning was performed continuously on the property from 1957 until the buildings were destroyed by fire in 1989 (ADEQ, 1999). The property is currently a 40,000-square foot (ft²) paved parking lot (Figure 3).

Seven underground storage tanks (USTs) were removed from the property in 1991. These included one 10,000-gallon and four 1,000-gallon solvent USTs and two 500-gallon heating oil or waste oil USTs. Available information indicates that petroleum distillate solvents were used at the Site (HGC, 2014). Locations of the USTs are shown on Figure 3.

The former Oliver's Cleaners water supply well, located on the property (Figure 3), was abandoned on December 29, 1996.

1.4 Summary of Previous Environmental Investigations and Actions

Environmental studies at the property were first initiated pursuant to UST regulations. In 1992, Zenitch was contracted by the property owner to collect soil samples in the vicinity of the

heating oil USTs (ADEQ, 1999). TPH ranged from 28 to 120 mg/kg in the soil samples; BTEX was not detected. In 1992, analysis of groundwater from the Oliver's Cleaners water supply well, completed within the regional aquifer, detected PCE and TCE at 2.9 and 0.5 µg/L, respectively (ADEQ, 1999).

In 1997, ADEQ collected 26 soil and soil gas samples at the property as part of a Preliminary Assessment/Site Inspection (PA/SI). The purpose of the investigation was to estimate the extent of PCE contamination in the vadose zone. According to the PA/SI report (ADEQ, 1999), the highest and most significant soil sampling result was found to be near the property's center 1,000-gallon UST. The second highest concentrations were found at the property's southeastern 1,000-gallon USTs. The contaminated area was estimated from the former center 1,000-gallon UST to the former southernmost 1,000-gallon UST.

A site investigation in support of an Early Response Action (ERA) evaluation at the Site was undertaken in 2002 (Kleinfelder and HGC, 2003). This investigation was intended to define the nature, degree and extent of non-aqueous phase liquids (NAPLs) and contaminants in soil, soil vapor and groundwater at the Site, and to investigate potential contamination of the regional aquifer. Measurable thicknesses of LNAPL resembling diesel fuel were observed in seven of the perched groundwater monitoring wells installed. LNAPL samples indicated the presence of PCE. Analysis of soil samples collected during monitoring well installation showed PCE concentrations up to 17 mg/kg. Dye shake tests failed to detect the presence of NAPL in soil samples. A passive soil gas screening survey indicated the widespread presence of chlorinated solvent compounds in soil vapor at shallow depths of 2 to 3 feet below ground surface (bgs). Active soil vapor sampling from probes and monitoring well headspace in May and June 2002 indicated the presence of PCE, TCE and *cis*-DCE; chloroform was also detected across the Site and trimethylbenzene isomers were locally present. In general, the concentrations of PCE, TCE and *cis*-DCE in soil vapor increased with depth.

Subsequent groundwater monitoring events (HGC, 2014) indicated the presence of PCE, TCE and *cis*-DCE in the LNAPL and in the perched groundwater beneath the facility, with groundwater concentrations exceeding Arizona Aquifer Water Quality Standards (AQWS) extending approximately 2,000 feet downgradient of the facility. The regional aquifer appeared to be unaffected by VOC contamination associated with the Site. Soil vapor monitoring in 2004 indicated that PCE was present at concentrations up to 5,900 µg/L in soil vapor (HGC, 2014).

Field work to support the ERA at the Site included further evaluation of the impact of petroleum distillate solvents on soil and groundwater; installing and testing of a soil vapor extraction (SVE) well; and designing and construction of an SVE system to remove VOCs from the vadose zone

(HGC, 2014). Operation of the SVE system at the Site began June 13, 2006, and the system was in operation until June 23, 2009; approximately 715 pounds of VOCs and over 10,000 pounds of hydrocarbons were removed as of May 2008. Concentrations of VOCs declined rapidly in the first six months of operation and more slowly after that time (HGC, 2014).

