APPENDIX D.1

CHINO I HYDRAULIC GRADE LINE, ETC.

1. CARTRIDGE FILTERS

The Chino I Desalter has five cartridge filter housings installed as pretreatment to the RO systems. Each filter housing contains 118 40-in long filter cartridges. Typically, filter cartridges can be operate at a constant hydraulic loading rate up to 4.5 gpm/10" filter length and an intermittent loading rate of 5 gpm/10" filter length. At this hydraulic loading rate, each existing filter housing has a continuous operating capacity of 2,100 gpm and a maximum intermittent capacity of 2,360 gpm. Therefore, the firm continuous capacity (one unit out of service) of the cartridge filters is 8,400 gpm and the total capacity is 10,500 gpm. Intermittently, the filters can operate at a firm capacity of 9,440 gpm and a total capacity of 11,800 gpm.

The feed flow requirement for each RO train is approximately 1,450 gpm (1,160 gpm of permeate at 80% recovery), which equates to a total raw water treatment requirement of 5,800 gpm. The required capacity following the installation of additional RO trains is 7,250 gpm and 8,700 gpm for one and two new RO trains, respectively. Although the addition of two new trains exceeds the continuous firm capacity of the existing cartridge filters, no new cartridge filter housings are required. Normally, all cartridge filter housings are online and only one unit is taken offline at a time for filter replacement. As previously mentioned, the cartridge filters can be operated intermittently at higher loading rates. With one unit out of service, the feed flow requirement with six RO trains online does not exceed the firm intermittent capacity of the cartridge filter system.

2. RO FEEDWATER PIPING

The RO feedwater piping receives water from the cartridge filters and supplies the four existing RO feed pumps. The piping is installed in a trench on the south side of the RO trains and extends just beyond the fourth high pressure pump suction connection. The pipe is terminated with a blind flange in the trench. The trench extends to the west wall of the existing RO building, but has no knockout holes or spools installed to allow for the RO feedwater line to be extended into the RO expansion area. Additionally, extension of the raw water line will intersect with the combined permeate line to the decarbonators, which is installed in the trench outside the west wall of the RO building.

In order to extend the raw water line to serve new RO feed pumps, the following modifications would be required:

- Decrease diameter from existing 30-in to 16-in in the existing trench
- Relocate the existing combined permeate line or traverse it, either above or below, with the reduced diameter RO feed line

3. RO CONCENTRATE AND CIP PIPING

Concentrate piping currently extends under the building wall in the northern pipe trench and daylights in the exterior pipe trench along the west wall of the RO building. The new RO trains can be connected to the existing piping by extending the northern pipe trench into the new process area. The existing 12-in concentrate line has sufficient capacity to accommodate the additional concentrate flow from the new RO trains.

Similarly, the CIP piping can be connected to the new trains in the extended northern trench. The trench is not closed off by a wall under the building wall, so new piping can be extended simply by removing a security gate that is in place.

4. RO TRAINS

A space approximately 45-ft wide exists to the west of the current RO building for expansion of the RO process building. The allocated space is somewhat small, but should be sufficient for the addition of two additional RO trains, assuming that the new building can be constructed as an addition to the existing building. If a new structure is required with access walkways between the existing and new buildings, the space is likely not sufficient. The space requirement is governed by the CDA's train height requirements. If this requirement can be relaxed for the expansion RO trains, then the footprint can be reduced or available access space in the process building can be increased.

5. CIP PUMP

The existing CIP was sized to serve the RO trains as originally designed with 24 vessels in the first stage. Assuming the intent is to clean an entire stage at one time, the required flowrate is between 1,120 and 1,400 gpm, typically at a discharge pressure of approximately 70-psig. The current pump only produces 960-gpm at 58 psig. Therefore, the existing CIP pump should be upsized to 1,400 gpm at 160-ft TDH. Additionally, the CIP pump should be fitted with a variable speed drive to provide better flow control and reduce surging against the membrane system.

