



# Groundwater CLEANUP

A NEWSLETTER ON  
NASA'S CLEANUP EFFORTS  
AT THE JET PROPULSION  
LABORATORY

DECEMBER 2011

## The Monk Hill Treatment System is Up And Running Removing Chemicals From Groundwater

The NASA-funded Monk Hill Treatment System (MHTS) is operational and is removing perchlorate and volatile organic compounds (VOCs) from groundwater near four previously closed and now upgraded water production wells in Pasadena. The City-owned treatment plant, built on property adjacent to Pasadena's Windsor Reservoir, was officially dedicated with a ribbon-cutting ceremony on October 20.

### Clean Water Flowing Again From Four Previously Closed Wells

With its completion and with a California Department of Public Health (DPH) drinking water permit issued on March 17, Pasadena Water & Power (PWP) has again begun serving clean water to its customers from the wells.

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**PHOTO, TOP**  
A new NASA-funded groundwater treatment plant is now operational, allowing the City of Pasadena to re-open four previously closed drinking water wells in the Arroyo Seco near the Jet Propulsion Laboratory (JPL).  
*Image Credit: NASA/Battelle*

**PHOTO, LEFT**  
Assistant Administrator of the NASA Office of Strategic Infrastructure Olga Dominguez extended NASA's warm wishes to the City of Pasadena at the October 20 MHTS ribbon-cutting ceremony. Committed to cleaning up the groundwater that resulted from long-discontinued historic waste disposal practices at the Jet Propulsion Laboratory (JPL), NASA has now funded the construction and operation of three area treatment plants. See related story on Page 4.  
*Image Credit: Pasadena Water & Power*

**PHOTO, RIGHT**  
Pasadena Water & Power (PWP) General Manager Phyllis Currie and Pasadena Mayor Bill Bogaard, both at the photo's center, cut the ribbon officially dedicating the new Pasadena treatment plant as they are flanked on the left by Assistant Administrator of the NASA Office of Strategic Infrastructure Olga Dominguez and NASA Cleanup Project Manager Steve Slaten. To the right of the Mayor are, left to right: US EPA Region 9 Superfund Division Director Jane Diamond, PWP Water Director Shan Kwan, and California Assemblyman Anthony Portantino.  
*Image Credit: Pasadena Water & Power*

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NASA is Progressing

Para Más Información En Español,  
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# history

The groundwater chemicals being addressed by NASA at and near the Jet Propulsion Laboratory (JPL) include volatile organic compounds (VOCs) and the chemical compound perchlorate. The chemicals originated from long-discontinued liquid and solid waste disposal practices by the U.S. Army at the site in the 1940s and 1950s. Liquid wastes from drains and sinks were disposed of in brick-lined underground seepage pits – a waste management practice that was common at the time. NASA acquired the site in the late 1950s and is committed to cleaning up the groundwater to a level protective of public health.



Toasting the new Monk Hill Treatment System (MHTS) with clean water from the NASA-funded Pasadena treatment plant are foreground to background and left to right, California Assemblyman Anthony Portantino, Pasadena Water & Power (PWP) Principal Water Engineer Gary Takara, PWP Water Engineering Manager Brad Boman, Pasadena Mayor Bill Bogaard, NASA Cleanup Project Manager Steve Slaten, US EPA Region 9 Superfund Division Director Jane Diamond, Assistant Administrator of the NASA Office of Strategic Infrastructure Olga Dominguez, and PWP General Manager Phyllis Currie. *Image Credit: Pasadena Water & Power*



New pumps are shown at a booster station near the Ventura well, one of four previously closed and now upgraded wells in the Arroyo Seco. *Image Credit: NASA/Battelle*

## MHTS Up and Running, continued from page 1

The wells -- Arroyo Well, Well 52, Ventura Well, and Windsor Well -- tap an aquifer beneath the Hahamongna Watershed Park in the Arroyo Seco. That aquifer is called the Monk Hill Sub-Basin of the Raymond Groundwater Basin. Pasadena closed the wells between 1985 and 1990 when elevated levels of VOCs were discovered in nearby groundwater. In 1990, a NASA-funded closed aeration carbon filter treatment system was installed to remove VOCs from the groundwater. Between 1997 and 2002, when perchlorate in the water was detected for the first time at elevated concentrations, the wells were closed again.