A pilot test was conducted in November 2007 to evaluate the efficacy of air sparging to remove chlorinated VOCs from the LNAPL at the Site (HGC, 2014). One air injection well and two nests of vapor monitoring probes were installed as part of the pilot test. Data collected for the test indicated that air sparging was successful at removing chlorinated VOCs from the LNAPL and that the SVE system effectively captured the VOCs. PCE concentration in the LNAPL was reduced 48 percent and TCE and *cis*-DCE concentrations were reduced 80 and 74 percent, respectively.

No chlorinated VOC concentrations were detected in samples from regional aquifer wells 7AZR-1 and 7AZR-2 in May 2012.

Two additional perched groundwater monitor wells (7AZP-11, 7AZP-12) and one additional regional aquifer well (7AZR-3) were installed in October and November 2012 (Figure 2). The perched groundwater wells were intended to further delineate the downgradient extent of solute plume in the perched groundwater. The lack of groundwater in well 7AZP-12 indicated that the perched groundwater “pinches out” to the south of this location, limiting the extent of the groundwater solute plume to the north. The presence of VOCs below the AWQS at well 7AZP-11 (4 µg/L PCE; 1 µg/L TCE) indicates that the groundwater solute plume is constrained to the northwest. The regional well (7AZR-3) was installed to the northwest, presumed to be downgradient of the existing regional wells 7AZR-1 and 7AZR-2, and beneath the delineated perched groundwater plume, in order to investigate if contamination from the perched groundwater had penetrated the regional aquifer. The lack of detectable VOCs in the regional aquifer confirmed that contamination found in the perched groundwater has not penetrated into the regional aquifer in this area.

A draft Remedial Investigation (RI) report was completed in May 2013 and updated in February 2014. The draft RI (HGC, 2014) concluded that Site-related human health risks associated with the perched groundwater solute plume downgradient of the former Oliver's Cleaners source area appear to be minimal as soil vapor concentrations near the water table are low and there are no drinking water wells in the perched groundwater. However, PCE and TCE concentrations in shallow soil gas below the asphalt at the former Oliver's Cleaners property generally exceed screening criteria for non-residential indoor air. Land and Water Use

Land use near the Site generally consists of a mix of commercial/industrial properties, residential properties and roads. Surface cover at the former Oliver's Cleaners Facility is asphalt paving. Future land use at and near the Site is anticipated to remain the same (i.e., a mix of commercial/industrial and residential properties).

The perched groundwater is not considered a drinking water source and there are no surface water uses within the Site area. The regional aquifer is considered to be a drinking water source for the City of Tucson. There are currently no drinking water wells within the perched or regional groundwater in the vicinity of the Site, but as many as three unused regional aquifer wells exist at the Site.

2. IDENTIFICATION OF ARARS

Identification of applicable or relevant and appropriate requirements (ARARs) is the major prerequisite for setting cleanup goals, selecting the remedy, and determining how to implement the remedy while assuring protection of human health and the environment. ARARs include any standard, requirement, criterion, or limitation under any Federal or State environmental law. Identification of ARARs will be included in the FS during evaluation of potential remedial alternatives as more is learned about site conditions, site contaminants, and remedial action alternatives.

The recommended approach for developing remediation goals is to identify screening levels during the FS based on site-specific information from the risk evaluation, and ultimately select remediation levels in the record of decision (ROD).

A preliminary evaluation of ARARs for the RI indicated that, due to the presence of COPCs in groundwater and soil at the Site, Arizona AWQS under [AAC R18-11-4] and Arizona soil remediation levels (SRLs) under [AAC R18-7-2] are applicable requirements. Additionally, Safe Drinking Water Act maximum contaminant levels (MCLs) are considered applicable requirements.

There are no available standards for contaminants in soil vapor. Due to the proximity of commercial and industrial properties to the Site and the potential for vapor migration into buildings, the OSHA permissible exposure limits (PELs) are considered to be relevant and appropriate requirements.

The EPA Regional Screening Levels (RSL) table (EPA, 2012) lists Superfund human health screening values for soil, air, and tap water. The RSLs are not promulgated standards, but rather guidance values that will be considered.