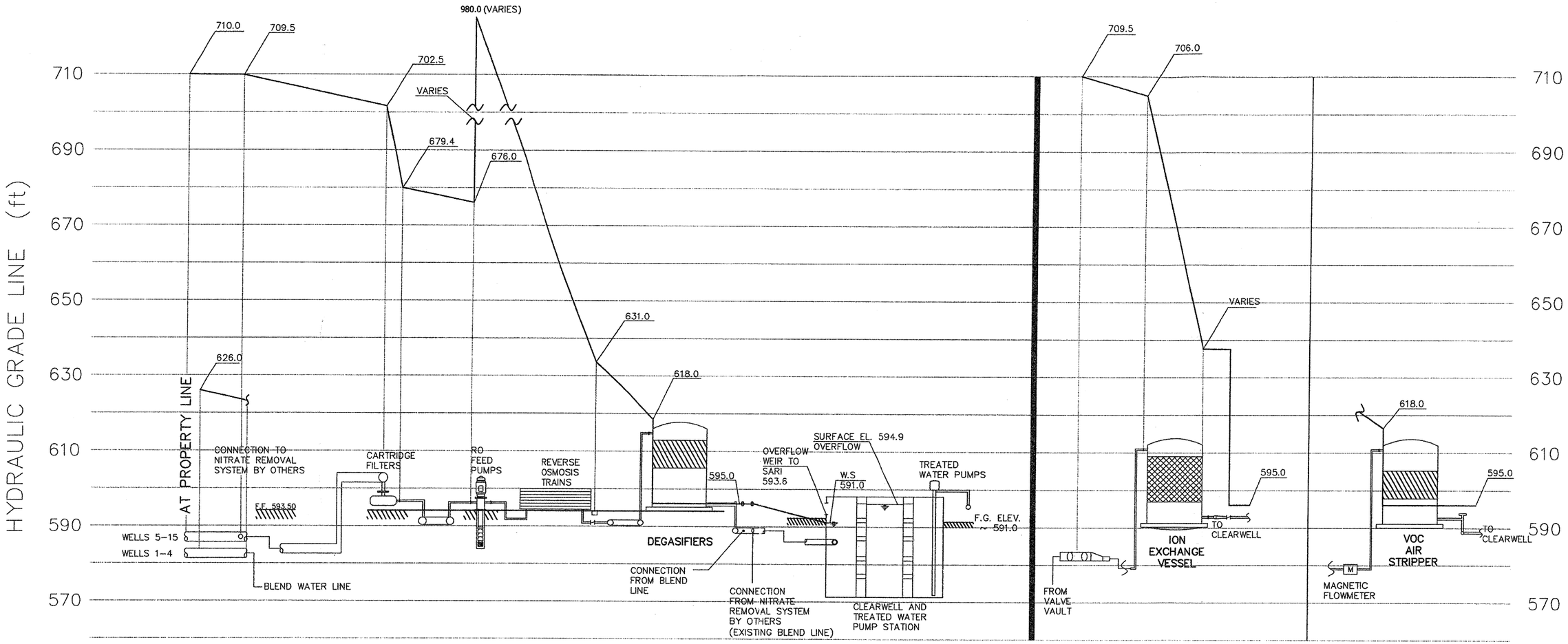
6. DECARBONATORS

An equipment pad exists to receive a third decarbonator, if required. The pad has a 1-in conduit stubout; however, the location of the termination of this conduit is not known. Combined RO permeate piping is installed to deliver water to the two existing decarbonators, and includes piping directly into the blended product water line, presumably to allowing the decarbonators to be bypassed. The decarbonator inlet piping was not observable due to the aluminum decking over the trench, so the existence of an inlet stubout for the future decarbonator could not be confirmed. However, the future outlet connection stubout is in place.

7. ELECTRICAL SYSTEM

The electrical room has space to accept three additional VFDs. Three clusters of 3-in conduits are stubbed up on a 4-in pad along the north wall of the electrical room (the location of the termination of these conduits is not known). The switchboard has breakers for the additional VFDs.

The HVAC system is undersized, as evidenced by the portable fans and cooling systems that have been placed in the electrical room by the operations staff. Any additional drives, especially large VFDs, will require modifications to the HVAC system for proper heat management.