PWP and NASA collaboratively oversaw the design and construction of the new system to remove perchlorate and VOCs from these four wells so that the City could apply to the state to reopen the wells. As part of the MHTS, the four wells were also upgraded to improve their overall infrastructure and their ability to extract groundwater for treatment at the new plant.

NASA assisted PWP in preparing for a February 24 California Department of Public Health (DPH) public hearing on DPH's then-proposed decision to allow PWP to serve drinking water from the four wells, and three weeks later, the permit was issued.★

## Five-Year Cleanup Review is Underway

NASA, in conjunction with the U.S. Environmental Protection Agency, is conducting a "Five-Year Review" of the groundwater cleanup remedies undertaken at and in the vicinity of the Jet Propulsion Laboratory (JPL) to determine if those remedies continue to be protective of human health and the environment. The remedies include three groundwater extraction and above-ground treatment systems to remove volatile organic compounds (VOCs) and perchlorate from the groundwater.

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## Monk Hill Treatment System is Clean and Green

NASA worked closely with Pasadena Water & Power (PWP) and solicited involvement with Windsor Reservoir neighbors in the design and construction of a treatment system that is as environmentally sound and as energy-efficient as possible.

In the months leading up to the start of construction, NASA sought public input on landscaping elements that would assist in having the plant better blend into the residential area. Suggestions made by members of the public were incorporated into the final design and landscaping. Additionally, to conserve water resources, the finished site is now landscaped with native, drought-tolerant plant species.



Landscape elements at the MHTS include a line of trees and other plants along Windsor Avenue that help hide from view the system's storage tanks.  
*Image Credit: NASA/Battelle*

In the Arroyo Seco, NASA designed upgrades to the four previously closed wells, including their connection to modified pipelines and new high-efficiency pumps. This improves energy efficiency and reduces greenhouse gas (GHG) emissions by 123 metric tons per year, equivalent to the annual GHG of 23 passenger vehicles.



*Image Credit: NASA/Battelle*

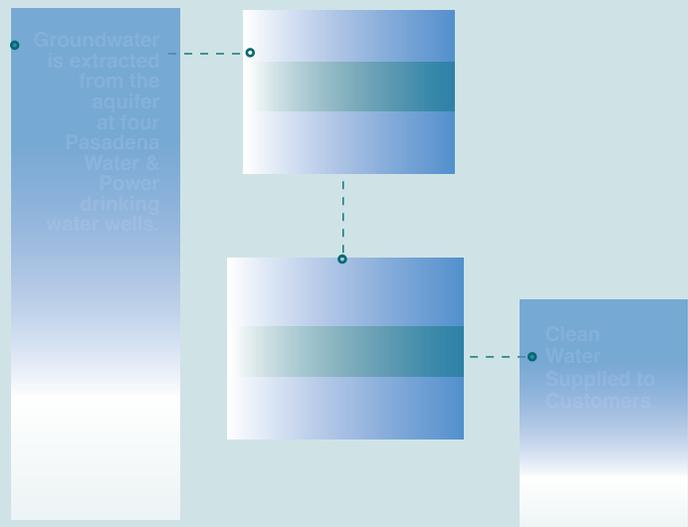
NASA also suggested and evaluated the use of solar energy for the project. The City followed through by installing more than 50,000 square feet of silicon photovoltaic panels on the Windsor Reservoir (see accompanying photo). The Windsor Solar Project, which went online at the end of May, should offset more than 20 percent of the electricity consumed by the treatment plant, PWP officials said.

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### Removing Groundwater Chemicals How does the MHTS work?

#### HOW IT WORKS

Groundwater is being treated at a rate of up to 7,000 gallons per minute in the MHTS, using an ion exchange system to remove perchlorate and a liquid-phase granular activated carbon (LGAC) system to remove volatile organic compounds, or VOCs. The ion-exchange technology uses perchlorate-selective resin beads to absorb or "capture" the perchlorate and remove it from the water to a non-detectable level. With LGAC, also known as a carbon filter process, water passes through a tank containing carbon particles. VOCs in the water attach to the carbon. After enough VOCs attach to it, the carbon is removed and processed at a licensed facility off site, and fresh carbon is placed in the system. After the carbon filter process, the water is disinfected to prevent the growth of bacteria in the clean water stored (post treatment) in the Windsor Reservoir.



## On-Site and Off, NASA is Progressing on Cleanup

With the completion of the Monk Hill Treatment System (MHTS), NASA has taken another step forward in the cleanup of groundwater in the vicinity of the Jet Propulsion Laboratory (JPL).

