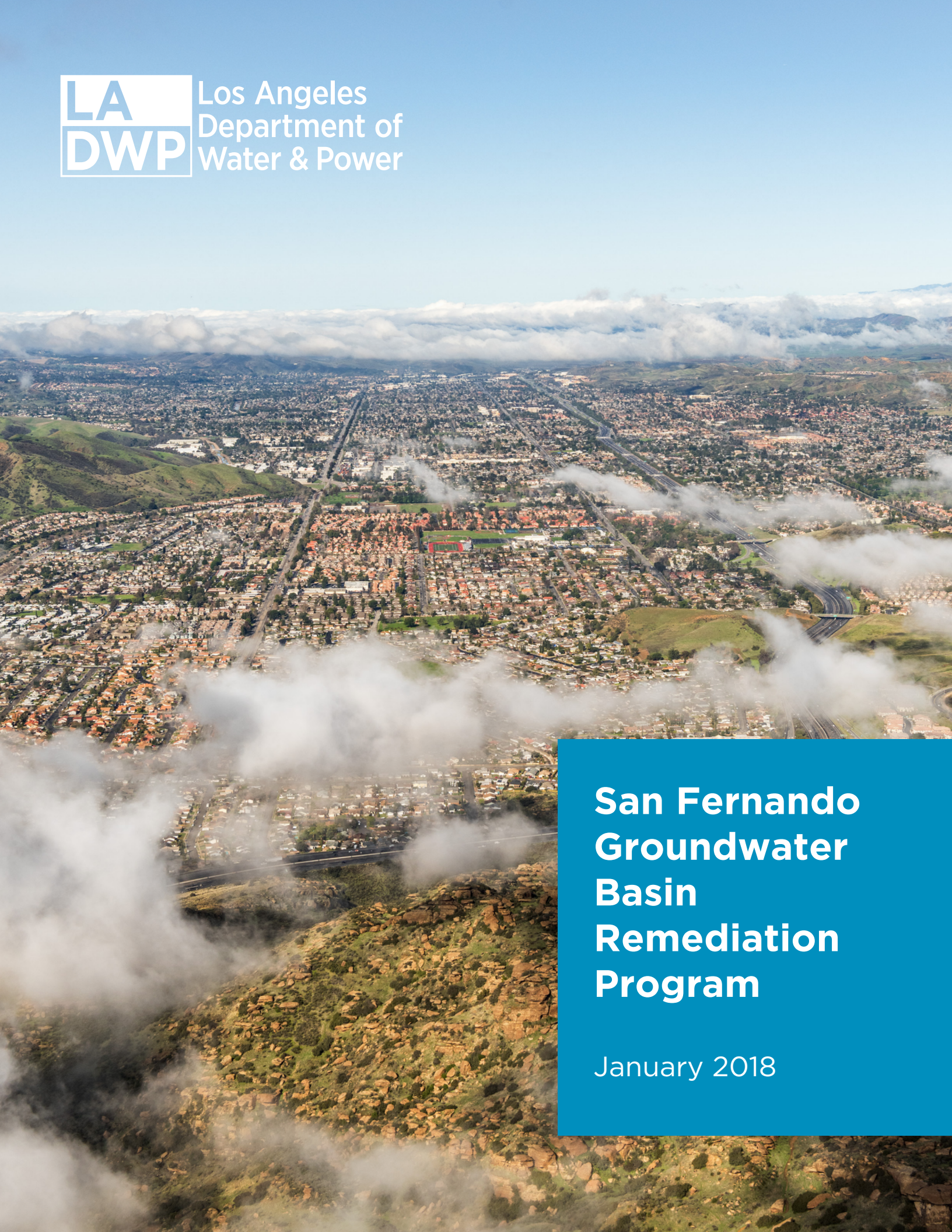


Los Angeles Department of Water & Power

San Fernando Groundwater Basin Remediation Program

January 2018

The SFB provides groundwater throughout the San Fernando Valley and the City of Los Angeles.