REVERSE OSMOSIS PROCESS

NITRATE REMOVAL PROCESS BY OTHERS

BLEND WATER LINE

NOTE: WELLS 5–15 FEED THE RO & IX SYSTEMS
WELLS 1–4 ARE DEDICATED TO BLENDING
WELL NO. 12, NOT CONSTRUCTED YET.

NOTE: THE ION EXCHANGE SYSTEM WILL BE CONSTRUCTED PRIOR TO THIS PLAN SET, IN CONJUNCTION WITH THIS PLAN SET (BY OTHERS), OR AFTER THIS PLAN SET HAS BEEN COMPLETED. THE **EXISTING** BYPASS LINE SHALL REMAIN IN SERVICE AT ALL TIMES, INCLUDING THE METERS, VALVING, ANALYZERS, AND APPURTENANCES, **UNTIL THE NEW ION EXCHANGE FACILITY IS COMPLETED AND IN SERVICE.** THE CONTRACTOR SHALL COORDINATE ALL ACTIVITIES THAT AFFECT THE ION EXCHANGE CONSTRUCTION AND WORK WITH THE ION EXCHANGE CONTRACTOR, IF REQUIRED.

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DRAWN BY: F.M.M.
CHECKED BY: C.L.M.
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Chino Basin Desalter Authority

CHINO I DESALTER EXPANSION PROJECT
ON-SITE IMPROVEMENTS
HYDRAULIC PROFILE

DRAWING NO. G5
SHEET: 6 OF 52 SHEETS
FILE NO.

H:\PDATA\1010109\CADD\WATER\DLV\CHINO1-DS\1109GEN05.DWG ASCLIZ 7/25/08 8:25 am

FROM WELLS 1–4

FROM WELLS 5–15

NOTE: WELL NO. 12 NOT CONSTRUCTED YET

N.C.

N.C.

VAULT 6

VAULT 1

VAULT 2

VAULT 5

CHINO HILLS
CITY OF CHINO
JURUPA
TWPS'S

OVERFLOW

AIR GAP

DIVERSION TO WASTE

AIR GAP

N.C.

VOC TOWER

DEGASIFIERS

CONCENTRATE

CLEARWELL AND END USER TREATED WATER PUMP STATIONS

VAULT 7

CARTRIDGE FILTERS

PERMEATE

RO TRAINS

RO FEED PUMPS

NC

FLASH MIX PUMP

SOLUTION STORAGE TANK

RECIRCULATION PUMP

CIP SYSTEM

ONSITE GENERATION SODIUM HYPOCHLORITE

0.8% N_aOCL

ELECTROLYZER

AQUEOUS AMMONIA

SODIUM HYDROXIDE

SILICA INHIBITOR

THRESHOLD INHIBITOR

SULFURIC ACID

OPEN CHANNEL FLOW METERING ELEMENT

VAULT 4

TO SAWPA SARI SEWER

AIR GAP

VAULT 3

NC

WATER SOFTENER

BRINE TO ONSITE GENERATION SODIUM HYPOCHLORITE

BRINE STORAGE

NITRATE REMOVAL SYSTEM

ION EXCHANGE
SEPARATE CONTRACT

WELL BYPASS EQUALIZATION BASIN

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DRAWN BY: D.D.T.
CHECKED BY: D.D.T.
DATE:
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Chino Basin Desalter Authority

