

**RECORD OF DECISION  
WEST CENTRAL PHOENIX – NORTH PLUME  
WQARF REGISTRY SITE  
PHOENIX, ARIZONA**



November 6, 2019

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## LIST OF ACRONYMS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
A.R.S.	Arizona Revised Statute
AWQS	Aquifer Water Quality Standard
BGS	Below Ground Surface
CAB	Community Advisory Board
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
COCs	Contaminants of Concern
DCA	Dichloroethane
DCE	1,1-dichloroethene
cDCE	cis-1,2-dichloroethene
DNAPL	Dense Non-aqueous Phase Liquid(s)
EPA	United States Environmental Protection Agency
ERA	Early Response Action(s)
ERD	Enhanced Reductive Dechlorination
F&B	F&B Manufacturing Company
FS	Feasibility Study
GPL	Groundwater Protection Level(s)
Hill Brothers	Hill Brothers Chemical Company
LAU	Lower Alluvial Unit
MAU	Middle Alluvial Unit
mg/kg	Milligrams per Kilogram
MNA	Monitored Natural Attenuation
NFA	No Further Action

PASI	Preliminary Assessment Site Investigation(s)
PCE	Tetrachloroethene
PRAP	Proposed Remedial Action Plan
Pyramid	Pyramid Industries, Inc.
RI	Remedial Investigation
Rinchem	The Rinchem Company
RO	Remedial Objective(s)
ROD	Record of Decision
SRL	Soil Remediation Level(s)
SRP	Salt River Project
SVE	Soil Vapor Extraction
Tarr	Tarr Acquisition, LLC
TCA	1,1,1-trichloroethane
TCE	Trichloroethene
UAU	Upper Alluvial Unit
ug/L	Micrograms per Liter
UIC	Underground Injection Control
VOCs	Volatile Organic Compounds
WQARF	Water Quality Assurance Revolving Fund

## **1.0 DECLARATION**

### **1.1 Site Name and Location**

This Record of Decision (ROD) is for the West Central Phoenix North Plume Water Quality Assurance Revolving Fund (WQARF) Registry Site (Site) located in Maricopa County, Phoenix, Arizona (Figure 1). The Site is located in a mixed commercial and industrial area of Phoenix and is bounded by Highland Avenue to the north, Indian School Road to the south, 37th Avenue to the east, and 43rd Avenue to the west (Figure 2).

The Site was added to the WQARF registry in 1998, with an eligibility and evaluation score of 50 out of 120.

### **1.2 Basis and Purpose**

This ROD presents the Selected Remedy for the Site, chosen in accordance with applicable requirements in Title 18, Chapter 16 of the Arizona Administrative Code (A.A.C.). The process for selecting the remedy complied with Arizona Revised Statute (A.R.S.) §49-287.04. The Arizona Department of Environmental Quality (ADEQ), as the lead agency, has reviewed the remedy and determined that Site completion criteria used to evaluate the selected remedial action for Contaminants of Concern (COCs) in groundwater and soil at the Site and Remedial Objectives (ROs) will be satisfied. This ROD describes the basis for the Selected Remedy and addresses all elements of A.A.C. R18-16-410 under the WQARF Program. The decision in this ROD is based upon previous activities and investigations conducted and performed for this Site that are documented and located in ADEQ's Administrative Record file. The State of Arizona, acting by and through ADEQ, has selected the remedy detailed in this document.

### **1.3 Site Assessment**

Tetrachloroethene (PCE) is the primary COC at the Site. Other COCs at the Site include trichloroethene (TCE) and 1,1-dichloroethene (DCE). PCE, TCE, and DCE have been detected in the soil, soil vapor, and groundwater at the Site. Other volatile organic compounds (VOCs) have been detected at the Site and are no longer considered COCs because concentrations of these other VOCs are below regulatory levels (i.e., soil remediation levels [SRLs], groundwater protection levels [GPLs], and Aquifer Water Quality Standards [AWQS]). Releases of VOCs to the environment primarily occurred at four facilities at the Site including F&B Manufacturing Company (F&B), Pyramid Industries, Inc. (Pyramid), The Rinchem Company (Rinchem), and Hill Brothers Chemical Company (Hill Brothers). The locations of these facilities are presented on Figure 2.

The COCs have been detected in the groundwater at concentrations exceeding their respective AWQS of five micrograms per liter (ug/L) for PCE and TCE, and seven ug/L for DCE. The highest COC concentrations have been detected in an area near a former vapor degreaser at F&B. Lower

COC concentrations have been detected near the other three facilities (Pyramid, Rinchem, and Hill Brothers).

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

- The excavation of approximately 210 cubic yards of contaminated soil within the source area at F&B.
- The installation and operation of a Soil Vapor Extraction (SVE) system within the source area at F&B. The SVE is currently operating and continues to remove the VOC mass in the soil vapor beneath F&B.
- In-situ groundwater treatment of the VOC-impacted groundwater within the source area at F&B using enhanced reductive dechlorination (ERD) injections. The ERD injections are ongoing and continue to remediate the VOC mass in the groundwater beneath F&B.
- The installation and operation of a SVE system at Hill Brothers. The SVE system removed approximately 277 pounds of VOCs. The SVE system at Hill Brothers was shut down in 2010.

#### **1.4 Selected Remedy**

The Selected Remedy, identified as the Reference Remedy in the Feasibility Study Report (FS) (Matrix, 2016) and proposed in the Proposed Remedial Action Plan (PRAP) (Matrix, 2017), to remediate the soil and groundwater at the Site includes the following remedial technologies:

- SVE to clean-up the impacted soil/soil vapor within the source area at F&B.
- In-situ ERD injections to clean-up the groundwater at the Site impacted with high concentrations of VOCs.
- Monitored natural attenuation (MNA) to verify the natural degradation of the COCs in the groundwater at the Site.

The Selected Remedy includes the following contingencies:

- Additional in-situ ERD injections to accelerate the clean-up of the VOCs in the groundwater at the Site.
- Wellhead treatment for a City of Phoenix, Salt River Project (SRP), or other water production well that is installed within or becomes impacted by the groundwater plume at the Site.

A detailed description of the Selected Remedy is provided in Section 3.0 of this ROD. The remedial equipment and the wells associated with the Site will be abandoned in accordance with the PRAP and applicable Arizona Department of Water Resources (ADWR) requirements including A.A.C. R12-15-816 upon completion of the remedial actions. ADEQ will delist the Site in accordance with A.R.S. §49-287.01(K) upon completion of the abandonment activities.

## **1.5 Statutory Determinations**

In January 2009, ADEQ completed the Remedial Investigation (RI) Report (LFR, 2009) pursuant to A.R.S. §49-287.03(E) and A.A.C. 18-16-406. The RI report:

- Established the nature and extent of the contamination and the sources thereof.
- Identified current and potential impacts to public health, welfare and the environment.
- Identified current and reasonably foreseeable uses of land and waters of the state.
- Obtained and evaluated information necessary for identification and comparison of alternative remedial actions.

In August 2016, ADEQ completed the FS Report (Matrix, 2016) pursuant to A.R.S. §49-287.03(F) and A.A.C. 18-16-407. The FS, based on information obtained during the RI, evaluated three remedial alternatives and identified the remedy for the Site. The FS:

- Provided for the development of a Reference Remedy and at least two alternative remedies which were capable of achieving all of the ROs.
- Confirmed that the Reference Remedy was based upon best engineering, geological, and hydrogeological judgement.
- Provided one alternative remedy that was more aggressive than the Reference Remedy.
- Provided one alternative remedy that was less aggressive than the Reference Remedy.

In June 2017, ADEQ completed the PRAP (Matrix, 2017) pursuant to A.R.S. §49-287.04 and A.A.C. 18-16-408. The PRAP presented the remedy recommended by the FS (Reference Remedy), selected the remedy, and provided costs to implement the remedy. Public comments on the Selected Remedy (i.e., Reference Remedy) were solicited and received. The PRAP:

- Identified the boundaries of the Site.
- Summarized the results of the RI and FS.
- Proposed the Selected Remedy and its cost.

- Described how the remedial goals and selection factors were evaluated.

Pursuant to A.R.S. §49-287.04 and A.A.C. 18-16-410, this ROD is the final administrative decision as defined under A.R.S. §41-1092. The Selected Remedy meets the following criteria as stipulated in A.R.S. §49-282.06:

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

## **2.0 SITE BACKGROUND**

### **2.1 Site Description**

The Site is located in an industrialized area of West Central Phoenix (Figure 2). The boundaries of the Site subject to remedial action include the area located between West Highland Avenue to the north, Indian School Road to the south, 37th Avenue to the east, and 43rd Avenue to the west. The Site includes the geographical areal extent of the contamination as shown by the current groundwater plumes impacted with VOCs (Figures 3 and 4).

Historical operations at the Site included the manufacture of aircraft, spacecraft, and electrical components; and chemical warehousing, repackaging, and distribution. The nearest residential areas are located east and northeast of the contamination at the Site. These residential areas are located up-gradient and cross-gradient of the contamination at the Site.

### **2.2 Source of Release**

The sources of contamination at the Site are releases of VOCs that occurred at the following facilities:

- F&B is an aircraft and spacecraft parts manufacturing facility that used PCE in a vapor degreaser from approximately 1967 to 1987, after which time 1,1,1-trichloroethane (TCA) was used. The results of investigations conducted at F&B indicated that the soil directly beneath the vapor degreaser was the primary source of PCE contamination in the vadose zone and the underlying groundwater at the Site.
- Pyramid operated an electrical components manufacturing facility from 1977 to 1994. The facility used various chemicals including acids, caustics, heavy metals, paints, and methylene chloride. Although PCE use at Pyramid has not been documented, analytical results of shallow soil samples collected from the southern and western portions of the facility indicate that releases possibly occurred near the loading dock, dry well, paint room, and historical hook cleaner areas. Methylene chloride and PCE were detected in a sediment sample collected from the drywell. Samples collected from soil borings drilled near the drywell also had detectable concentrations of these contaminants indicating that contaminants may have been introduced to the subsurface through the drywell.
- Rinchem operated a chemical warehouse and distribution facility from 1982 to 1993. The facility handled solvents, oils, and fuels including blended custom solvents. Chemicals were stored in a tank farm located on the western side of the property. A repackaging area and chemical processing area were located immediately adjacent to the tank farm. PCE use was documented at this facility. Tarr Acquisition, LLC (Tarr) took over operations in June 1993 as a chemical distributor, conducting the same types of operations as Rinchem, including handling of PCE and TCE. Soil samples collected at the facility indicated the

presence of VOCs including PCE, TCE, TCA, and methylene chloride. The highest concentrations of these VOCs were detected in a soil boring located near a concrete sump in the former repackaging area. Surficial soil samples collected in the former tank farm area also contained concentrations of benzene, toluene, ethylbenzene, total xylenes, and petroleum hydrocarbons.

- Hill Brothers operates a chemical repackaging and distribution facility. The business started operations at this location in 1969 and remains in operation today. The facility first received VOCs, and specifically chlorinated solvents, beginning in the 1970s. The chlorinated solvents received at the facility included PCE, TCE, and TCA. No other chlorinated solvents were delivered to, handled at, or distributed from the Hill Brothers facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. Chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in five-gallon, one-gallon, or quart containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. Hill Brothers stopped handling and repackaging the chlorinated solvents in 1995. Soil samples collected at the facility indicated the presence of VOCs. PCE and TCE were detected at low concentrations in two soil samples that were collected in the former solvent repackaging area.

## **2.3 Need for Remedial Action**

### **2.3.1 *Soil/Soil Vapor***

COCs are present in the soil and soil vapor within the F&B source area at the Site at concentrations that exceed Arizona's remediation standards for soil. A soil vapor plume is present at F&B that extends to the depth of groundwater. The historical soil vapor concentrations indicate that dense non-aqueous phase liquids (DNAPLs) are likely present within the vadose zone beneath the source area. The soil vapor plume and the DNAPL are a continuing source of groundwater contamination. Thus, remedial action is needed at the Site to remediate the impacted soil and soil vapor at the Site.

### **2.3.2 *Groundwater***

COCs including PCE, TCE, and DCE are present in the groundwater at the Site at concentrations that exceed the AWQS. Although groundwater at the Site is not currently used as a drinking water supply, the regional aquifer is considered a water supply for municipal and private well owners in the vicinity of the Site. Therefore, the aquifer must be protected and a remedial action for groundwater at the Site is required.

## 2.4 Chronology of Site Activities

A detailed history of the remedial investigations and ERAs conducted at the Site is presented in the RI Report, the FS Report, and the PRAP. A brief summary of these activities is presented below:

**1982:** VOCs were detected in the groundwater at the Site.

**1987:** The West Central Phoenix Area was designated a WQARF priority list site.

**1989 to 1993:** Preliminary Assessment Site Investigations (PASI) were conducted that included soil, soil vapor, and groundwater sampling at F&B, Pyramid, Rinchem, and Hill Brothers. Several contaminants, including PCE, TCE, and DCE, were detected in the soil and groundwater samples collected during these investigations. Additionally, ADEQ discovered that PCE had leaked from a degreaser into the soil at F&B.

**1993 to 1998:** Additional investigations were conducted at the Site that included soil, soil vapor, and groundwater sampling.

**1998:** The Site was placed on the WQARF Registry with a score of 50 out of a possible 120.

**2000 to 2006:** ADEQ removed approximately 210 cubic yards of soil beneath the vapor degreaser at F&B. In August 2001, ADEQ began operating a SVE system at F&B to remediate the PCE contamination beneath the vapor degreaser.

**2006:** The Draft RI Report was issued in August.

**2008:** Hill Brothers installed a SVE system to remediate the contaminated soils beneath the facility.

**2009:** The RI Report was finalized in January.

**2010:** The SVE system at Hill Brothers was shut down and dismantled. The SVE system removed approximately 277 pounds of VOCs. A No Further Action (NFA) for soils underlying the Hill Brothers facility was issued.

**2013:** The FS Work Plan was finalized in February.

**2016:** The FS Report was completed in August. ADEQ initiated an ERD pilot study to evaluate the potential of ERD at the Site.

**2017:** The PRAP was completed and issued for public comment in June 2017. The SVE system at F&B has operated continually since August 2001, except for shut down during maintenance and optimization activities. ADEQ continued ERD injections within the source area at F&B.

**2019:** As of September 2019, the SVE system at F&B had removed a total of approximately 55,100 pounds of VOCs since operation began in August 2001 (Matrix, 2019). ADEQ continued ERD injections within the source area at F&B.

## **2.5 Source Area Definition**

Data collected during the RI confirmed that contaminants were released into the soil and groundwater at the Site. COCs detected above regulatory levels at the Site include PCE, TCE, and DCE. The main source of the soil and groundwater contamination at the Site is F&B. Other sources of contamination at the Site include Pyramid, Rinchem, and Hill Brothers. Currently, the soil contamination is confined to the F&B property while the groundwater contamination extends across the Site. A description of the soil and groundwater contamination at the Site is presented in the following paragraphs.

