

# PROJECT NARRATIVE



## The North City Water Reclamation Plant

With 90 percent of its water supply imported, it was crucial for the City to develop and implement water management strategies to meet future demands and avoid water shortages. The North City Water Reclamation Plant (NCWRP) is the first large-scale water reclamation plant in San Diego's history.

Wastewater entering the plant undergoes a series of treatment and disinfection steps using the latest technology to supplement the water supply for the region, providing a source of water for parks, freeway landscaping, golf courses, and industrial sites. The facility has a current design capacity of 60 MGD, including 30 MGD of reclaimed water.

### North City Project Details

**Product:** WDPF//

**Plant Capacity:** 60 MGD

#### Major Components

- 12 Distributed Processing Units
- 1 Redundant WEstation Historian
- 1 OSI PI Historian
- 1 WEstalk Voice Response and Callout System
- 1 WEstation ODBC Server interface
- 1 WEstation Software and File Server
- 1 WEstation Datalink Server
- 10 WEstation Operator/Engineer Stations
- 1 Training Simulator

#### I/O Point Count

3,866 Total I/O points



The Point Loma Water Treatment Plant is one of three new facilities constructed for the San Diego COMNET Project.

## CITY OF SAN DIEGO – COMNET PROJECT *San Diego Metropolitan Wastewater Department (MWWD) Located in San Diego, California*

Serving two million customers, the San Diego Metropolitan Wastewater Department (MWWD) processes 275 million gallons of wastewater daily (MGD). To meet customers' needs and the demands of population growth, the City of San Diego embarked on a massive construction and upgrade strategy designed to completely overhaul the City's wastewater treatment facilities, and to construct two water reclamation plants, a sludge processing plant, and a central maintenance and operations center. The completion of the project marks the success of one of the farthest-reaching goals MWWD has ever undertaken.

Along with providing 15 cities and districts in a 450-square-mile area in southern California with safe, effective sewer system and water reclamation services, the MWWD is also dedicated to protecting the ocean water quality, supplementing the limited water supply, and meeting federal standards at the lowest possible cost. To help achieve these goals, MWWD chose to automate the COMNET project using Ovation<sup>®</sup> and WDPF//<sup>®</sup> expert control systems by Emerson Process Management. The City needed to standardize the control system and integrate all systems into a single network with every facility support system connected, and Emerson offered a complete, cost-effective, system solution.

### Emerson's Performance Partnership

Emerson was selected to help San Diego achieve its vision of the future due to our reputation for technical competence, our proven performance record, and our ability to integrate the process control system with many other systems on the network. A key factor in selecting Emerson was the ability to continually upgrade technology. This allowed MWWD to reduce maintenance costs and ensure the City that the system would grow with the needs of the residents, minimizing future obsolescence.

MWWD also wanted to reduce its operating costs by minimizing plant chemical usage, reducing energy consumption, and maximizing labor efficiency. Additionally, MWWD understood that selecting a control system that centralized plant information

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## Point Loma Wastewater Treatment Plant

The Point Loma Wastewater Treatment (PLWTP) is a crucial facility for MWWD. The upgrade and installation of new equipment at PLWTP provides the potential to save the City \$17 million of the next 15 years by reducing overall operation costs and the need for excess personnel. This phase included a complete retrofit of all equipment at the plant. New processes were added to the plant, including a sludge pump station housing the main sludge pumps, muffin monsters, and grit processing.

Additional construction included two digesters to accommodate higher volumes of wastewater and an upgrade of the cogeneration facility that turns methane gas generated by the digesters into electricity.

### Point Loma Project Details

**Product:** WDPF//

**Plant Capacity:** 190 MGD

#### Major Components

- 25 Distributed Processing Units
- 1 Redundant WESStation Historian
- 1 OSI PI Historian
- 1 WESstalk Voice Response and Callout System
- 1 WESStation ODBC Server Interface
- 1 WESStation Software and File Server
- 1 WESStation Datalink Server
- 1 Redundant WESgate Highway to Highway Interface
- 11 WESStation Operator/Engineer Stations
- 1 Training Simulator

#### I/O Point Count

7,014 Total I/O Points

would enable faster, more consistent, and more informed decision-making by management.

### Multi-layered Communication Systems

Emerson provided a Process Control and Management System that unified three new plants, one existing plant, six pumping stations, a collection system (connected by spread spectrum radio), dedicated fiber optic cable, and telecom leased lines – enabling all facilities to be controlled from the central control room (COMC) located at the Metropolitan Operations Center (MOC II). This system has enabled San Diego to become the technology benchmark of wastewater treatment and reclamation in the US.

