

**FOURTH FIVE-YEAR REVIEW REPORT  
FOR  
NINETEENTH AVENUE LANDFILL SUPERFUND SITE  
MARICOPA COUNTY, ARIZONA**



PREPARED BY

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for  
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## Executive Summary

This is the fourth Five-Year Review (FYR) of the Nineteenth (19<sup>th</sup>) Avenue Landfill Superfund Site (Site) located in the City of Phoenix (COP), Maricopa County, Arizona. The purpose of this FYR is to review information to determine if the remedy is and will continue to be protective of human health and the environment. Section 121(C) of the Comprehensive Environmental Response, Compensation, and Liability Act requires a five-year review whenever hazardous substances remain on-site as part of a remedy. The triggering action for this FYR was the signing of the previous FYR on September 28, 2010.

The Site is a closed landfill that occupies approximately 213 acres in an industrial area of Phoenix, Arizona and is owned by the COP. The Site is comprised of two disposal cells, Cells A and A-1, divided by the Salt River. Wastes disposed of at the Site were predominately municipal refuse, with some solid and liquid industrial wastes. In February 1979, the Arizona Department of Health Services issued a cease and desist order to the COP to close the landfill. The U.S. Environmental Protection Agency (EPA) placed the Site on the Superfund National Priorities Lists (NPL) in September 1983.

In September 1989, EPA selected the remedy for the Site to contain the landfill wastes on-site by constructing an impermeable cap to protect long-term human health and the environment. The remedy components as described in the ROD include the following:

- Levees would be placed along both the north and south banks of the Salt River at the landfill site to provide for flood protection;
- The river channel would be widened;
- A soil cap would be placed over the landfill so that rain water does not seep into the landfill material;
- A secure fence would be erected around the landfill boundary;
- Ambient air quality, methane gas, and groundwater would be monitored;
- A contingency plan would be implemented should groundwater quality standards be exceeded at the landfill boundary; and
- Methane gas would be collected and treated in a manner that eliminates any risk of explosion.

In December 1996, containment of the landfill wastes and prevention of infiltration of precipitation or any liquids were achieved by the construction of a compacted clay-soil cap with surface drainage structures channeling precipitation off the cap. The COP completed the construction of the soil-cement levees along the landfill cells that border the Salt River to prevent erosion and overtopping from the Salt River, and the placement of a subsurface pipe with backfill that prevents erosional undercutting along the east boundary of the landfill in 1996. The gas collection system was operational by October 1, 1996. The channel widening and fence placement were completed by December 6, 1996. No groundwater exceedances were recorded that required the implementation of the contingency plan.

In December 1995, an Explanation of Significant Difference (ESD) #1 was signed by EPA and ADEQ modifying the selected remedy by changing the lining material used in the perimeter drainage channels at the Site.

In October 2003, an ESD #2 was signed modifying the 1989 remedy by updating the maximum contaminant levels (MCLs) for specific constituents in groundwater, and adding the Arizona Ambient Air Quality Guidelines for volatile organic compounds (VOCs) as performance standards for ambient air quality monitoring at the Site.

In June 2006, an ESD #3 was signed modifying the remedy to require institutional controls (ICs) be added to the remedy, including a Declaration of Environmental Use Restriction (DEUR).

In July 2006, a DEUR to restrict use of property was recorded and attached to the deed by the COP to prevent incompatible land use.

In October 2012, the COP recorded an amendment to the 2006 DEUR, incorporating a Landfill Maintenance Contingency Plan, as a component of the Engineering Control Plan, to allow an intentional breach of the engineered protective cap if needed to perform emergency repair or maintenance activities of the landfill gas extraction system.

In July 2015, EPA signed an ESD #4 to modify the remedy identified in EPA's 1989 Record of Decision (ROD) to include two changes: (1) allows the current flare treatment system for Cell A-1 at the Site to be replaced with an improved carbon adsorption system (CAS) to contain and remove landfill gas contaminants; and (2) documents that a DEUR was placed in the chain of title for the Site in 2006, and that an Amendment to the DEUR was made in 2012. According to the review of relevant documents and data, site inspections, and interviews, the remedy is functioning as intended by the ADEQ Letter of Determination and the EPA Record of Decision. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

The remedy at the Nineteenth Avenue Landfill Superfund Site remains protective of human health and the environment.

Currently, there are no environmental exposure pathways that result in unacceptable risks, and none are expected as long as the engineered and institutional controls selected in the decision documents continue to be properly operated, monitored, and maintained, and the land use at the Site allows for the integrity of the remedy to continue.

## Five-Year Review Summary Form

SITE IDENTIFICATION		
<b>Site Name:</b> Nineteenth Avenue Landfill		
<b>EPA ID:</b> AZ D980496780		
<b>Region:</b> 9	<b>State:</b> AZ	<b>City/County:</b> Phoenix, Maricopa
SITE STATUS		
<b>NPL Status:</b> Deleted		
<b>Multiple OUs?</b> No	<b>Has the site achieved construction completion?</b> Yes	
REVIEW STATUS		
<b>Lead agency:</b> EPA If "Other Federal Agency" was selected above, enter Agency name: <a href="#">Click here to enter text.</a>		
<b>Author name (Federal or State Project Manager):</b> Andria Benner		
<b>Author affiliation:</b> EPA R9		
<b>Review period:</b> October 2014 – March 2015 -		
<b>Date of site inspection:</b> 17 March 2015		
<b>Type of review:</b> Statutory		
<b>Review number:</b> 4		
<b>Triggering action date:</b> September 28, 2010		
<b>Due date (five years after triggering action date):</b> September 28, 2015		
Issues/Recommendations		

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
There are no issues that affect the protectiveness of the remedy.
Sitewide Protectiveness Statement

<b>Operable Unit:</b> Nineteenth Avenue Landfill	<b>Protectiveness Determination:</b> Protective	<b>Addendum Due Date (if applicable):</b>
<i>Protectiveness Statement:</i>		
<p>The remedy at the Nineteenth Avenue Landfill Superfund Site is protective of human health and the environment. Currently, there are no environmental exposure pathways that result in unacceptable risks, and none are expected as long as the engineered and institutional controls selected in the decision documents continue to be properly operated, monitored, and maintained, and the land use at the Site allows for the integrity of the remedy to continue.</p>		

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## List of Abbreviations

AAAQG	Arizona Ambient Air Quality Guidelines
AAC	Arizona Administrative code
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
ADWR	Arizona Department of Water Resources
ARAR	Applicable or Relevant and Appropriate Requirements
AWQS	Arizona Water Quality Standard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CD	Consent Decree
CFR	Code of Federal Regulations
COP	City of Phoenix
DEUR	Declaration of Environmental Use Restriction
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Difference
FYR	Five Year Review
FS	Feasibility Study
HBGL	Arizona Health Based Guidance Levels
ICs	institutional controls
IRIS	Integrated Risk Information System
LOD	Letter of Determination
MCLs	Maximum Contaminant Levels
mg/L	milligrams per liter
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
RAP	Remedial Action Plan
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	EPA Regional Screening Levels
µg/L	micrograms per liter
VOCs	volatile organic compounds

# Fourth Five-Year Review Report for Nineteenth (19<sup>th</sup>) Avenue Landfill Superfund Site

## 1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

*“If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.”*

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

*“If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action.”*

The Arizona Department of Environmental Quality (ADEQ) in coordination with EPA Region 9 has conducted a FYR of the remedial actions implemented at the 19<sup>th</sup> Avenue Landfill Superfund Site (Site) in the City of Phoenix (COP), Maricopa County, Arizona. This report documents the results of the review. ADEQ as the supporting agency representing the State of Arizona provided input to EPA during this FYR process.

This is the fourth FYR for the Site. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. This FYR is therefore required by statute because the remedy allows buried and capped landfill wastes to remain on the site indefinitely. The triggering action for this statutory review is the previous FYR dated September 28, 2010.

This review was conducted from November 2014 through March 2015.

## 2. Site Chronology

The following table lists the dates of important events for the 19<sup>th</sup> Avenue Landfill Superfund Site.

**Table 1. Chronology of Site Events**

<b>Event</b>	<b>Date</b>
Discovery of problem or contamination (refuse washed into river)	May 1978
Pre- National Priorities List (NPL) responses	February 1979
Landfill closed by a cease and desist order issued by Arizona Department of Health Services (ADHS)	February 1979
Consent Order agreed to by City of Phoenix (COP) and ADHS	June 1979, amended Dec 79
Site listed on NPL by EPA	September 1983
Remedial Investigation/Feasibility Study (RI/FS) completed by COP	June 1988
Lead oversight responsibility assigned to ADEQ by EPA	1988
Remedial Action Plan (RAP) completed by COP	June 1989
Letter of Determination (LOD) signed by ADEQ approved RAP	September 1989
Record of Decision (ROD) signed by EPA approved ADEQ's LOD	September 1989
Remedial Design (RD) started by COP	October 1990
Consent Decree (CD) signed by ADEQ and COP	June 1992
Explanation of Significant Difference (ESD) #1 signed by agencies	December 1995
RD completed by COP	May 1995
Remedy construction completed by COP	December 1996
Preliminary Close-Out Report signed by ADEQ and EPA	February 1998
Remedial Action (RA) Report completed by COP	September 1998
First FYR Report approved by ADEQ and EPA	September 2000
Supplemental First FYR Report completed by ADEQ	July 2001
ESD #2 signed by ADEQ and EPA	September 2003
Second FYR Report approved by ADEQ and EPA	September 2005

Screening Level Ecological Risk Assessment (SLERA) completed by EPA	March 2006
ESD #3 signed by ADEQ and EPA	June 2006
Declaration of Environmental Use Restriction Recorded (DEUR) by COP	July 2006
Final Close-out Report signed by ADEQ and EPA	July 2006
19 <sup>th</sup> Ave Landfill delisted from the NPL	August 25, 2006
Third FYR Report approved by ADEQ and EPA	September 2010
DEUR amended	November 2012
ESD #4 signed by ADEQ and EPA	July 2015

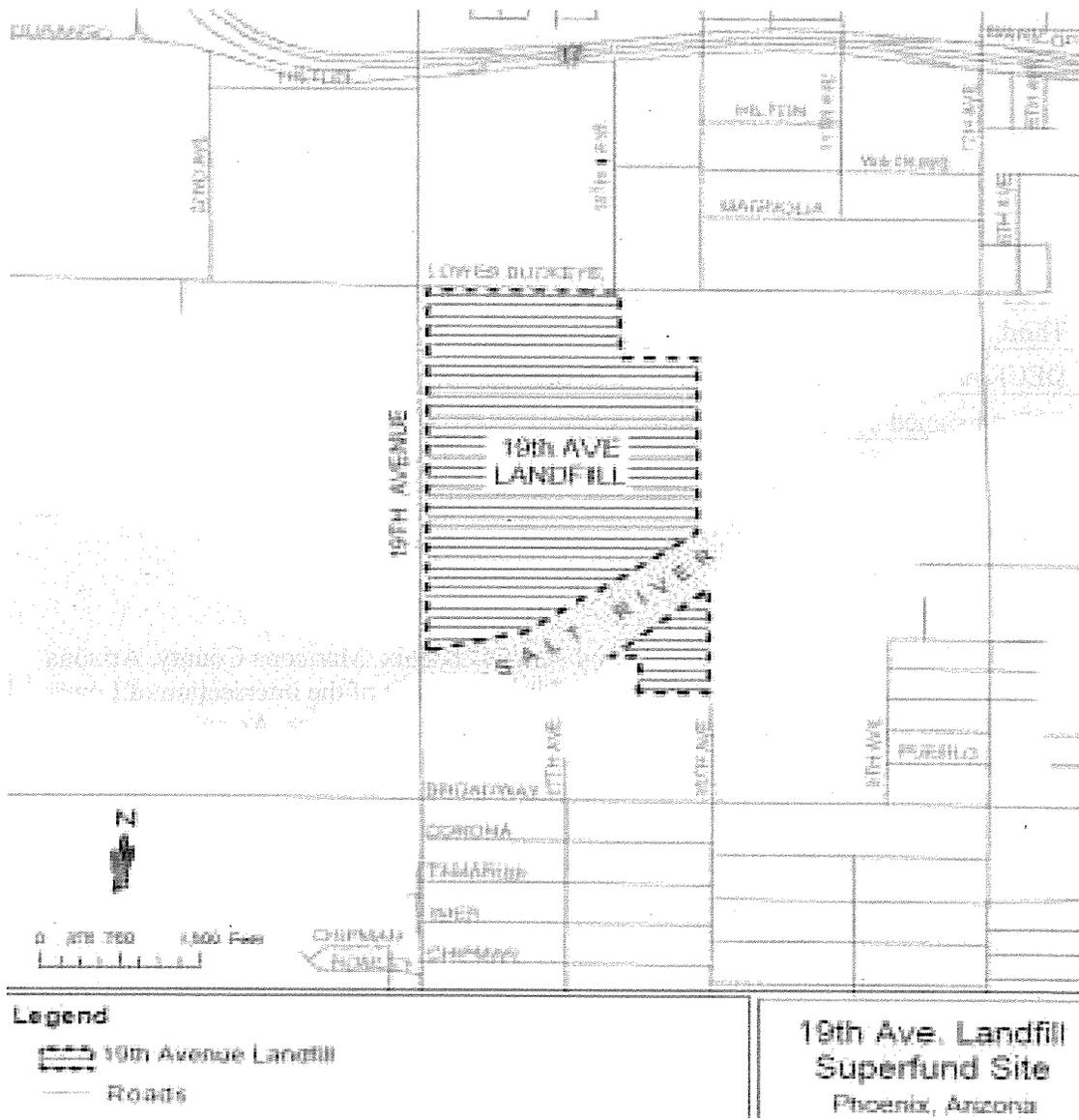
### 3. Background

#### 3.1. Physical Characteristics

The 213-acre Site is located in an industrial area of Phoenix, Maricopa County, Arizona (Figure 1). The site is geographically situated just southeast of the intersection of Lower Buckeye Road and 19<sup>th</sup> Avenue, and is intersected by the Salt River. An approximately 200 acre section of the site is located north of the Salt River and is referred to as Cell A (Figure 2). Beginning in the late 1950s, the Cell A gravel pits were excavated to an approximate depth of 30 to 35 feet below ground surface (bgs), although some pits were excavated as deep as 50 feet bgs. The pits were then backfilled predominately with municipal refuse from the Phoenix area.

The remaining 13-acre portion of the landfill, referred to as Cell A-1, is located south of the Salt River (Figure 2). Sometime before 1971, Cell A-1 was mined for sand and gravel, by late 1972, this cell was completely filled with refuse. The pit was excavated to a depth of 30 to 34 feet bgs in most of the southern two-thirds of the cell and to 10 to 20 feet bgs in the northern third.