The San Fernando Basin

Beneath the San Fernando Valley is a large body of groundwater held in the San Fernando Basin (SFB), a collection of aquifers made of gravel, sand and silt that store water underground. The SFB is one of the basins in the Upper Los Angeles River Area (ULARA) watershed and is recharged with rain water from the valley and surrounding mountains. The groundwater in the SFB is one of several critical water resources capable of providing drinking water throughout the City of Los Angeles. As a local source of water, the SFB could provide as much as 14% of the total drinking water supply in a normal year and has provided as much as 30% during extended dry periods when imported water has been less available.

The City of Los Angeles encompasses an area of 465 square miles with a population of nearly 4 million residents and an annual average water consumption of approximately 215 billion gallons. The daily average per capita water use is 104 gallons, about 4 bathtubs worth of water per person per day (Sustainable City pLAn, 2017).

The SFB serves as a major source of groundwater (Urban Water Management Plan, 2015), with a total of 115 groundwater wells in nine well fields in the SFB. A well field is an area containing wells drilled into an aquifer to produce usable amounts of water. Leaks and spills of contaminants from commercial, agricultural, and industrial use near a well field can seep through the ground, coming into contact with groundwater, and cause the City of Los Angeles to shut down wells. Currently, there are only about 30 wells in reliable operation. This reduction in reliable wells is due in large part to groundwater contamination, resulting in a 50% reduction in historical groundwater supply.

What is LADWP doing and why is it important?

The Los Angeles Department of Water and Power (LADWP) is undertaking a program - the SFB Remediation Program (Program) - to respond to the historical releases of hazardous substances, and restore and protect the full use of the SFB as a source of water, one of the largest contaminated groundwater areas in the United States.

The specific remediation objectives of the SFB Remediation Program are to:

- Protect the public health and environment by reducing exposure to contaminants.
- Prevent the migration of contaminants to prevent further impact to local groundwater.
- Remove contaminants from groundwater in the vicinity of the impacted basin.
- Restore the beneficial use of the SFB and the capacity for its planned use.

The efforts contemplated by LADWP for remediation of the basin will be transformative for the City as they would have the co-benefit of:

- Enhancing sustainability by reducing reliance on imported water.
- Strengthening water supply resiliency in case of a major earthquake.

In the event of a drought or an emergency, and as the City of Los Angeles becomes less dependent on imported water, the availability of local groundwater becomes more important. The City plans to obtain 50% of water locally by 2035 (Sustainable City pLAn, 2017). Appropriately responding to the contamination and thereby

restoring the historical capacity and full use of groundwater in the SFB will help the City meet its goals by supporting the ability to recharge and store recycled water and storm water in the aquifers of the SFB. The mission and purpose of LADWP is to provide a safe supply of drinking water to the City.

What is CERCLA?

