FINAL REPORT

PROPOSED REMEDIAL ACTION PLAN

PARK-EUCLID WQARF SITE TUCSON, ARIZONA

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Prepared for

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List of Acronyms and Abbreviations

µg/L	micrograms per liter
AAC	Arizona Administrative Code
ARS	Arizona Revised Statutes
ADEQ	Arizona Department of Environmental Quality
AWQS	Aquifer Water Quality Standards
bgs	below ground surface
CAB	Community Advisory Board
CatOx	catalytic oxidizer
cis-1,2-DCE	cis-1,2-dichloroethene
COCs	contaminants of concern
CVOC	chlorinated volatile organic compound
DEUR	declaration of environmental use restriction
ERA	early response action
FS	Feasibility Study
ft	feet
GAC	granular activated carbon
GPLs	groundwater protection levels
gpm	gallons per minute
HHRA	Human Health Risk Assessment
LNAPL	light non-aqueous phase liquid
LTM	long-term monitoring
LVZ	Lower Vadose Zone
m	meters
MNA	Monitored natural attenuation
MPE	multiphase extraction
PA	Perched Aquifer
PCE	tetrachloroethene
ppmv	parts per million by volume
PRAP	proposed remedial action plan
RA	Regional Aquifer
RI	Remedial Investigation Report
ROs	remedial objectives

RSLs	Regional Screening Levels
SRLs	Soil Remediation Levels
SVE	soil vapor extraction
TCE	trichloroethene
the Agreement	Agreement to Conduct Work
the Group	Park-Euclid Group
trans-1,2-DCE	trans-1,2-dichloroethene
TTG	Tetra Tech GEO
URS	URS Corporation
UVZ	Upper Vadose Zone
VC	vinyl chloride
VI	Vapor Intrusion
WPA	Work Plan Addendum
WQARF	Water Quality Assurance Revolving Fund

Certification Page

This Proposed Remedial Action Plan for the Park – Euclid Water Quality Assurance Revolving Fund (WQARF) Site in Tucson, Arizona was prepared by URS Corporation (URS) on behalf of the Park – Euclid Group. This report has been prepared under the supervision of the undersigned and is consistent with the usual thoroughness and competence of the environmental and engineering professions. Plans are in accordance with generally accepted engineering principles and practices. No other warranty is expressed or implied.

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URS Corporation (URS) has been retained by the Park-Euclid Group (the Group)[1] to prepare this proposed remedial action plan (PRAP) for the Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Site (the Site), located in Tucson, Arizona. On July 21, 2010, the Group and the Arizona Department of Environmental Quality (ADEQ) entered into an Agreement to Conduct Work (the Agreement) to prepare a Feasibility Study (FS) and PRAP under ADEQ oversight. ADEQ is required under Arizona Revised Statutes (ARS) §49-287.04 to issue a PRAP for the proposed Site remedy to the public for review and comment. This PRAP was prepared in accordance with ARS §49-287.04 and Arizona Administrative Code (AAC) R18-16-408 and is based primarily on information contained in the following documents:

- Final Remedial Investigation (RI) Report (Tetra Tech GEO [TTG], 2011)
- Remedial Objectives Report, Park-Euclid Water Quality Assurance Revolving Fund Site Tucson, Arizona (ADEQ, 2008)
- Final Feasibility Study (FS) Report, Park-Euclid WQARF Site, Tucson, Arizona (URS, 2017)

The information contained in the PRAP is drawn from and, in many cases, quotes directly from the above-referenced RI and FS reports without attribution other than that noted here. Information is also drawn from various other subsequent reports and studies as noted in specifically cited references including the 2018 and 2019 long-term monitoring reports (URS 2019a and 2019c) and the supplemental monitoring well installation report (URS 2020). These data, collected after the FS, were used to refine the proposed remedy presented in the PRAP.

The purpose of the PRAP is to inform the public on the remedy selected from the alternatives evaluation presented in the Feasibility Study (FS), which addresses the site-specific Remedial Objectives (ROs). The PRAP is part of the final remedy selection process under the WQARF program where public input is solicited on the selected remedy and on the rationale for proposing the selected remedy. ADEQ will review the public comments and prepare a responsiveness summary to address the public comments. The responsiveness summary will be part of the Record of Decision (ROD). The remedy for the Site will be finalized by ADEQ in the ROD.

This PRAP, in accordance with ARS §49-287.04, describes the following:

- The boundaries of the Site that is the subject of the remedial action;
- The results of the RI and the FS;
- The proposed remedy and cost; and
- How the remedy satisfies the ROs and selection factors required by ARS §49-287.04 and the rules set forth in AAC Title 18, Chapter 16, Article 4.

[1] The Park-Euclid Group is comprised of Mission Linen Supply (Mission) and Ira A. Haskell and Donna L. Haskell, husband and wife, Roy V. Haskell, the Estate of Abigail Redfern, the Estate of William R. Haskell, Peggy Haskell Robinson, and the Estate of Fletcher O. Haskell (collectively the Haskells).

The boundaries of the Site subject to remedial action include the area located between 8th Street to the north, 14th Street to the south, Mountain Avenue to the east, and Euclid Avenue to the west in Tucson, Arizona (Figure 1). The Site includes the 301 South Park Avenue source area and the hydrostratigraphic zones that encompass the soil and groundwater currently impacted with volatile organic compounds (VOCs).

The Site includes multiple hydrostratigraphic zones within the subsurface:

- The Upper Vadose Zone (UVZ) that consists of unsaturated soil from the surface to an average of about 90 feet below ground surface (bgs);
- The Perched Aquifer (PA) which is a thin saturated zone between about 90 and 100 feet bgs that sits atop a clay layer (aquitard) ranging in thickness from about 10 to 30 feet;
- The Lower Vadose Zone (LVZ) which consists of unsaturated soil located below the aquitard and extending to the top of the Regional Aquifer (RA), currently located about 195 feet bgs; and
- The RA which starts at a depth of about 195 feet bgs. The bottom of the RA is not defined at the Site, but the portion of the RA that has been impacted by contaminants above the Aquifer Water Quality Standards (AWQS) extends to about 300 feet bgs.

This section describes the results of the RI, completed in 2011, along with results of ongoing long-term monitoring of soil vapor and groundwater through 2019 and recent supplementary Site characterization activities including installation of additional soil vapor monitoring points, PA groundwater monitoring wells, and RA groundwater monitoring wells that have refined and expanded the RI's conclusions. The current soil vapor and groundwater monitoring well network is shown on Figures 2 and 3.

3.1 SITE HISTORY AND DESCRIPTION

3.1.1 Site Operational History

The Mission Linen Supply (Mission) facility located at 301 South Park Avenue in Tucson (Mission Plant) shown on Figures 2 and 3 was originally owned by Haskell Linen and operated starting in 1938. The plant was purchased by Mission on February 16, 1983 and is currently owned and operated by Mission to provide industrial laundry and linen supply services to the Tucson area. Dry cleaning was conducted at this facility utilizing tetrachloroethene (PCE) from 1971 until June 11, 1985. The 299 South Park Avenue property to the north of the Mission Plant is also owned by Mission and is currently unoccupied. This facility was originally owned and operated by Cascade Linen, recorded as early as 1949, until Haskell Linen purchased the property in the mid-1960s. Dry cleaning was conducted at the 299 South Park Avenue facility until approximately 1971, when the dry-cleaning equipment was moved to 301 South Park Avenue.

The dry-cleaning equipment consisted of two large dry-cleaning machines and one 2,000-gallon aboveground PCE storage tank with aboveground piping. The machines and the storage tank were removed in 1985.

3.2 SOURCES OF CONTAMINATION

The Final RI concluded that spills occurred in the former dry-cleaning area of the Mission Plant. Releases reportedly included accidental overfills of PCE tanks and accidental spills from the dry-cleaning machines. These spills likely moved through joints and cracks in the building floor to underlying soils and likely reached sewer lines through floor drains and sumps (TTG, 2011). The sewer line, owned and operated by Pima County, was later discovered to be in disrepair and leaking and was subsequently abandoned and replaced.

The PCE spills and releases moved down through the UVZ to the top of the PA and dissolved into a layer of diesel product (also known as light non-aqueous phase liquid [LNAPL]) located above the PA. The source of the diesel product is unknown, but is unrelated to the Site, and is believed to originate from an off-Site petroleum release or releases. Some of the PCE within the diesel layer dissolved into the PA.

The annular spaces surrounding two former water-supply wells at the Mission Plant (Old Well and MP-1 on Figure 3) were conduits that allowed vertical contaminant migration (in PA water and diesel fuel) through the aquitard extending to the RA until the wells were properly abandoned in the early 1990s. Historically, the decreasing elevation of the RA water table, subsequent to contaminants migrating down these conduits to the RA, also is interpreted to have resulted in contaminant smearing in the LVZ as the RA water table declined.

A conceptual diagram depicting the sources and migration of contamination from the Site is presented in Figure 4.

3.3 CONTAMINANTS OF CONCERN

The contaminants of concern (COCs) at the Site originating from dry cleaning operations at the Mission Plant include compounds that have been detected above regulatory levels or that have been detected at concentrations that may pose a risk to human health or to the environment.

3.3.1 Groundwater

COCs in groundwater consist of PCE and its degradation products trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride (VC). VC has not been detected in RA groundwater.

3.3.2 Soil

COCs in soil (both the UVZ and the LVZ) consist of PCE and its degradation products TCE, cis-1,2-DCE, trans-1,2-DCE, and VC. These compounds may be present in soil in multiple phases (e.g., adsorbed to soil, dissolved with moisture in the soil pore spaces, or as soil vapor).

3.3.3 Other Compounds

As stated previously, a diesel product layer is present in the PA with Site COCs dissolved within the product. The diesel product is unrelated to the Site and originated from an unknown off-Site source. Gasoline range organics have also been detected in LVZ soil gas. As with the diesel, these compounds are unrelated to Site operations but have impacted the ability to cost effectively treat COCs in LVZ vapors.

3.4 NATURE AND EXTENT OF CONTAMINATION

The RI, completed in 2011, determined the nature and extent of contamination in soil and groundwater for each zone within the subsurface. Since 2011, these data have been augmented by ongoing long-term monitoring for soil vapor and groundwater and by supplemental Site characterization activities including the installation of additional wells to further define the lateral and vertical extent of COCs. The current nature and extent of contamination is presented below for each subsurface zone.

3.4.1 Upper Vadose Zone

Soil vapor in the UVZ is routinely monitored at a series of seven monitoring well clusters labeled as VW-01 through VW-07 on Figure 3, each with wells screened at 5, 30, 55, and 85 feet bgs, to evaluate the potential for vapor intrusion (VI) into buildings at the surface. Concentrations in soil vapor have been compared to EPA's Regional Screening Levels (RSLs) and to the vapor equivalents of ADEQ's Soil Remediation Levels (SRLs). Appendix F-1 of the FS Report (URS, 2017) provides the details on the calculation of vapor equivalent concentrations for the SRLs.

The human health risk assessment with respect to VI concerns was included as Appendix D to the FS report, and a summary and update is provided in a risk evaluation update technical memorandum (URS, 2020b). Only the shallowest depth samples, 5 feet bgs, are considered in

the VI analysis. For the purpose of evaluating potential VI hazards, vapor concentrations from the 5-foot depth samples are multiplied by a conservative attenuation factor of 0.03 to account for the difference between soil vapor levels at that depth and anticipated indoor air concentrations. After applying this attenuation factor as an initial screening to the May 2019 sampling data, the only results that could potentially be a VI hazard under a residential scenario are for PCE and TCE. Figures 5 and 6 provide the interpreted extent of PCE and TCE at a depth of 5 feet bgs beneath the Mission Plant and surrounding area that exceed the respective RSLs for residential concerns after application of the 0.03 attenuation factor. The VI risk from COCs in the UVZ are further discussed in the Risk Assessment Update (URS, 2020b).

The only compound/depth in the UVZ that exceeded the residential SRL (when converted to equivalent soil vapor concentration of 48 parts per million by volume [ppmv]) other than the 5-foot depths shown on Figures 5 and 6 was PCE at a depth of 30 feet in VW-07. The interpreted distribution of PCE at this depth above the SRL in the UVZ is shown on Figure 7.

3.4.2 Perched Aquifer and Upper Aquitard

The groundwater elevations and concentrations of COCs in the PA are monitored at 37 monitoring well locations at the Site as shown on Figures 2 and 3. As discussed in the FS report, a previous multiphase extraction early response action (ERA) was successful in removing significant COC mass from the PA. The PA is not a water supply source and is monitored to confirm plume stability and that it does not act as a source of contamination to the RA.

Figure 8 shows the interpreted groundwater flow distribution in the PA beneath the Site, and Figures 9 through 12 show the interpreted distribution of PCE, TCE, cis-1,2-DCE, and VC at concentrations that exceed their respective AWQS. Although shown on these figures for reference, contaminants at and the contaminant plumes emanating from ADEQ's Park – Broadway Preliminary Investigation Site (PB Site) are unrelated to Site activities and are not considered in the remedial alternatives presented in Section 6. As demonstrated on these figures, the lateral extent of COC contamination in the PA originating from the Site has been defined to the AWQS. In a letter dated August 29, 2019 (ADEQ, 2019), ADEQ concurred with the Group's conclusion that characterization of the PA is complete.

The upper aquitard at the base of the PA acts as a barrier to inhibit the downward migration of COCs to the LVZ and RA. Beneath the plume, this largely clay aquitard ranges from about 10 to 30 feet thick. Figures 13 and 14 show the interpreted surface and thickness of the aquitard beneath the Site.

3.4.3 Lower Vadose Zone

As described in Section 3.2, COC contamination in the LVZ is interpreted to have resulted from smearing of contaminants that had entered this zone through the annulus of the two former onsite production wells as the RA water table declined. In the LVZ, soil vapor samples are routinely collected from a series of six vapor well clusters at the Mission Plant and surrounding area (Figure 3), each with four wells screened at different depths (130, 150, 170 and either 185 (VML-3 through -6) or 190 (VML-1 and -2) feet bgs. In addition, samples are collected from one vapor extraction well (VEL-3) and the unsaturated portion of one RA groundwater monitoring well (PER-14A). Because there is no VI exposure pathway for COC vapors in the LVZ, vapor concentrations in the LVZ are compared to soil SRLs and groundwater protection levels (GPLs)

converted to equivalent soil vapor concentrations to evaluate whether COCs in the LVZ could act as a continuing source of RA contamination. Appendices F-1 and F-2 of the FS Report (URS, 2017) provide details on the calculation of the vapor equivalents for SRL and GPL soil concentrations.

In the FS report (Appendix F-2), it was determined that remaining vapors in the LVZ could act as a continuing source to the RA. Further, a trend of rising water levels in the RA over the last 5 years increased the likelihood that previously unsaturated soil in the LVZ containing COCs, could become saturated and result in increased dissolved COC concentrations in the RA source area. Therefore, the FS recommended that the LVZ soil vapor extraction (SVE) ERA that had been operated previously at the Site from 2014 to 2015 be reinitiated. By May 2018, continued concentration rebound following the earlier SVE operation caused the maximum PCE vapor concentration in the LVZ (380 ppmv) to exceed both the GPL (0.80 mg/kg which is equivalent to approximately 221 ppmv) and residential SRL (0.51 mg/kg which is equivalent to approximately 48 ppmv) (URS 2017, Appendix F). The SVE ERA was restarted for routine operation in April 2019, and during the annual monitoring event in May 2019, COC concentrations at all wells/depths had decreased below the respective vapor equivalent SRLs and GPLs. In accordance with the ERA work plan addendum (URS, 2018), the system will be shut down temporarily following 12 months of continuous operation for a period of two months, after which vapor samples will be collected from the monitoring network and evaluated for potential rebound.

Figure 15 shows the concentrations of PCE which is the predominant COC in the LVZ, in May 2019 at each of the four depths in the six LVZ monitoring wells. However, because none of these concentrations exceed SRLs or GPLs, the distribution of remaining contamination in this zone is not presented. During the 2019 annual event, the highest concentrations of PCE at the monitoring wells in the LVZ were centered at VML-5 at each depth interval except for the 130 depth where the highest concentration was at VML-2. Both monitoring wells with maximum concentrations are near the northeast corner of the Mission Plant close to the former locations of the two former groundwater production wells. At each depth, concentrations decrease laterally in all directions away from the highest concentration although there appears to be a more predominant westward component of the distribution toward VML-4. As noted above, none of these concentrations currently exceed the vapor equivalent GPLs or SRLs.

3.4.4 Regional Aquifer

Groundwater in the RA is currently monitored periodically at 25 monitoring wells at the Site as shown on Figures 2 and 3. PCE and TCE are currently the only COCs that exceed the AWQSs. Figure 16 shows the current interpretation of groundwater flow distribution in the RA, and Figures 17 and 18 show the interpreted PCE and TCE distribution in the RA which has been defined to the AWQS. As demonstrated on these figures, the lateral extent of COC contamination in the RA has been defined at concentrations that exceed the AWQS.

The FS report recommended additional monitoring wells near the downgradient extent of the COC plume to confirm that the vertical extent of COC contamination at concentrations above the AWQS were adequately defined. After conclusion of the FS, three additional wells (PER-30, PER-31, and PER-32) were installed and monitored. The well sampling results confirmed the previous interpretation, and therefore, the vertical extent of COC contamination in the RA has

been defined to the AWQS. Additional details regarding installation and sampling of these new wells are in the 2018 LTM report (URS, 2019a).

3.5 REMEDIAL OBJECTIVES

ADEQ prepared a Remedial Objectives Report in 2008 (ADEQ, 2008). The ROs for land and groundwater use at the Site as stated in Appendix D to the Final RI Report (TTG 2011), are:

"To restore soil conditions to the remediation standards for non-residential use specified in AAC R18-7-203 (specifically background remediation standards prescribed in R18-7-204, predetermined remediation standards prescribed by R18-7-205, or site-specific remediation standards prescribed by R18-7-206) that are applicable to the hazardous substances identified (PCE, TCE, cis-1,2-DCE and trans-1,2-DCE, and vinyl chloride)."

"To protect for the use of the groundwater supply by the University of Arizona near the Park-Euclid WQARF site from contamination from the site. This action is needed for the present time and for as long as the UA wells are used for potable purposes, the resource remains available, and their use is threatened as a result of contamination from the Park-Euclid WQARF site. This action is also needed to protect potential future use of the groundwater supply for the City of Tucson, which is not expected within the next five to ten years."

Although the Arroyo Chico Wash traverses the Site east and north of the Mission plant, there are no ROs for surface water as there are no anticipated impacts to this ephemeral surface water feature.

The above ROs were the basis for the remedial alternative evaluation in the FS. The following statements further detail what is required for soil remediation by the ROs:

1. AAC R18-7-203 requires that soil concentrations: (1) are protective of surface water quality and aquifer water quality, not resulting in a violation of water quality standards; (2) do not exhibit hazardous waste characteristics beyond toxicity; and (3) do not threaten ecological receptors. UVZ and LVZ soils do not exhibit hazardous waste characteristics beyond toxicity, nor are they believed to threaten ecological receptors based on land use.
2. AAC R18-7-204 allows soil concentrations to be remediated to background conditions above soil standards; however, for this Site, the COCs are not naturally occurring in the environment and background concentrations are not applicable.
3. AAC R18-7-205 requires that soil concentrations: (1) meet residential standards on any property where there is residential use at the time remediation is completed; and (2) meet a 10^{-6} excess lifetime cancer risk for known human carcinogens and a 10^{-5} excess lifetime cancer risk for other carcinogens. For properties containing a childcare facility or school, a 10^{-6} excess lifetime cancer risk must be used. Therefore, non-residential standards are considered for the Mission Plant area, but residential standards are used elsewhere. Of the Site COCs, VC is a known human carcinogen while the remaining are other carcinogens.
4. AAC R18-7-206 states that site-specific remediation standards for soil may be derived by risk assessment considering exposure pathways and land use.

