MOTOROLA SOLUTIONS

NORTH INDIAN BEND WASH SUPERFUND SITE

INFORMATION PACKET

UPDATED: AUGUST 2022

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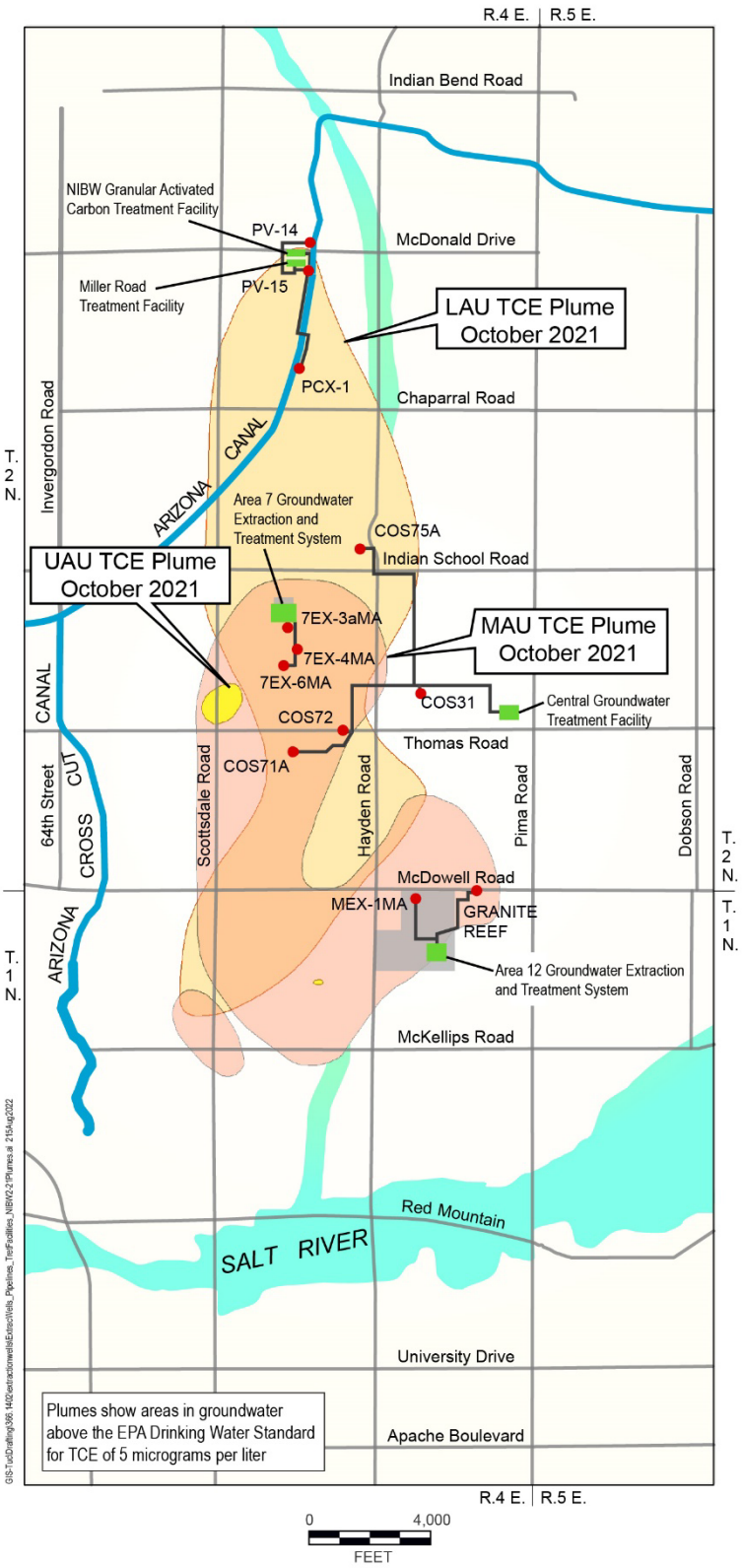


Extraction & Treatment of Groundwater Plumes
North Indian Bend Wash Superfund Site

North Indian Bend Wash Site History

In October 1981, industrial solvents known as volatile organic compounds (VOCs), chiefly trichloroethene (TCE), were detected at concentrations above the drinking water standard in two water supply wells operated in south Scottsdale by the City of Phoenix. The two wells were immediately shut down to prevent impacts to the public water supply. The water supplied to the public by the Cities of Phoenix and Scottsdale, both before and after the detection of VOCs in these wells, has met drinking water standards for VOCs.

Following this discovery, the Environmental Protection Agency (EPA) listed the Indian Bend Wash Superfund Site on the National Priorities List in September 1983. Originally, the Indian Bend Wash Site consisted of a 13 square-mile area of south Scottsdale and north Tempe. The EPA subsequently designated the portion north of the Salt River as the North Indian Bend Wash (NIBW) Site. The EPA currently defines the site as the area where VOC concentrations in groundwater exceed drinking water standards.