3. FEASIBILITY STUDY TASKS

This section discusses the tasks associated with the development of the FS Report. The FS tasks will be performed in order to meet the requirements of A.A.C. R18-16-407.

3.1 Development and Screening of Remedial Alternatives

The FS process, pursuant to [AAC R18-16-407] includes the identification of remedial objectives (ROs); the identification of potential treatment and containment technologies that satisfy the ROs; remedial technology screening; and development and analysis of remedial alternatives.

3.1.1 Remedial Objectives

The ROs developed as part of the RI process, pursuant to [AAC R18-16-406(I)], were based on field investigation results, the Land and Water Use Study, the Risk Evaluation, ADEQ input and input from the community during the draft RO Report public comment period. ROs are also used during alternatives development, where remediation goals are established based on ARARs, to identify appropriate remedial technologies.

Because the former Oliver's Cleaners property is currently, and will for the foreseeable future, be zoned for commercial use, non-residential soil cleanup standards apply. Therefore, the RO for land use at the former Oliver's Cleaners property is to restore soil conditions to the remediation standards for non-residential use specified in [AAC R18-7-203] (specifically background remediation standards prescribed in AAC R18-7-204, predetermined remediation standards prescribed in AAC R18-7-205, or site specific remediation standards prescribed in AAC R18-7-206) that are applicable to the hazardous substances identified (tetrachloroethene (PCE), trichloroethene (TCE) and cis-1,2-dichloroethene (cis-DCE)). This action is needed for the present time and for as long as the level of contamination in the soil threatens its use as a non-residential property.

There are no current groundwater uses in the Study area; however, the regional aquifer is considered to be a drinking water source for the City of Tucson. Therefore, the RO for regional groundwater at the Site is to protect for the use of the groundwater supply of the City of Tucson from contamination from the Site. This action is needed for the present time and for as long as the level of contamination in the soil threatens the use of the regional groundwater for municipal uses.

3.1.2 Development and Screening of Alternatives

Remedial alternatives are screened based on anticipated removal or reduction of contaminants at a site and the ability to achieve the ROs. The FS evaluation will look at future risk under reasonably foreseeable uses of the source property and surrounding properties. Typically, appropriate remedial technologies are screened using the following criteria:

- Compatibility with current and reasonably foreseeable land use,
- COC treatment effectiveness,
- Regulatory requirements,
- Constructability,
- Operation and Maintenance requirements,
- Health and Safety considerations,
- Generation and management of waste products,
- Flexibility, and
- Cost.

Initial feasibility studies and remedial treatment at the Site were executed under an ERA. Soil vapor extraction (SVE) was performed at the Site from June 2006 through June 2009. Remedial operations data collected during operation of the SVE system indicated successful removal of chlorinated organics from the Site (HGC, 2008e). A 1-day air sparging pilot study was performed from October 30 to November 2, 2007 (HGC, 2008c). Data indicated successful increased removal of VOCs at the Site during the pilot test.

The feasibility study shall provide for the development of a reference remedy and at least two alternative remedies [AAC R18-16-407(E)]. The reference remedy and alternative remedies shall be capable of achieving all of the remedial objectives. The reference remedy and any alternative remedy also may include contingent remedial strategies or remedial measures to address reasonable uncertainties regarding the achievement of remedial objectives or uncertain time-frames in which remedial objectives will be achieved. The reference remedy and other alternative remedies shall be developed and described in the feasibility study report in sufficient detail to allow evaluation using comparison criteria. These comparison criteria include practicability, risk, cost and benefit. An evaluation of comparison criteria will also be included in the FS report pursuant to [AAC R18-16-407(H)].

The reference remedy shall be developed based upon best engineering, geological, or hydrogeological judgment following engineering, geological, or hydrogeological standards of practice, considering the information in the remedial investigation, the best available scientific information concerning available remedial technologies, and preliminary analysis of the comparison criteria.