Therefore, soils in the UVZ must be remediated to non-residential levels in the Mission Plant area and residential levels elsewhere; as well as to levels that do not present an unacceptable VI risk or impact water quality above applicable groundwater standards. Due to the depth of the

LVZ soils and the overlying aquitard, contaminated soil does not pose a significant risk to humans via exposure or VI; thus, only the migration to a groundwater pathway is considered.

The second RO pertains to protecting the RA groundwater supply for the University of Arizona and City of Tucson but does not require that numeric standards be met in groundwater or that contaminant mass be destroyed. Because the second RO pertains to RA water quality, the RO relates to the PA only with regards to whether PA contamination would inhibit achieving the ROs for soil remediation and/or RA water quality.

This section presents a summary of the FS conducted for the Site.

4.1 HUMAN HEALTH RISK ASSESSMENT

The Human Health Risk Assessment (HHRA) and VI assessments conducted as part of the FS (URS, 2017) concluded that there were no current or anticipated future unacceptable risks or hazards associated with COC contamination at the Site. The FS concluded "There is no anticipated risk of exposure to PA contamination as (1) PA groundwater is not used as a potable resource currently or in the foreseeable future; (2) there is no unacceptable risk posed from vapor concentrations in the UVZ; and (3) the upper aquitard immediately beneath the PA is an effective hydraulic barrier separating the UVZ and PA from direct migration of contaminants into the LVZ and RA." Additional soil vapor and groundwater data were collected in 2018 and 2019, and evaluation of these data confirm the conclusions regarding human health risk drawn in the FS. COC concentrations in soil vapor and groundwater are comparable to or below those concentrations used to evaluate risk in the FS. Recent data were evaluated in detail in the context of the previous HHRA, and this evaluation along with appropriate conclusions are presented in the Risk Assessment Update Technical Memorandum (URS, 2020b).

4.2 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

The FS identified remedial strategies and remedial measures for addressing soil and groundwater impacts at the Site through a screening process that evaluated technology types and individual process options. A remedial strategy is an approach or combination of approaches to address contamination to achieve the ROs. A remedial measure does not address contamination directly but provides a means of attaining a clean water supply. Retained remedial technologies from the screening process were further evaluated in greater detail with respect to each of the corresponding intervals (i.e., UVZ, PA, LVZ, and RA). Retained technologies were then incorporated into alternatives and ultimately combined into remedies to address the four subsurface hydrostratigraphic intervals as described below.

4.3 DEVELOPMENT OF THE REFERENCE REMEDY AND ALTERNATIVE REMEDIES

Following the initial screening process, retained remedial technologies were used to develop a reference remedy

4.3.1 Reference Remedy

The Reference Remedy includes the components below.

4.3.1.1 Upper Vadose Zone

Monitored natural attenuation (MNA) until Year 15. This includes installation of two new wells and annual soil vapor monitoring at the new and existing locations. The anticipated duration is 15 years where the network size will be refined and the frequency reduced to biennial after Year 5.

4.3.1.2 Perched Aquifer

Continuous MNA for perpetuity which is reflected in the cost estimates by a duration of 200 years.

4.3.1.3 Lower Vadose Zone

Continuous SVE for five years with expanded LTM until Year 25.

4.3.1.4 Regional Aquifer

Installing a 775-foot-long in situ PlumeStop™ barrier from 200 to 330 feet bgs along 8th Avenue in the RA, accompanied by LTM until Year 40.

4.3.2 Less Aggressive Remedy

4.3.2.1 Upper Vadose Zone

MNA until Year 5. This includes installation of two new wells and annual soil vapor monitoring at the new and existing locations. The anticipated duration is five years assuming that concentrations continue to decrease and/or remain stable.

4.3.2.2 Perched Aquifer

MNA for 30 years with a contingency PlumeStop™ barrier at Year 25.

4.3.2.3 Lower Vadose Zone

Continuous SVE for five years with expanded LTM until Year 25.

4.3.2.4 Regional Aquifer

MNA with wellhead treatment at water supply wells in the RA until Year 200.

4.3.3 More Aggressive Remedy

4.3.3.1 Upper Vadose Zone

MNA until Year 30. This includes installation of two new wells and annual soil vapor monitoring at the new and existing locations. The anticipated duration is 30 years, where the network size is refined, and the frequency reduced to biennial after Year 5 and once every 5 years after Year 15.

4.3.3.2 Perched Aquifer

In-well sparging with SVE as vapor capture within the MPE wells for 5 years, followed by MNA until Year 35.

4.3.3.3 Lower Vadose Zone

Continuous SVE for five years with expanded LTM until Year 25.

4.3.3.4 Regional Aquifer

Pump and treat with a single extraction well at 50 gallons per minute (gpm) and ex situ granular activated carbon (GAC) treatment for 30 years followed by LTM until Year 35; with reinjection of treated water to the RA.

4.4 EVALUATION AND COMPARISON OF THE REMEDIES

The Reference, Less Aggressive, and More Aggressive remedies were compared relative to each other using comparison criteria defined in AAC R18-16-407(H.3) including practicability, risk,

cost, and benefit. Table 4-1, which was developed for the FS report, provides a side-by-side comparison of these criteria associated with the remedy alternatives for each of the four zones considered for treatment. Table 4-1 also presents numeric scores for each criterion, each remedy, and each zone.

4.5 PROPOSED REMEDY

Based on the comparative analysis and scoring shown in Table 4-1, the highest scoring alternatives for each zone were assimilated to form the Proposed Remedy, which utilizes a combination of alternatives from the reference, less aggressive, and more aggressive remedies. The remedy proposed in the FS included:

- UVZ Alternative 1: MNA until Year 15
- PA Alternative 2: MNA for 30 years
- LVZ Alternative 1: Continuous SVE for 5 years with expanded LTM until Year 25
- RA Alternative 3: Pumping with a single extraction well at 50 gpm and ex situ GAC treatment prior to reinjecting to the RA for 30 years, followed by LTM until Year 35.

The remedy proposed by the FS for the Site is expected to achieve the ROs, meet the remedial action criteria pursuant to A.R.S. §49-282.06, and is consistent with current and future land and water use.

An ERA is an action initiated pursuant to AAC R18-16-405 prior to selecting a remedy under AAC R18-16-410 and is implemented if the action is necessary to:

1. Address current risk to public health, welfare, and the environment;
2. Protect or provide a supply of water;
3. Address sources of contamination; or
4. Control or contain contamination, where such actions are expected to reduce the scope or cost of the remedy needed at the site.

Several remedial activities and ERAs have occurred at the Site including:

- 1982 – Removal of PCE-Containing Waste. The removal of PCE-containing waste occurred prior to the identification of contamination at the Site as documented in the Final RI Report.
- 1992 to 1994 – Production Well Abandonment. Remedial investigations at the Site indicated that the production wells, Old Well and MP-1, created conduits for diesel product and groundwater from the PA to migrate through the aquitard to the LVZ and ultimately the RA. The wells were properly abandoned as described in the FS.
- 2001 – LNAPL Removal Pilot Testing. A pilot study was conducted to remove diesel fuel LNAPL from the PA. Operation resulted in limited LNAPL recovery and pilot testing ceased in 2002.
- 1999 to 2006 – UVZ Soil Vapor Extraction. SVE system design and construction for soil contamination removal beneath the Site began in 1999. Normal system operation began in 2000. Monitoring results indicated that vapor concentrations reached asymptotic conditions and that there was minimal rebound in contaminant concentrations by 2002 pending a confirmation study. Based on recommendations presented in the study, operation continued until 2006. A total of 7,982 pounds of VOCs were removed.
- 2003 to 2014 – Multi-Phase Extraction. MPE pilot testing in the PA began in 2003 and full-scale design, construction, and operation were conducted from 2005 to 2014. The operational history and mass removal rates are documented in detail in the FS.
- 2005 to 2006 – Sewer Line Replacement. Pursuant to an agreement between Mission and Pima County, Mission replaced the Pima County 8-inch-diameter sanitary sewer main located beneath the Site. It was believed that PCE had entered the sewer line through miscellaneous spills entering floor drains.
- 2014 – 2015, 2019 (ongoing) – LVZ Soil Vapor Extraction. As discussed in the FS, SVE in the LVZ was pilot tested in January 2014. Based on the results, SVE was implemented as an ERA. Continuous system operation began in February 2015 and was discontinued in November 2015 for rebound testing. The final report for this phase of operation recommended SVE system operation restart because asymptotic trends in target VOC concentrations were not reached during the initial 9-months of operation. It also was determined that the vapor treatment technology should be changed from granular activated carbon to a catalytic oxidizer (CatOx) due to unexpected high concentrations of total volatile fuel hydrocarbons in the influent vapor. The permitting and modification of the system was conducted in accordance with the Work Plan Addendum (WPA) (URS, 2018) and as reported

in the Construction Completion Report (URS, 2019b). Continuous operation began in April 2019 and is ongoing.

6.1 REMEDY DESCRIPTION

This section presents a description of the Proposed Remedy including contingencies for the site. It also presents the estimated cost and duration of the Proposed Remedy. Note that the proposed remedy for the RA in this PRAP differs from that selected in the FS as a result of changed conditions in the RA. The Regional Aquifer Biodegradation Evaluation (URS, 2019c) and the Regional Aquifer Groundwater Model Update (URS, 2020c) provide additional details regarding the changed conditions and their impact on the proposed remedy for the RA.

6.1.1 Proposed Remedial Action – Upper Vadose Zone

The proposed remedy for the UVZ includes MNA of soil vapor to confirm that shallow vapors remain below concentrations that would pose an unacceptable VI risk to commercial workers and that ADEQ commercial SRLs are not exceeded. As noted in the risk assessment update (URS, 2020b), no vapor-equivalent non-residential SRL exceedances were noted, but exceedances of the residential SRL-equivalent vapor concentrations were found at one location. ADEQ allows the establishment of a declaration of environmental use restriction (DEUR) to confirm that current and future property owners are aware of contamination on a site and take appropriate actions to prevent or mitigate additional contamination. Because current vapor equivalent COC contamination exceeds the residential SRL, a DEUR will be required as a component of the remedy for the property where the Mission Plant resides to confirm that land use remains commercial. If future monitoring indicates that concentrations no longer exceed the appropriate SRL, then the property owner may request that the DEUR be released. The remedy includes the ADEQ fee for initial setup of the DEUR and ADEQ labor for preparation of the annual form for submittal to the property owner and for review of the form when returned. ADEQ's review will consist of confirmation that soil vapor concentrations continue to exceed residential SRLs (by annual monitoring data review) until such time as they no longer do and that the property use remains commercial during this period.

UVZ monitoring for COCs in soil vapor will be conducted at the Site for a period of up to 15 years. Monitoring will initially be conducted on an annual basis at 34 wells (28 nested wells and 6 shallow monitoring probes) for a period of 5 years. After 5 years, the network will be reduced to 25 wells and monitoring will be performed biennially for up to 10 additional years.

6.1.2 Proposed Remedial Action – Perched Aquifer

The proposed remedy for the PA includes MNA to confirm that volatilization of dissolved contamination in the PA would not result in accumulating vapors in shallow soils at concentrations posing an unacceptable VI risk.

PA monitoring will be performed for up to 30 years. For the first 5 years, 34 PA wells will be monitored annually for COCs, and 6 PA monitoring wells will be analyzed for dissolved gasses (i.e., methane, ethene, and ethane by Method RSK-175) to assess whether complete reductive dechlorination is occurring from VC to ethene. After 5 years, the monitoring network for COCs will be refined from 34 to 20 wells and for dissolved gasses from 6 to 4 wells. From years 5 to 15, sampling will be performed on a biennial frequency, and from years 15 to 30, the sampling frequency will be every 5 years.

MNA within the PA will continue until remaining COCs in the PA no longer have the potential to impact attainment of Site ROs which is expected to take up to 30 years.

6.1.3 Proposed Remedial Action – Lower Vadose Zone

The proposed remedy for the LVZ includes operation of the existing SVE system for up to three years from extraction locations PER-14A and VEL-3. This period of operation is assumed to be in addition to the year of operation performed previously under the ERA. Extracted vapor from these wells will be treated using the existing CatOx unit described in the LVZ SVE Construction Completion Report (URS, 2019b).

The system will be shut down after each year of operation for a period of two months, and rebound monitoring for COCs in soil vapor will be performed as described in the ERA Work Plan Addendum (URS, 2018). If concentrations in LVZ soil vapor do not rebound to values above the vapor equivalent GPL, system operation may be discontinued. However, if concentrations do rebound, then the SVE system will be restarted for another year, and this process repeated for up to three years of operation.

The LTM network includes 6 clusters each with 4 individually nested wells, 1 vapor extraction well, and 1 groundwater monitoring well (unsaturated portion of screen) (for a total of 26 individual wells) that will be sampled semi-annually during the 3-year SVE operation period (once during operation and once to evaluate rebound) and annually for up to 5 years after operations cease to assess rebound following shutdown (until Year 7).

6.1.4 Proposed Remedial Action – Regional Aquifer

The proposed remedy for the RA is based on the less aggressive approach presented in the FS which is MNA. This differs from the remedy selected in the FS and is based on the rapid reduction in plume magnitude and extent which has been observed since approximately 2014 when the RA remedy presented in the FS was originally developed. Modelling performed based on the 2014 plume projected that the COC plume in the RA would continue to migrate downgradient and eventually impact the University of Arizona's water supply well field at low concentrations. However, since that time, concentrations in many RA wells have decreased. The average and median concentrations of PCE in samples collected from wells in the RA plume decreased from 42 to 21 µg/L and from 26 to 11 µg/L, respectively, between 2012 and 2018. Both the plume extent and magnitude decreased significantly during this period.

Additional analyses have been performed to confirm that the ROs for the Site can be met without implementing a pump-and-treat remedy for the RA. These include:

- A formal statistical analysis of the analytical data to confirm overall decreasing concentration trends in the RA (URS, 2019c).
- Further evaluation of geochemical parameters to confirm that aquifer conditions are such that natural biodegradation is contributing to plume attenuation (URS, 2019c).
- Additional numerical modeling of the PCE plume using 2018 conditions as the baseline to confirm that there would be no significant impacts to the University of Arizona water supply well field (URS, 2020c).

These analyses demonstrate that the PCE plume in the RA will not significantly impact the University of Arizona's water supply wells and that MNA will be an effective remedy for the RA.

Samples will be collected from 25 wells on a biennial basis and analyzed for COCs for a period of up to 30 years. Every other year, when a full sampling event is not performed (off years), samples will be collected from the four UAM "sentinel" wells to provide early warning of any COC plume movement at the downgradient plume extent. The remedy assumes that two additional monitoring wells will be installed downgradient from the current plume to verify that plume behavior is consistent with model predictions and that two existing wells that are no longer needed will concurrently be abandoned. One or both new wells may be substituted for the UAM well monitoring during the off years depending on plume behavior. A monitoring report will be prepared after each biennial sampling event to document the results of sample analysis and the interpretation of groundwater flow and COC distribution in the RA. During the off years, a formal report will not be prepared but the results of monitoring will be evaluated to determine whether additional action is warranted. MNA within the RA will be performed until the groundwater ROs are met which is expected to take up to 30 years.

6.1.5 Proposed Contingencies

UVZ – To address uncertainty regarding the amount of time that will be required for soil vapor concentrations in the UVZ to fall below residential RSLs for VI concerns, a contingency for additional monitoring of select vapor monitoring wells at a depth of 5 feet bgs from year 15 to year 30 has been included. If needed, monitoring for COCs in soil vapor will performed at 5 locations on a biennial basis.

PA – No contingencies are proposed for the PA.

LVZ – Two additional years of operation and monitoring of the LVZ SVE system has been included as a contingency. This contingency also includes installation of an additional vapor recovery well and associated conveyance piping to connect this well to the catalytic oxidizer at the treatment compound. Permit compliance monitoring for this contingency along with annual performance/rebound monitoring will be performed consistent with that of the operational period for the proposed remedy.

RA – Wellhead treatment may be implemented if produced water from an existing or future Tucson Water, University of Arizona, or other potable production well is impacted with groundwater contamination associated with the Site. Wellhead treatment would consist of granular activated carbon treatment at a production well if COC concentrations in water extracted from the well exceed the AWQS for a Site COC. The cost of installing wellhead treatment at a production well would be well specific and variable depending on the well location, well production rate, and the timing of bringing the well online. This contingency assumes that wellhead treatment at one production well pumping at a rate of 500 gpm would be needed for a period of up to 10 years.

6.1.6 Performance Monitoring and Periodic Reviews

- **Groundwater and Soil Vapor Monitoring** – The performance monitoring program will be refined as part of the final design. Data evaluation and reporting will be performed at a frequency consistent with monitoring proposed for the four subsurface zones. The need for

continued monitoring to support MNA in the UVZ, PA, and RA will be reassessed and reported after each routine monitoring event. Results will typically consist of groundwater flow (PA and RA) and contaminant distribution analysis and evaluation of concentration changes over time using time-series graphs. Additional assumptions regarding the performance monitoring well network and sampling frequency are detailed in the cost estimates provided in the Appendix.

- DEUR Inspections. On an annual basis, ADEQ will prepare the DEUR questionnaire for submittal to the property owner and will review the completed form when returned. This review will include confirmation that soil vapor concentrations continue to exceed residential SRLs (by reviewing annual monitoring data) until such time as these levels are no longer exceeded and that the property use remains commercial during this period.
- SVE System Monitoring. Routine process monitoring will be conducted during the operation of the SVE system to ensure the system is operating effectively and meeting air permitting requirements. The process monitoring will include the collection of samples from the system influent and effluent along with operational parameters required by the air discharge permit and the operations and maintenance manual for the system.
- LVZ Rebound Monitoring. Monitoring of vapor concentrations in the monitoring wells will be conducted to verify that soil vapor concentrations have not rebounded after ceasing SVE operations. The results of the monitoring will be used to confirm that the soil concentrations are below the SRLs and GPLs. LVZ rebound monitoring will be conducted for up to five years on an annual basis following the discontinuation of SVE operation.
- Periodic reviews of remedial progress will be conducted as necessary to determine the effectiveness of the remedy in achieving the ROs. These reviews will be conducted, at a minimum, every five years.

6.2 ESTIMATED COST

Estimated costs for the Proposed Remedy and remedy contingencies are summarized in Table 6-1 with detailed costs and assumptions provided in the Appendix. Costs are presented in current dollars. The total estimated cost for implementing the Proposed Remedy in the first year (Year 0) is approximately $380,047, with an anticipated total remedy cost of $3,850,787 by remedy completion.

A flat rate of 10 percent was applied to each task to account for anticipated project management efforts. A variable uncertainty factor was applied to each task item in the cost estimates ranging from 5 to 20 percent. Tasks with relative predictability and consistency, such as LTM, were assigned lower uncertainty factors, whereas tasks with less certainty in the scope and performance were assigned higher uncertainty factors. These factors are not contingencies for additional remedial measures anticipated to be required for implementation, but rather capture the uncertainty associated with potential for increased expenditures associated with each task as described.

