



April 20, 2009

Ms. Betty Burnett  
Assistant General Manager/District Counsel  
South Coast Water District  
31592 West Street  
Laguna Beach, CA 92651

**Subject: Technical Memorandum  
Evaluation of Discharge Impacts from the  
South Coast Water District's Groundwater Recovery Facility and  
Comparison of NPDES Permits for Other Facilities**

Dear Ms. Burnett:

At the request of the South Coast Water District (SCWD), Environmental & GIS Services, LLC (eGIS) assisted SCWD with the evaluation of the discharges from the SCWD Groundwater Recovery Facility (SCWD GRF). Specifically, eGIS reviewed the impacts on the combined San Juan Creek Ocean Outfall (SJCOO) effluent by discharges from the SCWD GRF and compared the National Pollution Discharge Elimination System (NPDES) permit requirements for the SCWD GRF to NPDES permits issued for other facilities with discharges to ocean outfalls. This technical memorandum summarizes the findings of the evaluation.

## **BACKGROUND**

The following presents a summary of the SCWD GRF treatment facility operations, the raw water quality at the SCWD GRF, and the discharge and NPDES requirements for the SCWD GRF.

### **Summary of GRF Treatment**

The SCWD GRF treats low quality groundwater removed from the San Juan Valley Groundwater Basin (SJV Groundwater Basin) to produce drinking water that is distributed to SCWD customers. The GRF water treatment process primarily consists of reverse osmosis (RO) treatment and iron/manganese removal. The GRF system is summarized as follows:

**Groundwater well and sand filter** – An on-site groundwater well extracts brackish water from an underground aquifer (the raw water quality is discussed further in the following section). Minimal sand present in the removed water is removed via a sand filter.

**RO Treatment**– The majority of the water provided to the SCWD GRF plant by the on-site well undergoes reverse osmosis treatment and is pre-treated prior to entering the RO system. During pre-treatment, a threshold inhibitor is added to prevent minerals from building up on the fine RO membranes, and cartridge filters within two stainless steel containers remove suspended particles from the water. Following pre-treatment, the water is forced through the fine membranes of the RO system to separate dissolved solids from the water.

**Iron/Manganese-Removal** – Due to the presence of high concentrations of iron and manganese in the groundwater, approximately 17-percent of the raw water passes through an iron and manganese removal system to be used as blend flow. The iron and manganese removal system consists of sodium hypochlorite dosing and greensand filtration. Water from this treatment system is blended with water treated by the RO system.

**Decarbonation** – Groundwater treated by RO and iron and manganese removal is blended and sent to the forced-air decarbonator which removes excess carbon dioxide from the water.

**Post-Treatment** – To disinfect the water, sodium hydroxide, aqueous ammonia and sodium hypochlorite are added to the water.

**Potable Water Tank** – Before the potable water is distributed in the SCWD system, it is held temporarily in a 20,000-gallon, underground concrete storage tank (also called a clear well) to allow chloramines to form. Three high-power pumps convey the potable water to the distribution system.

**Air Gap** – The air gap structure prevents the return of brine/backwash into the facility.

### **GRF Raw Water Quality**

At present, the SCWD GRF treats groundwater extracted from one on-site groundwater well. The SCWD and the well are located within the SJV Groundwater Basin. Prior to the use of treatment technologies such as those at the SCWD GRF, low water quality in this basin had previously been a barrier to viable potable groundwater production. According to the California Department of Water Resources (DWR), Groundwater Bulletin 118, "...groundwater mineral content is variable in this basin...in general, [total dissolved solids] TDS content in groundwater increases from below 500 mg/L in the upper reaches of the valleys to near 2,000 mg/L near the coast..."<sup>1</sup> Additionally, according to the basin report within the Southern California Metropolitan Water District's (SCMWD) Groundwater Assessment Study, "except for the Upper San Juan, the TDS of most of the groundwater in storage in the main part of the groundwater basin is too

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<sup>1</sup> DWR, 2004. Groundwater Bulletin 118, Hydrologic Region South Coast, San Juan Valley Groundwater Basin.

high for domestic water use.”<sup>2</sup> The SCMWD also identified TDS, iron, manganese and sulfate as key constituents of concern in the SJV Groundwater Basin.

Laboratory analyses of raw groundwater shows influent at the SCWD GRF exhibits the following:

**Table 1  
Summary of Raw Groundwater Quality  
SCWD GRF Facility**

Parameter	Result	Units
Iron (Fe)	5.9 - 8.3	mg/L <sup>3</sup>
Manganese (Mn)	1.0 - 1.2	mg/L
Sulfate	590 - 1,180	mg/L
TDS	2,080 - 2,240	mg/L

As shown above, source water for the SCWD GRF exhibits high concentrations of iron, manganese, sulfate and TDS, consistent with the expected condition for this location in the basin.