At least one of the two alternative remedies must employ a remedial strategy or combination of strategies that is more aggressive than the reference remedy, and at least one of the alternative remedies must employ a remedial strategy or combination of strategies that is less aggressive

than the reference remedy. A more aggressive strategy is a strategy that requires fewer remedial measures to achieve remedial objectives, a strategy that achieves remedial objectives in a shorter period of time, or a strategy that is more certain in the long term and requires fewer contingencies.

Source control shall be considered as an element of the reference remedy and all alternative remedies, if applicable, except for monitoring and no action alternatives. [R18-16-407(F)]

Remedial measures necessary for each alternative remedy developed shall be identified in consultation with water providers or known well owners whose water supplies are affected by the release or threatened release of a hazardous substance. In identifying the remedial measures, 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 supplies and any operational implications shall be considered. 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 remedial objectives, such remedial measures shall remain in effect as long as required to ensure the continued achievement of those objectives [R18-16-407(G)].

Each retained remedial alternative will be evaluated for its ability to achieve ROs, and its compatibility with water management and land-use plans. Source control will be considered as an element of the analyzed remedies. Based on the comparison, a proposed remedy will be developed for the Site.

3.2 Community Involvement

Because of the proximity and similarity of this site to the Park-Euclid WQARF Site, a Community Advisory Board (CAB) has been formed that combines community members from both sites. Community involvement activities required for the FS process at this Site include:

- A combined CAB and public meeting to discuss the ROs for the site was held on February 18, 2014. Based on comments received at the meeting, a draft RO report was put out for 30-day public comment on February 19, 2014. After the 30-day comment period, the final RI report was issued including a response summary for any comments on the ROs received during the comment period. (The draft RI report was put out for public comment in May 2013.)
- This FS work plan has been issued after completion of the final RI report. A public notice has been posted announcing the issuance of the work plan; however, no comment period is required.

- A proposed remedial action plan (PRAP), following completion of the FS report, will be issued for 30-day public comment. A public notice will be put out announcing the issuance of the PRAP and the 30-day public comment period. A CAB meeting will also be scheduled during the public comment period.
- After the PRAP 30-day comment period, a final Record of Decision (ROD) will be issued with a response summary of any comments received. A public notice will be put out announcing the issuance of the ROD for the site. No comment period is required.