In addition to the total remedy costs, estimated costs were calculated for the proposed contingencies discussed in Section 6.1.5. The total estimated cost for implementing these contingencies is $1,756,660 and is presented by subsurface zone as follows:

- UVZ – $61,340

- PA – None
- LVZ – $594,940
- RA – $1,100,380

6.3 DURATION

The duration of the project is expected to be up to 30 years. This is based on the evaluation conducted in the FS and subsequent investigations and represents the anticipated time required to meet the ROs.

7.1 RATIONALE FOR SELECTION OF THE REMEDY

The proposed remedy includes a combination of MNA for the UVZ, PA, and RA with active SVE remediation of the LVZ. The FS report (URS, 2017) provides the rationale for selection of the remedies for the UVZ, PA, and LVZ but proposed additional refinement of the nature and extent of contamination in the PA and LVZ which has now been completed and is documented here in Section 3.4. Pump and treat with a single extraction well was proposed in the FS for treatment of dissolved contaminants in the RA along with additional characterization of the vertical extent of contamination in this zone. This additional characterization has been completed and confirmed the previous interpretation of vertical plume extent (Section 3.4.4). Since the time that the pump and treat alternative was originally developed based on data collected in 2014, concentrations have fallen dramatically in most RA wells, and active remediation of the RA is no longer necessary to achieve the RO for the RA based on modeling and additional analyses (URS, 2020c). To confirm this interpretation the following activities were completed:

- RA biodegradation evaluation
- Statistical evaluation of PCE concentration trends in the RA
- Supplemental groundwater flow and contaminant transport modeling based on the 2018 plume distribution

The biodegradation evaluation and statistical analysis are documented in the Regional Aquifer Biodegradation Evaluation Technical Memorandum (URS, 2019c) and the supplemental groundwater modeling is documented in the Regional Aquifer Groundwater Modeling Update (URS, 2020c). These documents support the conclusion that that given the current plume distribution, plume attenuation under natural conditions will be sufficient to achieve the ROs for the RA even under worst-case conditions. Data collected subsequent to 2018 continue to support this conclusion. On average, PCE concentrations in the RA fell by 1.1 µg/L between the 2018 and 2019 annual events.

Each component of the Proposed Remedy is a proven and reliable remedial alternative that will be protective of the public health and environment and will meet the ROs for the Site. The risk to human health and the environment with the Proposed Remedy is low, and all known exposure pathways are addressed. Over time, a combination of the proposed active and passive remedial options will result in reduced concentrations in each of the four zones evaluated thereby reducing risk even further. Soil vapor and groundwater monitoring are included in the remedy for each zone, as applicable, to confirm that the remedy is protective of public health and the environment after implementation. The combined components of the Proposed Remedy are consistent and compatible with current and anticipated future land and resource use. Upon implementation, this remedy is expected to enhance future land uses and have positive impacts on the local economy.

7.2 ACHIEVEMENT OF REMEDIAL OBJECTIVES AND REMEDIAL ACTION CRITERIA

The Proposed Remedy meets the ROs established by ADEQ for the Site and the Remedial Action Criteria defined by ARS §49-282.06, as it will:

I. Protect public health and welfare and the environment by:

   a. Confirming that UVZ vapors remain at levels below those presenting a VI risk and that UVZ soil concentrations are below non-residential SRLs beneath the Mission Plant area and below residential SRLs elsewhere via soil vapor monitoring.

   b. Monitoring PA contamination to confirm its stability and long-term attenuation.

   c. Remediating LVZ soils to equivalent vapor concentrations (derived from GPLs assuming equilibrium conditions as described in the FS) that are anticipated to be protective of RA groundwater.

   d. Confirming that RA groundwater concentrations continue to attenuate.

II. To the extent practicable, provide for the control, management, or cleanup of the hazardous substances to allow the maximum beneficial use of the waters of the State by:

   a. Remediating LVZ soils to concentrations below GPLs that are protective of RA groundwater.

III. Be reasonable, necessary, cost-effective, and technically feasible by:

   a. Implementing only necessary actions, specifically with respect to conducting MNA in the UVZ, PA, and RA rather than an expensive remedy with limited technical benefit.

   b. Utilizing existing remedial infrastructure for SVE in the LVZ.

7.3 CONSISTENCY WITH WATER MANAGEMENT PLANS

The proposed remedy is consistent with the water management plans of local water providers. There are no active supply wells currently impacted by the RA plume and the proposed alternative will ultimately restore water quality. This remedy will allow for beneficial use of the waters of the State, protect the groundwater supply for future use, and limit migration of the plume into unaffected areas. The City of Tucson does not currently operate any water supply wells in the Site vicinity, and in an October 2019 communication, Tucson Water's lead hydrologist stated that the probability of that the City would install one or more water supply wells in the Site vicinity is low throughout the proposed remedy expected duration (Korich, 2019). The University of Arizona does operate several groundwater supply wells downgradient of the plume to the north, but as previously described, the Proposed Remedy will be protective of current and future use of the University of Arizona water supply in this area.

7.4 CONSISTENCY WITH GENERAL LAND USE PLANNING

The Proposed Remedy is consistent with the current land use and is not anticipated to negatively impact current or future land use at the Site.

7.5 LEAD AGENCY STATEMENT FOR PROPOSED REMEDY

Based on the information currently available, ADEQ believes the Proposed Remedy provides a suitable balance to tradeoffs among the other alternatives with respect to the comparison criteria. ADEQ expects the Proposed Remedy will satisfy the remedial action criteria pursuant to ARS §49-282.06 and the ROs.

7.6 UNCERTAINTIES

Reasonable uncertainties associated with the Proposed Remedy at the Site that result in the need for contingencies include the following:

The HHRA concludes that there is no unacceptable VI risk to residential or non-residential occupants above the existing COC plume in the UVZ, although a DEUR will be required for the 301 South Park Avenue property until such time that vapor concentrations fall below the applicable residential SRLs and RSLs. The remedy for this zone includes up to 15 years of monitoring to evaluate whether concentrations remain above residential SRLs and RSLs, as appropriate. If concentrations fall below these levels, the property owner may request release from the requirements of the DEUR and monitoring may stop. However, should vapor concentrations remain above the standards after 15 years, the remedy includes a contingency for up to 15 years of additional shallow vapor point monitoring to address this uncertainty.

Although prior to restart of the SVE ERA, there were some exceedances of SRLs and GPLs in the LVZ, current COC concentrations in the LVZ while the SVE system is operating are below vapor equivalent residential and non-residential SRLs and GPLs. The Proposed Remedy includes a conservative estimate of up to three years of SVE in the LVZ (subsequent to the one year of operation already completed under the ERA). However, should soil gas concentrations after this period of operation not stabilize at values below the GPLs, the remedy includes a contingency for up to two additional years of operation to address this uncertainty.

The results of numerical groundwater modeling for the Site predict that there will be no significant adverse impacts to the UA production well field as a result of COC contamination associated with the Site. Further, in an October 2019 communication with the lead hydrologist for Tucson Water (Korich, 2019), the likelihood of Tucson Water needing to install water supply well(s) in the vicinity of the Site was deemed to be low throughout the expected remedy duration (30 years). Tucson Water further stated that it does not put potable water supply wells in areas with known groundwater contamination. However, to address uncertainty regarding the MNA alternative for this zone, a contingency for wellhead treatment at one production well for a period of 10 years during the remedy period has been included.

7.7 PUBLIC COMMENT PERIOD

The PRAP will be issued for a 90-day public comment period. A Community Advisory Board (CAB) meeting may be held during the public comment period. ADEQ will accept written comments on this PRAP that are postmarked within the comment period and submitted to:

Arizona Department of Environmental Quality
Attention: Tom Titus, Project Manager
1110 West Washington Street
Phoenix, Arizona 85007
Email: Titus.Thomas@azdeq.gov

Arizona Department of Environmental Quality (ADEQ). 2008. Remedial Objectives Report, Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona. April 15.

ADEQ, 2019. Letter from Mr. Tom Titus Re: Perched Aquifer Characterization, Park-Euclid WQARF Site, Tucson, Arizona. August 29.

Korich, 2019. Email Re: Park – Euclid WQARF Site. October 14.

Tetra Tech GEO (TTG). 2011. Final Remedial Investigation Report, Park-Euclid WQARF Site, Tucson, Arizona. November 15.

URS Corporation (URS). 2017. Final Feasibility Study Report, Park-Euclid WQARF Site, Tucson, Arizona. October 18.

URS. 2018. Work Plan Addendum, Lower Vadose Zone Soil Vapor Extraction Early Response Action, Park-Euclid WQARF Site, Tucson, Arizona. April 16.

URS. 2019a. 2018 Annual Report for Long-Term Monitoring, Park-Euclid WQARF Site, Tucson, Arizona. April 26.

URS. 2019b. Construction Completion Report, Lower Vadose Zone Soil Vapor Extraction Early Response Action, Park-Euclid WQARF Site, Tucson, Arizona. June 28.

URS. 2019c. Technical Memorandum, Regional Aquifer Biodegradation Evaluation, Park-Euclid WQARF Site, Tucson, Arizona. August 28.

URS. 2019d. 2019 Annual Report for Long-Term Monitoring, Park-Euclid WQARF Site, Tucson, Arizona. December 19.

URS. 2020a. Final Report, Supplemental Monitoring Well Installation, Park-Euclid WQARF Site, Tucson, Arizona. January 20.

URS. 2020b. Risk Assessment Update Technical Memorandum, Park-Euclid WQARF Site, Tucson, Arizona. February 24.

URS. 2020c. Technical Memorandum, Regional Aquifer Groundwater Model Update, Park-Euclid WQARF Site, Tucson, Arizona. March 5.

Tables

Table 4-1[1]
Comparative Analysis and Scoring of Remedies

Criteria	Upper Vadose Zone			Perched Aquifer		
	Reference Remedy	**Less Aggressive Remedy**	**More Aggressive Remedy**	**Reference Remedy**	**Less Aggressive Remedy**	**More Aggressive Remedy**
	MNA until Year 15	MNA until Year 5	MNA until Year 30	MNA for 200 years	MNA for 30 years	Sparging with SVE as Vapor Control
Practicability	The remedy is feasible and adequately effective/protective in the short term. Natural attenuation including biodegradation has been observed at the site. Long term soil vapor monitoring is a proven method of evaluating such attenuation.			Installing additional wells and implementing MNA for the PA is feasible. MNA is not expected to be effective in the short term, but attenuation is expected in the long term. An expanded monitoring network will provide the coverage required to evaluation potential future risks. The 200-year timeframe for monitoring is considered to be less practicable than the other options.	Installing additional wells and implementing MNA of the PA is feasible. MNA is not expected to be adequately protective in the short term, with meaningful attenuation occurring over the long term. An expanded monitoring network will provide the coverage required to evaluation potential future risks.	Air sparging is feasible and effective in the short term, with long term impact on MNA due to the removal of mass from the PA. Air sparging is a proven technology. The efficiency of the existing GAC vapor treatment is lower due to lower adsorption capacity for cDCE and VC.
Risk	Although not anticipated, there is potential for rebound of soil vapor concentrations from less permeable soil intervals and for degradation product VC to pose a risk to indoor air. This risk can be monitored.			VC in soil vapor originating from the degradation of PCE, TCE, and cDCE in the PA is a possibility and may pose a risk to indoor air. This potential risk can be monitored. The potential for lateral and vertical downward migration of contaminants is considered to be minimal. The risk of cross-contamination between the perched and regional aquifers will be evaluated following the installation of additional monitoring wells and can be mitigated using institutional controls.	VC in soil vapor originating from the degradation of PCE, TCE, and cDCE in the PA is a possibility and may pose a risk to indoor air. This potential risk can be monitored. The potential for lateral and vertical downward migration of contaminants is considered to be minimal. The risk of cross-contamination between the perched and regional aquifers will be evaluated following the installation of additional monitoring wells and can be mitigated using institutional controls.	There is potential for rebound in soil vapor concentrations originating from the PA is reduced due to operation of the SVE system and reduction in mass within the PA reducing potential for degradation product VC to pose a risk to indoor air, which can be monitored. The potential for lateral and vertical downward migration of contaminants is considered to be minimal and will be evaluated following the installation of additional monitoring wells and can be mitigated using institutional controls.
Cost to Completion (current dollar)	$280,000	$200,000	$330,000	$1,060,000	$490,000	$1,020,000
Benefit	No waste generation			Reduced potential risk and future environmental liability. Minor amounts of IDW from sampling and drilling.		Reduced potential risk and future environmental liability, but consumes energy and produces waste.
Scoring						
Practicability • Practicable = 2 • Less Practicable = 1 • Not Practicable = 0	2	1	1	1	2	1
Risks • Low = 3 • Medium = 2 • High = 1	3	2	3	3	3	3
Costs • Least Expensive = 3 • Mid-range Cost = 2 • Most Expensive = 1	2	3	1	1	3	2
Benefits • Beneficial = 1 • Not Beneficial = 0	1	1	1	1	1	0
Total Numeric Score	**8**	7	6	6	**9**	6

Acronyms

cDCE – *cis*-1,2-dichloroethene
GAC – granular activated carbon
IDW – investigation derived waste
MNA – monitored natural attenuation
PA – Perched Aquifer
PCE – tetrachloroethene
SVE – soil vapor extraction
TCE - trichloroethene
VC – vinyl chloride

The shaded zone alternatives had the highest comparative analysis scores and were combined into the Proposed Remedy.

1 – This table was extracted directly from the feasibility study report (URS, 2017) and is included here without modification.

Table 4-1[1]
Comparative Analysis and Scoring of Remedies

Criteria	Lower Vadose Zone	Regional Aquifer		
	Reference Remedy	**Reference Remedy**	**Less Aggressive Remedy**	**More Aggressive Remedy**
	Continuous SVE & Expanded LTM	In-Situ PlumeStop™ Barrier	MNA with Wellhead Treatment	Groundwater Pump & Treat
Practicability	SVE is a proven technology and has been tested in the LVZ at this site. Installation of additional wells in the LVZ is considered feasible, but carries risk. Based on pilot testing and the ERA, SVE is effective in the short term and MNA is considered to effective in the long term. The existing vapor-phase GAC treatment is less effective in treating degradation products cDCE and VC.	The technology has challenges associated with implementation across a wide barrier length and across a 130-foot depth. The base technology (activated carbon) is a proven technology for the adsorption of VOCs. Although cDCE and VC are not as easily adsorbed to carbon, the primary contaminants in the RA are PCE and TCE. Surface development limits the locations at which injection wells may be installed.	Implementation of MNA with additional monitoring wells and UA wellhead treatment is considered to be feasible, will be effective in the short-term, and effective in the long-term. GAC treatment is a proven technology. Wellhead treatment may require underground systems due to space restrictions. This alternative assumes that CoT will not develop the water supply in the area within the foreseeable future.	Extraction and potential treatment of groundwater is feasible, expected to result in the short-term containment of the dissolved RA plume, and expected to be effective in remediating the dissolved plume in the long term. Implementation of the remedy requires long-term lease or purchase of property for a treatment system and groundwater extraction well.
Risk	Installation of wells in the LVZ that penetrate the aquitard may result in a conduit for contamination of the RA. This risk may be mitigated using proper well construction procedures. Rebound in soil vapor concentrations from low permeability zones may pose a risk to the RA. This risk may be monitored using MNA.	Incomplete distribution of PlumeStop™ within the targeted zone or a change in groundwater flow direction may allow transport of contaminants past the treatment zone with potential impact to the UA wells. Variations in permeability are expected to result in uneven distribution of PlumeStop™. To account for this, an 83% efficiency in VOC removal is assumed.	Variation in UA long-term pumping rates or installation of a CoT production well in the vicinity of the Site may result in a variation in flow direction and transport velocity of the untreated dissolved plume thereby resulting in uncertainty regarding time and duration of wellhead treatment. This risk may be mitigated through long-term monitoring of the RA. There are unknown long-term liabilities associated with the expected persistence of the dissolved plume (over 200-years).	Potential failure of a single extraction well to capture the dissolved plume thereby allowing contaminants to migrate to the UoA production wells. The time required to remediate the plume may extend beyond the proposed 30 years.
Cost to Completion (current dollar)	$1,950,000	$7,920,000	$15,440,000	$7,790,000
Benefit	Reduced potential risk and future environmental liability, but consumes energy and produces waste.	Groundwater is treated in situ with no production of waste streams or consumption of product. Minor amounts of IDW from drilling.	None, as generates considerable amounts of spent GAC.	None, as generates considerable amounts of spent GAC.
Scoring				
Practicability • Practicable = 2 • Less Practicable = 1 • Not Practicable = 0	2	1	1	2
Risks • Low = 3 • Medium = 2 • High = 1	3	1	2	3
Costs • Least Expensive = 3 • Mid-range Cost = 2 • Most Expensive = 1	2	2	1	3
Benefits • Beneficial = 1 • Not Beneficial = 0	1	1	0	0
Total Numeric Score	**8**	5	4	**8**

Acronyms

cDCE – *cis*-1,2-dichloroethene
CoT – City of Tucson
GAC – granular activated carbon
IDW – investigation derived waste
LTM – long term monitoring
LVZ – lower vadose zone
MNA – monitored natural attenuation
PCE – tetrachloroethene
RA – Regional Aquifer
SVE – soil vapor extraction
TCE - trichloroethene
UA – University of Arizona
VOCs – volatile organic compounds
VC – vinyl chloride

The shaded zone alternatives had the highest comparative analysis scores and were combined into the Proposed Remedy.

1 – This table was extracted directly from the feasibility study report (URS, 2017) and is included here without modification.