Various manufacturing and other industrial facilities, including the former Motorola plant that was located on the southeast corner of Hayden and McDowell Roads, operated at what is now the NIBW site beginning in the late 1950s. Some of the facilities used organic solvents, such as TCE, that ultimately entered the soil and groundwater in portions of the site. TCE has not been used at any Motorola facility since the 1970s.

Remedial actions at the NIBW Site have consisted of three principal activities:

- Site characterization
- Groundwater remediation of the middle and lower aquifer units
- Soil remediation of known source areas

Site Characterization

The EPA, Motorola, and other responsible parties have conducted extensive studies to identify sources of VOCs affecting soils and to understand the occurrence and movement of VOCs in groundwater.

Motorola installed 26 groundwater monitoring wells at the NIBW site between 1983 and 1985. TCE was detected in groundwater in three distinct aquifer units present at the site: the Upper Alluvium Unit (UAU), Middle Alluvium Unit (MAU), and Lower Alluvium Unit (LAU). More than 150 groundwater monitoring wells have now been installed at the site to help understand and monitor changes in the magnitude and extent of VOCs in groundwater during the clean-up effort.

Based on results of soil, soil vapor, and UAU groundwater monitoring investigations conducted by the EPA and Motorola, 15 potential source areas of VOC impacted soils were identified in the NIBW Remedial Investigation/Feasibility Study, prepared by the EPA's technical consultant in 1991. Subsequent investigations and analyses conducted by the EPA and the involved parties focused investigation efforts on 10 potential source areas at the site.

Groundwater Remediation of the Middle and Lower Aquifers

In September 1988, the EPA issued a Record of Decision for Operable Unit I (OUI) to address groundwater contamination in the MAU and LAU. The objective was to contain MAU and LAU groundwater in areas where VOCs occurred at concentrations in excess of federal drinking water standards. Remediation was carried out by extracting groundwater at four existing City of Scottsdale (COS) production wells for treatment at a central facility with air stripping and vapor-phase carbon adsorption (note, COS had acquired the City of Phoenix wells in south Scottsdale by this time).

The Central Groundwater Treatment Facility (CGTF) began operating to implement the OUI remedy in October 1993. Motorola and the other Participating Companies (PCs – including Motorola, Siemens and GlaxoSmithKline) proactively made the following improvements to the OUI

remedy to enhance capture and containment of MAU and LAU groundwater:

- Replacing an MAU and LAU extraction well, COS75, with a new LAU only extraction well, COS75A, in 1995
- Installing a down gradient LAU extraction well, PCX-1, in 1997
- Constructing the Miller Road Treatment Facility (MRTF) in 1997 for treatment of groundwater extracted from PCX-1 and two Arizona American Water Company (now EPCOR Water) supply wells (PV-14 and PV-15)
- Implementing an MAU source control program at the former Motorola facility in early 1999, comprised of two extraction wells capable of a combined pumping rate of about 1,800 gallons per minute (gpm)
- Implementing an MAU source control program at the former Siemens' Area 7 in late 1999, initially comprised of three extraction wells (7EX-1UA, 7EX-3aMA, and 7EX-4MA) capable of a combined pumping rate of about 500 gpm

These proactive enhancements became part of the NIBW remedy when they were included in the Amended Consent Decree (CV-91-1835-PHX-FJM) signed in June of 2003. The Amended Consent Decree supersedes the OUI and the OUII Consent Decrees for the NIBW site.

Soil Remediation of VOC Source Areas

In September 1991, the EPA issued a Record of Decision for Operable Unit II (OUII) to address VOC impacts in the vadose zone (unsaturated sediments above the water table) and UAU groundwater system. The objective was to address on-going sources of VOCs to UAU groundwater and monitor subsequent reductions in VOC mass over time. It required vadose zone investigations and, if warranted, remediation at several potential source areas and assessment of mass flux from the UAU to the MAU and LAU for extraction and treatment by the OUI groundwater remediation system.

Vadose zone and UAU groundwater investigations and groundwater impact analyses associated with OUII were conducted between 1992 and 1995.

Based on the results from these programs, vadose zone remediation was implemented at the former Motorola facility (Area 12) and three Siemens source areas (Areas 6, 7, and 8). The last remaining vadose zone remediation program (Area 7) was closed out in 2016. In total, the soil cleanup effort removed more than 9,000 pounds of TCE and assured that the source areas are no longer a threat to UAU groundwater.

Optimization of Long-Term Groundwater Monitoring

Monitoring of the concentrations of VOCs in groundwater within the NIBW Superfund Site has taken place since 1983. The Groundwater Monitoring and Evaluation Plan (GMEP) requires an annual assessment of the scope and frequency of monitoring activities to optimize program effectiveness over time. In the first Five-Year Review of the NIBW Superfund Site (2011), EPA comprehensively reviewed groundwater monitoring data obtained pursuant to the GMEP and concluded significant progress had been achieved toward restoration of the UAU. Based on this finding, EPA and the NIBW PCs agreed to reassess and revise the UAU groundwater monitoring program as part of an optimized approach to be adopted in an updated GMEP.