CHINO I DESALTER EXPANSION PROJECT

ON-SITE IMPROVEMENTS

PROCESS FLOW DIAGRAM

DRAWING NO. G4

SHEET: 5 OF 52 SHEETS

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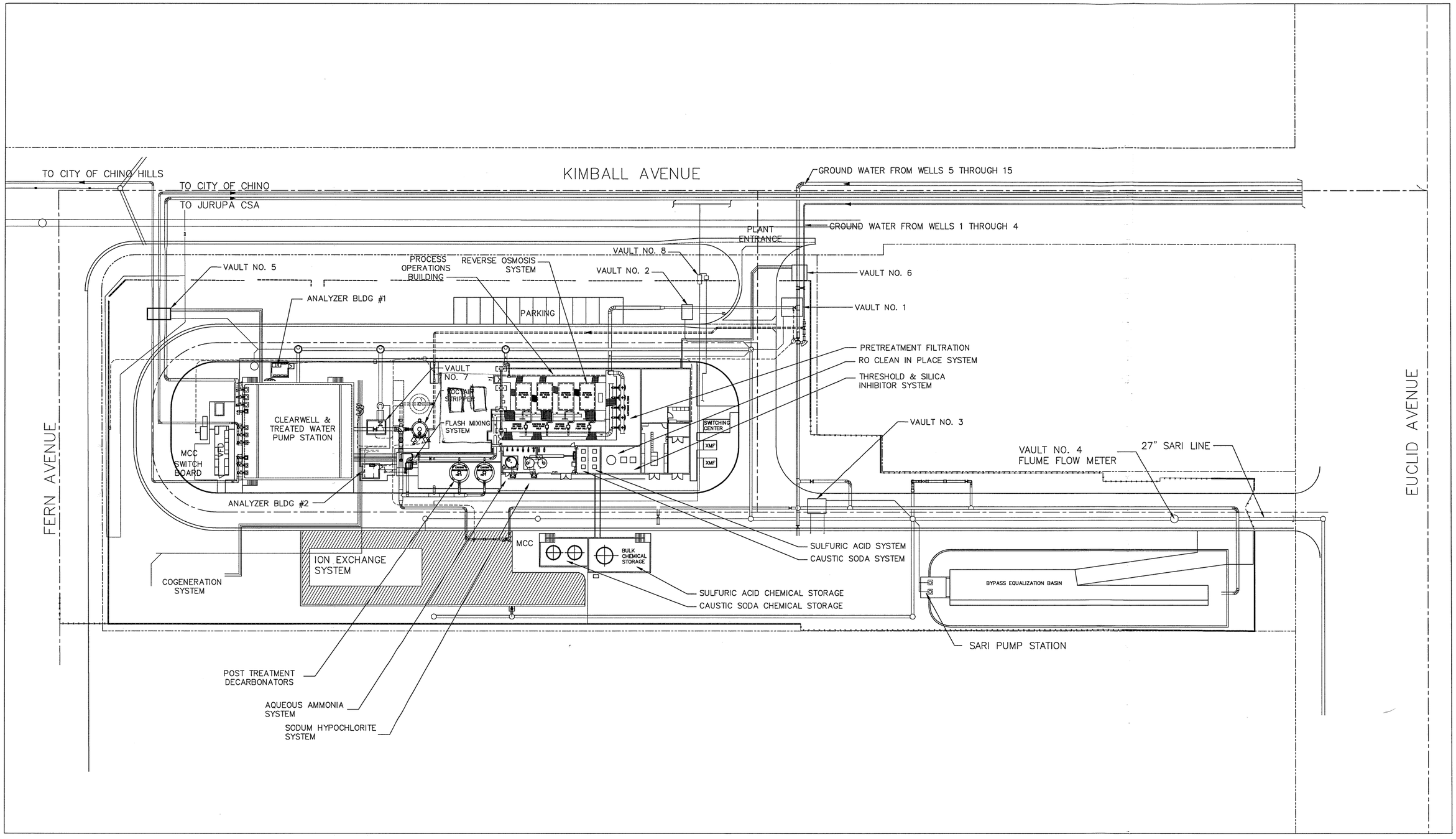

Desalter Site Plan

General Facility Information

Figure 1.1-1

TO CITY OF CHINO HILLS

TO CITY OF CHINO

TO JURUPA CSA

KIMBALL AVENUE

FERN AVENUE

EXISTING 36" RCP CHINO STORM DRAIN

GROUND WATER FROM WELLS 5 THROUGH 15

30" DIP GW

GROUND WATER FROM WELLS 1 THROUGH 4

EX WATER METER

EX BACKFLOW PREVENTER

EXIST 3" DIP PW

EXIST 8" DIP PW

EXIST VAULT NO.2 (METER)

EX 2" SPD

PLANT ENTRANCE

EXIST ASPHALT

EX 24" DIP GW

EX 10" DIP GW

EXIST VAULT NO.6 (METER)

10+04.00 AIR/VAC (1/C4)