#### **Summary of GRF Discharge and Original Ocean Outfall NPDES REQUIREMENTS**

The SCWD GRF generates waste brine primarily from the RO and iron and manganese treatment systems. The facility also generates backwash discharge. The SCWD GRF was originally designed and constructed to dispose of facility effluent to the ocean via the San Juan Creek Ocean Outfall (SJCOO) under NPDES permit CA 0104717 (Order Number R9-2000-0013, April 12, 2000) issued by the San Diego Office of the California Regional Water Quality Control Board (RWQCB). According to this order, the requirements for effluent discharge from the outfall are based on the 1997 California Ocean Plan.

This original permit described the disposal of the waste stream from the planned SCWD GRF as the following: “...0.32 M [million] gallons/day will be discharged through the Chiquita Land Outfall to the [South East Reclamation Regional Authority] SERRA Ocean Outfall.”<sup>4</sup> In addition to the SCWD GRF, the following additional facilities were included in this permit and discharged to the ocean outfall:

- SERRA Jay B. Latham Regional Treatment Plant (JBL RTP)
- City of San Clemente WRF (CSC WRF)
- SMWD Chiquita Water Reclamation Plant (SMWD Chiquita WRP)
- Moulton Niguel Water District (MNWD) 3A Reclamation Plant (MNWD 3A Plant)

<sup>2</sup> SCMWD, 2007. Groundwater Assessment Study: A Status Report on the Use of Groundwater in the Service Area of the Metropolitan Water District of Southern California, Chapter IV, Groundwater Basin Reports.

<sup>3</sup> mg/L – milligrams per liter (also parts per million)

<sup>4</sup> The SERRA Ocean Outfall was later named the SJCOO

- Santa Marguerita Water District (SMWD) Oso Creek WRP

According to the Monitoring and Sampling plan included in the original permit (Order Number R9-2000-0013), the combined effluent was sampled at a point "...downstream of any in-plant return flows, and disinfection units, where representative samples of the effluent discharged through the ocean outfall can be obtained." The combined effluent limitations for this original permit were the following:

**Table 2  
Summary of Original Ocean Outfall Effluent Discharge Requirements  
(Order Number R9-2000-0013)**

Parameter	Period	Effluent Limitation	Units
TSS	Avg. Monthly	30	mg/L
	Avg. Weekly	45	mg/L
	Instantaneous Max.	50	mg/L
Settleable solids	Avg. Monthly	1.0	mg/L
	Avg. Weekly	1.5	mg/L
	Instantaneous Max.	3.0	mg/L
Turbidity	Avg. Monthly	75	NTU <sup>5</sup>
	Avg. Weekly	100	NTU
	Instantaneous Max.	225	NTU

### CURRENT SJCOO NPDES REQUIREMENTS

During construction of the SCWD GRF, the original NPDES permit (Order Number R9-2000-0013) was superseded by Order Number R9-2006-0054 (August 16, 2006). According to this order, the requirements for effluent discharge from the outfall are based on the April 2005 California Ocean Plan. According to the current permit, the SJCOO also currently receives effluent from the following facilities that are included in the permit: the SOCWA JBL RTP, the SMWD Chiquita WRP, the MNWD 3A Plant, the CSC WRF and the San Juan Creek GRF (SJC GRF).

Unlike the monitoring of combined effluent prescribed in the original permit, the 2006 permit requires contributions to the SJCOO to be monitored at the following locations:

- M-001 At a location where representative samples of commingled effluent from all contributors to the SJCOO. The location shall be specifically be performed in the sampling vault in the Dohenny State Beach Park through a sampling port in the outfall pipe
- M-001A Final effluent from the SOCWA RTP and downstream of any in-plant return flows and disinfection units where representative samples of effluent treated solely at the treatment plant can be collected

<sup>5</sup> NTU - Nephelometric Turbidity Units

- M-001B Final effluent from the SMWD Chiquita WRP and downstream of any in-plant return flows and disinfection units where representative samples of effluent treated solely at the treatment plant can be collected
- M-001C Final effluent from the MNWD 3A and downstream of any in-plant return flows and disinfection units where representative samples of effluent treated solely at the treatment plant can be collected
- M-001D Final effluent from the CSC RP and downstream of any in-plant return flows and disinfection units where representative samples of effluent treated solely at the treatment plant can be collected
- M-001E Brine discharge from the SJC GRF prior to mixing with any other flows directed to the Ocean Outfall
- M-001F Brine discharge from the SCWD GRF prior to mixing with any other flows directed to the Ocean Outfall
- M-001G Treated effluent from the Segunda Deshecha (M02) Flood Control Channel urban runoff treatment process prior to mixing with flows in the San Clemente Land Outfall

