Prepared for

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PROPOSED REMEDIAL ACTION PLAN
CENTRAL & CAMELBACK
WQARF SITE
PHOENIX, ARIZONA

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I certify that this document and all attachments presented in this report are accurate and complete based on the available information. This report was prepared by the staff of Geosyntec Consultants under my supervision to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who are directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Brian McNamara, P.E.
Professional Engineer No. 51095

6/30/2017
Date

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ACRONYMS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
1,2-DCA	1,2-dichloroethane
A.A.C.	Arizona Administrative Code
A.R.S.	Arizona Revised Statute
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AMA	Active Management Area
AWQS	Aquifer Water Quality Standard
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	contaminant of concern
COP	City of Phoenix
DNAPL	dense non-aqueous phase liquid
EISB	Enhanced In Situ Bioremediation
EPA	Environmental Protection Agency
ERA	early response action
FS	Feasibility Study
ft bgs	feet below ground surface
GAC	granular activated carbon
Geosyntec	Geosyntec Consultants
GETS	groundwater extraction and treatment system
GPL	Groundwater Protection Level
HGC	Hydro Geo Chem
J&E	Johnson & Ettinger
ISCR	In Situ Chemical Reduction
lbs	pounds
LUST	leaking underground storage tank
Maroney's	Maroney's Cleaners and Laundry
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
MTBE	methyl tert-butyl ether
OEC	One East Camelback
O&M	operations and maintenance
PCE	tetrachloroethene
PRAP	Proposed Remedial Action Plan

RI	Remedial Investigation
ROD	Record of Decision
RO	remedial objective
RSL	Regional Screening Level
SCSA	Southwest Corner Source Area
SRL	Soil Remediation Level
SRP	Salt River Project
SVE	soil vapor extraction
TCE	trichloroethene
Use Report	ADEQ's Land and Water Use Report
VOC	volatile organic compound
WQARF	Water Quality Assurance Revolving Fund

1 INTRODUCTION

This Proposed Remedial Action Plan (PRAP) for the Central and Camelback Water Quality Assurance Revolving Fund (WQARF) Site was prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of the Arizona Department of Environmental Quality (ADEQ). The Central and Camelback WQARF Site (the Site) is located in Phoenix, Arizona (Figure 1).

1.1 Purpose and Scope

ADEQ is required under the Arizona Revised Statute (A.R.S.) § 49-287.04 to issue a PRAP, describing the proposed remedy at the Site, to the public for review and comment. This PRAP was prepared in accordance with Arizona Administrative Code (A.A.C.) R18-16-408 and is based on information contained in the following documents:

- *Remedial Investigation Report, Central and Camelback WQARF Site, Phoenix, Arizona* (Hydro Geo Chem [HGC], 2014) (Remedial Investigation [RI] Report)
- *Proposed Remedial Objectives Report, Central and Camelback Water Quality Assurance Revolving Fund Registry Site*, Phoenix, Arizona (ADEQ, 2014a) (Proposed Remedial Objectives [ROs] Report)
- *Final Feasibility Study, Central and Camelback Water Quality Assurance Revolving Fund Site, Phoenix, Arizona* (Geosyntec, 2015) (Feasibility Study [FS] Report)

The information contained in the PRAP is drawn directly from the above-referenced reports without attribution other than that noted here. The detailed history of remedial investigations, early response actions (ERAs), and preliminary screening of remedial alternatives completed for the Site are presented in the referenced documents and are not reiterated in detail here.

The purpose of the PRAP is to describe the proposed remedy selected to address the site-specific ROs from the alternatives evaluation presented in the FS Report. The PRAP is part of the final remedy selection process under WQARF where public input is solicited on remedial alternatives and on the rationale for proposing the preferred remedy. New information that ADEQ receives during the public comment period could result in the selection of a final remedy that differs from the proposed remedy. Therefore, the public is encouraged to review and comment on the remedy presented in this PRAP. Information on public participation activities associated with this PRAP is provided in Section 7.

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). In the ROD, ADEQ will finalize its decision regarding the implementation of the final remedy for the Site.

1.2 Site Description

The Site is located in Phoenix, Arizona (Figure 1) and is bounded by Georgia Avenue to the north, Mariposa Street to the south, 2nd Street to the east, and 1st Avenue to the west. The Site consists of soil and soil vapor impacts and two plumes of impacted groundwater originating from the former Maroney's Cleaners and Laundry (Maroney's) dry cleaning facility. The former Maroney's dry cleaning facility operated from approximately 1951 until 2006 at 4902 North Central Avenue (southwest corner of the Central Avenue and Camelback Road intersection). The RI Report refers to this area as the Southwest Corner Source Area (SCSA). A hazardous waste inspection conducted in 1993 indicated minor spillage at locations within the dry cleaning operations.

Prior to 1940, the area surrounding the Site was generally used for agricultural purposes. Starting in the late 1930s, residential developments, primarily single-family homes, were constructed along the main roads. Larger multi-family buildings were constructed starting in the 1950s. With the increase in residential housing, commercial development began to occur along Central Avenue and Camelback Road including retail and service activities such as automotive service stations and dry cleaning and laundry services.

2 SITE CHARACTERISTICS

The following subsections describe the nature and extent of Site contamination. Additional information on Site history and physical characteristics (i.e., geologic and hydrogeologic settings) is provided in the RI Report.

2.1 Source of Release

Volatile organic compound (VOC) contamination was first detected at the Site in 1993, with tetrachloroethene (PCE) being detected during investigations associated with nearby leaking underground storage tank (LUST) sites. PCE and trichloroethene (TCE) are the primary contaminants of concern (COCs) at the Site. Both PCE and TCE have been detected at concentrations exceeding their respective Aquifer Water Quality Standard (AWQS) of 5 micrograms per liter (µg/L). TCE detections may be the result of PCE degradation, rather than a separate TCE source. Other contaminants from historical LUST sites in the vicinity have also been identified, including benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tert-butyl ether (MTBE), and 1,2-dichloroethane (1,2-DCA). Currently, there are two plumes containing COCs at concentrations greater than the AWQS. One plume is located at the groundwater extraction wells at the SCSA and the other is located northeast of the SCSA and is currently migrating in a southerly direction (Figure 4).

The released PCE transferred from the soil and soil vapor to groundwater, and migrated with historic groundwater flows to the north and northeast of the Site, resulting in a plume nearly 0.5 miles long. Previous sampling results indicated the potential presence of dense non-aqueous phase liquid (DNAPL) in soil and groundwater beneath the former dry cleaning building. PCE has been detected in soil vapor during soil vapor surveys conducted at the Site.