Before the channelization of the Salt River was completed in March 1996, as a part of the final remedy, portions of the landfill were within the estimated 100-year flood plain of the Salt River. Flows in the Salt River at the landfill location resulted from controlled releases at dams more than 30 miles upstream as well as from rainfall and local sources of discharge into the river channel.



**Figure 1. Site Location**

19th Avenue Landfill EPA NPL Site, (Delisted) - Phoenix, Arizona

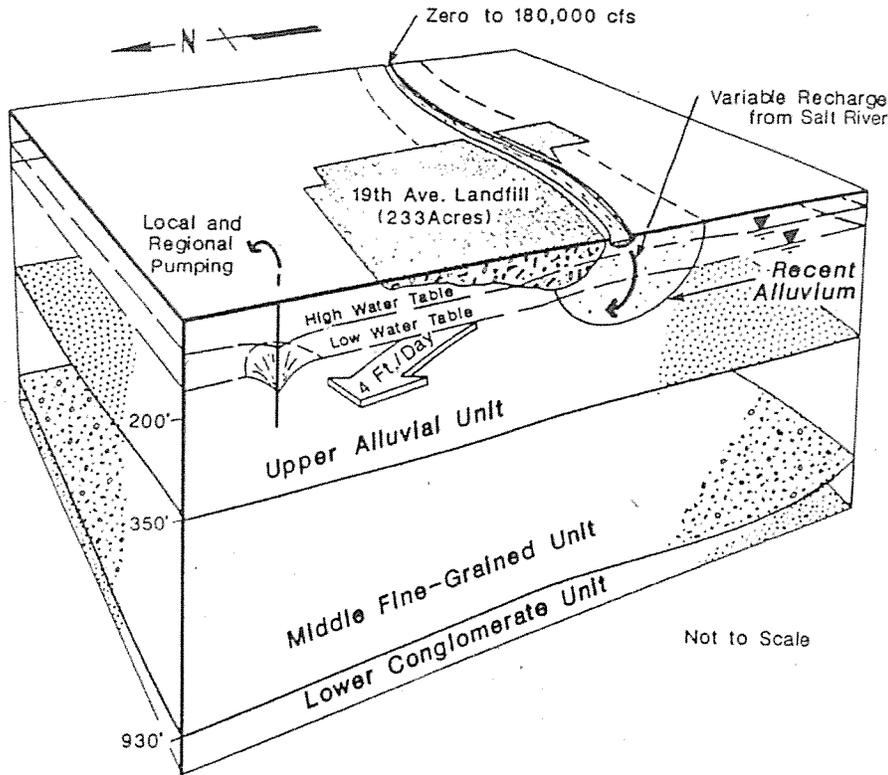


Figure 2. Detail Map for the 19<sup>th</sup> Avenue Landfill Superfund Site

### 3.2 Geology/Hydrology

The Site is situated in the southeastern portion of the west sub-basin of the Salt River Basin in central Arizona. The landfill is underlain by alluvial materials deposited within the structurally depressed basins of the region. These materials can be divided into five different units which extend 350 feet bgs. There is a 15 foot surface layer composed of silty sand. Beneath this layer there are approximately 100 feet of cobbles and coarse gravels. The next three units below this layer are divisions within the Upper Alluvial Unit (Figure 3).

The alluvial materials beneath the site can transmit a relatively large amount of water because they are generally coarse grained. The transmissivity of the materials between a depth of approximately 100 and 150 feet is estimated to be 190,000 gallons per day per foot. The transmissivity of the cobble and gravel deposits above 100 feet is probably even greater.



**Figure 3. Hydrogeologic Conceptual Diagram for 19<sup>th</sup> Ave. Landfill**

The direction of groundwater flow beneath the landfill is predominantly from the southeast to the northwest at the rate of 1 to 8 feet per day. Measured water levels have varied between 20 and 80 feet bgs, with the average depth to groundwater at the site is approximately 50 to 55 feet below ground surface. However, during periods of flow in the adjacent Salt River, the groundwater table rises and is in contact with the landfill refuse.

The groundwater hydraulics at the landfill are influenced by irrigation and industrial wells that pump groundwater and by recharge from surface water; these wells are generally located northwest of the Site. The use of agricultural irrigation wells northwest of the landfill is limited almost exclusively to the 6-month summer growing season. Groundwater flow gradients, and therefore flow rates, increase during the summer because of seasonal groundwater withdrawals. These withdrawals create drawdown in the aquifer and induce steeper flow gradients. Downward vertical gradients were observed in the Upper Alluvial Unit in response to summer agricultural irrigation pumping from nearby production wells.

During flood flows in the Salt River, water levels fluctuate 20 to 30 feet over a period of months. Most of the fluctuation is due to recharge from the Salt River caused by intermittent upstream release into the Salt River. Flows in the Salt River recharge the ground water at an average rate of approximately 1 foot per day. The high water tables resulting from the recharge of surface water are gradually reduced at an average rate of about 4 feet of head per year by regional agricultural pumping. When flow occurs in the Salt River, a groundwater mound develops beneath the river due to recharge. Due to the groundwater mounding, groundwater levels in shallow wells indicate a local reversal in flow direction; however, this does not affect the regional flow direction.

The Salt River is normally dry, and flows are a result of releases from upstream reservoirs. The 100-year floodplain covered approximately 50 percent of Cell A-1 and 30 percent of Cell A (prior to flood levee installation) and these areas are now outside the current Federal Emergency Management Agency 100-year floodplain map dated September 1996. Surface-water flow in the Salt River and 15<sup>th</sup> Avenue storm drain adjacent to the landfill have been observed to influence the groundwater levels in monitor wells at the landfill. Water percolates down from the Salt River bed and the bottom of the storm drain and enters the groundwater system.

### *3.3 Land and Resource Use*

In 1955, the 19<sup>th</sup> Avenue Landfill site was relatively undisturbed except for a shallow 20-acre excavation in the northwestern portion of Cell A north of the Salt River. In 1957, the COP extended an existing lease with the landowner to operate a municipal landfill. The landowner brought in another party to start sand and gravel mining at the site to create the space needed for the landfill. The mining and landfill operations began shortly thereafter.

The landfill was operated by the COP from 1964 until 1979. Due to the periodic inundation of the landfill by flood waters from the Salt River, the landfill was closed by a cease and desist order issued in February 1979 by the ADHS, predecessor to the ADEQ. The COP and ADHS entered into a consent agreement in June 1979. The Consent Order was amended in December 1979.

In September 1983, the Site was placed on the EPA's NPL. In 1987 to 1988, a RI/FS was conducted by the COP. In 1988, the EPA assigned the lead oversight responsibility for the site to the ADEQ. Measures taken to comply with the first amended Consent Order are described in Section 3.5. The primary contaminants of concern in the soil/refuse include volatile organic compounds (VOCs) such as toluene and ethylene.

The population within 6 miles of the Site is approximately 76,000 people. The nearest residence is 1/3 mile from the Site. The area's primary drinking water is provided by the COP water distribution system. The municipal system draws water from groundwater and surface water sources over 30 miles away. The nearest drinking water well is approximately 1,275 feet upgradient and the nearest COP drinking water well is approximately 2,550 feet upgradient (Tetra Tech 2014). There are 43 other types of wells located within a 1 mile radius of the Site. However, there is no known contamination of these wells at this time.

The Site is currently unused. However in 2010, the COP received some unsolicited proposals from developers interested in making use of the landfill property. Proposals to reuse the 19<sup>th</sup>

Avenue Landfill must continue to protect public health, the environment, and the integrity of the cleanup action. No proposals have been submitted during this FYR period.

The primary institutional control (IC) for the Site is a DEUR attached to the property's deed, which follows the land. The DEUR notifies future land owners of the requirement to maintain the cleanup actions and was implemented to safeguard the integrity of the landfill cap and restrict public access. The COP routinely inspects and maintains the perimeter security fence, topsoil cover and slopes, infiltration barrier layer, vegetative landscape, irrigation system, and all access roads. Maintenance may include: regrading of roads, repair of surface erosion and areas of settlement or subsidence, repair vegetation cover damage, repair irrigation system damage, and replacement of fencing, signs and locks. The COP is required to continue quarterly groundwater monitoring of the wells surrounding the landfill. Based on historical groundwater quality patterns, the landfill does not impact the groundwater.

The landfill is in the Rio Salado Redevelopment Area, which is proposed for redevelopment as the area meets the blight criteria established by Arizona Revised Statutes 36-1471 (COP 2014). The General Plan (in the redevelopment report) indicates this area would be "parks/open spaces – publicly owned" (COP 2014), although the current land use designation is "vacant nondevelopable (at present) landfill". The section of the Salt River that bisects the site is designated as the Rio Salado Habitat Restoration Area.

### *3.4 History of Contamination*

As previously described, the COP operated the landfill until 1979. Approximately nine million cubic yards of municipal refuse, solid and liquid industrial wastes, and some medical wastes and materials containing low levels of radioactivity were deposited in the landfill. Most of the liquids were poured into unlined pits in the north-central part of Cell A and along the eastern boundary. There was no formal record keeping system for the types of materials deposited and, at the time, few restrictions were imposed on the type of material that could be deposited. However, no evidence or mention of the disposal of liquid or solid, special or hazardous materials at Cell A-1 was discovered during the 1988 RI (Dames & Moore, 1989). A final soil cap was placed over the area once it was full of waste materials.

Parts of the landfill were covered with water by at least one flood event during 1965 and intermittently during the 1970s. Liquid waste disposal pits were breached at least once during these events. River flow and surface water run-off events in May 1978 washed out refuse from the southwest portion of Cell A and the northern third of Cell A-1. The washed out area in Cell A was then refilled with new refuse during the summer of 1978. The Cell A-1 area was refilled with construction debris in 1979. Early in 1979, the Salt River flooded again, raising the water table and filling several of the landfill pits. The high water breached several dikes, opening landfill cells and causing refuse to wash directly into the river. Water infiltrated directly into the cells, increasing the potential for leachate generation and resulting in leachate contamination of the groundwater. In addition, saturation of the waste materials generated excess amounts of methane gas. This scenario is not likely to occur again because the Salt River bed has been channelized to withstand a 100-year flood event (estimated). In addition, the north and south river banks have been strengthened with soil cement levees extending to 10 feet below the river channel.

### 3.5 Initial Response

To comply with the amended 1979 Consent Order, the COP covered the site with fill material (sand, gravel, and stones), stockpiled soil for final capping, installed groundwater monitoring wells (in 1981), built earthen berms around the boundary of the landfill, installed a methane gas collection system, and provided a 24-hour security guard until November 30, 1996. The guard was no longer required once the Site was secured by a permanent fence with secured access points.

### 3.6 Basis for Taking Action

Numerous hazardous substances were known or suspected to have been disposed of at the 19<sup>th</sup> Avenue Landfill. During the RI, the groundwater was found to contain very low levels of VOCs and heavy metals. Arsenic, barium, carbon tetrachloride, gross alpha activity, gross beta activity, mercury, nitrate, and vinyl chloride were detected in groundwater in excess of their respective maximum contaminant levels (MCLs).

The results of the COP's RI/FS including the risk assessment, as documented in the COP's 1989 Remedial Action Plan (RAP), indicated that public health risks resulting from releases from the landfill were limited to the possible accumulation of methane in enclosed areas at explosive levels, possible if the existing gas collection system was not operating properly. In addition, although there is no current use of local groundwater for drinking or other domestic purposes, this pathway could result in a risk to public health if domestic groundwater wells are developed in the future. Currently, COP provides drinking water to this area and will continue to do so in the future.

## 4. Remedial Actions

### 4.1. Remedy Selection

In June 1989, the COP prepared a RAP, which identified areas of concern for the remedial action and included a Feasibility Study (FS) with remedial action alternatives ranging from no action to excavation of the entire landfill.

In September 1989, ADEQ approved the RAP in a Letter of Determination (LOD) selecting Alternative 'A', as described in the FS. Shortly thereafter, in 1989, EPA signed a Record of Decision (ROD), concurring with the selected remedy in ADEQ's LOD.

The RAP identified the following areas of concern:

- *Refuse Washout.* Prevent erosion and overtopping of the landfill during a 100-year flood to eliminate the risk of refuse being washed out of the landfill and prevent impacts on surface water and sediment quality in the Salt River.
- *Surface Water Quality.* Prevent of infiltration of surface water into the landfill and the transport of landfill material in surface-water runoff to eliminate the possible impact of the landfill on surface water and sediment quality, to reduce the generation of leachate in the landfill, and to reduce localized air emissions from cracks or holes in the existing landfill cover.

- *Groundwater Quality.* Ensure that future potential ground-water degradation does not pose a risk to public health, welfare, or the environment.
- *Landfill Gas Accumulation.* Prevent off-site migration of landfill gas to eliminate the risk of explosions that could result from the accumulation of methane in enclosed spaces.

To address these areas of concern, the components of the selected remedy include:

- Levees would be placed along both the north and south banks of the Salt River at the landfill site to provide for flood protection;
- The river channel would be widened;
- A soil cap would be placed over the landfill so that rain water does not seep into the landfill material;
- A secure fence would be erected around the landfill boundary;
- Ambient air quality, methane gas, and groundwater would be monitored;
- A contingency plan would be implemented should groundwater quality standards be exceeded at the landfill boundary; and

Methane gas would be collected and treated in a manner that eliminates any risk of explosion. From October 1990 to May 1995, the engineering investigations, design and preparation of construction plans and specifications for the remedy were performed by the COP. The design work included evaluation, modification and expansion of the landfill gas control system; geotechnical investigations; surveying and mapping; storm drainage control and creation of sedimentation basins; landfill capping and grading and site security. During the period of 1995 until 2015, ADEQ and EPA modified the remedy four times by signing the following Explanation of Significant Differences (ESDs).

- In December 1995, ESD #1 allowed the COP to use a flexible lining system for the perimeter drainage channel.
- In October 2003, ESD #2 updated the maximum contaminant levels (MCLs) for specific groundwater contaminants and added the Arizona Ambient Air Quality Guidelines (AAAQG) for volatile organic compounds (VOCs) as performance standards for ambient air quality monitoring at the Site.
- In June 2006, ESD #3 required that institutional controls be established for the site, including the use of DEUR.
- In July 2015, ESD #4 modified the remedy by allowing the COP to treat the landfill gas in Cell A-1 by carbon treatment rather than flaring, and to document that the COP had recorded a DEUR on the Site in 2006, and a DEUR Amendment in 2012.