10+00.00 CONNECT TO EXISTING 16" DIP PIPING PER DETAIL 1 ON SHEET M5 (1)

EX 16" DIP GW

EXIST VAULT NO.1

EX ELEC VAULT

EX 2" SPD

10+77.00 4" BLOWOFF (2/C5)

EXISTING WI FENCE

EXISTING BLOCK WALL

(1/C3) PROFILE

(6) 12" GW BYPASS LINE DUCTILE IRON

BLEND WATER LINE METER REMOTE TRANSMITTER DISPLAY, MOUNT ON STEEL GALVANIZED POLE NEXT TO THE CURB FACING THE ROAD

EXISTING TWPS FLOW METER VAULT

EXIST CURB & GUTTER

EXIST ASPHALT

NEW POTABLE WATER SOURCE CONNECTION

(4) (48) 12+79.50 90° ELBOW

30" GW

2-2" SAMPLE PIPING

EX FH

FUTURE RO BUILDING EXPANSION

FUTURE GAC ADSORBERS

FUTURE VOC AIR STRIPPER

BYPASS LINE 12" METER SEE DETAIL (2/M5)

NEW VOC AIR STRIPPER SEE SHEET M6

13+55.70 90° ELBOW (48) (5)

13+64.26 90° ELBOW (48)

1" SAMPLE PIPE SCH. 80 PVC

13+68.53 CONNECT TO AIR STRIPPER

EX 24" VCP BRINE SARI

EXISTING PROCESS OPERATIONS BUILDING

SWITCHING CENTER

XMF

XMF

NEW PUMP JURUPA TWPS

EXIST. AC UNIT FOR TWPS BLDG.

4 EXSTG CHLORINE ANALYZERS TO BE RELOCATED

EXSTG NITRATE, PH, CHLORINE, CONDUCTIVITY ANALYZERS, TO BE RELOCATED

EXIST VAULT NO.7

NEW PUMPS CHINO2TWPS

EXISTING CLEARWELL & BOOSTER PUMP STATIONS

(3/M10)

DRAIN TO SARI

EX FLUSH MIX PUMP SPEC 16084 1.03H

MCC

VFD

SWITCH BOARD

NEW PUMP CHINO HILLS

EXISTING COGEN. PIPING

EX 24" FRP PERMEATE

EXISTING DECARBONATORS

BRINE

S. WATER

EX ASPHALT

FUTURE DEGASIFIER

2.0" SCH 80 PVC SOFT WATER PIPE

VAULT 3

27" BRINE SEWER

MCC

EXISTING BULK CHEMICAL STORAGE

BULK CHEMICAL STORAGE

EXISTING COGENERATION SITE

PROPOSED NITRATE REMOVAL SYSTEM LOCATION (BY OTHERS)

BRINE AND SOFT WATER PIPES, CONNECT TO SOFT WATER PUMPS (BY OTHERS) AND BRINE PUMPS (BY OTHERS) FROM THE ION EXCHANGE FACILITY (BY OTHERS). CONTRACTOR MUST COORDINATE WITH IXE FOR EXACT PIPE CONNECTION LOCATION.

1.5" SCH 80 PVC BRINE PIPE

EXISTING CHAIN LINK FENCE

MMH

MH

Asph.

× 591.7

× 591.6

× 588.5

× 589.5

× 593.4

× 593.9

588

590

COORDINATES

(1)	N 2298800.4081	E 6136533.7324
(4)	N 2298801.8462	E 6136254.2316
(5)	N 2298725.6511	E 6136253.8396
(6)	N 2298725.7078	E 6136242.8218
(7)	N 2298744.779	E 6136228.8550

PLAN
SCALE: 1"=20'

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2	07/08	RECORD DRAWING	
1			

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DRAWN BY D.D.T.
CHECKED BY D.D.T.
PROJECT ENGINEER RCE NO. EXP.