Table 6-1 - Summary of Costs for Proposed Remedy

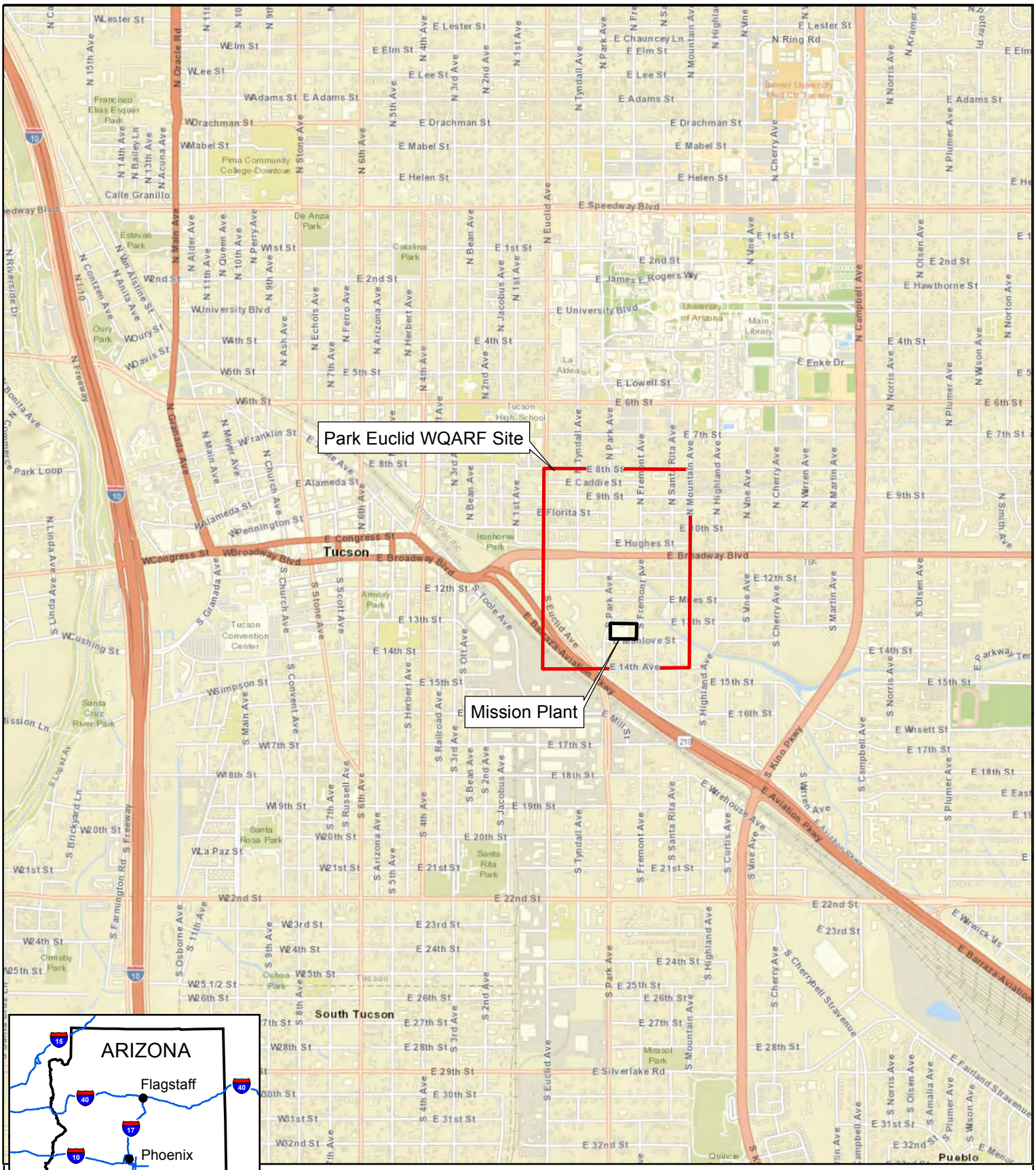
Proposed Remedy

Site:	Park Euclid WQARF Site	**Description**
Location:	Tucson, AZ	-MNA in the UVZ for 15 years
Phase:	PRAP	-MNA in the PA for 30 years
Year 0:	2021	-12-month SVE for 3 years in the LVZ followed by annual rebound monitoring. Five years post-SVE rebound monitoirng in the LVZ.
For:	30 Years	-MNA in the RA for 30 years
Date:	5/18/2020	

PROJECT COST SCHEDULE:

YEAR	PERIODIC O&M COST					
	UVZ	**PA**	**LVZ**	**RA**	**TOTAL**	**CUMULITIVE**
0	$48,967	$51,020	$236,120	$43,940	$380,047	$380,047
1	$40,822	$38,370	$236,120	$5,210	$320,522	$700,569
2	$40,822	$38,370	$262,140	$43,940	$385,272	$1,085,841
3	$40,822	$38,370	$41,100	$5,210	$125,502	$1,211,343
4	$40,822	$38,370	$41,100	$43,940	$164,232	$1,375,575
5	$32,042	$25,070	$41,100	$5,210	$103,422	$1,478,997
6	$852	$2,000	$41,100	$43,940	$87,892	$1,566,889
7	$32,042	$25,070	$204,920	$5,210	$267,242	$1,834,131
8	$852	$2,000	$0	$43,940	$46,792	$1,880,923
9	$32,042	$25,070	$0	$5,210	$62,322	$1,943,245
10	$852	$2,000	$0	$290,650	$293,502	$2,236,747
11	$32,042	$25,070	$0	$5,210	$62,322	$2,299,069
12	$852	$2,000	$0	$43,940	$46,792	$2,345,861
13	$32,042	$25,070	$0	$5,210	$62,322	$2,408,183
14	$852	$2,000	$0	$43,940	$46,792	$2,454,975
15	$171,192	$25,070	$0	$5,210	$201,472	$2,656,447
16	$0	$2,000	$0	$43,940	$45,940	$2,702,387
17	$0	$2,000	$0	$5,210	$7,210	$2,709,597
18	$0	$2,000	$0	$43,940	$45,940	$2,755,537
19	$0	$2,000	$0	$5,210	$7,210	$2,762,747
20	$0	$25,070	$0	$43,940	$69,010	$2,831,757
21	$0	$2,000	$0	$5,210	$7,210	$2,838,967
22	$0	$2,000	$0	$43,940	$45,940	$2,884,907
23	$0	$2,000	$0	$5,210	$7,210	$2,892,117
24	$0	$2,000	$0	$43,940	$45,940	$2,938,057
25	$0	$25,070	$0	$5,210	$30,280	$2,968,337
26	$0	$2,000	$0	$43,940	$45,940	$3,014,277
27	$0	$2,000	$0	$5,210	$7,210	$3,021,487
28	$0	$2,000	$0	$43,940	$45,940	$3,067,427
29	$0	$2,000	$0	$5,210	$7,210	$3,074,637
30	$0	$331,200	$0	$444,950	$776,150	$3,850,787
Total	**$547,917**	**$770,260**	**$1,103,700**	**$1,428,910**	**$3,850,787**	**$3,850,787**
Contingency Totals	**$61,340**	**$0**	**$594,940**	**$1,100,380**	**$1,756,660**	**$1,756,660**

Figures



Basemap Source: ESRI World Street Map

URS

Project Name: Park-Euclid WQARF Site

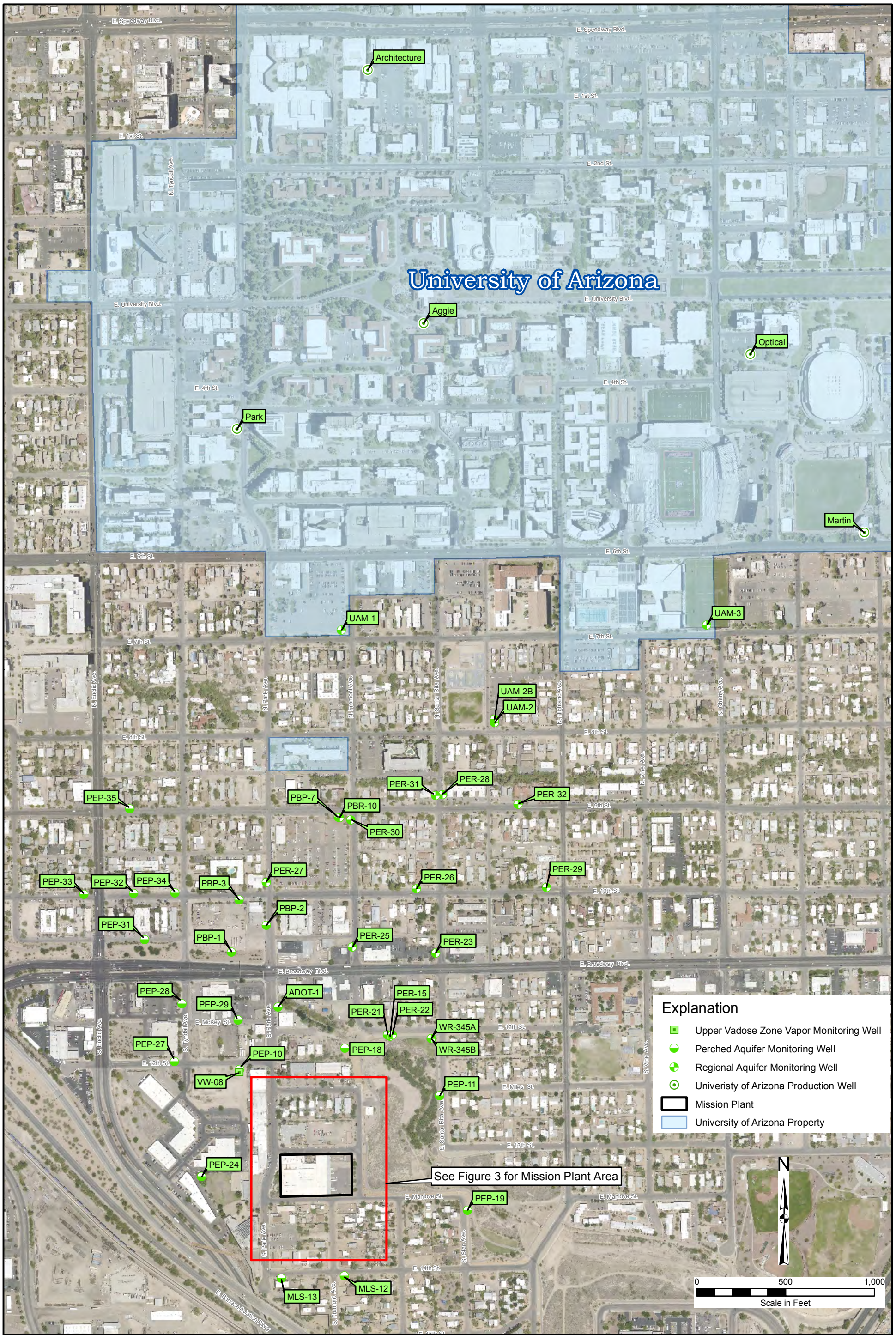
Job No: 60560366

Date: May 2020

SITE LOCATION MAP
PARK-EUCLID WQARF SITE
301 SOUTH PARK AVENUE
TUCSON, ARIZONA

Figure 1

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig01_SiteLocation.mxd



M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig02_Wells.mxd

Source: Aerial Imagery Source: Pima County, 2016

URS

Project Name: Park-Euclid WQARF Site

Job No: 60560366

Date: May 2020

WELL LOCATIONS AND EXISTING SAMPLING PROGRAM
PARK-EUCLID WQARF SITE
301 SOUTH PARK AVENUE
TUCSON, ARIZONA

Figure 2

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig03_Plant_Wells.mxd

Notes:

Source: Bing Maps aerial imagery web mapping service, (c) 2010 Microsoft Corporation and its data suppliers.

URS

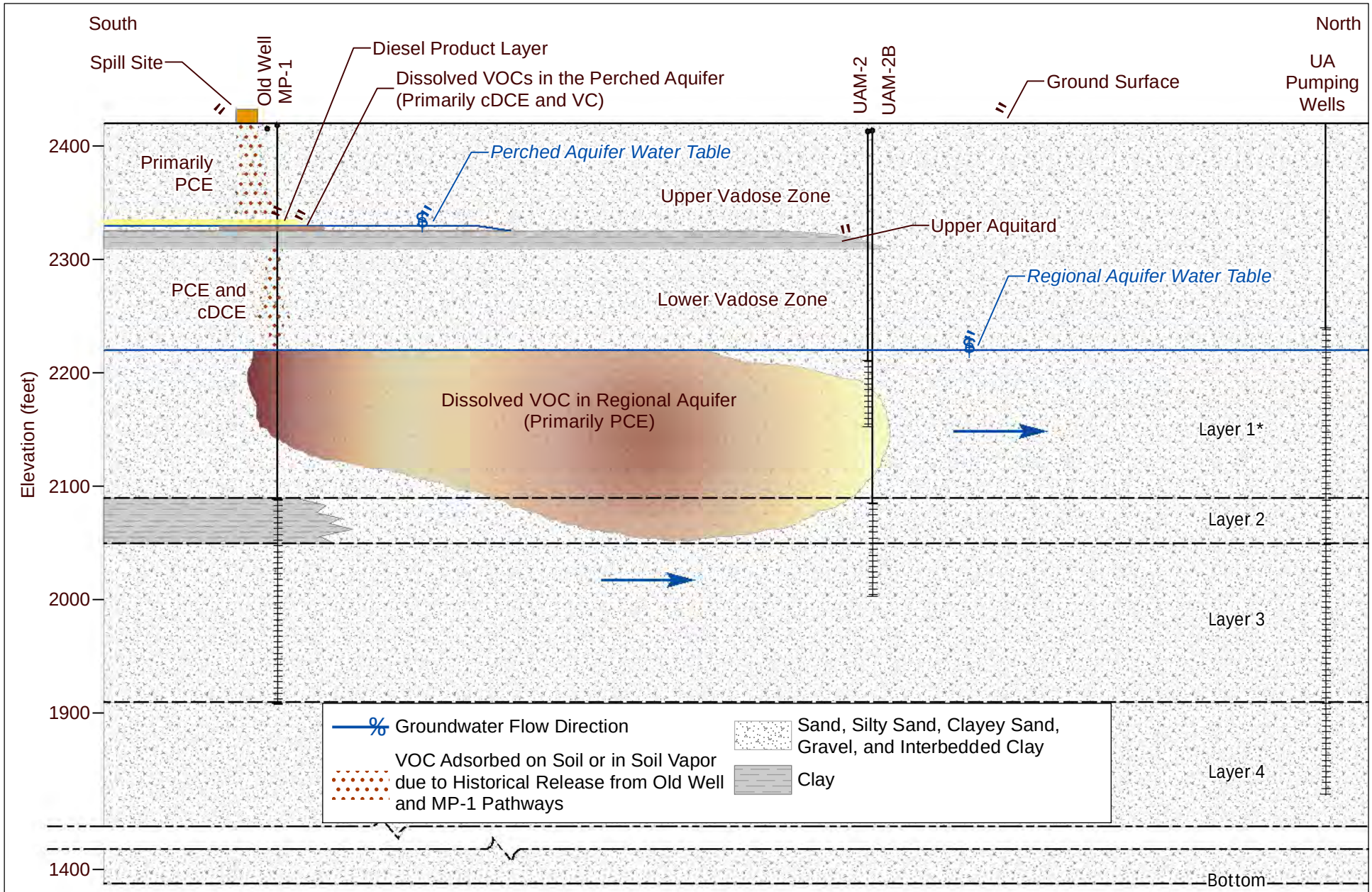
Project Name: Park-Euclid WQARF Site

Job No: 60560366

Date: May 2020

PLANT AREA WELL LOCATIONS
AND EXISTING SAMPLING PROGRAM
PARK-EUCLID WQARF SITE
301 SOUTH PARK AVENUE
TUCSON, ARIZONA

Figure 3



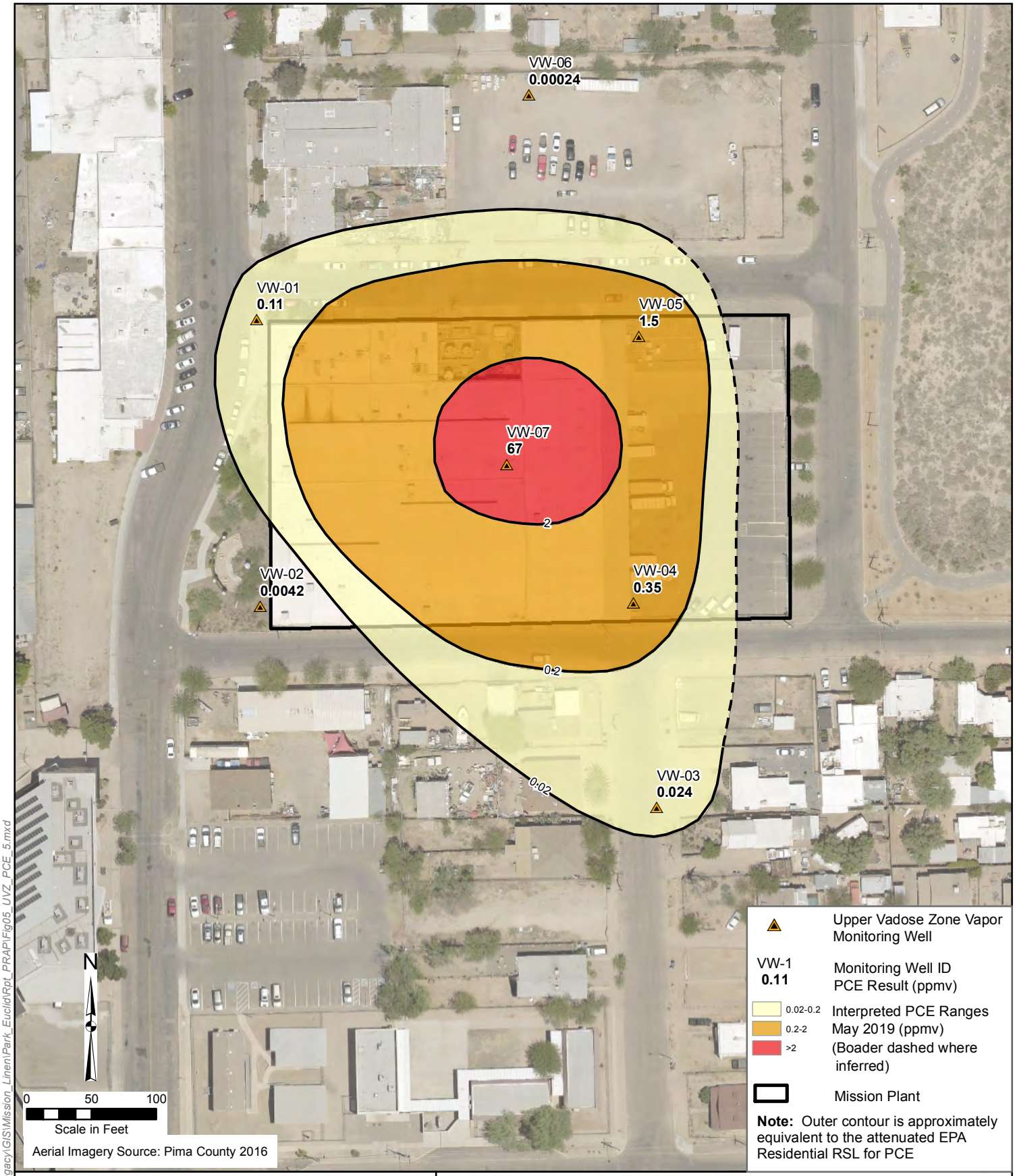
0 600 1,200

Horizontal Scale in Feet

*Layers presented are from the FS Groundwater Model

URS	Contamination Migration Conceptual Site Model
Project Name: Park-Euclid WQARF Site	
Job No: 60560366 / Date: May 2020	*Park-Euclid WQARF Site, Tucson, Arizona* **Figure 4**

