WATER SOLUTIONS
for Industrial Operations

Engineering services to maximize the value of your water resources, reduce water risks, meet regulatory requirements, and enhance your bottom line.
Effective Water Management... Your Success Depends on it.

Water is essential to your processes and productivity, yet supplies are scarce, competition is fierce, and public scrutiny over water practices is severe. At Carollo, we work with industrial clients to solve complex water challenges through innovative solutions that drive productivity, facility and system reliability, and overall profitability.

For more than 85 years, we have dedicated ourselves to advancing the application of water science and technology. With more than 25,000 water and wastewater projects to our name, our engineers and scientists offer integrated, proven solutions to meet your financial and operational objectives, including:

- **Water supply planning, water use assessments, and master plans** to optimize water resources, achieve maximum water value, and reduce risks that could lead to plant shutdowns or costly impacts.
- **Best value solutions** end-to-end through holistic design, planning, and construction management offerings.
- **Advanced treatment technologies** that meet your specifications for process water and water quality.
- **Cost-effective initiatives** for water recycling and gray water use to minimize your impact on fresh water supplies.
- **Creative public-private partnerships** for joint water management opportunities.
- **Best management practices and strategies** for reducing water footprints, waste, and discharge.
- **Full compliance** with regulatory and safety requirements.
- **Blue Plan-It® Decision Support System** provides a fully customizable simulation and optimization modeling tool to help you cost-effectively evaluate, optimize, expand, and/or modify your water and wastewater systems.
Trusted Water Experts for Reliable Solutions

Water is our focus, our business, and our passion. Since all of our work focuses on water, we lead the way in offering technically sound, reliable planning, design, and construction related services that maximize value for all of your water related challenges. Carollo provides an experienced and skilled planning, design, construction support, start-up, and commissioning team. In addition, we can provide turnkey design-build-operate-finance solutions for any size project. As your trusted partner, we will manage your water so you can manage your core business.

UNPARALLELED EXPERTISE

Projects with complex water challenges 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 optimizing your water and wastewater systems, while minimizing your capital and operational costs. Our staff includes civil, structural, electrical, mechanical, and I&C engineers along with planners, architects, CAD designers, programmers, and construction managers. With our technical expertise and institutional knowledge, we put our clients ahead of the curve.

INNOVATIVE, VALUABLE SOLUTIONS

At Carollo, we combine creativity, applied research, and technology with sound engineering to deliver cost-effective and valuable solutions. 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 in-house research capabilities and team of industry-leading engineers allow us to evaluate your unique water requirements and provide answers that maximize productivity, minimize your water footprint, and help avoid costly issues. Our Sustainability Group rounds out our services with strategies that integrate sustainable principles into all that we do.

SUPERIOR SERVICE AND PERFORMANCE

Engineering News Record consistently ranks Carollo among the nation’s top 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. We take tremendous pride in helping some of the top industrial clients in the world solve their most important water challenges.
Industrial Water and Wastewater Process Management

Water Supply, Reuse, Disposal and Treatment
- Pilot and Treatability Studies
- Strategic Planning and Design
- Permitting and Compliance
- Construction Administration and Inspection
- SCADA Programming
- Start-up and Commissioning
- Operations

Water Supply Planning and Management
- Water Supply and Resource Evaluations
- Area Characteristic Studies
- Water Conservation Alternative Evaluations
- Resource Alternative Studies
- Water Use Assessments and Financial Planning
- Asset Management
- Information Management and Integration
- Electronic Operations and Maintenance Manuals
- Risk Evaluation and Management
- Construction Procurement and Management
- Alternative Delivery Expertise including Design-Bid-Build, Design-Build, and CMAR

Treatment Technologies
- Arsenic Treatment
- Biological Treatment
- Brine Management and Brine Reduction
- Softening
- Low-Pressure Membranes
- Desalination (RO/EDR)
- Perchlorate Treatment
- Selenium Treatment
- UV Disinfection

Research and Development
- Water Quality Evaluations
- Treatability Analysis
- Optimization Studies
- Pilot and Bench-Scale Testing
- Computational Fluid Dynamics
Our Industrial Services Group provides comprehensive services for managing potable water, process water, and wastewater at a variety of industrial sites. As one of the largest water-focused engineering firms in the U.S., we deliver innovative, quality solutions customized to meet your water resource management needs.