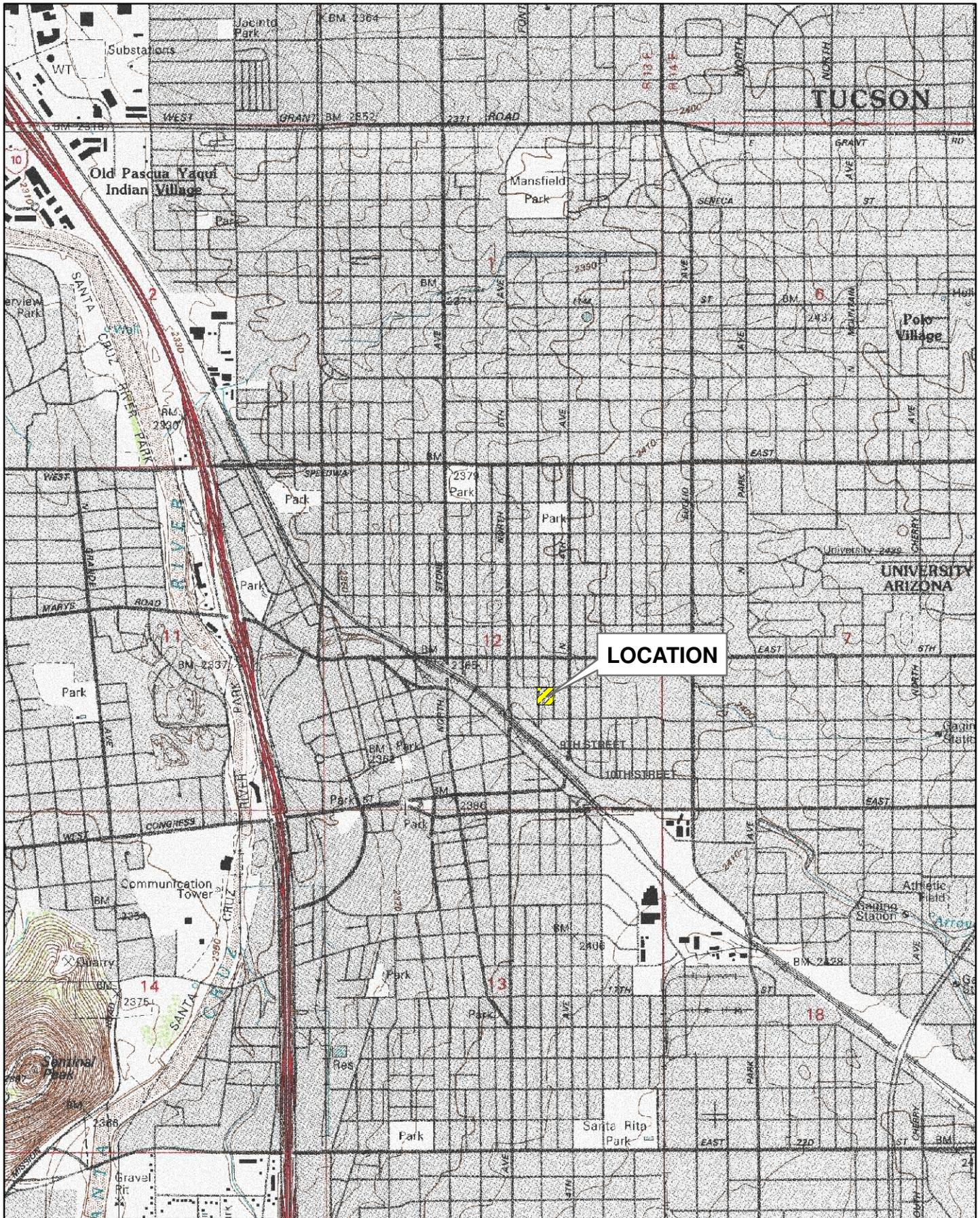
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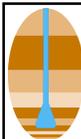
4. LIMITATIONS

The opinions and recommendations presented in this report are based upon the scope of services and information obtained through the performance of the services, as agreed upon by HGC and the party for whom this report was originally prepared. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

