ATTACHMENT 1

Appendix A

Soil-Sement for Dust Control

Outstanding Features and Benefits of Soil-Sement®:

- Greatly eliminates particulate matter (PM10 and PM2.5).
- Does not contain any carcinogenic polycyclic organic matter (POM) or [illegible] polycyclic aromatic hydrocarbons (PAH).
- Is environmentally safe, nontoxic, non-corrosive, non-flammable, water-based, and will not pollute groundwater.
- Has a cumulative effect and creates a stabilized surface which will resist strong [illegible] equipment & vehicles.
- Offers maximum [illegible] to wind, rain, ultraviolet light and other weather conditions.
- Increases load-bearing strength of all types of soils and surfaces.
- Prevents water from seeping into and destabilizing the surface.
- Dries clear, providing an aesthetically pleasing appearance.
- Meets air, water, groundwater and stormwater compliance.

MIDWEST
INDUSTRIAL SUPPLY, INC.

What is Soil-Sement®

Soil-Sement® is an environmentally safe, advanced powerful polymer emulsion that produces highly effective dust control, erosion control and soil stabilization. Soil-Sement® provides excellent bonding, cohesion, versatility, cost-effectiveness, environmental compliance and superior overall performance.

Soil-Sement®'s effectiveness results from the length and strength of its unique polymer molecule formulation and those polymer molecules' ability to bond with the surface materials. Its chemical structure is made of molecules attached in relatively straight-linked chains and then cross-linked among other chains or grids that may be 1,000,000 molecules long. It is a true giant compared to the much smaller molecular structure of oil, calcium, petroleum resin and asphalt emulsion products, which range from 100 to 10,000 molecules. As a result, Soil-Sement® can be as strong as steel or as resilient as rubber.

Soil-Sement® is the cumulation of 24 years of focused research and development, and unparalleled concentration on PM10, PM2.5, erosion control and stabilization solutions. It yields proprietary one-of-a-kind polymer chemistry manufactured to rigid quality standards utilized in combination with field experience in all industrial, commercial and municipal environments. The result is a performance and value combination that is unequaled by other chemical and polymer products. As a result Soil-Sement® has been the standard of comparison for all chemical types, including polymer products, since it's introduction in 1978. Especially today Soil-Sement® exemplifies the fact that all polymers are not made equal.

A Soil-Sement® treated surface will provide you with optimum performance 365 days a year!

MIDWEST
INDUSTRIAL SUPPLY, INC.

Since 1975, Midwest Industrial Supply, Inc. has built a reputation of leadership through products and services that continually redefine dust control, erosion control and stabilization technology.

Our customers expect products that deliver real benefits, with performance far superior to other types of products being used today.

Our advantages include a full on-site laboratory with the latest state-of-the-art equipment.

We also have a group of dedicated, experienced professionals who are always ready to assist you with all of your dust control, erosion control and stabilization needs.

Pre-certified by the California Air Resources Board

Manufacturing Capabilities

[illegible] 100,000 square feet of manufacturing and warehouse facilities in our [illegible] with satellite operations [illegible] United States, Canada and [illegible] a complete research and [illegible] total control over the [illegible] manufacturing quality and [illegible] our products. Midwest's [illegible] manufacturing process is designed to [illegible] ISO-9001.

[illegible] Customized Selling

[illegible] team to develop a [illegible] erosion control program [illegible] site's needs and requirements. [illegible] conditions, soil evaluations, [illegible] local air quality regulations, [illegible] are all combined as part [illegible] control plans. This [illegible] equipment [illegible] schedules and budget [illegible]

[illegible] Application

[illegible] application services [illegible] a full-time fleet [illegible] and operators [illegible] professionally [illegible] application services [illegible] dust control [illegible] applications [illegible] service [illegible] emergency situations.

[illegible] Reporting

[illegible] application specialists [illegible] required daily reports [illegible] comprehensive [illegible] air quality [illegible] compliance [illegible] and erosion control [illegible] quantity and [illegible] submitted for [illegible] agencies for [illegible] provisions [illegible] Clean Air Act [illegible] air quality [illegible]

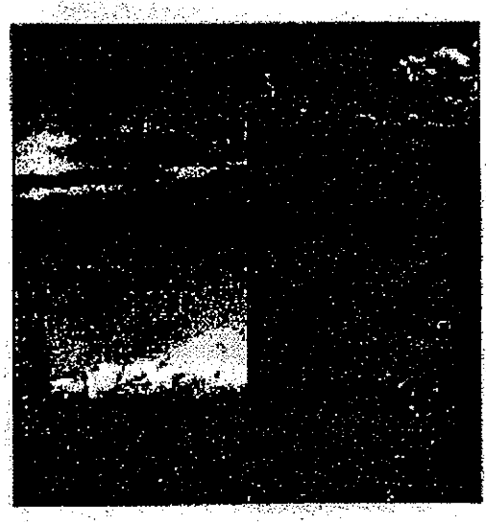
Now and In the Future...

Leader in Environmental Stewardship

Midwest Industrial Supply, Inc.

