

## Broadway-Pantano

### Water Quality Assurance Revolving Fund ([WQARF](#)) Site

#### Boundaries:

The Broadway-Pantano Site (Site) is located in east-central Tucson, Arizona and is bounded approximately by Speedway Boulevard to the north, Pantano Wash to the east, Calle Madero to the south (south of Broadway Boulevard), and Sahuara Avenue to the west (west of Wilmot Road). The Site consists of the closed municipal Broadway North Landfill (BNL), Broadway South Landfill (BSL) and the associated [tetrachloroethene](#) (PCE) contaminant plume.

The plume geographic boundaries depicted on the [Site map](#) represent the Arizona Department of Environmental Quality's (ADEQ) interpretation of data available at the time the map was constructed. The map is intended to provide the public with basic information as to the estimated extent of known contamination as of the date of map production. The actual extent of contamination may be different. Therefore, the plume may change in the future as new information becomes available.

#### Site Status Update:

The Western Containment System (WCS) continues to pump and treat PCE-contaminated groundwater. Since start-up in 2003, the WCS has treated over two billion gallons of water and removed 47.8 pounds of PCE.

In January 2009, under an amendment to the ADEQ/[City of Tucson](#) (COT) work share agreement, COT completed installation of three groundwater [monitor wells](#) west/northwest of the WCS wells to delineate the [downgradient](#) edge of the PCE plume.



**The Broadway-Pantano Western Groundwater Containment System**

#### Community Involvement Activities:

A [community advisory board](#) (CAB) was formed in January 2000. Details of meeting [agendas](#) and minutes for 2008 and 2009 can be viewed at the ADEQ Web site. These meetings are open to the public. The most recent [fact sheet](#) for the Site can be found on the ADEQ Web site.

The Draft Groundwater [Remedial Investigation](#) (RI) Report was issued for public comment and the groundwater [Remedial Objectives](#) (RO) public input meeting was held in Spring 2007. The Proposed Groundwater RO Report was issued for public comment in November 2008.

## Site History:

**1960-1971:** The BNL, which is the major source of contamination at this Site, was originally developed as a sand and gravel mining operation in the mid-1940s. From approximately 1960 to 1971, Pima County Sanitary District #1, the COT, and [Pima County](#) (County) operated municipal landfills at the sand and gravel pits. After 1971, the BNL was covered with soil and the land left undeveloped.

**1987:** PCE was detected in a COT water supply well at the western edge of the BNL and subsequently the well was shut down.

**1989-1991:** In 1989 and 1991, two other COT water supply wells at the Site were shut down because of PCE contamination. In 1990-1991, the COT installed groundwater monitor wells and began periodic monitoring of these wells to help delineate the extent of groundwater contamination.

**1994-1997:** In 1994, the COT designated five COT water supply wells located close to the Site groundwater plume as “last-on, first-off” (LOFO) wells, thus restricting their usage.

PCE was detected in the St. Joseph’s Hospital water supply well at levels below the drinking water standard in 1994, after which the COT began monitoring the well. By September 1995, the PCE concentration in the well had increased to 4.9 micrograms per liter (µg/l). The well was shut down, and the COT provided water to the hospital until a [granular activated carbon](#) (GAC) system was installed on the well in 1997. The GAC system removed PCE to levels below the drinking water standard or [Maximum Contaminant Level](#).

In 1997, the COT installed shallow groundwater monitor wells at the western edge of the BNL.

**1998:** In March, the COT issued an RI Report for the BNL. This report confirmed that the BNL was a major source of the groundwater contamination at the Site. This RI Report did not contain a complete assessment of the shallow soil gas; thus, more work was needed to complete the landfill part of the RI.

ADEQ installed three groundwater monitor wells, including two wells [upgradient](#) of the St. Joseph’s Hospital water production well. A fourth COT well (one of the wells designated LOFO in 1994) was shut down because of PCE contamination. The groundwater contamination was found to extend approximately two miles to the west from the BNL.