### ***2.5.1 Soil and Soil Vapor Contamination***

#### **F&B**

The former vapor degreaser at F&B is the primary source of PCE contamination at the Site. The highest concentration of PCE was detected in a soil sample collected beneath the degreaser at a concentration of 5,400 milligrams per kilogram (mg/kg) which exceeds the minimum GPL (1.3 mg/kg) and the non-residential SRL (13 mg/kg). An ERA was conducted to remove contaminated soil beneath the former vapor degreaser sump to a depth of approximately 22 feet below ground surface (bgs). However, soil sample data collected below 22 feet bgs indicated that PCE released from the degreaser had migrated vertically through the vadose zone to groundwater. Thus, a SVE system was constructed within the source area at F&B and has operated (as an ERA) since 2001 to remove the PCE impacted soil vapor. Historical soil vapor concentrations at F&B indicate the likely presence of DNAPL within the vadose zone beneath the source area. These PCE residues act as a continuing source of soil vapor and groundwater contamination.

#### **Pyramid**

PCE and methylene chloride have been detected in soil samples collected within the southwestern portion of the Pyramid facility. PCE was detected at a concentration of concern. PCE was detected at a maximum concentration of 2.5 mg/kg which exceeds the minimum GPL (1.3 mg/kg). The maximum PCE concentration does not exceed the non-residential SRL (13 mg/kg). Although PCE use at Pyramid has not been documented, the analytical results of shallow soil samples collected from the southern and western portions of the facility indicated that possible releases occurred near the loading dock/drywell, paint room, and historical hook cleaner areas.

#### **Rinchem**

PCE, DCE, TCA, dichloroethane (DCA), and cis 1,2-dichloroethene (cDCE) have been detected in soil samples collected at the Rinchem facility. The VOCs detected at concentrations of concern

included PCE and TCE. PCE and TCE were detected in soil samples collected near a concrete sump in the former repackaging area at maximum concentrations of 21 mg/kg and 1.2 mg/kg, respectively. The PCE concentration exceeds the minimum GPL (1.3 mg/kg) and the non-residential SRL (13 mg/kg). The TCE concentration exceeds the minimum GPL (0.61 mg/kg). The TCE concentration did not exceed the non-residential SRL (65 mg/kg).

### Hill Brothers

Soil samples collected at the Hill Brothers facility indicated the presence of VOCs detected at low concentrations at depths from five to 100 feet bgs within the former solvent repackaging area. However, no VOCs were detected at concentrations greater than the minimum GPLs or the SRLs.

### **2.5.2 Groundwater Contamination**

The Site is underlain by three water-bearing hydrogeologic zones, which are identified as, from oldest to youngest, the Lower Alluvial Unit (LAU), Middle Alluvial Unit (MAU), and Upper Alluvial Unit (UAU). The UAU is unsaturated at the Site. Groundwater in the upper portion of the MAU generally flows to the northwest. Groundwater in the middle portion of the MAU generally flows to the west.

Based on groundwater monitoring data collected at the Site, concentrations of PCE and TCE in groundwater exceed the AWQS of five µg/L and concentrations of DCE exceed the AWQS of seven µg/L. The groundwater impacted with VOC concentrations above the AWQS is present within the upper and middle intervals of the MAU (Figures 3 and 4). The highest VOC concentrations are within the upper MAU. PCE is the predominant COC present in the groundwater with the highest concentrations located at F&B and directly down-gradient of F&B. The highest TCE and DCE concentrations are present in the groundwater at F&B and directly down-gradient of F&B. TCE, PCE, and DCE are present at lower concentrations in the vicinity of the Rinchem and Hill Brothers facilities.

The VOC concentration contours presented on Figures 3 and 4 were developed using data collected in April 2019 for wells located east of North 42nd Avenue (Matrix, 2019) and in March 2014 for wells located west of North 42nd Avenue (Matrix, 2017). A summary of the groundwater sample results is presented below:

#### April 2019 Groundwater Results (Area East of North 42nd Avenue)

VOC concentrations in the groundwater within the upper MAU were as follows:

- PCE concentrations ranged from non-detect to a maximum of 1,500 ug/L;
- TCE concentrations ranged from non-detect to a maximum of 24 ug/L; and
- DCE concentrations ranged from non-detect to a maximum of 120 ug/L.

PCE was the only compound detected in the groundwater within the middle MAU at a concentration of 14 ug/L. No VOCs were detected in the lower MAU or deeper alluvial units.

March 2014 Groundwater Results (Area West of North 42nd Avenue)

VOC concentrations in the groundwater within the upper MAU were as follows:

- PCE concentrations ranged from not detect to a maximum of 23.9 ug/L;
- TCE concentrations ranged from non-detect to a maximum of 52 ug/L; and
- DCE concentrations ranged from non-detect to a maximum of 19.4 ug/L.

No VOCs were detected in the groundwater within the middle MAU or deeper alluvial units.

In summary, the concentrations of COCs in the groundwater at the Site have declined in concentration but still exceed the AWQS. The decreasing PCE concentrations and the presence of TCE, DCE, and cDCE indicate degradation processes are taking place in the groundwater in the vicinity and down-gradient of F&B. The decreasing concentrations of TCE in the vicinity of the Rinchem and Hill Brothers facilities also indicate degradation process are taking place in the groundwater near those facilities.

### 3.0 SELECTED REMEDY

The FS evaluated remedial alternatives for VOCs in soil and groundwater at the Site (Matrix, 2016). The remedial alternatives were developed to meet the ROs (ADEQ, 2008). The Selected Remedy proposed by the FS and carried forward to the PRAP (Matrix, 2017) includes the following components:

- The SVE system at F&B will continue to be operated and optimized to contain and remove the soil vapor VOC plume present in the vadose zone. The SVE system will continue operation for a period of up to 20 years.
- In-situ ERD injections will be implemented to remediate the groundwater in the upper MAU in areas of the plume with PCE concentrations greater than 100 ug/L. The implementation of ERD will include the installation of additional treatment and monitoring wells. The wells will be constructed with two or three screened intervals with a seal between the screened intervals to allow depth-specific injections into the zones with the highest COC concentrations. The treatment will be implemented by injecting bio-remediation agents into the treatment wells. Groundwater monitoring and sampling at selected monitoring wells will be conducted to monitor the performance of the ERD injections. The in-situ ERD injections will be conducted for a period of up to 10 years.
- Plume monitoring utilizing MNA will be implemented at the Site during and following the completion of in-situ ERD injections. MNA will include semi-annual groundwater monitoring at selected monitoring wells during implementation of the in-situ ERD injections for a period of up to 10 years. Upon conclusion of the in-situ ERD injections, MNA will include annual groundwater monitoring at selected monitoring wells for a period of up to 20 years to verify that attenuation continues to occur at the Site. MNA will be conducted for a total period of up to 30 years.
- The Selected Remedy includes the following two contingencies:
  - Additional in-situ ERD injections to accelerate the remediation of the groundwater plume at the Site should this be determined to be beneficial based on the groundwater monitoring results.
  - Wellhead treatment for a City of Phoenix, SRP, or other water production well that is installed within or becomes impacted by the groundwater plume at the Site.

The PRAP provides the basis for the Selected Remedy (Matrix, 2017). The Selected Remedy presented in this ROD differs slightly than what was proposed in the PRAP. The differences are summarized below:

- The ERD treatment area was expanded from areas inside the 1,000 ug/L concentration line to include areas inside the 100 ug/L concentration line. The ERD treatment area was expanded based on suggestions received from the City of Phoenix during the public comment period.
- The costs presented in the PRAP did not account for inflation. The costs presented in the ROD considered inflation using an inflation rate of three percent per year over the 30 year duration of the ROD.
- Five new monitoring wells were proposed in the PRAP to monitor the effectiveness of the ERD injections. These five monitoring wells are no longer needed due to the transfer of ownership of several existing monitoring wells from the City of Phoenix to ADEQ.

### 3.1 Selected Remedy Summary

#### SVE at F&B

The SVE system at F&B will continue to be operated. The SVE system consists of eight SVE wells drilled to various depths within the vadose zone beneath the former vapor degreaser at F&B (the primary source of release of PCE to the subsurface). The layout of the SVE system is shown on Figure 5. As the system continues to be operated, it will be optimized, as necessary, to maximize the efficiency of the system. Optimization of the SVE system will likely include the following techniques:

- **Focused Extraction:** The existing SVE system will be optimized to enhance the removal of the remaining mass by focusing extraction on existing wells that are more effective at extracting source area VOCs (as evidenced by regular field monitoring) and by shutting off extraction wells that no longer appear to be effective in removing VOCs. Routine monitoring will allow periodic shifting of active wells to maximize source removal. Additionally, selected SVE wells could be used as air infiltration points to change the vapor flow paths to further optimize the SVE system. The estimated duration of the focused extraction is seven years.
- **Pulsed Operation:** As the remaining VOC mass becomes more diffusion-limited, SVE operation can be transitioned to a periodic or “pulsed” operation such that active extraction occurs in intervals separated by periods of no extraction. Pulsed extraction is unlikely to increase the mass removal rate but may significantly decrease the operating expense (for a reduced, but sufficiently effective, mass removal rate). The intent of pulsed SVE operation is to allow diffusion from low-permeability lenses into more permeable pathways and then periodically remove the vapors from those more permeable layers. For example, the SVE system would be operated for one week followed by seven weeks of non-operation which would reduce costs by 75 to 80 percent. The estimated duration of the pulsed operation is 13 years.

The total duration of the SVE system operation is estimated to be up to 20 years which includes focused extraction for seven years followed by pulsed operation for 13 years. The actual duration will be based on the SVE system performance and monitoring data collected during system operation.

### In-Situ ERD Injections

In-situ ERD injections will be implemented to remediate the groundwater in the upper MAU in areas of the plume with PCE concentrations greater than 100 ug/L (Figure 6). This remedial component includes the installation of up to 25 new treatment wells. Each well will be constructed with two or three screened zones with a seal between the screened intervals to allow depth-specific injection in zones with the highest COC concentrations. The injection wells will be registered with the United States Environmental Protection Agency (EPA) in accordance with the Code of Federal Regulations (CFR) Title 40, Chapter I, Subchapter D, Part 144 – Underground Injection Control (UIC) Program prior to installation.

ERD injections will be conducted in up to nine existing treatment wells and up to 25 new treatment wells (Figure 6). The injection solution will include a bio-stimulation amendment such as a soluble sucrose-based solution or an oil-based solution to provide a carbon source to drive the redox conditions lower and a hydrogen releasing compound that will serve as the electron donor. During each injection event, the field crew will inject between 1,000 and 1,500 gallons of a sugar substrate solution into each injection zone (each injection well will have two or three screened zones) utilizing a temporary injection pipe. The proposed volume of injection solution is expected to achieve a 25-foot radius of influence around each well. The injection solution will be mixed in an onsite tank prior to injection.

Bioaugmentation (injecting microbes to accelerate bio-remediation) will be implemented using microbial cultures (*Dehalococcoides*). The bio-augmentation will be completed or supplemented (if the Site conditions warrant it) by extracting groundwater from a well within the same plume that is known to contain *Dehalococcoides* and injecting that water into well(s) that are experiencing slower dechlorination rates because of insufficient microbial activity. As appropriate, trace levels of nutrients (i.e., nitrogen, phosphorus, etc.) and/or yeast extracts may also be added to the wells to promote accelerated bacterial growth and increase dechlorination rates.

Performance groundwater monitoring and sampling will be conducted prior to the initial injection events and then periodically after each injection event to monitor the progress of the ERD injections. The results of the monitoring and sampling will be used to adjust (as needed) the injection solutions. The treatment wells will be located up-gradient of existing monitoring wells so that performance monitoring can be performed to assess overall remedy performance.

The duration of the in-situ ERD injections and subsequent performance groundwater monitoring and sampling is up to 10 years.

## MNA

MNA will be conducted at the Site concurrently with the in-situ ERD injections. MNA is a mechanism by which COCs are reduced (often slowly) by natural means without other control, removal, treatment, or aquifer-modifying activities. Natural dechlorination is occurring in some down-gradient portions of the plume as evidenced by the presence of PCE daughter products (TCE and DCE). This remedial measure will involve groundwater monitoring and sampling at monitoring wells located throughout the Site to verify that attenuation continues to occur (Figure 7). Groundwater samples will be analyzed for COCs and parameters indicative of natural attenuation including but not limited to electron acceptors and donors, dissolved oxygen, oxygen reductive potential, and ethene.

The COC concentrations in groundwater are expected to be remediated to the ROs within 20 years of concluding the in-situ ERD injections. MNA monitoring will initially be conducted at up to 20 monitoring wells on a semi-annual basis for a period of up to 10 years followed by annual monitoring for an additional period of up to 20 years. The total duration of the MNA groundwater monitoring and sampling is up to 30 years. The duration of monitoring, frequency of monitoring, and the number of wells to be monitored will be adjusted as warranted by the monitoring results.

## Contingencies

The Selected Remedy includes two contingencies to address changes in the viability of the remedy to protect human health and the environment and/or address changes in the groundwater usage at the Site. These contingencies may be implemented based on periodic reviews of the remedy and groundwater use evaluation of the community involvement area.

The Selected Remedy includes a contingency to provide additional in-situ ERD treatment of the groundwater plume to accelerate the degradation of the groundwater contaminants at the Site. This contingency will be implemented by installing up to 15 more injection wells and conducting in-situ ERD injections for a period of up to five years. This contingency also includes additional performance groundwater monitoring and sampling for a period of up to five additional years.

The Selected Remedy also includes a second contingency for wellhead treatment if the City of Phoenix, SRP, or other water production well that is installed within or becomes impacted by the groundwater plume at the Site. Wellhead treatment would be implemented if the use of the well becomes restricted due to COCs present in the water supplied from the well.

### **3.2 Achievement of Remedial Objections and Remedial Action Criteria**

In accordance with A.A.C. R18-16-406(I), ADEQ prepared the Remedial Objectives Report (ADEQ, 2008) that established ROs for the current and reasonably foreseeable uses of land and waters of the State of Arizona that have been or are threatened to be affected by a release of a hazardous substance. In accordance with A.A.C. R18-16-407, the ROs were evaluated in the FS

Report and, according to A.A.C. R18-16-408 and A.R.S. §49-287.04, considered in development of the remedial action alternatives presented in the PRAP Report.

The RO for soil at the Site is to “protect against possible exposure to hazardous substances in surface and subsurface soils that could occur during typical industrial uses.” Only soils at F&B currently contain COCs at concentrations which do not meet the RO. Therefore, the Selected Remedy to continue operation of the SVE system at F&B will meet the RO.

The RO for groundwater at the Site is “to protect the supply of groundwater for municipal and irrigation use and for the associated recharge capacity that is threatened by contamination emanating from the WCP North Plume Site. To restore, replace, or otherwise provide for the groundwater supply lost due to contamination associated with the WCP North Plume Site. This action will be needed for as long as the need for the water exists, the resource remains available, and the contamination associated with the WCP North Plume Site prohibits or limits groundwater use.”

