RECORD OF DECISION
7TH STREET AND ARIZONA AVENUE
WQARF REGISTRY SITE
TUCSON, ARIZONA

June 30, 2020

Prepared by

Arizona Department of Environmental Quality

400 West Congress Street

Suite 433

Tucson, Arizona 85701

7th STREET AND ARIZONA AVENUE WQARF SITE

RECORD of DECISION

APPROVAL PAGE

Prepared By: Joshua Campbell 30 June 2020

Joshua R. Campbell, Project Manager Date
Remedial Projects Unit
Arizona Department of Environmental Quality

Approved By: Tina LePage 02/08/21

Tina LePage, Manager Date
Remedial Projects Section
Arizona Department of Environmental Quality

Approved By: Laura L. Malone 6/29/2020

Laura Malone, Division Director Date
Waste Programs Division
Arizona Department of Environmental Quality

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environment Quality
AS	air sparging
AWQS	Arizona Water Quality Standards
bls	below land surface
cDCE	cis-1,2-dichloroethene
COCs	contaminants of concern
ERA	Early Response Action
ERD	enhanced reductive dechlorination
FS	feasibility study
ft.	feet
GAC	granular activated carbon
GPL	groundwater protection level
H+A	Hargis + Associates, Inc.
HGC	HydroGeoChem, Inc.
HGL	Hydro Geo Logic, Inc.
lbs.	pounds
LNAPL	light non-aqueous phase liquid
OOM	order of magnitude (an exponential value of base-10)
PCE	tetrachloroethene or tetrachloroethylene
PRAP	proposed remedial action plan
RI	remedial investigation
RO	remedial objective
RSL	regional screening levels
rSRL	residential soil remediation levels
SRLs	soil remediation levels
SVE	soil vapor extraction
TCE	trichloroethene or trichloroethylene
Terracon	Terracon Consultants, Inc.
tDCE	trans-1,2-dichloroethene
µg/L	micrograms per liter
µg/m³	micrograms per cubic meter
VISL	vapor intrusion screening levels
VGAC	vapor-phase granular activated carbon
VOC	volatile organic compounds
WQARF	Water Quality Assurance Revolving Fund

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Site Name and Location

The 7th Street and Arizona Avenue Water Quality Assurance Revolving Fund (WQARF) Registry Site (Site) is located in central Tucson, Pima County, Arizona. The Site is located in a mixed commercial and residential area, and is bounded approximately by Speedway Boulevard to the north, 4th Avenue to the east, 8th Street and the Union Pacific railroad to the south, and 10th Avenue to the west. (Figure 1-1).Two known sources contributed to the presence of contaminants at the site. These two sources are referred as the former Oliver's Cleaners source (the property at the southeast corner of 7th Street and 5th Avenue, parcel 117-05-074A), and the Stone Avenue source (at the southwest corner of 2nd Street and Stone Avenue, parcel 117-03-1120).

The Oliver's Cleaners source operated as a dry cleaner from 1928 through 1989, when the building burned down. Underground storage tanks, previously used to store solvent and fuel, where abandoned in place in 1989 then removed in 1991. The onsite groundwater well was found to contain tetrachloroethene (PCE) and trichloroethene (TCE) in 1992, and the Site was added to the WQARF registry in 2000.

The Stone Avenue source property was initially operated as a vehicle service center from 1950 to 1989. In 1996, the site began operating as a dry cleaner, until 2001. From 2001to 2014, the location was used for various wholesale and retail businesses. In 2013, a City of Tucson Environmental Site Assessment revealed PCE contamination in soil samples collected in 1999. The property was added to the Site as a source property in 2014.

1.2 Basis and Purpose

This Record of Decision (ROD) presents the Selected Remedy for the Site, chosen in accordance with applicable requirements in Title 18, Chapter 16 of the Arizona Administrative Code (A.A.C.). The process for selecting the remedy complied with Arizona Revised Statute (A.R.S.) §49-287.04. The Arizona Department of Environmental Quality (ADEQ), as the lead agency, has reviewed the remedy and determined that Site completion criteria used to evaluate the selected remedial action

for contaminants of concern (COCs) in groundwater and soil at the Site and Remedial Objectives (ROs) will be satisfied. This ROD describes the basis for the Selected Remedy and addresses all elements of A.A.C. R18-16-410 under the WQARF Program. The decision in this ROD is based upon previous activities and investigations conducted and performed for this Site that are documented and located in ADEQ's Administrative Record file. The State of Arizona, acting by and through ADEQ, has selected the remedy detailed in this document.

1.3 Site Assessment

PCE and several of its breakdown products, TCE and cis-1,2-dichloroethene (cDCE) are considered the COCs at the Site and have been detected in soil vapor and perched groundwater above regulatory standards. PCE concentrations in groundwater were detected up to a maximum of 1,300 micrograms per liter (µg/L). Concentrations of TCE in groundwater have been detected up to 300 µg/L. Cis- and trans-DCE have been detected at concentrations of up to 1,700 ug/L and 510 µg/L, respectively. Trans-1, 2-dichloroethene (tDCE), another common products of PCE breaking down, was only detected above the Arizona Aquifer Water Quality Standard (AWQS, 100 µg/L) in one groundwater monitoring well (MW-PD-14). These detections were made in 2005, and tDCE has not been detected above the AWQS at the Site since that year. Other volatile organic compounds (VOCs) have been detected at the Site and are not considered COCs because concentrations of these other VOCs are below regulatory levels (i.e., soil remediation levels [SRLs], groundwater protection levels [GPLs], and Aquifer Water Quality Standards).

In addition, soil gas concentrations in the vadose zone at the site have been detected above ambient air screening levels. The highest observed concentrations at the 7th Street & Arizona WQARF site are presented in Table 1-1. In 2018, one regional aquifer well showed PCE concentrations above the AWQS (5 µg/L). However, in groundwater sampling conducted in the winter of 2019-2020, PCE levels in that well were shown to have fallen below the AWQS. No public drinking water wells have been threatened by the 7th Street and Arizona Avenue perched groundwater contamination plume.

Table 1-1: Highest Observed COC Concentrations in Site Media

COC	Perched Groundwater Concentration (µg/L)	Arizona AWQS (µg/L)	Soil Vapor Well Concentration (µg/m^3)	Shallow Soil Gas Concentration (µg/m^3)	Estimated Indoor Air Concentration (µg/m^3)[a]	Ambient Air Screening Level (µg/m^3)	
						Cancer	Non-Cancer
PCE	1,300	5	14,000,000	499,000	14,970	47	180
TCE	300	5	4,360,000	16,900	507	3	8.8
cDCE	1,700	70	874,000	491	14.7	NA	NA
tDCE	510	100	55,300	BRL	NA	NA	NA

COC = contaminant of concern
PCE = tetrachloroethene
TCE = trichloroethene
cDCE = cis-1,2-dichloroethene
tDCE = trans-1,2-dichloroethene
µg/L = micrograms per liter
AWQS = aquifer water quality standard
µg/m3 = micrograms per cubic meter

a = Based on an EPA attenuation factor of 0.03
Residential Risk = 1E -6 for cancer SL;
Non cancer SL HQ=1
BRL = below reporting limit
NA = not applicable

Dry cleaning operations may have taken place on the former Oliver's Cleaners property from 1935 to 1989, when the building was destroyed by fire. Seven underground storage tanks (USTs) were removed from the property in 1991, including five solvent tanks (one 10,000 gallon capacity and four 1,000 gallon capacity). PCE and TCE were first detected in 1992 at concentrations below AWQS in the former Oliver's Cleaners supply well during an investigation under UST regulations. A 1997 Preliminary Assessment/Site Inspection determined that PCE contamination in soils was associated with a leak from at least two of the USTs. The Site was placed on the WQARF Registry in April 2000 with an eligibility and evaluation score of 40 out of a possible 120.

The COCs have been detected in the groundwater at concentrations exceeding their respective AWQS of 5 ug/L for PCE and TCE, and 7 µg/L for cDCE. The highest COC concentrations were under the warehouse at the Stone Avenue source. Lower COC concentrations have been detected near the Oliver's Cleaners source.

Several Early Response Actions (ERAs) have been implemented at the Site. These include:

- Implementation of soil vapor extraction (SVE) systems at Oliver's Cleaner (operated from 2006-2009) which removed ~770 pounds (lbs.) of VOCs from the subsurface.

- Implementation of SVE systems at 847 North Stone Avenue (operated from 2017-2019) which removed over 1,500 lbs. of VOCs.

1.4 Selected Remedy

The selected remedy for the Site was specified in the Proposed Remedial Action Plan (PRAP) dated April 28th, 2014. A PRAP Addendum (PRAP-A), dated January 31st, 2020, was issued to include considerations for the additional source property at 847 N Stone Avenue, which was added to the Site in 2014. The remedy will include soil vapor extraction for land use. Air sparging (AS) along with SVE will also be used at the Oliver's Cleaners source. Perched groundwater will be treated indirectly through source mass removal via SVE and AS. Subsequent monitored natural attenuation (MNA), involving routine groundwater monitoring and sampling of the perched and regional groundwater aquifers, will be conducted as well.

1.5 Statutory Determinations

ADEQ completed the remedial investigation (RI) report and the feasibility study (FS) reports in 2014 pursuant to A.R.S. §49-287.03. The RI report:

- Was conducted in accordance with AAC 18-16-406 and A.R.S. §49-287.03.
- Established the nature and extent of the contamination and the sources thereof;
- Identified current and potential impacts to public health, welfare, and the environment;
- Identified current and reasonably foreseeable uses of land and waters of the state; and
- Obtained and evaluated information necessary for identification and comparison of alternative remedial actions.

The FS report used the information collected during the RI to:

- Identify a reference remedy and alternative remedies that appear to be capable of achieving remedial objectives (ROs) in compliance with A.A.C. R-18-16-2; and
- Evaluate the remedies, based on the comparison criteria outlined in A.R.S. §49-282.06(B)(4), to select a remedy consistent with A.R.S. §49-282.06.