To accomplish this, a complex district information network was developed to link multiple sites and multiple systems. Each site specializes in a different part of the reclamation process. Spread over a vast geographical area, these plants are linked to COMC via a multi-layered COMNET Information Network that relies on 45 miles of fiber optic cabling, leased T1 communication lines, dial-up phone lines, and spread spectrum radio.

Emerson's automation strategy was designed to enable complete control from any one location by standardizing all I&C equipment and enhancing the monitoring and control system. The idea was that all enterprise and plant information could be reached through the control system via an easy-to-use interface, eliminating paperwork and increasing the accessibility and usability of plant information.

Each location has a multi-layered network consisting of four individual communications systems:

**District Information Network (DIN)**—ties all plant processes and business information into one wide-area network.

**Process Information Network (PIN)**—connects plant components along a high-speed network.

**Facility Information Network (FIN)**—communicates general information within individual plant facilities.

**Valve Information Network (VIN)**—contains a proprietary, two-wired loop for valve control that feeds into the DCS through a serial link controller to communicate with the plants' stand-alone systems.

### WDPF// System Installation

The order for San Diego's WDPF// control system came in 1994. The control system was installed in three treatment facilities and at a new central control facility at the Metropolitan Operations Center. The three phases of installation consisted of 1) the North City Reclamation Plant, 2) the Metropolitan Biosolids Center, and 3) the Point Loma Wastewater Treatment plant.

The WDPF// system communicates between facilities using the District Information Network that allows system operators at each facility to access and analyze real-time process information, trends, and historical data via preprogrammed reports advising

### The Metropolitan Biosolids Center (MBC)

As an essential component of San Diego's wastewater treatment system, the Metropolitan Biosolids Center (MBC) provides two treatment operations: thickening and digestion of the raw sludge generated at NCWRP and dewatering of blended wet biosolids from both PLWTP and NCWRP. To do this, the 17-mile Miramar pipeline from PLWTP and a five-mile pipeline from NCWRP were constructed.

The Metropolitan Biosolids Center runs with three WDPF// data highways. I/O is both hard-wired and data linked to the distributed control system (DCS), and fiber optic connections allow system engineers to run locally in any facility.

### The Metropolitan Biosolids Center (MBC) Project Details

**Product:** WDPF//

**Plant Capacity:** 4.2 MGD

#### Major Components

- 41 Distributed Processing Units
- 1 Redundant WESStation Historian
- 1 OSI PI Historian
- 1 WESstalk Voice Response and Callout System
- 1 WESStation ODBC Server Interface
- 1 WESStation Software and File Server
- 1 WESStation Datalink Server
- 1 Redundant WESgate Highway to Highway Interface
- 18 WESStation Operator/Engineer Stations
- 1 Training Simulator

#### I/O Point Count

13,900 Total I/O points (approximately 50% hardwired and 50% Modbus datalinked).

both operations and management of plant performance. The network has a secure windowing capability that permits varying department personnel to remotely observe line process activities and access data through a standard desktop PC.

### Large Pump Stations

One new pump station—Peñasquitos, and two existing pump stations— PS64 and PS65 propel wastewater into the trunk sewer as it is conveyed to the Point Loma and North City plants.

PS64 is a retrofitted DCS-controlled pump station with a supervisory tie to Pump Station 65. PS64 transports an estimated 32 million gallons of wastewater per day to the Point Loma Wastewater Treatment with a portion of the flow diverted to the North City Water Reclamation Plant. Peñasquitos, a new DCS-controlled pump station, transports an estimated 19 million gallons of wastewater per day to North City Water Reclamation Plant.

### Pump Station 64/65 Project Details

<b>Product</b>	WDPF//
<b>Plant Capacity</b>	PS64 - 33 MGD PS65 - 29 MGD
<b>Major Components</b>	<ul style="list-style-type: none"> <li>• 2 Redundant Distributed Processing Units</li> <li>• Gigabit Ethernet, Remote Single Mode Fiber Ethernet, Fiber QLC-AB PLC 5/40</li> <li>• 1 SS/EWS</li> <li>• 1 Dual CRT OWS</li> <li>• 1 Redundant HSR/LS</li> <li>• 2 Liebert UPSs</li> </ul>
<b>I/O Point Count</b>	350 Hardwired I/O points 300 Remote I/O points