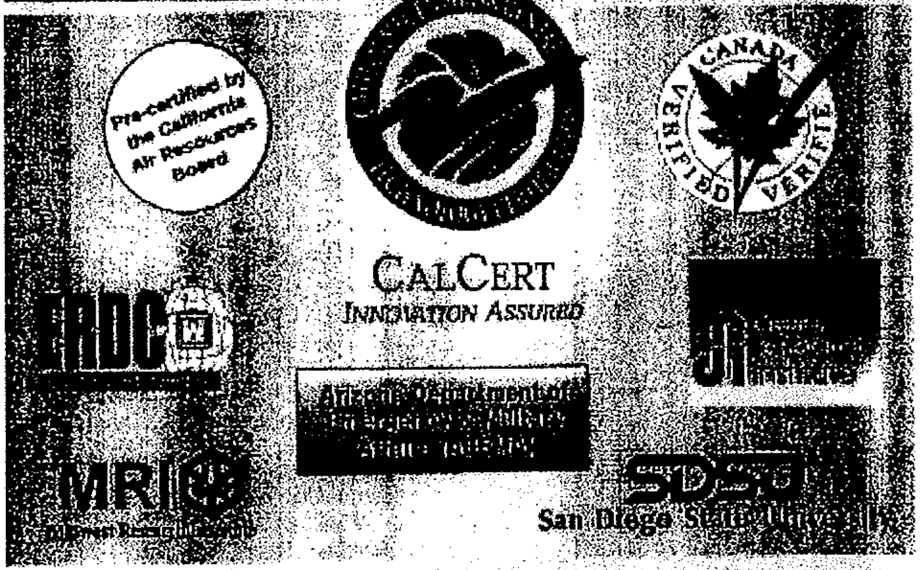
Midwest Industrial Supply, Inc. has over 28 years of experience of dust suppressant formulation, manufacturing and application experience. Our extensive research and development has resulted in products that are on the cutting edge of performance and environmental technology.

Midwest has always taken a leadership role in establishing regulatory requirements for chemical dust suppressants and stabilizers. We pride ourselves on the fact that our product line is engineered to reduce exposure to substances that cause cancer and other serious health effects...PM_{10}, $PM_{2.5}$, naturally-occurring asbestos-laden soil, radiation, PAHs, POMs, lead, ozone depletion and global warming. In other instances our products can be utilized to reduce the health hazards of heavy metals in mining and tailing operations, pesticide containment in soils and volatile organic compound (VOC) containment in soils.



Through the years Midwest Industrial Supply, Inc. has voluntarily sought and received third party verification of its stewardship...CalCert, California Air Resources Board (CARB), USEPA ETV, Canadian ETV and numerous testing and research projects — just a few of which are mentioned in the pages of this brochure.

Independent Tests & Certifications Confirm Soil-Sement's Superior Performance & Reliability!



The world's leading advocates of new environmental technologies, and internationally recognized scientific and engineering evaluators of environmental performance have verified that Soil-Sement® is highly effective for controlling dust and the damaging effects of erosion and sediment pollution, while protecting the environmental ecosystem.

Soil-Sement®

The staff of the internationally renowned California Air Resources Board (CARB) conducted an independent verification of the air quality benefits of Soil-Sement®. In particular, the staff of CARB determined that the use of Soil-Sement® as a dust suppressant, in accordance with the manufacturer's instructions, will result in a significant reduction of PM10 emissions from unpaved roads without contributing to existing levels of volatile organic compounds. Upon completing its evaluation, the staff of CARB notified all air pollution control districts in California that Soil-Sement®'s air quality claims had been verified. As a result of CARB's notification, air pollution control agencies have become familiar with Soil-Sement® and its proven air quality benefits.

OTHER:	Under normal handling conditions, the risk of exposure to residual monomer is negligible.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

BOILING/MELTING POINT @ 760 mm Hg:	212°F
VAPOR PRESSURE mm Hg @ 20°C:	17
SPECIFIC GRAVITY OR BULK DENSITY:	1.01 to 1.35
SOLUBILITY IN WATER:	Dilutable
APPEARANCE:	Milky White Liquid
ODOR:	Characteristic Acrylic odor
pH:	4.0 to 9.5

SECTION X – STABILITY AND REACTIVITY

STABILITY:	Stable
CHEMICAL INCOMPATIBILITY:	No hazardous reactions are expected to occur under normal industrial conditions.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition in the presence of air may yield carbon monoxide and/or carbon dioxide and water.
HAZARDOUS POLYMERIZATION:	Does not occur
CONDITIONS TO AVOID:	N/A
CORROSIVE TO METAL:	No
OXIDIZER:	No

SECTION XI – TOXICOLOGICAL INFORMATION

EFFECTS OF OVEREXPOSURE

INHALATION:	Vapor from stored, undiluted product can cause headache and nausea.
SKIN:	Stored, undiluted product is slightly irritating to skin.
EYES:	Slightly irritating to eyes.

INGESTION: May be irritating to digestive tract.

NAME	OSHA TWA	OSHA STEL	ACGIH TWA	ACGIH STEL
Acrylic & polyvinyl Acetate Polymer	None	None	None	None
Water	None	None		None

SECTION XII – ECOLOGICAL INFORMATION

Animal toxicity studies on blended SOIL-SEMENT® have not been carried out because we believe the fish toxicity studies done on the blend demonstrate it is as non-toxic as the individual emulsions which go into the blend. TABLE #1 gives the results of our fish toxicity tests.

In summary, these data show that the LC_{50} of SOIL-SEMENT® on goldfish is somewhere above 12,500 ppm. This is extremely low toxicity, especially in view of the legal requirement that chemicals must be labeled "toxic to fish" only if their LC_{50} is less than 1.0 ppm.

TABLE I

FISH TOXICITY STUDIES

EMULSION NUMBER	TYPE OF FISH	HOURS	LC_{50} PPM
C	Rainbow Trout	24	10,000
C	Rainbow Trout	96	8,950
C	Bluegill Sunfish	24	10,000
C	Bluegill Sunfish	96	5,640
C	Goldfish	24	4,000
H	Goldfish	24	7,500
G	Goldfish	24	10,000
D	Goldfish	24	13,400
F	Goldfish	24	13,400
SOIL-SEMENT®	Goldfish	24	12,500 - 25,000
SOIL-SEMENT®	Goldfish	48	12,500 - 25,000
SOIL-SEMENT®	Goldfish	72	12,500 - 20,000
B	Goldfish	24	24,000
E	Goldfish	24	24,000

The 48 hour LC_{50} for Daphnia Magna based on nominal test concentrations and mortality at the end of testing was calculated to be 3,432.8 parts per million (ppm).