During site characterization, an ERA was determined to be necessary to mitigate the potential off-Site migration of source area groundwater impacts, including protection of the existing groundwater extraction wells used for dewatering of a below-ground parking structure located at the One East Camelback (OEC) property to the east of the SCSA. Groundwater modeling of the underlying aquifer and step-down testing of the groundwater extraction wells were conducted to design the groundwater extraction and treatment system (GETS). The system was installed and commissioned in 2003 to remediate the SCSA groundwater impacts and hydraulically contain the source area. An additional ERA was initiated at the SCSA to remediate the impacted vadose zone, including both soil and soil vapor, and supplement the groundwater ERA. In 2005, a soil vapor extraction (SVE) pilot test was performed that demonstrated the effectiveness of this treatment technology for source area vadose zone remediation. A full-scale SVE

system was installed, with operation beginning in 2007. The GETS and SVE system are currently operating as ERAs, providing mitigation of source area impacts and hydraulic containment.

2.2 Vadose Zone

In 2007, soil sampling in the unsaturated zone at the SCSA indicated detectable PCE concentrations in 45 of 65 samples collected, with one sample having a PCE concentration of 210 milligrams per kilogram (mg/kg) (sample FCE-B1 at 35 feet below ground surface [ft bgs], located within the former Maroney's building footprint, Figure 2), which is above the Arizona Residential Soil Remediation Level (SRL) of 0.51 mg/kg.

Both passive and active soil vapor sampling events were performed from 2005 through 2013. PCE detections were observed within the vadose zone beneath the former Maroney's facility. The highest PCE soil vapor concentration (6,500 milligrams per cubic meter [mg/m^3]) was detected at SVE-1 (Figure 3) during 2005.

The SVE system was started on November 20, 2007 with the objective of removing VOCs from subsurface soil, thereby remediating the primary source of VOCs detected in the underlying groundwater. Since SVE operation began in 2007, approximately 6,794 pounds (lbs) of VOCs (primarily PCE) are estimated to have been recovered by the SVE system.

During September 2016, soil vapor samples were collected beneath the former dry cleaning facility to assess the extent of residual VOC concentrations in the vadose zone after SVE operations. The soil vapor results were compared to residential SRLs, screening levels based on the Environmental Protection Agency (EPA) carcinogenic and non-carcinogenic indoor air Regional Screening Levels (RSLs) for residential exposure, and to minimum Groundwater Protection Levels (GPLs). The September 2016 soil vapor results were below SRLs, vapor intrusion screening levels, and minimum GPLs (Geosyntec, 2017a).

2.3 Groundwater

Initial hydraulic conductivity estimates for the Site ranged from 15 to 75 feet/day, which is higher than expected given the clay and silt documented in the Site borings. Groundwater monitor wells in the area typically have a total depth ranging from 100 to 120 ft bgs. As of April 2017, the approximate depth to groundwater ranged from 64 to 82 ft bgs, with the 82 ft bgs depth being attributed to the drawdown from the GETS extraction wells.

Prior to 2000, the groundwater flow direction at the Site was to the north. The northerly flow direction was likely due to groundwater recharge from the unlined Salt River Project (SRP) Grand Canal located approximately 0.3 miles to the south of the Site. In the past, depth to groundwater has been as shallow as 40 ft bgs due to mounding from the unlined SRP Grand Canal recharge. The canal is now lined and associated mounding has dissipated. Lining of parts of the Grand Canal commenced in 1995. After lining the Grand Canal, the groundwater flow direction changed to the east, and then to southeast. The groundwater flow direction is also influenced by the GETS and the OEC groundwater dewatering extraction system located on the southeast corner of the intersection of Central Avenue and Camelback Road (Figure 2). Extraction from the dewatering system commenced in 1993. Based on monitoring performed in April 2017, the groundwater flow direction was generally to the southeast (Geosyntec, 2017b).

The groundwater plume has been affected by the historical changes in the groundwater flow direction. Impacted groundwater had previously been transported from the former Maroney's facility to the north, with a plume length of nearly 0.5 miles. The primarily northerly transport of VOCs was replaced by movement to the northeast, east, southeast, and then south-southeast toward the dewatering and extraction wells. Figures 4 and 5 show the extent of April 2017 PCE and TCE concentrations greater than the AWQS of 5 µg/L. During the April 2017 monitoring event, the maximum detected concentration of PCE was 44 µg/L, observed in OEC dewatering well DW-N2. The maximum detected concentration of TCE (36 µg/L) was observed in monitor well CC-17. Operation of the GETS and SVE ERAs appear to have resulted in source area reduction and hydraulic containment, which in turn have resulted in significant decrease in the extent of impacted soil, soil vapor and groundwater.

2.4 Surface Water

There have been no documented VOC releases to surface water at the Site. The surface water use portion of the Land and Water Use Report (Use Report) (ADEQ, 2014b) indicates that surface water usage within the Site is for residential irrigation. The source for surface water in the vicinity of the Site comes from groundwater production wells located outside of the Site boundary.

3 NEED FOR REMEDIAL ACTION

The risk evaluation conducted by HGC assesses VOCs and potential exposure pathways present at the Site. The soil, soil vapor, and groundwater monitoring results below the former Maroney's facility, as well as the downgradient groundwater impacts to the north and northeast of the Site, are included in the evaluation. Four components of exposure pathways are evaluated: source of release, retention of transport media, exposure point, and exposure route. The purpose of this section is to summarize the calculated risks at the Site and the primary goals of remedial action at the Site as determined from the Site RI and FS Reports.

3.1 Vadose Zone

Historically, the highest PCE soil concentrations were observed between 30 and 40 ft bgs in borings advanced within the footprint of the former dry cleaning facility. Since the SVE system has been in operation, laboratory analysis of the soil samples collected at the Site do not indicate VOC concentrations above their respective laboratory reporting limits. The SVE system continues to address the soil and soil vapor exposure pathways to protect human health and the environment. The SVE system will be operated until VOC soil vapor impacts are remediated to concentrations less than the residential SRLs, calculated soil vapor screening levels, and GPLs.

To assess for potential exposure to soils, soil gas concentrations were compared to the residential SRLs. The SRLs were converted from micrograms per kilogram (µg/kg) soil concentrations to micrograms per cubic meter (µg/m^3) in soil vapor using the Johnson and Ettinger (J&E) model spreadsheet default values for sandy clay based on Site boring logs and Site-specific soil properties.

Soil vapor screening levels for vapor intrusion and groundwater impacts were calculated using the J&E subsurface vapor intrusion model (EPA, 2004), along with updated chemical physical properties from the EPA RSL table (EPA, 2016). The J&E model uses contaminant partitioning and convective and diffusive mechanisms to estimate subsurface vapor transport into buildings.

To assess for potential vapor intrusion impacts, screening levels were calculated for carcinogenic and non-carcinogenic residential exposure scenarios using the J&E model spreadsheets. Chemical-specific and Site-specific soil parameters are used to estimate attenuation factors that are the ratio of a predicted indoor air concentration to the measured soil vapor concentration. Based on Site boring logs, Site-specific soil properties used in the spreadsheets were the J&E default values for sandy clay.

To assess for potential groundwater impacts, screening levels were calculated based on the minimum GPLs. The minimum GPLs were converted from µg/kg soil concentrations to µg/m^3 in soil vapor using the J&E model spreadsheet and the same chemical-specific and soil physical parameters that were used to derive soil vapor screening levels.