ERD injection at similar sites across the country has proven to be a viable remedy for the removal of contaminant mass. The results of the ERD injections conducted at F&B indicate decreasing concentrations of COCs in the groundwater demonstrating that ERD is an effective technology for remediating the groundwater at the Site (Matrix, 2019). Therefore, the Selected Remedy for groundwater includes in-situ ERD injections at the Site. In-situ ERD injections combined with MNA will reduce COCs to below the AWQS and meet the RO for groundwater.

The surface water use portion of the Land and Water Use Report (LFR, 2006) indicated no surface water usage within the Site. Accordingly, a surface water RO for the Site is not applicable.

Based on these determinations, the Selected Remedy demonstrates:

- The ability to achieve the ROs with regard to both land use and groundwater use;
- Consistency with plans of affected water providers and the general land use plans of the local government(s); and
- Compatibility with regard to practicability, cost, risk, and benefit.

### **3.3 Compliance with Arizona Administrative Code and Arizona Revised Statutes**

In 1998, the Site was placed on the WQARF Registry by ADEQ with a score of 50 out of a possible 120. In 2009, ADEQ issued the RI Report (LFR, 2009) for public comment to meet the requirements under A.A.C. R18-16-404(C)(1)(b) and A.A.C. R18-16-406(F). The report documented the results of the field investigation activities that were conducted between 1984 and 2009. Solicitation for ROs to be included in the RO Report was conducted during the Community Advisory Board (CAB) meeting process per A.A.C. R18-16-406(I). Based on the solicitation, Land

and Water Use Study, and water management plans of providers, a Draft RO Report was prepared and submitted for public comment prior to finalizing the RI Report. The RO Report (ADEQ, 2008) was finalized in December 2008 and included as an appendix to the RI Report.

A FS Work Plan (ARCADIS, 2013) was prepared for ADEQ in February 2013 and a public notice was issued in accordance with the requirements outlined in A.A.C. R18-16-404(C)(1)(d). A FS Report (Matrix, 2016) was prepared documenting the development and evaluation of alternatives for remediation of the Site and providing a recommendation of a final remedy capable of achieving the ROs developed for the Site.

A PRAP (Matrix, 2017) was prepared based on the work executed under the FS Work Plan and contained in the FS Report. The PRAP documented the results of the FS and evaluated the selected remedy. SVE, in-situ ERD injections, and MNA were selected as the remedy for the Site. Based on a comparison with alternative remedies, the Selected Remedy:

- Adequately assures the protection of public health, welfare, and the environment.
- To the extent practicable, provides for the control, management and cleanup of COC contamination, maximizing beneficial use of the groundwater use; and
- Is reasonable, necessary, cost-effective, and technically feasible.

The Selected Remedy is consistent with A.R.S. §49-282.06 as it provides protection to the public by providing control of hazardous substances with contingencies. Future use of groundwater by private or municipal well owners in the area is not anticipated based on the Land and Water Use Study (LFR, 2006).

### **3.4 Community Involvement and Public Comment Requirements**

A CAB was formed that met on a regular basis to discuss the issues and status of investigation and cleanup activities conducted at the Site. These meetings were open to the public. The most recent CAB meeting was held on May 27, 2017. A Community Involvement Plan (CIP) (ADEQ, 2016) was also developed and regularly updated for the Site. The specific public participation activities that have been completed for the Site are presented in Table 1.

### **3.5 Schedule**

The schedule for implementing the Selected Remedy will be dictated by the WQARF program priorities and available funding after the ROD has been executed and entered into the Administrative Record. SVE is scheduled to be conducted for up to 20 years. In-situ ERD injections and/or MNA will be conducted until the COCs are no longer present above their respective AWQS or the Director determines that the conditions of A.R.S. §49-282.06(D) have

been met. Based on current groundwater data trends, ADEQ estimates groundwater remediation at the Site will be needed for up to 30 years.

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

A contingency to provide additional in-situ treatment of groundwater contaminants to accelerate the degradation processes is included should this be determined to be beneficial based on intermediate monitoring results and Periodic Site Reviews. In addition, a contingency for wellhead treatment by ADEQ is included if the City of Phoenix, SRP, or other entity installs a water supply well or has an existing water supply well within the plume and its proposed use is restricted because of COCs present in the water supplied from the well. Upon completion of remedial actions, all remedial equipment and wells associated with the Site will be abandoned in accordance with the PRAP and applicable ADWR requirements as promulgated in A.A.C. R12-15-816. After completion of the above actions, ADEQ will delist the Site in accordance with A.R.S. §49-287.01(K).

**Table 1 - Community Involvement Activities**

Community Involvement Activity	Regulatory Citation/Rule	Date
Establish Community Involvement Area	A.R.S. §49-289.02(A)	April/May 1998
Notice of the Site listing on the Registry	A.R.S. §49-287.01 A.R.S. §49-289.03(A)	April 1998
Hazardous substance contamination notice and fact sheet	A.R.S. §49-289.02(B) A.R.S. §49-287.03(B) A.A.C. R18-16-404(C)(1)(i)	April 2000
Notice of RI scope of work, fact sheet, and outline of CIP	A.R.S. §49-287.03(B) A.R.S. §49-287.03(C) A.A.C. R18-16-403(F) A.A.C. R18-16-403(G)	1998
Establish CAB selection committee	A.R.S. §49-289.03(D)	April 2000/August 2014
Establish CAB	A.R.S. §49-289.03(C) A.R.S. §49-289.03(F)(1)	June 2000/October 2014
Prepare and update CIP	A.R.S. §49-287.03(D) A.R.S. §49-289.03(C) A.A.C. R18-16-403(E) A.A.C. R18-16-404(C)	June 2000/September 2009/April 2015/May 2016
Land and Water Use Study Questionnaires mailed	A.A.C. R18-16-404(C)(1)(a)	March/April/ August 2001/June/July 2006
Notice of opportunity to comment on Draft RI Report	A.A.C. R18-16-404(C)(1)(b) A.A.C. R18-16-406(F)	August 2006
Public notice for solicitation of ROs	A.A.C. R18-16-404(C)(1)(b) A.A.C. R18-16-406(I)(2)	August 2006
Notice of opportunity to comment on Proposed RO Report	A.A.C. R18-16-404(C)(1)(c) A.A.C. R18-16-406(I)(5)	September 2008
Public meeting(s) to discuss proposed/revised RO Report (if needed)	A.A.C. R18-16-406(I)(5)	Not Applicable
Notice of availability of Final RI and RO Reports	A.A.C. R18-16-406(J)	January 2009
Notice of availability of the FS Work Plan	A.A.C. R18-16-404(C)(1)(d)	February 2013
Notice of availability of the FS Report	Not Required	August 19, 2016
Issue notice of availability and opportunity to comment on the PRAP. Four comment letters were received.	A.R.S. §49-287.04(B) A.A.C. R18-16-404(C)(1)(e) A.A.C. R18-16-408(C)(1)	August 3, 2017 and December 21, 2017
Notice of ROD & Responsiveness Summary Availability	A.R.S. §49-287.04 (G) A.A.C. R18-16-404(C)(1)(f)	TBD

#### **4.0 RESPONSIVENESS SUMMARY**

In accordance with A.A.C. R18-16-410(B)(2) and A.R.S. §49-287.04(F), a comprehensive responsiveness summary was prepared to identify and respond to all comments received on the PRAP at the conclusion of all the public comment periods. A 90-day comment period for the PRAP was held starting on August 3, 2017 through November 1, 2017. A second 90-day comment period was held starting on December 21, 2017 through March 21, 2018. Four letters containing written comments were received during the comment period as follows:

- One letter from Andrea Martinez with SRP dated November 1, 2017.
- One letter from Julie Riemenschneider with the City of Phoenix dated November 1, 2017.
- One letter from Shane Burkhart with Hill Brothers dated March 20, 2018.
- One letter from Bruce Travers with Haley & Aldrich, Inc. dated March 21, 2018, prepared on behalf of Hill Brothers, with technical comments.

No other comments were received on the PRAP. A copy of the comment letters and the ADEQ response to the comments is presented in Appendix A.

## **5.0 COST**

As required in A.A.C. R18-16-410(C), this section presents the costs (excluding non-recoverable costs) previously incurred by ADEQ during Site characterization and implementation of the ERAs and presents the costs of the Selected Remedy.

### **5.1 Historic Costs**

The Site was placed on the WQARF Registry in 1998 due to the discovery of soil and groundwater contamination at the Site. Investigation and remediation of the Site by ADEQ began in 1984 and will continue as the Selected Remedy is implemented. ERAs were conducted at the Site starting in 2000 and were instrumental in reducing contaminant concentrations and risk of exposure. Significant costs have been incurred by ADEQ during characterization of the Site and implementation of the ERAs. These activities to date have cost ADEQ \$14,500,078.19.

### **5.2 Future Costs**

The estimated life cycle costs for implementing the Selected Remedy at the Site are summarized in Table 2. The estimated costs for the two contingencies are summarized in Table 3.

**Table 2 – Selected Remedy Cost Summary**

Year	Description	Cost
1	Install 13 Treatment Wells, In-Situ Treatment at 22 Wells, MNA at 20 Wells, & SVE	\$1,196,000
2	Install 12 Treatment Wells, In-Situ Treatment at 34 Wells, Bioaugmentation at 13 Wells, MNA at 20 Wells, & SVE	\$1,362,000
3	In-Situ Treatment at 34 Wells, Bioaugmentation at 12 Wells, MNA at 20 Wells, & SVE	\$733,000
4	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & SVE	\$735,000
5	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & SVE	\$758,000
6	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & SVE	\$780,000
7	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & SVE	\$804,000
8	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & Pulsed / Optimized SVE	\$720,000
9	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & Pulsed / Optimized SVE	\$631,000
10	In-Situ Treatment at 34 Wells, MNA at 20 Wells, & Pulsed / Optimized SVE	\$650,000
11	MNA at 20 Wells & Pulsed / Optimized SVE	\$94,000
12	MNA at 20 Wells & Pulsed / Optimized SVE	\$97,000
13	MNA at 20 Wells & Pulsed / Optimized SVE	\$100,000
14	MNA at 20 Wells & Pulsed / Optimized SVE	\$103,000
15	MNA at 20 Wells & Pulsed / Optimized SVE	\$106,000
16	MNA at 20 Wells & Pulsed / Optimized SVE	\$109,000
17	MNA at 20 Wells & Pulsed / Optimized SVE	\$112,000
18	MNA at 20 Wells & Pulsed / Optimized SVE	\$116,000
19	MNA at 20 Wells & Pulsed / Optimized SVE	\$119,000
20	MNA at 20 Wells & Pulsed / Optimized SVE	\$123,000
21	MNA at 10 Wells	\$54,000
22	MNA at 10 Wells	\$56,000
23	MNA at 10 Wells	\$58,000
24	MNA at 10 Wells	\$59,000
25	MNA at 10 Wells	\$61,000
26	MNA at 10 Wells	\$63,000
27	MNA at 10 Wells	\$65,000
28	MNA at 10 Wells	\$67,000
29	MNA at 10 Wells	\$69,000
30	MNA at 10 Wells	\$71,000
31	Site Closure (Abandon ADEQ owned wells & SVE System)	\$1,174,000
<b>TOTAL SELECTED REMEDY COST</b>		<b>\$11,245,000</b>
Notes: Costs assumes inflation rate of 3%		

**Table 3 – Contingency Cost Summary**

<b>Description</b>	<b>Cost</b>
In-Situ Treatment Acceleration	\$1,261,000
Wellhead Treatment	\$2,625,000
<b>TOTAL CONTINGENCY COST</b>	<b>\$3,886,000</b>

## 6.0 CONCLUSIONS

The Selected Remedy chosen for the Site consists of SVE at F&B, in-situ ERD injections within the groundwater contaminant plume, and MNA. Contingencies include expanded in-situ ERD injections and wellhead treatment by ADEQ for a new or existing City of Phoenix, SRP, or other water supply well if the proposed use of the well is restricted due to COCs present in the groundwater supplied from the well. SVE will be conducted for up to 20 years or until the RO for soil has been met. In-situ ERD injections and MNA will be conducted for up to 10 years and 30 years, respectively, or until the RO for groundwater has been met. At such time, remedial and monitoring activities will cease and all equipment (i.e., treatment wells, monitoring wells, etc.) associated with the Site investigation and remediation will be abandoned in accordance with the PRAP and ADWR requirements as stated in A.A.C. R12-15-816. At such time there will be no need to protect human health and the environment and the Site will be delisted as stated in A.R.S. §49-287.01 (K). At any time prior to completion of the ROD, a portion of the Site may be issued a no further action (NFA) in accordance with A.R.S. §49-287.01 (F) & (G).

## 7.0 REFERENCES

ADEQ, 2008. Proposed Remedial Objectives Report, West Central Phoenix North Plume, WQARF Site, Phoenix, Arizona. July 2008.

ADEQ, 2016. West Central Phoenix, Water Quality Assurance Revolving Fund (WQARF) Sites, East Grand Avenue, North Canal Plume, North Plume, West Grand Avenue, West Osborn Complex, Community Involvement Plan, Phoenix, Arizona. 2016.

ARCADIS, 2013. Final Feasibility Study Work Plan, West Central Phoenix North Plume, WQARF Registry Site, Phoenix, Arizona. February 1, 2013.

LFR, 2006. Land and Water Use Report, West Central Phoenix North Plume Site, Phoenix, Arizona. July 2006.