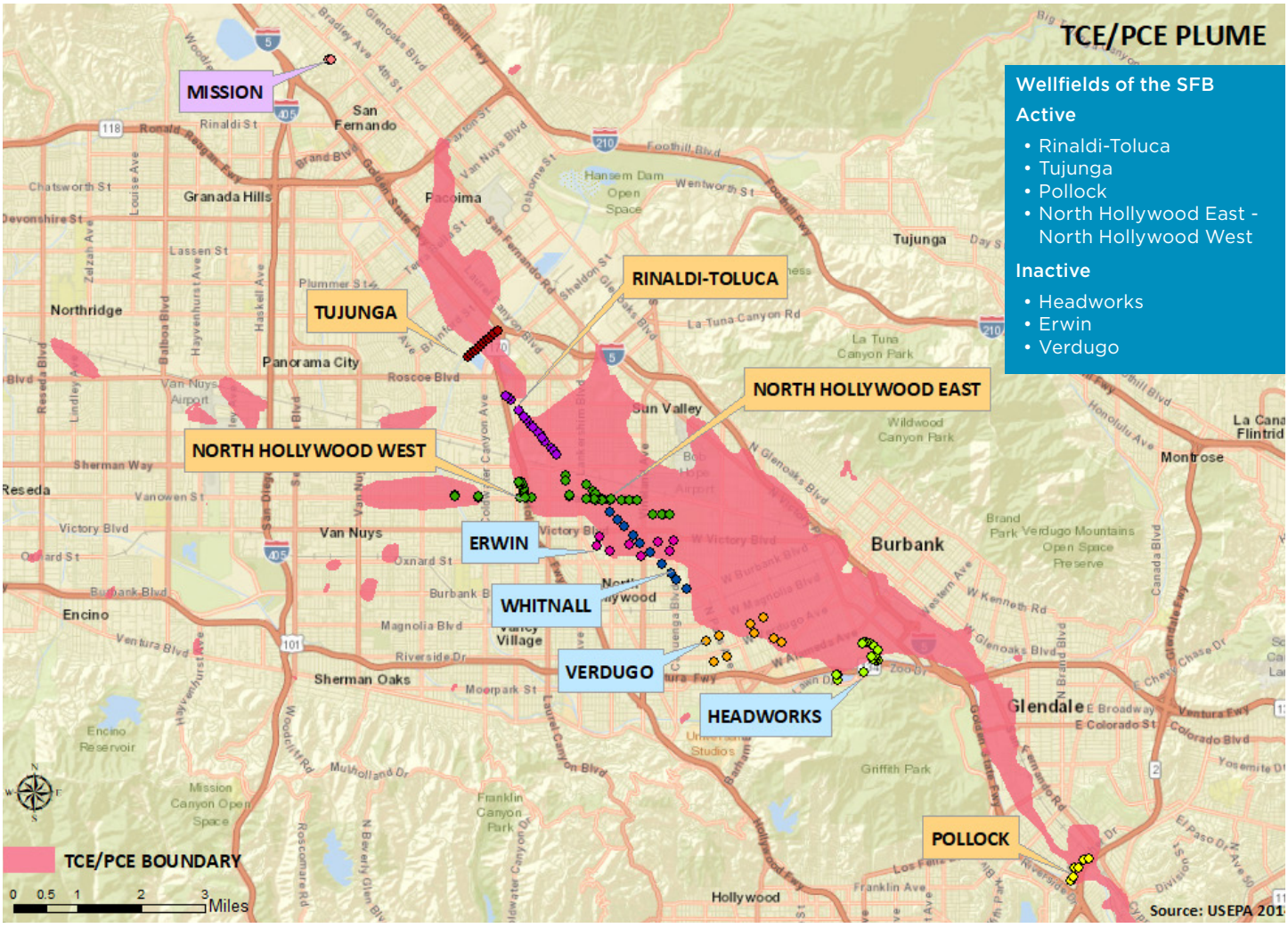
The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, is an environmental law enacted in 1980 that establishes processes for response actions, enforces accountability for potentially responsible parties, and promotes community involvement and long-term protectiveness. The Program will result in a CERCLA-quality groundwater cleanup that will protect human health and the environment, and restore the beneficial use of the SFB as a natural resource. Data will be gathered and analyzed to develop alternatives for response actions. The Program will prepare Remedial Investigation and Feasibility Studies (RI-FS) that present each of the proposed response actions. After seeking public input through a consultation process, the proposed response action plans are released.

All detailed studies and Program updates are available at ladwp.com/remediation.

Useful Definitions	
potentially responsible parties (PRPs)	An owner/operator at the time of disposal, a current owner/operator, a transporter, or an arranger for the disposal, treatment or transportation of a hazardous substance.
response action	A corrective action or project for clean-up; can be classified as remedial (generally longer-term response actions) or removal (generally shorter-term response actions, immediate actions).
Remedial Investigation/Feasibility Study (RI-FS)	A study intended to determine the nature/extent of the problem, establish cleanup criteria, identify alternatives, and support the technical/cost analyses of alternatives; and evaluate alternatives from a technical, environmental and cost effectiveness perspective, make recommendations, prepare conceptual design and cost estimate.
Interim action	An action which may be long in duration, but which addresses a limited area or media to reduce the threat to the public health, until a final response action is chosen.
Operable Unit	One of a number of distinct areas that may address a geographic area, specific problem or require a specific action.

