



FINAL

Seawater Reverse Osmosis Desalination Pilot Test Program Report





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Subject: **scwd²** Pilot Plant Test Program – Final Report

Dear Ms. Luckenbach:

CDM is pleased to submit the final report for the **scwd²** Pilot Plant Test Program. The report describes the pilot testing investigations and results, and presents treatment process recommendations and preliminary cost estimates for the proposed seawater reverse osmosis desalination plant. The results of the pilot test program demonstrate that seawater desalination will be a safe and reliable supplemental water supply for the City of Santa Cruz and the Soquel Creek Water District.

It has been a great pleasure to work with the Water Department and the Water District on this important project and we want to thank both agencies for their guidance and support.

Very truly yours,

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Glossary of Terms and Abbreviations

AACE	Association of Advancement of Cost Engineering
ACWD	Alameda County Water District
AL	action level
AOC	assimilable organic carbon
BDOC	biodegradable organic carbon
°C	degrees Celsius
CaCO ₃	calcium carbonate
CEB	chemically enhanced backwash
CFE	combined filter effluent
CIP	clean-in-place
ClO ₂	chlorine dioxide
DAF	dissolved air flotation
DBP	disinfection by-product
DBP Rule	Stage 2 Disinfectants and Disinfection By-products Rule
DLR	detection limit for purposes of reporting
DOC	dissolved organic carbon
DOC:N ratio	dissolved organic carbon to nitrogen ratio
DP	differential pressure
DPH	California Department of Public Health
DWR	Department of Water Resources
EPA	Environmental Protection Agency
FBR	Filter Backwash Rule
FDA	Food and Drug Administration
Flux	the amount of water that flows through a unit area <i>per unit time</i>
gfd	gallons per square foot per day (unit of flux)
GHWTP	Graham Hill Water Treatment Plant
gpm	gallons per minute
gpm/sf	gallons per minute per square foot (unit of filtration rate)
GMF	granular media filters
HAA	haloacetic acids
HAB	harmful algal blooms
HGL	hydraulic grade line
HR	high rejection
kWh	kilowatt hour; a unit of electrical energy
LCR	Lead & Copper Rule
LE	low energy
LML	Long Marine Laboratory
LPRO	low pressure reverse osmosis

LRAA	locational running annual average
LRV	log removal value
LT1ESWTR	Long-term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long-term 2 Enhanced Surface Water Treatment Rule
MCI	maximum chlorophyll index
MCL	maximum contaminant level
MDL	minimum detection limit
MERIS	Medium Resolution Imaging Spectrometer
MF	microfiltration
MFL	million fibers per liter
mg/L	milligrams per liter
mgd	million gallons per day
mL	milliliter
MPN	most probable number
mrem/yr	millirems per year; a unit of absorbed dose of radioactivity; a millirem is one thousandth of a Roentgen Man Equivalent (rem)
mm	millimeter
MRDL	maximum residual disinfectant level
MSDS	material and safety data sheet
mV	millivolt
N	total nitrogen
NaOH	sodium hydroxide or caustic soda; a strong base used to increase pH
NDF	Newark Desalination Facility
ng/L	nanograms per liter
NTU	Nephelometric Turbidity Units
O&M	operation and maintenance
ORP	oxidation reduction potential
PES	polyethersulfone
pg/L	picrograms per liter
pCi/L	picocuries per liter; a unit for measuring radioactivity; a picocurie is one trillionth of a curie
PO ₄	phosphate
Program	Pilot Test Program
psi	pounds per square inch
PVDF	polyvinylidene fluoride
RL	Reporting Limit
RO	reverse osmosis
RWQCB	Regional Water Quality Control Board
Salt rejection	The measure of salts removed by the RO desalination process based on the reduction of total dissolved solids, which is a parameter used to measure salinity
SCADA	Supervisory Control and Data Acquisition
SCWD	Santa Cruz Water Department
SqCWD	Soquel Creek Water District

SDI	silt density index; this is a measurement of a water sample’s potential to cause plugging of RO membranes
Secondary MCL	regulatory maximum contaminant levels recommended, but not required for the taste and aesthetics of drinking water
SEM	scanning electron microscopy
SOCs	synthetic organic compounds
Specific Flux	the amount of water that flows through a unit area <i>per unit time per unit of driving pressure</i>
SR	salt rejection
SRAA	system-wide running annual average
SSF	slow sand filters
SWRO	seawater reverse osmosis
SWTR	Surface Water Treatment Rule
TCR	Total Coliform Rule
TDH	total dynamic head
TDS	total dissolved solids
THM	trihalomethanes
TM	technical memorandum
TOC	total organic carbon; measure for the total organically bound carbon
TSS	total suspended solids
TTHMs	total trihalomethanes
UCRM	unregulated contaminants requiring monitoring
UF	ultrafiltration
UV	ultraviolet disinfection
µg/L	micrograms per liter
µm	microns (one millionth of a meter)
VOCs	volatile organic compounds
WHO	World Health Organization
WTP	water treatment plant
WWTF	wastewater treatment facility