FIGURES



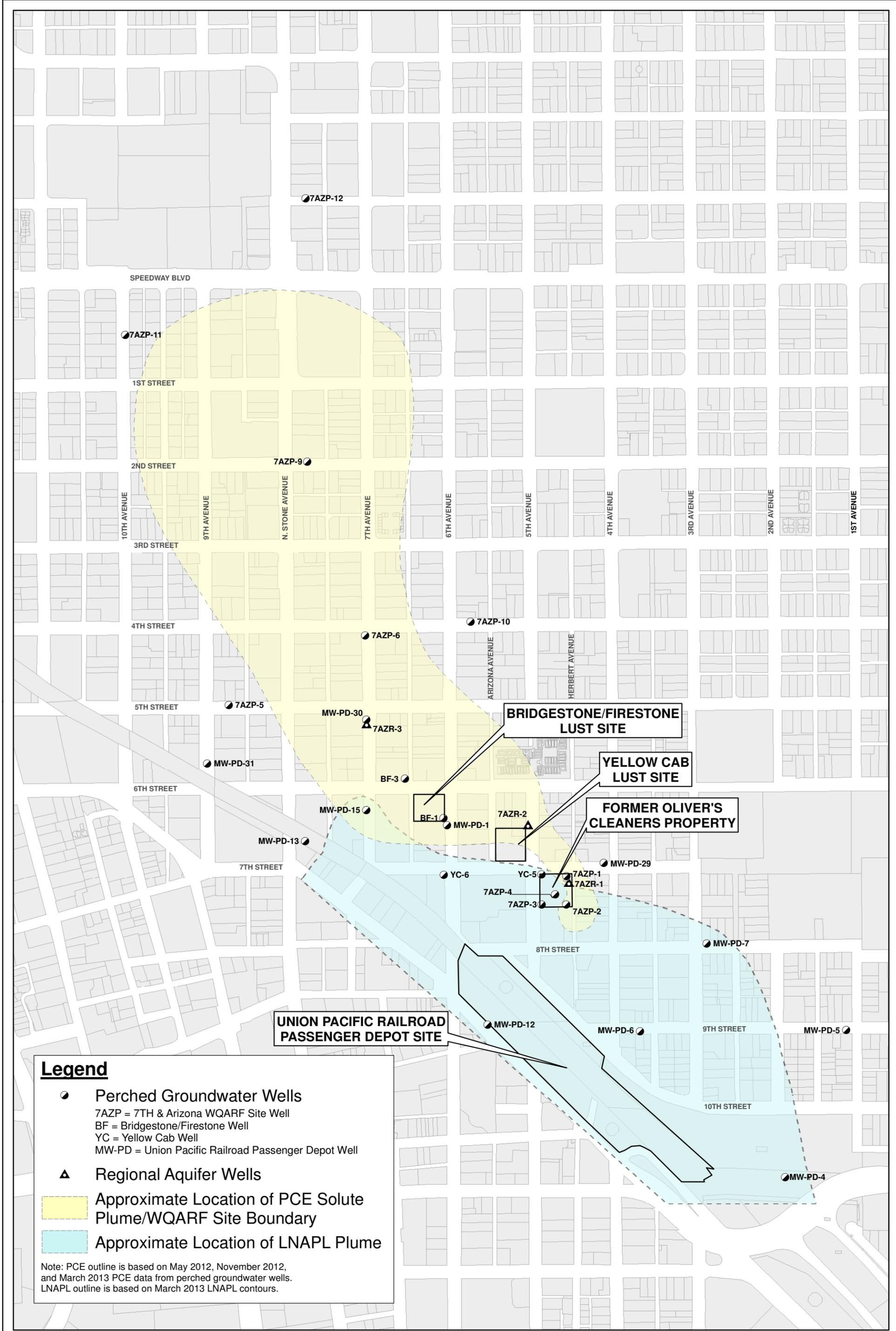
Spatial Reference: NAD 1983, UTM Zone 12N



**HYDRO
GEO
CHEM, INC.**

**LOCATION MAP
7TH STREET AND ARIZONA AVENUE WQARF SITE
TUCSON, ARIZONA**

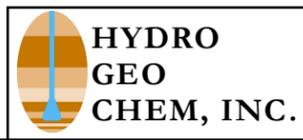
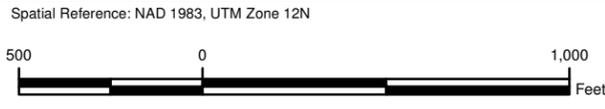
Approved MJB	Date 02/15/13	File 7AZ Site Location Map	Figure 1
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Legend