What is the extent of contamination?

The map illustrates the extent of contamination and the area of impacted groundwater in the SFB as mapped by the United States Environmental Protection Agency (EPA) in 2014. This area is described as a “contaminant plume”. A contaminant plume begins at the source of contamination and can become widespread, depending on the properties of contaminants and aquifer characteristics. The colored dots are LADWP wells, which are within or near the plume mapped by EPA. The plume shows two of the main SFB contaminants and is roughly twelve miles in length.



Plume of Major Contaminants: Trichloroethylene (TCE) and Perchloroethylene (PCE) (EPA 2014)

What contaminants are present in the SFB?

Contaminants of Concern (COCs)
Volatile organic compounds (VOCs), such as TCE and PCE, account for the majority of this groundwater contamination among other contaminants in several well fields.

Sources of Contamination
Groundwater contamination in the SFB was likely caused by improper storage, handling, and disposal of hazardous chemicals used in commercial and heavy industrial activities dating back to the 1940s. Potentially responsible parties are still being identified.

Contaminant of Concern	Uses and Occurrence	Human Health Risks
TCE (Trichloroethylene)	Starting chemical for refrigerant HFC-134a; adhesives, lubricants, paints, and pesticide; Helps to remove greases, oils, fats, waxes and tars.	Carcinogen; Can cause cancer upon inhalation or ingestion; Targets the cardiovascular and immune systems.
PCE (Perchloroethylene)	Dry cleaning agent, some consumer products (e.g. shoe polish), starting material for making other chemicals.	Likely to be a carcinogen; Exposure may result in nervous and reproductive system effects.
1,1-DCE (1,1-dichloroethylene)	Packaging materials, flexible films and flame-retardant coatings for fiber and carpet backing.	Possible human carcinogen; impacts the liver by exposure via either ingestion or inhalation.
Perchlorate salts	Mainly used in propellants, bleach and some fertilizers.	Not considered to be a carcinogen; Impacts the endocrine system, particularly the thyroid.
1,4 Dioxane	Paint strippers, dyes, greases, varnishes, and waxes; Impurity in antifreeze, deicing fluids and some consumer products.	Likely to be a carcinogen; Potential tumor sites are gastrointestinal, reproductive, respiratory and urinary.
Hexavalent Chromium	Exists naturally in the environment and in stainless steels for anti-corrosion properties; Industrially used in electroplating, textile dyes, and leather tanning.	Known human carcinogen; Can cause cancer upon inhalation and oral exposure.
Carbon tetrachloride	Dry cleaning agent, degreaser, refrigerant, fire extinguisher; Chlorofluorocarbon feedstock.	Likely to be a carcinogen; Long term exposure results in liver and kidney damage.

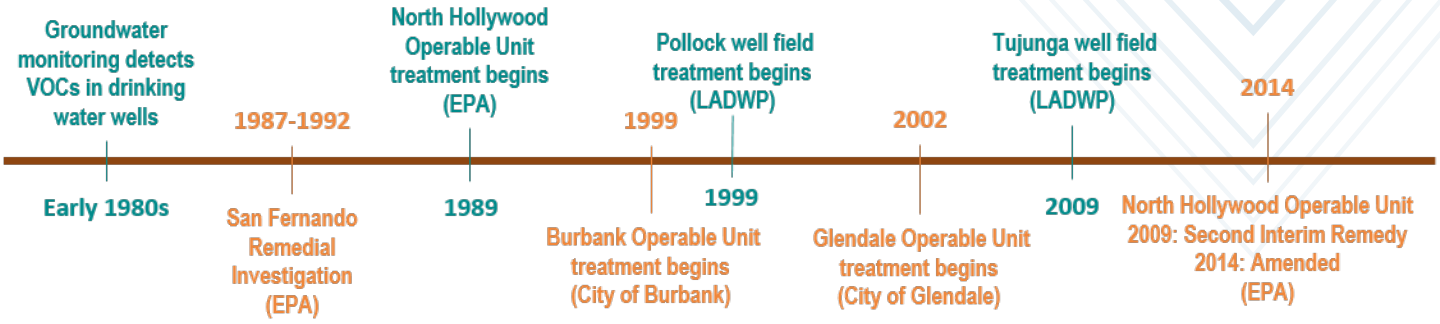
What previous remediation efforts have been made to restore the SFB?