3.2 Groundwater

Exposure via the groundwater pathway could occur due to the potential future conversion of SRP irrigation wells located in the vicinity of the Site to drinking water supply wells or the installation of municipal wells by the City of Phoenix (COP). Residents could be exposed by ingestion, inhalation, or dermal contact with impacted water. The objective of the GETS system is to remediate and contain and control the movement of impacted groundwater in the SCSA, with particular emphasis on mitigating migration to the OEC groundwater extraction system. Source remediation and control will be assessed by comparing groundwater results to AWQS standards listed in A.A.C. R18-11-406 which apply to aquifers that are classified for drinking water protected use.

3.3 Surface Water

There have been no documented releases to surface water. Accordingly, there are no associated remedial activities.

4 REMEDIAL OBJECTIVES

The ROs for the Site were developed by ADEQ pursuant to A.A.C. R18-16-406 of the Remedy Selection Rule. ROs are established for the current and reasonably foreseeable future uses of land and waters of the state that have been or are threatened to be affected by a release of a hazardous substance. Pursuant to A.A.C. R18-16-406(D), it is specified that reasonably foreseeable uses of land and water are those likely to occur within one hundred years, unless Site-specific information suggests a longer time period is more appropriate. Reasonably foreseeable uses are those likely to occur, based on information provided by water providers, well owners, land owners, government agencies, and others.

ADEQ prepared the Use Report based on information gathered during the public involvement process. Not every use identified in the Use Report has a corresponding RO (the requirement for RO is based on whether or not the use is reasonably foreseeable). The ROs are stated in the following terms:

(1) Protecting against the loss or impairment of each use;

(2) Restoring, replacing, or otherwise providing for each use;

(3) When action is needed to protect or provide for the use; and

(4) How long action is needed to protect or provide for the use.

4.1 ROs for Land

The Site is located in a mixed urban, commercial, and residential area. Based on the current zoning maps provided by the COP, the Site is zoned as residential (single and multi-family) and commercial (restricted, retail, intermediate, and high density). Future land use plans provided by the COP indicate that there are no immediate plans to change the land use or zoning for the areas within and adjacent to the Site.

Although the former dry cleaner property is currently zoned for commercial use, reasonably foreseeable use will be residential, as has been indicated by the current property owner. Therefore, ROs for land use at the former dry cleaner property are established referencing the residential SRLs for soil samples. The ROs state that soil conditions are to be restored to the remediation standard for PCE in residential areas, as specified in A.A.C. R18-7-205 as 0.51 mg/kg corresponding to an estimated excess lifetime cancer risk of one in one million (10^{-6}). As long as soil concentrations exceed the remediation standard, actions must be taken to mitigate potential receptor exposure to contaminants. Identified exposure routes include direct contact with soil resulting from construction or industrial activities or inhalation of contaminants from vapor intrusion into occupied structures. ROs for land use regarding vapor intrusion will reference Site-

specific soil vapor screening levels, calculated using the J&E model spreadsheets. The land use RO is applicable for the present time and for as long as the level of contamination in the soil or soil vapor threatens its use as a residential property.

4.2 ROs for Groundwater

The Site lies within the Phoenix Active Management Area (AMA). The Phoenix AMA was created by the Arizona Groundwater Management Code in 1980 and covers approximately 5,646 square miles in central Arizona. All groundwater withdrawn from any AMA must occur under a groundwater right or permit, unless groundwater is being withdrawn from an exempt well.

According to Arizona Department of Water Resources (ADWR) records, there are 10 non-exempt withdrawal wells within the Site boundaries and one well immediately adjacent to the Site boundaries (ten dewatering wells and one irrigation well, respectively). ADWR records indicate that there are no exempt withdrawal wells within the site boundaries and there are no grandfathered rights at the Site. COP and SRP have service area rights at the Site; however, of these two entities, only SRP currently has a groundwater extraction well adjacent to the Site boundaries.

Questionnaires were mailed to COP, SRP, and land owners to obtain information regarding current and future uses of groundwater within the Site. The following current and foreseeable reported groundwater uses within the Site were identified by the questionnaire:

- COP does not have groundwater wells within the Site but has indicated that it may install wells for municipal drinking water supply in the future. Currently, a portion of the groundwater within the Site is impacted with VOCs that would restrict use of the groundwater by COP if the city wanted to use the groundwater for municipal purposes.

- SRP currently owns one well (13.5E-9.4N) adjacent to the Site north boundary (Figure 2). PCE has consistently been detected above the AWQS of 5.0 µg/L in the SRP well; however, the most recent available analytical data indicates concentrations have been declining to near the AWQS (8.6 µg/L as of 24 June 2015). The SRP well is intermittently operated to provide water for irrigation; however, SRP anticipates that the may transition to drinking water supply in the reasonably foreseeable future, either by directly connecting the well to municipal water distribution systems or by piping to municipal water treatment plants located on the SRP canal system. Currently, the SRP well is not pumped on a

regular basis and, according to SRP, there are no anticipated changes in the pumping schedule.

- One Camelback Inc., the property owner of the OEC property on the southeast corner of Central Avenue and Camelback Road, operates and maintains the ten dewatering wells surrounding their building at the property (Figure 2). The dewatering wells are used to lower the depth of the water table and prevent groundwater from entering the building's underground parking garage. The extracted groundwater was historically treated due to the presence of petroleum hydrocarbons from a LUST release in this area. Groundwater treatment included passing the water through an air stripper to remove VOCs prior to discharge into the COP stormwater sewer. The treatment system was removed in 2017 due to the closure of the associated LUST site; however, the OEC dewatering wells are still in operation.

The RO for groundwater at the Site is to protect for the use as a groundwater supply by COP and SRP. This action will be needed if/when groundwater use changes to municipal/drinking water. The groundwater RO will be needed for as long as the level of impacts in the groundwater threaten the use of the regional groundwater for municipal/drinking water uses.

4.3 ROs for Surface Water

There have been no documented releases to surface water at the Site. Surface water for irrigation use within the Site is provided/distributed by the Medlock Homeowners Association, which is supplied by SRP from groundwater sources outside of the Site boundary. Accordingly, a surface water RO for the Site is not applicable.

4.4 Remediation Levels and Basis for Selection

Based on the RI and FS Reports, the groundwater pathway has a complete potential exposure route with VOC concentrations that exceed acceptable risk levels. The target cleanup levels for the VOCs in groundwater are their respective AWQS, which is 5 µg/L for both PCE and TCE.

The soil exposure pathway is deemed to be incomplete at this time. This is partially due to the lack of VOCs detected in soil samples shallower than 30 ft bgs. For Site soil and soil vapor, the objective is for VOC concentrations in soil to be below the corresponding residential SRLs and for VOC concentrations in soil vapor to be below calculated soil vapor screening levels for vapor intrusion and groundwater impacts.