Identified in Table 2 are the groundwater quality standards selected in the ROD and ESD #2 that are not be exceeded at the landfill boundary. The compliance point for groundwater contamination in the ROD and Consent Decree is considered the landfill facility boundary.

**Table 2. List of Applicable Groundwater Quality Standards**

Compound	ROD Original Standards µg/L	ESD #2 Revised Standards µg/L	Agency Enacting Change <sup>1</sup>
Toluene	2000	1000	AWQS and MCL
Naphthalene	None Established	28	HBGL
Pentachlorophenol	None Established	1	MCL
Barium	5000	2000	AWQS and MCL
Beryllium	5	4	AWQS and MCL
Arsenic	50	10	MCL
Antimony	50	6	AWQS and MCL
Thallium	5	2	Revised MCL
Nickel	50	100	Revised MCL

Notes: 1 AWQS – Arizona Water Quality Standard; HBGL – Arizona Health-based Guidance Levels

#### 4.1.1. Remedy Implementation

In September 1995, the erosion and drainage tasks were started. Capping was underway by October 1995. In March 1996, the channelization tasks were completed and work on the gas collection system was started. The final fill cover consisted of a 1-foot thick sub-base layer, a 3-foot thick infiltration barrier layer, and a 1-foot thick vegetation topsoil layer. The capping system and the drainage and levee system effectively prevent surface water from contacting the refuse and minimize surface water infiltration into refuse, which reduces leachate and its potential transport into the groundwater. The landfill landscaping started in May 1996 and was completed in November 1996, along with installation of the Armorflex™ channel and sedimentation pond lining system. Both the capping system and the erosion and drainage system were completed by the end of August 1996. The gas collection system was operational by October 1996. Flare station emissions tests were performed October 16 to 18, 1996.

The final remedy for the 19<sup>th</sup> Avenue Landfill, completed in February 1997, provided for containment of the landfill wastes on-site with the collection and flaring of landfill generated gases. ADEQ issued written approval of completion of the remedial action in accordance with the Consent Decree on June 30, 1997, which triggered the following four actions: preparation of a RA Report to document the end of construction activities to be prepared by the COP; initiation of Five Year Reviews to evaluate the effectiveness of the remedial action under §300.340 (f)(4)(ii) of the National Oil & Hazardous Substances Contingency Plan, §121 of CERCLA (as amended); implementation of a Groundwater Contingency Plan; and, preparation of the methane and ambient air monitoring programs.

Landfill gases that are generated are managed by separate gas collection and flare systems which operate independently in each cell of the landfill. The COP is required to monitor the methane at the landfill boundaries and perform other methane monitoring to ensure the system

is preventing off-site migration of landfill gas. In September 1998, the COP completed a RA Report documenting that the remedy was operational and functional.

In July 2006, the COP recorded a DEUR, which included both engineering and ICs for the property. The DEUR describes the contamination known to be present at the Site, the engineering controls that must be maintained, and the ICs required of the COP and any and all future owners of the Site. The specific IC mechanisms identified were the DEUR and the existing Arizona Department of Water Resources (ADWR) requirements. The DEUR controls the use and access to the landfill property, and ADWR restricts groundwater well site location, construction, and use that could impact the remedy. Residential use is specifically prohibited.

The Engineering Control Plan of the DEUR, describes five engineering controls on the property: a drainage and levee system, a capping system, an erosion and drainage system, a landfill gas extraction system, and fencing. The ICs are: the COP shall restrict use of the property to non-residential use, the COP shall continue conducting groundwater monitoring of the wells in accordance with the Consent Decree, and the COP shall implement the groundwater contingency plan if necessary. Groundwater monitoring is being performed at the site and the COP is now operating under a Groundwater Contingency Plan (the Plan). Should groundwater quality standards in the Plan be exceeded at or downgradient of the landfill boundary, the COP is required to evaluate the potential source of the groundwater degradation. Should ADEQ determine that the landfill is the cause of the degradation, the COP must evaluate, and potentially implement, measures to remediate groundwater. In the event that groundwater remediation would be required, the remedies proposed will be evaluated using the nine criteria specified in 40 CFR Part 300.430(e)(9)(iii).

In July 2006, ADEQ signed the Final Close-Out Report documenting that the COP had successfully completed all the remedial actions required at the Site and it was eligible for Site Completion.

In August 2006, EPA issued a "Notice of Intent to Delete" the 19<sup>th</sup> Avenue Landfill Superfund Site from the NPL, with a 30-day comment period. In September 2006, EPA issued a Final Notice of Deletion for the landfill in the Federal Register.

#### *4.1.1.1. Operation and Maintenance*

The purpose of the Landfill Operation and Maintenance (O&M) Program is to establish criteria for the landfill engineering controls to assure that (1) infiltration of surface water into the landfill does not occur and (2) the site is secure from unauthorized entrance. The COP has been performing all O&M activities at the landfill in accordance with the approved O&M Manual dated September 15, 1998, and the Operations, Maintenance & Monitoring Program Manual for the Landfill Gas Extraction System dated March 1999.

In 2012, an Amendment to the DEUR incorporated a Maintenance Contingency Plan to streamline landfill gas extraction system maintenance and allow the cap to be breached if necessary to make emergency repairs. In 2014, the COP completed an Updated O&M Manual (COP 2014) to be consistent with the requirements of the 2006 DEUR and the 2012 DEUR Amendment. The updated manual removed extraneous information, documents, and requirements not included in the DEUR and incorporated operational changes that were implemented since the original manual was issued. The updated manual has five engineering

control monitoring aspects: 1) drainage and levee system, 2) capping system, 3) erosion and drainage system, 4) landfill gas extraction system, and 5) perimeter site fencing. The COP Solid Waste Disposal Management Division or its designated representative conducts an inspection at least once per year. The 2014 COP O&M Update provides specific details on required inspection and monitoring.

During this FYR period, the COP continued to conduct monitoring of groundwater and methane, as well as routine maintenance activities. Maintenance activities included repair of eroded areas, repair of irrigation systems, fence repair, rodent control, and minor repair of wells, probes, and the gas control system. Air monitoring was conducted during 2013. The COP annual report (2014) indicated that no accidental releases occurred and all emissions were within permitted limits.

**Table 3. Annual O&M Costs**

<b>Date Range – Fiscal Year</b>	<b>Total Cost (rounded to the nearest \$1,000)</b>
July 2008 to June 2009	\$383,000
July 2009 to June 2010	\$412,000
July 2010 to June 2011	\$682,000
July 2011 to June 2012	\$704,000
July 2012 to June 2013	\$368,000

There are cost differences between this Table 3 and the totals in the annual inspection reports because the reports summarize costs on a 12-month annual basis (January through December), while the City tracks its costs on a fiscal year (July through the following June) basis.

## 5. Progress Since the Last Five-Year Review

### 5.1 *Previous Five-Year Review Protectiveness Statement and Issues*

The 2010 FYR for the 19<sup>th</sup> Avenue Landfill concluded that the site remedy is protective of human health and the environment.

*“The remedy at the Nineteenth Avenue Landfill Superfund Site is protective of human health and the environment. Currently, there are no environmental exposure pathways that result in unacceptable risks, and none are expected as long as the engineered and institutional controls selected in the decision documents continue to be properly operated, monitored, and maintained, and the land use at the Site allows for the integrity of the remedy to continue. A DEUR to restrict use of property was recorded for the Site in 2006, and it is effective in preventing incompatible land use.*

The third FYR had no issue; however, it recommended informal areas of improvement. These areas of improvement are listed in Table 4.

**Table 4. Status of Improvements from the 2010 FYR**

<b>Improvements recommended in previous FYR</b>	<b>Action Taken and Outcome</b>	<b>Date of Action</b>
Landfill maintenance deficiencies	as needed	On-going
Develop annual monitoring report	completed	2011, 2012, 2013, 2014
Update SAP and QAPP	completed	Aug 2014
Update O&M Plan	completed	Oct 2014
Update well inventory map	completed	Sept 2014
Evaluate landfill gas condensate monitoring data on regular basis	completed	2014

### *5.2 Work Completed at the Site During this Five Year Review Period*

Tetra Tech performed the annual site inspection on November 8, 2010 and observed the conditions of the five engineering controls in accordance with the DEUR and CD. Multiple issues of concern, believed to be generally minor in nature, were noted and none were considered a threat to human health or the environment (Tetra Tech 2010). The COP has conducted annual site inspections since then. The sedimentation basin was cleared of vegetation and stockpiled sediment during 2011. As a result of the annual inspection and monitoring during January 2013, approximately 3 acres of landfill surface area were repaired, in an event (Final Cover Repair Project) that lasted one week. The final cover repair project was conducted by AMTECH Associates, L.L.C (contracted by COP).

## **6. Five-Year Review Process**

### *6.1 Administrative Components*

EPA Region 9 initiated this fourth FYR in October 2014 and scheduled its completion for September 2015. The EPA Region 9 review team was led by Cynthia Wetmore of EPA, FYR Project Manager; Andria Benner of EPA (RPM) for the 19<sup>th</sup> Avenue Landfill Site; Laura Fischer, ADEQ Project Manager; Miriam Gilmer, USACE Project Manager; Deborah Johnston, USACE Biologist; and Peter Krembs, USACE Geologist. On October 17, 2014, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The EPA and the Corps conducted coordination conference calls with ADEQ as needed during the drafting of the FYR Report.

### *6.2 Community Involvement*

In the February 2015 *C.J. Jorgensen School News*, a notification was published announcing the commencement of the FYR process for the 19<sup>th</sup> Avenue Landfill Site, providing ADEQ contact information and inviting community participation in the Open House to be held at the

school on February 17, 2015. The school newsletter is available in Appendix B (information posted on second to last page).

The FYR report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository: Burton Barr Central Library, Reference Section, 1221 N. Central Avenue, Phoenix, AZ 85004.

### *6.3 Document Review*

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

#### ARARs Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund RAs must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, RA, location, or other circumstance at a CERCLA site.

The ARARs were initially established when EPA signed the 1989 ROD selecting the Site remedy based upon ADEQ's 1989 LOD, which approved the City's 1989 RAP for the Site. The ARARs were subsequently included in ADEQ's 1992 Consent Decree with the City.

In 2003, ADEQ and EPA signed Explanation of Significant Difference (ESD) #2 which modified the remedy to update the maximum contaminant levels (MCLs) for specific constituents in groundwater to reflect EPA changes in these standards, and to add the recently promulgated Arizona Ambient Air Quality Guidelines for volatile organic compounds (VOCs) as performance standards for air quality monitoring at the Site.

These ARARs identified very broadly in the 1989, with some more specific updates in the 2003 ESD are the following:

- **Surface Water Protection ARARs** – Designation of three protected uses (incidental human body contact; agricultural irrigation and livestock watering; and aquatic wildlife use) for a designated section of the Salt River for actual and future uses.
- **Groundwater Protection ARARs** – Safe Drinking Water Act MCLs, Safe Drinking Water Act proposed MCLs, and the Arizona Health-Based Guidance Levels (HBGLs) for Contaminants in Drinking Water and Soil (1992). The applicable groundwater standards in Arizona are derived from ADEQ's Water Quality Standards which established statewide numeric standards for protecting drinking water.
- **Air Emissions Limitation ARARs** – Resource Conservation and Recovery Act Proposed Rule on Methane Emissions for Landfills (1988), and Arizona Ambient Air Quality Guidelines (AAAQG) developed by the Arizona Department of Health (ADHS) for ADEQ in 1991, and last updated in 1999, established threshold concentrations for compounds in air, including VOCs.

- **Soil and Refuse Exposure Protection ARARs** – ADHS Suggested Health-Based Cleanup Levels for Contaminants in Soils (Table 3-2 of 1989 RAP) to protect groundwater, based on an ADHS 1987 draft policy for establishing drinking water action levels.

Table 5 lists the chemical-specific ARARs for drinking water included in the selected remedy when EPA signed the ROD and the subsequent ESD. These ARARs were evaluated for this FYR for continued groundwater treatment and monitoring.

**Table 5. Chemical-Specific ARARs - Summary of Drinking Water ARAR Changes**

<b>Contaminant of Concern</b>	<b>1989 ROD Standards (µg/L)</b>	<b>2003 ESD Revised Standards<sup>1</sup> (µg/L)</b>	<b>Current Arizona Regulations<sup>2</sup> (µg/L)</b>	<b>Current Federal Regulations<sup>3</sup> (µg/L)</b>	<b>ARARs Changed Since 1989 ROD or 2003 ESD?</b>
Toluene	2,000	1,000	1,000	1,000	No change
Naphthalene	None Established	28	140	None Established	Current Arizona standard less stringent
Pentachlorophenol	None Established	1	1	1	No change
Barium	5,000	2,000	2,000	2,000	No change
Beryllium	5	4	4	4	No change
Arsenic	50	10	10	10	No change
Antimony	50	6	6	6	No change
Thallium	5	2	2	2	No change
Nickel	50	100	210	None Established	Current Arizona standard less stringent

1. Updated MCLs established in 2003 EPA ESD,
2. Arizona Domestic Water Use Regulations, Arizona Administrative Code (AAC) R18-11, Appendix A, Table 1, Water Quality Criteria by Designated Use (2009)
3. Federal National Primary Drinking Water Regulations (2009)

There have been no revisions to the Chemical-Specific ARARs (drinking water laws or regulations) that affect the protectiveness of the remedy. The current Arizona regulations are less stringent for two contaminants (naphthalene, nickel) than the 2003 ESD standards. In addition, the groundwater underneath and near the Site is not used for drinking water purposes, and therefore, there is no risk of exposure to contaminated water.

Table 6 below summarizes and evaluates the ARARs identified in the 1989 ROD and 2003 ESD #2.

The COP and ADEQ have considered certain standards to be Site ARARs, based on the agreements reached in the 1992 CD or in subsequent communications. However, EPA did not sign the 1992 CD nor has EPA modified the remedy in the intervening years to incorporate these other standards as ARARs.