Diversified and Focused Services

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INDUSTRIES SERVED
AEROSPACE
BIOTECHNOLOGY AND PHARMACEUTICALS
FOOD AND BEVERAGE
PAPER AND PULP MANUFACTURING
SEMICONDUCTOR MANUFACTURING
DATA CENTERS
GENERAL MANUFACTURING
APPAREL AND TEXTILE MANUFACTURING
BRINE MANAGEMENT DESIGN PROVIDES COST-EFFECTIVE, FLEXIBLE SOLUTION

Confidential Semi-Conductor Client | Chandler, Arizona

Carollo provided design and construction management services for a new brine management system featuring pretreatment, high efficiency reverse osmosis, and thermal concentration technologies. The primary treatment train includes conventional lime softening using high-rate clarifiers, granular media filters, ion exchange, RO with energy recovery, a re-purposed brine concentrator, and brine evaporation ponds. The solids stream treatment features backwash equalization, thickened sludge storage, and solids dewatering using belt filter presses. The system also includes various chemical storage and feed systems, including lime silos and associated batching systems, caustic soda, carbon dioxide, polymer, magnesium chloride, ferric chloride, and hydrochloric acid.

The project team’s innovative design resulted in a solution that eliminates sewer discharge, produces high-quality permeate for reuse on-site and at the facility’s adjacent industrial campus, and provides long-term opportunities to discontinue or significantly minimize use of off-site brine ponds. It also offers the client and the City of Chandler operational flexibility for managing water quality and reducing O&M costs associated with chemical usage and solids handling.

REDDUCING COST BY TREATING AND REUSING INDUSTRIAL WASTEWATER

Confidential Pharmaceutical Client | South San Francisco, California

Currently, city water is used in several processes in one of the manufacturing and waste streams that is then discharged to the sewer. The major water users include the manufacturing and clean-in-place operation, cooling towers and steam boilers. The client undertook a study to identify and then evaluate potential opportunities to conserve city water and reduce discharges to the sewer.

Two treatment configurations were considered. The first was a membrane bioreactor (MBR) to aerobically treat the COD concentration of the wastewater stream and produce a filtered water that could be reused in the process. The second approach included the use of physical membrane barriers to separate the solids and organic matter from the water. In the latter concept, an initial microfiltration (MF) step removes most of the suspended material, and a downstream reverse osmosis (RO) step removes the organic material and the most of the remaining inorganic salts.

Capital and operating cost estimates were made for the two treatment configurations. The physical membrane treatment approach was estimated to cost less and had the added benefit of producing RO quality water allowing for further recycle, resulting in about a 3 year payback period. As a result of this study, the client embarked on bench scale testing to confirm the proof of concept treatment configuration and is moving to pilot testing of the MF/RO combination.
WATER OPTIMIZATION STUDY GUIDES DATA CENTER EXPANSION

**CyrusOne | Chandler, Arizona**

CyrusOne, a global provider of enterprise data colocation services, broke ground in 2012 with the first phase of its slated 1-million-square-foot data center. As part of its expansion planning, CyrusOne retained Carollo for a Water Optimization Conceptual Alternatives Study.

CyrusOne utilizes water-intensive Indirect Direct Evaporative Cooling (IDEC) Units for climate control. While the City’s allocated water was sufficient for the first phase of development, the company’s future phases call for additional water and/or more efficient water use to sustain operations.

Carollo evaluated potential internal and external mechanisms to maximize the utilization of the company’s IDEC technology based on available water quantity, water quality and discharge limitations. Services consisted of a site/utility plan, water quality analysis, water usage assessment, and treatment study with alternatives. CyrusOne is using the findings to secure and manage onsite water resources that support near-term and long-term expansions.

THIRTY YEARS OF INDUSTRIAL WASTEWATER SERVICES DRIVES PRODUCTIVITY AND SUSTAINABILITY

**Bell Carter Olive Company | Corning, California**

Carollo’s 30-year partnership with Bell Carter began with a wastewater processing master plan followed by a 1-mgd treatment plant, state-of-the-art direct membrane filtration system, pilot testing, feasibility studies, permitting assistance, among other engineering consulting services provided over the decades.

In 2012, Carollo designed an innovative system to reduce the company’s reliance on potable water supplies. Historically, the company used more than one million gallons of water daily to store, process, cook, and cool their product. Carollo redesigned its wastewater system to feature a novel cooling and treatment concept, which was retrofitted into a historic packing facility that is highly site constrained. The design involved a caisson-style pump station within an existing building to collect flows from the retort cookers and return them to the cooling loop sump and heat exchanger loop. This approach resulted in a recycling process that saves 54 million gallons of water annually. Bell Carter now reuses more than 80 percent of water used at its primary processing facility.

With Carollo’s services, Bell Carter continually meets its wastewater processing needs in a cost-effective manner; complies with all federal, state, and regional regulations; and achieves its sustainability goals through efficient water use. The company now represents the largest table olive producer in the U.S., and second largest in the world.