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig04 Conceptual Model.mxd



M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig05_UVZ_PCE_5.mxd

URS

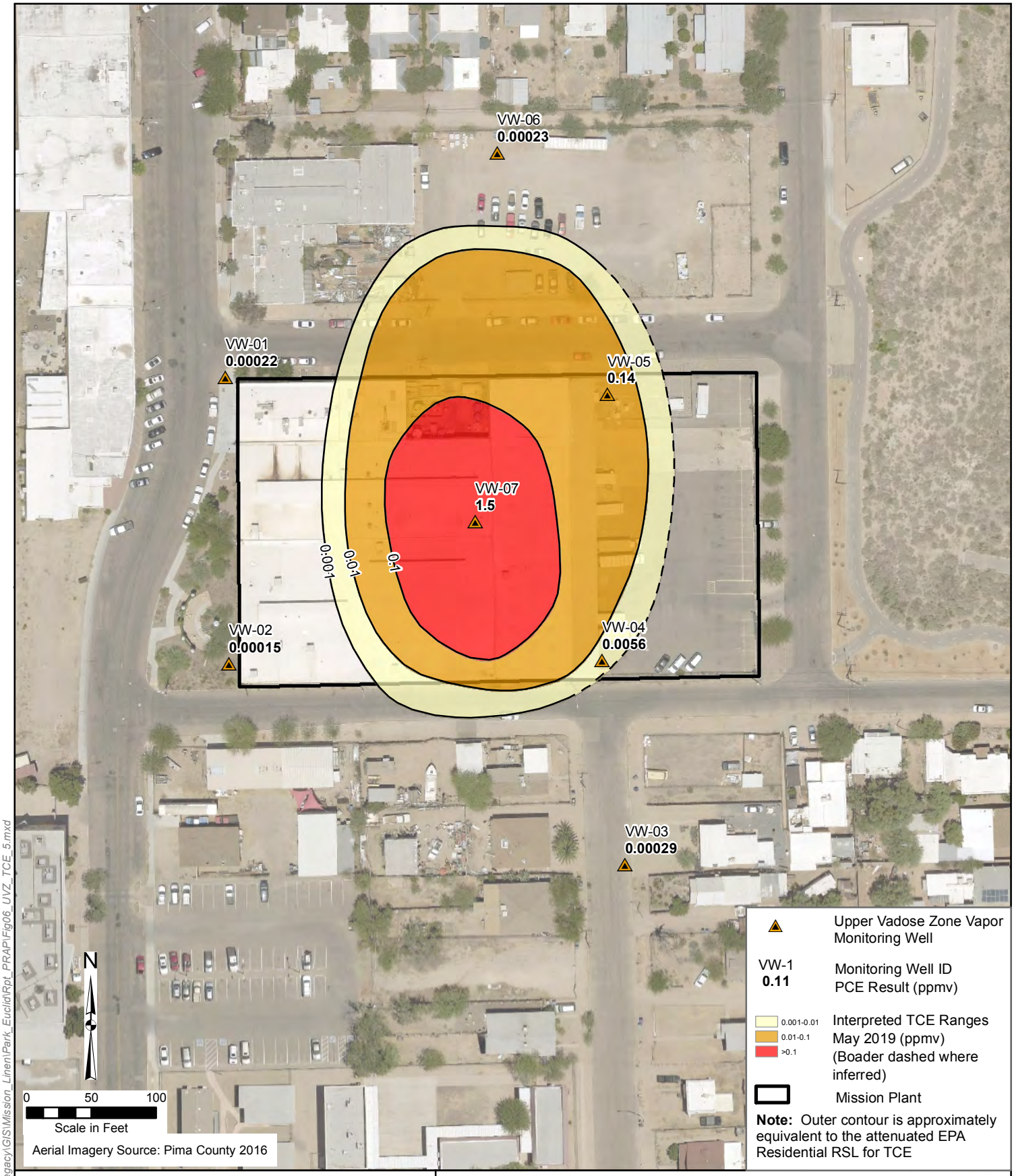
Project Name: Park-Euclid WQARF Site

Job No: 60560366

Date: May 2020

INTERPRETED DISTRIBUTION OF TETRACHLOROETHENE
UPPER VADOSE ZONE SOIL VAPOR, 5 FEET BGS
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 5



M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig06_UVZ_TCE_5.mxd

URS

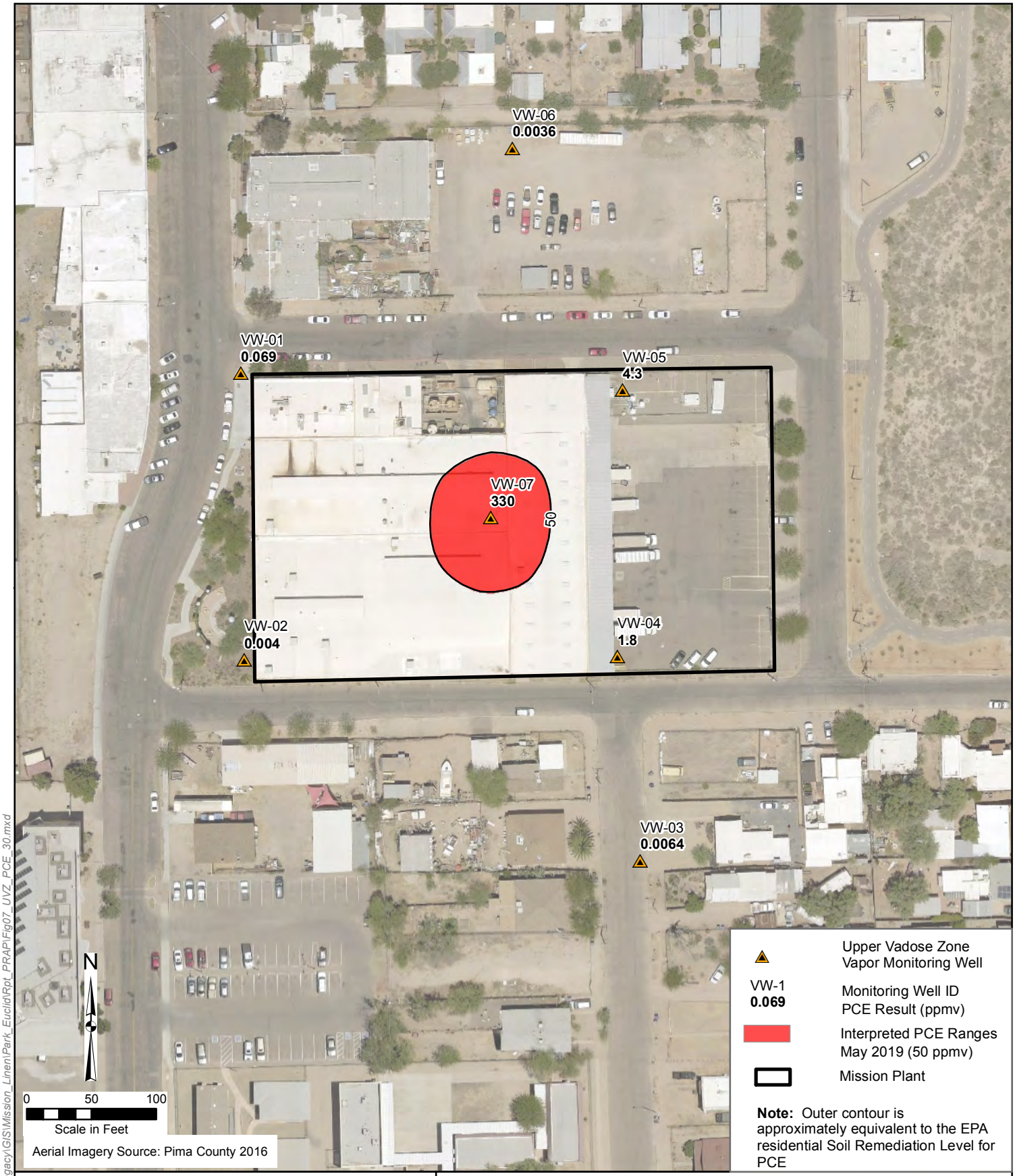
Project Name: Park-Euclid WQARF Site

Job No: 60560366

Date: May 2020

INTERPRETED DISTRIBUTION OF TRICHLOROETHENE
UPPER VADOSE ZONE SOIL VAPOR, 5 FEET BGS
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 6



URS

Project Name: Park-Euclid WQARF Site

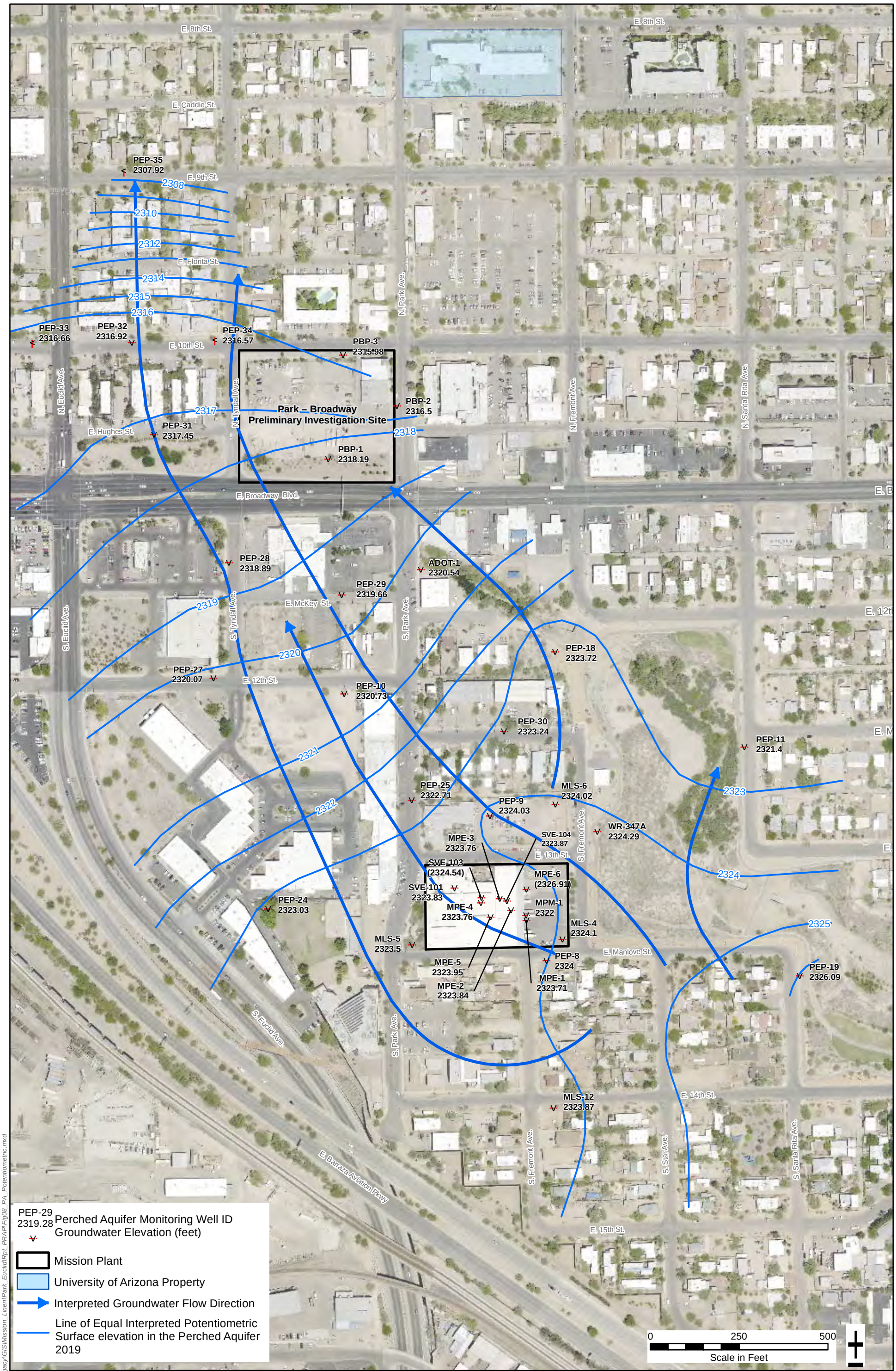
Job No: 60560366

Date: May 2020

INTERPRETED DISTRIBUTION OF TETRACHLOROETHENE
UPPER VADOSE ZONE SOIL VAPOR, 30 FEET BGS
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 7

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig07_UVZ_PCE_30.mxd



Notes:
( ) Data point omitted in developing the potentiometric surface as it is anomalous with nearby wells.

Aerial Imagery Source: Pima County, 2016

URS

Project Name: Park-Euclid WQARF Site

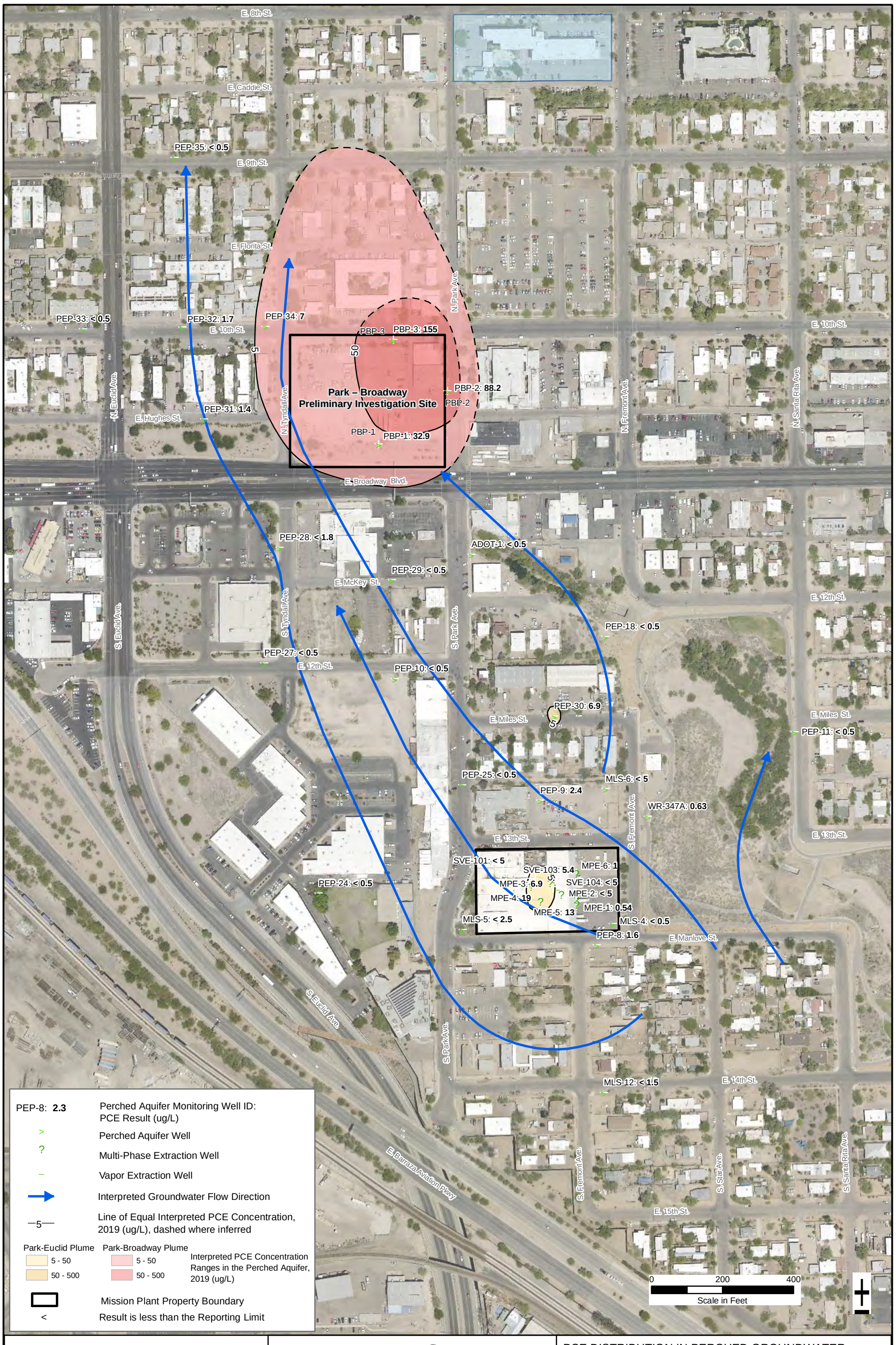
Job No: 60560366

Date: May 2020

PERCHED AQUIFER POTENTIOMETRIC MAP
2019 ANNUAL GROUNDWATER MONITORING
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 8

M:\DCS\Projects\ENVI_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig08_PA_Potentiometric.mxd



Note:
The AWQS for PCE is 5 µg/L.

Aerial Imagery Source: Pima County, 2016

URS

Project Name: Park-Euclid WQARF Site

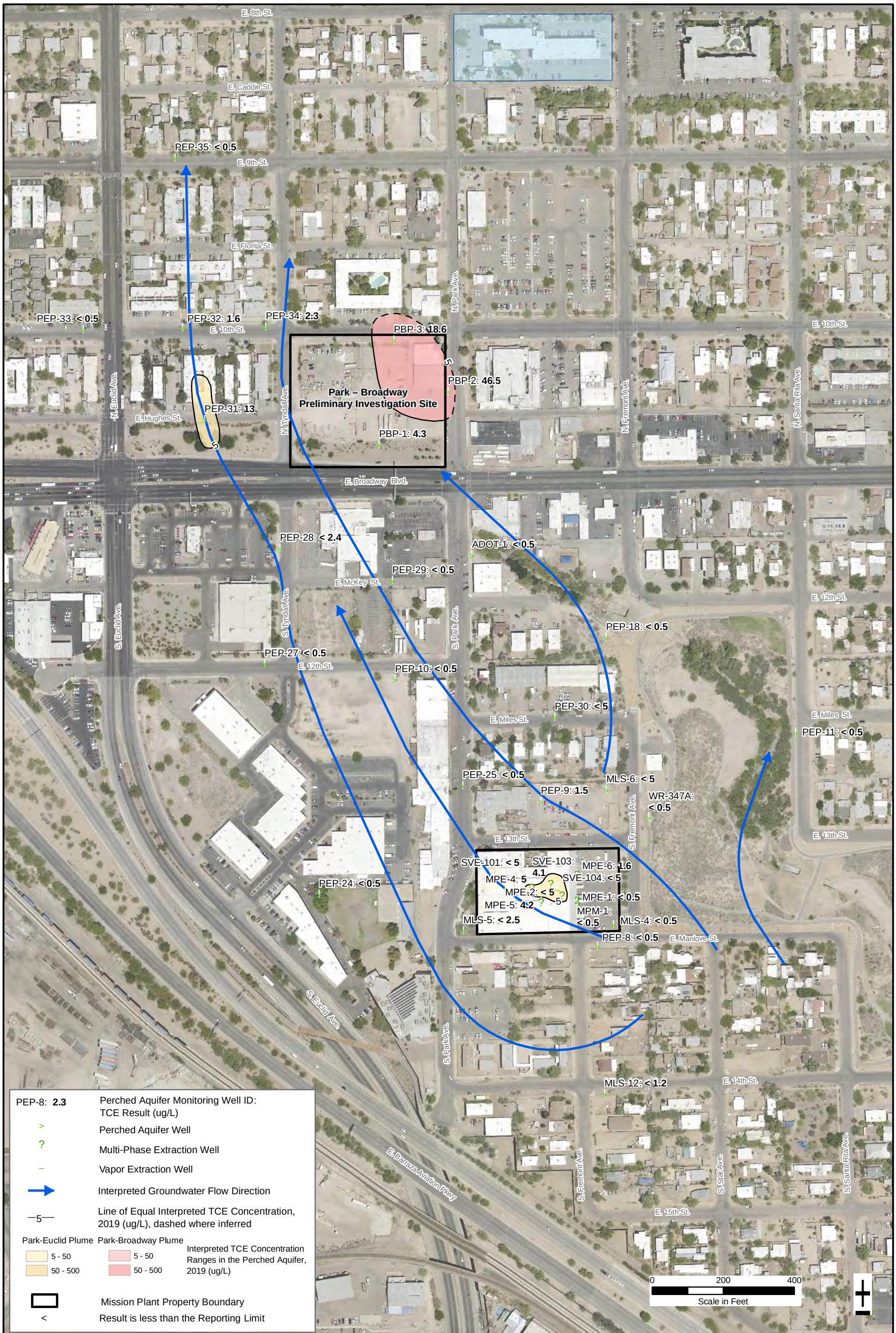
Job No: 60560366

Date: May 2020

PCE DISTRIBUTION IN PERCHED GROUNDWATER
2019 ANNUAL GROUNDWATER MONITORING
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 9

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig09_PA_PCE.mxd



Note:
The AWQS for TCE is 5 µg/L.