5 EVALUATION OF REMEDIAL ALTERNATIVES

In accordance with the Remedy Selection Rule (A.A.C. R18-16-407), the FS Report identifies at least three alternative remedies that are capable of achieving the ROs. As documented in the FS Report, three alternatives are evaluated for remediation of the vadose zone and groundwater. These alternatives are as follows:

- Reference Remedy: For vadose zone remediation, activities consist of continued operation of the SVE system until risk-based cleanup objectives are achieved and a focused soil vapor confirmation sampling event is performed to assess SVE system rebound. For groundwater remediation, activities consist of continued operation of the GETS and installation of a sentinel monitor well located south of monitor well CC-18 and north of the OEC dewatering wells. The sentinel monitor well would initially be monitored monthly for VOCs for three months. If the sentinel well VOC concentrations are greater than AWQS, then the OEC dewatering wells would be incorporated into the GETS. If the sentinel well VOC concentrations are less than AWQS, then CC-18 would be converted to an extraction well and incorporated into the GETS.

- More Aggressive Remedy: For vadose zone remediation, activities consist of those listed in the Reference Remedy plus expanding the SVE system based on results of a focused soil vapor confirmation sampling (assumes one additional soil vapor extraction location). For groundwater remediation, activities include those listed in the Reference Remedy plus in situ treatment targeting remaining VOC impacts around CC-17.

- Less Aggressive Remedy: For vadose zone remediation, activities include performing a focused soil vapor confirmation sampling event and, if results suggest low residual VOC mass remains, shutting down the SVE system to assess VOC rebound in soil vapor. If warranted, based on the rebound results, the SVE system would be shut down and decommissioned. For groundwater remediation, activities include continued operation of the GETS in its current configuration and the current groundwater monitor well network would be used to assess the progress of the remedy until residual VOC concentration are lower than the AWQS.

6 PROPOSED REMEDY

The following subsections present the proposed remedies for both vadose zone and groundwater, as well as the basis for selecting the proposed remedies. Detailed cost information of the proposed remedies is included in Appendix A.

6.1 Proposed Vadose Zone Remedy

The proposed remedy for the vadose zone is the Less Aggressive Remedy. Results from the September 2016 focused soil vapor confirmation sampling event indicate that soil vapor concentrations within the former Maroney's facility footprint are below SRLs, Site-specific risk-based screening levels for vapor intrusion and GPLs. Based on these results, and considering the exceedingly low recent SVE VOC mass recovery rates, it is recommended that the SVE system be shut down for rebound testing. If rebound testing results remain below residential SRLs, GPLs, and the Site-specific soil vapor screening levels, then the SVE system will be shut down and decommissioned. If the rebound testing results are above soil standards or the soil vapor screening levels, the SVE system will be restarted and operated in pulse mode until monitored soil vapor results are below the soil standards and site-specific screening levels, after which rebound testing will be repeated until acceptable results are observed.

The rebound testing will consist of up to three sampling events in which soil vapor samples will be collected from SVE extraction wells SVE-1, SVE-FC, SVE-2S, and SVE-2D. The SVE system will be operated for at least one week, extracting soil vapor from extraction well SVE-2S until steady-state conditions are achieved. At the end of this period, the SVE system will be shut down and samples collected from the extraction wells. The SVE wells will then be resampled approximately one month and three months after the shut-down date. If the PCE and TCE concentrations in the soil vapor samples are below the soil standards and Site-specific screening levels, the SVE system will be shut down and decommissioned.

6.2 Proposed Groundwater Remedy

The proposed groundwater remedy contains elements from both the Reference and More Aggressive Remedies, including continued operation of the current GETS and expanded semiannual groundwater monitoring plus several potential contingencies. Operation of the GETS and SVE ERAs appears to have resulted in source area reduction and hydraulic containment, which in turn have resulted in significant decrease in the extent of impacted groundwater. However, PCE concentrations continue to be observed above the AWQS at two separate plume areas: 1) centered around monitor well CC-17 and CC-18, and 2) by extraction wells CC-5 and DW-W2.

Continued operation of the GETS, pumping from extraction wells CC-5 and EW-2, will be implemented to remove COCs and maintain hydraulic containment of the PCE impacts for up to 10 years. GETS operational parameters will be measured to assess VOC mass removal and monitor granular activated carbon (GAC) breakthrough. An ERA enhancement of the GETS is included, consisting of a targeted enhanced in-situ bioremediation (EISB) injection. EISB is similar to activities described in the More Aggressive Remedy in that it involves injection of a biological and chemical amendment to directly reduce PCE and TCE groundwater impacts and stimulate biodegradation. In order to evaluate the effectiveness of EISB, it is proposed to initially focus the amendment injection around extraction well CC-5. Based on information obtained during the targeted EISB, additional amendment injections may be performed around extraction well CC-5 and/or other existing wells or an alternative enhancement such as a combined chemical/biological amendment or In Situ Chemical Reduction (ISCR) injections will be evaluated for targeted implementation.

Semiannual groundwater monitoring, including from selected OEC dewatering wells, would be continued for up to 10 years to assess plume stability and VOC concentration trends. If the PCE and TCE plumes appear to be stable, the groundwater monitoring frequency may be reduced to annual and the number of monitor wells may be decreased. As a contingency, if the PCE and TCE results continue to be greater than the AWQS, then an additional 10 years, or until concentrations are less than the AWQS, of GETS operation and groundwater monitoring would be performed along with more frequent EISB injections. Implementation of an alternative to EISB injections such as a combined chemical/biological amendment or ISCR injections will also be evaluated if EISB is not expediting contaminant reduction.

Once PCE and TCE concentrations in the groundwater monitor and extraction wells are below AWQS levels, the GETS will be shut down and quarterly groundwater monitoring will be performed for a period of one year to assess potential rebound. Groundwater monitoring activities will cease if PCE and TCE concentrations during rebound sampling are below the AWQS and the GETS will be decommissioned. The GETS system will resume operations if groundwater monitoring indicates PCE and TCE concentrations above the AWQS and additional EISB injections may be implemented. Implementation of an alternative to EISB injections such as a combined chemical/biological amendment or ISCR will also be evaluated if EISB is not expediting contaminant reduction.

If PCE and TCE concentrations greater than the associated AWQS are detected in the OEC dewatering wells treatment system influent, then select OEC well(s) will be connected to the current GETS. The additional flow from the OEC dewatering wells to the GETS will be within the GETS operational range.

6.3 Achievement of Remedial Objectives

The proposed remedies for the vadose zone and groundwater will achieve the ROs for the Site, as described in Section 4.

The proposed remedy for the vadose zone will achieve the ROs of remediating soil conditions to standards acceptable for residential use. The September 2016 focused soil vapor confirmation sampling results indicate that the long-term SVE operation has resulted in soil vapor concentrations below residential SRLs, Site-specific screening levels for soil vapor intrusion, and groundwater impacts. The soil and soil vapor screening levels are based on residential SRLs and carcinogenic and non-carcinogenic EPA indoor air RSLs for residential exposure via vapor intrusion, assuming a target cancer risk of 10^{-6} and a target noncancer hazard of 1, and the minimum GPLs.