The Site was placed on the [WQARF Registry](#) in December with an eligibility and evaluation score of 48 out of a possible 120.

**1999:** The COT installed four additional groundwater monitor wells at the Site to help with lateral and vertical delineation of the plume.

**2000:** In June, the COT and County completed installation of a deep [soil vapor extraction/air](#)

[injection](#) (SVE/AI) system at the BNL. The SVE/AI worked as follows: Clean air was injected deep below the landfill, and contaminated soil gas was extracted and treated with GAC to remove the PCE. The purpose of this [Early Response Action](#) (ERA) was to prevent, to the extent practicable, additional PCE contamination of the groundwater. The COT, with technical assistance from [Tucson Water](#) and the County, completed development and calibration of a groundwater model for the Site to be used for conceptualization of a groundwater ERA.

Two COT water supply wells located south of the groundwater plume were put on restricted pumping “standby” status. The COT installed the first groundwater monitor well at the BSL and the groundwater samples from this well were found to contain PCE above the [Aquifer Water Quality Standard](#) (AWQS).

Home Depot had been considering the purchase of property at the far southern tip of the BNL and conducted some site investigations in the area. In December, Home Depot completed a report regarding its investigation of properties located on and immediately to the south of the BNL which indicated that [dross](#) (metal waste) had been buried on these properties. Home Depot covered the dross site with soil and temporarily fenced off the part of the dross site not overlain by buildings and pavement. ADEQ later replaced the temporary fence with a permanent fence and warning signs.

**2001:** The COT completed the design of the WCS groundwater [pump and treat](#) and inject system with ADEQ oversight. In June, ADEQ and the COT executed a workshare agreement under which the COT would construct, operate and maintain the WCS with ADEQ oversight, and ADEQ would reimburse the COT for most of the costs. Under this agreement, ADEQ took over responsibility for operating the SVE/AI system. Also, with the execution of the workshare agreement, ADEQ took over the further investigation and remediation of the Site.

ADEQ installed four groundwater monitor wells needed to evaluate whether an ERA was needed for the two COT water supply wells located south of the BNL PCE plume.

**2002:** In June, the COT issued a groundwater RI Report. This report documented the results of groundwater investigations conducted through 2000; however, additional investigation would be needed to complete the groundwater part of the RI.

In November, ADEQ completed a focused investigation to determine whether an ERA was required to protect or provide for the use of the water from the two COT water supply wells located south of Broadway Boulevard and west of the BSL. Another aim of this investigation was to determine whether the BSL was contributing to the groundwater contamination at the Site. The data collected indicated that an ERA was not warranted and that the BSL appeared to not be contributing to the Site plume at that time; however ADEQ continued to monitor groundwater in the area. ADEQ installed eight groundwater monitor wells WCS performance monitoring and the groundwater RI.

The BNL SVE/AI system was turned off in September to conduct rebound [volatile organic compounds](#) (VOCs) testing of nested soil gas monitor probes/wells. Results from the VOC testing indicated insufficient rebound for continued operation of the system. Over the approximately two

year of operation, the SVE/AI had removed over 5,000 pounds of VOCs, including 1,200 pounds of PCE, from the [vadose zone](#).

ADEQ collected shallow soil gas data along the southwest perimeter of the BNL and tested the samples for VOCs for use in evaluating the shallow soil gas/indoor air pathway at the BNL.

**2003:** In the spring, ADEQ and the COT completed the installation of the WCS at the western edge of the plume. The WCS consisted of two [extraction wells](#), GAC treatment system, and two [injection wells](#). The total construction costs for this ERA were approximately \$3 million and were funded by ADEQ. On March 24, 2003, the WCS began full operation. Analytical results showed that the treatment system was removing the PCE to non-detectable levels.