ADEQ used the evaluation of remedial alternatives discussed in the FS report to choose a remedial method. ADEQ then prepared a PRAP pursuant to A.R.S. §49-287.04, and a PRAP addendum (PRAP-A), which both included:

- A description of the chosen remedy;
- How the remedy will achieve each of the ROs identified in the RI report;
- How accomplishment of the remedial objects is to be measured.

This ROD is a final administrative decision, pursuant to A.R.S. §49-287.04 and A.R.S. §41-1092. As outlined in A.A.C. R18-16-410, this ROD includes:

- A description of the remedy;
- A responsiveness summary regarding comments received on the PRAP, pursuant to A.A.C. R18-16-410(B);
- A demonstration that the remedy meets the public comment and community involvement requirements outlined in A.R.S. §49-2-5 and A.A.C. R18-16-410;
- A demonstration that the remedy will achieve the RO selected in the RI;
- A demonstration that the remedy meets the requirements of A.R.S. §49-282.06;
- A time period for commencing and completing the remedy;
- A total estimated cost; and
- A time frame for review of the remedy to ensure that the remedy is effective in achieving the ROs.

2.0 SITE BACKGROUND

2.1 Site Descriptions

The former Oliver's Laundry and Dry Cleaners Co. (Oliver's Cleaners) property is the initially-identified source of contamination at the Site and is located at 300 East 7th Street, Tucson, Arizona 85705 (NE-NW-SE-Sec 12-T14S-R13E, Tucson 7½' topographic quadrangle, Pima County Parcel 117-05-074A). 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 location of source properties are shown on Figure 1-1.

The facility at 847 North Stone Ave, Arizona 85705 (SW-NE-NW-Sec 12-T14S-R13E, Tucson 7½' topographic quadrangle; Pima County Parcel 117-03-1120) was identified in 2013 as an additional source of contamination within the existing plume footprint. It is bounded by 2nd Street to the north, Stone Ave to the east, Ash Ave to the west, and an apartment complex to the south. The property had served variously as a mechanic's shop and a dry cleaner in the past. Currently, the property includes a single, unoccupied warehouse structure with an outdoor storage yard.

2.2 Sources of Release

Environmental studies at the former Oliver's Cleaners property were first initiated pursuant to UST regulations. Analysis of groundwater from the former Oliver's Cleaners water supply well, completed within the regional aquifer, detected PCE and TCE at 2.9 and 0.5 µg/L, respectively. In 1997, ADEQ collected 26 soil and soil gas samples at the former Oliver's Cleaners property as part of a Preliminary Assessment/Site Inspection (PA/SI). According to the PA/SI report (ADEQ, 1999), the highest and most significant soil sampling result for PCE was found near the property's center 1,000-gallon UST. The second highest PCE concentrations were found at the property's southeastern 1,000-gallon USTs. The contaminated area was estimated to extend from the former center 1,000-gallon UST to the former southernmost 1,000- gallon UST, an area including the west end of the 10,000-gallon UST. Furthermore, the PA/SI report concludes that concentrations near

the 10,000-gallon UST may be associated with a release of drying cleaning solvent from the 1,000-gallon UST. The former Oliver's Cleaners water supply well located on the property was abandoned on December 29, 1996.

The City of Tucson began performing environmental investigations of the Stone Avenue Site in 2013; these investigations showed PCE contamination was present from the surface to perched groundwater. ADEQ incorporated the Stone Avenue Site into the 7th Street & Arizona Avenue WQARF Site in 2014 due to its location within the WQARF Site boundary. In 2016, a single perched groundwater monitor well (7AZP-19) was constructed within the warehouse on the property. Additionally, several soil vapor probes were installed on the property and adjacent properties. Elevated concentrations of PCE were detected in the soil, soil vapor and groundwater. Groundwater samples also showed TCE and cDCE concentrations below the relevant AWQSs. In 2017, ADEQ initiated an ERA, which included installation and operation of a SVE system to remediate elevated levels of PCE detected in the soil vapor.

2.3 Need for Remedial Action

2.3.1 Soil/Soil Vapor

The possibility of vapor intrusion into any present or future buildings at the source properties and surrounding properties necessitates remediation of contaminated soil and soil vapor. Additionally, removal of VOCs from the vadose zone will reduce dissolution of the contaminants to the perched groundwater.

2.3.2 Groundwater

Contaminants of concern have been detected in the perched groundwater below the site after being transported through the vadose zone at the source properties. Remediation of contaminated, perched groundwater will remove a source for continued phase-change transport back to the soil and soil vapor at the Site. Removal of contaminants for the perched aquifer will also limit or prevent transportation of contaminants to the regional aquifer, thus preventing long-term effects on the regional groundwater supply.

2.4 Chronology of Site Activities

The list below chronicles the major investigative and remedial activities at the Site.

1928–1956: Dry cleaning may have been performed on the Oliver's property, but cannot be verified.

1957–1989: Oliver's Cleaners owns the property and continuously operates a dry cleaning business.

1989: Oliver's Cleaners buildings are destroyed by fire.

1991: Seven underground storage tanks (1 - 10,000 gallon solvent, 4 - 1,000 gallon solvent, 2 - 500 gallon heating/oil tanks) are removed from the Oliver's property.

1992: Soil samples are collected in the vicinity of the Oliver's heating/waste oil tanks for TPH analysis. An analysis of a groundwater sample from the on-site water supply well detects PCE and TCE at concentrations below AWQS (Zenitech).

1996: The water supply well on the Oliver's property is abandoned.

1997: 26 soil and soil gas samples are collected as part of a PA/SI investigation. Contamination is found near all solvent tank locations (ADEQ).

2000: Site is placed on the WQARF Registry with a score of 40 out of 120.

2002: A site investigation is completed to assess whether an Early Response Action is appropriate. Investigation includes: sampling from perched groundwater and regional aquifer wells; LNAPL sampling; implementation of a passive soil gas survey; collection of soil samples for VOC, petroleum hydrocarbon, total organic carbon, and physical property characterization; and soil vapor sampling collected during installation of nested wells (Kleinfelder and HGC).

2003: First and second quarter groundwater monitoring/sampling is performed (Kleinfelder).

2004–2008: Soil vapor and groundwater monitoring activities are performed (HGC).

2005–2006: An SVE remedial system and well are installed at Oliver's Cleaners source under an ERA. An SVE pilot test is conducted to evaluate pneumatic properties (HGC).

2006–2009: SVE is operated continuously as a remedial action to remove VOCs from the Oliver's source property. Mass removal remedial data and operations and maintenance data are collected (HGC).

2007: An air sparge well and associated vapor wells are installed at Oliver's Cleaners source. An air sparge pilot test is conducted to evaluate the efficacy of removing chlorinated VOCs from the LNAPL (HGC).

2009: SVE remedial system at Oliver's source is shut down after removal of approximately 770 pounds VOCs.

2011–2012: Soil vapor samples are collected from nested probes and monitoring wells to establish current Site conditions at Oliver's Cleaners source (HGC).

2012: Groundwater sampling of all existing monitoring wells is performed to establish current Site conditions (HGC).

2013-March: RI/FS Work Plan is submitted to and approved by ADEQ (HGC). ARS §49-287.03 newspaper notification is posted for 30-day public comment for start of RI and FS studies. Perched groundwater wells are sampled for geochemical evaluation. A shallow soil gas survey

is performed (HGC). April: Baseline Human Health Risk Assessment is drafted, to be included as an appendix to the RI Report (HGC).

2013-May: Land Use Study report is drafted, to be included as an appendix to the RI Report (HGC). Remedial Investigation Report is drafted (HGC).Notice of 30-day public comment period for draft RI Report is posted in local newspaper on May 17.

2013-August: Responsiveness summary to address COT comments were drafted (HGC).

2014-February: Notice of solicitation of Remedial Objectives and CAB meeting is posted in local newspaper on February 4. RO Report is drafted and 30-day public comment period starts on February 19 (ADEQ).

2014-March: Availability of FS Work Plan is posted in local newspaper on March 28. RI Report is finalized (HGC).

2014-April: FS Report is finalized on April 24 (HGC).

2014-May: Notice of 30-day public comment period for PRAP to be posted in local newspaper on May 5.

2017- May: Partial installation of SVE system at Stone Ave source, including SVE wells and vaults, and piping runs (URS/AECOM).

2017-October: Completed installation of SVE system at Stone Ave Source, including electrical, blower, and GAC vessels (URS/AECOM).

2017-November: Groundwater sampling conducted (H+A).

2017-December: SVE Systems operations begin at Stone Ave source area.

2018-December: Groundwater sampling conducted (H+A).

2019-April: SVE system at Stone Ave shut down to conduct rebound testing after removing over 1,500 lbs. of PCE. System not restarted.

2019-October: First round of soil vapor rebound sampling at Stone Ave source (HGC).

2019-December: Second round of rebound sampling at Stone Ave source (HGC). Groundwater monitoring conducted (H+A).

2020-February: Proposed Remedial Action Plan Addendum covering Stone Ave source issued for public comment period on February 10. Third round of rebound sampling at Stone Ave source conducted.

2.5 Source Areas Definition

2.5.1 Soil/Soil Vapor

Soil vapor source areas are limited to the source properties: the former Oliver's Cleaners property located at 300 North Arizona Avenue, and the warehouse property at 847 North Stone Avenue.

2.5.2 Groundwater

The approximate WQARF Site boundaries are based on the extent of a groundwater plume of PCE in the perched aquifer underlying the Site (Figure 2-1). The PCE solute plume begins at the former Oliver's Cleaner's facility, and extends at least 1,200 meters to the north-northwest. A large body of light non-aqueous phase liquid (LNAPL), consisting of diesel-range petroleum hydrocarbons floating on the perched water table, is associated with releases from the Union Pacific Railroad (UPRR) passenger depot located approximately 900 feet to the south of the Oliver's Cleaners source property. This LNAPL body exists at the southern, up-gradient fringe of the PCE solute plume. As pointed out in the Human Health Risk Assessment, samples collected from this LNAPL contain concentrations of PCE, TCE, and cDCE, indicating a mixture of the chlorinated solvents and diesel hydrocarbon plumes (HGC, 2013). Two leaking underground storage tank (UST) sites, the Yellow Cab and the former Bridgestone-Firestone facilities, are located ~300 feet and 800 feet (respectively) northwest of the former Oliver's Cleaners location within the extent of the PCE solute plume. These USTs are not thought to have contributed to the PCE solute plume.