The proposed remedy for groundwater includes a combination of continued operation of the GETS and groundwater monitoring to assess when groundwater VOC concentrations are below AWQS values. The proposed groundwater remedy will achieve ROs for regional groundwater at the Site by protecting the groundwater supply for potential use by COP and SRP.

6.4 Achievement of Remedial Action Criteria

In direct accordance with the requirements of A.R.S. § 49-282.06, remedial actions shall:

1. Assure the protection of public health and welfare and the environment.
2. To the extent practicable, provide for the control, management or cleanup of the hazardous substances in order to allow the maximum beneficial use of the waters of the state.
3. Be reasonable, necessary, cost-effective and technically feasible.

The selected remedies will achieve the above-listed remedial action criteria by providing:

- Adequate protection of public health and welfare and the environment;
- A thorough and timely means for continued monitoring of the existing groundwater impacts, including assessment of plume capture by extraction wells, and evaluation of the progress of remediation over time;
- Control, management, and cleanup of the VOCs in the groundwater to the extent practicable;
- Beneficial use of the groundwater resource by COP and SRP; and
- A reasonable, cost-effective, and technically feasible remedial approach.

6.5 Consistency with Water Management Plans

Water management plans at the Site include continued use of an existing groundwater irrigation production well by SRP, and COP and/or SRP reserving their right to use the groundwater as a source for drinking water in the future. The goal of the Proposed Remedy for groundwater is to achieve VOC concentrations less than the applicable AWQS, which is consistent with the existing water management plans.

6.6 Consistency with General Land Use Planning

The general land use plans for the Site include mixed residential (single and multi-family housing) and commercial (restricted, retail, intermediate, and high density). The Proposed Remedy for soil and soil vapor is consistent with general land use plans. The September 2016 focused soil vapor confirmation sampling indicated that soil vapor results collected within the former Maroney's facility footprint were below residential SRLs and Site-specific screening levels for vapor intrusion and groundwater impacts.

6.7 Life Cycle Costs

The estimated life cycle costs for the proposed final remedies are as follows:

Proposed Final Remedy Cost Breakdown	
Vadose Zone Proposed Remedy	
Rebound Testing Costs	$19,000
Contingency Costs	$48,000
Closure Costs	$81,000
Total Costs	$148,000
Groundwater Proposed Remedy	
Capital Costs (Including EISB Injection for CC-5 Area and Amendment Injection for CC-17 or CC-18 Area)	$1,030,000
Operation and Maintenance (O&M) and Groundwater Monitoring Costs for 10 Years	$2,831,000
Contingency Costs	$3,996,000
Closure Costs	$1,135,000
Total Costs	$8,992,000

A breakout of these costs is presented in Appendix A. Details of the various cost items are presented in the following subsections.

6.7.1 Vadose Zone Proposed Remedy Costs

Table A-1 in Appendix A presents a cost breakdown for the vadose zone Proposed Remedy. The costs for the vadose zone Proposed Remedy assumes shutting down the current SVE system and performing rebound testing. Rebound testing costs include sample collection, short-term operation of the SVE system during sample collection, reporting, and analytical costs. Contingency costs are included for additional SVE operation in pulse mode if rebound testing indicates PCE and TCE concentrations above soil standards and Site-specific screening levels. For contingency cost estimate, the additional SVE operation was assumed to be for six months. Closure costs assume decommissioning and removal of the SVE system, disposal of the GAC, and abandonment of the SVE wells.

6.7.2 Groundwater Proposed Remedy Costs

Table A-2 in Appendix A presents the cost breakdown for the groundwater Proposed Remedy. The costs for the groundwater Proposed Remedy include continued operation of the GETS and semiannual groundwater monitoring, including select OEC dewatering wells for 10 years. An additional alternative included in the cost of the Proposed Remedy is one additional EISB injection associated with the area around CC-5. The costs for the additional EISB injection for the area around CC-5 are based on the current assumed parameters for the planned initial EISB injection event.

A second additional alternative included in the Proposed Remedy costs include the implementation of a combined chemical/biological amendment or ISCR injections associated with CC-17 or CC-18. The costs include bench-scale testing and a pilot study. For full scale implementation, the costs assume that one injection event will be performed in two "barrier" configurations oriented from west to east in the vicinity of either CC-17 or CC-18 depending upon the groundwater impacts at the time. Each barrier will be approximately 250 ft in length and will be approximately 100 ft apart. The barriers will treat impacted groundwater as it flows through them toward the extraction wells located to the south. The costs include the installation of 20 injection wells and one injection event. Additional capital costs for the groundwater Proposed Remedy include permit renewal and/or modification, potential equipment replacement, and project management.

Annual costs include semiannual groundwater monitoring and routine O&M costs for the GETS. The O&M costs are based on current costs and include labor, oversight, reporting, utilities, repair/maintenance, GAC change-outs, and analytical costs. Two GAC change-outs are expected for every five years.

Contingency costs include continued GETS operation, an additional EISB injection around extraction well CC-5, an additional combined chemical/biological amendment injection or ISCR around CC-17 or CC-18, and semiannual groundwater monitoring if PCE and TCE concentrations are above the AWQS. Calculations indicate that the additional GETS operation and groundwater monitoring would be for 10 years. Quarterly groundwater monitoring to assess concentration trends and potential rebound will be conducted for one year. Costs are also included for connecting select OEC well(s) to the GETS if the OEC effluent PCE or TCE concentration are above the AWQS. If OEC well(s) are connected to the GETS, a permit to discharge to the COP sanitary sewer would be required during times when effluent discharge to the SRP canal is prohibited (e.g., during canal rehabilitation). Closure costs assume decommissioning and removal of the GETS system, GAC disposal, and abandonment of extraction and monitor wells.

6.8 Lead Agency Statement for Proposed Remedy

Based on the information currently available, ADEQ believes the proposed remedies meet the remedial action criteria and provide efficient and effective use of available funding pursuant to A.R.S. § 49-282.06 (Section 6.3) and the ROs (Section 4).

7 COMMUNITY PARTICIPATION

7.1 Public Comment Period

The public comment period will be no less than 90 days. ADEQ will accept oral and written comments on this PRAP that are received/postmarked within the comment period and submitted to:

Arizona Department of Environmental Quality
Attn: Kevin Snyder, Project Manager
1110 West Washington Street
Phoenix, Arizona 85007
(602)771-4186

7.2 Public Meetings

ADEQ may present the PRAP and the remedial alternatives in a Central and Camelback WQARF Site Community Advisory Board meeting or separate public meeting. Oral and written comments will be accepted at the meeting. If held, the meeting will take place during the 90-day public comment period.

7.3 Administrative Record

Interested parties can review the PRAP and other Site documents at the Site website at http://www.azdeq.gov/node/892 or at the ADEQ Main Office located at 1110 West Washington Street, Phoenix, Arizona. With 24-hour notice, an appointment to review related documentation is available Monday through Friday from 8:30 a.m. to 4:30 p.m. at the ADEQ Records Management Center. Please contact the Records Management Center at (602) 771-4380 or (800) 234-5677 to schedule an appointment to review these documents.