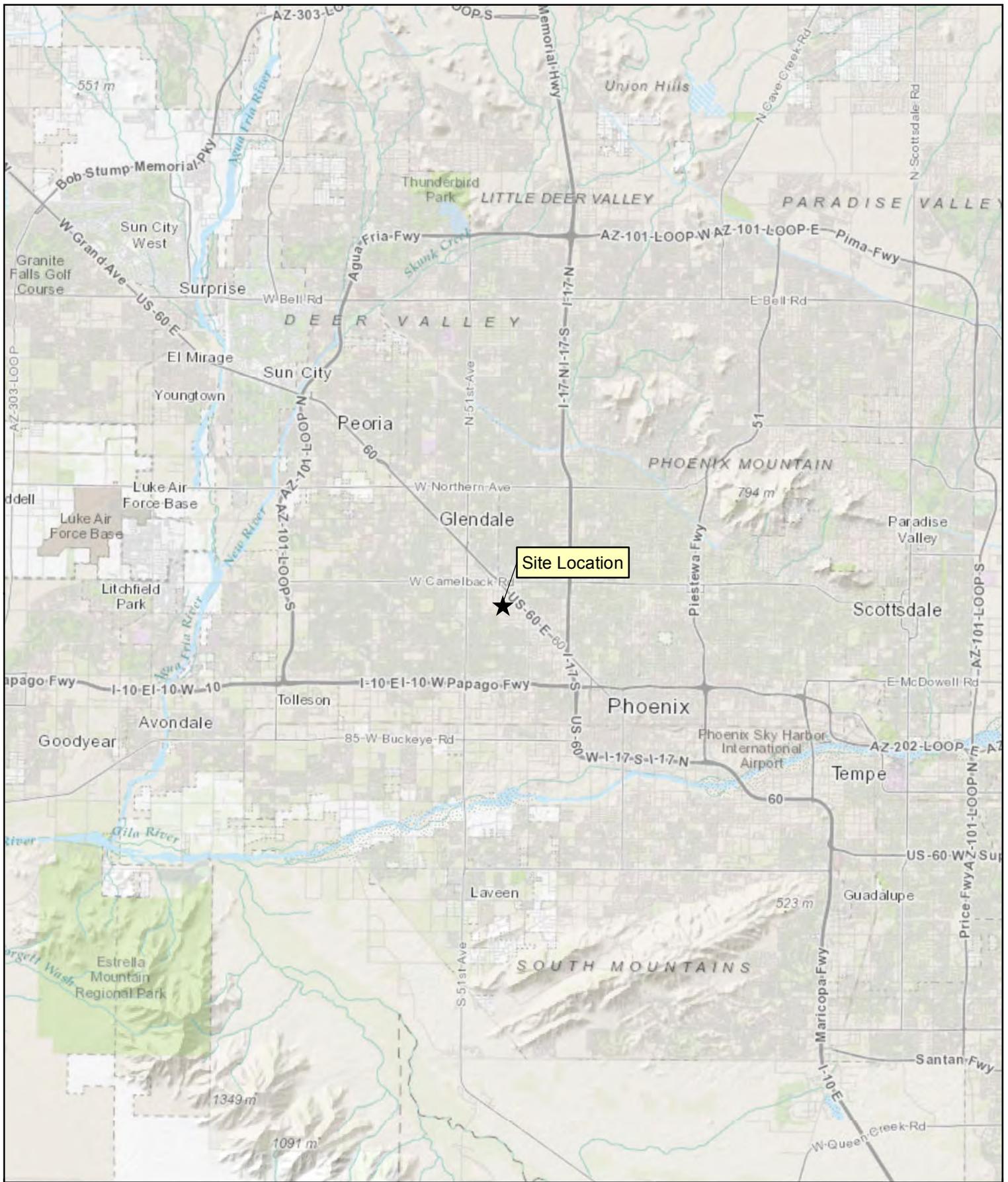
LFR, 2009. Final Remedial Investigation Report, West Central Phoenix North Plume Site, Phoenix, Arizona. January 2009.

Matrix-CALIBRE Team (Matrix), 2016. Feasibility Study, West Central Phoenix North Plume Water Quality Assurance Revolving Fund (WQARF) Site, Phoenix, Arizona. August 19, 2016.

Matrix, 2017. Proposed Remedial Action Plan, West Central Phoenix North Plume, WQARF Site, Phoenix, Arizona. June 2017.

Matrix, 2019. Early Response Actions and Groundwater Monitoring Report, April 2019, for the West Central Phoenix North Plume Water Quality Assurance Revolving Fund Arizona Superfund Response Action Contract. June 13, 2019.

## **FIGURES**



Drawn By: JKC  
 QC'd By:  
 Drawing Date: 04/03/2015

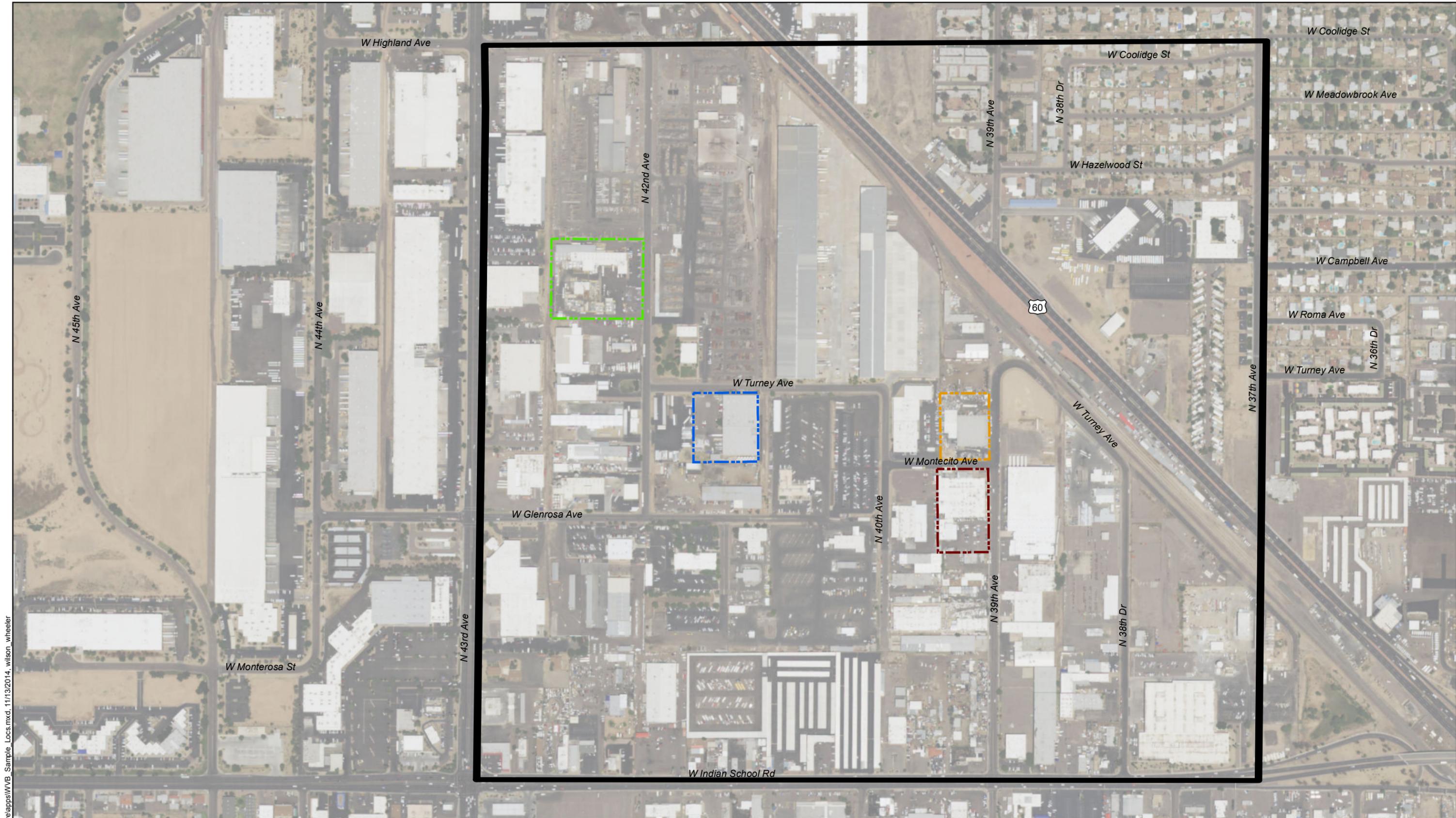
**Legend**

★ Site Location

Site Location Map  
 West Central Phoenix North Plume  
 WQARF Site

Figure 1

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- Legend**
-  Site Boundary
  -  Hill Brothers Facility
  -  F&B Manufacturing Co. Facility
  -  Rinchem Facility
  -  Pyramid Facility

Site Detail Map  
West Central Phoenix North Plume  
WQARF Site

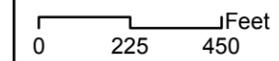
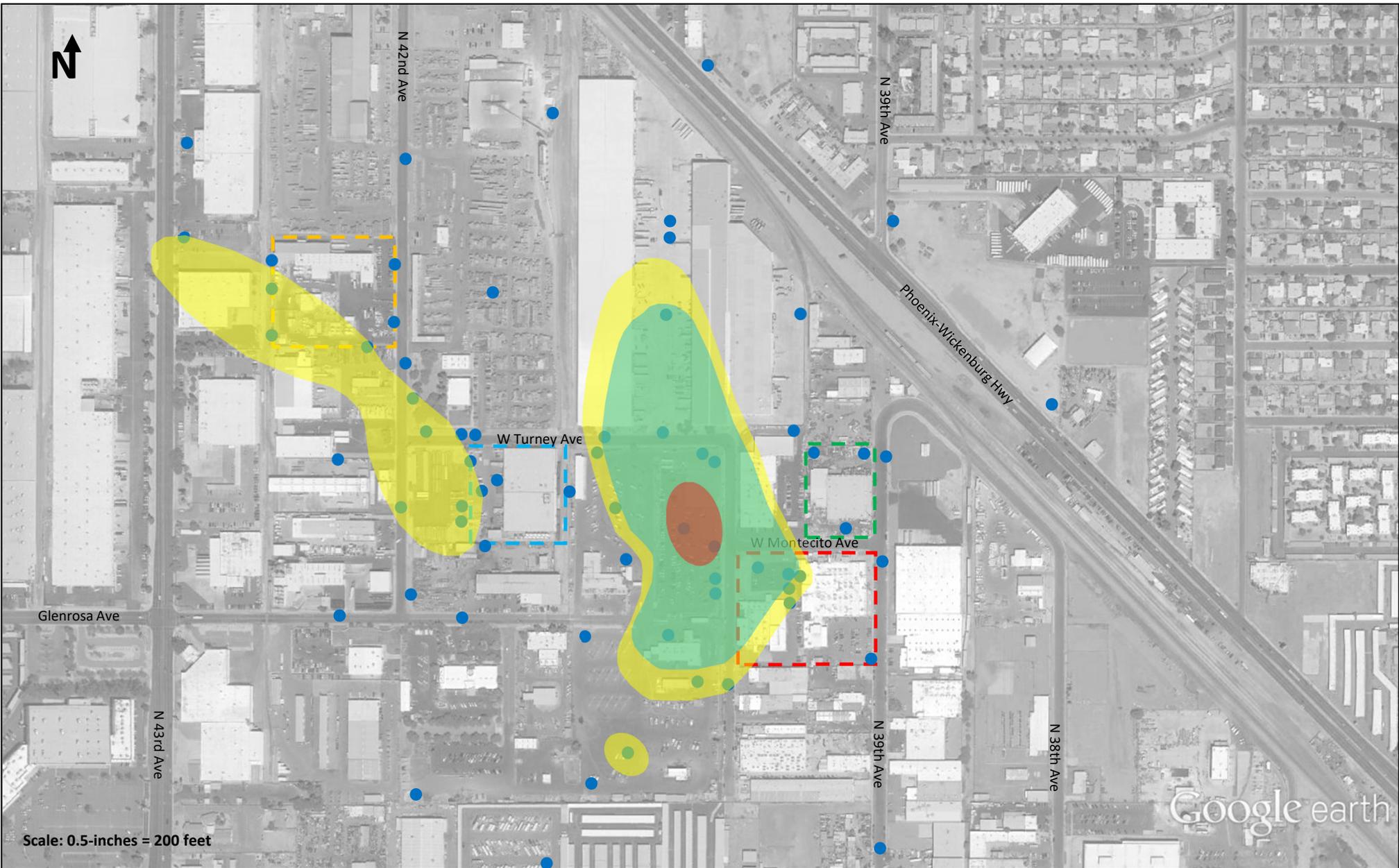


Figure  
2

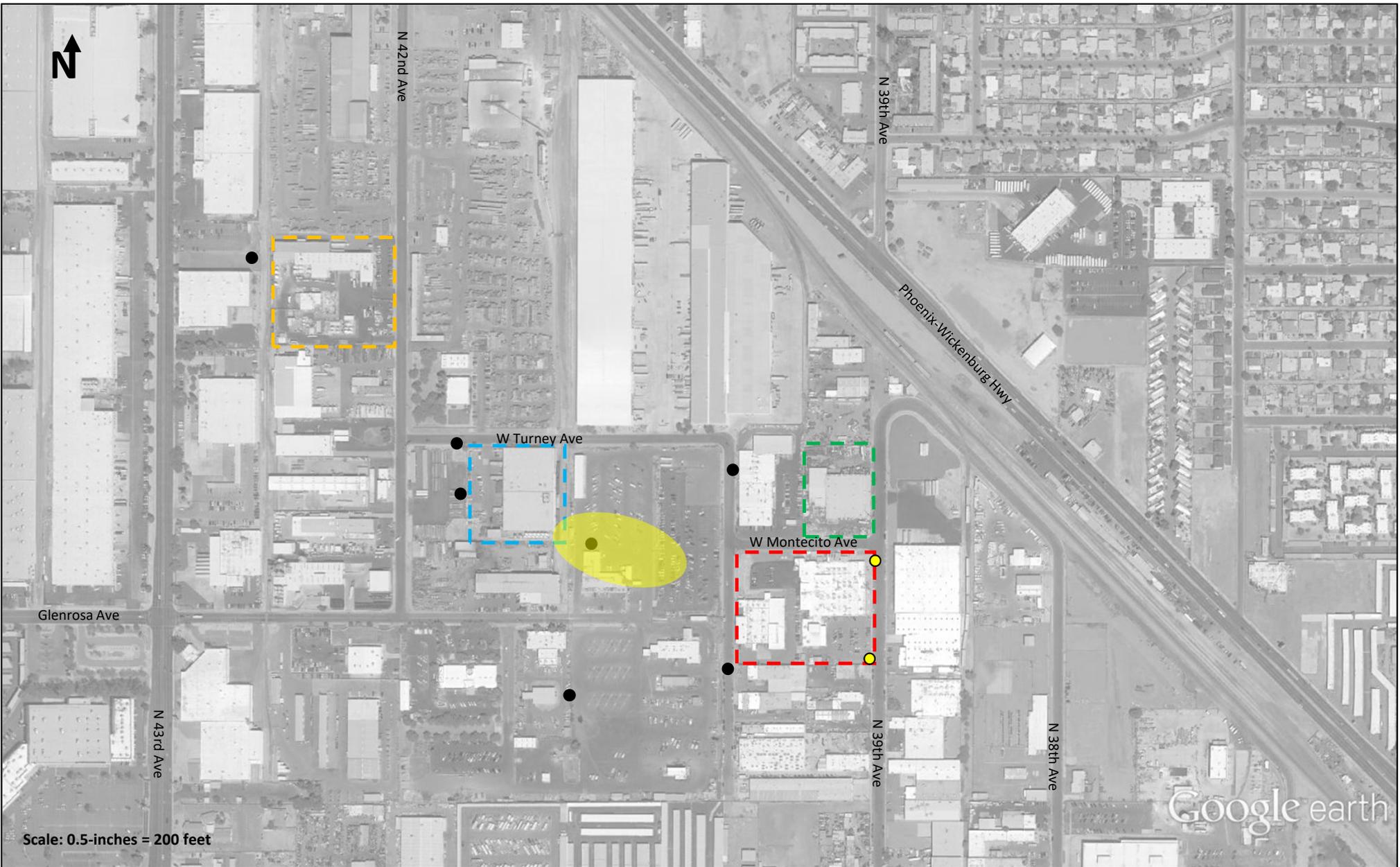


**LEGEND**

	F&B Manufacturing Facility		Upper MAU Well
	Pyramid Facility		>5 to 100 ug/L Concentration
	Rinchem Facility		>100 to 1,000 ug/L Concentration
	Hill Brothers Facility		>1,000 ug/L Concentration

Notes:  
 MAU = Middle Alluvial Unit  
 WCP = West Central Phoenix  
 VOC = Volatile Organic Compound  
 ug/L = Micrograms Per Liter  
 WQARF = Water Quality Assurance Revolving Fund