When the WCS was initially brought on line, the extraction rate was 1100 gallons per minute (gpm). However, in the summer, the injection capacities in the R-090A and R-091A injection wells decreased because of plugging so the WCS extraction rate was reduced to 800 gpm. Subsequently, both injection wells were rehabilitated/redeveloped and injection-specific capacities improved but not to original levels. Back flushing of the injection wells would need to be performed regularly to maintain performance.

ADEQ conducted surface soil testing at the BNL in April 2003. Thirty-five samples were collected from topographically low areas and locations where it appeared that a release of some substance(s) may have occurred previously. These samples were tested for semi-VOCs, metals, pesticides, and [polychlorinated biphenyls](#). Twelve samples were collected approximately 25 feet beyond the dross site fence perimeter and tested for metals. For the constituents tested in these samples, none were found above the Arizona residential or non-residential [soil remediation levels](#).

Rebound testing of the deep nested soil gas monitor wells at the BNL continued to show insufficient rebound for bringing the SVE/AI system back on line.

ADEQ again collected soil gas data along the southwest perimeter of the BNL and tested the samples for VOCs for use in evaluating the shallow soil gas/indoor air pathway at the BNL.

**2004:** In November, groundwater monitoring results indicated that the BSL PCE plume might be merging with the BNL PCE plume.

ADEQ installed four new deep nested soil gas monitor wells at the BNL to provide additional sampling points for evaluation of BNL SVE/AI system rebound. Rebound testing of these and the original deep nested soil gas monitor wells at the BNL showed insufficient rebound for bringing the SVE/AI system back on line.



**Monitor Well on Residential Street Right-of-Way**

**2005:** Groundwater sampling events confirm that the BSL PCE plume had merged with the BNL PCE plume. Therefore, ADEQ expanded the RI to include the BSL groundwater contamination.

In August, the COT installed two groundwater monitor wells [downgradient](#) of the northwestern edge of the plume to help delineate this part of the plume and to evaluate the effectiveness of WCS capture. One sample from one of these wells contained PCE at 5.8 µg/l during the initial sampling. Subsequent samplings of this well have shown the groundwater at that location to be either slightly above or slightly below the AWQS of 5.0 µg/l. All samples collected from the other well have contained PCE concentrations that were either less than the AWQS or non-detectable. The well water elevation data indicate that these two wells are not within the WCS capture zone.

**2006:** Two groundwater monitor wells were installed in the northern part of the BSL in the spring to further delineate the groundwater contamination. At this time it appears that the only groundwater contaminant of concern at the BSL is PCE and the only exceedances of the AWQS for PCE are in the northern part of the BSL. ADEQ also installed deep nested soil gas monitor wells in the northern half of the BSL to assess whether an ERA would be warranted.

In the summer, ADEQ decided to separate the groundwater part of the RI from the landfill part of the RI to expedite the groundwater cleanup at the Site. Rebound testing of the deep nested soil gas monitor wells at the BNL again showed insufficient rebound for bringing the SVE/AI system back on line.

ADEQ again collected shallow soil gas data along the southwest perimeter of the BNL and tested the samples for VOCs for use in evaluating the shallow soil gas/indoor air pathway at the BNL.

**2007:** In November and December of 2007, ADEQ completed installation of a cluster of three groundwater monitor wells at a location approximately one-quarter mile downgradient from the BNL. Each well was screened at a different depth below the water table. The purpose of installing this well cluster was to help delineate the vertical extent of contamination and to allow for other groundwater testing needed for the groundwater [feasibility study](#).

The Draft Groundwater RI Report was issued for public comment, and the groundwater RO public input meeting was held in Spring 2007.

**2008:** SVE rebound testing was performed at the BNL in January and the results continued to show negligible rebound of VOC concentrations in vadose zone soil gas. In March, ADEQ initiated the groundwater modeling study in preparation for the future groundwater FS. In May, a groundwater monitor well was installed at the northwestern edge of the BNL to more fully characterize that part of the Site. The Proposed Groundwater RO Report was issued for public comment in November. In December, ADEQ/COT amended the work share agreement for COT to install three groundwater monitor wells downgradient of the WCS, and ADEQ finalized a scope of work for completing the BSL RI field work.

