



# Cannon

Water Resources



# Reliable Responsive Solutions

## Relentless Pursuit of the *Elegant* Solution

**Elegant** ['ɛlɪɡənt] *adj*: simple, refined, appropriate, harmonious. We strive for it in all we do.

Our team of professionals includes:

- Civil Engineers
- Structural Engineers
- Environmental Engineers
- Mechanical Engineers
- Chemical Engineers
- Petroleum Engineers
- Process Engineers
- Electrical Engineers
- Surveyors
- GIS Specialists
- Technicians and Designers
- Automation and Controls Engineers
- Agricultural Engineers
- Landscape Architecture

*We have provided Reliable Responsive Solutions to clients for projects large and small since 1976.*

## Safety

Ensuring safety is critical; it's not just about keeping records and maintaining programs. We are committed to providing a safe and healthful workplace, incorporating "best practices" in our policies and procedures, and identifying and correcting risks. Our safety programs and commitment to safety are intended to foster an injury-free, productive workplace. We are proud to have earned the industry's highest safety rating, and our Experience Modification Rating (EMR) places us as a leader amongst our peers.

In addition to providing an enjoyable, safe, and healthful work environment, we encourage and support employee health and wellness through a variety of fitness-related company activities throughout the year.

*Safety and wellness are more than just policies at Cannon—they are cornerstones to how we work in the field and in our offices.*



# Water Supply

## Overview

- Transmission and Distribution
- Reservoirs and Tanks
- Treatment Systems
- Potable/Recycled Water Systems
- Wells/Pumps
- Regulatory Compliance
- Operations and Maintenance

## Services

- Pipeline Design
- Pump/Booster Station Design
- Well/Pump Design
- Tank/Reservoir Design
- Wellhead Treatment Design
- Contract Documents and Specifications
- System Master Planning and Modeling
- Cost Estimating
- Capital Improvement Program Development
- Fire Flow Analysis and Testing
- Energy Efficiency Studies
- Energy Audits
- Seismic Evaluations
- Urban Water Management Plans
- Drought Protection Plans
- Water Conservation Plans, Programs, and Systems
- GIS Mapping
- Construction Management
- Surveying and Mapping
- Program Management
- Automation
- 3D Laser Scanning
- Assessment District Engineering

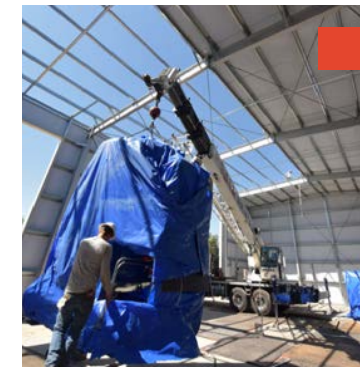
## Projects



### Water Main Replacement

*Santa Monica, California*

To ensure that Santa Monica residents continued to receive a dependable supply of water, the City replaced and upgraded existing cast-iron water mains with ductile-iron pipe. Cannon prepared surveys, plans, specifications, cost estimate, and construction support for the abandonment and removal of approximately 12,500 linear feet of deteriorated 6-, 8-, and 12-inch diameter cast-iron and asbestos cement pipe, as well as the installation of approximately 12,500 linear feet of ductile-iron pipe. Effective coordination of the surveying and geotechnical subconsultants kept the project on track and within budget.



### Ion Exchange Water Treatment for Barstow Wells

*Barstow, California*

Golden State Water Company (GSWC) owns and operates water systems throughout California. One of the wells in their Bradshaw Well Field in Barstow, California produced water with significantly high nitrate levels. To bring the total nitrate concentration levels within an acceptable range, GSWC installed an Ion Exchange (IX) Water Treatment System and blended the treated water with water from another well. GSWC hired Cannon to provide the civil, mechanical, structural, electrical, and instrumentation engineering efforts for this project. Cannon also provided construction management and observation services during buildout and installation of the IX system.