NASA has now completed an interim three-plant treatment strategy to remove groundwater chemicals from beneath JPL and from beneath areas adjacent to JPL. Existing NASA-funded treatment plants have been removing groundwater chemicals from the source area on JPL and from the farthest reaches of the area affected by the chemicals. The MHTS plant is roughly in the center of the affected area and is treating groundwater at a rate as high as 7,000 gallons per minute (gpm).

### Source Area Treatment System

NASA's source area treatment system -- at a rate of 300 gpm -- is addressing the groundwater area with the highest chemical concentrations. The on-site plant has been helping since 2005 to stop chemicals from moving off the JPL facility. Since commencement of the project to the end of October 2011, about 1,623 pounds of perchlorate have been removed from groundwater beneath JPL, using a fully contained fluidized bed reactor system with naturally occurring microorganisms that break down the chemical compound. Approximately 39 pounds of volatile organic compounds (VOCs) in the groundwater beneath the source area have also been removed, using the same liquid-phase granular activated carbon (LGAC) technology that is being used in the new MHTS.

### Lincoln Avenue Water Company (LAWC) System

The LAWC system, operating near two LAWC production wells at a rate of up to 2,000 gpm, continues removing chemicals from the leading edge of the plume. This system also allows LAWC to continue to provide clean drinking water to its customers. Using ion exchange technology, more than 767 pounds of perchlorate had been removed from groundwater through the end of October 2011. Using LGAC technology, the LAWC system has also removed close to 175 pounds of VOCs from LAWC groundwater since system startup in 2004.★

for more

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A link to the NASA Cleanup Project Web Site may be found on computers at the

#### Pasadena Central Library

285 E. Walnut St., Pasadena, CA 91101  
(626) 744-4052

Hard copy information repositories for the Cleanup Project may be found at the

#### Altadena Public Library

600 E. Mariposa Ave., Altadena, CA 91001  
(626) 798-0833

#### La Cañada Flintridge Public Library

4545 Oakwood Ave.  
La Cañada Flintridge, CA 91011  
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# GETTING HERE FROM THERE

# 1980-2011

## The Monk Hill Treatment System

## · timeline

### Early 1980s

Pasadena Water & Power (PWP) begins detecting significant levels of volatile organic compounds (VOCs) in its groundwater sources.

### Between 1985 & 1990

Four municipal wells in the Arroyo Seco are closed during this period.

### 1990

Pasadena installs a NASA-funded closed aeration with carbon treatment system to remove the VOCs from the groundwater near the four closed wells.

### 1992

NASA's groundwater monitoring leads to the JPL site being listed on EPA's National Priorities List (NPL). Under the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, and the 1986 Superfund Amendments and Reauthorization Act (SARA), NASA continues its process of environmental investigations and groundwater cleanup.

### Between 1997 & 2002

Elevated levels of perchlorate are detected for the first time in Pasadena wells near JPL, and the wells are closed again.

### January 27 & 28, 2004

NASA holds two public meetings to discuss its on-site treatment plant and NASA's proposed Removal Action for off-JPL groundwater. These meetings were followed by an extended public comment period on the proposed Removal Action.

### May, 2004, 2005, 2006, & 2007

NASA's Groundwater Cleanup Project staffs a booth at the JPL annual "Open House," greeting members of the public with information about the cleanup progress.

### March 29, 2005



NASA's Groundwater Cleanup Project holds a Community Information Session, an opportunity for the public to learn about and comment on progress being made in cleaning up groundwater beneath and near JPL.

### January 2006

The California Institute of Technology, as the contractor that manages JPL for NASA, and the City of Pasadena sign an Agreement in Principle for NASA to fund the construction and operation of a groundwater treatment plant for four closed City water production wells in the Arroyo Seco, southeast of JPL.

### May 3, 2006

NASA holds a public meeting to discuss its Proposed Plan for cleanup of the Monk Hill Subarea. This was followed by an extended public comment period on the Proposed Plan that continued through July 7, 2006.

### June 21, 2006



NASA sponsors an informal public meeting to encourage input from area residents as to where, specifically, to locate a groundwater treatment plant in Northwest Pasadena, construction plans for the plant, and its operation.

*Image Credit: NASA/M. Fellows*

### July 31, 2007

Federal and state regulators that oversee NASA's cleanup approve a NASA Interim Record of Decision (IROD) that calls for NASA to fund a treatment facility to be built on City-owned property adjacent to the Windsor Reservoir. Approval of the IROD allows the City of Pasadena to proceed with the permitting process to construct and operate the plant.