**Figure 3**  
**Upper MAU VOC**  
**Groundwater Concentrations**  
**WCP – North Plume WQARF Site**  
**Phoenix, AZ**



**LEGEND**

- |  |                            |   |                             |
|--|----------------------------|---|-----------------------------|
|  | F&B Manufacturing Facility |  | Middle MAU Monitoring Well  |
|  | Pyramid Facility           |  | Westbay Monitoring Well     |
|  | Rinchem Facility           |  | >5 to 15 ug/L Concentration |
|  | Hill Brothers Facility     |   |                             |

Notes:  
 MAU = Middle Alluvial Unit  
 WCP = West Central Phoenix  
 VOC = Volatile Organic Compound  
 ug/L = Micrograms Per Liter  
 WQARF = Water Quality Assurance Revolving Fund

**Figure 4**  
**Middle MAU VOC**  
**Groundwater Concentrations**  
**WCP – North Plume WQARF Site**  
**Phoenix, AZ**



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**Legend**  
 ▲ SVE Well    □ SVE Equipment System    ← SVE Piping

SVE System Layout  
 West Central Phoenix North Plume  
 WQARF Site  
 April 6, 2015

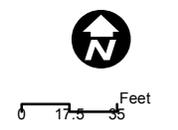
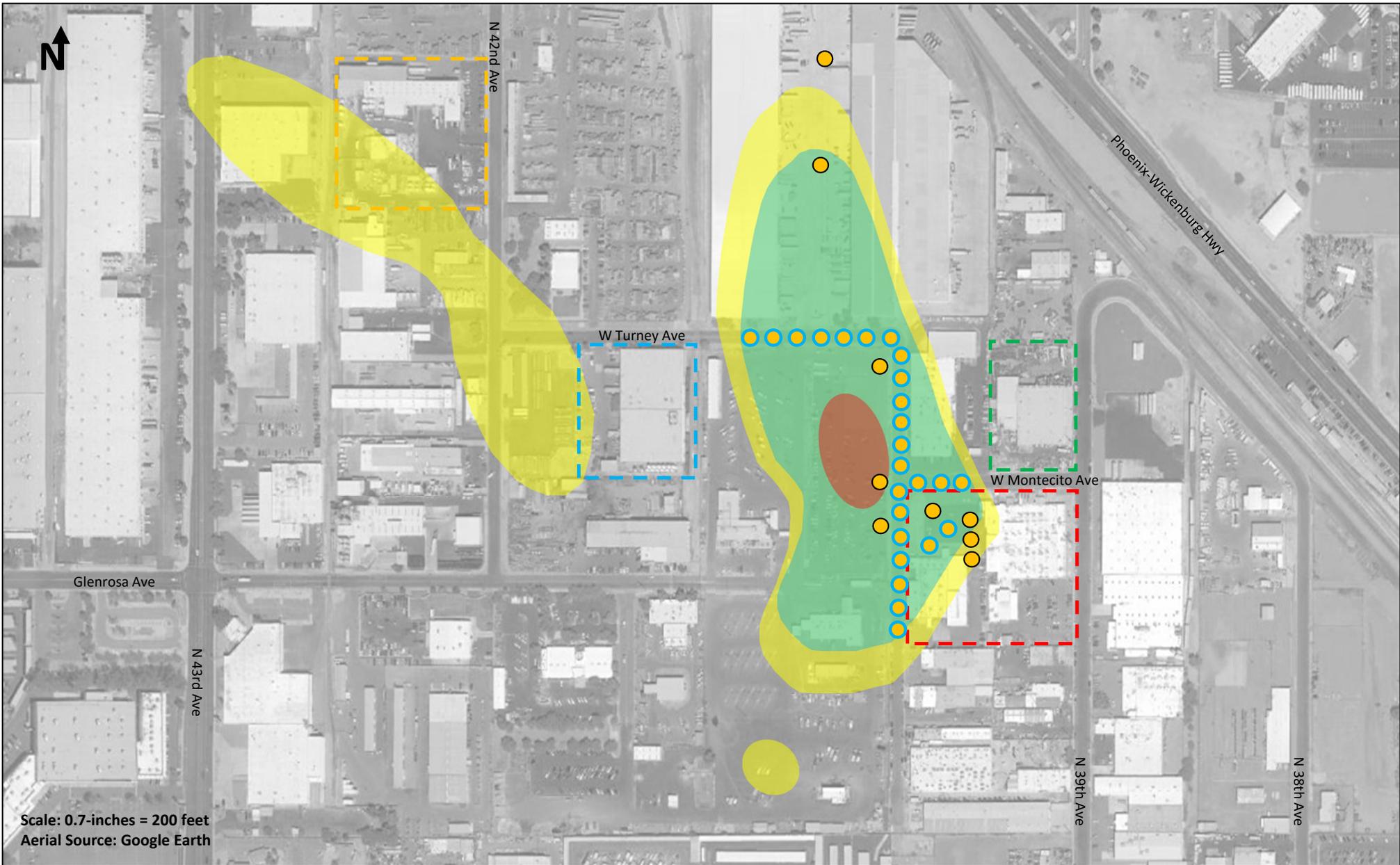


Figure 5



Scale: 0.7-inches = 200 feet  
 Aerial Source: Google Earth

**LEGEND**

- F&B Manufacturing Facility
- Pyramid Facility
- Rinchem Facility
- Hill Brothers Facility
- Existing Treatment Well
- Proposed Treatment Well
- >5 to 100 ug/L VOC Concentration
- >100 to 1,000 ug/L VOC Concentration
- >1,000 ug/L VOC Concentration

**Notes:**

MAU = Middle Alluvial Unit  
 WCP = West Central Phoenix  
 ERD = Enhanced Reductive Dechlorination  
 VOC = Volatile Organic Compound  
 ug/L = Micrograms Per Liter  
 WQARF = Water Quality Assurance Revolving Fund

**Figure 6**  
**ERD Groundwater**  
**Treatment System Layout**  
**WCP – North Plume WQARF Site**  
**Phoenix, AZ**



**LEGEND**

	F&B Manufacturing Facility		Upper MAU Monitoring Well
	Pyramid Facility		Upper MAU Treatment Well
	Rinchem Facility		Middle MAU Monitoring Well
	Hill Brothers Facility		Westbay Monitoring Well

Notes:  
 MAU = Middle Alluvial Unit  
 WCP = West Central Phoenix  
 WQARF = Water Quality Assurance Revolving Fund

**Figure 7**  
**Well Location Map**  
**WCP – North Plume WQARF Site**  
**Phoenix, AZ**

**APPENDIX A**

**RESPONSIVENESS SUMMARY**

**PROPOSED REMEDIAL ACTION PLAN COMMENTS**

## **RESPONSIVENESS SUMMARY**

In accordance with Arizona Administrative Code (A.A.C.) R18-16-410(B)(2) and Arizona Revised Statute (A.R.S.) §49-287.04(F), this comprehensive responsiveness summary has been prepared to identify and respond to all comments received on the Proposed Remedial Action Plan (PRAP) after the conclusion of the public comment period. A 90-day comment period for the PRAP was held starting on August 3, 2017 through November 1, 2017 and a second 90-day comment period was held starting on December 21, 2017 through March 21, 2018. Four letters containing written comments were received during the comment period as follows:

1. One letter from Andrea Martinez with the Salt River Project (SRP) dated November 1, 2017.
2. One letter from Julie Riemenschneider with the City of Phoenix dated November 1, 2017.
3. One letter from Shane Burkhardt with Hill Brothers Chemical Company (Hill Brothers) dated March 20, 2018.
4. One letter from Bruce Travers with Haley & Aldrich, Inc. (Haley & Aldrich) dated March 21, 2018, prepared on behalf of Hill Brothers, with technical comments.

No other comments were received on the PRAP. The comments are summarized below with Arizona Department of Environmental Quality (ADEQ) responses. Copies of the letters follow the summaries and responses.

### **Written Comments from Andrea Martinez with SRP**

#### ***Comment #1***

Ms. Martinez Wrote:

#### **Contingency for Proposed Remedy – Wellhead Treatment**

SRP appreciates the inclusion of contingencies in the proposed remedy for the WCP-NP Site but believes that the contingency for wellhead treatment should be strengthened to fully support the Remedial Objectives (RO) for groundwater and protect the regional aquifer for municipal and irrigation use. Although the PRAP discusses the importance of protecting the regional aquifer for municipal and irrigation purposes in various sections, section 5.10 of the PRAP (“Contingency for Proposed Remedy”) does not explicitly address contingencies for existing irrigation wells and does not cover SRP interests:

*“The second contingency is to provide wellhead treatment for a new City of Phoenix [COP] or other municipal well that could theoretically be installed within the plume...”*

As discussed in the *West Central Phoenix North Plume Feasibility Study* (August 2016), SRP operates nine irrigation wells in the vicinity of the WCP-NP Site. One of these wells (9.5E-7.7N) lies within a 1-mile radius of the current site boundary. Due to SRP’s aging wellfield and long-term water supply demands, it may become necessary to re-drill wells in closer proximity to the plume due to the general unavailability of land within the ADWR water rights requirements.

In addition, SRP recently signed a contract to supply water to the City of Goodyear. Once the agreement goes into effect, groundwater supply wells in and around the West Central Phoenix WQARF site, including SRP well 9.5E-7.7N, will be transitioned from irrigation wells to drinking water supply wells. The water will be delivered to the Goodyear drinking water plant via the Grand Canal.

SRP respectfully requests that any SRP water production well (irrigation or drinking water well) located within the footprint of the plume, either in the present or future, be included in the wellhead treatment contingency plan. We also respectfully suggest that the second contingency be rewritten as follows:

*To the extent contaminant levels in the groundwater are above the AWQS, the second contingency is to provide wellhead treatment for City of Phoenix, Salt River Project, or other municipal well(s) that could theoretically be installed or located within the plume at an additional cost of \$2,625,000.*

ADEQ Response:

ADEQ concurs with the comment and has revised the contingency for wellhead treatment in the Record of Decision (ROD) to include SRP and other production well(s).

**Written Comments from Julie Riemenschneider with the City of Phoenix**

***General Comment #1***

Ms. Riemenschneider Wrote:

In general, the City supports the following aspects of the reference remedy; vadose zone source control and saturated zone source/plume treatment. The City supports the continued operation and optimization of the Soil Vapor Extraction (SVE) on the F&B Manufacturing Company facility.

The City also supports the implementation of an enhanced reductive dechlorination (ERD) remedy for the groundwater plume.

ADEQ Response:

Thank you for your comment.

***General Comment #2***

Ms. Riemenschneider Wrote:

It should be noted that the majority of the proposed ERD system is located on the City's Glenrosa Facility. This is an active facility. ADEQ would need to meet separately with various facility stakeholders from the City to discuss the feasibility of the ERD system being located here. Depending on the timing of the ERD system and future use by the City of our facility, other areas such as City streets might be an alternative solution. It should be noted that an agreement between the City and ADEQ would have to be entered into prior to any work being conducted. The City looks forward to discussing the proposed remedy in detail with ADEQ.

ADEQ Response:

ADEQ concurs with the comment. The proposed enhanced reductive dechlorination (ERD) injection well locations have been revised in the ROD. The revised ERD injection well locations are within the right-of-way of North 40th Avenue, West Montecito Avenue, and West Turney Avenue.

***General Comment #3***

Ms. Riemenschneider Wrote:

The City concurs that the presence of degradation products in the groundwater helps support that natural attenuation (sic) is occurring at the site. The City is concerned that the plume is not stable and long term monitored natural attenuation (sic) (MNA) will take an estimated 30 years. The City is also concerned that MNA is the remedy for the plume that has a groundwater concentration of 500 ug/L of PCE and less per the text (p.16) or 1000 ug/L of PCE or less per figure 5-2. The City would support ERD or other chemical oxidation efforts in this portion of the plume from 1000 ug/L to 100 ug/L to help decrease the high concentration and shorten the extensive length of time to reach the AWQS.

ADEQ Response:

ADEQ concurs with the comment. The area of the plume to be treated with in-situ ERD injections has been revised in the ROD. The area of the plume to be treated with in-situ ERD injections includes the area of the plume within the 100 micrograms per liter (ug/L) PCE iso-concentration contour line.

***General Comment #4***

Ms. Riemenschneider Wrote:

The City appreciates that ADEQ has added a well-head treatment contingency for a “new City of Phoenix or other municipal well” into the remedy and has included costs for such treatment. The City hopes that continued operation and optimization of the SVE system and installing a robust ERD system will aid in the timely cleanup of this site.

ADEQ Response:

Thank you for your comment.

***Specific Comment #1***

Ms. Riemenschneider wrote:

In Section 1.2 Site Description, ADEQ should expand the write up on F&B Manufacturing Company. The remedial investigation report that ADEQ wrote contains a considerable amount of information about this facility and the releases that occurred over time. This information would appear to be relevant here in the PRAP as it appears the ADEQ is focusing the remedial action at this facility and directly downgradient of it, which is discussed in section 5.0.

ADEQ Response:

This level of detail is not required for the PRAP or the ROD. The operational, chemical usage, and chemical release data and details for the F&B Manufacturing Company (F&B) were previously documented in the Remedial Investigation Report and other reports. These reports are available via the ADEQ website or the ADEQ Records Center.

### ***Specific Comment #2***

Ms. Riemenschneider Wrote:

In section 4.2, RO's for Groundwater; The City concurs with ADEQ regarding the remedial objective (RO) for groundwater. Although the City is not currently pumping any municipal wells in this area, we value this water resource for our future water needs. As such, the City agrees with ADEQ that this groundwater should be restored to municipal regulatory standards for future use.

ADEQ Response:

Thank you for your comment.

### ***Specific Comment #3***

Ms. Riemenschneider Wrote:

In section 5.0, Evaluation of Remedial Alternatives: second bullet point talks about a volatile organic compound (VOC) plume with an estimated level of 100 ug/L contour. Please indicate the VOC this 100 ug/l references.

ADEQ Response:

The three bulleted paragraphs in Section 5.0 were copied from the Feasibility Study Report. These bulleted paragraphs reference PCE at the 100 ug/L contour.

### ***Specific Comment #4***

Ms. Riemenschneider Wrote:

In section 5.6, Consistency with Water Management Plans; please reference the different water management plans ADEQ is referring to in this section.

ADEQ Response:

This section generally references the City of Phoenix Water Resources Plan from 2011 and the SRP management plans presented on their website.

### ***Specific Comment #5***

Ms. Riemenschneider Wrote:

The City recommends the ERD system be expanded into the portions of the plume with values of 100 µg/L to 1000 µg/L of PCE; not just the area above 1000 µg/L as currently stated (see figure 5-2).

ADEQ Response:

ADEQ concurs with the comment. The area of the plume to be treated with in-situ ERD injections has been revised in the ROD. The area of the plume to be treated with in-situ ERD injections includes the area of the plume within the 100 ug/L PCE iso-concentration contour line.

### ***Specific Comment #6***

Ms. Riemenschneider Wrote:

The City suggests that ADEQ have a baseline of groundwater wells that will be monitored during the entire ERD and MNA remedy. These wells should be indicated on a map. The other wells could be "floaters", that is, these wells would change over time depending on where the plume has migrated. The baseline wells should remain the same and be sampled until ERD and MNA is complete.