### Anaverde 3430 East Pump Station

*Palmdale, California*

Cannon designed a new pump station in Antelope Valley for Anaverde, LLC and Los Angeles County Waterworks District No. 40. This 1,200 gpm pump station is located in the 3430 Pressure Zone and pumps from two onsite 2.0 MG welded steel storage reservoirs into a closed-system pressure zone. Due to the construction of the development, the storage reservoir for the 3430 pressure zone was not accessible until after the final phase of the development. A VFD drive pump and motor were designed by Cannon and installed at this station.

The pump station continually monitors the pressures within the closed system and adjusts the outflow from the station to meet water system demands. The pump station houses one VFD drive pump, one additional operating pump, and one standby pump for emergencies.



### Seven New Wells; Arsenic Mediation; Water Production Facility

*Delano, California*

As part of the City's Arsenic Mediation Project, Cannon prepared a topographic survey and conducted boundary research, equipped and designed the pumps and discharge piping to connect to the existing distribution system, coordinated the design for a sodium hypochloride disinfection system, and provided electrical services to construct seven wells. Drilling these wells allowed the City to extract groundwater from arsenic-free zones and avoid the arsenic layer in the underlying aquifer, which had been influencing the older, existing wells. As such, the new wells improved the area's available supply of potable water.



# Wastewater

## Overview

- Collection Systems
- Treatment
- Reuse and Disposal
- Regulatory Compliance
- Operations and Maintenance

## Services

- Engineering and Design
- Master Planning and Modeling
- Sewer System Management Plans
- Feasibility Studies
- Assessment District Engineering
- Salt and Nutrient Management
- Infiltration/Inflow/Video Analysis
- Lift Station/Well Design
- Process Optimization
- Facility Design and Evaluations
- Operations and Maintenance Studies
- Metering and Flow Analysis
- Effluent Disposal Operations and Maintenance
- Energy Audits
- Surveying
- Construction Management
- Program Management
- Automation
- 3D Laser Scanning

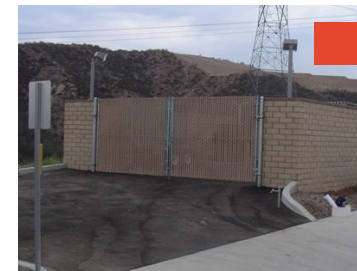
## Projects



### Wastewater Treatment Plant Upgrade and Master Plan

*McFarland, California*

Known as the “heartbeat of agriculture,” the City of McFarland operates a wastewater collection, treatment, and disposal facility (WWTP). Cannon assisted with completion of the WWTP’s 20-year master plan, which will transition the existing aerated lagoon system into an extended aeration activated sludge plant with biological nutrient removal. The plan master outlines approximately \$12 million in improvements that will be phased over many years. These improvements began with construction of a new headworks facility and an aeration basin for the activated sludge plant. Future work includes new clarifiers and RAS/WAS pump station, effluent pump station, and dewatering facilities (solar beds and screw press).



### Tank Farm Regional Lift Station and Sewer Mains

*San Luis Obispo, California*

The City of San Luis Obispo abandoned three existing sewer lift stations and replaced them with a new regional lift station and new sewer mains. The sewer mains range in length and diameter, including 6,750 linear feet of 16-inch, 250 linear feet of 12-inch, 4,000 linear feet of 10-inch, and 1,000 linear feet of 8-inch gravity sewer mains and 4,000 linear feet of 16-inch sewer force main. For this project, Cannon provided engineering, surveying, and construction observation.



### Los Angeles Avenue J Trunk Sewer

*Lancaster, California*

Numerous developments in the West Lancaster area relied on the extension of the Los Angeles County Sanitation District’s Avenue J Trunk Sewer. To maintain service for these new developments, Cannon prepared plans and specifications for an approximately 2-mile reach of 21-, 18-, and 15-inch VCP sewer located in Avenue L, between 60th Street West and 80th Street West. The installation of this new sewer line eliminated an existing sewage lift station operated by the City of Lancaster. Once the connections downstream were made, lift station flows were redirected, and the sewer was put into service.