SECTION XIII – DISPOSAL CONSIDERATIONS

ATTACHMENT 2

Appendix B

Example of OCWD Pilot Test Result for Trace Organics and Selected Endocrine Disrupter Removal

EMPLOYING ADVANCED TECHNOLOGY FOR WATER REUSE IN ORANGE COUNTY

Joanne L. Daugherty, OCWD, Fountain Valley, CA
Shivaji S. Deshmukh, OCWD, Fountain Valley, CA
Mehul V. Patel, OCWD, Fountain Valley, CA
Michael R. Markus, OCWD, Fountain Valley, CA

Abstract

The Groundwater Replenishment (GWR) System in Orange County, CA, is an indirect potable reuse project that will initially produce 70 million gallons per day (mgd) of highly treated recycled water with an ultimate capacity of 130 mgd for groundwater recharge and groundwater basin protection from seawater intrusion. The project is jointly sponsored by Orange County Water District (OCWD) and the Orange County Sanitation District and consists of three major components: 1) the Advanced Water Purification Facility (AWPF) and pumping stations, 2) a major pipeline connecting the treatment facilities to existing recharge basins, and 3) an extension of the existing seawater intrusion barrier. The AWPF will treat clarified secondary effluent, currently discharged into the ocean, using microfiltration (MF), reverse osmosis (RO), and advanced oxidation (ultraviolet light treatment with hydrogen peroxide). The product water will be pumped to injection wells and recharge basins, where the water will naturally pass through the ground and blend with Orange County's other sources of groundwater. Besides providing a new, local source of water, the project will eliminate the need for an additional outfall to the ocean, and will improve Orange County's groundwater basin water quality.

Demolition of OCWD's renowned Water Factory 21 was necessary to allow construction of the 70 mgd treatment facility. To maintain the seawater intrusion barrier during AWPF construction, OCWD has constructed a new 6 mgd MF system, installed new RO membranes, and constructed a new ultraviolet (UV) light treatment system to produce 5 mgd of injection water until AWPF construction is complete, expected in August 2007. This project, known as GWR System Phase 1, consists of a submersible MF system, the use of polyamide RO membranes, and a low-pressure high-output (LPHO) UV light with hydrogen peroxide advanced oxidation system.

Once the GWR System Phase 1 construction and startup was complete, a series of water quality tests was performed on the system to ensure viability. The treatment system successfully completed a 30-day acceptance test and met the water quality requirements set forth in the California Regional Water Quality Control Board Producer/User Water Recycling permit. Since June 21, 2004, approximately 5 mgd of product water has been used to supplement sources to protect OCWD's groundwater basin against seawater intrusion. Although pilot testing was performed on the individual treatment systems prior to constructing the Phase 1 treatment facility, this is the first opportunity to operate all three full-scale systems for an extended period of time prior to implementation of the 70 mgd water reuse plant.

The focus of this paper will be to present current MF, RO, and UV effluent quality as compared to past lime clarification, RO, and UV data, current permit requirements, and water quality of sources currently used for recharge and blending. Emerging contaminant removal by RO and UV treatment processes will also be presented and discussed.

Introduction

In 1933, Orange County Water District (OCWD) was formed to maintain the quality and quantity of Orange County's groundwater basin and protect Orange County's water rights to the natural flows of the Santa Ana River [1]. Orange County's groundwater basin (the Basin) covers 229,000 acres and currently provides potable water for over 2.3 million residents of North and Central Orange County. The Basin's primary water supply is obtained from the Santa Ana River, which is recharged into the Basin. Supplemental sources are imported from the Colorado River and State Water Project. Santa Ana River water and imported water is captured and diverted to OCWD recharge basins for Basin replenishment. OCWD currently owns over 1,000 acres of land dedicated to groundwater recharge near the Santa Ana River and sub-streams [2].

The Basin is capable of storing up to 66 million acre-feet of water [2]. The basin may operate at less than full capacity, but the basin's water quality and stability are generally compromised when 500,000 acre-feet of water is withdrawn [2]. The Basin is connected to the Pacific Ocean by a 2.5-mile stretch between the Huntington and Newport Beach mesas known as the Talbert Gap. As groundwater basin levels decrease (i.e., basin overdraft), seawater is drawn into the Basin through the Talbert Gap, and the water quality of the Basin is negatively impacted. Since groundwater pumping and recharge directly affect the Basin water levels, a balance between the two must be carefully maintained. From 1993 to July 2003, groundwater producers were allowed to pump up to 75% of their respective area's demand. This groundwater pumping percentage limitation is known as the Basin Production Percentage (BPP). This level of pumping led to an overdraft of the Basin, and in July 2003 the BPP was lowered to 66%, which marked a significant shift in basin management. Costs for managing the Basin are levied through the replenishment assessment (RA), which is the rate producers pay for pumping groundwater within the allowable BPP. Currently, the 2003-2004 RA is $149 per acre-ft. Since approximately two-thirds of the District's operating revenue is paid for by the RA, it is in the District's best interest to set the BPP and RA to allow for maximum pumping without compromising the groundwater quality and quantity. A basin Equity Assessment is charged for any additional pumping above the BPP [2].

To address the issue of seawater intrusion, in 1976 OCWD began recycling Orange County Sanitation District (OCSD) wastewater and injecting it along the Talbert Gap via a series of injection wells to form a hydraulic barrier. The treatment facility was known as Water Factory 21 (WF-21) and was the first wastewater treatment plant of its kind. WF-21 treated secondary effluent using lime clarification, recarbonation, chlorination, mixed media filtration, granular activated carbon (up to the year 2000), reverse osmosis (using cellulose acetate membranes), and, since 2000, advanced oxidation (ultraviolet light treatment with hydrogen peroxide). For over 25 years, WF-21 provided approximately 5-15 million gallons per day (mgd) of water for the Talbert Gap seawater intrusion barrier (the Barrier).

Since early 1990s, it was evident that WF-21 was reaching the end of its useful life. During its latter years, WF-21 produced 5 mgd of injection water, which was blended with other potable and deep well water sources to achieve a total of 15 mgd of injection water for the Barrier. Though the Barrier was successful in reducing seawater intrusion, it was also clear from increasing chloride concentrations near the Talbert Gap that additional supplies beyond 15 mgd were needed to sustain the Barrier. Options of expanding and/or replacing WF-21 were evaluated, but it was determined that it was more cost-effective to replace WF-21 than to try and expand the existing facility. The Groundwater Replenishment System developed from the need to expand production and create an additional source of water for recharge in Orange County.