As is shown above, the 2006 version of the NPDES permit required individual monitoring of SCWD GRF effluent prior to discharge to the SJCOO. As such, the NPDES permit identified the following effluent requirements for the SCWD GRF:

**Table 3  
Summary of SCWD GRF Effluent Discharge Requirements (Order  
Number R9-2006-0054)**

Parameter	Period	Effluent Limitation	Units
TSS	Avg. Monthly	60	mg/L
Settleable solids	Avg. Monthly	1.0	mg/L
	Avg. Weekly	1.5	mg/L
	Instantaneous Max.	3.0	mg/L
Turbidity	Avg. Monthly	75	NTU
	Avg. Weekly	100	NTU
	Instantaneous Max.	225	NTU

After commencement of the facility operations, SCWD received notification of compliance violations from the RWQCB. The RWQCB indicated that the GRF discharged effluent to the SJCOO with levels of turbidity, settleable solids, and total suspended solids that exceeded the discharge requirements. Following receipt of the notification of violations, SCWD temporarily terminated operations at the facility. To prevent further violations, the outflow at the GRF was redirected to a sewer lift station that contributes to the SOCWA sewage treatment facility and the SCWD GRF does not currently discharge effluent directly to the SJCOO.

## EVALUATION OF IMPACTS TO SJCOO EFFLUENT FROM GRF DISCHARGES

According to Order Number R9-2000-0013, the GRF was originally designed under the expectation that the permit thresholds applied to the combined outfall flow from the SJCOO and did not apply to individual facility contributions to the SJCOO.

To determine the effect on the SJCOO effluent from GRF discharges directly to the SJCOO, eGIS reviewed available monitoring data for the SJCOO obtained between July 2007 and July 2008. To calculate the mass of TSS contributed by each discharger to the SJCOO, the following equation was used:

$$\text{Mass TSS (kg)} = \left( \frac{\text{Avg. flow volume}_{dw}}{\text{in gallons}_{dw}/\text{day}} \right) \times \left( \frac{3.78 \text{ liters}_{dw}}{1 \text{ gallon}_{dw}} \right) \times \left( \frac{\text{TSS in mg}_{ss}/\text{L}_{rw}}{\text{mg}_{ss}/\text{L}_{rw}} \right) \times \left( \frac{1 \text{ kg}_{ss}}{10^6 \text{ mg}_{ss}} \right)$$

Where:

dw - discharge water  
ss - suspended solids

Using the equation above and available monitoring data for each facility contributing to the SJCOO, an average mass of TSS per day can be calculated for each contributing facility, as summarized in the following table:

**Table 4**  
**Comparison of Contributor's Effluent Discharges to SJCOO Effluent Quality**

Facility	Average Flow (MGD) <sup>6</sup>	Avg. TSS in Effluent (mg/L)	Avg. Mass of TSS per day (kg/day) <sup>7</sup>
SJC GRF	0.47	34.8	61.8
MNWD 3A	1.81	5.6	38.3
CSC RP	3.54	9.8	131.1
SMWD CWRP	3.65	15.9	219.4
SOCWA JBL	8.19	7.9	244.6
SCWD GRF	0.22	94.6	78.7

Using the information provided in the table above, an average total daily flow of 17.88 MGD with a total TSS mass of 773.9 kg/day is generated by the SCJOO including discharges from the GRF. Without the contribution from the GRF, the SJCOO would discharge a total of 17.66 MGD with a total TSS mass of 695.2 kg/day.