Requirement	Citation	Document	Description	Effect on Protectiveness	Comments
Federal Safe Drinking Water Act	40 CFR, Part 141 Subparts B and G	1989 ROD and 2003 ESD #2	Established maximum contaminant levels (MCLs) for a number of common organic and inorganic chemicals.	Changes do not affect protectiveness (see Table 1)	
ADEQ Aquifer Water Quality Standards (AWQSs)	Arizona Administrative Code (AAC), R18-11-4-1 et. seq.	2003 ESD #2	Established statewide narrative and numeric standards for drinking-water protective use	Changes do not affect protectiveness (see Table 1)	
Arizona Health-Based Guidance Levels (HBGLs) for Contaminants in Drinking Water and Soils	AAC, R18-4-104 (2008)	2003 ESD #2	Established State health-based guidance levels for drinking water and soils	Changes do not affect protectiveness	The cap eliminated any pathway for potential risk of human exposure to the waste and mitigated infiltration of rainwater and potential migration of leachate or contaminated wastewaters into the groundwater.
Arizona Surface Water Protection Regulations	Arizona Water Quality Standards - Protected Use for the Salt River (AAC R18-11-109)	1989 ROD	Identified the designated protective use of the Salt River within the vicinity of the Site.	Changes do not affect protectiveness	The Salt River is dry most years and release flows are controlled by an upstream reservoir.
Arizona Ambient Air Quality Guidelines (AAAQGs)	Health based guidelines for residential screenings, not standards	2003 ESD #2	Established performance standards for certain VOCs for air quality monitoring.	No change	There have no changes in the VOC ambient air quality monitoring requirements in the past five years.
Resource Conservation and Recovery Act	Proposed Rule on Methane Emissions for Landfills (1988)	1989 ROD	Established an upper limit of 1.25% by volume for landfill facility structures and an upper limit of 5% by volume at landfill boundaries.	No change	The methane upper limit by volume percent requirements have not changed.

**Table 6. Applicable or Relevant and Appropriate Requirements**

### Human Health Risk Assessment Review

The risk assessment was reviewed to identify any changes in exposure or toxicity that would impact protectiveness of human health. A baseline risk assessment was included in the RAP as part of the ROD (1989). The assessment indicated that the landfill does not pose a current risk to public health, although releases from the 19<sup>th</sup> Avenue Landfill have affected, to some extent, the groundwater environment at the landfill boundary.

A contingency plan (requiring an evaluation and a possible supplemental remedial action) is to be implemented if contaminant levels exceed MCLs at the property boundary (considered to be the compliance point). However, this has not occurred to date as all follow-up sample concentrations were below MCLs.

Another potential risk to public health and the environment may occur as a result of a rising water table which saturates a greater volume of refuse and releases additional leachate. The risk to the environment resulting from additional leachate generation by this mechanism is unknown and cannot be precisely quantified. Historical water quality data have not indicated any correlation between an increasing water table elevation and increasing groundwater VOC concentrations. Exposure to groundwater from a shallow drinking water well, assuming such a well were drilled on or near the landfill boundary and used as a drinking water source, represents the only potential public health risk. However, the COP currently supplies drinking water in the area and will continue to do so in the future. The area is becoming increasingly industrialized, lessening the chance of ingestion of groundwater via a new domestic well. Of the seven drinking water wells located within a 1-mile radius of the landfill, the closest well is located approximately 1,275 feet south of the landfill (groundwater moves northwest so this would be an upgradient well).

The exposure point for the methane exposure pathway would be populations in enclosed spaces on or near the landfill. Air sampling in the vicinity of the landfill indicated that the concentrations of VOCs in air in the vicinity of the landfill are within the range expected for the Phoenix urban area.

No current risks to public health were identified for surface and groundwater, soil and refuse, and ambient air quality exposure pathways that were examined. The hazard associated with methane was limited to the off-site migration of methane if the gas collection system fails to operate.

No site changes have occurred since the ESD that would change the results of the human health risk assessment.

### Vapor Intrusion

EPA's understanding of contaminant migration from soil gas and/or groundwater into buildings has evolved over the past few years leading to the conclusion that vapor intrusion may have a greater potential for posing risk to human health than assumed when the ROD was prepared. The potential for vapor intrusion was evaluated following a "multiple lines of evidence" approach consistent with EPA's April 2013 "External Review Draft – Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air."

The potential for vapor intrusion was not discussed in the 1989 ROD or the three subsequent ESDs for the Site. Methane is the only contaminant that would be of concern for vapor intrusion. Releases of methane are controlled under COP's air permit.

No buildings exist, nor are any planned to be built, within or in close proximity to the landfill or the flare locations. Therefore, vapor intrusion is not a likely risk factor. However, any future development which may be planned in the vicinity of the landfill should consider vapor intrusion as a risk factor.

Toxicity Values:

EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by the Agency in risk assessment when newer scientific information becomes available. Media-specific concentration results are compared to EPA's Regional Screening Levels (RSLs) as a first step in determining whether response actions may be needed to address potential human health exposures. The RSLs are chemical-specific concentrations for individual contaminants that correspond to an excess cancer risk level of  $1 \times 10^{-6}$  (or a Hazard Quotient of 1 for non-carcinogens), and they have been developed for a variety of exposures scenarios (e.g., residential, and commercial/industrial). RSLs are not de facto cleanup standards for a Superfund site, but they do provide a good indication of whether actions may be needed.

In the past five years, there have been no changes to the tapwater toxicity values (oral reference dose, inhalation reference concentration, or carcinogenicity assessment as found in the EPA IRIS database) for the contaminants of concern at the Site (Table 7). IRIS was reviewed for this FYR in January 2015.

**Table 7. Summary of RSLs (Nov 2014) for Site Groundwater Contaminants of Concern**

Contaminant of Concern	RSL for cancer risk in excess of $1 \times 10^{-6}$ ( $\mu\text{g/L}$ )	RSL for non-cancer hazard ( $\mu\text{g/L}$ )	EPA Protective Risk Range ( $\mu\text{g/L}$ )	Current Cleanup Level ( $\mu\text{g/L}$ )
Toluene	none	1,100	< 1,100	1,000
Naphthalene	0.17	none	0.17-17	28
Pentachlorophenol	0.04	none	0.04-4	1
Barium	none	3,800	<3,800	2,000
Beryllium	none	25	<25	4
Arsenic	0.052	none	0.052-5.2	10
Antimony	none	7.8	<7.8	6
Thallium	none	0.2	<0.2	2
Nickel	none	200	<200	100

The selected cleanup levels for naphthalene, arsenic, and thallium are outside EPA's protective risk range. Since there is no complete pathway for receptors to contact groundwater (the aquifer for drinking water), there is no risk from those chemicals that have cleanup levels higher than the RSLs.

#### Ecological Review

The risk assessment was reviewed to identify any changes in exposure or toxicity that would impact ecological protectiveness. A baseline risk assessment was included in the RAP as part of the ROD (1989). On the basis of the RI, the surface water and sediments in the Salt River had not been adversely affected by Site releases. Maximum observed surface-water concentrations did not exceed standards set for protection of aquatic wildlife and agricultural uses. A permanent fish population is not supported by the Salt River adjacent to the landfill because the flow is intermittent. Therefore, bioaccumulation of compounds in fish was not considered a potential impact. The animal species that were identified in the vicinity of the landfill may drink from the Salt River when there is water present. This would provide an intermittent exposure route; however, ARARs for protection of aquatic and wildlife are not exceeded. Therefore, there is no risk to small animals or birds through exposure to surface water.

The small mammals and birds observed at the landfill would not be expected to ingest soils and refuse. Therefore, no complete exposure pathway exists. The air above the landfill provides another potential exposure pathway for small mammals and birds. Air quality monitoring during the remedial investigation showed no apparent additional impact from landfill emissions on the quality of ambient air near the landfill. Small mammals and birds would not be exposed to any additional risk due to air quality impacts.

No site changes have occurred since the previous FYR that would affect the ecological risk assessment.

#### *6.4 Data Review*

The hydrogeologic data review for this FYR included compliance groundwater monitoring data, groundwater level data, and well survey data (City of Phoenix, AZ, TetraTech, Inc., September 30, 2014 Well Inventory Study). The COP's Quarterly Groundwater Monitoring Reports (2010 - 2013) still incorrectly identify the monitoring threshold or maximum contaminant level (MCL) for arsenic as 0.05 milligram per liter (mg/L). The correct threshold, as stated in the 2003 ESD #2, is 0.01 mg/L. This discrepancy was noted in the 2010 FYR but the data continued to be misinterpreted and not correctly documented in groundwater reports until 2014. For well data beginning with quarterly reports in 2014, the threshold was correctly reported and correctly interpreted. Additionally, the thallium MCL, which also was updated in the 2003 ESD #2, was incorrectly reported as 0.005 mg/L instead of 0.002 mg/L for years 2010 through 2013. It was correctly reported in 2014 as 0.002 mg/L.

#### Groundwater

The Site originally contained 19 monitoring wells installed in the Upper Alluvial unit as shown on Figure 4. However, one of the original wells, identified as Well I-8, was abandoned in 1996 (p. 2 "Well Inventory Study", Tetra Tech 2014) and replaced by Well I-8R (River North R) that is no longer monitored,

During the period leading up to the 2015 FYR, the COP continued to conduct quarterly groundwater sampling and depth to groundwater measurements at the 18 monitoring wells (Table 8) that comprises the current monitoring network. The quarterly samples were submitted for analysis to an Arizona Department of Health Services (ADHS) certified laboratory that used State-approved analytical methods. The COP continued to prepare and submit quarterly reports to the agencies, and some reports summarized data collected over more than one quarter. Fourth quarter groundwater elevations for 2014 are shown on Figure 5.