Groundwater Replenishment System

The Groundwater Replenishment (GWR) System was developed and is jointly sponsored by both OCWD and OCSD, two agencies committed to wastewater recycling. The GWR System is an indirect potable reuse project that will initially produce 70 mgd with an ultimate capacity of 130 mgd for groundwater recharge and groundwater basin protection from seawater intrusion. The project consists of three major components: 1) the Advanced Water Purification Facility (AWPF) and pumping stations, 2) a major pipeline connecting the treatment facilities to existing recharge basins, and 3) the addition of eight new well sites for expansion of the existing seawater intrusion barrier, currently consisting of 28 injection well sites.

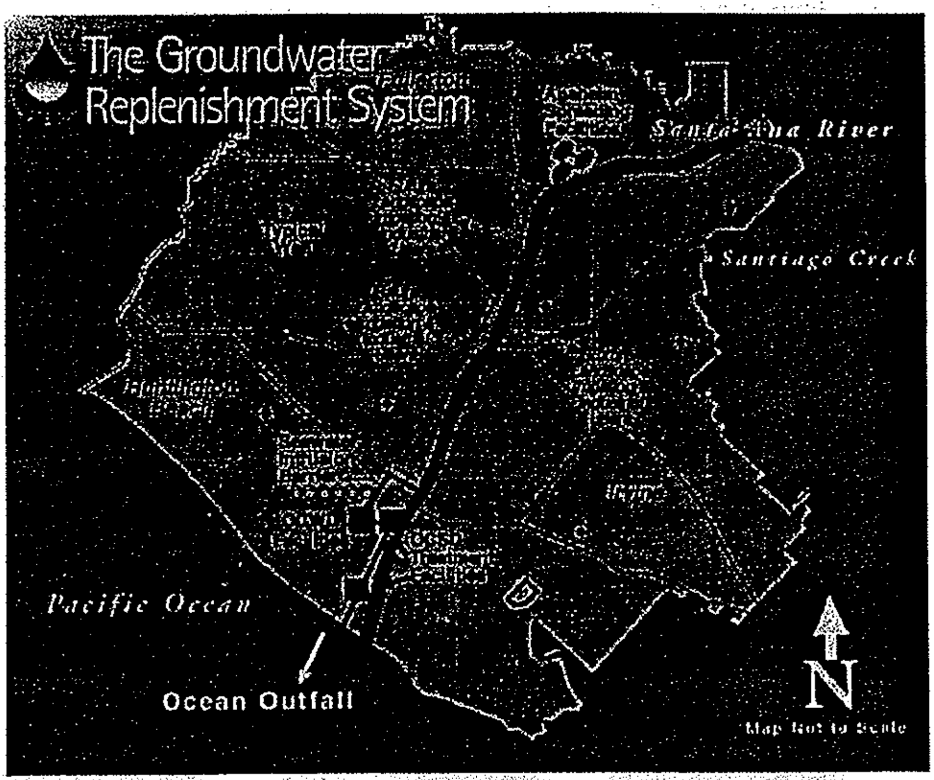


Figure 1. OCWD's Groundwater Basin and GWR System Facilities

The AWPF will treat clarified secondary effluent, currently discharged by OCSD into the ocean, using microfiltration (MF), reverse osmosis (RO), and advanced oxidation (ultraviolet light treatment with hydrogen peroxide). The AWPF product water will be equally distributed to the seawater intrusion barrier and recharge basins. Approximately 35 mgd will be pumped to injection wells, and the remaining 35 mgd will be piped and pumped to dedicated recharge basins, where the water will naturally pass through the ground and blend with Orange County's other sources of groundwater. The GWR System will not only provide a new, local source of water, but will also eliminate the need for an additional outfall to the ocean and improve Orange County's groundwater basin water quality.

Because of the shortage of available land at the Fountain Valley site, demolition of OCWD's renowned WF-21 was necessary to make way for the 70 mgd treatment facility. Yet the detrimental impacts to the Basin's water quality would be too great if the Basin was without Barrier protection for over two years during GWR System construction; the seawater intrusion barrier had to be maintained during AWPF construction. It was determined that phased demolition of OCWD's WF-21 and construction of a 5 mgd MF, RO, and UV advanced oxidation system was the best solution to allow construction of the 70 mgd treatment facility. It would also protect the Basin from seawater intrusion during GWR System construction. This 5 mgd facility is known as GWR System Phase 1.

GWR System Phase 1

In order to reduce overall construction costs, the design team attempted to utilize as much of the existing WF-21 facilities as possible during GWR System Phase 1 construction without encroaching in the 70 mgd treatment facility footprint. GWR System Phase 1 consisted of construction of a new MF system, installing new RO membranes in the existing WF-21 RO system, and installing a new ultraviolet (UV) light treatment system just upstream of WF-21's existing UV system. GWR System Phase 1 is expected to produce 5 mgd until AWPF construction is complete, expected in August 2007. This 5 mgd project consists of a submersible MF system, the use of polyamide RO membranes, and a low-pressure high-output (LPHO) UV light with hydrogen peroxide advanced oxidation system. Besides sustaining the Barrier during the 70 mgd facility construction, Phase 1 also provides OCWD's operators and engineers with hands-on experience for the larger facility. Although pilot and demonstration testing was performed on the individual treatment systems prior to constructing the Phase 1 treatment facility, this is the first opportunity to operate the system on a full-scale basis for an extended period of time prior to implementation of the 70 mgd water reuse plant. This early construction also allows OCWD personnel to identify any potential concerns and implement changes prior to construction of the full 70 mgd system. Once the 70 mgd facility is built, much of the Phase 1 equipment will be transferred to the 70 mgd plant to allow for increased production. The manufacturers of the MF, RO, and UV equipment are the same as those supplied for the 70 mgd facility, allowing for a seamless transition to the larger plant.