### Sewer, Force Main, and Lift Station No. 5 Replacement Project

*Paso Robles, California*

The existing 13th Street gravity sewer main conveying wastewater from east to west and under Hwy. 101 was well beyond its remaining useful service life. With several long segments almost completely obstructed and the location and depth not conforming to Caltrans requirements, this sewer was in dire need of replacement and relocation. The City selected Cannon to evaluate existing wastewater flow patterns and develop a new means to convey flows to the City’s wastewater treatment plant. The solution included replacing existing Lift Station No. 5 and installing a new force main heading east to an existing trunk sewer in North River Road. This included using a 12-inch steel casing that was cast into the recently expanded 13th Street Bridge over the Salinas River. Cannon’s scope included topographic and right-of-way surveys, preparation of a preliminary design report, preparation of plans and technical specifications, construction cost estimates, and construction management services.



# Recycled Water

## Overview

- Non-Potable Reuse (Municipal, Industrial, Agricultural)
- Indirect Potable Reuse
- Treatment
- Transmission and Distribution
- Regulatory Compliance
- Operations and Maintenance

## Services

- Tertiary Treatment Evaluation and Design
- Disinfection Evaluation and Design
- Process Optimization
- Treatment and Distribution System Operations
- Water Quality Management
- Salt and Nutrient Management
- Permitting
- Customer Conversions
- Feasibility Studies
- Master Planning
- System Modeling
- Pump/Booster Station Design
- Pipeline Design
- Contract Documents and Specifications
- Cost Estimating
- GIS Mapping
- Energy Efficiency Studies
- Surveying and Mapping
- Construction Management
- Program Management
- Automation

## Projects



### GN3 Well Collection Recycled Water Main

*Glendale, California*

The City of Glendale Water & Power retained Cannon to design 1,300 linear feet of 12-inch diameter PVC C-900 recycled water main. As part of a Federally-funded groundwater remediation project, the new recycled water main conveyed high-chromium well water from an existing well along Grand Central Avenue to the City's new chromium removal plant on Flower Street. The scope of work also included preparing plans and specifications to EPA standards.



### Regional Recycled Water Plan

*San Luis Obispo, California*

The San Luis Obispo Integrated Regional Water Management Plan (IRWMP) identified recycled water projects as one of the key strategies for providing long-term water supply reliability in addition to diversifying its water supply portfolios, reducing reliance on surface water imports, and eliminating discharge of treated wastewater to the ocean. The County of San Luis Obispo selected Cannon to complete the Regional Recycled Water Strategic Plan as part of the Proposition 84 planning grant award. Completion of this plan supported the greater IRWMP efforts by prioritizing regional recycled water projects, enabling comparison of recycled water projects with alternative water resources, and identifying one or more projects for the third round of Prop 84 Implementation Grant funding. This plan allowed the County to upgrade and maintain infrastructure, as well as spend its money wisely.



### Water Reuse Transmission System

*San Luis Obispo, California*

The City of San Luis Obispo retained Cannon to design 41,000 linear feet of transmission main for the purpose of delivering highly treated recycled water to irrigate numerous parks, schools, golf courses, and greenbelts located within the City. Cannon's scope included topographic and right-of-way surveys as well as preparation of plans, specifications, cost estimates, and support during construction.



### Effluent Disposal Pipeline

*Delano, California*

As a result of rapid population growth, the City of Delano scheduled expansion of their existing Wastewater Treatment Plant. To aid in this effort, the City selected Cannon to provide engineering and surveying services for the design of their effluent disposal pipeline. The scope of work included the design of a 3-mile pipeline and a 30-acre percolation pond site. The percolation pond was constructed primarily for effluent disposal but with the secondary benefit of providing irrigation to adjacent agricultural land.

The scope also included design of irrigation turn-outs to serve the farms along the pipeline, construction plans and specifications, and cost estimates. Survey services included aerial topographic surveys, topographic surveys and record boundary surveys, as well as alignment analysis, utility research.