The EPA conducted a comprehensive remedial investigation that characterized and revealed the VOC contamination of the groundwater in the San Fernando Valley, starting in the late 1980s. Efforts to clean up the contaminated groundwater were then initiated through the EPA's Superfund program. Local, state, and federal agencies along with the cities of Los Angeles, Glendale and Burbank have been making efforts to identify and remediate the contamination, shown in the timeline on the following page.

Changing groundwater conditions and additional VOC contamination in the aquifer hampered the remediation and containment of the VOC plume near North Hollywood. The contamination continued to spread to other areas of the SFB and forced LADWP to shut down groundwater wells previously serving drinking water to Los Angeles residents. In response to this, EPA has undertaken new containment and remediation efforts that are anticipated to contain concentrated areas of the contaminant plumes as well as other areas of contamination in the vicinity of other LADWP wells. Although progress has been made in identifying, containing, and removing contaminants, full containment has not been achieved and some contaminant plumes continue to expand.

LADWP granular activated carbon treatment at Tujunga Well Field (2009)

Without comprehensive containment and groundwater basin remediation, the City will lose the ability to use this valuable local groundwater resource.



State and Federal Agencies Involved	
Agency	**Responsibility**
United States EPA	To protect human health and the environment by writing and enforcing regulations baed on laws passed by Congress www.epa.gov
State Water Board – Division of Drinking Water	To regulate public drinking water systems, oversee water recycling projects, support and promote water system security https://www.waterboards.ca.gov
State Water Board – Division of Financial Assistance	To administer the implementation of the State Water Board's financial assistance programs that includes funding for construction of facilities, remediation, watershed protection and pollution control projects.
State Water Board – Los Angeles Regional Water Quality Control Board	To preserve, enhance and restore the quality of California's water resources for the protection of the environment, the public and all beneficial use.
California Department of Toxic Substances Control	To protect the public and environment form harmful effects of toxic substances by restoring contaminated resources, enforcing hazardous waste laws, and reducing hazardous waste generation www.dtsc.ca.gov

LADWP granular activated carbon treatment at Pollock Well Field (1999)

Current and Future Remediation Efforts by LADWP

Characterization of Groundwater Contamination

LADWP undertook an extensive well field characterization and treatment evaluation from 2009 through 2015. The 6-year $11.5 million study characterized the SFB contamination. Twenty-six new monitoring wells were installed and sampled in support of the groundwater characterization at an additional cost of approximately $22 million. These new monitoring wells, along with a network of more than 70 existing wells, were used to characterize groundwater quality in the Northern portion of the SFB and to help develop a conceptual site model for the basin. These wells continue to be sampled in the area containing the City's most productive well fields:

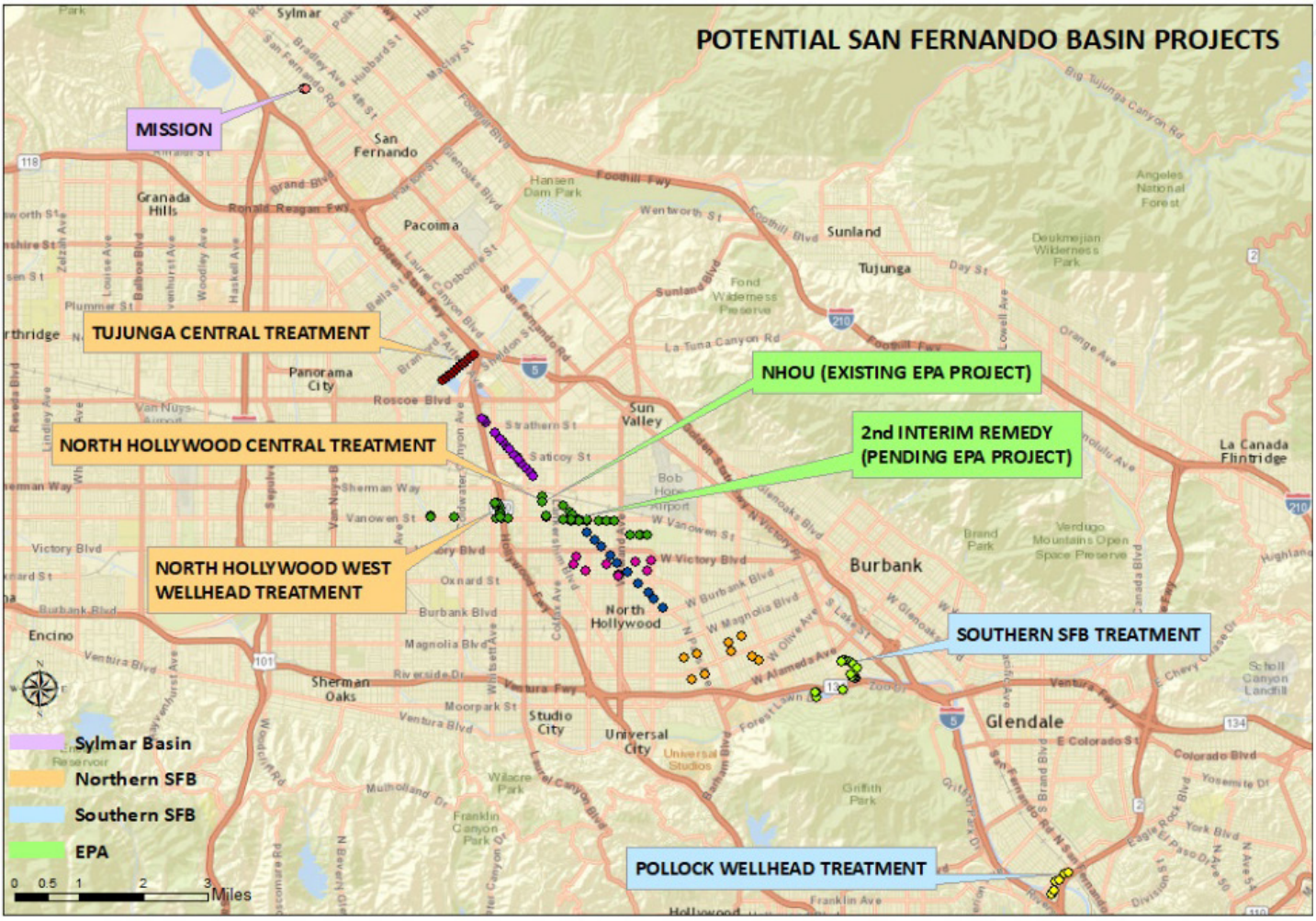
- North Hollywood West
- Tujunga
- Rinaldi-Toluca
- North Hollywood East

Efforts are also underway to better characterize contamination of the Southern SFB well fields along the River Supply Conduit (RSC) pipeline, including the areas near the Pollock well field.

Water quality data analysis and well field characterizations serve as an integral part of the Program. They allow for the development of preliminary cleanup goals and objectives. Furthermore, they provide information for screening and evaluating response actions and remedial actions. LADWP plans to complete one or more response actions for each well field in substantial compliance with the National Contingency Plan (NCP). The NCP provides the organizational structure and procedures for responding to releases and threatened releases of hazardous substances, pollutants, and contaminants. Complying with NCP is important as it ensures that the public is informed and engaged in the process, and can lead to holding potentially responsible parties accountable for the contamination. More details on the Superfund Cleanup Process can be found at epa.gov.