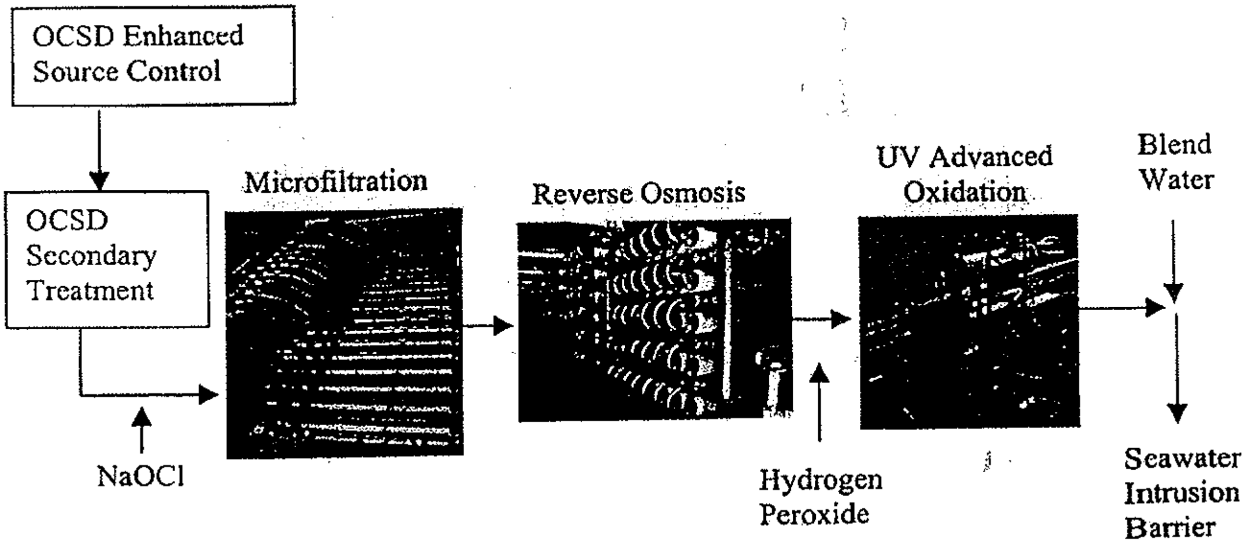


Figure 2. GWR System Phase 1 Process Flow Diagram

GWR System Phase 1 has successfully replaced WF-21. WF-21 operation was officially decommissioned on January 21, 2004. Once construction of GWR System Phase 1 was complete and prior to use for Barrier injection, a series of water quality tests was performed on the system to ensure viability. Water quality data was submitted to the California Department of Health Services and the Santa Ana Regional Water Quality Control Board (RWQCB), demonstrating that water quality produced from the 5 mgd plant met all water quality permit requirements. Five months after WF-21 was decommissioned, GWR System Phase 1 product water was blended with other sources and used for Barrier injection. Since June 21, 2004, approximately 5 mgd of product water has been used to supplement sources to protect OCWD's groundwater basin against seawater intrusion.

GWR System Phase 1 Description

OCSD Enhanced Source Control

OCWD heavily relies on OCSD's enhanced source control program to meet all required water quality standards. Before the water even enters OCSD's treatment facility, the water is carefully monitored to ensure that the efficiency of OCSD and OCWD treatment systems in removing constituents to allowable concentrations is not compromised. OCSD's source control program has effectively identified and reduced source concentrations of 1,4-dioxane and n-Nitrosodimethylamine (NDMA), two chemicals previously of concern to OCWD.

MF System

The GWR System Phase 1 MF treatment component is a 6.67 mgd submerged CMF-S system manufactured by US Filter. The system consists of two cells; each cell has 19 racks, each able to hold 36 modules. There are approximately 14,500 polypropylene hollow fibers (outside-in configuration) per module, totaling over 18 million fibers between the two cells. The fibers have inside and outside diameters of 0.39 and 0.65 millimeters, respectively, and have a pore size of 0.2 micron [3]. OCWD is currently operating the two cells at different flow rates. One cell contains 32 modules per rack (608 modules) and the other cell contains 36 modules per rack (684 modules). One cell runs at design flux (4.5 gallons per minute per module) and the other fluctuates to maintain production flow for the reverse osmosis system. Every 22 minutes, the system undergoes a backwash to improve filtration efficiency, which involves reverse filtration and air scouring to remove particles that have accumulated on the outer membrane surface. The backwash lasts approximately three minutes. Every 21 days, the MF system undergoes a cleaning to remove contaminant buildup not removed during the backwashes. During the cleaning, the membranes are allowed to soak in a cleaning solution for approximately three hours. Sodium hypochlorite is added upstream of the MF system to maintain between 3-5 milligrams per liter (mg/L) of chloramines to minimize potential membrane fouling. In addition, a strainer was installed upstream of the MF system, removing any material greater than 2 mm in size.

RO System

GWR System Phase1 implementation consisted of replacing the cellulose acetate RO membranes with polyamide RO membranes. The polyamide membranes are ESPA2, manufactured by Hydranautics. Each RO element has a membrane area of 400 square feet. These membranes are designed to operate at a flux of 12 gallons per square foot per day (gfd) at roughly 85% recovery [4], compared to 10 gfd with the cellulose acetate membranes. OCWD was able to reuse the existing RO vessels and facility, thereby reducing Phase 1 construction costs. Currently four of the six RO subunits are operated. During WF-21 operation, due to the lower flux, five of the six subunits were operated. The RO membranes currently operate between 100 and 200 pounds per square inch. This pressure is substantially lower than pressures required to operate cellulose acetate membranes. RO membranes are expected to require cleaning twice a year.