Aerial Imagery Source: Pima County, 2016

URS

Project Name: Park-Euclid WQARF Site

Job No: 60560366

Date: May 2020

TCE DISTRIBUTION IN PERCHED GROUNDWATER
2019 ANNUAL GROUNDWATER MONITORING
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 10

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig10_PA_TCE.mxd

Note:
The AWQS for cis-1,2-DCE is 70 µg/L.

Aerial Imagery Source: Pima County, 2016

URS

Project Name: Park-Euclid WQARF Site

Job No: 60560366 | Date: May 2020

cis-1,2-DCE DISTRIBUTION IN PERCHED GROUNDWATER
2019 ANNUAL GROUNDWATER MONITORING
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 11

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig11_PA_cis12DCE.mxd

Note:
The AWQS for VC is 2 µg/L.

Aerial Imagery Source: Pima County, 2016

URS

Project Name: Park-Euclid WQARF Site

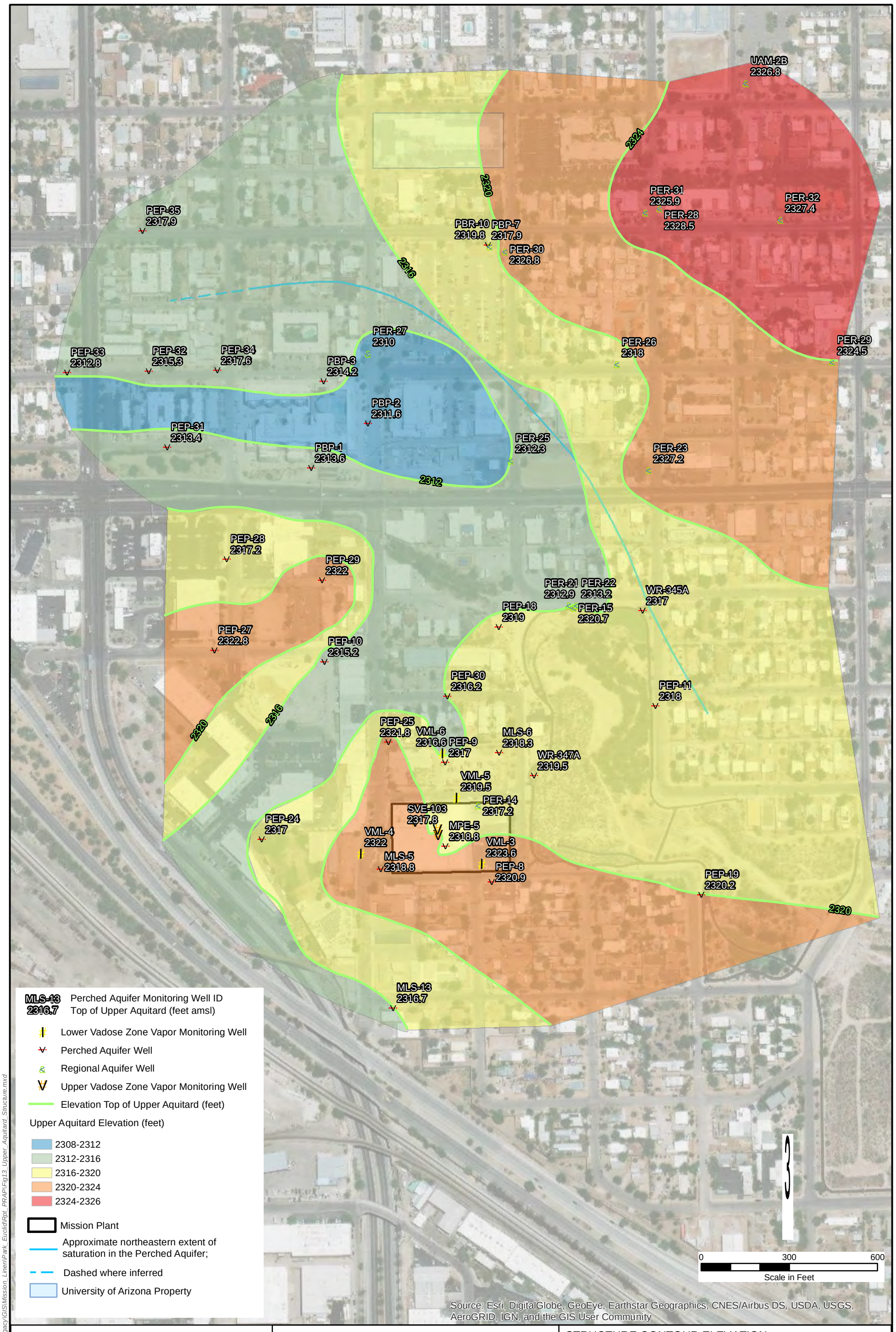
Job No: 60560366

Date: May 2020

VC DISTRIBUTION IN PERCHED GROUNDWATER
2019 ANNUAL GROUNDWATER MONITORING
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 12

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig12_PA_VC.mxd



Notes:

Scale: 1:3,600

URS

Project Name: Park-Euclid WQARF Site

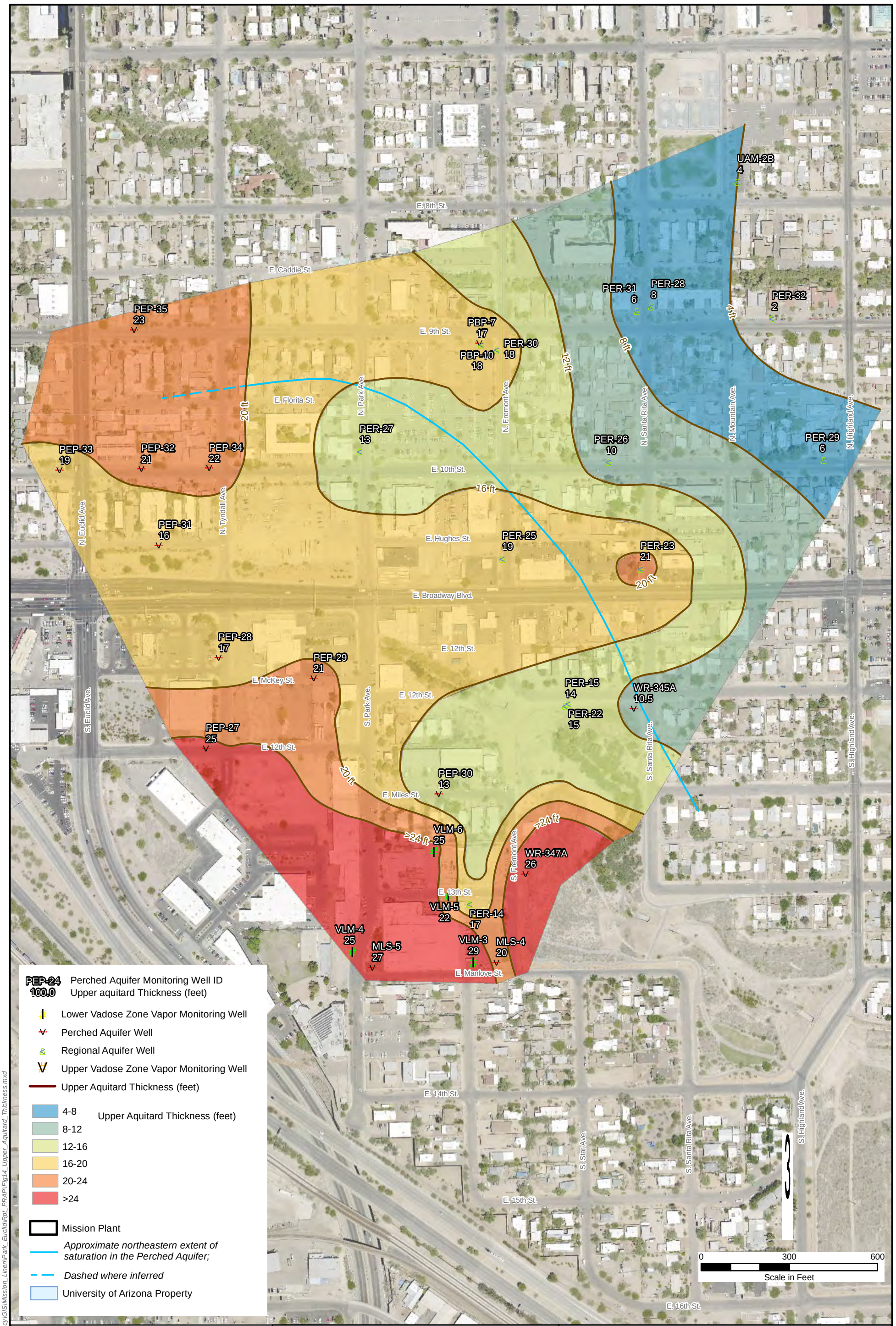
Job No: 60560366

Date: May 2020

STRUCTURE CONTOUR ELEVATION
MAP - TOP OF UPPER AQUITARD
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 13

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig13_Upper_Aquitard_Structure.mxd



Notes:

Scale: 1:3,600

NOTE: Only RA wells penetrated the PA aquitard, PA wells are posted for reference purposes.

URS

Project Name: Park-Euclid WQARF Site

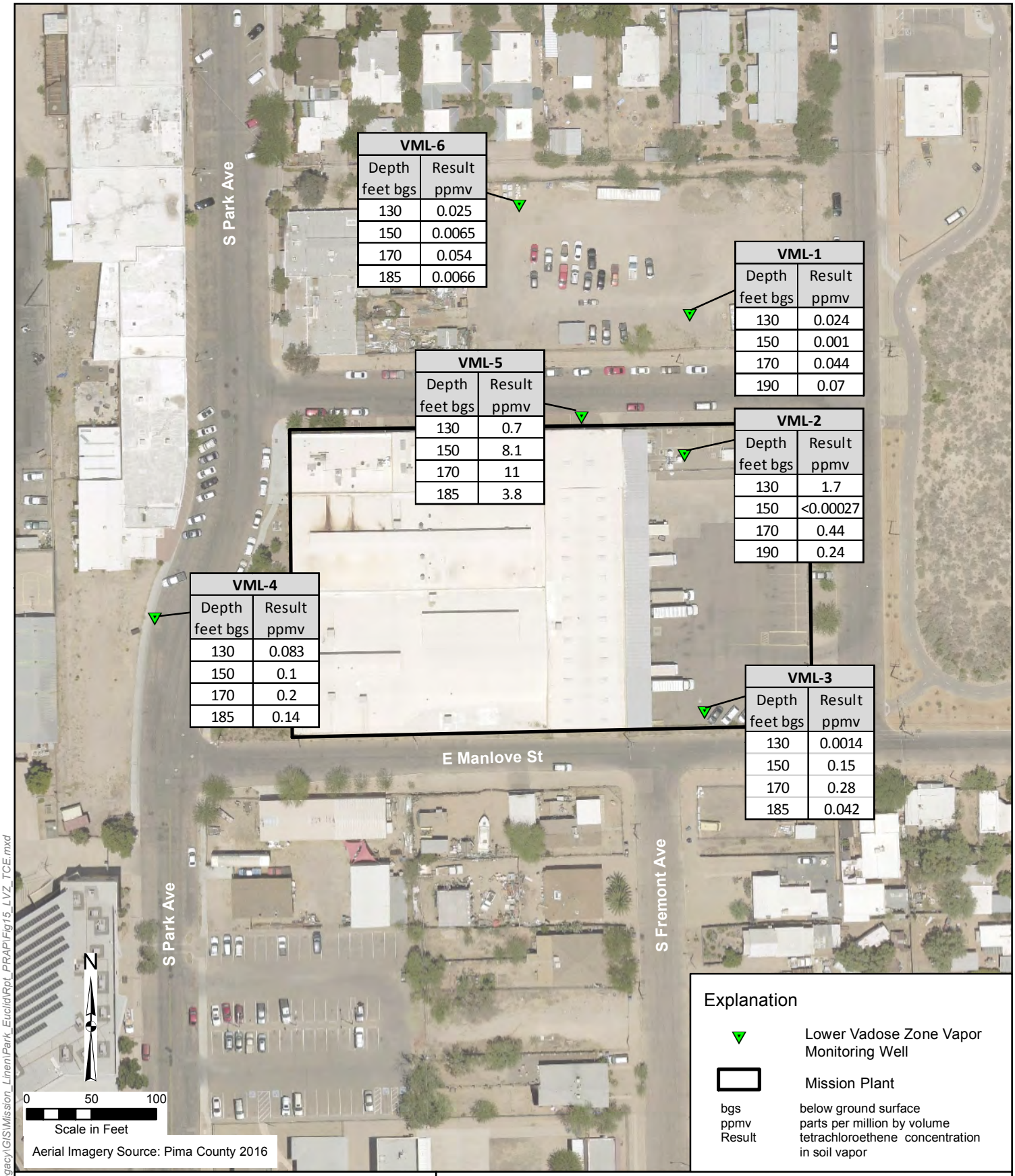
Job No: 60560366

Date: May 2020

UPPER AQUITARD THICKNESS MAP
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 14

M:\DCS\Projects\ENVI_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig14_Upper_Aquitard_Thickness.mxd



VML-6

Depth feet bgs	Result ppmv
130	0.025
150	0.0065
170	0.054
185	0.0066

VML-1

Depth feet bgs	Result ppmv
130	0.024
150	0.001
170	0.044
190	0.07

VML-5

Depth feet bgs	Result ppmv
130	0.7
150	8.1
170	11
185	3.8

VML-2

Depth feet bgs	Result ppmv
130	1.7
150	<0.00027
170	0.44
190	0.24

VML-4

Depth feet bgs	Result ppmv
130	0.083
150	0.1
170	0.2
185	0.14

VML-3

Depth feet bgs	Result ppmv
130	0.0014
150	0.15
170	0.28
185	0.042

URS

Project Name: Park-Euclid WQARF Site

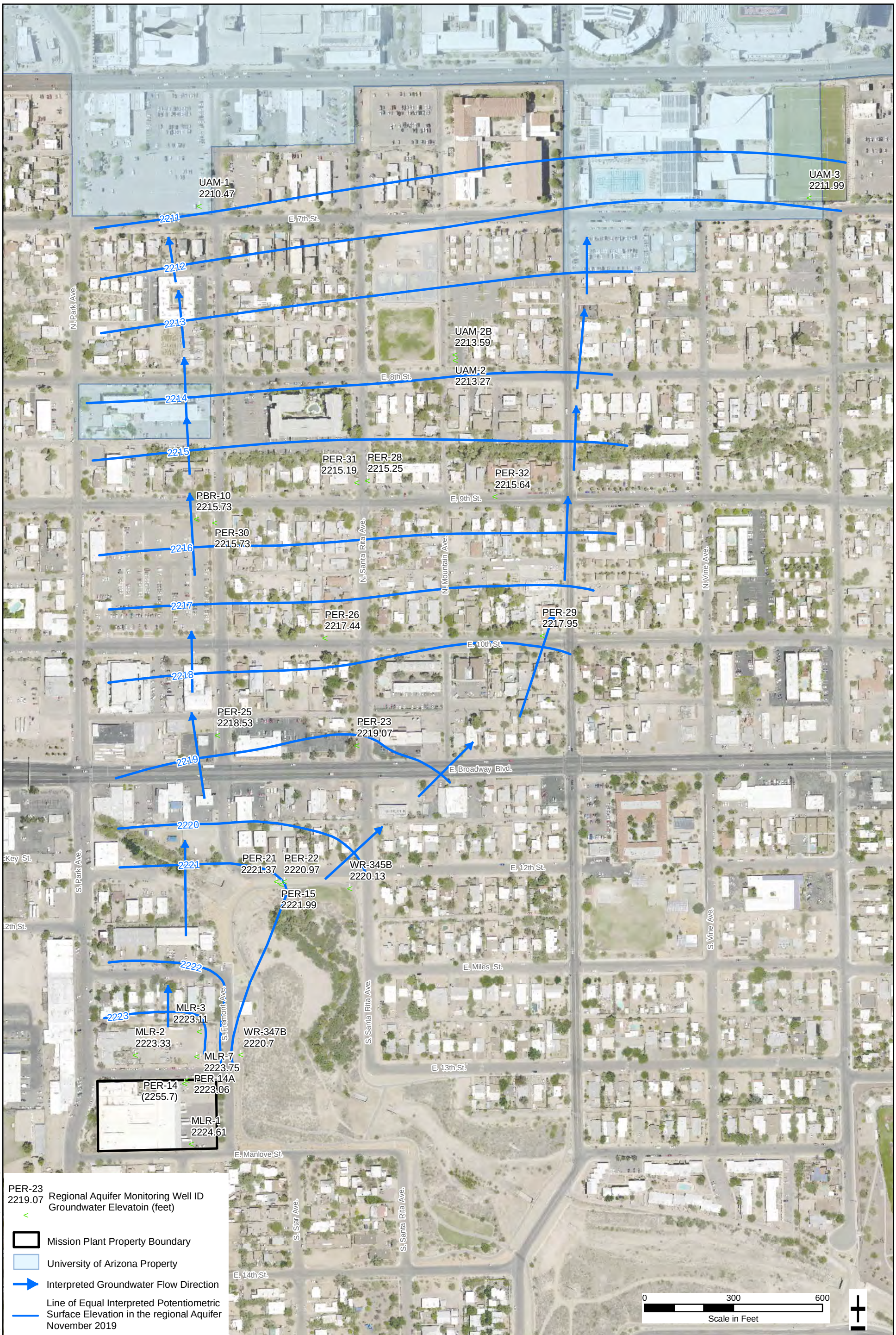
Job No: 60560366

Date: May 2020

MAY 2019 TETRACHLOROETHENE CONCENTRATIONS
LOWER VADOSE ZONE VAPOR MONITORING WELLS
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 15

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig15_LVZ_TCE.mxd



Note:
( ) Data point omitted in developing the potentiometric surface as it is anomalous with nearby wells.
+ PER-14 is screened in a deeper zone than surrounding wells.