Finally, the former dry-cleaning facility located at 847 North Stone Avenue was added to the site in 2014 as a secondary source after investigations by City of Tucson revealed high levels of PCE in the soil and groundwater below the site. This source is within the originally-defined area of the PCE solute plume from the Oliver's Cleaners source. It is located ~3,000 feet north-northwest of the Oliver's Cleaners location, at the southwest corner of Stone Avenue and 2nd Street.

3.0 POTENTIALLY RESPONSIBLE PARTY INVESTIGATION

Pursuant to A.R.S. §49-283(A), a potentially responsible party (PRP) search was conducted by HydroGeoLogic, Inc. (HGL) for ADEQ in 2016 (HGL, 2016). ADEQ has determined that cost recovery may not be appropriate for this Site because the potentially responsible parties appear to be insolvent or no longer exist. Therefore, ADEQ does not plan to recover costs incurred for remedial action at this Site at this time. ADEQ does reserve the right to recover remedial action costs in the future if additional information shows that cost recovery may be appropriate.

4.0 SELECTED REMEDY

The proposed remedy for both sources at this Site was identified as SVE with treatment of the process stream with granular activated carbon (GAC) vessels. Air sparging technology will also be used at the Oliver's Cleaners source due to the presence of the LNAPL. Additionally, long-term monitoring of groundwater and soil vapor will be necessary. SVE and AS remedial technologies have already been tested or conducted at the Site and have proven to be successful. SVE is anticipated to effectively remove contaminants from the vadose zone and significantly diminish the risks from vapor intrusion. The combined SVE/AS remedy is anticipated to effectively remove chlorinated ethenes which have intermixed with the diesel LNAPL body beneath the Oliver's Cleaners source, and therefore deplete an ongoing source of potential contamination in perched groundwater and soil vapor.

4.1 Remedial Strategy

4.1.1 Vadose Zone

Operation of a SVE system with carbon adsorption of the process stream is the proposed remedial action to reduce the concentration of contaminants of concern in the vadose zone. Air sparging will also be used at the former Oliver's Cleaners source to remove VOCs from the LNAPL mass under that property. Based on the current conceptualization of the Site, SVE and AS are the most practical and cost-effective methods for removing the COCs from the vadose zone at both the Oliver's Cleaners and Stone Avenue source properties and the LNAPL layer at the Oliver's Cleaners source. Reduction of COC mass in the source areas is expected to decrease mass transfer to groundwater and allow for natural attenuation of the COC plume in groundwater. SVE is also intended to reduce COC concentrations in soil vapor at both source properties to below levels with an unacceptable risk for vapor intrusion.

The goal of reducing PCE in the vadose zone is to reduce PCE concentrations below the residential Vapor Intrusion Screening Level (VISL; 367 µg/m^3 for PCE) or industrial VISL (1,567 µg/m^3 for PCE), as appropriate to land use. This will also reduce concentrations of PCE in soil and reduce PCE available for leaching into the perched groundwater. SVE systems remediate contaminated soil

through an ex-situ removal process. The SVE process extracts soil vapors from the subsurface, treats them at the surface, and then discharges the treated vapors to the atmosphere. SVE was effective in removal of PCE at both source properties during the ERA phase.

It is anticipated that SVE will be highly effective at reducing PCE in the vadose zone. After shutdown of the ERA-phase SVE system at the Stone Avenue source in April of 2019, PCE concentrations rebounded, but not to the high concentrations observed prior to remedial efforts. It is likely that PCE was less effectively removed from the finer materials located from 20 feet to 38 feet below land surface (ft. bls). After shutting down the SVE system, PCE has slowly volatilized from the fine-particle soils underlying the property.

The results of SVE remedial operations and the air sparging pilot test during the ERA phase indicated that these technologies were successful at removing and capturing COCs from the Source properties. Soil vapor extraction removed a significant mass of COCs from the vadose zone at both sources: more than 760 lbs. in two years of SVE operation at Oliver's Cleaners and 1,500 lbs. in 18 months at the Stone Ave source. These masses represented one to six orders-of-magnitude (OOM) decrease in PCE concentrations in soil vapor probes and extraction wells at Oliver's Cleaners and Stone Avenue. Both sources have since rebounded by zero- to 1.2-OOM.

The SVE wells will be operated in "pulse mode", with a period of active extraction followed by a period of rebound. Based on soil vapor sampling in the SVE wells at both sources, active extraction periods will last nine months, followed by three months of rebound. This will create a one-year operation/rebound cycle. Based on past performance, it is expected that each period of operation will result in a one-half- to two- (0.5 - 2 OOM) reduction in soil vapor COC concentrations. In the case that soil vapor sampling shows that COC concentrations have fallen below their respective industrial VISL before a nine-month operational period has elapsed at a given Source property, the active extraction system will be turned off and the rebound period allowed to begin early, with the extra time attached to the three-month rebound period such that the total time for the operation/rebound cycle remains one year. Assuming a conservative reduction of one-half-OOM in COC concentrations per annual cycle, it will take approximately five **5** cycles/years to remove enough PCE such that concentrations in soil vapor remain under the industrial VISL. Other COC are

likely to fall below their respective industrial VISL in less time. Soil vapor sampling after another, final round of rebound will be used to verify that COC concentrations in soil vapor have fallen below their respective industrial VISL.

The AS pilot test at the Oliver's Cleaners source indicated that COC mass can be volatilized from the LNAPL body and captured using SVE (HGC, 2008a). The most current estimate for the mass of PCE under the Oliver's source is 178 lbs. in all media (H+A, 2020). Soil vapor extraction, coupled with air sparging, is expected to reduce soil vapor concentrations of COC to below VISLs at both source properties in less than five years.

Following the shutdown of the SVE system at the Stone Avenue source in April 2019, the soil vapor treatment system was disconnected and removed from the site. Implementation of the remedy will require a new system to be installed and operated at the Site. The SVE system will be operated until PCE concentrations in soil vapor remain below VISLs, as outlined above. This remedial measure will focus on source control through the removal of VOC mass in the vadose zone, which will mitigate the potential for vapor intrusion and ongoing groundwater impacts from residual VOCs. Measurements of operational parameters will be used to assess system performance and for system optimization. Operational/rebound schedules may be adjusted to enhance VOC removal, as outlined above. ADEQ will oversee the operation of the SVE system. Operation of the SVE systems will require continued compliance with Pima County Air Quality Department air permits, along with quarterly SVE performance testing and reporting.

In addition to the SVE/AS remedy, an institutional control may also be put in place for either of the source properties. An institutional control protects human health and the environment by restricting property activity, use, or access. The institutional control for this Site would consist of placing a Declaration of Environmental Use Restriction (DEUR), per A.R.S. §49-152(C), on an affected source property. Placement of a DEUR would be contingent upon property owner approval. The DEUR would be used to prohibit residential development of the affected property and would still allow the affected property to be developed for non-residential purposes.

4.1.2 Groundwater

The proposed remedy for groundwater will be monitored natural attenuation (MNA). MNA involves routine groundwater sampling and analysis to monitor the results of one or more naturally occurring physical, chemical, or biological processes that reduce the mass, toxicity, volume, or concentration of chemicals in groundwater. Natural attenuation is a mechanism by which COCs are reduced by natural means without other control, removal, treatment, or aquifer-modifying activities. These in-situ processes may include dilution, adsorption, volatilization, precipitation, and biological degradation of the contaminants in the groundwater.

The proposed MNA program will include annual groundwater monitoring and sampling to evaluate plume migration, plume stability, and natural attenuation of the plume. The current monitoring program includes annual water level monitoring and collection of groundwater and/or LNAPL samples for VOC analysis from the current monitoring well network. These efforts include water level measurements from 47 perched and five regional monitor wells. Groundwater samples are collected and analyzed for VOCs from 36 monitor wells (31 perched and 5 regional, see **Error! Reference source not found.**). Figures 4-1 and 4-2 show the locations of perched and regional groundwater monitoring wells, respectively. Table 4-2 shows the construction information for groundwater monitoring wells. As the impacted plume decreases in size and COC concentration over time, the number of wells selected for groundwater monitoring and sampling may be decreased; this progress will be assessed annually after each annual sampling event. Any changes to the monitoring program will be documented in ADEQ memorandums to record, presented to the public in Community Action Board meetings and updates, and in five-year review reports for the Site. Monitoring efforts will continue on an annual basis until all monitored wells show COC concentrations below AWQS for two straight years.

Monitored natural attenuation for groundwater will continue until 1) the above conditions are met; or 2) ten years have elapsed following the cessation of soil vapor extraction operations. If the first condition is met, site closure for groundwater will be initiated. In the case of the second condition, more aggressive, *in situ* groundwater remediation will be pursued. This will require a ROD amendment and will use Enhanced Reductive Dechlorination (ERD) amendments to

biologically dechlorinate any remaining chlorinated ethenes in the regional groundwater under the site. ERD operations will continue until all monitored wells show COC concentrations below AWQS for two straight years; it is unlikely that this would take more 10 years.