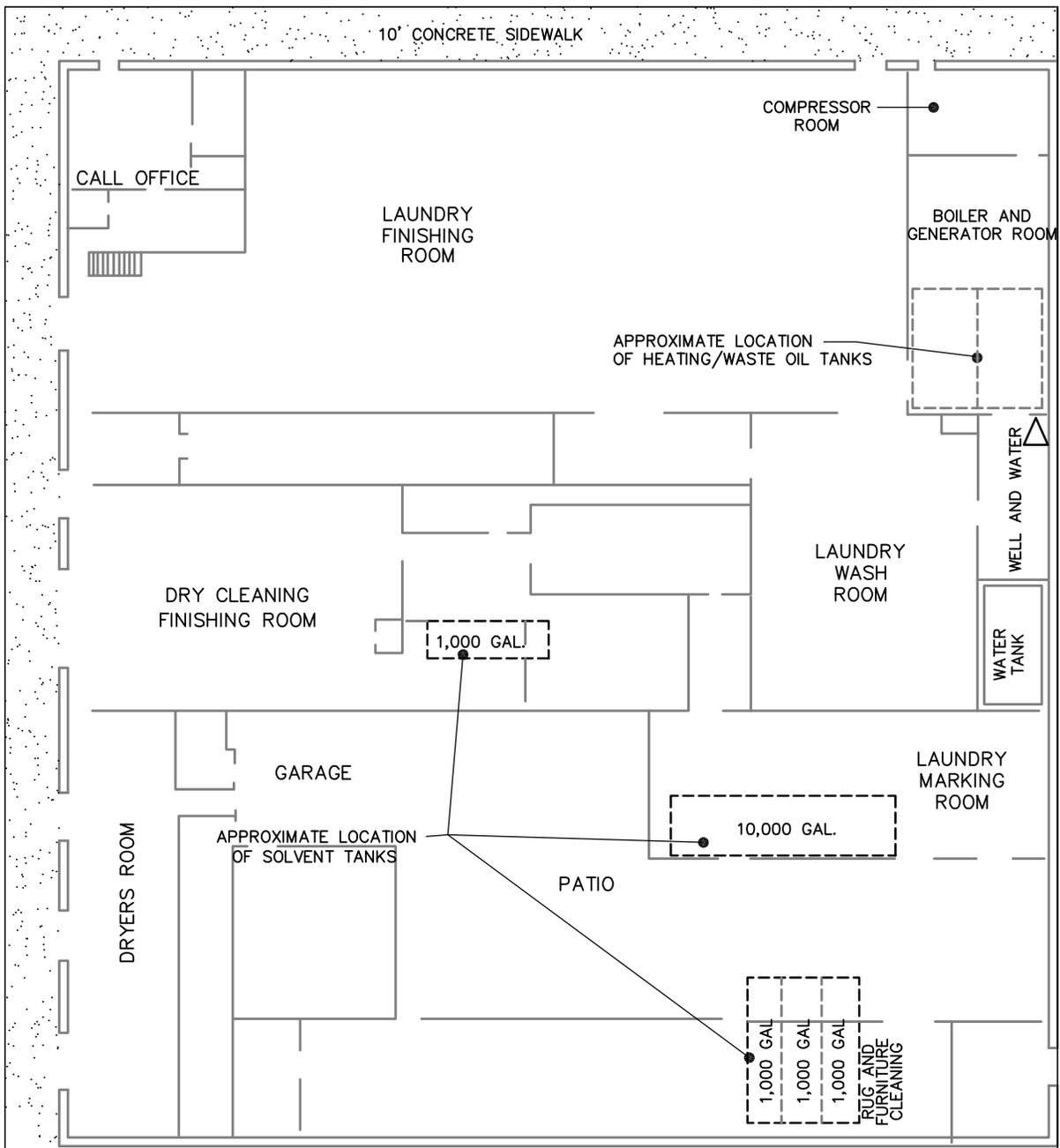
- Perched Groundwater Wells
 7AZP = 7TH & Arizona WQARF Site Well
 BF = Bridgestone/Firestone Well
 YC = Yellow Cab Well
 MW-PD = Union Pacific Railroad Passenger Depot Well
- ▲ Regional Aquifer Wells
- Approximate Location of PCE Solute Plume/WQARF Site Boundary
- Approximate Location of LNAPL Plume

Note: PCE outline is based on May 2012, November 2012, and March 2013 PCE data from perched groundwater wells. LNAPL outline is based on March 2013 LNAPL contours.



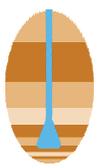
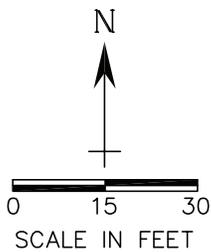
SITE PLAN			
7TH STREET AND ARIZONA AVENUE WQARF SITE			
TUCSON, ARIZONA			
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Spatial Reference: NAD 1983, UTM Zone 12N



EXPLANATION

△ ABANDONED REGIONAL AQUIFER WELL



**HYDRO
GEO
CHEM, INC.**

**FORMER OLIVER'S CLEANERS PROPERTY
SCHEMATIC DIAGRAM OF FACILITIES AND USTs**

Approved MJB	Date 02/08/13	Author CAD	Date 02/08/13	File No 2012016003d
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Fig **3**