URS

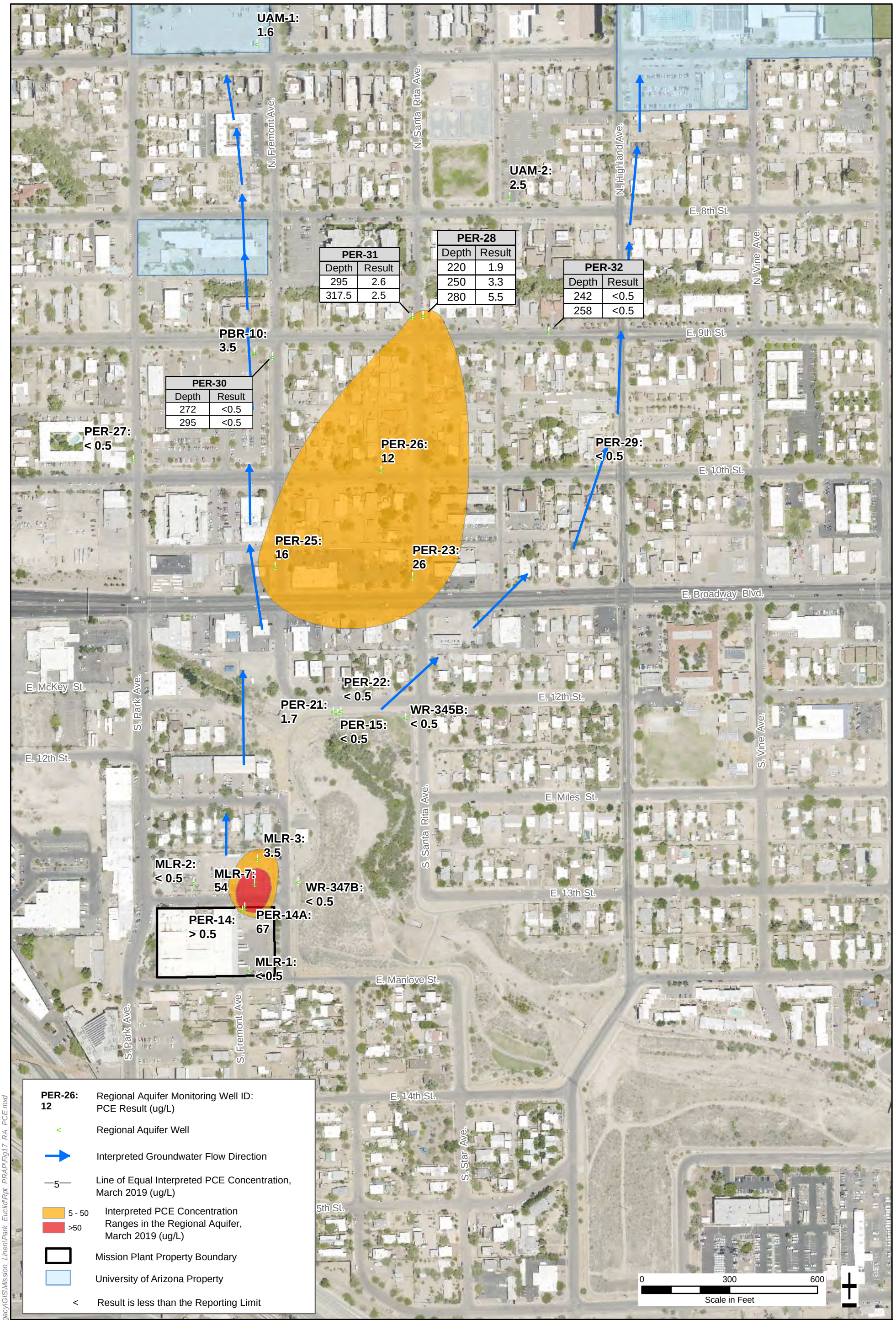
Project Name: Park-Euclid WQARF Site

Job No: 60560366 | Date: May 2020

REGIONAL AQUIFER POTENTIOMETRIC MAP
APRIL 2019
PARK-EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 16

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig16_RA_Potentiometric.mxd



Note:
The AWQS for PCE is 5 µg/L.

URS

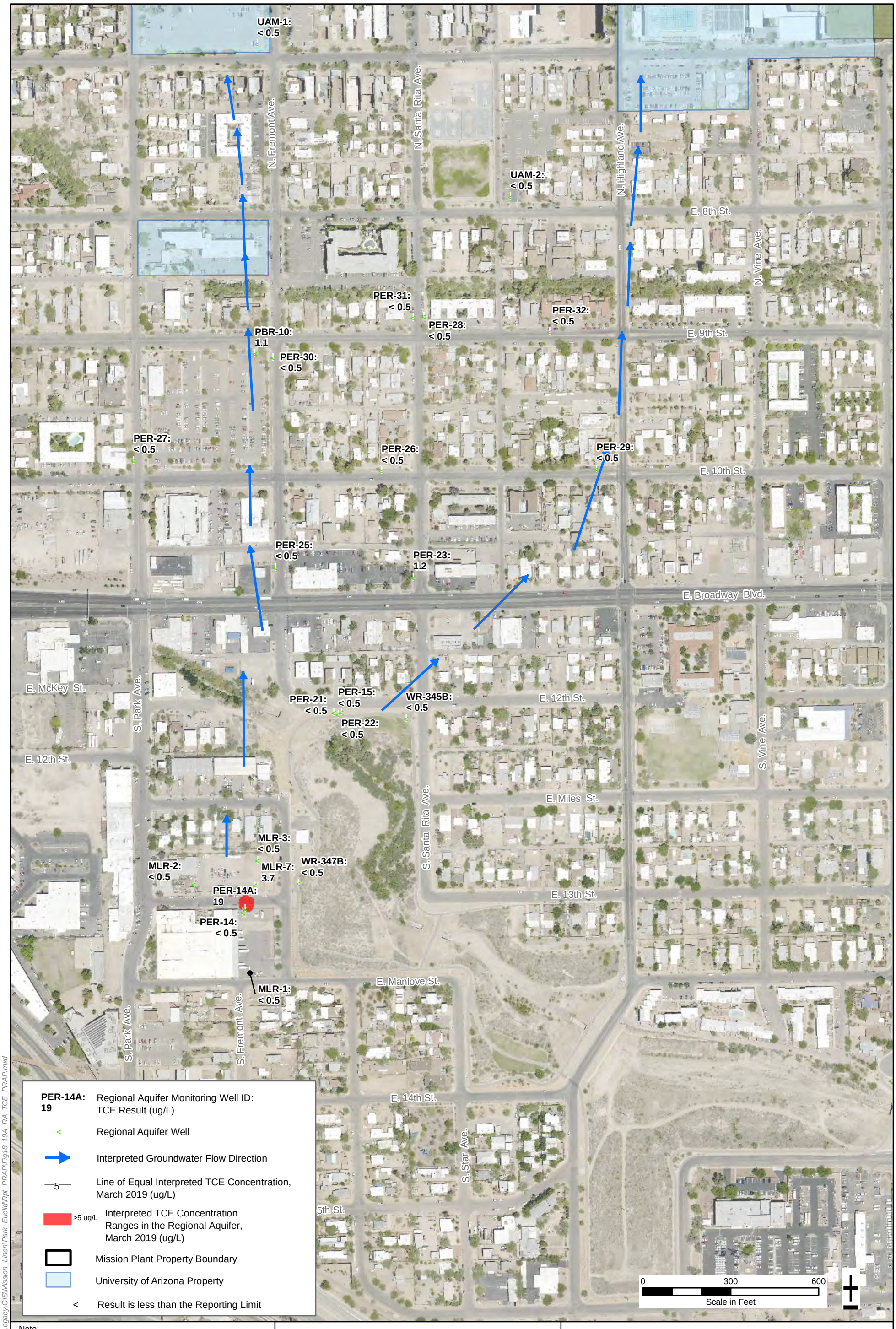
Project Name: Park-Euclid WQARF Site

Job No: 60560366 | Date: May 2020

INTERPRETED 2019 PCE DISTRIBUTION
REGIONAL AQUIFER GROUNDWATER
PARK EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 17

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig17_RA_PCE.mxd



Note:
The AWQS for TCE is 5 µg/L.

URS

Project Name: Park-Euclid WQARF Site

Job No: 60560366 | Date: May 2020

INTERPRETED DISTRIBUTION OF TRICHLOROETHENE
REGIONAL AQUIFER GROUNDWATER
PARK EUCLID WQARF SITE
TUCSON, ARIZONA

Figure 18

M:\DCS\Projects\ENV_Legacy\GIS\Mission_Linen\Park_Euclid\Rpt_PRAP\Fig18_19A_RA_TCE_PRAP.mxd

Appendix
Detailed Cost Summary

Upper Vadose Zone Remedy - PRAP Estimate

MNA for 15 years

Site:	Park Euclid WQARF Site	**Description**
Location:	Tucson, AZ	-MNA of UVZ vapor wells for 15 years, then no action
Phase:	PRAP	-Monitor 34 individual wells initially
Year 0:	2021	-Refine to 25 individual wells and reduce sampling frequency
For:	15 Years	-No further action after Year 15
Date:	5/18/2020	

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**DEUR Setup**				**$8,145**
1.01	One-Time Setup Fee	LS	$8,145	1	$8,145
2.00	**Annual DEUR Review**				**$252**
2.01	Annual ADEQ Review of DEUR Status	hr	$63	4	$252
3.00	**Vapor Monitoring & Reporting (first 5 years)**				**$39,970**
3.01	Labor and supplies to sample UVZ vapor monitoring wells	well	$500	34	$17,000
3.02	Vapor analytical - TO-15 for COCs	sample	$200	38	$7,600
3.03	Evaluation and Reporting - UVZ	LS	$10,000	1	$10,000
3.04	*Project Management Fee*	*%*		*10*	*$3,460*
3.05	*Uncertainty*	*%*		*5*	*$1,910*
4.00	**Vapor Monitoring & Reporting (5 to 15 years)**				**$31,190**
4.01	Labor and supplies to sample UVZ vapor monitoring wells	well	$500	25	$12,500
4.02	Vapor analytical - TO-15 for COCs	sample	$200	28	$5,600
4.03	Evaluation and Reporting - UVZ	LS	$8,900	1	$8,900
4.04	*Project Management Fee*	*%*		*10*	*$2,700*
4.05	*Uncertainty*	*%*		*5*	*$1,490*
5.00	**Annual CoT Access Fees**				**$600**
5.01	CoT Agreement Fee	well	$100	6	$600
6.00	**Site Closeout**				**$139,150**
6.01	Evaluation and Coordination	LS	$17,000	1	$17,000
6.02	Well Abandonment - UVZ	well	$2,000	34	$68,000
6.03	Reporting and Closeout	LS	$25,000	1	$25,000
6.04	*Project Management Fee*	*%*		*10*	*$11,000*
6.05	*Uncertainty*	*%*		*15*	*$18,150*

PROJECT COST SCHEDULE (15 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M COST
7.00	**O&M Cost**			
7.00	Vapor Monitoring and DEUR Setup	0	$48,967	$48,967
7.01	Vapor Monitoring	1	$40,822	$89,789
7.02	Vapor Monitoring	2	$40,822	$130,611
7.03	Vapor Monitoring	3	$40,822	$171,433
7.04	Vapor Monitoring	4	$40,822	$212,255
7.05	Vapor Monitoring	5	$32,042	$244,297
7.06	No action	6	$852	$245,149
7.07	Vapor Monitoring	7	$32,042	$277,191
7.08	No action	8	$852	$278,043
7.09	Vapor Monitoring	9	$32,042	$310,085
7.10	No action	10	$852	$310,937
7.11	Vapor Monitoring	11	$32,042	$342,979
7.12	No action	12	$852	$343,831
7.13	Vapor Monitoring	13	$32,042	$375,873
7.14	No action	14	$852	$376,725
7.15	Vapor Monitoring and Site Closeout	15	$171,192	$547,917
TOTAL COSTS			**$547,917**	

Upper Vadose Zone Remedy - PRAP Estimate (with contingency for additional 15 years of monitoring)

MNA for 30 years

Site:	Park Euclid WQARF Site	**Description**	
Location:	Tucson, AZ	-MNA of UVZ vapor wells for 30 years, then no action	
Phase:	PRAP	-Refine to 25 individual wells and reduce sampling frequency after 5 years	
Year 0:	2021	-Further refine to 5 individual wells at 5-feet bgs after 15 years	
For:	30 Years	-No further action after Year 30	
Date:	5/18/2020		

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**DEUR Setup**				**$8,145**
1.01	One-Time Setup Fee	LS	$8,145	1	$8,145
2.00	**Annual DEUR Review**				**$252**
2.01	Annual ADEQ Review of DEUR Status	hr	$63	4	$252
3.00	**Vapor Monitoring & Reporting (first 5 years)**				**$39,970**
3.01	Labor and supplies to sample UVZ vapor monitoring wells	well	$500	34	$17,000
3.02	Vapor analytical - TO-15 for COCs	sample	$200	38	$7,600
3.03	Evaluation and Reporting - UVZ	LS	$10,000	1	$10,000
3.04	*Project Management Fee*	*%*		*10*	*$3,460*
3.05	*Uncertainty*	*%*		*5*	*$1,910*
4.00	**Vapor Monitoring & Reporting (5 to 15 years)**				**$31,190**
4.01	Labor and supplies to sample UVZ vapor monitoring wells	well	$500	25	$12,500
4.02	Vapor analytical - TO-15 for COCs	sample	$200	28	$5,600
4.03	Evaluation and Reporting - UVZ	LS	$8,900	1	$8,900
4.04	*Project Management Fee*	*%*		*10*	*$2,700*
4.05	*Uncertainty*	*%*		*5*	*$1,490*
5.00	**Vapor Monitoring & Reporting (15 to 30 years)**				**$6,820**
5.01	Labor and supplies to sample UVZ vapor monitoring wells	well	$500	5	$2,500
5.02	Vapor analytical - TO-15 for COCs	sample	$200	6	$1,200
5.03	Evaluation and Reporting - UVZ	LS	$2,200	1	$2,200
5.04	*Project Management Fee*	*%*		*10*	*$590*
5.05	*Uncertainty*	*%*		*5*	*$330*
6.00	**Annual CoT Access Fee (0 to 15 years)**				**$600**
6.01	CoT Agreement Fee	well	$100	6	$600
7.00	**Annual CoT Access Fee (15 to 30 years)**				**$200**
7.01	CoT Agreement Fee	well	$100	2	$200
8.00	**Site Closeout**				**$139,150**
8.01	Evaluation and Coordination	LS	$17,000	1	$17,000
8.02	Well Abandonment - UVZ	well	$2,000	34	$68,000
8.03	Reporting and Closeout	LS	$25,000	1	$25,000
8.04	*Project Management Fee*	*%*		*10*	*$11,000*
8.05	*Uncertainty*	*%*		*15*	*$18,150*

PROJECT COST SCHEDULE (30 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M
9.00	**O&M Cost**			
9.00	Vapor Monitoring and DEUR Setup	0	$48,967	$48,967
9.01	Vapor Monitoring	1	$40,822	$89,789
9.02	Vapor Monitoring	2	$40,822	$130,611
9.03	Vapor Monitoring	3	$40,822	$171,433
9.04	Vapor Monitoring	4	$40,822	$212,255
9.05	Vapor Monitoring	5	$32,042	$244,297
9.06	No action	6	$852	$245,149
9.07	Vapor Monitoring	7	$32,042	$277,191
9.08	No action	8	$852	$278,043
9.09	Vapor Monitoring	9	$32,042	$310,085
9.10	No action	10	$852	$310,937
9.11	Vapor Monitoring	11	$32,042	$342,979
9.12	No action	12	$852	$343,831
9.13	Vapor Monitoring	13	$32,042	$375,873
9.14	No action	14	$852	$376,725
9.15	Vapor Monitoring	15	$32,042	$408,767
9.16	No action	16	$452	$409,219
9.17	Vapor Monitoring	17	$7,272	$416,491
9.18	No action	18	$452	$416,943
9.19	Vapor Monitoring	19	$7,272	$424,215
9.20	No action	20	$452	$424,667
9.21	Vapor Monitoring	21	$7,272	$431,939
9.22	No action	22	$452	$432,391
9.23	Vapor Monitoring	23	$7,272	$439,663
9.24	No action	24	$452	$440,115
9.25	Vapor Monitoring	25	$7,272	$447,387
9.26	No action	26	$452	$447,839
9.27	Vapor Monitoring	27	$7,272	$455,111
9.28	No action	28	$452	$455,563
9.29	Vapor Monitoring	29	$7,272	$462,835
9.30	Vapor Monitoring and Site Closeout	30	$146,422	$609,257
TOTAL COSTS			**$609,257**	

Perched Aquifer Remedy - PRAP Estimate

MNA for 30 years

Site:	Park Euclid WQARF Site	**Description**
Location:	Tucson, AZ	-MNA of PA wells for 30 years
Phase:	PRAP	-Monitor 34 individual wells annually
Year 0:	2021	-Refine network to 20 wells and reduce sampling frequency to biennial in year 5
For:	30 Years	-Reduce sampling frequency to every 5 years in year 15
Date:	5/18/2020	-No further action after Year 30

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**Plume Monitoring & Reporting (first 5 years)**				**$36,370**
1.01	Labor and supplies to sample PA groundwater monitoring wells	well	$500	34	$17,000
1.02	Groundwater analytical - 8260B for COCs	sample	$65	38	$2,470
1.03	Groundwater analytical - RSK-175	sample	$85	6	$510
1.04	Evaluation and Reporting - PA	LS	$11,500	1	$11,500
1.05	*Project Management Fee*	*%*		*10*	*$3,150*
1.06	*Uncertainty*	*%*		*5*	*$1,740*
2.00	**Plume Monitoring & Reporting (5 to 30 years)**				**$23,070**
2.01	Labor and supplies to sample PA groundwater monitoring wells	well	$500	20	$10,000
2.02	Groundwater analytical - 8260B for COCs	sample	$65	22	$1,430
2.03	Groundwater analytical - RSK-175	sample	$85	4	$340
2.04	Evaluation and Reporting - PA	LS	$8,200	1	$8,200
2.05	*Project Management Fee*	*%*		*10*	*$2,000*
2.06	*Uncertainty*	*%*		*5*	*$1,100*
3.00	**Adiministrative Controls**				**$12,650**
3.01	Develop administrative controls	LS	$10,000	1	$10,000
3.02	*Project Management Fee*	*%*		*10*	*$1,000*
3.03	*Uncertainty*	*%*		*15*	*$1,650*
4.00	**Annual CoT Access Fees**				**$2,000**
4.01	CoT Agreement Fee	well	$100	20	$2,000
5.00	**Site Closeout**				**$306,130**
5.01	Evaluation and Coordination	LS	$17,000	1	$17,000
5.02	Well Abandonment - PA	well	$6,250	32	$200,000
5.03	Reporting and Closeout	LS	$25,000	1	$25,000
5.04	*Project Management Fee*	*%*		*10*	*$24,200*
5.05	*Uncertainty*	*%*		*15*	*$39,930*

PROJECT COST SCHEDULE (30 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M COST
6.00	**O&M Cost**			
6.00	Plume Monitoring + Administrative Controls	0	$51,020	$51,020
6.01	Plume Monitoring	1	$38,370	$89,390
6.02	Plume Monitoring	2	$38,370	$127,760
6.03	Plume Monitoring	3	$38,370	$166,130
6.04	Plume Monitoring	4	$38,370	$204,500
6.05	Plume Monitoring	5	$25,070	$229,570
6.06	No action	6	$2,000	$231,570
6.07	Plume Monitoring	7	$25,070	$256,640
6.08	No action	8	$2,000	$258,640
6.09	Plume Monitoring	9	$25,070	$283,710
6.10	No action	10	$2,000	$285,710
6.11	Plume Monitoring	11	$25,070	$310,780
6.12	No action	12	$2,000	$312,780
6.13	Plume Monitoring	13	$25,070	$337,850
6.14	No action	14	$2,000	$339,850
6.15	Plume Monitoring	15	$25,070	$364,920
6.16	No action	16	$2,000	$366,920
6.17	No action	17	$2,000	$368,920
6.18	No action	18	$2,000	$370,920
6.19	No action	19	$2,000	$372,920
6.20	Plume Monitoring	20	$25,070	$397,990
6.21	No action	21	$2,000	$399,990
6.22	No action	22	$2,000	$401,990
6.23	No action	23	$2,000	$403,990
6.24	No action	24	$2,000	$405,990
6.25	Plume Monitoring	25	$25,070	$431,060
6.26	No action	26	$2,000	$433,060
6.27	No action	27	$2,000	$435,060
6.28	No action	28	$2,000	$437,060
6.29	No action	29	$2,000	$439,060
6.30	Plume Monitoring and Site Closeout	30	$331,200	$770,260
TOTAL COSTS			**$770,260**	