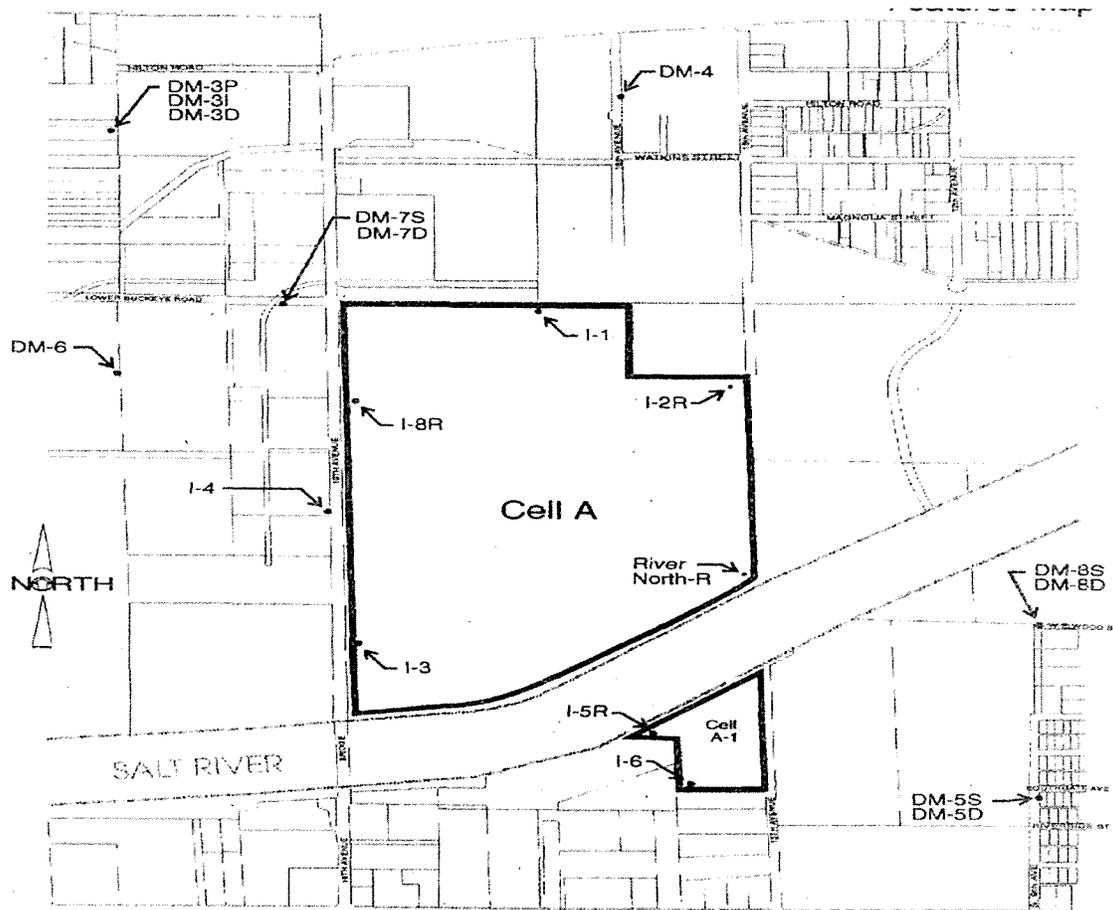


Figure 4. Groundwater Monitoring Wells



## 19th Ave Superfund Site Q4 2014 Groundwater Elevations

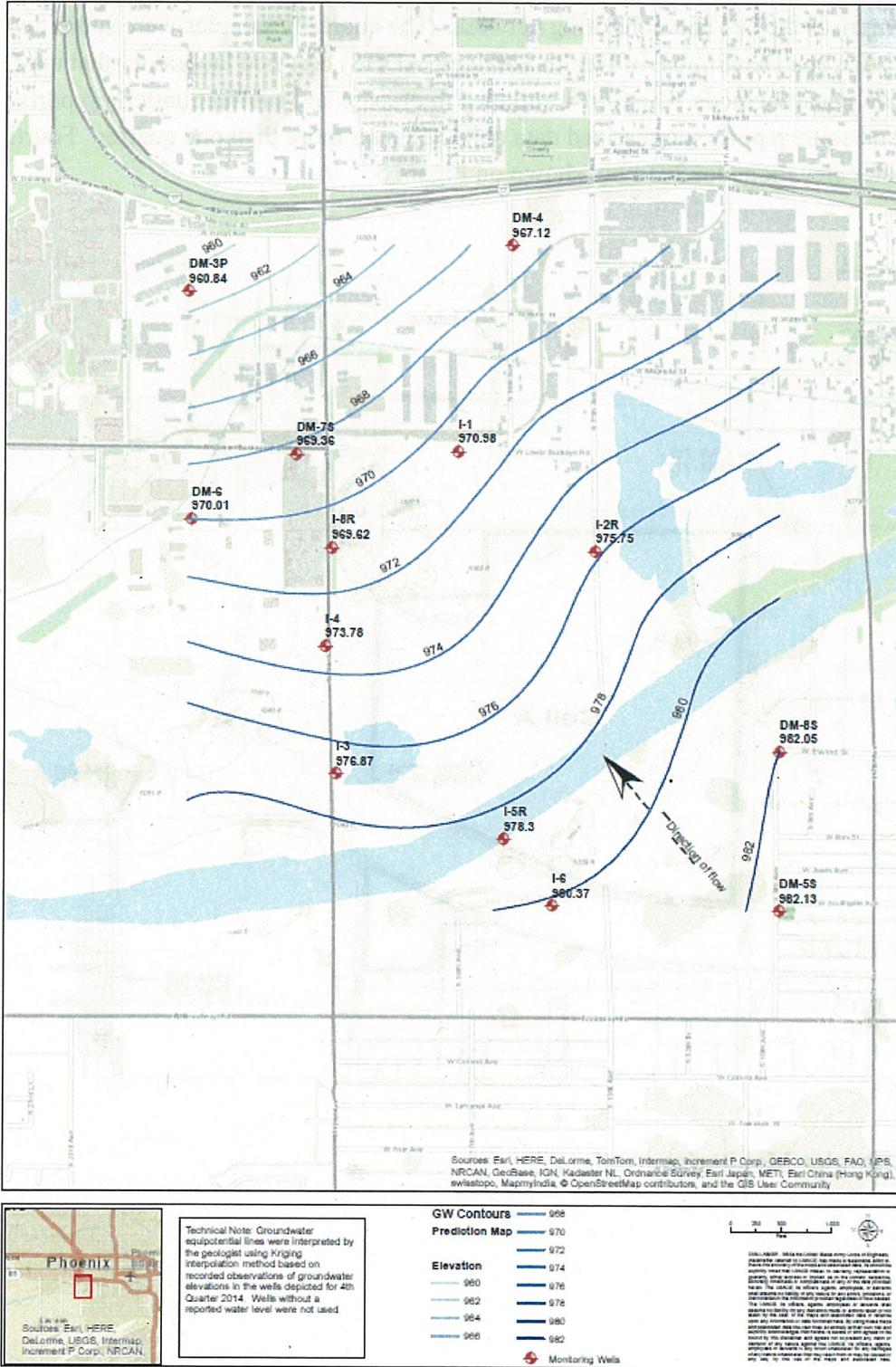


Figure 5. Groundwater Elevation Map Fourth Quarter 2014

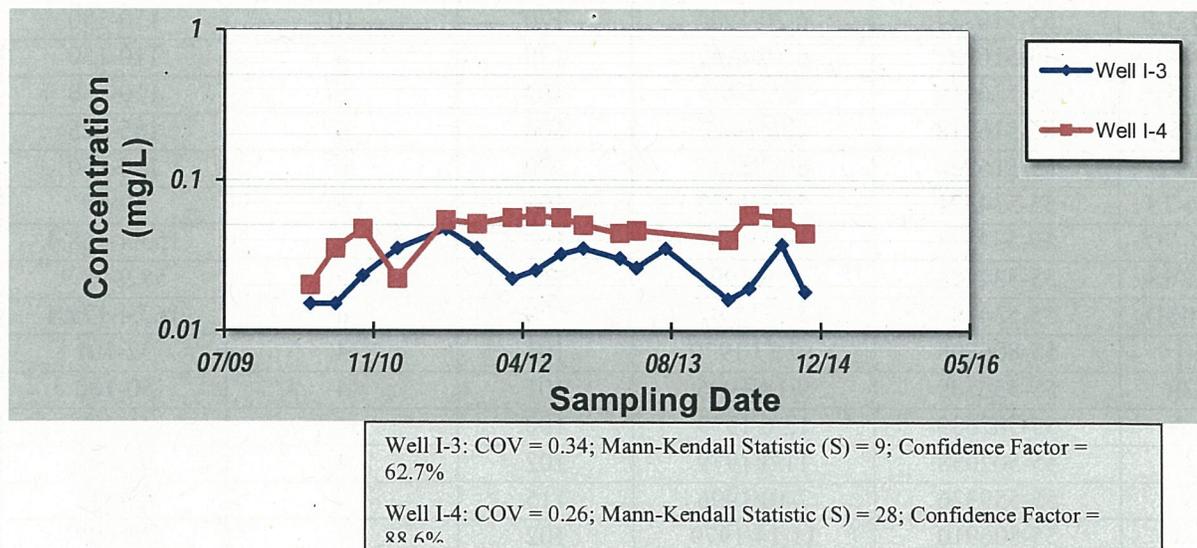
**Table 8. City of Phoenix 19th Ave Landfill Well Network**

<b>WELL NAME</b>	<b>ADWR 55 REGISTRY NUMBER</b>	<b>COMPLETION DATE</b>	<b>WELL DEPTH (feet)</b>	<b>CASING DIAMETER (inches)</b>	<b>SCREEN INTERVAL (feet)</b>
DM-3-D	55-516922	6/15/1987	370	6	280-320
DM-3-I	55-516923	6/26/1987	232	6	185-225
DM-3-P	55-516924	6/20/1987	170	10	110-150
DM-4	55-516921	6/19/1987	170	6	110-150
DM-5-S	55-516919	8/5/1987	164	6	110-150
DM-5-D	55-516918	8/8/1987	300	6	185-225
DM-6	55-516920	6/12/1987	170	6	110-150
DM-7S	55-534371	5/13/1992	101	6	59-99
DM-7D	55-534372	5/13/1992	169	6	153.4-168.4
DM-8S	55-534796	5/13/1992	99	6	58.9-98.9
DM-8D	55-534797	5/13/1992	179	6	163.4-178.4
I-1	55-806908	10/27/1979	101	4	32-101
I-2R	55-556389	9/18/1996	101	4	60-100
I-3	55-502039	12/6/1979	100	4	46-100
I-4	55-502038	11/3/1979	102	4	33-102
I-5R	55-559326	7/10/1996	115	4	65-115
I-6	55-806910	11/14/1979	102	4	32-102
I-8R	55-559327	7/11/1996	115	4	65-115

A 2004 ADEQ Technical Memorandum documented that, over the eight year period from 1996 to 2003, consistent exceedances of the 10 µg/L standard for arsenic in groundwater occurred in only two monitor wells (I-3 and I-4) along the western (obliquely downgradient) edge of the capped area of the landfill (Figure 6). Arsenic concentrations in those two wells increase when the regional water table is lowered due to seasonal groundwater pumping. Concentrations decreased after the water table stabilizes or rises. The ten other routinely monitored shallow site wells, including four wells farther downgradient, are subject to comparable water table fluctuations, but consistently show stable arsenic concentrations near or below the 10 µg/L standard.

The current data strongly support the 2004 Technical Memorandum conclusion that the arsenic is naturally occurring in the aquifer sediments and is mobilized at the water table surface by reducing conditions beneath the capped area of the landfill, but is relatively immobile in the naturally oxidizing conditions outside the capped area. As groundwater moves from beneath the capped area, naturally oxidizing conditions precipitate the dissolved arsenic (and related redox-sensitive metals) as oxide minerals of low solubility within a very short distance. The 2010-2014 site data shows the same patterns and continues to support the conclusions of the 2004 tech memo. The arsenic concentrations

downgradient, and in all other site wells, continue to remain near or below the MCL of 10 µg/L (see analysis in Appendix H of 2010 FYR Report). Therefore, it appears the same oxidizing conditions continue to be present. Regardless, arsenic will continue to be monitored at the Site to ensure the conditions observed in the past and current FYR remain the same.



- Notes:
1. sampling event in 3<sup>rd</sup> quarter 2013 was unavailable for Well I-4 because the well was dry; it was not considered in the analysis.
  2. Confidence in trend = confidence (%) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $>95\%$  = increasing or decreasing;  $\geq 90\%$  = probably increasing or probably decreasing;  $< 90\%$  and  $S > 0$  = no trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = no trend;  $< 90\%$  and  $COV < 1$  = stable.
  3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Groundwater*, 41(3):355-367, 2003.

**Figure 6. Trend Analyses for Arsenic Concentrations at Wells I-3 and I-4**

However, the COP should reassess groundwater contaminant data reported from 2010 through 2013 and correct the quarterly reports. The inaccurate threshold used for arsenic monitoring (as well as thallium) may have led to confusing or inaccurate conclusions in the COP's quarterly reports because the incorrect MCL was being used as a monitoring threshold. The reports failed to accurately communicate the extent of the presence of arsenic even if the groundwater in this area is not used for drinking water.

**Table 9. Arsenic Groundwater Exceedances from 2010 to 2014 by Well**

Date Sampled	Concentrations of Arsenic that Exceeded Criteria of 0.01 mg/L									
	Monitoring Well									
	DM-3I	DM-3P	DM-5S	DM-7D	DM-8D	DM-8S	I-1	I-2R	I-3	I-4
2/20/2014									0.016	
2/13/2014										0.049
4/28/2014										0.058
4/30/2014									0.019	
8/18/2014				0.013					0.037	
8/21/2014										0.056
8/27/2014	0.014									
8/28/2014					0.016	0.016				
11/4/2014									0.018	0.044
2/21/2013									0.03	
2/25/2013										0.044
4/18/2013									0.026	
4/23/2013										0.046
7/25/2013									0.035	
2/28/2012									0.022	
3/5/2012										0.056
5/1/2012										0.023
5/14/2012			0.04							
5/17/2012									0.025	0.057
8/9/2012									0.032	
8/16/2012	0.01				0.011	0.011				
8/20/2012										0.056
10/23/2012									0.035	
10/25/2012										0.05
1/20/2011					0.011	0.01				
2/2/2011	0.011									
2/3/2011				0.011						
2/7/2011							0.01	0.01	0.035	
2/8/2011		0.011								
2/9/2011										0.022
7/20/2011									0.047	0.054
11/2/2011									0.035	
11/3/2011					0.01	0.01				
12/27/2011										0.051
4/21/2010									0.015	0.02
7/14/2010										0.035
7/15/2010									0.015	
10/11/2010					0.01	0.01				
10/14/2010									0.023	0.047

Notes: 2014 in black, 2013 in red, 2012 in blue, 2011 in orange, 2010 in green.

These exceedances are within documented background conditions.

**Table 10. Nickel and Thallium Groundwater Exceedances from 2010 to 2014 by Well**

<b>Concentrations of Nickel (MCL 0.1 mg/L) and Thallium (MCL 0.002 mg/L that Exceed Criteria</b>			
Monitoring Well	Date Sampled	Nickel mg/L	Thallium mg/L
DM-7S	9/15/2014	0.14	
DM-7S	11/4/2014	0.14	
DM-7S	8/18/2014	0.17	
I-3	8/18/2014		0.0026
I-4	8/21/2014		0.0028
I-8R	2/8/2011		0.0025
I-8R	4/26/2010		0.0026

Surface Water and Sediment

No surface water bodies are located within the landfill cells; however, the Salt River bisects the Site. Stormwater runoff is directed to the perimeter drainage channels and into retention basins. From the basins, it is released to the Salt River. No surface water or sediment monitoring is conducted in the adjacent Salt River because the landfill was properly closed in accordance with the State’s stormwater runoff requirements.

Landfill Gas (LFG)

As a means of controlling subsurface migration of landfill gases to off-site locations, the COP installed a gas extraction and treatment (flaring) system which is monitored on a monthly basis (Figure 7). Annual average air concentrations, resulting from landfill emissions, were within general background levels typically found in the urban Phoenix area (ROD 1989). After the system was renovated, subsurface concentrations of methane decreased at most off-site locations. A follow-up engineering study indicated that the concentrations at all locations dropped below the lower explosive limit (LEL) for methane.

The COP performs landfill gas monitoring on a monthly basis. The system includes 43 dual depth monitoring probes at Cell A, 11 dual depth probes at Cell A-1, 8 probes in the Salt River channel and 5 triple depth probes on the south bank of the Salt River (Figure 8). Between 2005 and 2012, the 19<sup>th</sup> Ave Landfill reduced the total emissions from approximately 5,000 to less than 1,000 tons, a 90 percent decrease. In 2012, the landfill collected and flared 84 tons of methane and released 15 tons of methane which is equivalent to 322 MT CO<sub>2e</sub> (metric tons carbon dioxide equivalent emissions) (COP 2013). The 19<sup>th</sup> Avenue Landfill probes were below five percent methane by volume for the entire reporting period in 2010, 2012, 2013, and 2014. In October 2011, the methane concentrations at perimeter probe LG19B12 at the 19<sup>th</sup> Avenue Landfill Cell A were detected above five percent by volume of the LEL. Detection of methane over five percent by volume at this probe was made at the deep monitoring level only. This probe

was installed in refuse. Based on the data and results of COP activities to reduce the level of methane detected at the probe, COP believes that the methane detected is originating from off-site at the east of the property, formerly a rendering plant. The probe is not located near any significant occupied structures and there was no risk to human health or the environment. The ADEQ concluded that future problems are unlikely to develop, particularly since the additional, effective LFG controls are now in place.