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Chino Basin Desalter Authority

CHINO I DESALTER EXPANSION PROJECT

ON-SITE IMPROVEMENTS

YARD PIPING PLAN

DRAWING NO. C2

SHEET NO. 10 OF 52

FILE NO. D7032-010

APPENDIX D.2

CHINO I DESALTER PRODUCT WATER PUMP STATION CRITERIA

Table D.2 Existing Chino I Product Water Pump Station Criteria[a]
Chino Desalter Phase 3 PDR
JCSD/Ontario/WMWD

Description	Units	Existing Criteria
JCSD Pump Station		
Type: Vertical Turbines in Clearwell		
Entitlement		
JCSD	AF/yr	2,700
Ontario	AF/yr	1,500
SARWC	AF/yr	800
Total	AF/yr	5,000
Entitlement Annual Average Flow		
JCSD	gpm (mgd)	1,670 (2.4)
Ontario	gpm (mgd)	930 (1.3)
SARWC	gpm (mgd)	500 (0.7)
Total	gpm (mgd)	3,100 (4.5)
Proportion of Nameplate Capacity[b]		
JCSD	gpm (mgd)	1,870 (2.7)
Ontario		1,040 (1.5)
SARWC		560 (0.8)
Total		3,470 (5.0)
No. of Pumps		
In Service	No.	3
Reliability (Standby)	No.	1
Total	No.	4
Design Pump Flow Rate		
Each	gpm (mgd)	1,588 (2.3)
All Pumps	gpm (mgd)	6,352 (9.1)
Firm	gpm (mgd)	4,764 (6.9)
Design Total Dynamic Head (TDH)	ft (psi)	367 (159)
Motor Horsepower		
Each		200
Total		800
Drives: VFD		

Table D.2 Existing Chino I Product Water Pump Station Criteria[a]
Chino Desalter Phase 3 PDR
JCSD/Ontario/WMWD

Description	Units	Existing Criteria
<u>City of Chino Hills Pump Station</u>		
Type: Vertical Turbines in Clearwell		
Entitlement	AF/yr	4,200
Entitlement Annual Average Flow	gpm (mgd)	2,600 (3.7)
Proportion of Nameplate Capacity[b]	gpm (mgd)	2,910 (4.2)
No. of Pumps		
In Service	No.	2
Reliability (Standby)	No.	1
Total	No.	3
Design Pump Flow Rate		
Each	gpm (mgd)	1,839 (2.6)
All Pumps	gpm (mgd)	5,517 (7.9)
Firm	gpm (mgd)	3,678 (5.3)
Design Total Dynamic Head (TDH)	ft (psi)	290 (126)
Motor Horsepower		
Each	hp	200
Total	hp	600
Drives: 2 VFD, 1 Constant Speed		
<u>City of Chino Pump Station</u>		
Type: Vertical Turbines in Clearwell		
Entitlement	AF/yr	5,000
Entitlement Annual Average Flow	gpm (mgd)	3,100 (4.5)
Proportion of Nameplate Capacity[b]	gpm (mgd)	3,470 (5.0)
No. of Pumps		
In Service	No.	2
Reliability (Standby)	No.	1
Total	No.	3
Design Pump Flow Rate		
Each	gpm (mgd)	2,350 (3.4)
All Pumps	gpm (mgd)	7,050 (10.2)
Firm	gpm (mgd)	4,700 (6.8)
Design Total Dynamic Head (TDH)	ft (psi)	260 (113)
Motor Horsepower		
Each	hp	200
Total	hp	600
Drives: VFD		

Notes:
a. Source: Chino I O&M Manual; Tables 12.3-4, 12.3-5, and 12.3-6
b. Share of 14.2 mgd Chino I product water nameplate capacity based upon proportion of total Chino I entitlement.

CHINO II EXPANSION CRITERIA

WESTERN MUNICIPAL WATER DISTRICT

CITY OF ONTARIO CALIF. BALANCED COMMUNITY INCORPORATED 1891

Jurupa COMMUNITY SERVICES DISTRICT

Chino II Desalter Expansion

Preliminary Engineering Report

FINAL

October 2009

carollo

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WMWD/JCSD/City of Ontario - Chino Basin Desalter Authority
(WMWD - CDA)

CHINO II DESALTER - WATER TREATMENT PLANT

PRELIMINARY ENGINEERING REPORT

TABLE OF CONTENTS

Page No.