Table 4-1: 7th St and Arizona Ave WQARF Site Monitoring Wells

Well Name	ADWR Identifier	Aquifer	LNAPL Present?	Northing (ft.)	Easting (ft.)	Monitored Parameters
7AZP-1	55-591718	Perched	No	447346.479	993826.79	WLs, VOCs
7AZP-2	55-591719	Perched	Yes	447179.925	993827.832	WLs, VOCs, SVOCs
7AZP-3	55-591720	Perched	Yes	447180.33	993684.018	WLs, VOCs, SVOCs
7AZP-4	55-591721	Perched	Yes	447241.212	993761.95	WLs, VOCs, SVOCs
7AZP-5	55-214637	Perched	No	448336.054	991842.107	WLs, VOCs
7AZP-6	55-214638	Perched	No	448753.758	992635.997	WLs, VOCs
7AZP-9	55-908158	Perched	No	449772.337	992289.069	WLs, VOCs
7AZP-10	55-908157	Perched	No	448838.421	993253.36	WLs, VOCs
7AZP-11	55-914796	Perched	No	450510.308	991215.961	WLs, VOCs
7AZP-12	55-914795	Perched	No	451317.162	992265.334	WLs
7AZP-13	55-223844	Perched	No	448334.637	993512.517	WLs, VOCs
7AZP-14	55-223843	Perched	No	450241.743	992046.804	WLs
7AZP-15	55-223842	Perched	No	449279.185	991159.142	WLs, VOCs
7AZP-19	55-919266	Perched	No	449643.8	992026.5	WLs, VOCs
7AZP-20	55-920039	Perched	No	451755.75	990994.66	WLs, VOCs
7AZR-1	55-591722	Regional	No	447313.505	993841.492	WLs, VOCs
7AZR-2	55-214640	Regional	No	447651.326	993600.195	WLs, VOCs
7AZR-3	55-914797	Regional	No	448233.896	992647.0476	WLs, VOCs
7AZR-4	55-223840	Regional	No	448455.805	993595.97	WLs, VOCs
7AZR-5	55-921777	Regional	No	451756.219	991012.195	WLs, VOCs
BF-1	55-548521	Perched	No	447683.465	993104.38	WLs, VOCs
BF-3	55-555810	Perched	No	447911.237	992877.393	WLs, VOCs
MW-PD-1	55-571702	Perched	No	447640.41	993123.18	WLs
MW-PD-5	55-571709	Perched	No	446454.578	995471.427	WLs, VOCs
MW-PD-6	55-571707	Perched	Yes	446436.624	994264.727	WLs, VOCs, SVOCs
MW-PD-7	55-571704	Perched	Yes	446958.7	994649.106	WLs, VOCs, SVOCs
MW-PD-11	55-571711	Perched	No	445013.122	994068.677	WLs
MW-PD-12	55-575075	Perched	Yes	446469.811	993371.288	WLs, VOCs, SVOCs
MW-PD-15	55-576300	Perched	Yes	447725.38	992650.438	WLs, VOCs, SVOCs
MW-PD-18	55-578710	Perched	Yes	446414.048	992289.694	WLs, VOCs, SVOCs
MW-PD-20	55-902365	Perched	No	445562.481	993134.598	WLs
MW-PD-21	55-902366	Perched	No	445661.318	992321.283	WLs
MW-PD-22	55-902368	Perched	No	445978.083	991861.488	WLs
MW-PD-23	55-902369	Perched	No	446431.5	991774.4581	WLs
MW-PD-25	55-902372	Perched	No	445706.14	995928.201	WLs, VOCs
MW-PD-26	55-902374	Perched	No	445251.472	995725.482	WLs, VOCs
MW-PD-27	55-902375	Perched	No	446922.063	995467.523	WLs
MW-PD-28	55-902376	Perched	No	447394.699	994591.749	WLs, VOCs
MW-PD-29	55-902377	Perched	No	447397.49	994038.101	WLs, VOCs
MW-PD-30	55-902378	Perched	No	448258.097	992647.6402	WLs, VOCs
MW-PD-39	55-917021	Perched	No	447270.497	991556.246	WLs
MW-PD-40	55-917022	Perched	No	447762.965	993598.9787	WLs, VOCs
MW-PD-41	55-917023	Perched	No	447458.419	996385.293	WLs
MW-PD-42	55-917024	Perched	No	446387.723	996473.462	WLs, VOCs
MW-PD-43	55-917025	Perched	No	444375.01	995564.275	WLs, VOCs
MW-PD-44	55-917026	Perched	No	445321.96	992001.8867	WLs
YC-5	55-552811	Perched	Yes	447357.54	993681.743	WLs, VOCs, SVOCs

Well Name	ADWR Identifier	Aquifer	LNAPL Present?	Northing (ft.)	Easting (ft.)	Monitored Parameters
YC-6	55-553162	Perched	Yes	447348.073	993108.723	WLs, VOCs, SVOCs

Table 4-2: Monitoring Well Construction Details

Well Identifier	ADWR Identifier	Date Completed	Boring Diameter (inches)	Boring Depth (ft. bls)	Casing Depth (ft. bls)	Perforated Interval (ft. bls)	Sand Pack Interval (ft. bls)	Casing Material/ Diameter/ Slot Size (inches)	Top of Casing Elevation (ft. amsl)
7AZP-1	55-591718	4/18/2002	9.25	87	85	60-85 *	57.5-87	PVC / 4 / 0.020	2378.27
7AZP-2	55-591719	4/10/2002	9.25	86	83.9	58.7-83.9 *	54.5-86	PVC / 4 / 0.020	2378.35
7AZP-3	55-591720	4/15/2002	9.25	87	85	60-85 *	57-85	PVC / 4 / 0.020	2377.26
7AZP-4	55-591721	4/16/2002	9.25	87	85	60-85	58-85	PVC / 4 / 0.020	2377.58
7AZP-5	55-214637	2/13/2007	11	90	85	65-85	60-90	PVC / 4 / 0.020	2369.81
AZP-6	55-214638	2/15/2007	11	95	95	65-95	60-95	PVC / 4 / 0.020	2386.61
7AZP-9	55-908158	11/15/2007	10	100	90	70-90	65-95	PVC / 4 / 0.020	2380.76
7AZP-10	55-908157	11/15/2007	10	95	94	74-94	70-95	PVC / 4 / 0.020	2385.61
7AZP-11	55-914796	11/1/2012	9.75	90	90	70-90	60-90	PVC / 4 / 0.020	2367.24
7AZP-12	55-914795	10/24/2012	9.6	90	87	67-87	60-90	PVC / 4 / 0.020	2378.00
7AZP-13	55-223844	11/20/2014	10	90	85	65-85	60-90	PVC / 4 / 0.020	2388.66
7AZP-14	55-223843	11/21/2014	10	90	85	65-85	60-90	PVC / 4 / 0.020	2377.07
7AZP-15	55-223842	12/10/2014	8	90	87	67-87	61-90	PVC / 4 / 0.020	2371.26
7AZP-19	55-919266	3/16/2016	9	100.5	94.8	79.8-94.8	78.5-95.5	PVC / 4 / 0.020	2381.34
7AZP-20	55-920039	10/12/2016	8.25	100	95	80-95	75.5-95.5	PVC / 4 / 0.020	2365.13
BF-1	55-548521	6/10/1995	10	80.5	80.5	50.5-80.5	47-80	PVC / 4 / 0.020	2375.38
BF-3	55-555810	4/4/1996	10	75	75	50-75	45-75	PVC / 4 / 0.020	2373.07
MW-PD-1	55-571702	4/7/1999	12	70	69.5	49.5-69.5	47'-70	PVC / 4 / 0.020	2374.46
MW-PD-5	55-571709	4/19/1999	12	86	86	66-86	66-86	PVC / 4 / 0.020	2396.21
MW-PD-6	55-571707	4/21/1999	12	89	88	58-88	55'-89	PVC / 4 / 0.020	2385.18
MW-PD-7	55-571704	4/22/1999	12	83	79	59-79	54-80.5	PVC / 4 / 0.010	2384.29
MW-PD-11	55-571711	5/11/1999	12	93	91.5	71.5-91.5	68-93	PVC / 4 / 0.010	2403.34
MW-PD-12	55-575075	7/1/1999	7.5	86	85.5	65.5-85.5	62.5-86	PVC / 4 / 0.010	2386.38
MW-PD-15	55-576300	9/2/1999	7.5	77	76	51-76	48-76.5	PVC / 4 / 0.010	2368.45
MW-PD-18	55-578710	2/5/2000	12	83.5	82.5	57.5-52.5	55-83.5	PVC / 4 / 0.020	2378.49
MW-PD-20	55-902365	3/5/2005	12	97.5	97.5	67.5-97.5	64-97.5	PVC / 4 / 0.020	2391.79
MW-PD-21	55-902366	3/5/2005	10.75	90	90	60-90	57-90	PVC / 4 / 0.020	2383.58
MW-PD-22	55-902368	3/19/2005	10.75	84	83	53-83	50.5 -83	PVC / 4 / 0.020	2373.03
MW-PD-23	55-902369	2/19/2005	12	82	82	62-82	59.5-82	PVC / 4 / 0.020	2375.74
MW-PD-25	55-902372	3/2/2005	12	97.5	95	70-95	67-95	PVC / 4 / 0.020	2395.78
MW-PD-26	55-902374	2/15/2005	12	100	98.8	73-98	67-100	PVC / 4 / 0.020	2401.80

Well Identifier	ADWR Identifier	Date Completed	Boring Diameter (inches)	Boring Depth (ft. bls)	Casing Depth (ft. bls)	Perforated Interval (ft. bls)	Sand Pack Interval (ft. bls)	Casing Material/ Diameter/ Slot Size (inches)	Top of Casing Elevation (ft. amsl)
MW-PD-27	55-902375	2/17/2005	12	90	90	70-90	67-90	PVC / 4 / 0.020	2390.48
MW-PD-28	55-902376	3/9/2005	12	90	90	70-90	67-90	PVC / 4 / 0.020	2383.08
MW-PD-29	55-902377	2/21/2005	12	90	89	59-89	56-90	PVC / 4 / 0.020	2379.67
MW-PD-30	55-902378	2/23/2005	12	85	81	61-81	58-85	PVC / 4 / 0.020	2375.29
MW-PD-30**									2372.29
MW-PD-31 ABD	55-902379	3/7/2005	12	85	84.5	64.5-84.5	61-84.5	PVC / 4 / 0.020	2364.50
MW-PD-39	55-917021	5/29/2014	8	75	73	53-73	48-75	PVC / 2 / 0.020	2367.58
MW-PD-40	55-917022	5/23/2014	8	80	80	60-80	55-80	PVC / 2 / 0.020	2382.42
MW-PD-41	55-917023	5/20/2014	8	100	100	80-100	75-100	PVC / 2 / 0.020	2403.48
MW-PD-42	55-917024	5/21/2014	8	100	100	80-100	75-100	PVC / 2 / 0.020	2404.80
MW-PD-43	55-917025	5/28/2014	8	105	104	84-104	79-105	PVC / 2 / 0.020	2413.16
7AZR-1	55-591722	4/20/2002	16 / 10	201	195	135-195	129.7-196	PVC / 4 / 0.020	2378.23
7AZR-2	55-214640	3/2/2007	12 / 10	210	205	165-205	159.4-210	PVC / 4 / 0.020	2379.54
7AZR-3	55-914797	10/30/2012	9.75	200	200	160-200	155-200	PVC / 4 / 0.020	2374.78
7AZR-3**									2372.31
7AZR-4	55-223840	11/18/2014	12 / 8	203	200	160-200	155-200	PVC / 4 / 0.020	2390.30
7AZR-5	55-921777	4/17/2018		246		200-240	197-240.2	PVC / 4 / 0.020	2354.71
YC-5	55-552811	4/12/1996	12	87	85	55-80	45-87	PVC / 4 / 0.020	2377.20
YC-6	55-553162	12/15/1995	unknown	85	85	55-80	50-80	PVC / 4 / 0.010	2374.64