UV System
In addition to providing disinfection treatment, UV reduces NDMA via direct photolysis. In 2000, a Calgon UV system was installed at WF-21 in response to NDMA levels exceeding 100 parts per trillion (ppt) present in WF-21 RO permeate and groundwater. The UV reactor consisted of 15 medium-pressure lamps. For the GWR System UV treatment system, Trojan Technologies' low-pressure high-output system was selected. One train was supplied for the GWR System Phase 1 facility. Each train is rated for 8.75 mgd and consists of three chambers; each chamber has two reactors, with 72 lamps housed within each reactor. Because the UV train is oversized for the 5 mgd plant, the UV intensity is adjusted based on flow, temperature, and transmittance (measured at 254 nanometers) [5]. Approximately 3 parts per million (ppm) of hydrogen peroxide is added upstream of the UV system to provide advanced oxidation. As hydrogen peroxide undergoes UV photolysis, hydroxyl radicals are produced, which react with certain low molecular weight organics such as 1,4-dioxane.

GWR System Phase 1 Product Water Quality

Per the requirements set forth in the GWR System Phase 1 water quality permit, GWR System product water must meet all drinking water maximum contaminant levels. Permit level requirements must also be met for selected inorganic chemicals, volatile organic chemicals (VOCs), non-volatile synthetic organic chemicals (SOCs), disinfection byproducts (DBPs), chemicals with notification levels, and radionuclides. In addition, identified unregulated chemicals, Environmental Protection Agency (EPA) priority pollutants, endocrine disrupting chemicals (EDCs), pharmaceuticals, and tentatively identified compounds (TICs) must be tested and reported. Results from a majority of these parameters are based on grab samples reported by OCWD on a quarterly basis [6,7].

The first quarter of GWR System Phase 1 operation began July 1 and ended September 30, 2004. During this time, an average of 4.8 mgd was produced by the MF, RO and UV treatment facility. The product water was blended with approximately 2 mgd of deep well water and 13 mgd of potable water, for a total of 20 mgd supplied to the seawater intrusion barrier. During the sampling, all six UV reactors were activated and a dose of 3 ppm was targeted upstream of the UV system.

Influent Water Quality
Water quality entering OCWD's GWR System Phase 1 is listed in Table 1. Data is based on grab samples taken in July 2004, unless otherwise noted. Samples were taken upstream of sodium hypochlorite injection. All influent water is clarified secondary effluent provided by OCSD. Currently, OCWD receives OCSD effluent that has undergone activated sludge treatment. During operation of the 70 mgd facility, OCWD will receive a blend of activated sludge and trickling filter secondary effluent (roughly 80% and 20%, respectively).

The water quality results from the GWR System Phase 1 influent testing meet the design criteria of the GWR System. Based on influent water quality seen during GWR System Phase 1 operation, OCWD anticipates full compliance in meeting product water quality requirements set forth in the permit for the 70 mgd facility.

Table 1. Plant Influent Parameters

Parameter	Method	Result	Reportable Detection
pH	On-line	7.4	NA
Electrical Conductivity	2510B	1820 um/cm	1 um/cm
Ammonia Nitrogen	4500NH3H	30.5 mg/L	0.1 mg/L
Chloride	300.0	226 mg/L	0.5 mg/L
Fluoride	4500F-C	0.96 mg/L	0.1 mg/L
Nitrate Nitrogen	4500NO3F	<0.1 mg/L	0.1 mg/L
Nitrite Nitrogen	4500NO3F	0.894 mg/L	0.002 mg/L
Sodium	200.7	222 mg/L	0.1 mg/L
Total Coliform	9221B	800,000 MPN	2 MPN
Total Dissolved Solids	2540C	962 mg/L	1 mg/L
Total Hardness (as CaCO3)	200.7	325 mg/L	1 mg/L
Total Organic Carbon	5310C	16 mg/L	0.05 mg/L
Turbidity	2130B	1.8 NTU	0.1 NTU
NDMA	Isotopic Dilution – GC/MS/MS-Cl	36 ng/L	2 ng/L

UV Product Water Quality

Over a hundred samples from the UV product were taken and reported during the first quarter permitting period. UV product samples were taken at the end of GWR System Phase 1 treatment processes, prior to blending. Phase 1 product water quality met all of the permit requirements for every constituent sampled. A selection of the water quality data from the UV product testing is listed in Table 2. Data is based on grab samples taken in July 2004, unless otherwise noted.

Table 2. UV Product Parameters

Parameter	Method	Result	Reportable Detection
pH	4500H+B	7.2	NA
Electrical Conductivity	2510B	51.1 um/cm	1 um/cm
Ammonia Nitrogen	4500NH3H	1.4 mg/L	0.1 mg/L
Chloride	300.0	5.4 mg/L	0.5 mg/L
Fluoride	4500F-C	0.13 mg/L	0.1 mg/L
Nitrate Nitrogen	4500NO3F	0.31 mg/L	0.1 mg/L
Nitrite Nitrogen	4500NO3F	0.045 mg/L	0.002 mg/L
Sodium	200.7	6.1 mg/L	0.1 mg/L
Total Coliform	9221B	<2 MPN	2 MPN
Total Dissolved Solids	2540C	15 mg/L	1 mg/L
Total Hardness (as CaCO3)	200.7	<1 mg/L	1 mg/L
Total Organic Carbon	5310C	0.25 mg/L	0.05 mg/L
Turbidity	2130B	0.1 NTU	0.1 NTU
NDMA	Isotopic Dilution – GC/MS/MS-Cl	<2 ng/l	2 ng/l

A large majority of the constituents tested for permit compliance were not detected in the UV product. Tables 3 through 8 include selected data along with associated maximum concentration limits submitted to the RWQCB as part of OCWD's first quarterly report.

