



# WATER SOLUTIONS

## for Sustainable Mining

Effective water management is one of the mining industry's key challenges. At **Carollo Engineers**, we help mining companies achieve sustainable water management throughout all phases of the mine life cycle.

  
*Engineers...Working Wonders With Water®*





## Effective Water Management... Your Success Depends on It

Water is critical to mining, yet it is one of the most challenging resources to secure and manage. Supplies are limited, regulations are strict and increasing, and the pressure for reduced consumption, water quality protection, and responsible water management is high. Today more than ever, mining companies need sustainable and effective water management to succeed.

At Carollo, where **water is all we do**, we help mining clients solve complex water challenges throughout each stage of the mine life cycle. From water supply production and treatment to wastewater disposal and reuse, we provide interactive and cost-effective water management solutions to help mines thrive.

Our mining clients benefit from our customized approach to complex engineering design and construction management challenges. We tailor each solution to maximize water resources, drive productivity and reliability, and support long-term sustainability practices.

As your engineering partner, **we will focus on your water so you can focus on mining.**

Our goal is to serve as an integral member of your team to develop long-term and cost-effective strategies that help you address your triple bottom line, avoid expensive solutions, and ensure efficiency and compliance.



## Our Core Service Offerings Include:



**WATER**  
OUR FOCUS  
OUR BUSINESS  
OUR PASSION

- **Water supply planning & management** to optimize water resources and achieve maximum water value.
- **Comprehensive water use assessments** with plans for maximizing water usage, reducing risks, and avoiding costly impacts that could lead to unscheduled shutdowns.
- **Best value water & wastewater treatment solutions** through holistic design, end-to-end planning, and construction management offerings.
- **Cost-effective initiatives** for effluent recycling, water reuse, and gray water use to minimize impacts on fresh water supplies.
- **Full compliance** with regulatory and safety requirements.
- **Advanced treatment technologies** that meet your specifications for process water and water quality.
- **Creative public-private partnerships** for joint water usage and management opportunities.
- **Best management practices & strategies** for reducing water footprints, waste, and discharge.
- **Blue Plan-It® Decision Support System**, a fully customizable simulation and optimization modeling tool, to help our clients manage their complete water balance/systems to cost-effectively evaluate, optimize, expand, and modify your water solution needs.



For more than 85 years, we have dedicated ourselves to advancing the application of water science and technology for sustainable water supplies. With more than 25,000 public and private water and wastewater projects to our name, our engineers and scientists offer integrated, proven capabilities to meet your varying production needs.

## Safety Is Job Number One!

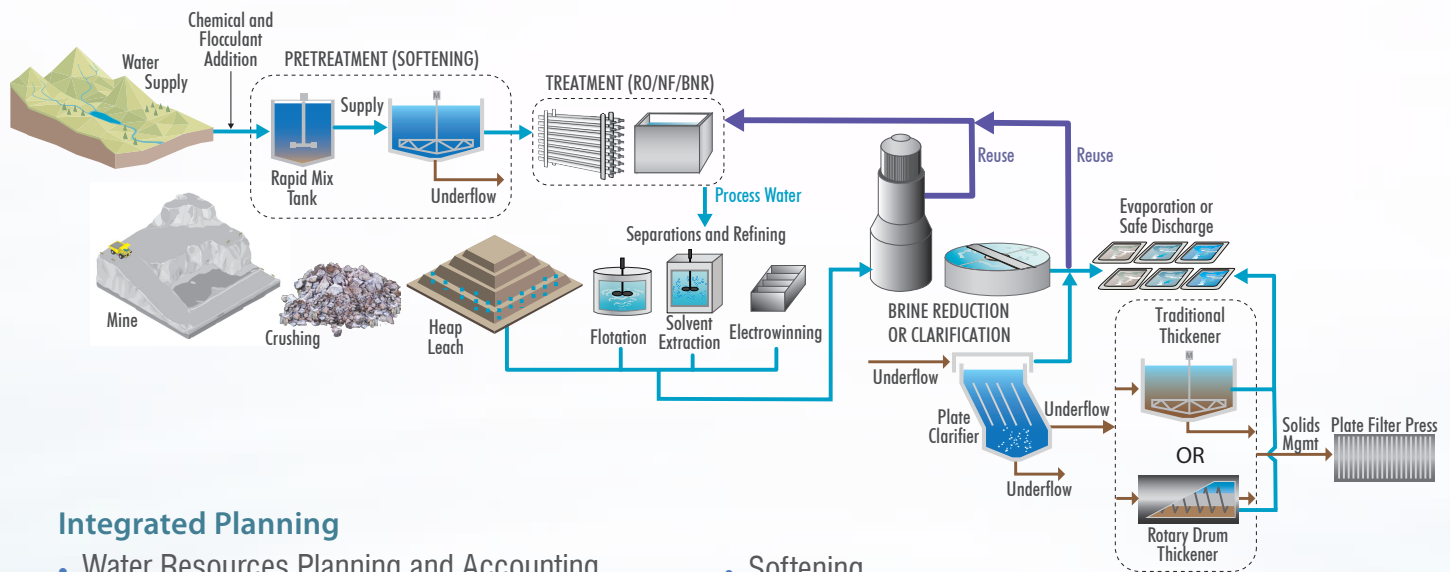
Carollo incorporates a safety mind set, not only in our design but during construction and operations. We fully understand the strong emphasis on safety and the high priority that the mining industry places on it.