## **Contaminants:**

The contaminants in groundwater currently exceeding the AWQSs are [tetrachloroethene](#) (PCE), [trichloroethene](#) (TCE), and [vinyl chloride](#). Cis-1,2-[dichloroethene](#) (cis-1,2-DCE) and [methylene chloride](#), which have historically been considered groundwater contaminants of concern, have not been detected in Site groundwater at a level exceeding the AWQS since 2005.

The contaminants in soil at the dross site currently exceeding the Arizona residential soil remediation levels are [arsenic](#), [cadmium](#), [chromium](#), [copper](#), and [lead](#). [Beryllium](#) has also been found at a concentration exceeding the soil remediation level in one subsurface soil sample north of the dross site. Contaminants of concern at the Site may change as new data become available.

## **Public Health Impact:**

No one is known to be drinking contaminated water from this Site; however, if you are drinking water from a private well within the boundaries of the Site, please contact the ADEQ Project Manager. The COT's policy is to shut down any COT water supply well containing a VOC concentration that reaches one-half of the drinking water standard. The [St. Joseph's Hospital](#) Well, which also has been impacted by the contamination, has a [wellhead](#) treatment system which removes the VOCs to non-detectable levels. The BNL Dross Site is covered with soil and fenced with warning signs to prevent public exposure.

The COT's 1998 BNL RI Report included the results of a risk assessment. This risk assessment was based on assumptions that were extremely protective of human health. It was concluded that there is no emergency risk to residents next to the landfill, yet the risk assessment did indicate that there is a possible future risk of VOC-contaminated landfill gases migrating underground toward residences next to the landfill if the landfill gases were left uncontrolled. ADEQ has performed soil gas testing along the southwest perimeter of the landfill and is presently working to determine if this soil gas could represent a risk to public health.

## **Site Hydrogeology:**

The Site is located within the Tucson Basin, a northwest trending structural basin filled with [alluvial](#) sediments. The sediments at the Site consist predominantly of sand and sandy gravel and are relatively unconsolidated down to approximately 500 feet below ground surface (bgs). At approximately 500 feet bgs, marked consolidation is seen with a corresponding significant decrease in [aquifer](#) permeability.

Depth to groundwater at the Site ranges from approximately 315 feet bgs to 370 feet bgs, and the groundwater generally flows to the west/northwest.

## Contacts:

Name	Phone/Fax	E-Mail
Gretchen Wagenseller, ADEQ Project Manager	(520) 628-6708*/ (520) 628-6745 fax	<a href="mailto:wagenseller.gretchen@azdeq.gov">wagenseller.gretchen@azdeq.gov</a>
Eileen Palese, ADEQ Community Involvement Coordinator	(520) 628-6712*/ (520) 628-6745 fax	<a href="mailto:palese.eileen@azdeq.gov">palese.eileen@azdeq.gov</a>

\* In Arizona, but outside the Tucson area, call toll free (888) 271-9302.

## Information Repository:

Interested parties can review select Site information at the [Murphy-Wilmot Branch Library](#) located at 530 N. Wilmot Road in Tucson, (520) 594-5420.

The complete official Site file is located in Phoenix at the ADEQ Central Office at 1110 W. Washington Street; however, select documents are also available in Tucson at the [Southern Regional Office](#) at 400 W. Congress, Suite 433. Files are available for review Monday through Friday from 8:30 a.m. to 4:30 p.m. To arrange for a time to review the Site file at the main ADEQ office, please call the ADEQ Records Management Center with 24-hour notice at (602) 771-4380 or (800) 234-5677 (Arizona toll-free). Please call (520) 628-6715 to arrange a file review appointment at the Southern Regional Office.