### June 10 - July 11, 2008

As the lead agency under the California Environmental Quality Act (CEQA), PWP prepares a Mitigated Negative Declaration (MND) for the Monk Hill Treatment Plant project. The document is distributed to the public and circulated for a 30-day review period beginning on June 10, 2008. The project is approved by PWP on July 10, 2008 and a Notice of Determination (NOD) is filed by PWP through the Los Angeles County Clerk's Office on July 11, 2008.

### June 18, 2008

NASA and PWP sponsor a Community Information Session on construction and landscape plans as well as aesthetics for the proposed Pasadena treatment facility. Some of the input from area residents attending that session and input solicited by NASA and PWP throughout this period of time was incorporated into the final landscape and plant design specifications.

### March 17, 2009



A groundbreaking ceremony is held kicking off plant construction for a new NASA-funded City of Pasadena Monk Hill groundwater treatment plant. The plant will remove perchlorate and VOCs from groundwater drawn by four formerly closed drinking water wells. Actual construction begins in April.

*Image Credit: Pasadena Water & Power*

### February 24, 2011

The California Department of Public Health (DPH) holds a public hearing to provide an opportunity for the public to make comments on the proposed decision to issue a permit amendment to allow PWP to serve drinking water produced by Arroyo Well, Well 52, Ventura Well, and Windsor Well, and treated at the new Monk Hill Treatment Plant.

### March 17, 2011

Exactly two years after breaking ground for construction of the Monk Hill Treatment System, the California DPH issues a drinking water permit to the City of Pasadena, allowing PWP to pump and distribute water from the four previously closed wells in the Arroyo Seco. ★

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# Groundwater CLEANUP

A Newsletter On NASA's  
Cleanup Efforts at the  
Jet Propulsion Laboratory

## FIVE-YEAR CLEANUP REVIEW continued from page 2

The review is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law under which NASA is conducting all cleanup activities associated with past practices at JPL. There are six components to the five-year review process: (1) community involvement and notification, (2) document review, (3) data review and analysis, (4) site inspection, (5) interviews with managers of the water providers where NASA has funded treatment systems, and (6) the protectiveness determination. The methods, finding, and conclusions of this review will be documented in a "Five-Year Review Report" that will be submitted to the EPA and made available in full to the public. A Five-Year Review Report summary fact sheet will also be posted on the water cleanup Web Site, <http://jplwater.nasa.gov>.

NASA expects the Five-Year Review to be completed by December with a final report to be issued in February 2012. At that time the report will be posted on the NASA Groundwater Cleanup Program Web Site at <http://jplwater.nasa.gov> and in hard copy form at the Altadena Public Library, the La Cañada Flintridge Public Library, and the JPL Employee Library. At the Pasadena Central Library, those interested can link from any library computer to the online Information Repository. Questions about the report can be addressed to the NASA Manager for Community Involvement Merrilee Fellows at (818) 393-0754 or by email at: [mfellows@nasa.gov](mailto:mfellows@nasa.gov).★



## Saving Trees

NASA is now printing its newsletter on 30 percent "post consumer waste" which means 30 percent of the paper is completely recycled. In addition, this newsletter has been printed using 100 percent vegetable oil-based printing inks. You can help us save even more paper by choosing to receive our materials via email. Also, if you no longer wish to receive any communications from us in any form, please let us know by sending an email message addressed to [mfellows@nasa.gov](mailto:mfellows@nasa.gov).



## MHTS IS CLEAN AND GREEN continued from page 3

More than 95 percent of the plant's construction waste materials were recycled, including 744 tons of rock, 48 tons of concrete, 3,144 tons of soil, eight tons of steel, and five tons of mixed debris.

NASA also negotiated with Pasadena and the construction contractor to remove post-filtration cartridge filters, resulting in a capital cost reduction of approximately \$400,000.

There will be no sanitary sewer discharges associated with the MHTS. Instead, NASA's design virtually eliminates utility or waste water from the periodic flushing and backwashing produced at the MHTS. Instead of wasting about 100 acre-feet of utility water that will likely be generated by the system each year, that water will itself be treated at the plant and then discharged to the Arroyo Seco spreading basins. More than 99 percent of the clean water will then drain back into the aquifer, thus conserving a valuable local resource.★

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