7.4 Other Contact Information

Name/Title	Phone/Fax	E-mail
Kevin Snyder, ADEQ Project Manager	(602) 771-4186	Snyder.Kevin@azdeq.gov
Wendy Flood, ADEQ Community Involvement Coordinator	(602) 771-4410	Flood.Wendy@azdeq.gov

8 REFERENCES

ADEQ, 2014a. *Proposed Remedial Objectives Report, Central and Camelback Water Quality Assurance Revolving Fund Registry Site, Phoenix, Arizona,* 16 October 2014.

ADEQ, 2014b. *Land and Water Use Report, Central & Camelback Water Quality Assurance Revolving Fund Registry Site, Phoenix, Arizona*, April 2014.

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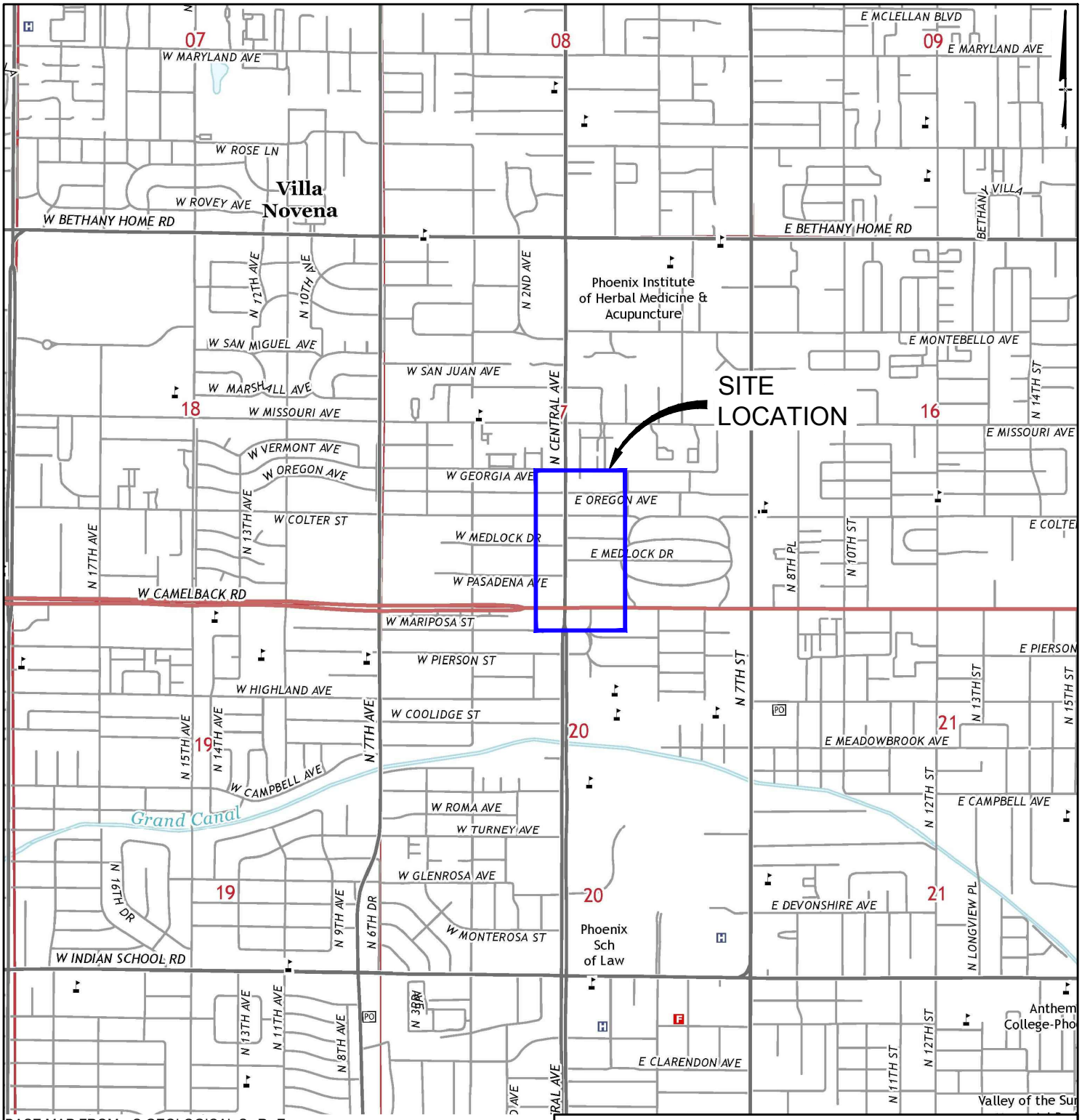
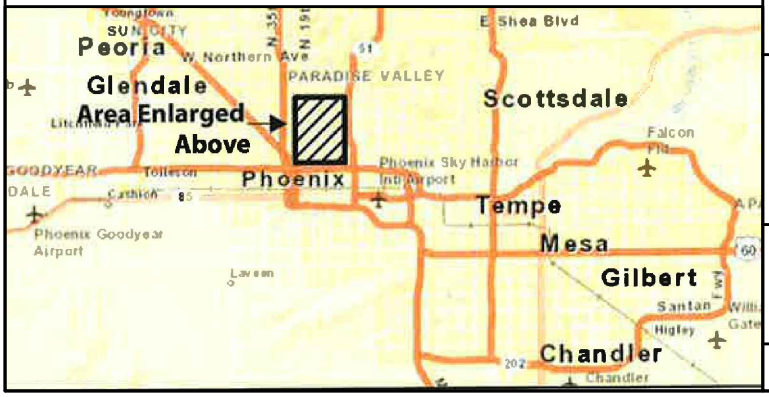
FIGURES