Lower Vadose Zone Remedy - PRAP Estimate

SVE for 3 Years with Annual Rebound Monitoring

Site:	Park Euclid WQARF Site	**Description**
Location:	Tucson, AZ	
Phase:	PRAP	-12-month SVE with CatOx for 3 years from PER-14A and VEL-3
Year 0:	2021	-Two month rebound period after each year of operation followed by annual sampling
For:	8 Years	-Annual monitoring of LVZ vapor wells post-SVE operation to assess rebound for 5 years
Date:	5/18/2020	-No further action after Year 7

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**Annual Continuous SVE Operation (Years 0 to 2)**				**$154,120**
1.01	Maintenance and Monitoring	qtr	$9,500	4	$38,000
1.02	Electrical (Blower)	mon	$200	12	$2,400
1.03	Electrical (CatOx)	mon	$2,440	12	$29,280
1.04	O&M Labor - monthly	mon	$4,360	12	$52,320
1.05	Vapor Sampling - monthly	mon	$450	12	$5,400
1.06	*Project Management Fee*	*%*		*8*	*$10,200*
1.07	*Uncertainty*	*%*		*12*	*$16,520*
2.00	**Periodic Operational Costs**				**$26,020**
2.01	Air Permit Fee to PDEQ	yr	$4,500	1	$4,500
2.02	Catalyst Replacement	EA	$20,000	1	$20,000
2.03	*Project Management Fee*	*%*		*5*	*$1,230*
2.04	*Uncertainty*	*%*		*5*	*$290*
3.00	**Performance and Rebound Vapor Monitoring & Reporting (Years 0 to 7)**				**$40,900**
3.01	Labor and supplies to sample LVZ vapor monitoring wells	well	$500	26	$13,000
3.02	Vapor analytical - TO-15 for COCs	sample	$200	29	$5,800
3.03	Evaluation and Reporting - LVZ	LS	$15,000	1	$15,000
3.04	*Project Management Fee*	*%*		*10*	*$3,380*
3.05	*Uncertainty*	*%*		*10*	*$3,720*
4.00	**Annual CoT Access Fees**				**$200**
4.01	CoT Agreement Fee	well	$100	2	$200
5.00	**Site Closeout**				**$163,820**
5.01	Evaluation and Coordination	LS	$17,000	1	$17,000
5.02	Well Abandonment - LVZ	cluster	$12,500	7	$87,500
5.03	Reporting and Closeout	LS	$25,000	1	$25,000
5.04	*Project Management Fee*	*%*		*10*	*$12,950*
5.05	*Uncertainty*	*%*		*15*	*$21,370*

PROJECT COST SCHEDULE (8 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M COST
6.00	**O&M Cost**			
6.00	Operate SVE & Vapor Monitoring	0	$236,120	$236,120
6.01	Operate SVE & Vapor Monitoring	1	$236,120	$472,240
6.02	Operate SVE & Vapor Monitoring (with periodic cost)	2	$262,140	$734,380
6.03	Rebound Vapor Monitoring	3	$41,100	$775,480
6.04	Rebound Vapor Monitoring	4	$41,100	$816,580
6.05	Rebound Vapor Monitoring	5	$41,100	$857,680
6.06	Rebound Vapor Monitoring	6	$41,100	$898,780
6.07	Rebound Vapor Monitoring and Site Closeout	7	$204,920	$1,103,700
TOTAL COSTS			**$1,103,700**	

Lower Vadose Zone Remedy - PRAP Estimate (With Contingency Additional SVE Well and Additional 2 Years Operation)

SVE for 5 Years with Annual Rebound Monitoring

Site:	Park Euclid WQARF Site	**Description**
Location:	Tucson, AZ	-Installation of a new extraction well and connect to the treatment system
Phase:	PRAP	-12-month SVE with CatOx for 5 years from PER-14A, VEL-3, and new exraction well
Year 0:	2021	-Two month rebound period after each year of operation followed by annual sampling
For:	10 Years	-Annual monitoring of LVZ vapor wells post-SVE operation to assess rebound for 5 years
Date:	5/18/2020	-No further action after Year 9

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**Enhance SVE - Additional Extraction Well - Capital Costs**				**$105,890**
1.01	Install and Hookup Additional SVE Well	well	$71,200	1	$71,200
1.02	Installation Oversight, Sampling, & Reporting	well	$11,000	1	$11,000
1.03	*Project Management Fee*	*%*		*12*	*$9,870*
1.04	*Uncertainty*	*%*		*15*	*$13,820*
2.00	**Annual Continuous SVE Operation (Years 0 to 4)**				**$154,120**
2.01	Maintenance and Monitoring	qtr	$9,500	4	$38,000
2.02	Electrical (Blower)	mon	$200	12	$2,400
2.03	Electrical (CatOx)	mon	$2,440	12	$29,280
2.04	O&M Labor - monthly	mon	$4,360	12	$52,320
2.05	Vapor Sampling - monthly	mon	$450	12	$5,400
2.06	*Project Management Fee*	*%*		*8*	*$10,200*
2.07	*Uncertainty*	*%*		*12*	*$16,520*
3.00	**Periodic Operational Costs**				**$26,020**
3.01	Air Permit Fee to PDEQ	yr	$4,500	1	$4,500
3.02	Catalyst Replacement	EA	$20,000	1	$20,000
3.03	*Project Management Fee*	*%*		*5*	*$1,230*
3.04	*Uncertainty*	*%*		*5*	*$290*
4.00	**Performance and Rebound Vapor Monitoring & Reporting (Years 0 to 9)**				**$40,900**
4.01	Labor and supplies to sample LVZ vapor monitoring wells	well	$500	26	$13,000
4.02	Vapor analytical - TO-15 for COCs	sample	$200	29	$5,800
4.03	Evaluation and Reporting - LVZ	LS	$15,000	1	$15,000
4.04	*Project Management Fee*	*%*		*10*	*$3,380*
4.05	*Uncertainty*	*%*		*10*	*$3,720*
5.00	**Annual CoT Access Fees**				**$300**
5.01	CoT Agreement Fee	well	$100	3	$300
6.00	**Site Closeout**				**$179,630**
6.01	Evaluation and Coordination	LS	$17,000	1	$17,000
6.02	Well Abandonment - LVZ	cluster	$12,500	8	$100,000
6.03	Reporting and Closeout	LS	$25,000	1	$25,000
6.04	*Project Management Fee*	*%*		*10*	*$14,200*
6.05	*Uncertainty*	*%*		*15*	*$23,430*

PROJECT COST SCHEDULE (10 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M COST
7.00	**O&M Cost**			
7.00	Operate SVE, Vapor Monitoring, and Install Well	0	$342,110	$342,110
7.01	Operate SVE & Vapor Monitoring	1	$236,220	$578,330
7.02	Operate SVE & Vapor Monitoring (with periodic cost)	2	$262,240	$840,570
7.03	Operate SVE & Vapor Monitoring	3	$236,220	$1,076,790
7.04	Operate SVE & Vapor Monitoring	4	$236,220	$1,313,010
7.05	Rebound Vapor Monitoring	5	$41,200	$1,354,210
7.06	Rebound Vapor Monitoring	6	$41,200	$1,395,410
7.07	Rebound Vapor Monitoring	7	$41,200	$1,436,610
7.08	Rebound Vapor Monitoring	8	$41,200	$1,477,810
7.09	Rebound Vapor Monitoring & Site Closeout	9	$220,830	$1,698,640
TOTAL COSTS			**$1,698,640**	

Regional Aquifer Remedy - PRAP Estimate

MNA for 30 years

Site: Park Euclid WQARF Site
Location: Tucson, AZ
Phase: PRAP
Year 0: 2021
For: 30 Years
Date: 5/18/2020

Description
-MNA at approximately 25 RA groundwater wells for 30 years
-Abandoment of 2 existing wells and installation of 2 new wells at year 10
-No further action after Year 30

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**Plume Monitoring & Reporting (biennial)**				**$42,540**
1.01	Labor and supplies to sample RA monitoring wells	well	$600	25	$15,000
1.02	Groundwater analytical - 8260B for COCs	sample	$65	28	$1,820
1.03	Evaluation and Reporting - RA	LS	$20,000	1	$20,000
1.04	*Project Management Fee*	*%*		*10*	*$3,690*
1.05	*Uncertainty*	*%*		*5*	*$2,030*
2.00	**Plume Monitoring & Evaluation (off year)**				**$3,810**
2.01	Labor and supplies to sample RA monitoring wells	LS	$600	4	$2,400
2.02	Groundwater analytical - 8260B for COCs	LS	$65	6	$390
2.03	Evaluation and Reporting	LS	$500	1	$500
2.04	*Project Management Fee*	*%*		*10*	*$330*
2.05	*Uncertainty*	*%*		*5*	*$190*
3.00	**Episodic Monitoring Well Installation & Abandonment**				**$246,710**
3.01	Work Plan & Coordination - RA	LS	$25,000	1	$25,000
3.02	Drilling and Installation Services - RA	well	$68,000	2	$136,000
3.03	Oversight, Development, & Reporting - RA	well	$13,800	2	$27,600
3.04	Well Abandonment - RA	well	$12,500	2	$25,000
3.05	*Project Management Fee*	*%*		*10*	*$21,360*
3.06	*Uncertainty*	*%*		*5*	*$11,750*
4.00	**Annual CoT Access Fees**				**$1,400**
4.01	CoT Agreement Fee	well	$100	14	$1,400
5.00	**Site Closeout**				**$401,010**
5.01	Evaluation and Coordination	LS	$17,000	1	$17,000
5.02	Well Abandonment - RA	well	$12,500	22	$275,000
5.03	Reporting and Closeout	LS	$25,000	1	$25,000
5.04	*Project Management Fee*	*%*		*10*	*$31,700*
5.05	*Uncertainty*	*%*		*15*	*$52,310*

PROJECT COST SCHEDULE (30 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M COST
6.00	**O&M Cost**			
6.00	Plume Monitoring	0	$43,940	$43,940
6.01	Sentinel Well Monitoring	1	$5,210	$49,150
6.02	Plume Monitoring	2	$43,940	$93,090
6.03	Sentinel Well Monitoring	3	$5,210	$98,300
6.04	Plume Monitoring	4	$43,940	$142,240
6.05	Sentinel Well Monitoring	5	$5,210	$147,450
6.06	Plume Monitoring	6	$43,940	$191,390
6.07	Sentinel Well Monitoring	7	$5,210	$196,600
6.08	Plume Monitoring	8	$43,940	$240,540
6.09	Sentinel Well Monitoring	9	$5,210	$245,750
6.10	Plume Monitoring & Install Wells	10	$290,650	$536,400
6.11	Sentinel Well Monitoring	11	$5,210	$541,610
6.12	Plume Monitoring	12	$43,940	$585,550
6.13	Sentinel Well Monitoring	13	$5,210	$590,760
6.14	Plume Monitoring	14	$43,940	$634,700
6.15	Sentinel Well Monitoring	15	$5,210	$639,910
6.16	Plume Monitoring	16	$43,940	$683,850
6.17	Sentinel Well Monitoring	17	$5,210	$689,060
6.18	Plume Monitoring	18	$43,940	$733,000
6.19	Sentinel Well Monitoring	19	$5,210	$738,210
6.20	Plume Monitoring	20	$43,940	$782,150
6.21	Sentinel Well Monitoring	21	$5,210	$787,360
6.22	Plume Monitoring	22	$43,940	$831,300
6.23	Sentinel Well Monitoring	23	$5,210	$836,510
6.24	Plume Monitoring	24	$43,940	$880,450
6.25	Sentinel Well Monitoring	25	$5,210	$885,660
6.26	Plume Monitoring	26	$43,940	$929,600
6.27	Sentinel Well Monitoring	27	$5,210	$934,810
6.28	Plume Monitoring	28	$43,940	$978,750
6.29	Sentinel Well Monitoring	29	$5,210	$983,960
6.30	Plume Monitoring and Closeout	30	$444,950	$1,428,910
TOTAL COSTS			**$1,428,910**	

Regional Aquifer Remedy - PRAP Estimate (with 10-year Well Head Treatment Contingency)
MNA for 30 years with Well Head Treatment

Site: Park Euclid WQARF Site
Location Tucson, AZ
Phase: PRAP
Year 0: 2021
For: 30 Years
Date: 5/18/2020

Description
-MNA at approximately 25 RA groundwater wells for 30 years
-Abandoment of 2 existing wells and installation of 2 new wells at year 10
-Wellhead treatment at one production well for 10 years from Year 11 to Year 21
-No further action after Year 30

ALTERNATIVE COMPONENTS:

Item No.	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL (ROUNDED)
1.00	**Plume Monitoring & Reporting (biennial)**				**$42,540**
1.01	Labor and supplies to sample RA monitoring wells	well	$600	25	$15,000
1.02	Groundwater analytical - 8260B for COCs	sample	$65	28	$1,820
1.03	Evaluation and Reporting - RA	LS	$20,000	1	$20,000
1.04	*Project Management Fee*	%		*10*	*$3,690*
1.05	*Uncertainty*	%		*5*	*$2,030*
2.00	**Plume Monitoring & Evaluation (off year)**				**$3,810**
2.01	Labor and supplies to sample RA monitoring wells	LS	$600	4	$2,400
2.02	Groundwater analytical - 8260B for COCs	LS	$65	6	$390
2.03	Evaluation and Reporting	LS	$500	1	$500
2.04	*Project Management Fee*	%		*10*	*$330*
2.05	*Uncertainty*	%		*5*	*$190*
3.00	**Episodic Monitoring Well Installation & Abandonment**				**$246,710**
3.01	Work Plan & Coordination - RA	LS	$25,000	1	$25,000
3.02	Drilling and Installation Services - RA	well	$68,000	2	$136,000
3.03	Oversight, Development, & Reporting - RA	well	$13,800	2	$27,600
3.04	Well Abandonment - RA	well	$12,500	2	$25,000
3.05	*Project Management Fee*	%		*10*	*$21,360*
3.06	*Uncertainty*	%		*5*	*$11,750*
4.00	**Wellhead Treatment - Capital Costs per System**				**$520,270**
4.01	System Design, Permitting, and Coordination	EA	$24,000	1	$24,000
4.02	System Purchase - 2 GAC vessels (500 gpm) with 10 tons carbon	EA	$220,000	1	$220,000
4.03	Pressure Relief Valves, Sampling Ports, and Bag Filters	EA	$27,000	1	$27,000
4.04	System Installation (assume underground)	EA	$103,760	1	$103,760
4.04	Electrical & Controls	EA	$35,000	1	$35,000
4.05	Freight and Taxes	EA	$20,210	1	$20,210
4.06	*Project Management Fee*	%		*10*	*$43,000*
4.07	*Uncertainty*	%		*10*	*$47,300*
5.00	**Wellhead Treatment - Annual O&M Costs per Well**				**$16,900**
5.01	Utility Services	yr	$2,400	1	$2,400
5.02	Routine Maintenance	qtr	$2,600	4	$10,400
5.03	*Project Management Fee*	%		*10*	*$1,280*
5.04	*Uncertainty*	%		*20*	*$2,820*
6.00	**Changeout GAC (10,000 lbs)**	EA	$35,500	1	**$35,500**
7.00	**Wellhead Treatment System Removal**				**$19,800**
7.01	System Removal	LS	$15,000	1	$15,000
7.02	*Project Management Fee*	%		*10*	*$1,500*
7.03	*Uncertainty*	%		*20*	*$3,300*
8.00	**Water Supply Well - Annual Monitoring Costs per Well**				**$26,070**
8.01	Labor and supplies to sample water supply well and system	mo	$600	12	$7,200
8.02	Groundwater analytical - 8260B for COCs	sample	$65	36	$2,340
8.03	Evaluation and Reporting	yr	$12,000	1	$12,000
8.04	*Project Management Fee*	%		*10*	*$2,160*
8.05	*Uncertainty*	%		*10*	*$2,370*
9.00	**Annual CoT Access Fees**				**$1,400**
9.01	CoT Agreement Fee	well	$100	14	$1,400
10.00	**Site Closeout**				**$401,010**
10.01	Evaluation and Coordination	LS	$17,000	1	$17,000
10.02	Well Abandonment - RA	well	$12,500	22	$275,000
10.03	Reporting and Closeout	LS	$25,000	1	$25,000
10.04	*Project Management Fee*	%		*10*	*$31,700*
10.05	*Uncertainty*	%		*15*	*$52,310*

PROJECT COST SCHEDULE (30 Year Period of Analysis):

Item No.	DESCRIPTION	YEAR	PERIOD O&M COST	CUMULATIVE O&M COST
11.00	**O&M Cost**			
11.00	Plume Monitoring	0	$43,940	$43,940
11.01	Sentinel Well Monitoring	1	$5,210	$49,150
11.02	Plume Monitoring	2	$43,940	$93,090
11.03	Sentinel Well Monitoring	3	$5,210	$98,300
11.04	Plume Monitoring	4	$43,940	$142,240
11.05	Sentinel Well Monitoring	5	$5,210	$147,450
11.06	Plume Monitoring	6	$43,940	$191,390
11.07	Sentinel Well Monitoring	7	$5,210	$196,600
11.08	Plume Monitoring	8	$43,940	$240,540
11.09	Sentinel Well Monitoring	9	$5,210	$245,750
11.10	Plume Monitoring & Install Wells	10	$290,650	$536,400
11.11	Sentinel & Wellhead Monitoring & O&M	11	$568,450	$1,104,850
11.12	Plume & Wellhead Monitoring & O&M	12	$86,910	$1,191,760
11.13	Sentinel & Wellhead Monitoring & O&M	13	$48,180	$1,239,940
11.14	Plume & Wellhead Monitoring & O&M	14	$86,910	$1,326,850
11.15	Sentinel & Wellhead Monitoring & O&M	15	$83,680	$1,410,530
11.16	Plume & Wellhead Monitoring & O&M	16	$86,910	$1,497,440
11.17	Sentinel & Wellhead Monitoring & O&M	17	$48,180	$1,545,620
11.18	Plume & Wellhead Monitoring & O&M	18	$86,910	$1,632,530
11.19	Sentinel & Wellhead Monitoring & O&M	19	$48,180	$1,680,710
11.20	Plume & Wellhead Monitoring & O&M	20	$86,910	$1,767,620
11.21	Sentinel & Wellhead Monitoring & O&M	21	$48,180	$1,815,800
11.22	Plume and Wellhead Monitoring	22	$70,010	$1,885,810
11.23	Sentinel & Wellhead Monitoring & Treatment System Removal	23	$51,080	$1,936,890
11.24	Plume Monitoring	24	$43,940	$1,980,830
11.25	Sentinel Well Monitoring	25	$5,210	$1,986,040
11.26	Plume Monitoring	26	$43,940	$2,029,980
11.27	Sentinel Well Monitoring	27	$5,210	$2,035,190
11.28	Plume Monitoring	28	$43,940	$2,079,130
11.29	Sentinel Well Monitoring	29	$5,210	$2,084,340
11.30	Plume Monitoring and Closeout	30	$444,950	$2,529,290
TOTAL COSTS			**$2,529,290**	