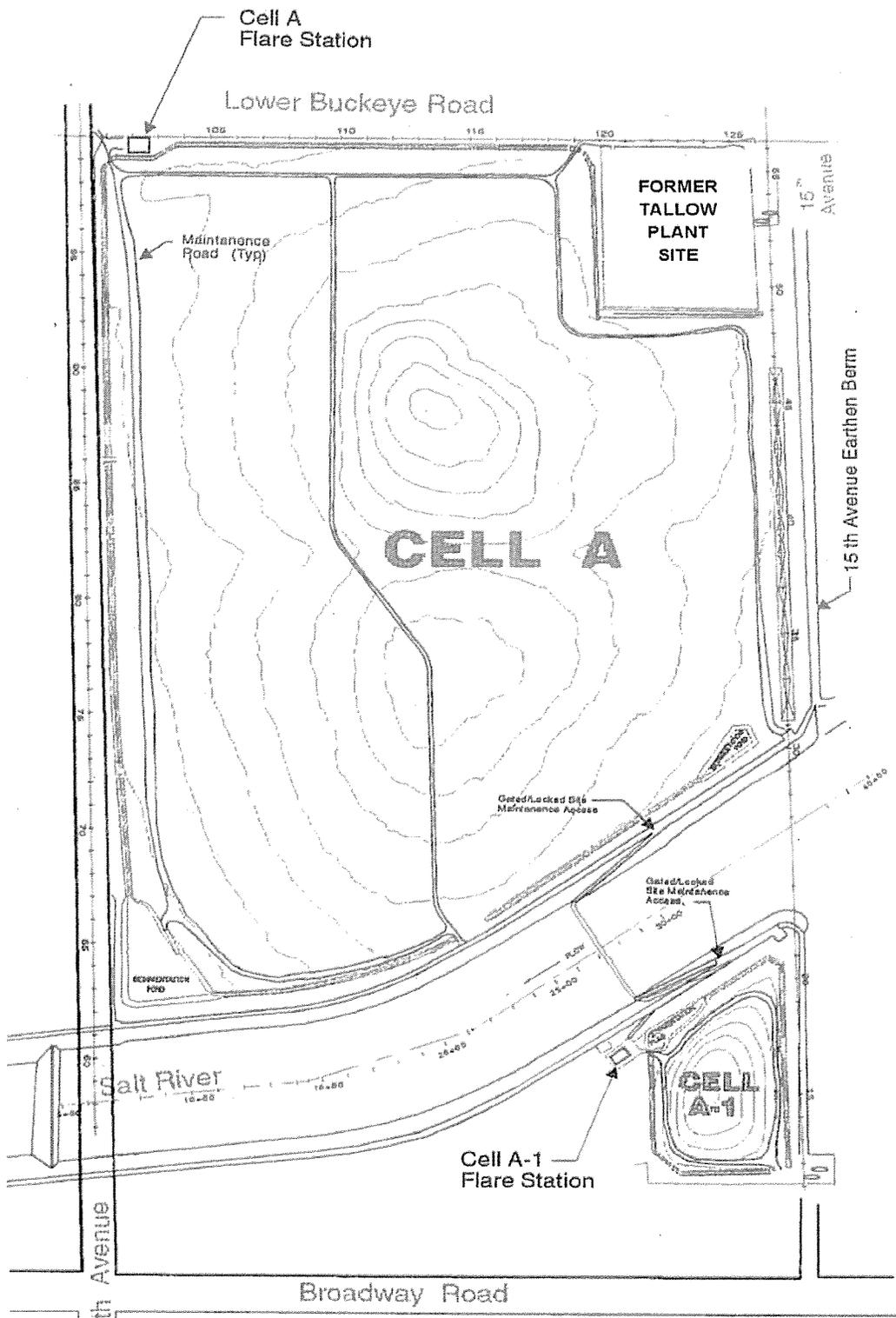


Figure 7. Location of Flare Stations

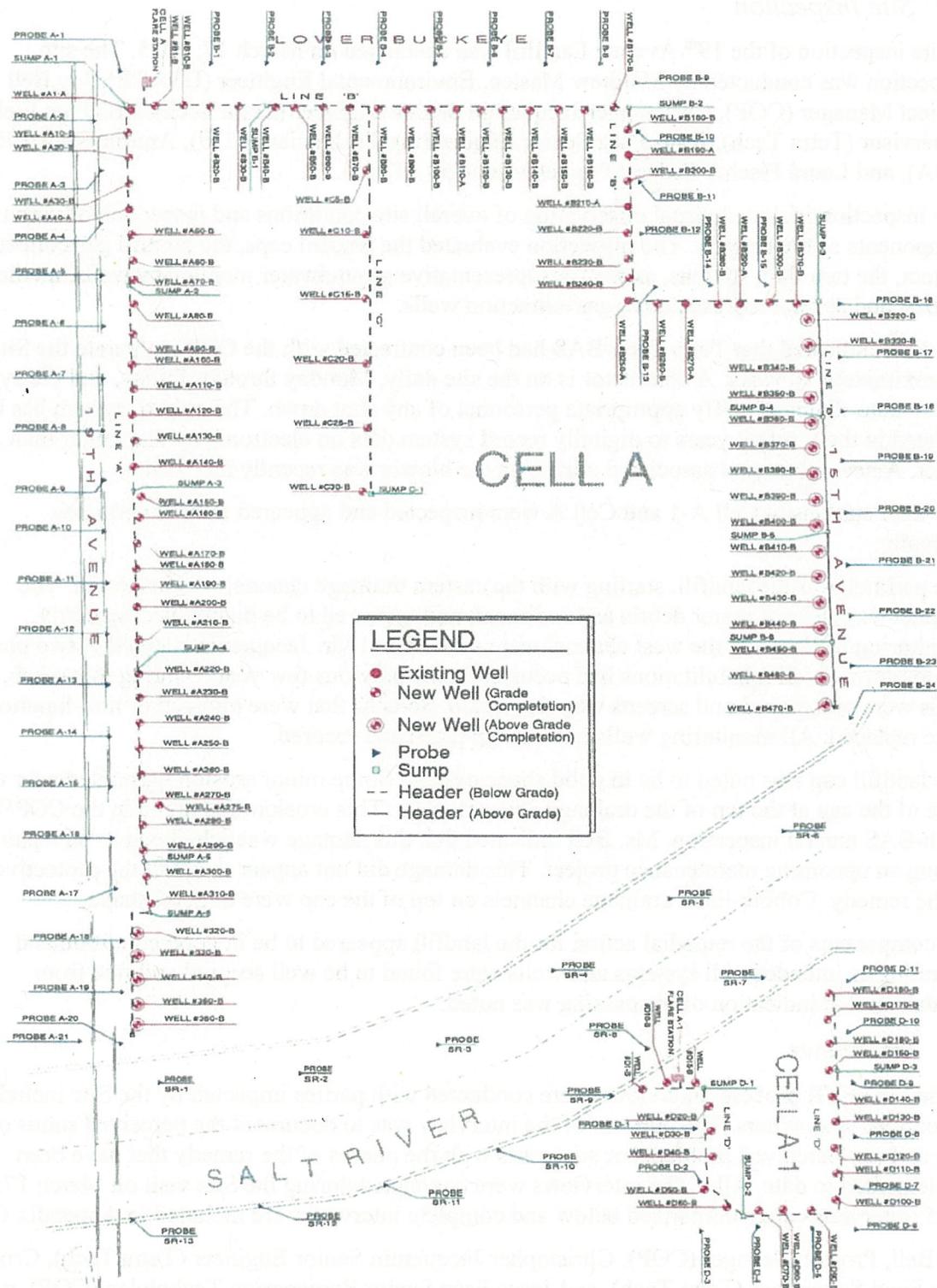


Figure 8. Landfill Gas Extraction System Features Map

## 6.5 Site Inspection

A site inspection of the 19<sup>th</sup> Avenue Landfill was conducted on March 17, 2015. The site inspection was conducted by Matthew Masten, Environmental Engineer (USACE), Joy Bell Project Manager (COP), Christopher Jacquemin Senior Engineer (Tetra Tech), Cris Fine Field Supervisor (Tetra Tech), Jesus Paez Senior Engineering Technician (COP), Andria Benner RPM (EPA), and Laura Fischer Federal Project Manager (ADEQ).

The inspection included visual observation of overall site conditions and inspection of various components of the remedy. The inspection evaluated the landfill caps, the landfill gas collection system, the two flare stations, as well as representative groundwater monitoring wells, methane probes, and several representative gas extraction wells.

Mr. Fine indicated that Tetra Tech-BAS had been contracted with the COP to operate the Site for approximately 10 years. A contractor is on the site daily, Monday through Friday, and the system has an auto-dialer to notify appropriate personnel of any shut down. The control system has been updated in the last few years to digitally record system data on electronic media, rather than paper. A new motor and associated wiring on the blower was recently installed.

The flare stations in Cell A-1 and Cell A were inspected and appeared to be functioning normally.

The perimeter of the landfill, starting with the eastern drainage channel was inspected. The channel was clear of major debris and sediment, and appeared to be maintained regularly. Monitoring wells along the west channel were viewed and Mr. Jacquemin stated that two phases of monitoring well rehabilitations had occurred in the previous few years. During this rehab, wells were videotaped and screens were inspected. Screens that were plugged or non-functioning were replaced. All monitoring wells had caps in place and secured.

The landfill cap was noted to be in good shape overall. Some minor erosion was noted near the edge of the cap at the top of the drainage channel walls. This erosion was noted in the COP/Tetra Tech-BAS annual inspection. Ms. Bell indicated that this damage was scheduled to be repaired during an upcoming maintenance project. This damage did not appear to affect the protectiveness of the remedy. Cobble-lined drainage channels on top of the cap were in good shape.

All components of the remedial action for the landfill appeared to be in good condition and operating as intended. All systems and wells were found to be well secured and free from vandalism. No indication of trespassing was noted.

## 6.6 Interviews

During the FYR process, interviews were conducted with parties impacted by the Site including the current landowners. The purpose of the interview was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date. All of the interviews were conducted during the Site visit on March 17, 2015. Interviews are summarized below and complete interviews are included in Appendix C.

Joy Bell, Project Manager (COP), Christopher Jacquemin Senior Engineer (Tetra Tech), Cris Fine Field Supervisor (Tetra Tech), and Jesus Paez Senior Engineering Technician (COP), were interviewed during the site visit. O&M costs were not discussed during the interviews.

The remedy appears to be functioning as designed. All groundwater sampling as required is being completed on-time. The COP is committed to completing the groundwater sampling as required, using proper sampling protocols and state-approved laboratory test methods. The COP is contracted with an ADHS-certified laboratory to perform the sampling analysis. Well repair is completed as needed to replace broken pumps and all wells are securely locked. In the past five years, methane gas probe data indicates that the City is controlling methane migration. The flare systems are processing less methane gas as that production is decreasing. Landfill gas data and flare operation indicates that Cell A-1 has declining methane such that operation of the flare may become increasingly difficult. Planning for that occurrence, the COP requested and obtained approval from the Maricopa County Air Quality Department to replace the flare with a CAS.

With ADEQ approval, the COP requested to eliminate submittal of exceedance reports for arsenic at wells I-3 and I-4 due to established cause as presented in the ADEQ April 14, 2004 technical memorandum. With ADEQ approval, the COP clarified that arsenic exceedance conditions at upgradient wells DM-8D and DM-8S did not require exceedance reports. This has saved the COP money by reducing the number of exceedance reports required. With ADEQ approval, the COP requested a change for pentachlorophenol analysis from test method 625 to test method 515.4 so that the detection limit could be met (methodology has not changed since 2000). Pending ADEQ approval, COP has requested to make changes to the Consent Decree to remove outdated references and codify the decisions made on wells I-3 and I-4 regarding arsenic.

### *6.7 Institutional Controls*

On June 29, 2006, ADEQ and EPA signed ESD #3 requiring a Declaration of Environmental Use Restriction (DEUR) on the property to ensure long-term O&M of the remedy with ICs and to ensure compatibility with the remedy of future land uses (includes Engineering Control Plan). On July 19, 2006, the COP recorded a DEUR with Engineering and ICs for the property. The DEUR describes the contamination known to be present at the Site, the engineering controls that must be maintained, and the ICs required of the COP and any and all future owners of the Site.

The specific IC mechanisms identified were the DEUR and the existing Arizona Department of Water Resources (ADWR) requirements. The ICs are: the COP shall restrict use of the property to non-residential use, the COP shall continue conducting groundwater monitoring of the wells in accordance with the Consent Decree and Agreement, and the COP shall implement the groundwater contingency plan (as described in the Consent Decree and Agreement) if necessary.

The DEUR controls the use and access to the landfill property and the ADWR restricts groundwater well site location, construction, and use that could impact the remedy. Residential use of the property is specifically prohibited. The Engineering Control Plan of the DEUR, describes the five engineering controls on the property: a drainage and levee system, a capping system, an erosion and drainage system, a landfill gas extraction system, and fencing. The DEUR states that *“the City/Property Owner shall not conduct or permit any excavation or construction activities on the Property, nor create or permit surface impoundments, infiltration units, or any other soil disturbance or other activity on or adjacent to the Property that may impair the integrity of any engineering control without the express written approval of ADEQ obtained in advance of any such activity.”*

## 7. Technical Assessment

### 7.1 *Question A: Is the Remedy Functioning as Intended by the Decision Documents?*

Yes, the remedy is functioning as intended in the decision documents.

The landfill cover system has been effective in containing the waste and contaminants, and preventing leaching of contaminants through the vadose zone via percolation. A DEUR with engineering and ICs was recorded for the Site on July 19, 2006. The DEUR describes the contamination known to be present at the Site, the engineering controls that must be maintained, and the institutional controls required of the COP and any and all future Site owners. The COP has submitted to ADEQ Annual Inspection Reports every January, as required by the DEUR. The COP has provided appropriate security measures at the Site.

In general, the COP has been performing O&M activities according to the 1992 CD, and the Site's Updated O&M Plan. In addition, the COP has been routinely submitting quarterly monitoring reports to ADEQ.

The COP performs regular checks, maintaining daily logs for the flare operations and weekly logs for operations and maintenance of the Site and its instruments to ensure compliance with procedures required by the ROD, CD, and DEUR, and to ensure protection of human health and the environment.

The COP may need to reassess groundwater contaminant data reported from 2010 through 2013. The inaccurate threshold used for arsenic monitoring (as well as thallium) may have led to inaccurate conclusions in the COP's quarterly reports. The reports failed to accurately communicate the extent of the presence of arsenic.

### 7.2 *Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?*

Yes, the exposure assumptions used at the time of the remedy selection are still valid.

The exposure assumptions have not significantly changed. Currently there are no known complete routes of exposure to contaminants from the Site. Engineering controls are in place and well maintained. Institutional controls are in effect that prevent/prohibit human incursion onto the Site. The long-term monitoring and engineering and ICs will need to remain in place and be maintained in perpetuity because contamination has been left in place. Monitoring results for groundwater contamination and landfill gas emissions have been shown to be consistent or decreasing over time. The COP's Quarterly Groundwater Monitoring Reports (2010-2013) incorrectly identified the monitoring threshold for arsenic as 0.05 mg/L. The correct threshold, as stated in the 2003 ESD, is 0.01 mg/L. This discrepancy was noted in the 2010 FYR. For well data beginning with quarterly reports in 2014, the threshold was correctly reported.

There have been no changes to the chemical-specific ARARs for groundwater or air since the standards were updated in the 2003 ESD #2 signed by ADEQ and EPA. However, changes in screening levels resulted in RSLs that are lower than the approved cleanup levels for arsenic,

thallium, and naphthalene. Since there is no complete exposure pathway, the selected standards remain protective of human health and the environment.

### *7.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?*

No additional information has been identified that would call into question the protectiveness of the remedy.

### *7.4 Technical Assessment Summary*

According to the review of relevant documents and data, site inspections, and interviews with the COP, the remedy is functioning as intended by the ADEQ LOD and the EPA ROD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. There is no other information that calls into questions the protectiveness of the remedy.

## 8. Issues

There are no issues that affect the protectiveness of the remedy.

## 9. Recommendations and Follow-up Actions

There are no recommendations that affect protectiveness.

## 10. Protectiveness Statement(s)

The remedy at the Nineteenth Avenue Landfill Superfund Site is protective of human health and the environment.

Currently, there are no environmental exposure pathways that result in unacceptable risks, and none are expected as long as the engineered and institutional controls selected in the decision documents continue to be properly operated, monitored, and maintained, and the land use at the Site allows for the integrity of the remedy to continue.

## 11. Next Review

The 19<sup>th</sup> Avenue Landfill Superfund Site requires ongoing statutory Five-Year Reviews as a matter of statute, because the remedy does not allow for unlimited use and unrestricted exposure. The next review for the Site will be conducted within five years of the completion date of this FYR Report.