# Watershed Management

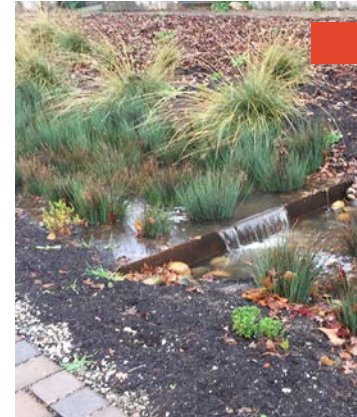
## Overview

- Stormwater
- Flood Control
- Groundwater Quality
- Low Impact Development

## Services

- System Engineering and Design
- Drainage Studies and Reports
- Floodplain Analysis and Mapping
- Floodway Analysis
- Watershed Evaluations and Mapping
- Hydrologic Analysis and Modeling
- Sustainable Design/Low Impact Development (LID)
- Storm Water Pollution Prevention Plans (SWPPPs)
- NPDES Permitting
- Retention/Detention Basin Design
- Erosion and Sediment Control Plans
- Grading and Drainage Design
- Bank and Shore Protection
- Master Planning
- System Master Planning/Computer Modeling
- Salt and Nutrient Management Plans
- Cost Estimating
- Surveying
- Program Management
- Construction Management

## Projects



### 12th & 21st Street Improvements and Stormwater Enhancement

*Paso Robles, California*

Faced with streets prone to flooding and poor pavement, the City of Paso Robles decided to employ a sustainable approach to manage stormwater runoff along 12th and 21st streets. As a pilot project for Green and Complete Street design elements, the City started with 21st street. Stormwater enhancements along both 12th and 21st streets included bioretention areas, daylighted creek channels, storm drainpipes/culverts, energy dissipation features, replacement of aging sewer lines, repaving with conventional and pervious pavement/paver systems, and engineered soil mixes and open channel plantings. Cannon was selected to complete the design and provide construction management services.

This innovative approach earned the City several awards and accolades by professional organizations.



### Highway 1 & 13th Street Drainage Improvements

*Oceano, California*

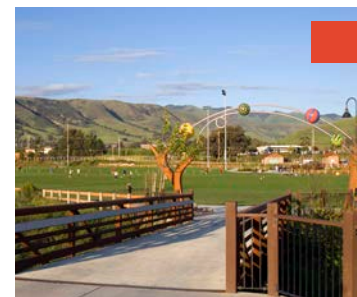
The intersections of 13th Street/Hwy. 1 and 17th-19th Streets/Hwy. 1 in Oceano were historically prone to flooding during significant rain events. To alleviate flooding and drainage issues, the County of San Luis Obispo retained Cannon to design new storm drain improvements. These improvements included new inlet structures, culvert pipes, junction structures, LID detention basins, and outlet facilities. Major considerations included hydrology and hydraulics, topography, property access/acquisition, railroad crossings, utility conflicts, environmental permitting, construction and O&M costs, and implementation schedule.



### Blosser Bioretention

*Santa Maria, California*

Using funds provided by a grant from the State Water Resources Control Board, and in partnership with the Central Coast Low Impact Development Initiative (LIDI), the City of Santa Maria pursued improvements to an existing drainage and infiltration facility located along Blosser Road. Successful implementation of the project includes reduced pollutant loads from stormwater leaving the site; LID features for water quality treatment and infiltration of stormwater into native soils; increased groundwater recharge; a new public park space; and engagement with the local community to increase public understanding of the project's benefits. Cannon was selected to provide engineering and design, landscape architecture, irrigation, and public outreach services.



### Damon Garcia Sports Facility Drainage Design

*San Luis Obispo, California*

The City of San Luis Obispo constructed a public sports facility on a 23.5-acre parcel of land. This facility includes multiple field configurations to accommodate numerous field sport activities, for which Cannon provided engineering design and survey services. Work included preparation of plans, specifications, and opinions of probable cost for grading, drainage, off-site improvements, infrastructure, and utilities. Cannon prepared multiple storm event floodplain analyses of more than 3,000 linear feet of Acacia Creek and more than 2,000 linear feet of Orcutt Creek, both of which traverse and bisect the park site.