NOTES:
* = Also constructed with nested soil vapor probes
** = February 14, 2018 re-survey. Vertical Datum: NAVD88.
amsl = above mean sea level

4.2 Achievement of Remedial Objectives

4.2.1 Basis for Remedial Objectives

The remedial objectives (ROs) for the Site are based on RI field investigation results and historical data, the Land and Water Use Study, and the Human Health Risk Assessment (HGC, 2014a). The ROs focus on current soil contamination and exposure pathways of concern, as well as protection of the regional aquifer. The identified exposure pathway of concern at the Site includes potential vapor intrusion into the commercial building at the Stone Avenue source, and any commercial buildings that may, in the future, be constructed on the former Oliver's Cleaners property.

4.2.2 Remedial Objectives for Land Use

As stated in the Remedial Objectives Report, the RO for land use is:

> *To restore soil conditions to the remediation standards for non-residential use specified in A.A.C. R18-7-203 (specifically background remediation standards prescribed in R18-7-204, predetermined remediation standards prescribed in R18-7-205, or site specific remediation standards prescribed in R18-7-206) that are applicable to the hazardous substances identified (tetrachloroethene (PCE), 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.*

4.2.3 Remedial Objectives for Groundwater

As stated in the Remedial Objectives Report, the RO for groundwater is:

> *The remedial objective for regional groundwater at the site is to protect for the use of the groundwater supply by the City of Tucson from contamination at 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.*

Note that the RO for Groundwater applies to regional groundwater, only. Perched groundwater remediation is addressed by the RO for Land Use.

4.2.4 Metrics for Remedial Objectives

Achievement of the ROs will be measured as follows:

Soil vapor monitoring at the source properties will be performed semi-annually until it is demonstrated that COC concentrations decrease and remain below applicable industrial VISLs. These levels will be based on industrial VISLs: 1,567 µg/m³ for PCE, 100 µg/m³ for TCE. These industrial VISL are equal to 100/3rds of the U.S. EPA's Regional Screening Limits for industrial air. There is no established industrial air RSL for cDCE, and thus no VISL. Soil vapor monitoring of VOCs will continue at each source property until soil vapor concentrations of PCE and TCE have decreased below their industrial VISL concentrations and held there for two rounds of semi-annual soil-vapor sampling, followed by three rounds of rebound sampling over a quarter.

Monitoring of soil vapor concentrations in nested probes on and off of the source properties will allow for 3-dimensional characterization of the soil vapor plume in the vicinity of the source properties, and will be useful in evaluating the efficiency of the SVE system. Ten shallow soil vapor probes within the former Oliver's Cleaners property will be installed to monitor shallow soil vapor concentrations the impact of the SVE system on bringing those concentrations below their respective VISL. Likewise, soil vapor probes installed at and around the Stone Avenue source property will be used to monitor shallow soil vapor at that source property. In the case that the source properties are rezoned as residential, and a DEUR is put in place to prevent residential development, soil remediation targets will be based on residential SRLs.

Monitoring of perched groundwater will be performed via analysis of samples from monitoring wells to demonstrate that contaminant concentrations in the perched groundwater are decreasing to below Aquifer Water Quality Standards. Additional monitoring wells in the perched groundwater will allow for better definition of hydraulic gradients and groundwater flow direction in the northern portion of the solute plume. Long-term monitoring of VOCs and geochemical parameters in perched and regional groundwater will continue until 1) soil vapor levels have decreased to acceptable levels (as defined above); and 2) no groundwater samples collected within the site have shown COC concentrations exceeding AWQS during five annual sampling events

4.3 Achievement of Remedial Action Criteria

In accordance with AAC R18-16-406(I), the Remedial Objectives Report included in the RI established ROs for the current and reasonably foreseeable uses of land and waters of the State of Arizona that have been affected by a release of a hazardous substance. In accordance with AAC R18-16-407, the ROs were evaluated in the FS Report and, according to AAC R18-16-408 and ARS §49-287.04, considered in development of the remedial action alternatives presented in the PRAP Report and PRAP Addendum.

The selected remedy is consistent with ARS. §49-282.06(A), as it: 1) is protective of human health and the environment; 2) provides for the control, management, or cleanup of hazardous substances to allow the maximum beneficial use of the waters of the state; and 3) is reasonable, necessary, cost-effective and technically feasible.

The proposed remedy is protective of human health in that it directly addresses potential exposure via vapor intrusion by reducing current soil vapor COC concentrations, thereby reducing the current and future risk to human health. This will be achieved by reducing soil vapor COC concentrations to below respective industrial VISL in a manner described in section 4.2.4 (Metrics for Remedial Objectives.)

The proposed remedy manages and cleans up hazardous substances to ensure maximum use of waters of the state in the future. Accomplishment of this criteria is through removal of soil-based contamination, eliminating the potential for that contamination to migrate to groundwater in the future. Accomplishment of the criteria will be verified when COC concentrations in soil-vapor at the Source properties have dropped below industrial VISL (as described in section 4.2.4 Metrics for Remedial Objectives, above) and monitored natural attenuation brings groundwater COC concentrations below their respective AWQS levels.

The proposed remedy is reasonable and technically feasible (per ARS. §49-282.06) because it focuses on the source properties, COCs and contaminated media of concern; and it uses well-established technology which has been demonstrated to work at the Site. The remedy is necessary based on the need to remove shallow soil vapor concentrations of COCs that pose a potential vapor

intrusion risk to workers at commercial properties, and which could act as a source of groundwater contamination in the future. Soil vapor extraction with air sparging has been demonstrated to effectively remove chlorinated VOCs from the vadose zone at the source properties. The remedy is cost-effective when compared with alternative remedies, as shown in the FS Report (HGC, 2014b).

4.4 Consistency with Current and Future Land Use

As discussed in the RI Report (HGC, 2014a), the zoning for the Site is established. Both the former Oliver's Cleaners property and the Stone Avenue source property, where the remedial action is intended to occur, are currently zoned as commercial properties. Future land use, with a change in zoning approval by COT, may become mixed use commercial/residential. In this case, ADEQ may ask the property owners to sign a DEUR on the property to ensure that current and future property owners maintain the properties for non-residential use or undertake measures to mitigate vapor intrusion risk. The Site remedy is therefore consistent with City of Tucson land use planning.

4.5 Community Involvement and Public Comment Requirements

ADEQ has completed all required community involvement and public comment requirements for the 7th Street & Arizona Avenue WQARF Site, as outlined in A.A.C. Title 18, Chapter 16, Article 4 and A.R.S. Title 49, Chapter 2, Article 5. The activities and time periods for these requirements are listed on Table 4-3.

Table 4-3: Community Involvement and Public Comment Requirements

Community Involvement Activity	Regulatory Citation/Rule	Date
Establish CIA	A.R.S. § 49-289.02(A)	June 9, 2000
Notice of the site listing on the Registry	A.R.S. § 49-287.01 A.R.S. § 49-289.03(A)	Notice published in The Daily Territorial March 12, 2000.
Hazardous substance contamination notice and fact sheet	A.R.S. § 49-289.02(B) A.R.S. § 49-287.03(B) A.A.C. R18-16-404(C)(1)(i)	Appeared in Fact Sheet published January 2014. Additional fact sheet distributed Spring 2013.
Community Involvement Plan (CIP)	A.R.S. § 49-287.03(D) A.R.S. § 49-289.03(C) A.A.C. R18-16-403(E) A.A.C. R18-16-404(C)	Notice published in The Daily Territorial March 29, 2013. CAB merged with Park Euclid WQARF site CAB November 14, 2013.