## Appendix A: List of Documents Reviewed

Arizona Department of Environmental Quality. April 2004. Technical Memorandum on arsenic concentrations in groundwater monitor wells at the 19<sup>th</sup> Avenue Landfill Superfund Site.

City of Phoenix. October 2014. Operation and Maintenance Manual 19<sup>th</sup> Avenue Landfill, 2014 Update.

City of Phoenix. April 2014. 19<sup>th</sup> Avenue Landfill Progress Report 1<sup>st</sup> Quarter 2014

City of Phoenix. Jan 2014. Report: Rio Salado Redevelopment Study Area.

City of Phoenix. January 2014. 4<sup>th</sup> Quarter 2013 Progress Report and 4<sup>th</sup> Quarter 2013 Groundwater Quality Monitoring Report

City of Phoenix. December 2013. 2012 Greenhouse Gas Emissions Inventory for Government Operations.

City of Phoenix. October 2013. 3<sup>rd</sup> Quarter 2013 Progress Report and 3<sup>rd</sup> Quarter 2013 Groundwater Quality Monitoring Report

City of Phoenix. April 2013. 2013-18 Preliminary Capital Improvement Program.

City of Phoenix. April 2013. 1<sup>st</sup> Quarter 2013 Progress Report and 1<sup>st</sup> Quarter 2013 Groundwater Quality Monitoring Report

City of Phoenix. January 2013. 19<sup>th</sup> Avenue Landfill Quarterly Progress Report Fourth Quarter 2012

City of Phoenix. October 2012. 3<sup>rd</sup> Quarter 2012 Progress Report and 3<sup>rd</sup> Quarter 2012 Groundwater Quality Monitoring Report

City of Phoenix. July 2012. 2<sup>nd</sup> Quarter 2012 Progress Report and 2<sup>nd</sup> Quarter 2012 Groundwater Quality Monitoring Report

City of Phoenix. October 2011. 19<sup>th</sup> Avenue Landfill Quarterly Progress Report Third Quarter 2011

City of Phoenix. July 2011. 19<sup>th</sup> Avenue Landfill Quarterly Progress Report Second Quarter 2011

Tetra Tech. September 2014. Well Inventory Study 19<sup>th</sup> Avenue Landfill Superfund Site.

Tetra Tech. December 2010 Annual Site Inspection for the 19<sup>th</sup> Avenue Municipal Solid Waste Landfill

# Appendix B: Press Notice

From C.J. Jorgensen February 2015 School Newsletter

DELISTED 19<sup>TH</sup> AVENUE LANDFILL SUPERFUND SITE

JANUARY 2015

The U.S. Environmental Protection Agency (EPA) in collaboration with the Arizona Department of Environmental Quality (ADEQ) has initiated the fourth Five-Year Review (FYR) of cleanup actions undertaken at the delisted 19<sup>th</sup> Avenue Landfill Superfund Site (Site). This Site, owned by the City of Phoenix (COP), was removed from EPA's National Priorities List (NPL) on September 26, 2006. The purpose of the FYR is to evaluate whether the cleanup actions for the Site remain protective of human health and the environment. ADEQ and EPA are requesting public involvement in the review process. Please see information on reverse about how to get involved.

## ADEQ 5-Year Review Open House

To keep the community involved and obtain input, ADEQ wants to interview people who have knowledge or concerns about Site cleanup activities. To get involved, please call Caroline Oppleman, ADEQ Community Involvement Coordinator, at (602) 771-6890 for a telephone interview or attend:

**ADEQ FYR Open House**  
**Tuesday, February 17, 2015**  
**5:30 p.m. to 7:30 p.m.**  
CJ Jorgensen School Cafeteria  
1701 W. Roeser Rd, Phoenix, 85041





DELISTED 19TH AVENUE LANDFILL SUPERFUND SITE FIVE-YEAR REVIEW  
Community Interview

Name: \_\_\_\_\_

Affiliation: \_\_\_\_\_

Date: \_\_\_\_\_

1. What is your overall impression of the project?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. What effects have site operations had on the surrounding community?

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Do you have concerns regarding the site or its operation and administration? If so, please explain.

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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4. Are you aware of any events, incidents or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

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5. Do you feel informed about the site's activities and progress?

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6. Do you have any additional comments, suggestions, or recommendations regarding the site's management or operation?

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# Appendix C: Interview Forms

Five-Year Review Interview Record					
<b>Site:</b>	Nineteenth Avenue Landfill, Phoenix, Arizona			<b>EPA ID No:</b>	AZD9804967 80
Interview Type: Teleconference & Site Visit					
Location of Visit: Nineteenth Avenue Landfill					
Date: 3/17/2015					
Time: 1300 hrs					
Interviewers					
Name	Title			Organization	
Matthew Masten, P.E.	Environmental Engineer			USACE	
Interviewees					
Name	Organization	Title	Telephone	Email	
Marty Arambel, P.E.	City of Phoenix	Project Manager		marty.arambel@phoenix.gov	
Joy Bell, P.E.	City of Phoenix	Project Manager	602-256-5605	joy.bell@phoenix.gov	
Jesus Paez	City of Phoenix	Senior Engineering Technician		jesus.paez@phoenix.gov	
Christopher Jacquemin	Tetra Tech-BAS	Senior Engineer	602-682-3356	chris.jacquemin@tetrattech.com	
Chris Fine	Tetra Tech - BAS	Field Supervisor	602-267-0336	chris.fine@tetrattech.com	
Summary of Conversation					
<p><b>1. Is the remedy functioning as expected?</b> Yes.</p> <p><b>2. What do the monitoring data show?</b> All groundwater sampling as required is being completed on-time. The City of Phoenix is committed to completing the groundwater sampling as required, using proper sampling protocols and state-approved (Arizona Department of Health Services (ADHS)) laboratory test methods. The City is contracted with an ADHS-certified laboratory to perform the sampling analysis. Well repair is completed as needed to replace broken pumps and all wells are securely locked.</p> <p>Groundwater monitoring is completed quarterly as required. Tables of three-quarter averages are included in quarterly progress reports. Specific trends and their probable causes are difficult to identify. Results are evaluated for specific constituents when exceedances of the Consent Decree Threshold Levels occur and when Exceedance Reports are required. Exceedance Reports are prepared by an Arizona registered professional.</p> <p>Wells I-3 and I-4 have had Arsenic exceedance conditions, with the last confirmed exceedance conditions occurring in the third quarter of 2014. In March 2014, ADEQ agreed that exceedance reports for Arsenic at these two wells were no longer necessary, supported by an ADEQ technical memo dated April 14, 2004.</p> <p>An exceedance condition was recently confirmed for Sulfate from the third quarter sampling. An Exceedance Report was submitted and monthly sampling at this well began as required. One possible cause of the sulfate was the addition of oxygen into the well during its recent rehabilitation causing changes to the well water chemistry.</p> <p>Other constituent results have noted levels above the Threshold Levels, but Exceedance Reports were not required. Results above the Threshold Levels for Thallium, Gross Alpha, Nickel, and Nitrate as Nitrogen were measured over the past five years at different wells. In 2010 and 2011, well DM-3I had a threshold level exceedance for 1,1-dichloroethene and in 2010, wells DM-3D and I-5R had a threshold level exceedance for chloromethane in 2010, but no other volatile organic threshold level exceedances have occurred since then in any well. Thallium threshold level exceedances were detected in well I-8R in 2010 and 2011, and in wells I-3 and I-4 in 2014. Gross Alpha threshold level exceedances were detected in DM-3I, DM-5D, and I-1 in 2011; in DM-5D, DM-5S, DM-8S, and I-8R in 2012; in DM-3D, DM-3I, DM-3P, DM-5D, and I-6 in 2013; and in DM-3P, DM-5D, DM-5S, and I-6 in 2014. Threshold level exceedances for Nickel occurred in DM-7S and I-3 in 2014 only. Threshold level exceedances for Nitrate as Nitrogen occurred in well I-3 in 2010 and 2012-2014, and in well I-8R in 2014.</p> <p>In the past five years, methane gas probe data indicates that the City is controlling methane migration. The only area where methane has been detected is in the northeast corner, an area that bordered a former rendering plant. ADEQ concurred that select probes installed at that border could be monitored for vacuum only, adding B-12 to that list in 2011. In 2012, there was a methane exceedance at B-11D, also near that area. All probes not within that area have not had methane exceedances and usually not even methane detections.</p> <p>Landfill gas data and flare operation indicates that Cell A-1 has declining methane such that operation of the flare may become increasingly difficult. Planning for that occurrence, the City requested and obtained approval from the Maricopa County Air Quality Department to replace the flare with a carbon adsorption system.</p>					

**3. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If not, describe staff and frequency of site inspections and activities.**

Yes.

The City Senior Engineering Technician who manages the groundwater monitoring activities is on-site several days each quarter for quarterly sampling and well depth sounding, and he is on-site monthly as required for monthly sampling when there are Exceedance Conditions. He is also on-site for any pump and well maintenance, including the well rehabilitation activities performed within the past year as reported to ADEQ in reports certified by an Arizona registered engineer.

City Solid Waste Environmental Specialists are there multiple times per week to monitor and adjust wells, monitor probes, and inspect the site for any issues such as cut fences or erosion. City maintenance staff are there at least quarterly to weed, clear drainage channels of any soil, perform limited cap repair and/or maintain wells or sumps.

The City contractor Tetrattech-BAS is there every day. A technician from Tetrattech-BAS monitors each flare station every day and performs routine maintenance on the flare station equipment and sumps throughout the month.

**4. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**

No.

**5. Have there been opportunities to optimize O&M or sampling efforts? If so, please provide supporting details and metrics.**

Yes.

With contractor Tetrattech-BAS, we have optimized our well monitoring and adjustments. City Solid Waste Environmental Specialists monitor the wells monthly and send the data to Tetrattech-BAS for review. Tetrattech-BAS analyzes the data with their Information Management System to make well adjustment recommendations. City Solid Waste Environmental Specialists then take the recommendations to the field and make adjustments to the wells. Also, the City Solid Waste Inspections Supervisor has been using an automated work order generating system to issue tasks to inspectors and maintenance staff. This should help the City better track landfill O&M tasks performed and staff time needs.

With ADEQ approval, the City requested to eliminate submittal of exceedance reports for arsenic at wells I-3 and I-4 due to established cause as presented in the ADEQ April 14, 2004 technical memorandum. With ADEQ approval, the City also clarified that arsenic exceedance conditions at upgradient wells DM-8D and DM-8S also did not require exceedance reports. This has saved the City effort by reducing the amount of submittals required every quarter. This has saved the City money by reducing the number of exceedance reports required.

With ADEQ approval, the City requested a change from test method 625 to a test method 515.4 so that the detection limit could be met when testing for pentachlorophenol.

Pending ADEQ approval is a City request to make changes to the Consent Decree to remove outdated references and codify the decisions made on wells I-3 and I-4 regarding arsenic.

**6. Are you aware of any changes to City, State or Federal regulations or ordinances that may impact operations or remedies at the site?**

No.

**7. What effects have site operations had on the surrounding community?**

No effects of which we are aware.

**8. Are you aware of any community concerns regarding the site or its operation and administration?**

No.

**9. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.**

Yes. This site experiences vandalism in the form of cuts into the perimeter fence for trespassing, theft of steel valve box covers, and spray painting our no trespassing signs. We are able to repair the fence and replace covers the same day discovered, and graffiti is usually removed in a few days. In 2012, a backflow preventer on an irrigation line along 19<sup>th</sup> Ave was stolen and water caused deep erosion rills on west side of Cell A along 19<sup>th</sup> Avenue. In 2013, vandals removed four flap gate covers. Public Works maintenance staff re-installed two but the two largest are still pending re-installation by the Streets Department.

**10. Do you have any additional comments, suggestions, or recommendations regarding the site's management or operation?**

Yes. The City has submitted suggestions to revise the Consent Decree. The suggestions have been made with the intent to incorporate information from three Explanation of Significant Differences (ESD), specifically ESD #2 with final Threshold Levels, and to update information on test method change approvals and past well replacements. These proposed revisions will make it easier to manage the site as all requirements would be accessible in one document.

**Additional Site-Specific Questions**

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# Appendix D: Site Inspection Checklist



3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency	EPA		
Contact	Andria Benner	Remedial Project Manager	17 March 15 415-972-3189
	Name	Title	Date Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

Agency	_____		
Contact	_____	_____	_____
	Name	Title	Date Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

Agency	_____		
Contact	_____	_____	_____
	Name	Title	Date Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

Agency	_____		
Contact	_____	_____	_____
	Name	Title	Date Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

4. **Other interviews** (optional)  Report attached.

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**III. ON-SITE DOCUMENTS & RECORDS VERIFIED** (Check all that apply)

1. **O&M Documents**

<input checked="" type="checkbox"/> O&M manual	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
<input type="checkbox"/> As-built drawings	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Maintenance logs	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A

Remarks 2014 O&M manual, daily logs, maintenance checklists

2. **Site-Specific Health and Safety Plan**

<input checked="" type="checkbox"/> Contingency plan/emergency response plan	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
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Remarks

3.	<b>O&amp;M and OSHA Training Records</b> Remarks	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
4.	<b>Permits and Service Agreements</b> <input checked="" type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits Remarks Maricopa County permit was on site.	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
5.	<b>Gas Generation Records</b> Remarks	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
6.	<b>Settlement Monument Records</b> Remarks Regular inspections and maintenance is performed.	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
7.	<b>Groundwater Monitoring Records</b> Remarks Quarterly reports are available.	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
8.	<b>Leachate Extraction Records</b> Remarks N/A	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
9.	<b>Discharge Compliance Records</b> <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A
10.	<b>Daily Access/Security Logs</b> Remarks	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A

<b>IV. O&amp;M COSTS</b>	
1.	<p><b>O&amp;M Organization</b></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> State in-house  <input checked="" type="checkbox"/> PRP in-house  <input type="checkbox"/> Federal Facility in-house  <input type="checkbox"/> Other         </div> <div style="width: 45%;"> <input type="checkbox"/> Contractor for State  <input checked="" type="checkbox"/> Contractor for PRP  <input type="checkbox"/> Contractor for Federal Facility         </div> </div>
2.	<p><b>O&amp;M Cost Records</b></p> <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate _____ <input type="checkbox"/> Breakdown attached
Total annual cost by year for review period if available	
From _____ To _____	_____ <input type="checkbox"/> Breakdown attached
Date                      Date	Total cost
From _____ To _____	_____ <input type="checkbox"/> Breakdown attached
Date                      Date	Total cost
From _____ To _____	_____ <input type="checkbox"/> Breakdown attached
Date                      Date	Total cost
From _____ To _____	_____ <input type="checkbox"/> Breakdown attached
Date                      Date	Total cost
3.	<p><b>Unanticipated or Unusually High O&amp;M Costs During Review Period</b>          Describe costs and reasons:          O&amp;M Cost was not provided during the site inspection or on-site interviews.</p>
<b>V. ACCESS AND INSTITUTIONAL CONTROLS</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
<b>A. Fencing</b>	
1.	<p><b>Fencing damaged</b>    <input type="checkbox"/> Location shown on site map    <input checked="" type="checkbox"/> Gates secured    <input type="checkbox"/> N/A</p> Remarks: Fence and locked gates in good shape
<b>B. Other Access Restrictions</b>	
1.	<p><b>Signs and other security measures</b>    <input type="checkbox"/> Location shown on site map    <input type="checkbox"/> N/A</p> Remarks: Signage in place.