ADEQ Response:

The wells to be monitored and sampled during the remedy will be based on the nature and extent of the groundwater contamination as well as data obtained during the implementation of the remedy.

### ***Specific Comment #7***

Ms. Riemenschneider Wrote:

The PRAP does not specify how the wells will be abandoned at the time of closure of this site. The City assumes that ADEQ will abandon all wells following the Arizona Department of Water Resources (ADWR) requirements.

ADEQ Response:

All wells associated with the Site will be abandoned in accordance with applicable Arizona Department of Water Resources requirements as stated in A.A.C. R12-15-816.

***Specific Comment #8***

Ms. Riemenschneider Wrote:

Cost Table: ERD Area Remediation Task: Bioaugmentation is listed but there are no costs associated with that task.

ADEQ Response:

The cost for bioaugmentation was included in the ERD Remediation cost presented in Section 5.8 of the PRAP. The cost for bioaugmentation can be found in Appendix A of the PRAP in the line item costs for Year 1 and Year 2.

***Specific Comment #9***

Ms. Riemenschneider Wrote:

Cost Table: It should be noted that contingency wellhead treatment costs are only in present dollars and do not include inflation costs. The City recommends these costs be amended to include inflation.

ADEQ Response:

The need for implementing wellhead treatment as well as the start and end dates of wellhead treatment are unknown. Thus, these costs are presented in the ROD in present dollars.

**Written Comments from Shane Burkhardt with Hill Brothers**

***Comment #1***

Mr. Burkhardt Wrote:

HBCC has reviewed the PRAP that was included as Appendix B to the September 21, 2017 Notice Letter. Our primary concern with the PRAP is the incorrect representation of HBCC's historical operations as related to the handling of volatile organic compounds (VOCs). VOC usage and

handling at HBCC was on a much smaller scale than reflected in the PRAP. The following paragraph provides an accurate description of these operations.

*Hill Brothers Chemical Company (Hill Brothers) operates a chemical repackaging and distribution facility. The business started operations at this location in 1969 and remains in operation today. The facility first received VOCs, and specifically chlorinated solvents, beginning in the 1970s. The chlorinated solvents received at the facility included tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA). No other chlorinated solvents were delivered to, handled at, or distributed from the HBCC facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. Chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in 5-gallon, 1-gallon, or quart containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. HBCC stopped handling and repackaging the chlorinated solvents in 1995.*

Our specific comments regarding historical operations, our prior remedial efforts, our current site conditions, and other comments on the PRAP are provided in the attached Appendix A.

ADEQ Response:

The ROD includes the information provided in your comment.

***Comment #2***

Mr. Burkhart Wrote:

HBCC has reviewed the PRAP's Appendix A – Detailed Costs to Implement the Proposed Remedy. Since the PRAP has not clearly identified which portions of the proposed remedy are related to each individual potential responsible party (PRP), we are not able to provide detailed comments on these costs at this time. We would like the opportunity to comment once the PRAP identifies which component of the PRAP applies to each PRP.

Given the limited information provided, we can only provide two comments at this time. First, the costs to implement the PRAP are that the estimated well abandonment costs of \$6500 per well is excessive. Second, given that HBCC already remediated its property and operations, and contamination at F&B were several orders of magnitude greater than at other facilities, all future costs should be allocated to F&B.

ADEQ Response:

The estimated well abandonment cost of \$6,500 per well is reasonable based on the average depth of the wells at the site, typical contractor well abandonment footage rates, typical contractor mobilization and demobilization rates, and typical waste disposal fees.

ADEQ is aware that Hill Brothers conducted investigation and remedial activities at their facility at the Site. The allocation of historical and future costs will be determined after the ROD is signed under the direction of the Attorney General.

***Comment #3***

Mr. Burkhart Wrote:

The vast majority of the Arizona Department of Environmental Quality (ADEQ) past costs and future remedial costs are directly related to the F&B Facility. F&B by far is the PRP with the greatest impact to the North Plume site, has required the greatest site characterization activities, and the most extensive past and future remedial activities. Historic PCE concentrations in groundwater at the F&B facility are more than 1,700 times greater than at the HBCC facility (at F&B, as high as 150,000 micrograms per liter [ug/L] compared to HBCC with PCE concentrations no greater than 86 ug/L). It also appears that the PCE plume emanating from the Rinchem/Tarr facility has migrated to the northwest and is impacting groundwater beneath the HBCC facility. In comparison to F&B and Rinchem/Tarr, HBCC's contribution to the North Plume is *de minimis* and our liability should reflect that fact.

Additionally, the statement of past costs provided with the September 21, 2017 Notice Letter attributes nearly \$600,000 in past costs to HBCC. This number is extremely excessive in light of HBCC's historical operations compared to other PRP's operations. Although we requested the detailed invoices associated with these asserted costs so that we could provide comments at this time, they were not provided to us. We preserve our request to review invoices for costs that ADEQ seeks to allocate to HBCC and reserve the right to review and comment on any allocation of past costs to HBCC.

ADEQ Response:

The allocation of historical and future costs will be determined after the ROD is signed under the direction of the Attorney General.

## **Bruce Travers with Haley & Aldrich on behalf of Hill Brothers**

### ***Comment #1***

Mr. Travers wrote:

Page 2, Section 1.2 SITE DESCRIPTION, Paragraph 4

This section presents an incorrect description of the history of the chemical usage and more specifically the VOCs history at the HBCC site. VOCs, specifically chlorinated solvents, were first received at the HBCC facility in mid-1970. The chlorinated solvents included tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA). No other chlorinated solvents were delivered to, handled at, or distributed from the HBCC facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. The chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in 5-gallon, 1-gallon or quart containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. HBCC stopped handling and repackaging the chlorinated solvents in 1995. We recommend the Site Description of Hill Brothers' facility be revised as follows:

*Hill Brothers Chemical Company (Hill Brothers) operates a chemical repackaging and distribution facility. The business started operations at this location in 1969 and remains in operation today. The facility first received VOCs, and specifically chlorinated solvents, beginning in the 1970s.*

*The chlorinated solvents received at the facility included tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA). No other chlorinated solvents were delivered to, handled at, or distributed from the Hill Brothers facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. Chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in 5-gallon, 1-gallon, or quart containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. Hill Brothers stopped handling and repackaging the chlorinated solvents in 1995.*

ADEQ Response:

The ROD includes the information provided in your comment.

**Comment #2**

Mr. Travers wrote:

Page 5, Section 2.1.2 Soil/Soil Vapor, Last Full Paragraph

The chemical history for the HBCC is incorrect as noted in the Page 2, Section 1.2 comment above. In addition, of the 90 soil samples collected at 6 boring locations, only 2 soil samples had detected concentrations of VOCs, but the detected concentrations were all below the Arizona R-SRLs. This paragraph does not indicate the limited detection of VOCs in soil samples. We therefore recommend deleting the paragraph and replacing with the following:

*Hill Brothers operates a chemical repackaging and distribution facility. During the time period when Hill Brothers handled and repackaged chlorinated solvents, the solvents were delivered in 55-gallon drums. Chlorinated solvents were never stored in aboveground or underground storage tanks. Ninety soil samples were collected at six boring locations. Two of the ninety samples had detectable concentrations of VOCs. In one soil sample, TCE was detected at 0.032 milligrams per kilogram (mg/kg) and PCE was detected at 0.031 mg/kg. In the other soil sample, only PCE at a concentration of 0.026 mg/kg was detected. Each of these detected VOC concentrations were below the Arizona R-SRLs of 27 mg/kg for TCE and 53 mg/kg for PCE. The detections were also below the Groundwater Protection Level (GPL) of 0.61 mg/kg for TCE and 1.3 mg/kg for PCE.*

ADEQ Response:

The ROD includes the information provided in your comment.

**Comment #3**

Mr. Travers wrote:

Page 8, Section 3.1 SOIL/SOIL VAPOR, First Paragraph

This section should also state:

*Hill Brothers operated an ADEQ approved soil vapor extraction system between 2008 and 2010. The SVE system removed approximately 277 pounds of total VOCs which equates to approximately 20 to 25 gallons of total VOCs. On June 28, 2010, Hill Brothers requested from ADEQ a No*

*Further Action (NFA) Determination for soils. ADEQ issued a NFA Determination for soils on December 1, 2010.*

ADEQ Response:

The ROD includes the information provided in your comment.

***Comment #4***

Mr. Travers wrote:

Page 8, Section 3.1 SOIL/SOIL VAPOR, Third Paragraph

As stated in the comment just above, soil remediation at the HBCC facility is not needed because HBCC has already conducted a site-specific soil vapor extraction (SVE) system and obtained a NFA Determination for soils, not just because the soil sampling data shows VOC concentrations are below non-residential SRLs (NR-SRLs) or the minimum GPLs. Recommend adding the following:

*In addition, because Hill Brothers already conducted site remediation and received an NFA Determination for soils, further soil remediation is unnecessary.*

ADEQ Response:

The ROD does not propose soil remediation at the Hill Brothers facility.

***Comment #5***

Mr. Travers wrote:

Page 9, Section 3.2 GROUNDWATER

Impacted groundwater in the vicinity of the HBCC facility is very limited and therefore no remedial action for groundwater should be required. The paragraph should state only groundwater remediation in the vicinity of F&B is needed. Historical groundwater data for the HBCC facility indicates that no additional remediation, including monitored natural attenuation (MNA), is needed at this location. Recommend revising as follows:

*Remedial action for groundwater in the vicinity of F&B is needed. Historical groundwater data for the Hill Brothers' facility indicates that no additional remediation (which would include*

*monitored natural attenuation [MNA]) is needed at this location as the VOC source has been remediated via the SVE system.*

ADEQ Response:

The ROD proposed monitored natural attenuation (MNA) for selected monitoring wells located throughout the Site. Remedial action will be required for groundwater at the Site until the volatile organic compound (VOC) concentrations in the groundwater at the Site are below the Aquifer Water Quality Standard (AWQS).

***Comment #6***

Mr. Travers wrote:

Page 15, Section 5.1 PROPOSED REMEDY, Plume Monitoring (MNA)

The discussion of MNA needs additional clarity and specificity. For example, the 10-year annual MNA monitoring for the more comprehensive plume-wide monitoring well network does not specify which wells will be included in that monitoring network, nor does the PRAP identify which wells will be included in the 20 well monitoring network for years 11 through 20, or the 10 well network for years 21 through 30. We recommend that the PRAP present supporting data that technically justifies why each monitoring well in the monitoring network is being proposed and under what conditions that monitoring well will be included or excluded in subsequent monitoring periods.

The monitoring network for the three much smaller plume areas should only need to be monitored under the MNA scenario for no more than 10 years. The data collected from the small plume monitor well should provide a sufficient data set to statistically determine water quality trends (such as a Mann Kendall evaluation), and at the currently low VOC concentration should not require 30 years of monitoring.

In addition, the PRAP should specify that further monitoring will not be required once monitored levels are below the Aquifer Water Quality Standard for two consecutive monitoring periods.

The PRAP also states that additional monitoring wells may need to be installed. Where will these wells be located? Given the low concentrations found throughout the WQARF site, additional wells should only be necessary for the F&B plume.

ADEQ Response:

The wells to be monitored and sampled, the need and location for new wells, and the duration of sampling will be based on the nature and extent of the groundwater contamination as well as data obtained during the implementation of the remedy. Remedial action will be required for groundwater at the Site until the VOC concentrations in the groundwater at the Site are below the AWQS.

***Comment #7***

Mr. Travers wrote:

Page 15, Section 5.1 PROPOSED REMEDY, Plume Monitoring (MNA)

This section states that the ADEQ's contractor calculated that the plume cleanup levels will be achieved in 30 years. Please explain how this time to plume cleanup levels was calculated and what the accuracy of that prediction is.

ADEQ Response:

The 30-year duration was based on the mass of contamination anticipated to be removed by ERD and soil vapor extraction and the time anticipated for the remaining groundwater concentrations to drop below the AWQS. The accuracy of the 30-year duration was not determined.

***Comment #8***

Mr. Travers wrote:

Page 17, Section 5.2 RATIONALE FOR SELECTION OF REFERENCE REMEDY, Fifth Paragraph

This paragraph states that over 20 years of monitoring has been conducted at the downgradient monitor wells. The current water quality data set should be more than sufficient to determine water quality trends (increasing, decreasing, or unchanged using a statistical analysis such as the Mann-Kendall test). We recommend that a statistical analysis be done to evaluate whether additional monitoring is even necessary. Only if statistical trends do not show decreasing levels should MNA be required at downgradient wells, and in that event, additional statistical analysis should be conducted annually to determine whether further sampling is needed. In no case should more than 10 additional years of MNA monitoring be needed to monitor these low VOC concentration plumes.

ADEQ Response:

Remedial action (i.e., MNA) will be required for groundwater at the Site until the VOC concentrations in the groundwater at the Site are below the AWQS. The duration of monitoring, frequency of monitoring, and wells to be monitored will be adjusted, as needed, based on the nature and extent of the groundwater plume.

***Comment #9***

Mr. Travers wrote:

Page 20, Section 5.3 PERFORMANCE MONITORING RECOMMENDATIONS, MNA Phase

Table 5-1 reportedly lists the 16 existing monitoring wells that will be included in the MNA program. Will any other existing monitoring wells be used to monitor the small plumes? If so, please list these monitor wells.

ADEQ Response:

The wells to be monitored and sampled will be based on the nature and extent of the groundwater contamination as well as data obtained during the implementation of the remedy. Remedial action will be required for groundwater at the Site until the VOC concentrations in the groundwater at the Site are below the AWQS.

***Comment #10***

Mr. Travers wrote:

Page 22, Section 5.10 CONTINGENCY FOR PROPOSED REMEDY

What are the triggers that would cause the contingencies to be enacted? Define what future groundwater use would necessitate the need to accelerate the in-situ treatment. Please explain how the reduction in the remedy timeframe was estimated.

The second contingency does not appear to be valid. Under what scenario would the City of Phoenix require that a new well need to be located within the plume boundary? The City of Phoenix water distribution network is more than capable of adding new production capacity outside of the plume area and distributing that water to their customers.

ADEQ Response:

The need to accelerate the in-situ treatment will be based on the need for clean groundwater at the site. The selected remedy for the site must meet the Remedial Objectives established for groundwater at the site. Thus, wellhead treatment is included as a contingency for the selected remedy.