# Construction Management

## Overview

- Streets & Highways
- Bridges
- Parking Lots
- Buildings
- Wastewater Treatment Plants
- Collection Facilities
- Water Distribution Systems
- Water Treatment Plants
- Storm Drainage Collection
- Systems and Facilities
- Parks
- Bikeways
- Trails

## Services

- Construction Management
- Contract Administration
- Construction Inspection
- Resident Engineering
- Structures Representative
- Construction Surveys and Staking

## Projects



### Complete/Green Street Construction Management

*Paso Robles, California*

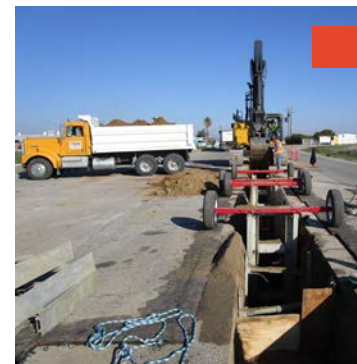
Historic runoff from the Mountain Springs Creek watershed, along with subsequent development of the urban areas over the course of several decades, resulted in frequent flooding, poor pavement, and inadequate facilities for bicycle and pedestrian traffic along 21st Street in Paso Robles. To improve the situation, the City of Paso Robles pursued a green/complete street and stormwater enhancement project along 21st Street. Cannon was selected to complete the design and provide construction management services. Cannon's construction management team oversaw improvements, which included stormwater bioretention areas, daylighted creek channel, storm drain pipes/culverts, energy dissipation feature, replacement of an aging sewer line, waterline reconstruction, repaving with conventional and pervious pavement/paver systems, engineered soil mixes and open channel plantings, and street trees.



### Wastewater Treatment Plant Upgrade Construction Management

*Guadalupe, California*

The City of Guadalupe's aging wastewater treatment facility did not meet revised State discharge standards. Through grant and local funding, the City had a compressed timeline and tight budget to complete the necessary upgrades. The City selected Cannon to provide construction management and inspection services. Because minimal shut downs of short durations of the plant were allowed during construction, a systematic planning and management process was required to accommodate continual operation of the existing facilities during construction.



### Phase I Airport Area Infrastructure Improvements

*Paso Robles, California*

The City of Paso Robles has continued to see great expansion around the Municipal Airport area. To support current and projected growth, the City identified and developed a phased replacement and upgrade of existing utilities throughout. Phase I of the Improvement Project included replacement of existing sewer mains, lift station, and various linear infrastructure improvements. The City hired Cannon to provide construction management and inspection services for the project. Cannon's scope of work included construction management, construction observation and special inspections, materials engineering, sampling and testing; along with close coordination with biological monitors due to the presence of sensitive habitat, including vernal pools.



### Well No. 2 and Biological Nitrate Removal Treatment Plant

*Glendale, California*

In 2013, Crescenta Valley Water District (CVWD) began to explore options to reactivate Well No. 2, which had been shutdown for more than 40 years due to high nitrate levels. After learning about new technology that could efficiently remove nitrates using a biological process, CVWD selected Cannon to provide construction management of the installation of the necessary facilities to bring Well No. 2 online. Cannon's scope of work included construction management and inspection services, record of construction files using ProCore, review and response to RFIs, management of contract change orders, and more.





## Cannon's Well Worth It Campaign

To know that almost one billion people on the planet live without access to safe, clean drinking water is mind-blowing. One in nine are without water.

What can we do?

As engineers, planners, and surveyors, we thrive on finding solutions to problems. We do that by designing and constructing needed infrastructure projects in our communities. However, to affect lives on a global scale requires a different level of effort. So in 2010 we created the "Well Worth It" Campaign partnering with the charitable organization, charity: water. Through this effort, we are raising awareness and funds for clean, safe water projects around the globe.

Want to know more about our efforts? Visit [WellWorthIt.CannonCorp.us](http://WellWorthIt.CannonCorp.us) for more information.

## Water Crisis Statistics



50% of patients  
have water-related diseases.



\$4 return in productivity  
for every \$1 invested in water & sanitation.



443 million days  
of school are lost every year.



6 hours per day  
are used to gather water.



768 million people  
do not have access to safe water.



158 gallons per day  
average American's water consumption.





Reliable Responsive Solutions<sup>SM</sup>

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*Toll Free: 866.750.8165*