Establish Community Advisory Board (CAB) selection committee	A.R.S. § 49-289.03(D)	N/A (see "Establish CAB")
Establish CAB	A.R.S. § 49-289.03(C) A.R.S. § 49-289.03(F)(1)	Created via merger with Park Euclid WQARF site CAB November 14, 2013.
Issue notice of Remedial Investigation (RI) scope of work, fact sheet and outline of Community Involvement Plan (CIP)	A.R.S. § 287.03(B) A.R.S. § 287.03(C) A.A.C. R18-16-403(F) A.A.C. R18-16-403(G)	Notice published in The Daily Territorial March 29, 2013.
Establish information repository	A.R.S. § 49-289.03(B)	Around or before August 2006.
Notice of availability of draft Land and Water Use Study	A.A.C. R18-16-404	Included with opportunity to comment on draft RI report.
Notice of opportunity to comment on draft RI report	A.A.C. R18-16-404(C)(1)(b) A.A.C. R18-16-406(F))	Notice published in The Daily Territorial May 17, 2013.
Public meeting to establish Remedial Objectives (ROs)	A.A.C. R18-16-404(C)(1)(b) A.A.C. R18-16-406(I)	February 18, 2014.
Notice of opportunity to comment on proposed RO report and availability of final RO report	A.A.C. R18-16-404(C)(1)(c) A.A.C. R18-16-406(I)	Notice published in The Daily Territorial on March 21, 2014.
Public meeting(s) to discuss proposed/revised RO reports if needed	A.A.C. R18-16-406(I)(5)	N/A
Notice of availability of final RI/RO report	A.A.C. R18-16-406(J) A.A.C. R18-16-404(C)(1)(c)	Notice was published in The Daily Territorial on April 24, 2014.
Notice of the availability of the FS work plan	A.A.C. R18-16-404(C)(1)(d)	Notice was published in The Daily Territorial on March 28, 2014.
Notice of the availability of the Final FS	N/A	Notice was published in The Daily Territorial on May 6, 2014.
Notice of the availability of and opportunity to comment on the Proposed Remedial Action Plan (PRAP)	A.R.S. § 49-287.04(B) A.A.C. R18-16-404(C)(1)(e)	Notice was published in The Daily Territorial on May 5, 2014.
Notice of the availability of and opportunity to comment on the Proposed Remedial Action Plan Addendum (PRAP-A)	A.R.S. § 49-287.04(B) A.A.C. R18-16-404(C)(1)(e)	Notice was published in The Daily Territorial on February 02, 2020.
Notice of Record of Decision & Responsiveness Summary Availability	A.R.S. § 49-287.04 (G) A.A.C. R18-16-404(C)(1)(f)	Notice published in The Daily Territorial on July 02, 2020.

4.6 Schedule

The schedule for implementing the Selected Remedy will be dictated by the WQARF program priorities and available funding after the ROD has been executed and entered into the Administrative Record. SVE is scheduled to be conducted for up to 5 years. Monitoring will be conducted until the COCs are no longer present above their respective AWQS or the Director determines that the conditions of A.R.S. §49-282.06(D) have been met. Based on current

groundwater data trends, ADEQ estimates active groundwater remediation at the Site will be needed for up to 5 years, with an additional 25 years of monitored natural attenuation.

During implementation of the Selected Remedy, Periodic Site Reviews will be performed at a minimum of every five years to determine the viability of the remedy.

Upon completion of remedial actions, all remedial equipment and wells associated with the Site will be abandoned in accordance with the PRAP and applicable ADWR requirements as promulgated in A.A.C. R12-15-816. After completion of the above actions, ADEQ will delist the Site in accordance with A.R.S. §49-287.01(K).

5.0 RESPONSIVENESS SUMMARY

In accordance with AAC R18-16-410(B)(2) and ARS §49-287.04(F), a comprehensive responsiveness summary was prepared to identify and respond to all comments received on the PRAP and PRAP-Addendum at the conclusion of all the public comment period.

A 30-day comment period for the PRAP was held starting on May 05, 2014 through June 03, 2014. One comment letter was received during the comment period.

- Molly Moore, Tucson, AZ, May 25, 2014.

A 90-day comment period for the PRAP-Addendum was held starting on February 10, 2020 through May 11, 2020. One comment letter was received during the comment period.

- City of Tucson, Tucson Water, May 11, 2020

The responsiveness summary, including copies of letters received and ADEQ responses, is included in Appendix A.

6.0 COSTS

6.1 Historic Costs

Including funds through the end of Fiscal Year 2020, the total historical costs for activities at the Site have been $2.64 million.

6.2 Future Costs

An estimate of life-cycle costs has been prepared for a 15-year program to demonstrate that the proposed remedy is protective of human health and the environment (Table 5-1). The total estimated cost is based on remedial design and installation of two SVE systems and one AS remedial systems with five years of remedial operation plus an additional partial year of rebound monitoring. Potential ADEQ costs associated with this remedy, in addition to design and capital costs for installation of the remedial systems, include five years of SVE/AS equipment rental, five years of annual O&M, six years of remedial operation monitoring and fifteen years of MNA. All of these programs will begin contemporaneously. In case the ERD contingency must be activated, this will last up to ten more years.

The remedy and long-term monitoring is based on the current status of the Site and does not provide for foreseeable future uses. If property development occurs at either source property in the future, the owner of that property (per the DEUR) would be responsible for the costs necessary to address environmental concerns associated with developing their respective property.

The estimated capital cost to implement SVE/AS over both source properties is approximately $1.4 million, with five years of additional SVE operation and maintenance costs of approximately $1.7 million. Estimated costs include: system design and construction, operation and maintenance, and closure. Vapor-phase granular activated carbon (VGAC) change-outs for the SVE system are assumed to occur on an annual basis. Estimated closeout costs include disposal of spent VGAC, proper abandonment of the SVE extraction wells and removal of equipment. Site-wide groundwater monitoring costs will continue for up to ten years after cessation of SVE operations. Costs for six years of source-property remedial monitoring are estimated at $983,000 (see **Table**

6-1: Lifecycle Cost Analysis for Selected Remedy, below), and the full 16-year program (including five years of active SVE/AS operations, six years of source soil vapor monitoring and sixteen years of site-wide monitoring) is estimated to cost $6.4 million. The estimated costs include a 10% contingency and assumes the SVE system will be in operation at each source for five years, and that soil vapor monitoring will continue at each Source property for another year following cessation of SVE operations. The total estimated costs for the entire life cycle assume a compounded future worth at a 3.00% inflation rate.

In case that monitored natural attenuation of groundwater COC is not successful in meeting the groundwater RO in year 16, the ERD contingency will go into effect. In this case, additional costs will include installation of up to three additional wells will be built at a cost of ~$150,000, semi-annual ERD injection events that will account for $60,000 per year (for up to 10 years), and site-wide groundwater monitoring will continue at a maximum cost of $100,000 per year (for up to 10 more years). Thus, the scheduled cost for this contingency would be from $310,000 for one year up to $1.75 million for a full ten years of ERD.

Table 6-1: Lifecycle Cost Analysis for Selected Remedy

Payment Period	ADEQ Fiscal Year	Capital Costs (Olivers)	Ops & Maint (Olivers)	Capital Costs (Stone)	Ops & Maint (Stone)	Monitoring (Site-Wide)
0	2021	$ 47,655	$ -	$ 141,035	$ 232,330	$ 151,984
1	2022	$ 201,265	$ 86,651	$ -	$ 187,140	$ 156,543
2	2023	$ -	$ 168,752	$ -	$ 187,140	$ 161,240
3	2024	$ -	$ 174,236	$ -	$ 134,775	$ 166,077
4	2025	$ -	$ 179,900	$ -	$ 134,775	$ 171,059
5	2026	$ -	$ 191,350	$ -	$ 47,679	$ 176,191
6	2027	$ -	$ -	$ -	$ -	$ 181,477
7	2028	$ -	$ -	$ -	$ -	$ 186,921
8	2029	$ -	$ -	$ -	$ -	$ 192,528
9	2030	$ -	$ -	$ -	$ -	$ 198,304
10	2031	$ -	$ -	$ -	$ -	$ 204,253
11	2032	$ -	$ -	$ -	$ -	$ 210,381
12	2033	$ -	$ -	$ -	$ -	$ 216,692
13	2034	$ -	$ -	$ -	$ -	$ 223,193
14	2035	$ -	$ -	$ -	$ -	$ 229,889
15	2036	$ -	$ -	$ -	$ -	$ 236,786
16	2037	$ 387,470	$ -	$ 617,705	$ -	$ 243,889
Life Cycle Subtotals		$ 636,389	$ 800,889	$ 758,740	$ 923,839	$ 3,307,408
Capital Cost Subtotal		$ 1,395,129				
Ops & Maint Subtotal		$ 1,724,728				
Monitoring Subtotal		$ 3,307,408				
	Site Total	$ 6,427,265				

Notes:

SVE operation at each source is assumed to occur for 5 years. Year 1 through Year 5 costs assume a Future Worth inflation rate of 3.00%. Costs associated with the Oliver's Cleaners source, published in 2014, have been adjusted for inflation.

7.0 CONCLUSIONS

The remedy for the 7th Street and Arizona Avenue WQARF Site is a remedial action utilizing SVE and AS to remove chlorinated ethenes from soil vapor and LNAPL for prevention of human exposure to COCs from vapor intrusion, in addition to long-term monitoring of perched groundwater and the regional aquifer. Additionally, a possible DEUR placed on either source property will furthermore prevent the property from being used for residential purposes; the property owners will then have to provide engineering controls to reduce or eliminate the possibility of COC vapor migration.

According to A.A.C. R18-16-410(B)(8), ADEQ will review the remedy every five (5) years from the issuance of the ROD. The five-year review will ensure that the remedy is progressing as expected. The review will also enable ADEQ to ensure that the performance standards specified in the PRAP remain protective of human health and the environment. ADEQ will continue to review the remedy every five years until continued operation of the remedy is no longer feasible to at the Site.

8.0 REFERENCES

Arizona Department of Environmental Quality (ADEQ). 1999. *Preliminary Assessment/Site Inspection Report: Oliver's Cleaners*.

Environmental Protection Agency (EPA). 2012. *Regional Screening Levels for Chemical Contaminants at Superfund Sites.* http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

H+A. 2020. *Mass of Tetrachloroethylene Beneath Former Oliver's Cleaners, 7th Street and Arizona Avenue, WQARF Site.* May 29, 2020.

HGC. 2006a. *Field Work Plan, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona.* January 9, 2006.

HGC. 2006b. *Draft Work Plan Addendum, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona.* February 17, 2006.

HGC. 2008a. *Air Sparge Pilot Testing Report, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona.* February 28, 2008.

HGC. 2008b. *2008 Operation and Maintenance Summary Report, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona.* August 18, 2008.

HGC. 2013. *Baseline Human Health Risk Assessment, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona*. July 22, 2013.

HGC. 2014a. *Remedial Investigation Report, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona.* March 21, 2014.