Numerous key personnel maintain current MSHA certification and have completed operator-specific contractor training and site-specific safety training with various mining clients. At Carollo, we strive for continuous improvement of our safety policies, training, and safety culture, not just for the safety of our staff but for everyone on site. Our team adheres to MSHA guidelines and proactively identifies safety issues.



# Water Services for All Phases of the Mine Cycle

As a full-service water consulting firm, Carollo is equipped to address the varying and multi-faceted aspects of your water supply, treatment, reuse, and sustainability needs. We integrate experts from our specialized practice groups into each project to deliver comprehensive integrated water management solutions.



## Integrated Planning

- Water Resources Planning and Accounting
- Permitting and Regulatory Assistance
- Water Balance and Hydraulic Modeling
- Master Planning and Reuse Studies
- Stakeholder Consensus Building

## Research & Development

- Water Quality and Treatability Evaluation
- Optimization Studies
- Pilot and Bench-Scale Testing

## Water & Wastewater Treatment

- Pilot and Treatability Studies
- Planning/Positioning/Programming
- Design/Engineering/CA&I
- Start-up and Commissioning
- Alternative Delivery Expertise

## Treatment Technologies

- Arsenic Treatment
- Biological Treatment
- Brine Management and Brine Reduction

- Softening
- Low-Pressure Membranes
- Desalination (RO/EDR)
- Nitrate/Perchlorate Treatment
- Selenium Treatment
- UV Disinfection

## Water Reuse & Recycling

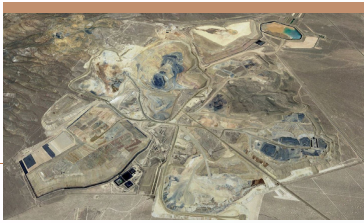
- Strategic Planning and Design
- Optimization Strategies for Economic Sustainability
- Permitting and Compliance
- Treatability Analyses

## Conveyance/Infrastructure

- Pipelines
- Pump Stations
- Infiltration Basins

## Business Solutions

- Financial Planning and Asset Management
- Information Management and Integration
- Energy Conservation



## COMPREHENSIVE MINE SITE WATER MANAGEMENT STUDIES AND DESIGN

Design of Large-Scale Arsenic Water Treatment Plants, Pump Stations, and Rapid Infiltration Basins

**Barrick Gold** | Nevada

Barrick Gold enlisted Carollo Engineers for the scoping, pre-feasibility, and feasibility studies to evaluate the treatment solution for the mine's approximate 50-mgd flows of dewatering water over the next 15-year planning horizon. Key elements of the project included effective treatment and design flexibility to address the changing water quality and variability in the mine plan, and arsenic treatment to meet Nevada Profile 1 standards.

Carollo conducted multi-year studies to define water infrastructure needs, including treatment, storage, transmission, and disposal for very large site-wide mine dewatering flows. Technology selection studies, supported by bench-scale and pilot-scale testing, provided clear guidance on optimum infrastructure solutions for the life of mine operations.