To calculate the average TSS in the total effluent from the SJCOO, the equation presented above was rearranged to solve for TSS, which yields the following:

<sup>6</sup> MGD – million gallons per day

<sup>7</sup> kg - kilogram

$$\left( \begin{array}{c} \text{TSS} \\ \text{in} \\ \text{mg}_{\text{ss}}/\text{L}_{\text{dw}} \end{array} \right) = \left( \begin{array}{c} \text{Mass TSS (kg)} \\ \text{Avg. flow volume}_{\text{dw}} \\ \text{in gallons}_{\text{dw}}/\text{day} \end{array} \right) \times \left( \begin{array}{c} 1 \text{ gallon}_{\text{dw}} \\ 3.78 \text{ liters}_{\text{dw}} \end{array} \right) \times \left( \begin{array}{c} 10^6 \text{ mg}_{\text{ss}} \\ 1 \text{ kg}_{\text{ss}} \end{array} \right)$$

Using this equation, the average TSS in the total effluent from the SJCOO can be calculated, yielding an average SCJOO effluent TSS of 11.5 mg/L, which is significantly less than the general effluent limitations presented in Table A of the 2005 California Ocean Plan (60 mg/L<sup>8</sup>). Additionally, the average TSS in the total effluent from the SJCOO without contributions from the GRF can be calculated, yielding an average SCJOO effluent TSS of 10.4 mg/L without contributions from the GRF. Therefore, discharges of effluent from the GRF directly to the SJCOO contribute only an additional 1.1 mg/L of increased TSS in the effluent from the SJCOO.

## EVALUATION OF OTHER OCEAN OUTFALL NPDES PERMITS

To determine whether differences exist in the discharge requirements for other facilities that discharge to ocean outfalls, eGIS reviewed the NPDES permits and documents for other facilities that note compliance with the 2005 California Ocean Plan. The permit conditions, discharge characteristics, and monitoring requirements for these facilities are discussed in the following sections.

### Summary of Monterey Ocean Outfall NPDES Permit

The Monterey Regional Water Pollution Control Agency (MRWPCA) discharges up to 81.2 MGD of secondary treated wastewater and brine waste from the Regional Treatment Plant (RTP) to Monterey Bay via an outfall diffuser approximately 11,260 feet offshore. This discharge is performed under NPDES permit CA004851 (Order R3-2008-0008) from the Central Coast RWQCB (Attachment A).

According to the NPDES documents, regional, commercial, and industrial wastewater is conveyed to the RTP, which is treated and comprises the majority of the secondary treated wastewater. During the dry season, treated wastewater is reclaimed by the MRWPCA facility for irrigation of farmland, greatly reducing the volume of wastewater being discharged to Monterey Bay via the outfall. The MRWPCA also accepts 30,000 to 50,000 gallons per day of brine wastes that include softener regenerant waste, groundwater nitrate removal brine and reverse osmosis brines. These brines are trucked to the RTP from businesses that would otherwise dispose these wastes to the sanitary sewer. According to Fact Sheet, Section II.E (Page F-8) of Order R3-2008-0008, the MRWPCA has recently sought to keep these brines segregated from the influent flow of the [RTP] “[t]o combat high salt concentrations in reclaimed wastewater...” because irrigation uses of reclaimed wastewater are sensitive to elevated levels of total dissolved solids (TDS). Therefore, the brine wastes are held at the RTP in a 375,000-gallon, lined holding pond and are ultimately discharged or blended with secondary treated wastewater from the RTP before being discharged to the diffuser.

<sup>8</sup> Average monthly effluent limitation

As noted in Order R3-2008-0008 (Attachment E, page E-4), during the dry season the facility "is recycling essentially 100% the wastewater flow less what is needed for blending with brine wastes". Under this Order, the facility blends secondary treated effluent with brine as needed to meet the permit conditions for brine waste discharges. The Order contains a single set of water quality based effluent limitations (WQBELS) that are consistent with the ocean plan, are applicable to any ratio of blended secondary effluent and brine waste flows, and dictate the amount of secondary effluent required for blending with brine waste.<sup>9</sup>

According to Section II "Monitoring Locations" presented in Attachment E of the NPDES permit, discharge monitoring for this ocean outfall is performed at the following locations:

- INF-001 Influent wastewater with a domestic component (this excludes brine waste but includes hauled septage), prior to treatment and following all significant inputs to the collection system or the headworks of untreated wastewater and inflow and infiltration
- INF-002 Influent brine waste via haulers to the brine waste storage facility prior to blending with secondary effluent as applicable
- EFF-001 Locations where representative sample of effluent, which includes any component of brine waste, discharge through the ocean outfall can be collected, after treatment and chlorination/dechlorination and before contact with receiving water
- RSW-A Shoreline monitoring station – 900 feet north of the outfall, 1,000 feet offshore
- RSW-B Shoreline monitoring station – adjacent to the outfall, 1,000 feet offshore
- RSW-C Shoreline monitoring station – 900 feet south of the outfall, 1,000 feet offshore
- RSW-D Shoreline monitoring station – 1,800 feet south of the outfall, 1,000 feet offshore

Section IV of Attachment E further clarifies that "...brine waste samples shall be collected as grab samples and manually composited per the Discharger's current brine waste and outfall facility configuration and sampling protocols..." Based on this and the monitoring points identified in the NPDES documentation, although brine influent is sampled, brine effluent from the RTP is not monitored individually, but is instead monitored as part of the total blended effluent at location EFF-001.