### Peñasquitos Pump Station Project Details

<b>Product</b>	WDPF//
<b>Plant Capacity</b>	32 MGD
<b>Major Components</b>	<ul style="list-style-type: none"> <li>• 2 Redundant Distributed Processing Units</li> <li>• Gigabit Ethernet, Multiple QLC Field I/O Modbus Datalinks</li> <li>• 1 SS/EWS</li> <li>• 1 Redundant HSR/LS</li> </ul>
<b>I/O Point Count</b>	175 Hardwired I/O points 450 Remote I/O points

### Ovation Installation

By 1997, the NCWRP/PLWTP/MBC portions of the project were either well underway or completed, and the City was ready to implement the next phases, which included the construction of the South Bay Water Reclamation facility and modernization of several pump stations. The Ovation control system had recently been introduced to the market. Appreciating Ovation's use of non-proprietary hardware and the interoperability of WDPF and Ovation, the City chose it as the platform for the MWWD Wastewater Collection Division SCADA system.

## Sewer Pump Project Details

**Product:** Ovation

Plant Capacity: 340 MGD

### Major Components

- 1 Redundant Fast Ethernet Network
- 2 Redundant Controllers
- 3 Tri-CRT Engineer/Operator workstations
- 2 Dual CRT Engineer/Operator workstations
- 3 Single CRT Engineer/Operator workstations
- 1 Software/Database Server
- 2 Historian/Report Servers
- SCADA equipment including MDS spread-spectrum radios and Allen-Bradley PLCs

### I/O Point Count

12 Hardwired I/O points

800 Remote I/O points

80 Remote sites (expanding to 120)

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## South Bay/Grove Avenue Project Details

**Product:** Ovation

**Plant Capacity:** 15 MGD

### Major Components

- 1 Redundant Fast Ethernet Network
- 10 Redundant Controllers
- 3 Tri-CRT Engineer/Operator workstations
- 12 Dual CRT Engineer/Operator workstations
- 1 Software/Database Server
- 2 Historian/Report Servers
- Redundant switch to FDDI DIN

### I/O Point Count

5433 Remote I/O points

## Sewer Pump Stations using SCADA Technology

Due to mountainous terrain, clusters of sewer pump stations communicate using a SCADA communication server to mountaintop repeater stations. Six repeater stations around the City have redundant spread-spectrum radios with directional antennas that communicate to MOC. The six master MAS radios at MOC communicate to six Ovation controllers via MODBUS over Ethernet. A total of 80 Allen Bradley PLC remotes are monitored via a spread-spectrum radio.

The initial phase of this project included eighty sewage pumping stations and the Mission Bay Sewer Interceptor System connected to the Ovation network via serial links to the controllers. Like the previous phases of the COMNET project, all workstations provided for this phase are connected to the operations complex network for remote supervisory and control from the central operations facility.

The City of San Diego achieved many benefits by expanding the current system with this Ovation addition. First, this is a completely open-network and SCADA system. This allows remote access of the system via Emerson's Web Viewer software. Also, the City saves valuable space and electricity from reduced footprint and power consumption of Ovation. Overall, the City is capitalizing on their earlier investment, while concurrently profiting from the state-of-the-art technology offered by Ovation.

## South Bay Water Reclamation Plant/Grove Avenue Pump Station

The South Bay Water Reclamation Plant provides an important, reliable source of reclaimed water to the southern region of San Diego for agriculture, landscape, and future groundwater recharge. Following stringent reclaimed water standards, the water reclamation facility treats 15 MGD of wastewater produced in the southern region of the City of San Diego. Future plans include a 42 MGD secondary treatment plant and sludge processing facility located on the same site.

The South Bay project included the construction of related pipelines and the Grove Avenue Pump Station. Sharing the same Fast Ethernet network as South Bay, Grove Avenue essentially acts as the influent pump station for South Bay. This Fast Ethernet network is extended using media converters to transfer the network traffic from Multimode fiber to single-mode fiber. Both plants have been designed to incorporate the newest technologies and meet strict odor control standards.

## Achievements

The City of San Diego has received many awards for the COMNET project, several of which can be attributed to the efficiency and reliability of operating with Emerson Control Systems. These awards include:

- *National Wastewater Management Excellence Award from the Environment Protection Agency*
- *Gold Award from the Association of Metropolitan Sewerage Agencies (AMSA)*
- *1999 Engineering Award from the California Water Environment Association*
- *National Engineer's Week Engineering Project Achievement Award from the San Diego Chapter of the California Society of Engineers, 1999*
- *SAVE Award from the Society of American Value Engineers for \$183 million saved through value engineering, 1996*