Carollo continues to support the project by providing design services for the treatment plants.



## MORENCI WATER TREATMENT PLANT

A Cost-Effective Design to Expand the Capacity of the Water Treatment Plant for the Mining Town

Morenci, Arizona

Carollo Engineers provided engineering design services for the expansion of the Morenci Water Treatment Plant. The water system serves Morenci, Clifton, and the Morenci Mine Facility.

Carollo developed a cost-effective solution to the area's challenge of limited water supply to support the growing community through an extensive Value Engineering and Cost Estimation process. The completed expansion increased the plant capacity to 6-mgd, providing a much needed increase to the clean water supply for this mining town.

The project scope included obtaining the Approval to Construct permits from the Arizona Department of Environmental Quality.



## MOLYCORP MINE PHOENIX PROJECT

Engineering Services to Support Cerium Removal Facility

**Molycorp, Inc.** | Mountain Pass, California

Carollo Engineers provided preconstruction services, including design of mechanical piping systems, hydraulic and thermal analysis, and pipe support design.

Our team also provided real time 3-D modeling of process systems to support fast-tracked procurement and construction activities.

Carollo's services included construction support for the installation of all process pumps, storage tanks, reactors, thickeners, filter press, bag packer system, conveyors, chlorine scrubber, process piping, and valves, including FRP, polypropylene lined carbon steel, welded carbon steel, stainless steel, and CPVC pipe ranging in size from 12 to 14 inches.



## ADVANCED WATER TREATMENT FACILITY

Subject Matter Expert for a New Advanced Water Treatment Facility

**Compañía Minera Antamina S.A. (Antamina)** | Lima, Peru

Antamina is currently proceeding with the design of a new \$62M advanced water treatment facility with membrane filtration and reverse osmosis. The facility will be treating tailings pond water downstream of a pretreatment process unit that removes heavy metals.

Our team members served as Subject Matter Experts during a Hazard and Operability workshop and the Value Improvement Process workshop for Antamina.

At the owner's request, Carollo provided review and oversight of the proposed technical solutions, including feedback on design criteria and life cycle cost analyses.



# Trusted Water Experts for Reliable Solutions



## UNPARALLELED EXPERTISE

Tough water challenges in mining require experts who know water. While other engineering firms cater to multiple markets, **water is all we do**. This singular focus means you will collaborate with the best and brightest water professionals who share your goals for effective water management. With our technical expertise and institutional knowledge, we put our clients ahead of the curve.



## INNOVATIVE, VALUABLE SOLUTIONS

At Carollo, no two projects are the same. We combine creativity, science, and technology with sound engineering to deliver cost-effective and value-laden outcomes. Our in-house research group and team of industry-leading engineers will evaluate your unique water requirements and provide answers that maximize productivity, minimize your water footprint, and help avoid costly issues.



## SUPERIOR SERVICE AND PERFORMANCE

*Engineering News Record* consistently ranks our firm among the nation's top 10 design firms for water and wastewater engineering design services. We achieve this status through our consistent commitment to quality service and our track record of delivering tailored, high-performing water management systems.

# ONE FIRM

## for All Your Water Management Needs

Carollo Engineers is an environmental engineering and management consulting firm that provides planning, design, and construction management services for sustainable water and wastewater solutions.

Our staff includes civil, structural, electrical, chemical, mechanical, environmental, and instrumentation and control engineers, as well as planners, financial analysts, architects, CAD designers, and construction managers – all experts dedicated to water.

Carollo's Research Group supports projects with cutting-edge treatment technologies, improved operations practices, and insights on major trends in the water and wastewater industry. Our Sustainability Group rounds out our services with strategies that integrate sustainable principles into all that we do.

We maintain 42 offices throughout the United States. Many of these offices are located in areas with a heavy concentration of mining activity, allowing us to provide local, dedicated teams to meet your water project needs.