Table 3. VOC Results

Parameter	Method	Permit Requirement	Result	Reportable Detection
Benzene	524.2	1 ug/L	<0.5 ug/L	0.5 ug/L
Carbon Tetrachloride	524.2 / 551.1	0.5 ug/L	<0.5 ug/L / <0.1 ug/L	0.5 ug/L / 0.1 ug/L
1,2-Dichlorobenzene	524.2	600 ug/L	<0.5 ug/L	0.5 ug/L
1,4-Dichlorobenzene	524.2	5 ug/L	<0.5 ug/L	0.5 ug/L
1,1-Dichloroethane	524.2	5 ug/L	<0.5 ug/L	0.5 ug/L
1,2-Dichloroethane	524.2	0.5 ug/L	<0.5 ug/L	0.5 ug/L
1,1-Dichloroethene	524.2	6 ug/L	<0.5 ug/L	0.5 ug/L
cis-1,2-Dichloroethene	524.2	6 ug/L	<0.5 ug/L	0.5 ug/L
trans-1,2-Dichloroethene	524.2	10 ug/L	<0.5 ug/L	0.5 ug/L
Methylene Chloride	524.2	5 ug/L	<0.5 ug/L	0.5 ug/L
Toluene	524.2	150 ug/L	<0.5 ug/L	0.5 ug/L
1,2,4-Trichlorobenzene	524.2	5 ug/L	<0.5 ug/L	0.5 ug/L

Table 4. Non-Volatile SOC Results

Parameter	Method	Permit Requirement	Result	Reportable Detection
Hexachlorobenzene	508 / 525.2	1 ug/L	<0.5 ug/L / <0.1 ug/L	0.5 ug/L / 0.1 ug/L
Hexachlorocyclopentadiene	508 / 525.2	50 ug/L	<0.5 ug/L / <0.1 ug/L	0.5 ug/L / 0.1 ug/L
HCH-gamma (Lindane)	508 / 525.2	0.2 ug/L	<0.1 ug/L / <0.1 ug/L	0.1 ug/L / 0.1 ug/L
Methoxychlor	508 / 525.2	30 ug/L	<1 ug/L / <0.1 ug/L	1 ug/L / 0.1 ug/L
Molinate	507 / 525.2	20 ug/L	<0.5 ug/L / <0.1 ug/L	0.5 ug/L / 0.1 ug/L
Oxamyl	531.1	50 ug/L	<2 ug/L	2 ug/L
Pentachlorophenol (PCP)	515.1 / 528 / 525.2	1 ug/L	<0.1 ug/L / <1 ug/L / <1 ug/L	0.1 ug/L / 1 ug/L / 1 ug/L
Picloram	515.1	500 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1016	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1221	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1232	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1242	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1248	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1254	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
PCB-1260	508	0.5 ug/L	<0.5 ug/L	0.5 ug/L
Simazine	507 / 525.2	4 ug/L	<0.1 ug/L / <0.1 ug/L	0.1 ug/L / 0.1 ug/L
Thiobencarb	507 / 525.2	70 ug/L	<0.5 ug/L / <0.1 ug/L	0.5 ug/L / 0.1 ug/L

Table 5. Disinfection Byproduct Results

Parameter	Method	Permit Requirement	Result	Reportable Detection
Total THMs	524.2 / 551.1	80 ug/L	<0.5 ug/L / 0.2 ug/L	0.5 ug/L / 0.1 ug/L
Monochloroacetic Acid	552.2	60 ug/L, total HAA5	<1 ug/L	1 ug/L
Dichloroacetic Acid	552.2	60 ug/L, total HAA5	<1 ug/L	1 ug/L
Trichloroacetic Acid	552.2	60 ug/L, total HAA5	<1 ug/L	1 ug/L
Monobromoacetic Acid	552.2	60 ug/L, total HAA5	<1 ug/L	1 ug/L
Dibromoacetic Acid	552.2	60 ug/L, total HAA5	<1 ug/L	1 ug/L
Bromate	300.1B	10 ug/L	<5 ug/L	5 ug/L
Chlorite	300.1B	1000 ug/L	<10 ug/L	10 ug/L

Table 6. Unregulated Chemical Results

Parameter	Method	DHS Action Level	Result	Reportable Detection
Boron	200.7	1 mg/L	0.28 mg/L	0.1 mg/L
Hexavalent Chromium (dissolved)	218.6	NA	<1 ug/L	1 ug/L
Perchlorate	314.0	6 ug/L	<2.5 ug/L	2.5 ug/L
Vanadium	200.7	50 ug/L	<0.5 ug/L	0.5 ug/L
Dichlorodifluoromethane	524.2	1 mg/L	<0.5 ug/L	0.5 ug/L
Ethyl tert-butyl ether	524.2	NA	<1 ug/L	1 ug/L
Tertiary-amyl methyl ether	524.2	NA	<1 ug/L	1 ug/L
Tert-butyl alcohol	524.2	12 ug/L	<2 ug/L	2 ug/L
1,2,3-Trichloropropane	524.2 / TCP-LOW / 504.1	0.005 ug/L	<0.5 ug/L / <0.005 ug/L / <0.01 ug/L	0.5 ug/L / 0.005 ug/L / 0.01 ug/L
1,4-Dioxane	Purge and Trap – GC/MS	3 ug/L	<1 ug/L	1 ug/L