Since May 2012, the NIBW Technical Committee had discussed an approach for future UAU groundwater monitoring that included streamlined groundwater data acquisition. This approach was documented in the NIBW PC's revised long-term UAU groundwater monitoring program proposal entitled, "Final Technical Memorandum - Recommendations for Upper Alluvial Unit Aquifer Long-Term Groundwater Monitoring Program, North Indian Bend Wash Superfund Site, Scottsdale, Arizona", dated March 11, 2013. This proposal, which was approved by EPA, recommended formal abandonment of 30 UAU monitoring wells that were no longer needed to define either water level or water quality conditions in the UAU. The UAU wells were successfully abandoned in accordance with all Arizona Department of Water Resources (ADWR) requirements during field work conducted from August 2, 2013 to January 9, 2014.

Groundwater Remedy Enhancements

Modifications and improvements to the OUI remedy were made by Motorola and the other PCs after issuance of the Amended Consent Decree in 2003, including installation of additional extraction wells, construction of an additional groundwater treatment facility, and replacement of an extraction well:

- Two additional extraction wells were installed to expand the MAU source control program at the former Siemens' Area 7, including wells 7EX-5MA in 2001 and 7EX-6MA in 2015. The well 7EX-5MA became inoperable in 2012 and was abandoned in 2015, following which well 7EX-6MA, intended to replace the capacity of both wells 7EX-4MA and 7EX-5MA, was constructed and added to the system.
- Well 7EX-4MA was removed from service in October 2016 due to poor performance. The NIBW PCs performed a limited rehabilitation of well 7EX-4MA in 2019. Several holes were discovered in the casing following the rehabilitation activities and the casing appeared to be in overall poor condition. Attempts to repair the casing and install a liner in the well are in progress. Although well 7EX-6MA was principally installed to replace well 7EX-5MA, as previously mentioned, it was also located and designed to serve as a replacement well for 7EX-4MA, should ongoing rehabilitation efforts prove to be ineffective. Well 7EX-6MA and 7EX-4MA share a common pipeline that connects the wells to the treatment system. As such, increased pumping from well 7EX-6MA is possible when well 7EX-4MA is offline.
- The NIBW Granular Activated Carbon (GAC) Treatment Facility (NGTF) was constructed and began operation in 2013. The NGTF treats groundwater extracted from well PCX-1 to provide hydraulic capture of the Northern LAU plume and limit migration of the plume toward the EPCOR wellfield.
- One extraction well COS-71, located in the central portion of the Site, became inoperable and was decommissioned in April 2014. This extraction well was replaced with a newly drilled well, COS-71A, which extracts groundwater from the MAU and LAU.

In addition, the PCs are considering extracting groundwater from an existing monitoring well (PG-41MA/LA) located north of PCX-1 to enhance capture of the plume within the northern LAU. Testing of PG-41MA/LA was performed in May 2021 to assess water quality, to evaluate possible pumping rates of the well and to determine the feasibility of using the well as a remedial extraction well. The testing demonstrated that the well is suitable for use as a remedial extraction well. The PCs are working with the City of Scottsdale and SRP to bring this well online as an additional extraction well to enhance remediation in the northern LAU.

Five-Year Reviews

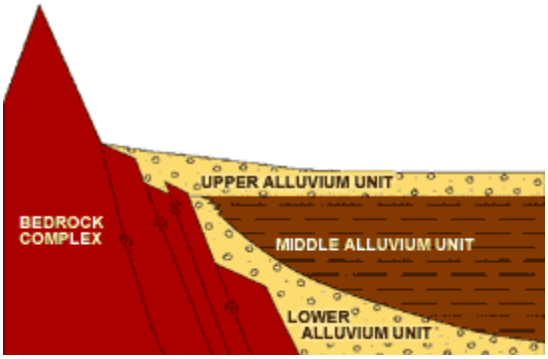
The EPA conducted its first Five-Year Review of the NIBW Superfund Site in 2011 to evaluate the implementation and performance of the site remedy to determine if it remained protective of human health and the environment. In the first Five-Year Review, EPA comprehensively reviewed groundwater monitoring data obtained pursuant to the GMEP and concluded significant progress had been achieved toward restoration of the UAU. EPA concluded that the remedy was protective of human health and the environment and containment of the groundwater plume had been demonstrated.

The EPA conducted the second Five-Year Review of the site in 2016, which concluded that while the remedy remained protective and containment of the groundwater plume had been demonstrated, the areas in the immediate vicinity of the former soil-impacted source areas needed to be re-evaluated for potential vapor intrusion risk due to new standards developed in 2014. The PCs conducted vapor intrusion investigations at multiple historical source areas and indoor air investigations at the former Siemens source area (Area 7). Based on the results of this evaluation, a sub-slab venting system was installed at four units of one multi-family residence near Area 7. The second Five-Year Review also identified a need to evaluate potential exposure to treatment facility emissions. The PCs developed an air dispersion model and conducted confirmatory sampling to demonstrate concentrations in the vicinity of the treatment systems are below applicable risk levels.

The EPA conducted its third Five-Year Review of the site in 2021, which concluded that while the remedy is currently protective of human health and the environment, the extent of potential vapor intrusion risk at one of the historical sources and groundwater flow patterns near the western margin of the site needed to be evaluated. The PCs submitted comments on the third Five-Year Review and a request for revision in November 2021. Discussions are underway between EPA, ADEQ, and the Participating Companies to address the concerns raised in the third Five-Year Review.

Geology and Groundwater Hydrology

The NIBW Superfund Site is located along the Indian Bend Wash in south Scottsdale. In this area, the underlying geology consists of a thick sequence of sediments that extend to depths of over 1,000 feet below the ground surface.



The NIBW Site is part of an area referred to as the Paradise Valley basin, which is a broad, sediment-filled trough surrounded by the McDowell Mountains to the northeast and the Phoenix Mountains, Camelback Mountain, and the Papago Buttes on the west and southwest. Granite and other consolidated rocks forming the mountains along the basin margins generally underlie the basin sediments. The sediments filling the basin are alluvial deposits consisting of layers of gravel, sand, silt, and clay. Alluvial deposits, or alluvium, are derived from the weathering of exposed rocks in adjacent or sometimes quite distant mountains and transported and deposited into the basin by streams over a period of hundreds of thousands or even millions of years.

Since the early 1980s, more than 150 groundwater monitoring wells have been installed and dozens of site-specific studies have been completed by the EPA and the companies involved in the remediation effort. These investigations have provided a good understanding of the complex geology and hydrology of the NIBW area, including the three principal aquifers – the UAU, MAU, and LAU, in which groundwater is present.

NIBW Upper Alluvium Unit (UAU)

The UAU consists mostly of coarse-grained sediments (sand and gravel) and finer-grained silt and clay deposits that occur primarily in the uppermost soils. The coarse-grained sediments of the UAU are much like the sand, gravel, and boulders present in the riverbed of the Salt River. The UAU extends from the ground surface to a depth ranging from about 90 to

190 feet across the NIBW area, with an average thickness of about 140 feet. Groundwater is typically found at an average depth of about 110 feet in the UAU across most of the NIBW Site in what is termed an unconfined aquifer. An unconfined aquifer is like a sandbox filled with porous sediments. The groundwater surface, or water table, rises when recharged (i.e., water is added to the aquifer) and falls when water is pumped out or moves downward into underlying layers. The UAU in the northern NIBW Site has little or no groundwater whereas there is a saturated thickness of several tens of feet in areas to the south. In those areas where groundwater is found in the UAU, the direction of movement is generally from east to west.

NIBW Middle Alluvium Unit (MAU)

The MAU represents the finer-grained portion of the basin deposits and consists chiefly of weakly cemented silt and clay layers with sand and gravel interbeds. The MAU is typically 500 to 600 feet thick throughout most of the NIBW Site but thins to the west along the basin margin. For example, the MAU in some locations west of Scottsdale Road is 60 feet thick or less and disappears all together as the basin sediments encroach upon the exposed bedrock of the Papago Buttes to the southwest of the NIBW Site.

The MAU is generally saturated with groundwater, but the layered silt and clay beds confine the aquifer to predominantly horizontal or lateral flow and limit vertical groundwater movement. While the general direction of groundwater flow is from the northeast to the southwest, pumping of production wells largely controls groundwater movement in the MAU. A cone of depression, or sink, for MAU groundwater is generally centered around extraction wells that pump from the MAU in the central part of the site. Extraction wells completed solely within this unit are capable of producing over 1,000 gpm of groundwater. The pattern of groundwater movement is also influenced by the thinning of the MAU sediments towards the southwestern part of the Site. In this region, impediments to vertical flow are not as prevalent, and MAU groundwater can migrate into the underlying LAU aquifer.

NIBW Lower Alluvium Unit (LAU)

The LAU is generally a coarse-grained unit, however LAU sediments range in size (from clay to boulders), and in how strongly they are cemented. Consolidation within the LAU increases with depth at the site. Although total thickness of the unit has not been defined at many locations in the NIBW area, thickness of LAU sediments is interpreted to be very large (over a thousand feet) near the center of the Paradise Valley basin and to decrease substantially toward the basin margins. Across the center of the NIBW Site, the top of the LAU is found approximately 600 to 700 feet below the ground surface.

The LAU is a confined and fully saturated aquifer in the NIBW area. Extraction wells completed within the LAU are capable of producing 2,000 gpm or more of groundwater. Because the aquifer is so productive, many groundwater wells operated by the area water providers derive much of their supply from the LAU. The heavy pumping of the LAU controls groundwater flow within the unit and also induces a downward gradient, or driving force, for movement of groundwater from the overlying UAU and MAU into the LAU. Since the MAU generally restricts vertical movement of groundwater in the NIBW area, much of the recharge of groundwater to the LAU occurs along the basin margin, particularly to the southwest of the Site, where the MAU is thin or absent. As such, groundwater moves northeast in the LAU from the southwest margin recharge area, north through the central part of the site, and converges toward the cone of depression created by extraction wells in the vicinity of the EPCOR Water well field.

Remediation Technologies

We use four primary technologies to treat soil vapor and groundwater at the NIBW site:

- Air Stripping
- Ultraviolet Oxidation
- Soil Vapor Extraction
- Granular Activated Carbon

Method #1: Air Stripping Water Treatment Technology

Groundwater treatment by air stripping, also known as packed tower aeration, is the most reliable and effective technology to remove low to moderate concentrations of VOCs, such as TCE, dissolved in water. The process is very simple and described below.

Step 1: Groundwater containing TCE or other VOCs is pumped from the aquifer to the top of a treatment tower that is filled with plastic packing material. The packing material consists of plastic balls, much like whiffle balls.

Step 2: The water trickles down through the packing while clean air is blown upward from the base by a high-speed fan. As the air comes in contact with the water trickling down the packing, the VOCs contained in the water transfer to the passing air flow.

Step 3: VOCs that are "stripped" from the incoming water move upward with the airflow, exit the tower and pass through air filters, if required. The filters, typically filled with granular activated carbon (GAC), remove the VOCs from air so that the exiting air meets federal, state, and local standards. The carbon is periodically replaced as necessary.

Step 4: The treated water is collected at the base of the tower where it is available as a clean water supply. If the treated water is intended for potable use, it is disinfected at the water provider's facility before it enters the municipal drinking water system.

Method #2: Ultraviolet Oxidation Technology

Ultraviolet oxidation (UV/OX) systems remove VOCs, such as TCE, from groundwater by oxidizing organic constituents in the groundwater using a strong oxidizer and irradiation with ultraviolet light. UV/OX processes can be configured in batch or continuous flow operations.

Step 1: Groundwater containing TCE or other VOCs is pumped from the aquifer to a treatment facility where an oxidant, commonly hydrogen peroxide, is injected into the groundwater.

Step 2: The groundwater and oxidant flows through a UV/OX system where high-intensity UV radiation interacts with the oxidant in the water to oxidize organic contaminants to carbon dioxide and water.

Step 3: The treated water is collected as it flows from the UV/OX system and becomes available for further treatment or as a clean water supply.

Method #3: Soil Vapor Extraction Technology

Soil Vapor Extraction (SVE) systems work like a vacuum system to remove VOCs, such as TCE, that exist in porous soils above the water table. The process is described below.

Step 1: An air vacuum blower operates to pull suction from specially constructed SVE wells. The SVE wells consist of plastic pipe (“casing”) that is perforated in intervals where there are known VOCs in soil. Air from the surrounding soil pores is drawn into the SVE wells thereby removing the VOCs contained in the air and removing VOCs adhered to the soils. In very porous soils, SVE can effectively remove VOCs in soil vapor from a distance of over 300 feet from the extraction well.

Step 2: Air containing the VOC vapors is passed through one or more GAC filters as necessary to meet treatment requirements. The VOCs are adsorbed by the carbon and removed from the air. The carbon is periodically removed from the canisters as it loses treatment efficiency and replaced with fresh carbon. The spent carbon is returned to the supplier for regeneration.

Step 3: The treated air is discharged to the atmosphere.

Method #4: Granular Activated Carbon (GAC) Technology

GAC is commonly used to remove VOCs from water. Adsorption is both a physical and chemical process of accumulating substances at the interface between liquid and solid. Because GAC is a highly porous material, it provides a large surface area to which VOCs will adsorb. The GAC used at the NIBW Site is primarily made from coconut shells.

A lead-lag, liquid phase GAC treatment system is considered one of the most fail-safe treatment processes available to remove VOCs from water and may also provide the added benefit of removing other impurities from groundwater, thereby reducing municipal treatment costs.

Step 1: Groundwater containing TCE and other VOCs is pumped from the aquifer and may be run through a pretreatment filter to remove solids.

Step 2: The groundwater flows through the GAC treatment system. As the water comes into contact with the GAC, the TCE adsorbs to the surface of the carbon and into the porous GAC interfaces.

Step 3: Water then flows through a second GAC treatment vessel to ensure removal of any remaining trace amounts of VOCs in the water.

Step 4: The treated water is collected where it is available as a clean water supply. If the treated water is intended for potable use, it is disinfected at the water provider's facility before it enters the municipal drinking water system.

Treatment Facilities

Groundwater Extraction and Treatment System at Area 7

Area 7 is a former Siemens electronics manufacturing site located at the southeast corner of 2nd Street and 75th Street in Scottsdale, Arizona. Siemens is the responsible party for Area 7, with Motorola Solutions (the successor to Motorola) overseeing operations and maintenance on behalf of Siemens. Siemens installed the Area 7 Groundwater Extraction and Treatment System (GWETS) to enhance the NIBW groundwater remedy by extracting and treating MAU groundwater containing relatively higher VOC concentrations associated with the source area and by reducing VOC mass allowed to migrate to the CGTF extraction wells for removal and treatment. Groundwater extraction is currently performed using MAU groundwater extraction wells designated as 7EX-3aMA and 7EX-6MA. The extracted groundwater is treated by ultraviolet oxidation (UV/OX) followed by air stripping. Treated water is pumped to the UAU using two upgradient groundwater injection wells (7IN-1UA and 7IN-2UA).

The Area 7 MAU source control program was initiated in 1999. Treated water from the Area 7 GWETS is routinely below the TCE detection limit of 0.5 micrograms per liter (µg/L). With a treatment capacity of about 400 gpm, the Area 7 GWETS has extracted and treated about 23,000 pounds of TCE from the MAU since 1999.

Soil Vapor Extraction and Treatment at Area 7

Soil Vapor Extraction (SVE) was used at Area 7 to remove vapor-phase TCE from the soil. SVE at Area 7 has resulted in removal of approximately 8,000 pounds VOCs.

The SVE system at Area 7 was installed in 1994 as required by the OUII Consent Decree. After years of operation and followed by rebound and evaluation periods, a work plan was approved in 2008 to operate the Area 7 SVE system under a pulsing regime until December 2009. After the pulsing period, the Area 7 SVE system was shut down for a planned 3-year period to observe overall vapor rebound. At the end of the 3-year period in December 2012, soil-vapor samples were collected from the soil-vapor monitoring wells. The results of this sampling were input into a modeling program to determine whether the performance criteria had been met. Upon demonstration that the performance criteria had been met, in August 2013 the NIBW PCs requested that a certification of completion for the Area 7 SVE and UAU groundwater extraction be granted by EPA and the Arizona Department of Environmental Quality (ADEQ). In December 2013, EPA's consultant, Gilbane, on behalf of EPA, provided comments and conducted further analysis. Using conservative methodologies, Gilbane showed that even in a worst-case scenario, TCE concentrations would not exceed limits established by EPA. Based on the model results by Gilbane, and the NIBW PC's model simulations, the agencies concluded that there is no threat posed to the UAU groundwater by minimal residual concentrations in the soils at Area 7. In April 2014, the NIBW PCs again requested a certificate of completion and closure for the Area 7 SVE and UAU groundwater treatment systems. EPA agreed in April 2015 that the SVE system had met performance criteria and issued a Letter of Determination requesting a decommissioning plan. The NIBW PCs submitted a decommissioning plan in May 2015 for the proper disassembly, removal and/or abandonment of all on-site equipment. EPA approved the Decommissioning Plan in June 2015, and the system was decommissioned in July and August 2015. A final report was prepared and submitted to EPA in November and following a site inspection, was approved by EPA in March 2016, certifying closure of this component of the NIBW remedy. Closure of the Area 7 system signaled completion of the final step in implementation of the vadose zone (unsaturated soils) remedy.

Groundwater Extraction and Treatment System at Area 12

Motorola Solutions is involved in remediation efforts at Area 12, a former Motorola facility located at 8201 E. McDowell Road in Scottsdale (now a General Dynamics facility). Between 1996 and 1998, an SVE system was used at Area 12 to successfully address soil impacts. Our cleanup efforts continue at the site using a groundwater extraction and treatment system (GWETS).

Motorola implemented proactive extraction and treatment of groundwater at Area 12, in partnership with the Salt River Project (SRP), a local water and electricity provider. The Amended Consent Decree incorporated the Area 12 GWETS into the site remedy.

The Area 12 system extracts relatively higher concentrations of TCE from the MAU groundwater at the former Motorola site that would otherwise migrate slowly to the COS extraction wells, where water is extracted and treated at the Central Groundwater Treatment Facility. The Area 12 system supplies water for use by SRP.

The Area 12 GWETS consists of two large extraction wells connected to an air stripping tower located in the southeast portion of the former Motorola plant site.

SRP offered to assist with Area 12 groundwater remediation to assure availability of a long-term, reliable groundwater supply in the NIBW Site. SRP generously provided the groundwater treatment system that has been extensively upgraded and is now in use at Area 12. Motorola relocated this groundwater treatment system from Mesa where it had been used by SRP to clean up VOC impacts at one of the SRP production wells. We also provided treatment for an existing SRP production well located just east of the former Motorola facility, designated as SRP 23.6E-6N and also known as the SRP Granite Reef well. We installed a new groundwater extraction well on-site, designated as MEX-1MA, which is also used for SRP water

supply. Collectively, these two wells can pump about 1,800 gpm to the treatment system. Treated water is discharged to the SRP distribution system, primarily for use in Phoenix.

Motorola implemented a number of upgrades before operating the system, including installing:

- Higher efficiency tower packing
- A new water distribution system
- A VOC monitor on the air outlet
- A comprehensive control system

As a voluntary remedial action program, Motorola initially obtained a National Pollutant Discharge Elimination System Permit to regulate discharge of treated water and an Air Quality Permit to govern air emissions. To date, the system has functioned effectively to meet all operating permit conditions. Treated water from the Area12 GWETS is routinely below the TCE detection limit of 0.5 µg/L. Groundwater extraction and treatment at Area 12 has subsequently been incorporated into the Amended Consent Decree executed in June 2003 as a required remedial action and the only permit required is an Arizona Pollutant Discharge Elimination System permit.

Since groundwater extraction began in February 1999, nearly 10.6 billion gallons of groundwater have been pumped and about 8,100 pounds of TCE have been removed by the treatment system.

Soil Vapor Extraction at Area 12

In 1996, Motorola installed an SVE system at Area 12. Until 1998, the system was used to remove TCE from soil vapor. The area requiring cleanup was determined through testing done by Motorola and the EPA.

To remove TCE from the soil, SVE wells were installed at six locations designated 12VE-3 through 12VE-8. At each of the six locations, a cluster of three SVE wells provided for vapor extraction at three intervals of between five and nearly 90 feet below ground. Pilot studies and actual site monitoring data indicated vapor extraction would be effective over a distance of at least 300 feet away from the SVE wells.

The SVE wells were connected by underground pipes to a central treatment system. Soil vapor from each well was extracted by vacuum blowers and treated by passing the vapor through three GAC filters in series. The treatment system also included a liquid separator, particulate air filter and heat exchanger.

Almost 1,000 pounds of VOCs were estimated to have been extracted from the soils at Area 12. Initially, the removal rates were estimated to be about 30 pounds per day, but rapidly declined to an estimated 0.2 pounds per day after nine months of operation and several planned shutdown periods to allow for rebound.

As required by EPA, we assessed the impact of any remaining TCE soil vapor concentrations at the end of the SVE program and determined there was no longer a potential threat to groundwater. The EPA acknowledged in a letter dated August 18, 2000, that the remedial efforts at Area 12 had attained the required performance standards and approved discontinuation of SVE operations. Motorola has properly abandoned the SVE wells and removed the SVE equipment according to a plan approved by EPA.

Groundwater Extraction and Treatment System at the Central Groundwater Treatment Facility (CGTF)

The CGTF is located at Pima Park in South Scottsdale in the vicinity of Thomas and Pima Roads. The CGTF is owned and operated by the COS and provides drinking water to their municipal system. The City operates the treatment facility according to procedures approved by EPA and the ADEQ. The costs to design, construct, and operate the CGTF are paid for by the NIBW PCs.

The site connects four impacted water supply wells to a central treatment facility for removal of TCE using air stripping. The wells have a maximum combined extraction rate of around 9,000 gpm and are used to provide treated water to the COS drinking water system. Over the years, the

groundwater extraction and treatment rate has averaged around 5,000 gpm.

TCE in groundwater is removed by packed tower aeration (air stripping treatment technology). The CGTF has three treatment towers, each with a packed column that can treat up to 3,150 gpm of water. The water enters the column at the top of the packing material and flows by gravity downward to a sump. TCE is removed or stripped from the water as it flows over the packing material by air passing upward through the column. A blower pulls approximately 14,000 cubic feet per minute of air in counter-current flow through the column and passes it to the next stage of the process, known as the vapor phase treatment system. From the sump, the treated water is disinfected with chlorine and enters one of two five million-gallon reservoirs.

The vapor phase treatment system removes TCE in the air from the packed tower aeration, if needed. The air from each column is preheated by a gas burner to reduce relative humidity and then passes through a 20,000-pound GAC filter. The carbon filter adsorbs the TCE in the air and the treated air is discharged to the atmosphere. The treated air is monitored regularly and the activated carbon is replaced as necessary to ensure that the treated air meets local, state, and federal standards. Treated water from the CGTF is routinely below the TCE detection limit of 0.5 µg/L. Since the CGTF became operational in 1994, more than 69 billion gallons of groundwater have been treated and returned to beneficial use and over 54,000 pounds of TCE have been removed from the groundwater. COS provides a summary of CGTF operational data in Quarterly Compliance Monitoring Reports to EPA.

Groundwater Extraction and Treatment System at the Miller Road Treatment Facility (MRTF)

The MRTF is a groundwater treatment facility owned and operated by EPCOR Water (referred to herein as EPCOR), formerly known as the Arizona American Water Company, successor to the Paradise Valley Water Company. The MRTF is located just south of McDonald Drive on Cattletrack (formerly Miller) Road in Scottsdale, Arizona. The facility provides treatment to remove TCE from groundwater extracted from the LAU in the two southernmost wells of the EPCOR well field (PV-14 and PV-15).

The MRTF was designed and constructed collaboratively and proactively through cooperation between EPCOR's predecessor, the Paradise Valley Water Company, and the NIBW PCs after low level concentrations of TCE were detected in monitoring wells sited approximately 3,500 feet south of the current EPCOR well field in 1994. Construction of the MRTF began in March 1996 and the facility was operational in March 1997, about two years before TCE was detected in the southernmost EPCOR extraction well, PV-15.

The construction was reviewed by the EPA and the ADEQ. The NIBW PCs provided funding for design and construction and continue to fund ongoing operation and maintenance of the MRTF.

In 2003, the EPA included groundwater extraction and treatment at MRTF as part of the required remediation efforts at the NIBW Site in the Amended Consent Decree and established operational requirements. The MRTF currently provides treatment for the EPCOR wells PV-14 and PV-15. It was previously also used to treat groundwater from well PCX-1, a well owned and operated by SRP. Together with the other companies involved, Motorola Solutions worked closely with SRP to install PCX-1 on the Arizona Canal bank approximately 3,500 feet south of the southernmost EPCOR well to extract groundwater containing TCE before it reached the EPCOR well field. The MRTF is capable of treating around 6,300 gpm of

groundwater. Water extracted from well PCX-1 is now treated at a facility known as the NGTF, commissioned in 2013.

There are three treatment towers at the MRTF, each capable of treating around 2,100 gpm of water. The treatment towers installed at MRTF use packed tower aeration (air stripping treatment technology) to reduce influent TCE concentration to levels that meet or surpass drinking water standards. The water enters the top of the treatment tower and TCE is removed from the water as it flows over the packing material and contacts air passing upward through the column. A blower at the base of the column previously introduced air in counter-current flow through the column at a high air to water ratio of 40:1, which was more than what was necessary to treat the low concentrations of TCE in well PV-14 and PV-15. In 2014, the PCs gained approval from Maricopa County to reduce the air to water ratio in the MRTF air strippers to 20:1. This treatment protocol is protective and saves on facility energy use. Air from the stripping towers flows through a GAC vapor phase treatment system, as necessary. The treated water from the column flows into a clearwell beneath the MRTF and is then pumped to another EPCOR facility where it is disinfected using a hypochlorite solution, blended with water from other EPCOR groundwater wells and treated through an arsenic removal process prior to use in the EPCOR distribution system. Alternatively, the water may at times be distributed to the Arizona Canal for SRP use. Treated water from the MRTF is routinely below the TCE detection limit of 0.5 µg/L.

At the start of the MRTF groundwater extraction and treatment program in 1997, together with the other companies involved, Motorola Solutions initiated a comprehensive monitoring program for the Paradise Valley area. The monitoring program and subsequent state-of-the-art groundwater modeling indicate that the MRTF extraction wells will capture impacted groundwater in the LAU. Since 1997, when the MRTF became operational, and through 2014, more than 48 billion gallons of groundwater have been treated and returned to beneficial use, removing more than 8,300 pounds of TCE from LAU groundwater.

About EPCOR Water

EPCOR Water is owned by EPCOR Utilities, and is privately owned by the City of Edmonton, Canada. EPCOR Utilities is an integrated energy provider, supplying water, wastewater, and power distribution services to more than 1 million customers across Western Canada and the United States. In 2012, EPCOR Water bought Arizona American Water Company. EPCOR Water provides potable water service to 11 water utility districts in Arizona. Within the City of Scottsdale, Town of Paradise Valley and unincorporated areas of Maricopa County, it serves approximately 4,700 connections (approximately 10,000 people). The sole source of groundwater for these municipalities is pumped from six wells located immediately west of the Arizona Canal between Lincoln Drive and McDonald Drive in Scottsdale, and an allotment of Colorado River Water from the Central Arizona Project.

Groundwater Extraction and Treatment System at the NIBW GAC Treatment Facility (NGTF)

The NGTF is located adjacent to the MRTF, just south of McDonald Drive on Cattletrack Road in Scottsdale, Arizona. The NGTF is owned by Motorola Solutions and operated by the COS in accordance with plans approved by the EPA and the ADEQ.

This facility provides treatment using liquid phase GAC technology to remove TCE from groundwater extracted from the LAU by PCX-1, a well owned and operated by SRP. Treated water from the NGTF is routinely below the TCE detection limit of 0.5 µg/L. Together with the other companies involved, Motorola worked closely with SRP to install well PCX-1 on the Arizona Canal bank approximately 3,500 feet south of the southernmost EPCOR well with the purpose of extracting groundwater containing TCE before it reached the EPCOR well field. Treated water from the NGTF is conveyed to either the Arizona Canal for SRP distribution or to

the COS Chaparral Water Treatment Facility for blending with treated surface water and use in Scottsdale's potable distribution system.

The NGTF is capable of treating an average of 2,600 gpm of groundwater extracted from well PCX-1. Since operation began in 2014, NGTF has removed over 3,700 pounds of TCE from the groundwater.

The NGTF also provides space for future expansion to potentially treat other wells to enhance the NIBW remedy if needed. The NGTF is operated by the COS, a proven, reliable partner at the NIBW site, with much of the treated water distributed to the COS potable water system. This facility uses liquid phase GAC technology; thus no separate air treatment is necessary or required. Motorola Solutions retains ownership of the land and facility. Immediately north of the NGTF is a xeriscaped pollinator garden, along with a COS-sponsored public art sculpture that was installed in the Fall of 2014 and dedicated in April 2015. A path through the garden provides access between Cattletrack Road and the Arizona Canal bank.