# Carollo Engineers Office Locations Nationwide

## ARIZONA

Phoenix  
Tucson  
Yuma

## CALIFORNIA

Carlsbad  
Fresno  
Inland Empire  
Los Angeles  
Oceanside  
Orange County  
Roseville  
Sacramento  
San Diego  
San Francisco  
Sunnyvale  
Walnut Creek

## COLORADO

Broomfield  
Fort Collins  
Littleton

## FLORIDA

Broward County  
Miami  
Orlando  
Palm Beach  
Sarasota  
Tampa

## HAWAII

Honolulu

## IDAHO

Boise

## ILLINOIS

Chicago

## MASSACHUSETTS

Boston

## MISSOURI

Kansas City

## NEBRASKA

Omaha

## NEW MEXICO

Albuquerque

## NEVADA

Las Vegas  
Reno

## OKLAHOMA

Oklahoma City

## OREGON

Portland

## TEXAS

Austin  
Dallas  
El Paso  
Fort Worth  
Houston  
McAllen

## UTAH

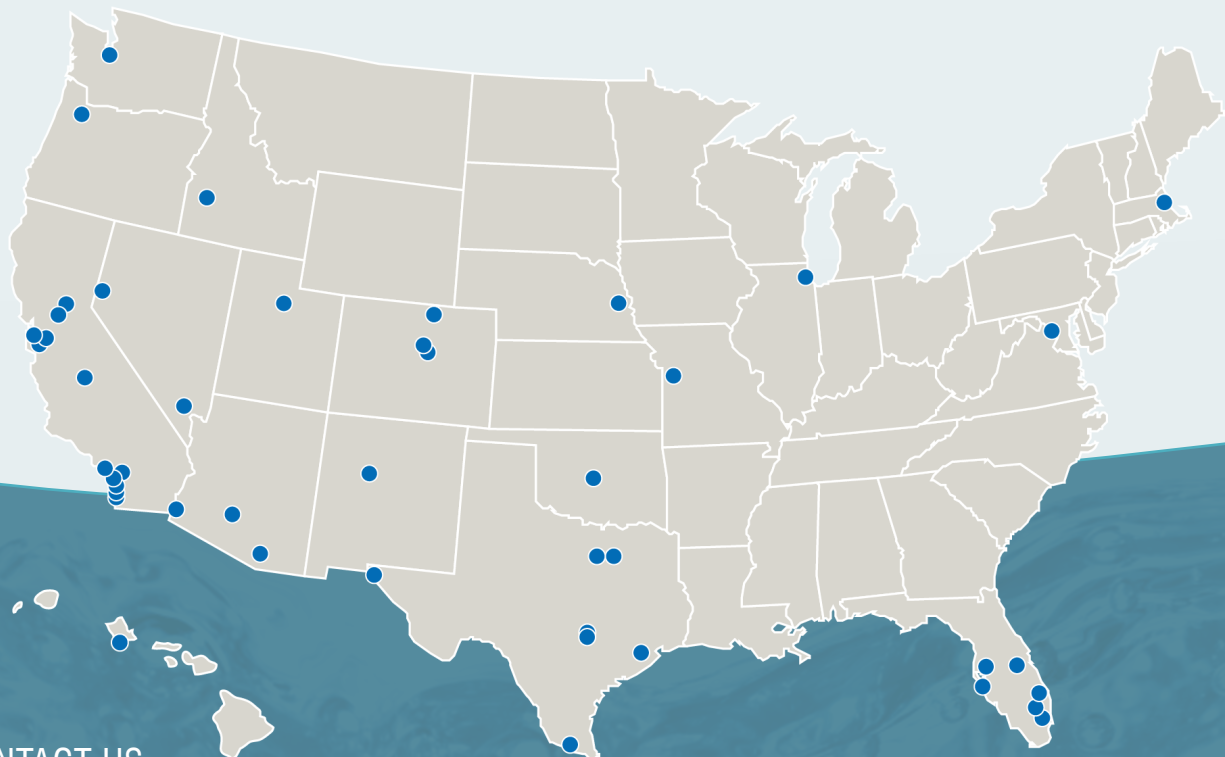
Salt Lake City

## VIRGINIA

Arlington

## WASHINGTON

Seattle



## CONTACT US

4600 E. Washington Street, Suite 500

Phoenix, Arizona 85034

P: 602.263.9500

F: 602.265.1422

[www.carollo.com/private-sector](http://www.carollo.com/private-sector)

  
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