C. Institutional Controls (ICs)			
1.	<b>Implementation and enforcement</b>		
	Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	Type of monitoring (e.g., self-reporting, drive by)	drive by	
	Frequency	daily	
	Responsible party/agency	City of Phoenix and Tetra Tech - BAS	
	Contact	Chris Fine	Lead Operator 602-267-0336
		Name	Title Date Phone no.
	Reporting is up-to-date	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Reports are verified by the lead agency	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Other problems or suggestions:	<input type="checkbox"/> Report attached	
2.	<b>Adequacy</b>	<input checked="" type="checkbox"/> ICs are adequate	<input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A
	Remarks		
D. General			
1.	<b>Vandalism/trespassing</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No vandalism evident
	Remarks	Only damage is to flapper gates discharging to Salt River drainage	
2.	<b>Land use changes on site</b>	<input checked="" type="checkbox"/> N/A	
	Remarks		
3.	<b>Land use changes off site</b>	<input checked="" type="checkbox"/> N/A	
	Remarks		
VI. GENERAL SITE CONDITIONS			
A. Roads	<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A	
1.	<b>Roads damaged</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
	Remarks		

<b>B. Other Site Conditions</b>			
Remarks Site is in good condition, functioning properly			
<b>VII. LANDFILL COVERS</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
<b>A. Landfill Surface</b>			
1.	<b>Settlement</b> (Low spots) Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Settlement not evident
2.	<b>Cracks</b> Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Cracking not evident
3.	<b>Erosion</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
4.	<b>Holes</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
5.	<b>Vegetative Cover</b> Remarks small shrubs evident, overgrowth kept under control	<input type="checkbox"/> Grass <input type="checkbox"/> No signs of stress	<input checked="" type="checkbox"/> Cover properly established <input checked="" type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram)
6.	<b>Alternative Cover (armored rock, concrete, etc.)</b> Remarks Armored channels are in good shape, as well as armored drainage basin	<input type="checkbox"/> N/A	
7.	<b>Bulges</b> Areal extent _____ Height _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Bulges not evident

8.	<b>Wet Areas/Water Damage</b> <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks	<input checked="" type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Location shown on site map    Areal extent _____ <input type="checkbox"/> Location shown on site map    Areal extent _____ <input type="checkbox"/> Location shown on site map    Areal extent _____ <input type="checkbox"/> Location shown on site map    Areal extent _____
9.	<b>Slope Instability</b> <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks	
<b>B. Benches</b> <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Applicable (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	<b>Flows Bypass Bench</b> Remarks	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
2.	<b>Bench Breached</b> Remarks	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
3.	<b>Bench Overtopped</b> Remarks	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
<b>C. Letdown Channels</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	<b>Settlement</b> Areal extent _____    Depth _____ Remarks	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of settlement
2.	<b>Material Degradation</b> Material type _____    Areal extent _____ Remarks	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of degradation
3.	<b>Erosion</b> Areal extent _____    Depth _____ Remarks Only minor erosion evident near top of drainage channel, not affecting integrity of cap or channel	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion

4.	<b>Undercutting</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks		
5.	<b>Obstructions</b>	Type _____	<input checked="" type="checkbox"/> No obstructions <input type="checkbox"/> Location shown on site map
	Areal extent _____	Size _____	
	Remarks		
6.	<b>Excessive Vegetative Growth</b>	Type _____	
	<input checked="" type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Remarks		
<b>D. Cover Penetrations</b>			
		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Gas Vents</b>	<input type="checkbox"/> N/A <input checked="" type="checkbox"/> Active <input type="checkbox"/> Passive	<input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning
		<input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition	<input type="checkbox"/> Evidence of leakage at penetration
	Remarks		
2.	<b>Gas Monitoring Probes</b>	<input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning	<input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks		
3.	<b>Monitoring Wells (within surface area of landfill)</b>	<input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning	<input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks		
4.	<b>Leachate Extraction Wells</b>	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A
	Remarks		
5.	<b>Settlement Monuments</b>	<input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed	<input checked="" type="checkbox"/> N/A
	Remarks		

<b>E. Gas Collection and Treatment</b>		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Gas Treatment Facilities</b> <input checked="" type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks		
2.	<b>Gas Collection Wells, Manifolds and Piping</b> <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks		
3.	<b>Gas Monitoring Facilities</b> ( <i>e.g.</i> , gas monitoring of adjacent homes or buildings) <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks		
<b>F. Cover Drainage Layer</b>		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Outlet Pipes Inspected</b> Remarks	<input checked="" type="checkbox"/> Functioning	<input type="checkbox"/> N/A
2.	<b>Outlet Rock Inspected</b> Remarks	<input checked="" type="checkbox"/> Functioning	<input type="checkbox"/> N/A
<b>G. Detention/Sedimentation Ponds</b>		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Siltation</b> <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Siltation not evident Areal extent _____                Depth _____ Remarks		
2.	<b>Erosion</b> Areal extent _____                Depth _____ <input checked="" type="checkbox"/> Erosion not evident Remarks		
3.	<b>Outlet Works</b> <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks flapper gates are damaged		
4.	<b>Dam</b> Remarks	<input type="checkbox"/> Functioning	<input checked="" type="checkbox"/> N/A

<b>H. Retaining Walls</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Deformations</b> Horizontal displacement _____ Rotational displacement _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
2.	<b>Degradation</b> Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
<b>I. Perimeter Ditches/Off-Site Discharge</b>		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Siltation</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Siltation not evident
2.	<b>Vegetative Growth</b> Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Vegetation does not impede flow	<input checked="" type="checkbox"/> N/A
3.	<b>Erosion</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
4.	<b>Discharge Structure</b> Remarks _____	<input checked="" type="checkbox"/> Functioning	<input type="checkbox"/> N/A
		flapper gates are damaged	
<b>VIII. VERTICAL BARRIER WALLS</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Settlement</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
2.	<b>Performance Monitoring</b> Type of monitoring _____ Frequency _____ Remarks _____	<input type="checkbox"/> Performance not monitored <input type="checkbox"/> Evidence of breaching	Head differential _____
<b>IX. GROUNDWATER/SURFACE WATER REMEDIES</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
<b>A. Groundwater Extraction Wells, Pumps, and Pipelines</b>		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Pumps, Wellhead Plumbing, and Electrical</b> Remarks _____	<input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating	<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A

2.	<b>Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances</b> <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks
3.	<b>Spare Parts and Equipment</b> <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks
<b>B. Surface Water Collection Structures, Pumps, and Pipelines</b> <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	<b>Collection Structures, Pumps, and Electrical</b> <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks
2.	<b>Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances</b> <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks
3.	<b>Spare Parts and Equipment</b> <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks
<b>C. Treatment System</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	<b>Treatment Train</b> (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____ <input type="checkbox"/> Additive ( <i>e.g.</i> , chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks
2.	<b>Electrical Enclosures and Panels</b> (properly rated and functional) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks

3.	<b>Tanks, Vaults, Storage Vessels</b> <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks
4.	<b>Discharge Structure and Appurtenances</b> <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks
5.	<b>Treatment Building(s)</b> <input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks
6.	<b>Monitoring Wells (pump and treatment remedy)</b> <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks
<b>D. Monitoring Data</b>	
1.	Monitoring Data <input type="checkbox"/> Is routinely submitted on time <input type="checkbox"/> Is of acceptable quality
2.	Monitoring data suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining
<b>D. Monitored Natural Attenuation</b>	
1.	<b>Monitoring Wells (natural attenuation remedy)</b> <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks
<b>X. OTHER REMEDIES</b>	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	

<b>XI. OVERALL OBSERVATIONS</b>	
<b>A.</b>	<b>Implementation of the Remedy</b>
	<p>Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).</p> <p><small>Per information from interviews and site observations, the implemented remedy appears to be functioning as designed. The remedy is accomplishing its objectives of keeping landfill refuse in place, preventing the landfill from eroding during flood seasons, and controlling underground soil gas produced due to the decomposing waste. This is being accomplished with levees in place along both the north and south banks of the Salt River at the landfill site to provide for flood protection with widening the Salt River in preparation for a 100-year flood event. A soil cap with vegetative/erosion layer that prevents rain water from getting into the landfill material and creating leachate. Gas collection and treatment systems are in place burning off the decreasing, small amounts of landfill gas produced. Regular monitoring of the landfill gas, groundwater and ambient air show that landfill gas has substantially decreased through time and remains contained.</small></p>
<b>B.</b>	<b>Adequacy of O&amp;M</b>
	<p>Describe issues and observations related to the implementation and scope of O&amp;M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.</p> <p>N/A</p>
<b>C.</b>	<b>Early Indicators of Potential Remedy Problems</b>
	<p>Describe issues and observations such as unexpected changes in the cost or scope of O&amp;M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.</p> <p>N/A</p>
<b>D.</b>	<b>Opportunities for Optimization</b>
	<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <p>N/A</p>

## Appendix E: Photographs from Site Inspection Visit

The following photos were taken during the March 17, 2015 site visit.



Photo 1 - Cell A flare and blower



Photo 2 - Cell A flare, redundant air compressors



Photo 3 - Cell A flare operating panel



Photo 4 - Capped methane extraction well



Photo 5 - Erosion along west drainage channel



Photo 6 - Gas collection system, above-grade



Photo 7 - Secured monitoring well, BZ4

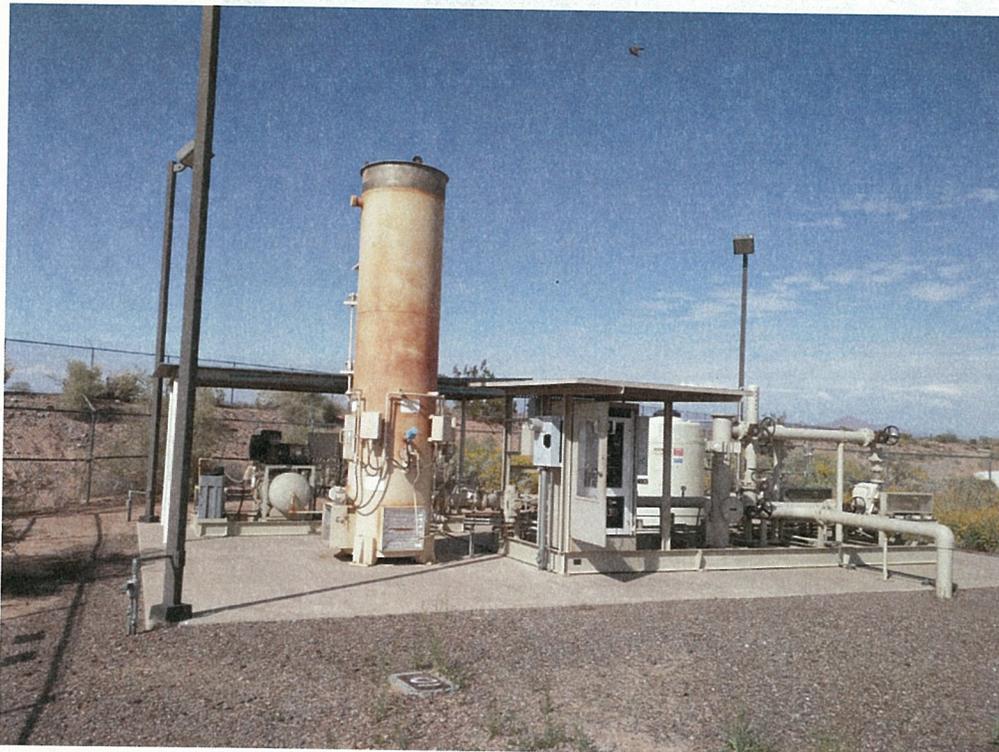


Photo 8 - Cell A-1 flare



Photo 9 - Signage at Cell A-1 flare

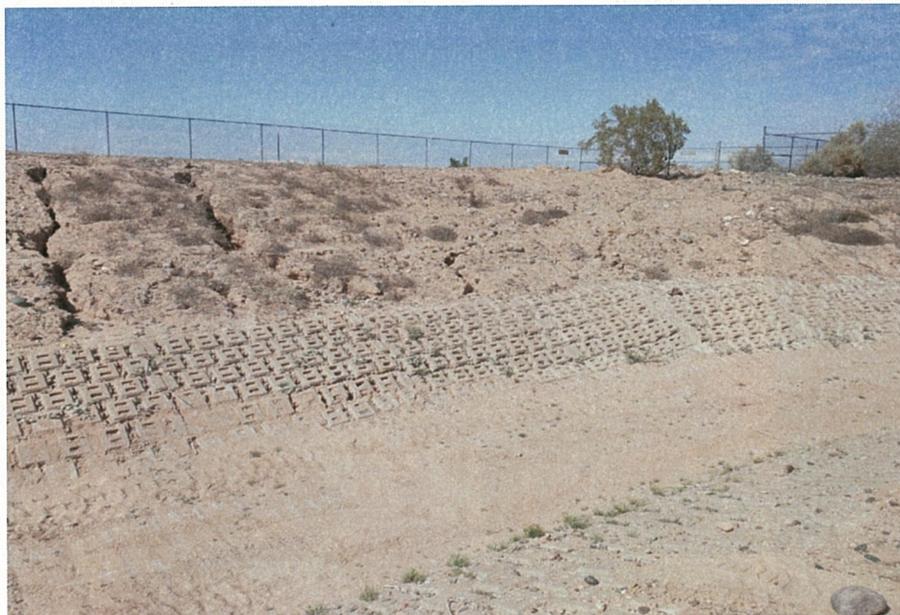


Photo 10 - Cell A-1, levee side erosion, looking north