According to Section VI.C.2.c "Brine Waste Disposal Study" presented in the NPDES permit, prior to performing the planned increases in the brine discharge volume, the discharger will complete a Brine Waste Disposal Study that includes the following elements: "... (1) a projection of the brine volume and characteristics; (2) an assessment

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<sup>9</sup> Central Coast RWQCB Staff report for regular meeting of March 20-21, 2008



of the impact of the increased brine volume on permit compliance; [and] (3) an assessment of the impact of the increased brine volume on the minimum probable initial dilution at the point of discharge...". Based on this, the impact of the brine waste as a component of the overall discharge has been considered in the development of the discharge requirements.

### Summary of Oceanside Ocean Outfall NPDES Permit

The City of Oceanside operates a Brackish Groundwater Desalination Facility (BGDF) that treats groundwater extracted from the Mission Hydrologic Subarea for potable uses. The facility provides treatment consisting of pH adjustment, filtration, and demineralization by reverse osmosis. The BGDF has a design capacity of 6 MGD of final potable water, which results in 2 MGD of waste brine; however, in 2003, the average daily flow of waste brine from BGDF was 0.7 MGD. The BGDF disposes the waste brine to the Oceanside Ocean Outfall (OOO) under NPDES Permit CA0107433 (Order Number R9-2005-0136) (Attachment B), which is managed by the San Diego Office of the RWQCB. Waste effluent from the San Luis Rey Wastewater Treatment Plant (SLRWTP) and La Salina Wastewater Treatment Plants (LSWTP) is also discharged to the OOO under this NPDES permit. Discharges from these facilities and the BGDF are also commingled with discharged from the Fallbrook Public Utility District, US Marine Corps Base Camp Pendleton and the Biogen IDEC Pharmaceuticals Corporation. According to the NPDES permit, monitoring to the OOO is performed at the following locations:

- M-INF1 At a location where all influent flows to SLRWTP are accounted for in monitoring events; upstream of any in-plant return flows; and where representative samples of influent can be collected.
- M-INF2 At a location where all influent flows to LSWTP are accounted for in monitoring events; upstream of any in-plant return flows; and where representative samples of influent can be collected.
- M-001 Downstream of any in-plant return flows at SLRWTP where representative samples of effluent treated solely at SLRWTP can be collected.
- M-002 Downstream of any in-plant return flows where representative samples of effluent treated solely at LSWTP can be collected.
- M-003 Outfall 001 At a location where representative samples of commingled effluent from SLRWTP, LSWTP, BGDF and Biogen IDEC Pharmaceuticals Corp. can be collected before combining with wastewaters from Fallbrook Public Utility District and US Marine Corp Base Camp Pendleton.

Based on Order Number R9-2005-0136, waste brines generated by BGDF are discharged directly to the OOO and monitored for compliance with effluent limitations at M-003 after commingling with other dischargers.

## CLOSING REMARKS

Based on eGIS's review, the following conclusions were found:

- Based on calculations using monitoring data, discharges of effluent from the GRF directly to the SJCOO would contribute only an additional 1.1 mg/L of increased TSS in the effluent from the SJCOO. Additionally, the calculated average TSS in the combined effluent from the SJCOO would be 11.5 mg/L, which is significantly less than the general effluent limitations presented in Table A of the 2005 California Ocean Plan (60 mg/L). Therefore, the additional 1.1 mg/L contributed by the SJCOO does not appear to significantly affect the combined effluent from the outfall.
- Based on a review of other NPDES permits and waste discharge orders for facilities that dispose to ocean outfalls, variations exist in the monitoring and sampling location requirements for the contribution of brine to other ocean outfalls. Specifically, blending of brine waste with treated wastewater is permitted at the MRWPCA RTP to achieve the outfall effluent requirements and waste brines generated by Oceanside BGDF are monitored for compliance with effluent limitations after commingling with other discharges to the ocean outfall.

Sincerely,



Dwight R. Mudry, Ph.D.  
Environmental Specialist



Sarah L. Denton, PG CEM  
Environmental Specialist

Attachments:

- A MRWPCA NPDES Permit CA004851 (Order R3-2008-0008)
- B Oceanside Ocean Outfall (OOO) NPDES Permit CA0107433 (Order R9-2005-0136)