US EPA North Hollywood Operable Unit (1989)

Potential Treatment Facilities and Projects in the SFB



Planning and Implementation

LADWP is taking action to address the risk to human health and the environment and to restore the groundwater in the SFB. Additional work is required, and is ongoing, to evaluate the appropriate response actions. The potential projects (pending the completion of Feasibility Studies) and EPA proposed projects in this vicinity that are part of this potential approach are shown in the figure to the right. LADWP also plans to evaluate ways to minimize the volume of water that requires treatment by prioritizing pumping from wells in areas with higher levels of contamination to minimize the potential spreading of contamination to wells that currently do not require treatment. LADWP aims to initially focus on response actions within the North Hollywood West, Rinaldi-Toluca, and Tujunga Well Fields where the beneficial use of the SFB is most impacted.

NHW Well Field Treatment Facilities Construction Begins (2017)

Inside Look at the Program's Progress

LADWP completed an Interim Remedial Investigation and Feasibility Study (RI-FS) for the North Hollywood West (NHW) Well Field in December 2016. Three remediation alternatives were identified after an initial screening of technologies and response actions for the removal of 1,4 -dioxane: (1) no action, (2) purchase of an alternative water source, and (3) pump and treat contaminated groundwater. The pump and treat interim alternative was approved because of its long-term effectiveness and reliability. The approved alternative provides a high likelihood of reduced contaminant toxicity, mobility, and volume in groundwater. As a result, there will be a high likelihood of reducing risk to human health and the environment from potential exposure to contaminated groundwater. Using existing wells and infrastructure reduces the time, environmental impact, and cost required for implementation.

After holding public meetings, responding to public comments, and taking the public responses into consideration, LADWP adopted the plan and is implementing their proposed plan for an interim remedial action at NHW. Construction of wellhead treatment facilities at NHW is underway as shown in the Fall 2017 photo.

A Treatment System to Provide Safe Drinking Water

Pump and treat is a common and versatile method for cleaning up groundwater impacted with contaminants such as those identified at NHW. Groundwater is pumped from wells to an above-ground treatment system designed to break down or remove the contaminants. The above-ground treatment system selected for NHW contains Ultraviolet Advanced Oxidation Process (UV AOP) treatment with hydrogen peroxide to remediate the contaminants present in the NHW well field. Other parts of the treatment system include sand separators, cartridge filters, and granular activated carbon vessels. These treatment technologies may also be used for remediation of other well fields if found to be applicable and cost-effective to treat the groundwater contamination present at those sites.

Program Funding

Proposition 1, also known as "the Water Bond", was approved by voters in 2014. It is essential in providing up to 50% funding for significant investments to improve water reliability and help meet the long-term water needs of California. LADWP has estimated the total SFB Remediation Program cost to be approximately $600 million. LADWP received a Proposition 1 grant approval for $44 million dollars to remediate the 1,4-dioxane at the NHW well field. Proposition 1 planning grants have been preliminarily approved for approximately $6 million related to the North Hollywood Central, Pollock, and Tujunga Remediation projects. Future applications for approximately $250 million will be filed over the next few years to cover construction costs for these future response actions once they are defined. LADWP will continue to proactively seek local, state, and federal funding to offset potential impacts to rate payers.

Community Involvement

As an important part of NCP and CERCLA compliance, LADWP has engaged members of the community in conceptual discussions, milestones, and preliminary planning stages of the Program. The Community Involvement Plan is updated annually and available at ladwp.com/remediation. Outreach includes communications to individuals, organizations, and Neighborhood Councils throughout the City, public meetings at the Valley Plaza Library, and posting to the LADWP website (ladwp.com). Community members and stakeholders are encouraged to submit their comments and feedback or to request a meeting or presentation for their community group with the LADWP Community Involvement Coordinator at remediation@ladwp.com.

The Path Forward

LADWP is taking an accelerated approach to address the contamination. This is with the support and cooperation of many agencies and the citizens of Los Angeles. The project timeline below depicts how the various potential response actions could proceed in the Northern SFB and Pollock well fields. The milestones are pending completion of Remediation Investigation/ Feasibility Studies and selection of appropriate remedies.

ladwp.com/remediation