Table 7. EPA Priority Pollutant Results

Parameter	Method	Permit Requirement	Result	Reportable Detection
N-Nitrosodi-N-Proplylamine	Isotopic Dilution	NA	<5 ug/L	5 ug/L
N-Nitrosodiphenylamine	525.2	NA	<5 ug/L	5 ug/L
Aldrin	508 / 525.2	NA	<0.03 ug/L / <0.1 ug/L	0.03 ug/L / 0.1 ug/L
HCH-alpha (Alpha-BHC)	508 / 525.2	NA	<0.02 ug/L / <0.1 ug/L	0.02 ug/L / 0.1 ug/L
HCH-beta (Beta-BHC)	508 / 525.2	NA	<0.02 ug/L / <0.1 ug/L	0.02 ug/L / 0.1 ug/L
HCH-delta (Delta-BHC)	508 / 525.2	NA	<0.02 ug/L / <0.1 ug/L	0.02 ug/L / 0.1 ug/L
4,4' - DDT	508 / 525.2	NA	<0.01 ug/L / <0.1 ug/L	0.01 ug/L / 0.1 ug/L
4,4' - DDE	508 / 525.2	NA	<0.01 ug/L / <0.1 ug/L	0.01 ug/L / 0.1 ug/L
4,4' - DDD	508 / 525.2	NA	<0.01 ug/L / <0.1 ug/L	0.01 ug/L / 0.1 ug/L
Dieldrin	508 / 525.2	NA	<0.02 ug/L / <0.1 ug/L	0.02 ug/L / 0.1 ug/L
Endosulfan I	508 / 525.2	NA	<0.05 ug/L / <0.1 ug/L	0.05 ug/L / 0.1 ug/L
Endosulfan II	508 / 525.2	NA	<0.01 ug/L / <0.1 ug/L	0.01 ug/L / 0.1 ug/L
Endosulfan Sulfate	508 / 525.2	NA	<0.05 ug/L / <0.1 ug/L	0.05 ug/L / 0.1 ug/L
Endrin Aldehyde	508 / 525.2	NA	<0.1 ug/L / <0.1 ug/L	0.1 ug/L / 0.1 ug/L

Table 8. EDC and Pharmaceutical Results

Parameter	Method	Permit Requirement	Result	Reportable Detection
17a-Ethynyl Estradiol	Hormones	NA	<10 ng/L	10 ng/L
17-b Estradiol	Hormones	NA	<10 ng/L	10 ng/L
Estrone	Hormones	NA	<10 ng/L	10 ng/L
Polybrominated Diphenyl Ethers	508 (total of eight cogeners)	NA	<0.05 ug/L	0.05 ug/L
Caffeine	507 / 525.2	NA	<0.3 ug/L / <0.1 ug/L	0.3 ug/L / 0.1 ug/L

Based on the GWR System Phase 1 product water data collected during this first quarter, it is evident that the MF, RO, and advanced oxidation treatment processes are capable of providing a high quality source of water for the groundwater basin. OCWD will continue to collect and monitor water quality data not only for permit compliance, but also to evaluate the individual treatment processes to enhance operational efficiency. Improvements identified during GWR System Phase 1 operation will be applied to the 70 mgd facility.

Diluent Water Quality

Water quality parameters from the various sources used for blending are listed in Table 3. Data is based on grab samples taken in July 2004, except for water flow, which was determined from on-line monitoring. GWR System Phase 1 data has been added to this table for comparison. OCWD is required to blend Phase 1 product water with potable and deep well sources for the remainder of GWR System Phase 1 operation. During the initial two years of the 70 mgd facility operation, OCWD will be required to blend plant product water with other sources. At the recharge basins, the blending requirement will be met using Santa Ana River water as the diluent source. At the seawater intrusion barrier, potable water will be imported to meet the blending requirement. Pending approval, OCWD plans to inject 100% recycled water into the seawater intrusion barrier for Basin protection.

Table 9. Blend Water Parameters

Parameter	**Deep Well No. 1**	**Deep Well No.3**	**Deep Well No.4**	**Deep Well No.5**	**Fountain Valley potable**	**Huntington Beach potable**	**GWR System Phase 1**
Water Flow	2 mgd total between all wells				5.1 mgd	7.8 mgd	4.8 mgd
Nitrate (NO3)	<0.4 mg/L	<0.4 mg/L	<0.4 mg/L	<0.4 mg/L	4.34 mg/L	1.8 mg/L	1.6 mg/L
Nitrite Nitrogen	0.006 mg/L	0.014 mg/L	0.010 mg/L	0.004 mg/L	<0.002 mg/L	0.004 mg/L	0.045 mg/L
Nitrate + Nitrite Nitrogen	<0.1 mg/L	<0.1 mg/L	<0.1 mg/L	<0.1 mg/L	0.98 mg/L	0.4 mg/L	0.35 mg/L

GWR System Construction Update

The construction of the GWR System consists of five major construction contracts all currently under construction. The construction of the 14-mile pipeline has been divided into three construction contracts. As of December 2004, approximately 34,000 feet of the total 69,000 feet of pipeline has been installed across the three contracts. The Barrier expansion contract consists of eight injection well sites, four monitoring well sites, and associated pipeline installation. Drilling for two monitoring wells and one injection well has been completed to date. The largest construction contract is the AWPF in Fountain Valley. The first phase of WF-21 demolition has been completed. Construction is rapidly progressing at the future MF and RO sites with deep excavation and hauling activities occurring. Early site work is taking place and approximately 700 of 3500 production piles have been poured.

Conclusions

GWR System Phase 1 product water analyzed during the first quarter of operation has proven that the treatment processes selected for the GWR System will meet all California DHS and RWQCB requirements for indirect potable water reuse. The success of the GWR System Phase 1 facility also validates overall GWR System design and future expansion. With the completion of the 70 mgd facility, OCWD will provide a substantial, high quality source of water to supplement existing Orange County sources for Basin protection and replenishment. The proven effectiveness of the MF, RO, and UV advanced oxidation treatment processes and the strong commitment from both OCWD and OCSD in dealing with emerging contaminants will facilitate GWR System's continued viability for water reuse in Orange County.

References

1. Orange County Water District (2003), A History of Orange County Water District.

2. Orange County Water District (March 2004), "Groundwater Management Plan."

3. Camp Dresser & McKee, et al. (November 2000), "Groundwater Replenishment System Project Development Phase – Development Information Memorandum No.3 Microfiltration System, 100% Submittal."

4. Separation Processes, Inc. (June 2004), "Groundwater Replenishment System - Phase 1 Reverse Osmosis Membrane Demonstration Test."

5. Camp Dresser & McKee, et al. (February 2003), "Groundwater Replenishment System – UV Demonstration System Submittal."

6. California Regional Water Quality Control Board, Santa Ana Region, "Order No. R8-2004-0002 – Producer/User Water Recycling Requirements for the Orange County Water District."

7. California Regional Water Quality Control Board, Santa Ana Region, "Monitoring and Reporting Program No. R8-2004-0002 for the Orange County Water District."