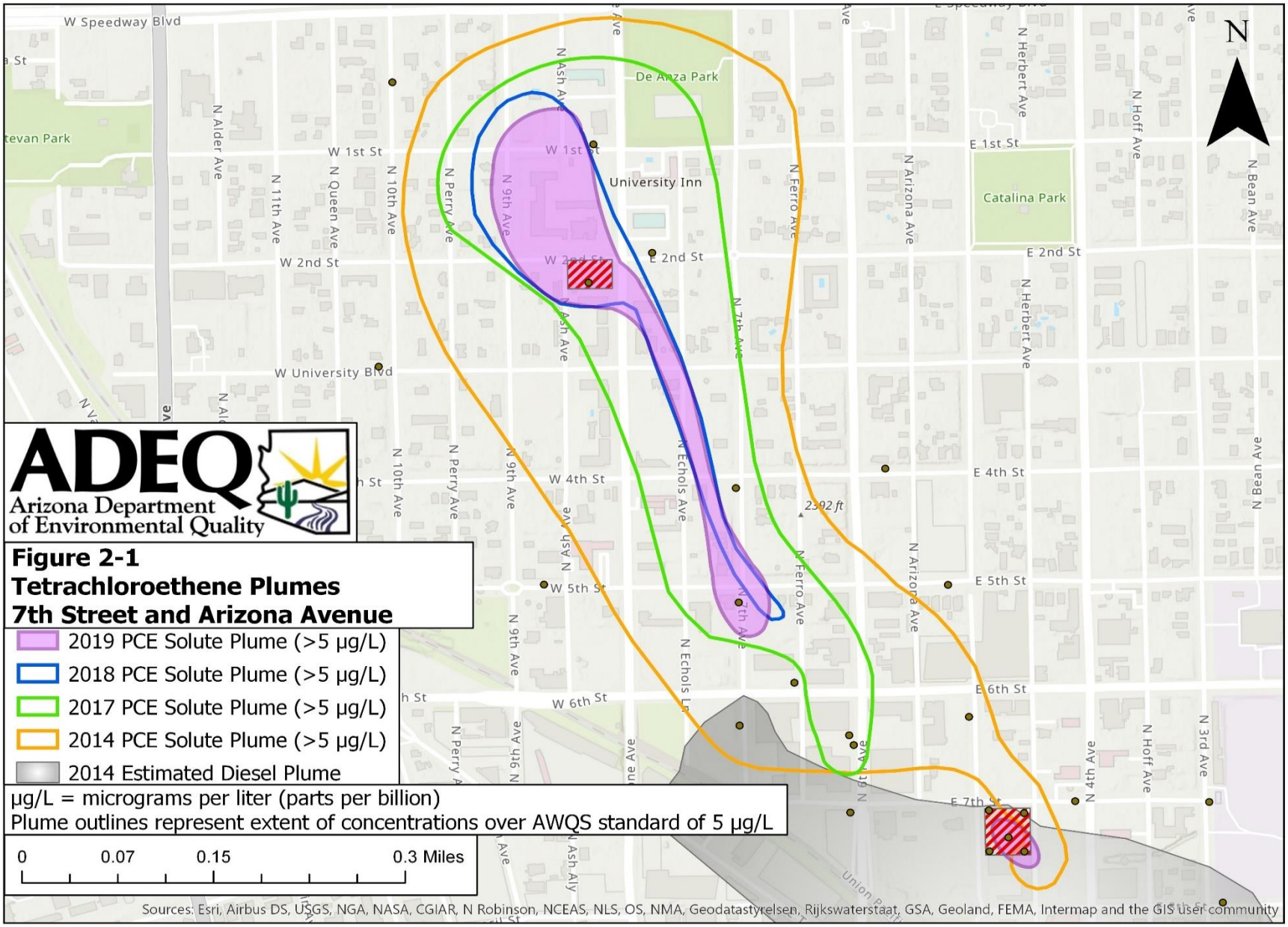
HGC. 2014b. *Feasibility Study Report, 7th Street and Arizona Avenue WQARF Site, Tucson, Arizona.* April 24, 2014.

HGL. 2016. *PRP Search Report, 7th Street and Arizona Avenue WQARF Registry Site, Tucson, Arizona.* June 2016.

Kleinfelder and HGC. 2003. *Early Response Action Evaluation Report, 7th Street and Arizona Avenue Water Quality Assurance Revolving Fund (WQARF) Site Tucson, Arizona.* July 2003.

FIGURES

Figure 1-1
Site Location and Source Properties
7th Street and Arizona Avenue WQARF Site


ADEQ
Arizona Department of Environmental Quality
Figure 2-1
Tetrachloroethene Plumes
7th Street and Arizona Avenue
2019 PCE Solute Plume (>5 µg/L)
2018 PCE Solute Plume (>5 µg/L)
2017 PCE Solute Plume (>5 µg/L)
2014 PCE Solute Plume (>5 µg/L)
2014 Estimated Diesel Plume
µg/L = micrograms per liter (parts per billion)
Plume outlines represent extent of concentrations over AWQS standard of 5 µg/L
0
0.07
0.15
0.3 Miles
N
W Speedway Blvd
De Anza Park
University Inn
Catalina Park
W 1st St
E 1st St
W 2nd St
E 2nd St
W University Blvd
W 4th St
E 4th St
W 5th St
E 5th St
W 6th St
E 6th St
E 7th St
N Ash Ave
N 9th Ave
N Perry Ave
N Echols Ave
N Ferro Ave
N Arizona Ave
N Herbert Ave
N Hoff Ave
N Bean Ave
N 3rd Ave
N 4th Ave
N 10th Ave
N Queen Ave
N 11th Ave
N Alder Ave
2392 ft
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

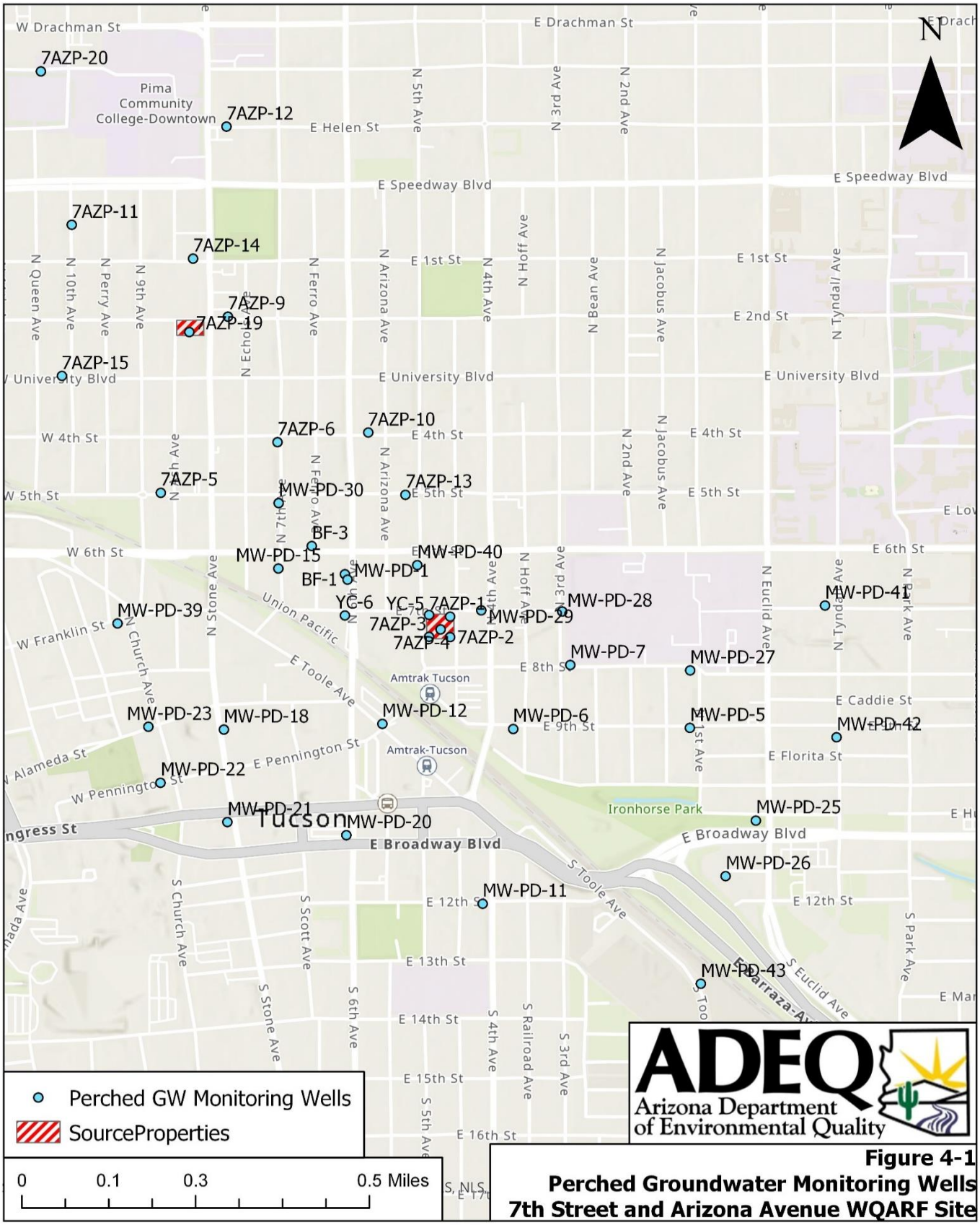


Figure 4-1
Perched Groundwater Monitoring Wells
7th Street and Arizona Avenue WQARF Site