BASE MAP FROM U.S GEOLOGICAL SURVEY



2,000 1,000 0 2,000 Feet

SITE LOCATION

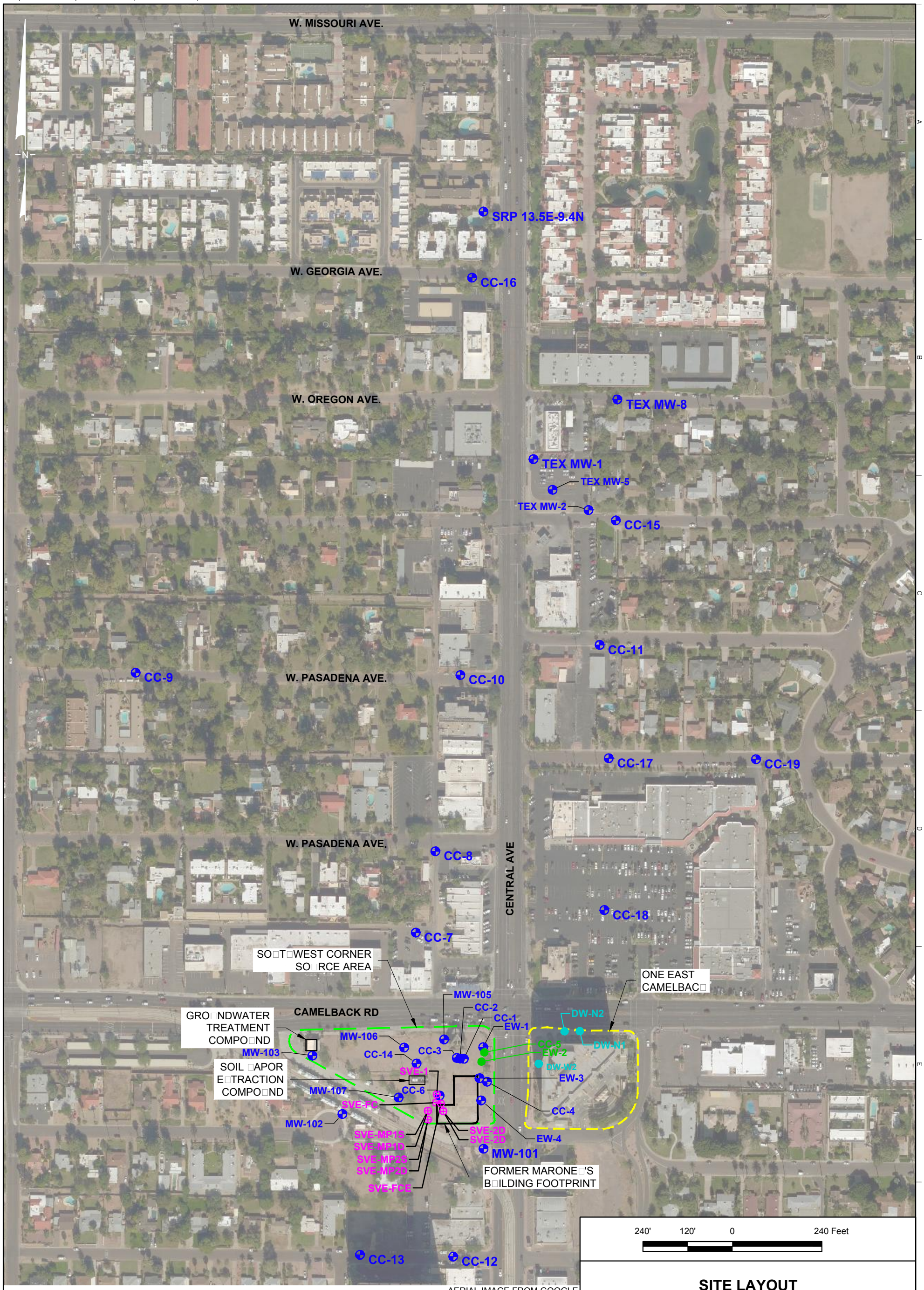
Central and Camelback WQARF Site
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ	March 2017	Figure 1

N:\GEOSYNTEC\WQARF SITE\VICINITY MAP\WQARF VICINITY MAP EXHIBIT

N:\GEOSYNTEC\WQARF SITE\SITE LAYOUT\SITE LAYOUT FIGURE 2 EXHIBIT



AERIAL IMAGE FROM GOOGLE

240' 120' 0 240 Feet

NOTES

- Groundwater Monitor Well
- Groundwater Extraction Well
- Groundwater Dewatering Well
- Soil Vapor Extraction Well

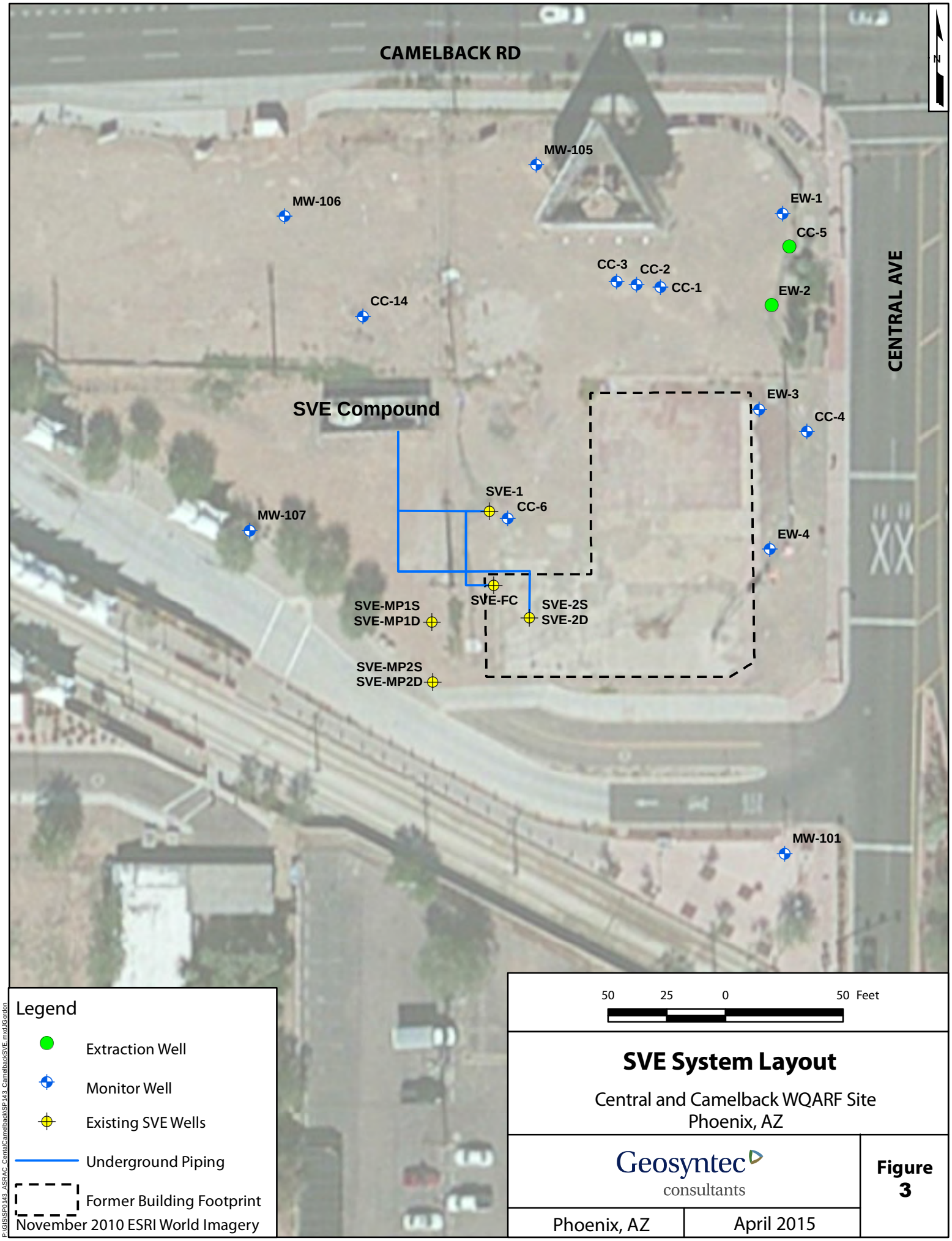
SITE LAYOUT

Central and Camelback WQARF Site
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | March 2017