Mail Station: PAB259  
Phone: (602) 236-2618  
Email: andrea.martinez@srpnet.com

November 1, 2017

***Via Electronic Mail***

To: Mr. Kevin Snyder  
Waste Programs Division, Project Manager  
Arizona Department of Environmental Quality  
1110 W. Washington St.  
Phoenix, AZ 85007  
Email: snyder.kevin@azdeq.gov

Reference: Proposed Remedial Action Plan for West Central Phoenix North Plume Water Quality Assurance Revolving Fund Site; Phoenix, AZ

**RE: Salt River Project Comments to Proposed Remedial Action Plan for West Central Phoenix North Plume**

Salt River Project Agricultural Improvement and Power District (SRP) appreciates the opportunity to provide comments on the Proposed Remedial Action Plan (PRAP) published in June 2017 for the West Central Phoenix (WCP) North Plume (NP) Water Quality Assurance Revolving Fund (WQARF) site in Phoenix. SRP has reviewed the PRAP and supports the proposed remedy. However, SRP requests that the Arizona Department of Environmental Quality (ADEQ) address the following comments before issuing a Record of Decision (ROD) for the WCP-NP Site:

**Contingency for Proposed Remedy – Wellhead Treatment**

SRP appreciates the inclusion of contingencies in the proposed remedy for the WCP-NP Site but believes that the contingency for wellhead treatment should be strengthened to fully support the Remedial Objectives (RO) for groundwater and protect the regional aquifer for municipal and irrigation use. Although the PRAP discusses the importance of protecting the regional aquifer for municipal and irrigation purposes in various sections, section 5.10 of the PRAP (“Contingency for Proposed Remedy”) does not explicitly address contingencies for existing irrigation wells and does not cover SRP interests:

*“The second contingency is to provide wellhead treatment for a new City of Phoenix [COP] or other municipal well that could theoretically be installed within the plume ...”*

As discussed in the *West Central Phoenix North Plume Feasibility Study* (August 2016), SRP operates nine irrigation wells in the vicinity of the WCP-NP Site. One of these wells (9.5E-7.7N) lies within a 1-mile radius of the current site boundary. Due to SRP's aging wellfield and long-term water supply demands, it may become necessary to re-drill wells in closer proximity to the plume due to the general unavailability of land within the ADWR water rights requirements.

In addition, SRP recently signed a contract to supply water to the City of Goodyear. Once the agreement goes into effect, groundwater supply wells in and around the West Central Phoenix WQARF site, including SRP well 9.5E-7.7N, will be transitioned from irrigation wells to drinking water supply wells. The water will be delivered to the Goodyear drinking water plant via the Grand Canal.

SRP respectfully requests that any SRP water production well (irrigation or drinking water well) located within the footprint of the plume, either in the present or future, be included in the wellhead treatment contingency plan. We also respectfully suggest that the second contingency be rewritten as follows:

*"To the extent contaminant levels in the groundwater are above the AWQS, the second contingency is to provide wellhead treatment for City of Phoenix, Salt River Project, or other municipal well(s) that could theoretically be installed or located within the plume at an additional cost of \$2,625,000,*

SRP appreciates the opportunity to provide the foregoing comments to ADEQ. SRP reserves its right to provide additional comments once the foregoing concerns are addressed.

If you have any questions, please call me at 602-236-2618.

Sincerely,



Andrea Martinez  
Principal Environmental Compliance Engineer

cc: Bob Pane, SRP  
David Sultana, SRP



**City of Phoenix**  
OFFICE OF ENVIRONMENTAL PROGRAMS

November 1, 2017

Arizona Department of Environmental Quality  
Waste Programs Division  
Mr. Kevin Snyder  
1110 W. Washington Street  
Phoenix, Arizona 85007

Re: Comments regarding the Proposed Remedial Action Plan (PRAP) for West Central Phoenix (WCP) North Plume Water Quality Assurance Revolving Fund (WQARF) prepared by Matrix-CALIBRE Design Group for the Arizona Department of Environmental Quality (ADEQ) on June, 2017.

Dear Mr. Snyder,

The City of Phoenix (City) has reviewed the above referenced PRAP for WCP North Plume and has the following comments for ADEQ.

**General comments:**

In general, the City supports the following aspects of the reference remedy; vadose zone source control and saturated zone source/plume treatment. The City supports the continued operation and optimization of the Soil Vapor Extraction (SVE) on the F&B Manufacturing Company facility. The City also supports the implementation of an enhanced reductive dechlorination (ERD) remedy for the groundwater plume.

It should be noted that the majority of the proposed ERD system is located on the City's Glenrosa Facility. This is an active facility. ADEQ would need to meet separately with various facility stakeholders from the City to discuss the feasibility of the ERD system being located here. Depending on the timing of the ERD system and future use by the City of our facility, other areas such as City streets might be an alternative solution. It should be noted that an agreement between the City and ADEQ would have to be entered into prior to any work being conducted. The City looks forward to discussing the proposed remedy in detail with ADEQ.

The City concurs that the presence of degradation products in the groundwater helps support that natural attenuation is occurring at the site. The City is concerned that the plume is not stable and long term monitored natural attenuation (MNA) will take an estimated 30 years. The City is also concerned that MNA is the remedy for the plume that has a groundwater concentration of 500 ug/L of PCE and less per the text (p.16) or 1000 ug/L of PCE or less per the figure 5-2. The City would support ERD or other chemical oxidation efforts in this portion of the plume from 1000 ug/L to 100 ug/L to help decrease the high concentration and shorten the extensive length of time to reach AWQS.

November 1, 2017

The City appreciates that ADEQ has added a well-head treatment contingency for a "new City of Phoenix or other municipal well" into the remedy and has included costs for such treatment. The City hopes that continued operation and optimization of the SVE system and installing a robust ERD system will aid in the timely cleanup of this site.

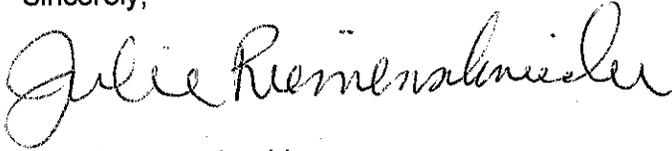
**Specific comments:**

1. In Section 1.2 Site Description, ADEQ should expand the write up on F&B Manufacturing Company. The remedial investigation report that ADEQ wrote contains a considerable amount of information about this facility and the releases that occurred over time. This information would appear to be relevant here in the PRAP as it appears the ADEQ is focusing the remedial action at this facility and directly downgradient of it, which is discussed in section 5.0.
2. In section 4.2, RO's for Groundwater; The City concurs with ADEQ regarding the remedial objective (RO) for groundwater. Although the City is not currently pumping any municipal wells in this area, we value this water resource for our future water needs. As such, the City agrees with ADEQ that this groundwater should be restored to municipal regulatory standards for future use.
3. In section 5.0, Evaluation of Remedial Alternatives: second bullet point talks about a volatile organic compound (VOC) plume with an estimated level of 100 ug/L contour. Please indicate the VOC this 100 ug/l references.
4. In section 5.6, Consistency with Water Management Plans; please reference the different water management plans ADEQ is referring to in this section.
5. The City recommends the ERD system be expanded into the portions of the plume with values of 100 ug/L to 1000 ug/L of PCE; not just the area above 1000 ug/L as currently stated (see figure 5-2).
6. The City suggests that ADEQ have a baseline of groundwater wells that will be monitored during the entire ERD and MNA remedy. These wells should be indicated on a map. The other wells could be "floaters", that is, these wells would change over time depending on where the plume has migrated. The baseline wells should remain the same and be sampled until ERD and MNA is complete.
7. The PRAP does not specify how the wells will be abandoned at the time of closure of this site. The City assumes that ADEQ will abandon all wells following the Arizona Department of Water Resources (ADWR) requirements.
8. Cost Table: ERD Area Remediation Task: Bioaugmentation is listed but there are no costs associated with that task.
9. Cost Table: It should be noted that contingency wellhead treatment costs are only in present dollars and do not include inflation costs. The City recommends these costs be amended to include inflation.

November 1, 2017

The City appreciates the opportunity to comment on this PRAP. If ADEQ would like to meet and discuss any of these comments, please contact me at 602-256-5681.

Sincerely,

A handwritten signature in cursive script that reads "Julie Riemenschneider".

Julie Riemenschneider  
Environmental Programs Coordinator  
Office of Environmental Programs, City of Phoenix

C: Rosanne Albright, OEP (electronic copy)  
Alexander Richards, WSD (electronic copy)  
Elizabeth Zima, OEP (electronic copy)



HALEY & ALDRICH, INC.  
One Arizona Center  
400 E. Van Buren St., Suite 545  
Phoenix, AZ 85004  
602.760.2450

21 March 2018  
File No. 131289-002

Hill Brothers Chemical Company  
7121 West Bell Road, Suite 250  
Glendale, Arizona 85308

Attention: Shane Burkhart, Director, Corporate Safety & Compliance

Subject: Technical Review of the June 2017 Proposed Remedial Action Plan, West Central Phoenix North Plume WQARF Site, Phoenix, Arizona  
Prepared for Arizona Department of Environmental Quality, Waste Programs Division, Remedial Projects Unit, Prepared by Matrix-CALIBRE Team

Dear Mr. Burkhart:

As requested, Haley & Aldrich, Inc. (Haley & Aldrich) is providing Hill Brothers Chemical Company (HBCC) with technical comments to the above reference June 2017 Proposed Remedial Action Plan (PRAP) for the West Central Phoenix (WCP) North Plume Water Quality Assurance Revolving Fund (WQARF) Site. This comment letter is in response to the 21 September 2017 certified letter from the Arizona Department of Environmental Quality (ADEQ) regarding "Notice Letter Pursuant to Arizona Revised Statutes (A.R.S.) 49-287.04, West Central Phoenix – North Plume WQARF Registry Site, Phoenix Arizona". The Notice Letter requested that HBCC submit in writing the following:

- Comments on the PRAP pursuant to A.R.S. 49-287-04(B)(3);
- Comments on the ADEQ's proposed cost to implement the PRAP; and
- Proposed alternative methods of allocating liability among responsible parties pursuant to A.R.S. 49-287.04(1)

In correspondence from HBCC to ADEQ dated 28 November 2017, HBCC requested a 90-day extension to the 21 December 2017 response date for providing the cost credit documentation and comments on the proposed PRAP. In a response letter dated 9 January 2018, ADEQ granted the 90-day extension request and identified 21 March 2018 as the new response deadline.

The following provides our technical comments to selected sections or portions of the PRAP.

## Comments to the PRAP

### INTRODUCTION

HBCC appreciates the opportunity to provide these comments on the PRAP. The PRAP provides an excellent summary of the history of activities at the F&B Manufacturing Company (F&B) site and the plans for further remedial activities to address contamination that originated at that location. This approach is appropriate in light of the history of operations and prior sampling data, which demonstrate that F&B was by far the predominant contributor of volatile organic compounds (VOCs) to the WCP North Plume WQARF Site.

The PRAP, however, needs to be revised to reflect an accurate picture of HBCC's historical operations, its prior remedial efforts, and current conditions. As explained herein, HBCC only handled small quantities of chlorinated solvents. Prior sampling and monitoring activities at HBCC's facility have demonstrated that the amount of VOC material once found on site was quite small, particularly when compared to other surrounding properties. On-site remediation at HBCC was completed successfully after removing less than 300 pounds of total VOCs—approximately 0.6% of the 51,000 pounds of VOCs removed from the F&B facility as of January 2017. Each month the F&B remediation removes as much VOCs as the total amount removed at HBCC. Ultimately, HBCC spent \$970,311.74 on on-site investigation and remedial efforts, and those efforts were successful at removing the small mass of VOCs in soil at the site. Monitoring data shows that only two percent (2 of 90) soil samples had detectable levels of VOCs, and both of those results were below Arizona Residential Soil Remediation Standards (R-SRLs).

In light of past operations, remedial activities, and site conditions, the PRAP correctly concludes that additional remediation is not required at HBCC's facility. This conclusion should be extended to monitoring as well, given that recent sampling data shows there is no existing contamination at, or caused by, HBCC's activities.

HBCC supports ADEQ's efforts to address the remaining contamination resulting from F&B's activities and appreciates the opportunity to provide these comments.

### COMMENTS

The following cites the page and section numbers of the PRAP where HBCC has comments.

#### **Page 2, Section 1.2 SITE DESCRIPTION, Paragraph 4.**

This section presents an incorrect description of the history of the chemical usage and more specifically the VOCs history at the HBCC site. VOCs, specifically chlorinated solvents, were first received at the HBCC facility in mid-1970. The chlorinated solvents included tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA). No other chlorinated solvents were delivered to, handled at, or distributed from the HBCC facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. The chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in 5-gallon, 1-gallon, or quart

containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. HBCC stopped handling and repackaging the chlorinated solvents in 1995. We recommend the Site Description of Hill Brothers' facility be revised as follows:

*Hill Brothers Chemical Company (Hill Brothers) operates a chemical repackaging and distribution facility. The business started operations at this location in 1969 and remains in operation today. The facility first received VOCs, and specifically chlorinated solvents, beginning in the 1970s.*

*The chlorinated solvents received at the facility included tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA). No other chlorinated solvents were delivered to, handled at, or distributed from the Hill Brothers facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. Chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in 5-gallon, 1-gallon, or quart containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. Hill Brothers stopped handling and repackaging the chlorinated solvents in 1995.*

**Page 5, Section 2.1.2 Soil/Soil Vapor, Last Full Paragraph**

The chemical history for the HBCC is incorrect as noted in the Page 2, Section 1.2 comment above. In addition, of the 90 soil samples collected at 6 boring locations, only 2 soil samples had detected concentrations of VOCs, but the detected concentrations were all below the Arizona R-SRLs. This paragraph does not indicate the limited detection of VOCs in soil samples. We therefore recommend deleting the paragraph and replacing with the following:

*Hill Brothers operates a chemical repackaging and distribution facility. During the time period when Hill Brothers handled and repackaged chlorinated solvents, the solvents were delivered in 55-gallon drums. Chlorinated solvents were never stored in aboveground or underground storage tanks. Ninety soil samples were collected at six boring locations. Two of the ninety samples had detectable concentrations of VOCs. In one soil sample, TCE was detected at 0.032 milligrams per kilogram (mg/kg) and PCE was detected at 0.031 mg/kg. In the other soil sample, only PCE at a concentration of 0.026 mg/kg was detected. Each of these detected VOC concentrations were below the Arizona R-SRLs of 27 mg/kg for TCE and 53 mg/kg for PCE. The detections were also below the Groundwater Protection Level (GPL) of 0.61 mg/kg for TCE and 1.3 mg/kg for PCE.*

**Page 8, Section 3.1 SOIL/SOIL VAPOR, First Paragraph**

This section should also state:

*Hill Brothers operated an ADEQ approved soil vapor extraction system between 2008 and 2010. The SVE system removed approximately 277 pounds of total VOCs which equates to approximately 20 to 25 gallons of total VOCs. On June 28, 2010, Hill Brothers requested from ADEQ a No Further Action (NFA) Determination for soils. ADEQ issued a NFA Determination for soils on December 1, 2010.*

**Page 8, Section 3.1 SOIL/SOIL VAPOR, Third Paragraph**

As stated in the comment just above, soil remediation at the HBCC facility is not needed because HBCC has already conducted a site-specific soil vapor extraction (SVE) system and obtained a NFA Determination for soils, not just because the soil sampling data shows VOC concentrations are below non-residential SRLs (NR-SRLs) or the minimum GPLs. Recommend adding the following:

*In addition, because Hill Brothers already conducted site remediation and received an NFA Determination for soils, further soil remediation is unnecessary.*

**Page 9, Section 3.2 GROUNDWATER**

Impacted groundwater in the vicinity of the HBCC facility is very limited and therefore no remedial action for groundwater should be required. The paragraph should state only groundwater remediation in the vicinity of F&B is needed. Historical groundwater data for the HBCC facility indicates that no additional remediation, including monitored natural attention (MNA), is needed at this location. Recommend revising as follows:

*Remedial action for groundwater in the vicinity of F&B is needed. Historical groundwater data for the Hill Brothers' facility indicates that no additional remediation (which would include monitored natural attention [MNA]) is needed at this location as the VOC source has been remediated via the SVE system.*

**Page 15, Section 5.1 PROPOSED REMEDY, Plume Monitoring (MNA)**

The discussion of MNA needs additional clarity and specificity. For example, the 10-year annual MNA monitoring for the more comprehensive plume-wide monitoring well network does not specify which wells will be included in that monitoring network, nor does the PRAP identify which wells will be included in the 20 well monitoring network for years 11 through 20, or the 10 well network for years 21 through 30. We recommend that the PRAP present supporting data that technically justifies why each monitor well in the monitoring network is being proposed and under what conditions that monitoring well will be included or excluded in subsequent monitoring periods.