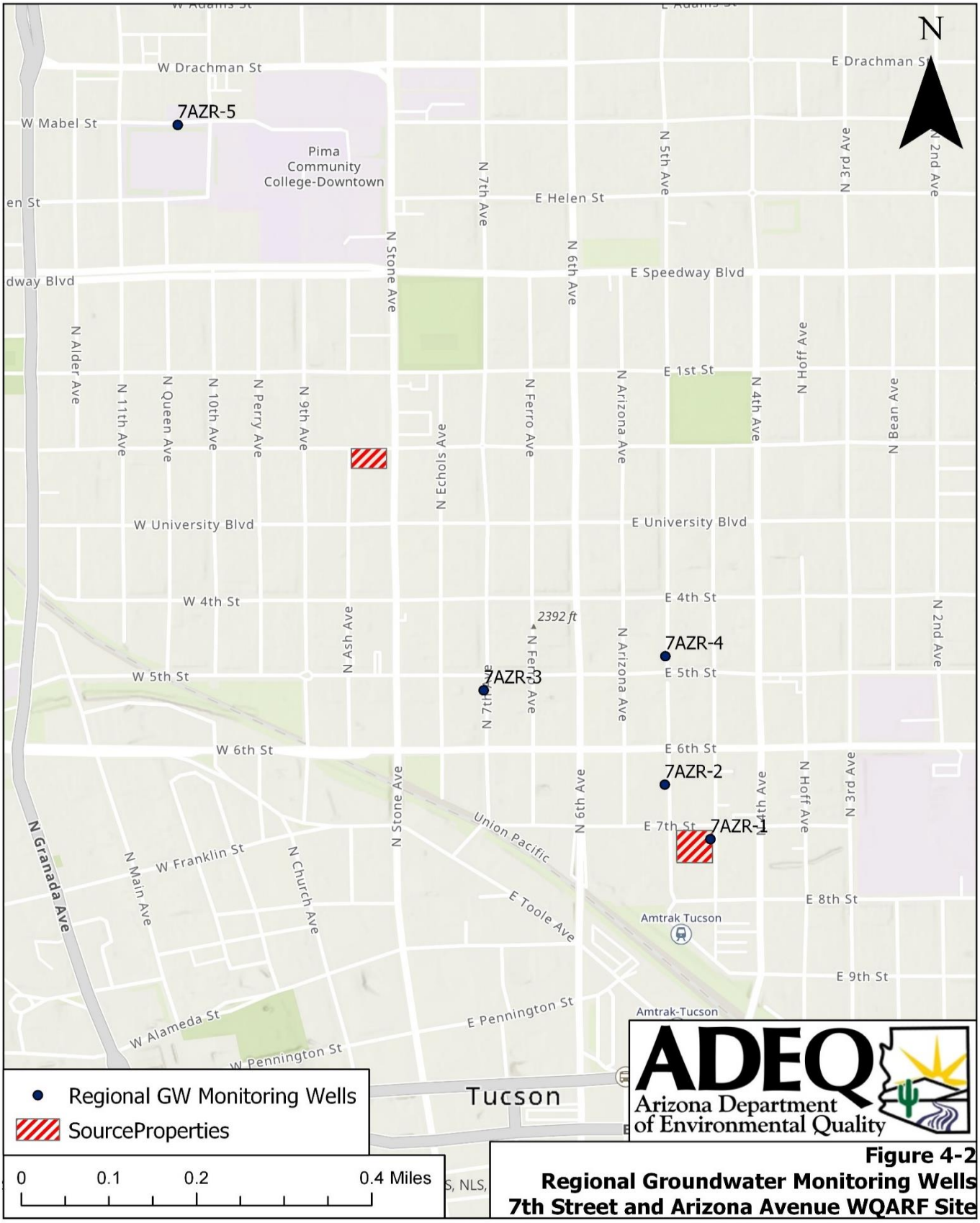


Figure 4-2
Regional Groundwater Monitoring Wells
7th Street and Arizona Avenue WQARF Site

APPENDIX A

RESPONSIVENESS SURVEY

On May 25th, 2014 ADEQ received one email comment from a local resident in the 7th Arizona neighborhood:

> *I would like to express my support for the Proposed Remedial Action Plan for the old Oliver Cleaners site at 7th and Arizona. I am a long time resident and active member of the Pie Allen Neighborhood Assoc. and I am very concerned about this contamination.*
>
> *Molly Moore*
>
> *921 E. 7th St*
>
> *Tucson, AZ 85719*

ADEQ is appreciative of the support for cleanup of the 7th & Arizona WQARF Site from the community.

On May 11th, 2020, ADEQ received a comment letter from Tucson Water:

> *Subject: Comments on the Proposed Remedial Action Plan (PRAP) Addendum, 7th Street and Arizona Avenue Water Quality Assurance Revolving Fund (WQARF) Site, Tucson, Arizona.*
>
> *The City of Tucson/ Tucson Water appreciates the opportunity to review and provide comment on the Proposed Remedial Action Plan (PRAP) Addendum for the 7th Street and Arizona Avenue WQARF Site dated January 31, 2020. Below are Tucson Water's comments regarding the PRAP.*
>
> *Comment 1 – Emphasis on Protecting the Regional Aquifer*
>
> *Tucson Water would like to see more emphasis placed in protecting the regional aquifer. The PRAP Addendum states that the proposed remedy for groundwater will be monitoring. While this can be an acceptable approach, the report does not present a complete monitoring plan for current and future monitoring of the PCE in groundwater both in the perched and regional aquifer. Section 5.1.2 of the PRAP Addendum briefly mentions that the monitoring program will include annual groundwater level measurements and annual groundwater sampling. Specifically, forty-two perched and five regional wells will be used to monitor groundwater levels. There is no record of which wells will be used for this monitoring plan. Similarly, this section briefly mentions thirty-three groundwater samples will be collected from twenty perched and five regional wells. A reference to Figure 6 would help clarify which perched*

wells are being proposed. Although Figure 6 provides the location of the perched water quality monitor wells, a location figure is not provided for the regional groundwater monitoring wells. Tucson Water suggests providing a regional groundwater monitoring location figure in the PRAP Addendum. […]

Table 4-1 lists which wells will be used for water level measurements and monitoring natural attenuation. Figures 4-1 and 4-2 show the locations of the perched and regional aquifer monitoring wells, respectively.

[cont.]*The 2014 Feasibility Study provided remedial well details (i.e., well location, & well construction) however, additional perched and regional monitor wells have since been installed and added to the monitoring network. The information is important for understanding the remedy, therefore Tucson Water requests an updated map be included in the PRAP showing the locations of the wells which will be selected to monitor the regional aquifer and provide the well construction details in either an attached or in a future monitoring and analysis plan.* […]

Table 4-2 lists construction data for groundwater monitoring wells.

[cont.]*Comment 2 – Data Inconsistency*

The PRAP Addendum includes some inconsistencies in the data presented in Table 3 and Figures 4 and 5. Figure 4 shows PCE concentration from 26-36 feet at SVE-2 with a concentration of 6,860 µg/m3 but Table 3 shows a concentration of 3,860 µg/m3. Similarly, SVE-3 PCE concentration at depths from 41-86 feet is shown as 243 µg/m3 while Table 3 lists a concentration of 87 µg/m3.[…]

The tetrachloroethene concentration for the sample collected from soil vapor well SVE-2M in May 2019 was 6,860 µg/m3. The tetrachloroethene concentration for the sample collected from soil vapor well SVE-3D in May 2019 was 87 µg/m3.

The second set of inconsistencies are found in Figure 5. This figure shows the SVE-2 PCE concentration between 26-36' to be 6,860 µg/m3 but Table 3 shows a concentration of 3,860 µg/m3. Similarly, SVE-4 PCE concentrations between (41-86 feet) are shown in this figure to be 4,000,000 µg/m3 but Table 3 shows a concentration of 5,200,000 µg/m3. Please confirm these concentrations and update the applicable tables and figures. […]

The tetrachloroethene concentration for the sample collected from soil vapor well SVE-2M in May 2019 was 6,860 µg/m³. The tetrachloroethene concentration for the sample collected from soil vapor well SVE-4D in December 2017 was 5,200,000 µg/m3.

> *[cont.]Comment 3 – Data Gaps*
>
> *Tucson Water agrees with ADEQ that installing additional wells north of the Stone Avenue site will help characterize the hydraulic gradient and groundwater flow direction of distal portions of the contamination plume. Tucson Water would like to emphasize the importance of closing this data gap to the northeast of perched well 7AZP-19. According to Cross-Section B-B', the aquitard is not well-defined north of the source area and thins considerably from 7AZR-3 to 7AZP-19. A well-placed monitoring well could help define the effectiveness and extent of the aquitard and eliminate any concerns of vertical migration of PCE into the regional aquifer.* […]

Although another well would contribute to the public's understanding of the geology of the Speedway/Stone intersection area, it is not necessary to place another well between 7AZP-19 and 7AZR-5, to the northwest. Wells 7AZP-20 and 7AZR-5 will serve as the final indicators for plume migration. If, over the course of the monitoring lifetime of the Site, contaminants of concern are detected in samples from either of these wells, we can revisit the possibility of installing another well. Which well these hypothetical detections are made in will also give us more information about the competence of the aquitard between 7AZP-19 and 7-AZP-19/7AZR-5.

> [cont.] *PCE has been detected upgradient in the regional aquifer at monitoring well 7AZR-3 at a concentration of 5.2 ug/L which exceeds the AWQS of 5µg/L. Note this result is missing from the PRAP Addendum. Tucson Water would like to see data results for regional aquifer wells 7AZR-5, 7AZR-3, and 7AZR-1 included in Figure 7.*[...]

That detection was made in 2018. Subsequent sampling of 7AZR-3 in December 2019 showed that levels fell back below the AWQS of 5µg/L, to anywhere from 4.86 µg/L to 0.559 µg/L at different depths within the screened interval. No data were included for regional aquifer monitoring wells on figures because none of them provided samples with concentrations above the AWQS in 2019.

[cont.]*Summary*

Thank you for the opportunity to review the PRAP Addendum. Tucson Water requests that ADEQ correct inconsistencies with the PCE results shown in the Figures and Tables of the report and provide a map showing concentrations detected in the regional aquifer. We also believe there are data gaps with delineation of the northeast extent of the perched contaminants based on the undefined aquitard thickness. Filling these data gaps would provide Tucson Water confidence in the success of the proposed remedy as it concerns regional groundwater protection. PCE has been found in both the perched and regional aquifer at concentrations which exceed the AWQS, and the data gaps may present a threat to the regional aquifer.

Should you need clarification on these comments, please contact Beth Scully at 520-837-2227, or Beth.Scully@tucsonaz.gov.

Sincerely,

Dee Korich, Chief Hydrologist, Tucson Water [end comment]

Thank you for your comments. Rest assured that ADEQ shares TW's concerns in regards to the quality and integrity of Tucson's drinking water.