Figure 2


CAMELBACK RD
CENTRAL AVE
MW-105
MW-106
EW-1
CC-5
CC-3
CC-2
CC-1
EW-2
CC-14
SVE Compound
EW-3
CC-4
SVE-1
CC-6
MW-107
EW-4
SVE-FC
SVE-MP1S
SVE-MP1D
SVE-2S
SVE-2D
SVE-MP2S
SVE-MP2D
MW-101
N
Legend
Extraction Well
Monitor Well
Existing SVE Wells
Underground Piping
Former Building Footprint
November 2010 ESRI World Imagery
50 25 0 50 Feet
SVE System Layout
Central and Camelback WQARF Site
Phoenix, AZ
Geosyntec consultants
Figure 3
Phoenix, AZ
April 2015
P:\GIS\SP143 ASRAC Central\Camelback\SP143 CamelbackSVE.mxd\JGordon

NOTES

AERIAL IMAGE FROM BING

- Monitor Well
- Extraction Well
- Groundwater Dewatering Well Sampled
- Tetrachloroethene (PCE) concentration isopleths in micrograms per liter (µg/L)
- (2.4) PCE concentrations in µg/L
- * Not part of this sampling event
- (NS) Not Sampled

260' 130' 0 260 Feet

PCE CONCENTRATIONS WITH CONCENTRATION ISOPLETHS APRIL 2017

Central and Camelback WQARF Site
Phoenix, Arizona

Geosyntec consultants

Figure 4

Phoenix, AZ | May 2017

N:\GEOSYNTEC\WQARF SITE\PCE MONITORING\WQARF PCE 2017 APRIL EXHIBIT

NOTES

AERIAL IMAGE FROM BING

- Monitor Well
- Extraction Well
- Groundwater Dewatering Well Sampled
- Trichloroethene (TCE) concentration isopleths in micrograms per liter (µg/L)
- (2.4) TCE concentrations in µg/L
- * Not part of this sampling event
- J Estimated concentration below laboratory minimum reporting level but above method detection limit
- (NS) Not Sampled

260' 130' 0 260 Feet

TCE CONCENTRATIONS WITH CONCENTRATION ISOPLETHS APRIL 2017

Central and Camelback WQARF Site
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2017

Figure 5

N:\GEOSYNTEC\WQARF SITE\TCE MONITORING\WQARF TCE 2017 APRIL EXHIBIT

APPENDIX A

Detailed Cost Information for the Proposed Remedy

Table A-1
Soil Proposed Remedy Cost Breakdown
Central and Camelback WQARF Site

Vadose Zone Proposed Remedy - Rebound Test and Shutdown SVE	
	Total Cost
Estimated Rebound Testing Costs	
Soil Vapor Well Sampling (Labor, Four Events)	$4,000
Oversight and Reporting	$6,000
Utilities (APS)	$2,000
Analytical Costs	$4,000
Miscellaneous Field Equipment	$1,000
Project Management/Administration	$2,000
Total Rebound Testing Costs	**$19,000**
Estimated Contingency Costs	
Additional 6 Months of SVE Operation	$25,000
Rebound Testing	$18,000
Project Management/Administration	$5,000
Contingency Costs Total	**$48,000**
Estimated Closure Costs	
Abandon SVE Extraction wells	$37,000
GAC Disposal	$10,000
Removal of SVE Equipment/Fencing/Power Service	$12,000
Coordination/Oversight of Decommissioning Activities	$14,000
Project Management/Administration	$8,000
Closure Costs Total	**$81,000**
Total Rebound Testing, Closure, & Contingency Costs	**$148,000**

Notes:

- Labor and utility costs are based on current SVE system operational costs
- Costs are rounded to nearest $1000

Abbreviations:

APS - Arizona Public Service Electric Company

SVE - soil vapor extraction

GAC - vapor-phase granular activated carbon

Table A-2
Groundwater Proposed Remedy Cost Breakdown
Central and Camelback WQARF Site

Groundwater Proposed Remedy - Continued GETS & Groundwater Monitoring	
	Total Cost [1]
Estimated Capital Costs	
Permit Renewal/Modification	$15,000
Misc. GETS Equipment Replacement	$16,000
Additional Targeted EISB Injection Event - CC-5 Area	$115,000
Bench-scale Testing/Pilot Study Amendment for CC-17 or CC-18 Area	$100,000
Injection Well Installation / One Time Amendment Injection for CC-17 or CC-18 Area	$690,000
Project Management/Administration	$94,000
Capital Costs Total	**$1,030,000**
Estimated Annual Costs [2]	
Semiannual Groundwater Monitoring & Reporting (including OEC wells)	$62,000
GETS O&M and Reporting	$116,000
Utilities (APS and COP)	$8,000
GAC Changeout (assumes 2 changeouts/5 years)	$36,000
Miscellaneous Field Equipment	$3,000
Miscellaneous Sampling Equipment	$1,000
Project Management/Administration	$23,000
Annual Costs Total	$249,000
Total O&M and Groundwater Monitoring Costs for 10 Years [3]	**$2,831,000**
Estimated Contingency Costs [3]	
Additional 10 years of Groundwater Monitoring and Reporting	$943,000
Additional 10 years of GETS O&M and Reporting	$1,788,000
Additional Targeted EISB Injection Event - CC-5 Area	$115,000
Additional Amendment Injection Event for CC-17 or CC-18 Area	$172,000
Quarterly Rebound Monitoring (1 year)	$90,000
Extraction Pipeline Connecting OEC Dewatering Wells to GETS	$515,000
Discharge Permit Modification	$10,000
Project Management/Administration	$363,000
Contingency Costs Total	**$3,996,000**
Estimated Closure Costs	
Abandon 29 Monitor and Extraction Wells (includes video logging, well perforation, and disposal of cuttings/waste material)	$700,000
Abandon 20 Amendment Injection Wells (assume no video logging or well perforations)	$183,000
GAC Disposal	$36,000
Removal of Treatment Building/Equipment and Removal of Piping from Extraction Wells/Backfill Trenches	$55,000
Removal of Extraction Well Vaults	$8,000
Oversight of Demo Activities	$50,000
Project Management/Administration	$103,000
Closure Costs Total	**$1,135,000**
Total Capital, O&M, Groundwater Monitoring, Closure, & Contingency Costs	**$8,992,000**

Notes:

[1] Costs are rounded to nearest $1000

[2] Labor and utility costs are based on current GETS operational costs

[3] Total O&M and Groundwater Monitoring costs include a 3% cost increase from year to year

Abbreviations:

APS - Arizona Public Service Electric Company

COP - City of Phoenix

OEC - One East Camelback

GETS - Groundwater Extraction Treatment System

O&M - operations and maintenance

GAC - liquid-phase granular activated carbon