The monitoring network for the three much smaller plume areas should only need to be monitored under the MNA scenario for no more than 10 years. The data collected from the small plume monitor well should provide a sufficient data set to statistically determine water quality trends (such as a Mann Kendall evaluation), and at the currently low VOC concentration should not require 30 years of monitoring.

In addition, the PRAP should specify that further monitoring will not be required once monitored levels are below the Aquifer Water Quality Standard for two consecutive monitoring periods.

The PRAP also states that additional monitoring wells may need to be installed. Where will these wells be located? Given the low concentrations found throughout the WQARF site, additional wells should only be necessary for the F&B plume.

**Page 15, Section 5.1 PROPOSED REMEDY, Plume Monitoring (MNA)**

This section states that the ADEQ's contractor calculated that the plume cleanup levels will be achieved in 30 years. Please explain how this time to plume cleanup levels was calculated and what the accuracy of that prediction is.

**Page 17, Section 5.2 RATIONALE FOR SELECTION OF REFERENCE REMEDY, Fifth Paragraph**

This paragraph states that over 20 years of monitoring has been conducted at the downgradient monitor wells. The current water quality data set should be more than sufficient to determine water quality trends (increasing, decreasing, or unchanged using a statistical analysis such as the Mann-Kendall test). We recommend that a statistical analysis be done to evaluate whether additional monitoring is even necessary. Only if statistical trends do not show decreasing levels should MNA be required at downgradient wells, and in that event, additional statistical analysis should be conducted annually to determine whether further sampling is needed. In no case should more than 10 additional years of MNA monitoring be needed to monitor these low VOC concentrations plumes.

**Page 20, Section 5.3 PERFORMANCE MONITORING RECOMMENDATIONS, MNA Phase**

Table 5-1 reportedly lists the 16 existing monitor wells that will be included in the MNA program. Will any other existing monitor wells be used to monitor the small plumes? If so, please list these monitor wells.

**Page 22, Section 5.10 CONTINGENCY FOR PROPOSED REMEDY**

What are the triggers that would cause the contingencies to be enacted? Define what future groundwater use would necessitate the need to accelerate the in-situ treatment. Please explain how the reduction in the remedy timeframe was estimated.

The second contingency does not appear to be valid. Under what scenario would the City of Phoenix require that a new well need to be located within the plume boundary? The City of Phoenix water distribution network is more than capable of adding new production capacity outside of the plume area and distributing that water to their customers.

**CONCLUSION**

With the revisions suggested herein, the PRAP will provide an accurate picture of HBCC's past operations, prior remedial efforts, and current conditions. HBCC handled small amounts of chlorinated solvents, and successfully remediated on-site source contamination at great expense. Recent sampling data shows those proactive, early efforts were successful and HBCC asks that the PRAP take those efforts into full account. HBCC respectfully requests that the PRAP focus all future resources on the remaining contamination at the F&B facility.

Sincerely yours,

HALEY & ALDRICH, INC.



Bruce C. Travers, R.G.  
Senior Associate – Hydrogeologist





**HILL BROTHERS** *Chemical Co.*  
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March 20, 2018

Christina Silva  
Regulatory Compliance Administrator  
Remedial Projects Unit/6210B  
Arizona Department of Environmental Quality  
1110 West Washington Street  
Phoenix, Arizona 85007

Subject: Hill Brothers Chemical Company Response to the Arizona Department of Environmental Quality  
Notice Letter Dated September 21, 2017  
Pursuant to A.R.S. § 49-287.04  
West Central Phoenix – North Plume, Water Quality Assurance Revolving Fund Registry Site  
Phoenix, Arizona

Dear Ms. Silva:

Pursuant to the above referenced Notice Letter, Hill Brother Chemical Company (HBCC) provides this response, which includes technical comments on the June 2017 Proposed Remedial Action Plan (PRAP) for the West Central Phoenix (WCP) North Plume Water Quality Assurance Revolving Fund (WQARF) Site, two copies of the statement of costs, and the supporting documentation that accompanies our request for Cost Credits against any outstanding liability for the HBCC Site located at 4450 North 42<sup>nd</sup> Avenue, Phoenix, Arizona.<sup>1</sup>

**1.a. Comments on the Proposed Remedial Action Plan (PRAP)**

HBCC has reviewed the PRAP that was included as Appendix B to the September 21, 2017 Notice Letter. Our primary concern with the PRAP is the incorrect representation of HBCC's historical operations as related to the handling of volatile organic compounds (VOCs). VOC usage and handling at HBCC was on a much smaller scale than reflected in the PRAP. The following paragraph provides an accurate description of these operations.

Hill Brothers Chemical Company (Hill Brothers) operates a chemical repackaging and distribution facility. The business started operations at this location in 1969 and remains in operation today. The facility first received VOCs, and specifically chlorinated solvents, beginning in the 1970s. The chlorinated solvents received at the facility included tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA). No other chlorinated solvents were delivered to, handled at, or distributed from the HBCC facility. The chlorinated solvents were delivered in 55-gallon drums, approximately 10 to 20 drums at a time. Chlorinated solvents would either be resold (unopened in their original 55-gallon drum containers) or repackaged for resale in 5-gallon, 1-gallon, or quart containers. At no time were chlorinated solvents delivered via railcars. The only chemicals received via railcars were chlorine, caustic soda, magnesium hydroxide, ferric chloride, and ferrous chloride. Chlorinated solvents were never stored in aboveground or underground storage tanks. HBCC stopped handling and repackaging the chlorinated solvents in 1995.

<sup>1</sup> Thank you for your December 14 email, and January 9, 2018 letter, which confirmed the extension of time to provide these comments until March 21, 2018.

Our specific comments regarding historical operations, our prior remedial efforts, our current site conditions, and other comments on the PRAP are provided in the attached Appendix A.

### **1.b Comments on the PRAP Cost to Implement**

HBCC has reviewed the PRAP's Appendix A - Detailed Costs to Implement the Proposed Remedy. Since the PRAP has not clearly identified which portions of the proposed remedy are related to each individual potential responsible party (PRP), we are not able to provide detailed comments on these costs at this time. We would like the opportunity to comment once the PRAP identifies which component of the PRAP applies to each PRP.

Given the limited information provided, we can only provide two comments at this time. First, the costs to implement the PRAP are that the estimated well abandonment costs of \$6500 per well is excessive. Second, given that HBCC already remediated its property and operations, and contamination at F&B were several orders of magnitude greater than at other facilities, all future costs should be allocated to F&B.

### **1.c Comments on Alternative Methods of Allocating Liability**

The vast majority of the Arizona Department of Environmental Quality (ADEQ) past costs and future remedial costs are directly related to the F&B Facility. F&B by far is the PRP with the greatest impact to the North Plume site, has required the greatest site characterization activities, and the most extensive past and future remedial activities. Historic PCE concentrations in groundwater at the F&B facility are more than 1,700 times greater than at the HBCC facility (at F&B, as high as **150,000 micrograms per liter [µg/L]** compared to HBCC with PCE concentrations no greater than **86 µg/L**). It also appears that the PCE plume emanating from the Rinchem/Tarr facility has migrated to the northwest and is impacting groundwater beneath the HBCC facility. In comparison to F&B and Rinchem/Tarr, HBCC's contribution to the North Plume is *de minimis* and our liability should reflect that fact.

Additionally, the statement of past costs provided with the September 21, 2017 Notice Letter attributes nearly \$600,000 in past costs to HBCC. This number is extremely excessive in light of HBCC's historical operations compared to other PRP's operations. Although we requested the detailed invoices associated with these asserted costs so that we could provide comments at this time, they were not provided to us. We preserve our request to review invoices for costs that ADEQ seeks to allocate to HBCC and reserve the right to review and comment on any allocation of past costs to HBCC.

## **2. Information on Known Persons Liable Under this Investigation**

HBCC has no additional information on identified or unidentified persons related to the WCP North Plume WQARF Site.

## **3. Cost Credit Itemized Statement of Costs, Supporting Documentation, Signed Certificate Statement, and Signed Agreement to Reimburse**

Beginning with on-site activities characterization in 1996 and 1997, HBCC conducted various Site Characterization and Soil Remedial activities with oversight and approval from ADEQ. HBCC entered into agreements with ADEQ to conduct Remedial Investigation Activities, with the effective date for the Agreement to Conduct Remedial Investigation Activities being January 13, 2003. The effective date for the First Amendment to Agreement to Conduct Remedial Investigation Activities was April 1, 2005. The following provides a timeline and description of the various activities conducted at the request of ADEQ on behalf of HBCC that are associated with the Site investigation and remediation, and the associated submitted Cost Credits.

- 1989 – ADEQ conducted Preliminary Assessment/Site Investigation (PA/SI) in 1989 which included shallow soil and soil gas sampling. Soil gas samples and soil samples detected low levels of VOCs. ADEQ requested additional investigation to assess potential groundwater impacts.
- 1996 – EMCON conducted Preliminary Site Characterization in accordance with an ADEQ approved work plan. Only two (2) of the 90 soil samples detected VOCs above the laboratory

method detection limits (MDLs) and below the Arizona residential soil remediation levels (SRLs). Four groundwater HydroPunch samples detected 1,1-dichloroethene (1,1-DCE), PCE, and TCE.

- 1997 – EMCON prepared and submitted the Preliminary Site Investigation Report to ADEQ.
- 2002 – GeoTrans prepared a Work Plan and Field Sampling Plan for a Passive Soil Gas Investigation. This work plan/field sampling plan is noted in the January 13, 2003 Agreement to Conduct Remedial Investigation Activities.
- 2003 – Geomatrix conducted the Passive Soil Gas Investigation. Fifty-three (53) passive soil gas samples were collected and submitted for analysis. PCE, TCE, and 1,1-DCE were detected.
- December 2003 – ADEQ requested further investigation at three of the areas investigated during the Passive Soil Gas Investigation.
- 2004 – Geomatrix prepared the Depth-Specific Soil Gas Investigation and Soil Vapor Well Installation Work Plan. This work plan was noted in the April 1, 2005 First Amendment to Agreement to Conduct Remedial Investigation Activities.
- 2005 – Geomatrix responded to ADEQ comments on the 2004 Depth-Specific Soil Gas Investigation and Soil Vapor Well Installation Work Plan. This response to comment letter was also noted in the April 1, 2005 First Amendment to Agreement to Conduct Remedial Investigation Activities.
- 2005/2006 – Geomatrix conducted depth-specific soil gas investigation at the four locations. Three soil vapor extraction (SVE) wells were installed based on the depth-specific soil gas results. Upper and lower screen intervals were completed at each SVE location.
- 2006 – Geomatrix conducted three (3) months of soil vapor monitoring. A radius of influence (ROI) test was also conducted.
- 2007 – Geomatrix prepared the Soil Gas Monitoring and ROI Report of Findings. Geomatrix also prepared the Remediation Work Plan.
- 2008 – AMEC Geomatrix conducted the SVE system startup.
- 2008 and 2009 – AMEC Geomatrix collected groundwater samples from ADEQ monitor wells WCP-75 and WCP-77.
- 2008 to 2010 – AMEC Geomatrix operated the SVE system per the ADEQ approved Remediation Work Plan and Operations and Maintenance (O&M) Manual.
- 2010 – AMEC Geomatrix requested from ADEQ a No Further Action Determination for Soils. The SVE historical operating data and rebound testing results were included in the request. The SVE system removed 277 pounds of total VOCs.
- December 1, 2010 – ADEQ granted a No Further Action Determination for Soils.
- 2011 – AMEC Geomatrix removed the SVE system and abandoned the SVE wells and piping.

The Cost Credit Statement and Documentation (Appendix B) provides an accounting spreadsheet and supporting documents for the various investigative and remedial activities noted in the time-line above. The Cost Credit Statement and Documentation has identified the invoices and HBCC payments associated with the investigative and remediation activities by the various consultants listed above. The total dollar value spent by

HBCC to complete the ADEQ required activities is \$970,331.74 (see Appendix B, Exhibit A). Please note that Mr. Bruce Travers, R.G. has been the outside technical consultant/project manager for this project since early 1998 and is knowledgeable of the various investigative and remedial activities that have been conducted at the Site.

HBCC corporate management (Ron Hill, President and CEO; and Everett McLean, Director, Corporate Compliance (through 1999)) and facility operations staff (Charles Hill, Phoenix Facility Operations Manager (through 1999); and Julie Tennyson, Phoenix Facility Operations Manager (2002 through 2010)), also provided needed project oversight and managerial and technical assistance with the completion of the various investigative and remedial activities outlined above. HBCC staff also directly interacted with ADEQ staff during the Site investigation. The HBCC staff contributions are based upon the staff declarations included in Appendix B, Exhibit B. We have reviewed the HBCC historical investigative and remedial history and have selected only those years when there was a substantial amount of activities being conducted that would support the HBCC staff interaction.

Outside counsel Albert Acken, Esq., has provided necessary environmental legal counsel addressing the Notice Letter and historical investigative and remedial activities. Bruce Travers, through Haley & Aldrich has provided technical assistance and historical knowledge of the various investigative and remedial activities associated with the HBCC project. He has assisted HBCC in compiling and verifying the various scopes of work, invoices and costs associated with response to the Notice Letter. The Cost Credits for these activities are also outlined in Appendix B, Exhibit B.

With the Cost Credit Statement and Documentation, HBCC has included a Certification signed by HBCC representatives that the Cost Credit Statement and Documentation are true, accurate, and complete (Appendix B). HBCC has also included a signed Agreement that HBCC will reimburse ADEQ for ADEQ's total reasonable cost for reviewing the Cost Credit Statement and Documentation (Appendix B, Exhibit C).

#### CONCLUSION

Thank you for the opportunity to provide these comments. HBCC looks forward to working with ADEQ to resolve this matter equitably and expeditiously.

Sincerely yours,

HILL BROTHERS CHEMICAL COMPANY



Shane T. Burkhart  
Director, Corporate Compliance  
Environmental, Health, Safety, Security, and Transportation

Enclosures: