

# Apache Powder

## [EPA](#) National Priorities List (NPL) Site

### **Boundaries:**

The [Apache Powder Site](#) (Site) is located in Cochise County, Arizona, approximately seven miles southeast of the incorporated town of Benson and 2.5 miles southwest of the unincorporated town of St. David. The Site study area covers approximately nine square miles and includes 945 acres of land owned by [Apache Nitrogen Products, Inc.](#), formerly known as the Apache Powder Company. The San Pedro River bounds the eastern side of the Site, running from the southeast corner of the property toward the northwest.



**The San Pedro River  
Near the Apache Powder Site**

### **Site Status Update:**

#### *Northern Area Groundwater*

The [U.S. Environmental Protection Agency](#) (EPA) and the Arizona Department of Environmental Quality (ADEQ) have completed investigations of the Northern area groundwater contamination and chosen [monitored natural attenuation](#) (MNA) as a final remedy enhancement to the existing remediation system. All remedies for the Northern Area are now in place and long-term [operation and maintenance](#) of these remedies has begun. In September 2008, EPA issued its Preliminary Closeout Report for the entire Apache Site.

As of the end of November, 2010, the Northern Area Treatment wetland has treated over 570 million gallons of groundwater and removed over 565,000 pounds of nitrate-nitrogen (nitrate-N). Currently, the wetland is reliably treating nitrate-N contaminated groundwater to less than 2.0 milligrams per liter (mg/l) or parts per million (ppm).



**Nitrate Treating Wetlands**

## Southern Area Soils and Groundwater

The design and implementation of the MNA remedy for the Southern Area groundwater was completed in Fall 2007. In addition, institutional controls that are called for in an amended [Record of Decision](#) (ROD) were in place in Fall 2008. Native soil covers have been constructed for former pond areas. All remedies for the Southern Area are now in place and long-term operation and maintenance of these remedies has begun. In September 2008, EPA issued its Preliminary Closeout Report for the entire Apache Site.

### **Community Involvement Activities:**

Public meetings are organized for Site issues where there is considerable public interest.

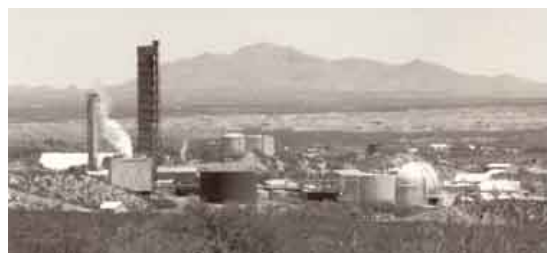
As required by the ROD for this Site, Apache Nitrogen Products provides semi-annual notices to the surrounding community regarding the extent of groundwater contamination and the danger of using this water for drinking water. These notices are also posted on Apache's website at: <http://www.apachenitro.com/news1.htm>. Apache also keeps an inventory of private well use in the area, and they monitor/track groundwater drilling in the area.

The EPA developed and distributed the following newsletters and [fact sheets](#): Status of Apache Cleanup Activities - May 1999, TNT Removal Action Planned for December 1999 - November 1999, Update on Cleanup at Apache – March 2004, EPA Announces Proposed Plan (for Soil and Groundwater Cleanup in the Southern Area of the Site) – July 2005, [Decision Made on Revising Cleanup of Southern Area](#) – June 2006, Northern Area Groundwater Remedy Update – October 2006, and [Five-Year Review of Soils and Groundwater Cleanup Actions](#) – February 2007. EPA and ADEQ participated in community meetings in St. David on July 19, 2005, September 1, 2005, and November 1, 2006.

In November 2008, Apache sponsored a two-day event that celebrated ten years of operating the wetland treatment system and for achieving “construction complete” status with EPA. The first day of the event included a wetland seminar in Tucson that featured presentations by wetland experts from throughout the west. On the second day, Apache held a cookout and celebration at the treatment wetland. Over 100 people including Apache's neighbors, regulators, and environmental professionals attended the wetland celebration.

### **Site History:**

**1922-1971:** Apache Powder (now Apache Nitrogen Products, Inc.) began manufacturing dynamite in 1922 for mining and construction projects throughout the southwest. Later, Apache broadened its product line to include [ammonium nitrate](#), nitrogen-based fertilizer products, blasting agents, and nitric acid. Today, Apache manufactures various forms of ammonium nitrate and nitric acid.



**Apache Powder Plant**

Prior to 1971, manufacturing wastewater was discharged on site into dry washes which flow directly into the San Pedro River. After 1971, wastewater was discharged into unlined evaporation ponds resulting in the contamination of a [perched](#) groundwater zone. This discharge of wastewaters to the perched groundwater also resulted in contamination of the shallow [aquifer](#), and the San Pedro River.

**1979-1980:** The [Arizona Department of Health Services](#) (ADHS) identified potential groundwater contamination problems in 1979. In 1980, the EPA found high levels of heavy metals (such as lead, chromium, zinc and strontium) in some of the on-site ponds, and ten shallow aquifer wells [downgradient](#) from Apache were found to contain nitrate at concentrations up to 470 mg/l.

**1986-1989:** After additional studies in 1986, ADHS instructed Apache to obtain a state groundwater protection permit to address source discharges. However, Apache continued to operate in violation of applicable state water quality regulations from 1988 through 1993.

The EPA completed a [preliminary investigation](#) of the Site in June 1988. This investigation confirmed the State's earlier findings of nitrate contamination, as well as heavy metals contamination of Site soils. In 1989, Apache began supplying bottled water to nearby residents whose drinking water wells were contaminated with nitrate.

**1990-1994:** The Site was formally listed on the [National Priorities List](#) (NPL) on [August 30, 1990](#), and EPA issued a unilateral administrative order to Apache in December 1994 to conduct remedial design/remedial action activities under the [Comprehensive Environmental Response, Compensation and Liability Act](#) (CERCLA).

In June 1992, ADEQ and EPA agreed that ADEQ would be responsible for ensuring Apache's compliance with state requirements for [aquifer protection](#), [air quality](#) and [hazardous waste management](#), and that EPA would be responsible for overseeing Apache's CERCLA cleanup. EPA completed a Baseline Public Health Evaluation and Ecological Assessment for the Site in September 1992.

The [remedial investigation](#) (RI) and [feasibility study](#) (FS) were completed in June 1994. The RI revealed nitrate-N contamination in perched groundwater at the southern end of the Site exceeding 1000 ppm. Nitrate-N contamination in the shallow groundwater of the Site was found at concentrations as high as 400 ppm. East of the Site, concentrations of nitrate-N up to 220 ppm were detected in samples from the San Pedro River. Shallow groundwater sampling along the west bank of the river revealed nitrate-N concentrations up to 570 ppm. The federal drinking water standard for nitrate-N is 10 ppm.

In September 1994, EPA signed the ROD for the Apache Powder Site. The selected groundwater remedies consisted of [pumping and treating](#) the perched groundwater zone by forced evaporation using a brine concentrator, and pumping and treating the shallow aquifer by use of constructed wetlands and then recharging the treated water back into the shallow aquifer. The 1994 ROD also included soil excavation, removal, and treatment at a permitted off-site disposal area, the removal and treatment of drums containing hazardous materials, and [capping](#) of any contaminated soils left on site.

**1995:** In January, Apache completed construction of a brine concentrator. All discharges to the evaporation ponds have since ceased. In March, as required by the ROD, eight households that had been supplied bottled water since 1989 were hooked up to deep aquifer replacement wells.

**1997:** In September, per the ROD, construction of a 4.5-acre Northern Area Treatment Wetland to treat 150 gallons per minute (80 million gallons per year) of nitrate-N contaminated groundwater in the northern portion of the Site was completed.

**1998-2003:** In November 1998, [perchlorate](#) contamination was detected in the Southern Area groundwater at the Site ranging up to 670 parts per billion (ppb) in the perched aquifer and 300 ppb in the shallow aquifer. The source of perchlorate contamination is thought to be Chilean sodium nitrate that was used in historic manufacturing processes. Although neither EPA nor ADEQ have a drinking water standard for perchlorate, ADHS issued a [Health Based Guidance Level](#) for perchlorate in drinking water of 14 ppb in May 2000.

Between November 1999 and June 2000, an EPA-mandated removal action of 870 tons of TNT-contaminated soils was completed. The removal action included the excavation, pre-burning, removal, and off-site disposal of these soils. Between December 1999 and June 2000, 262 drums (110 gallons each) containing [dinitrotoluene](#) (DNT), in the form of 2,4-DNT and 2,6-DNT, as well as [vanadium-pentoxide](#) were removed from the Site. In addition, approximately 1,300 tons of soil contaminated with [arsenic](#), DNT, and vanadium-pentoxide were excavated. These materials were transported to a permitted hazardous waste disposal facility where they were treated and disposed.

Additional characterization of the interaction between the perched zone and shallow aquifer in the Southern Area of the Site was conducted in Summer and Fall 2000. These investigations included construction of additional [monitor wells](#), exploration [boreholes](#), groundwater modeling, and a geophysical survey.

From 1997 through 2001, the wetland was in its growth phase to develop its aquatic vegetation. During this time enough biomass was produced to trigger [anaerobic denitrification](#). However, operational problems during the summer of 2002 prevented full-scale startup. Intensified efforts to monitor the wetland and achieve full-scale startup in the summer of 2003 were then developed.

In 2003, a groundwater characterization report and a supplemental FS for the Southern Area that included analysis of soil and groundwater remedial alternatives were completed. This work concluded that MNA would be a viable remedial alternative for the groundwater contamination in the southern portion of the Site.

**2004:** Late in the year, the Northern Area treatment wetland achieved full-scale startup.

**2005:** The final remedy for the perched aquifer, the Southern Area shallow aquifer, and contaminated soils in the Southern Area was specified in a ROD Amendment in September. The selected remedy for the Southern Area groundwater is MNA. The remedy for the Southern Area contaminated soils is a low-permeability native soil cover with institutional controls including a deed restriction on the southern portion of the Apache property.

**2006:** Soil borings installed in Summer have shown that the shallow aquifer groundwater contamination in the Southern Area is much less extensive than previously thought. These new data indicate that the contamination in the shallow aquifer appears to be confined to two small areas that are hydraulically isolated from the shallow aquifer in the Northern Area of the Site and from the San Pedro River.

**2007:** Construction of native soil covers for abandoned pond areas in the Southern Area began in the fall.

**2008:** Because some of the nitrate-N plume in the Northern Area had migrated beyond the capture area of the wetland [extraction well](#) (SEW-1) before it was constructed, additional characterization in this area was needed. These investigations were completed during the first half of the year, and they led to the decision by EPA and ADEQ to supplement the Northern Area groundwater remedy with MNA. This decision was formalized in an [Explanation of Significant Differences](#) in July.

The native soil covers for abandoned pond areas in the Southern Area were completed early in the year.

**2009 -2010:** The Northern Area Treatment Wetland continued to operate; institutional controls were in place; groundwater monitoring continued; and nitrate concentrations in the Northern Area continued to decline.

### **Contaminants:**

The current contaminants of concern at the Site include [arsenic](#), [fluoride](#) and [nitrate](#) in the perched groundwater; nitrate in the shallow groundwater aquifer; arsenic, [antimony](#), [barium](#), [beryllium](#), [chromium](#), [lead](#), [manganese](#) and nitrate in the inactive pond soils and sediments; and 2,4-[dinitrotoluene](#) (DNT), [2,6-DNT](#) and lead in Wash 3 Area. Additionally, the waste materials [vanadium pentoxide](#) and [trinitrotoluene](#) (TNT) were found in soils on the Site, and [perchlorate](#) has been found in the perched and shallow aquifer. Contaminants of concern at the Site may change as new data become available.

### **Public Health Impact:**

Currently there are no known human exposures to groundwater contamination at this Site. However, if you are drinking water from a private well within the boundaries of the Site, please call the ADEQ Project Manager. In 1995, Apache Powder replaced a number of shallow aquifer domestic wells that had nitrate contamination with deeper regional aquifer wells and they are now supplying bottled water to two households. Perchlorate has not been detected in any domestic wells.

### **Site Hydrogeology:**

The is located in the Upper San Pedro River Basin, in the Basin and Range physiographic province. The basin is bounded by several mountain ranges including the Whetstone Mountains to the west, the Dragoon Mountains to the east, the Huachuca Mountains to the southwest, and the Mule mountains to the southeast.

The San Pedro River drains approximately 2,500 square miles, of which 700 square miles are in Mexico. The river flows northward from Mexico and joins the Gila River near Winkelman, Arizona. The river is perennial where it intersects the water table, and it supports a rich riparian ecosystem.

The Upper San Pedro River Basin is a deep [alluvial](#)-filled structural basin created by downdrop of the valley floor and uplift of the surrounding mountains. The thickness of the alluvium near the center of the basin is probably greater than 1,000 feet.

The shallow aquifer, which occurs along the San Pedro River and its tributaries, consists primarily of unconsolidated gravel, sand, and silt deposits. It is generally 40 to 100 feet thick, and yields water easily when wells are properly constructed. The shallow aquifer is unconfined in most of the basin, but can be locally confined by fine-grained silt and clay deposits. Depth to water in the shallow aquifer is between 40 and 70 feet below ground surface (bgs).

Separating the shallow aquifer from the deeper regional aquifer is a thick unit of clay and silt called the St. David Clay. This clay unit is about 300 feet thick and is an effective [aquitard](#) that confines the groundwater in the deep regional aquifer.

The upper portion of the deep regional aquifer is composed of clayey and silty gravel beds near the mountains, and clay, silt, and sandy silt with interbeds of gypsum near the center of the basin. The lower portion of the deep regional aquifer is composed of older sedimentary rocks including lenses of gravel, sandstone, and siltstone.

The deep regional aquifer ranges in thickness from less than 100 feet at the basin margins to over 1,000 feet in the center of the basin. Wells penetrating into the deep regional aquifer exhibit [artesian](#) conditions. Some wells in the St. David area actually flow at the surface.

At the Apache Powder Site, the shallow aquifer and the deep regional aquifer are present. In addition, there is a small perched zone on Apache's property that resulted from wastewater discharges to unlined washes and ponds. Until recently, the perched zone drained into the shallow aquifer and was a source of nitrate and perchlorate contamination in the shallow aquifer in the Southern Area of the Apache Powder Site. However, this perched zone is now nearly dry and probably no longer discharges to the shallow aquifer.

In the Southern Area of the Site, the shallow aquifer is further divided into the Molinas Creek Sub-Aquifer, and the alluvial aquifer associated with the San Pedro River. Nitrate and perchlorate groundwater contamination only occurs in the Molinas Creek Sub-Aquifer and the perched zone. Perchlorate has never been detected in the shallow alluvial aquifer associated with the San Pedro River or in the river itself.

The groundwater flow direction in the shallow aquifer is generally northward (sub-parallel to the river). However, the Molinas Creek Sub-Aquifer appears have almost no flow due to its apparent hydraulic isolation from the rest of the shallow aquifer.

More detailed descriptions of the hydrogeology of the Site can be found in reports and studies available at the Benson Public Library (see Information Repository Section below).

## Contacts:

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

\*\*Call EPA's toll-free message line at (800) 231-3075.

## Information Repository:

Interested parties can review select Site documents at the [Benson Public Library](#) located at 300 S. Huachuca in Benson, (520) 586-9535. The complete official Site file can be reviewed at the EPA Region IX, [Records Center](#), Mail Stop SFD-7C, 95 Hawthorne Street, Room 403, San Francisco, CA 94105, (415) 536-2000.

The ADEQ 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. Please call (520) 628-6715 or toll-free (888) 271-9302 to arrange a file review appointment at the Southern Regional Office.

Files are available for review with 24-hour notice from the Central Office. Please contact (602) 771-4380 or (800) 234-5677 to schedule an appointment to review these documents. Once all documents requested have been collected, you will be contacted for a review Monday through Friday from 8:30 a.m. to 4:30 p.m. at the ADEQ Records Management Center, 1110 W. Washington Street in Phoenix, AZ.