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GENERAL

1.1 BACKGROUND

With more than 800 wells, the Chino Groundwater Basin provides a critical water supply for agriculture, industry, and public drinking water. Although over pumping of groundwater has resulted in subsidence in some areas of the Chino Basin, a hydraulic surcharge results in overflows of contaminated groundwater to the Santa Ana River. The primary contaminants are total dissolved solids (TDS), nitrates, and volatile organic compounds (VOCs).

The Chino Desalters were constructed as part of the Chino Basin Desalter Authority's (CDA) groundwater management project to help maintain hydraulic control of the Chino Basin, increase yield of the Basin, remove contaminants from the groundwater, and to provide a potable water supply. The Chino I Desalter (Chino I) began operation in 2000 and produces approximately 14-MGD through a combination of reverse osmosis, anion exchange for nitrate removal, and air stripping for VOC treatment. The Chino II Desalter was originally designed in 2002 and went online in June 2006. The onsite facilities for the desalter consisted of two contracts, (1) the overall onsite facilities contract with the reverse osmosis system and (2) the ion exchange treatment system component. In June 2006, the complete onsite facilities were brought into operation producing potable product water that is distributed to the Jurupa Community Services District (JCSD) 1,110 water zone. Other districts and agencies indirectly receive treated water through connections to the 1,110 zone, either through pressure reducing stations or booster pump stations.

Western Municipal Water District (WMWD), JCSD, and the City of Ontario have jointly developed the scope for the expansion of the Chino Desalter facilities, known as the Chino Desalter Phase 3 Project (Project). The Project includes expansion of the Chino II Desalter facilities and the construction of new product water pipelines. The planned expansion of the Chino II Desalter results in an additional 10.5-MGD of product water capacity, to be divided equally between the agencies sponsoring the expansion. This means that each agency will receive 3.5-MGD from the expansion.

1.2 GRANT FUNDING

Expansion of the Chino II Desalter is funded in part through a $4,500,000 grant from the American Recovery and Reinvestment Act (ARRA), distributed through the State Water Board. As a condition of the grant, the grantee, WMWD, is providing matching funds through a partnering agreement with the City of Ontario and Jurupa Community Services District. A summary of the State Water Board agreement is presented in Appendix A.

ARRA funding for this project required that the Notice to Proceed be issued to the contractor by October 31, 2009.

1.3 COST ALLOCATIONS

Costs for the Chino II Desalter Expansion are split between the project sponsors, with a portion of the work being funded by all CDA members. Cost allocation is discussed in detail in Section 4.4.3 of *Chino Desalter Phase 3 Comprehensive Predesign Report*.

1.4 PERMITTING

1.4.1 Domestic Water Supply Permit

The Chino II Desalter currently operates under a California Department of Public Health (CDPH) Domestic Water Supply Permit (Chino Basin Desalter Authority - Desalter 2, System No. 3310083 Water Supply Permit Amendment No. 05-20-06P-005 for the Chino II Desalter, dated June 7, 2006). In order to permit the expansion of the Chino II Desalter, the CDA will need to complete the short one-page "Amended Permit Application". An initial technical engineering report is also required and is to accompany the permit application.

The second step in the permitting process is to submit the design plans, the Technical, Managerial, and Financial (TMF) assessment form, and to develop a TMF report. The CDPH will issue the TMF assessment form once the application for the permit and a set of design drawings are received. The TMF report is a separate submittal from the report that accompanies the amended application form, but can build from that report (TMF report requirements are outlined in Section IV of CDPH's "Domestic Water Supply Permit, Applicant Instructions"). The TMF assessment form will be issued to the applicant for completion and submittal to the CDPH prior to issuance of the water supply permit.

1.4.2 AQMD Requirements

The expansion of the Chino II desalter will require the addition of a decarbonator that will release carbon dioxide (CO_2) into the atmosphere. Carbon dioxide release is not regulated by the AQMD and thus an AQMD permit is not required.

1.4.3 California Environmental Quality Act (CEQA)

CEQA permitting for the Chino II Desalter Expansion is being performed by Tom Dodson & Associates. The following text is taken from a memorandum from Mr. Tom Dodson to Jack Safely, P.E., Water Resources Manager for WMWD, dated 02 December 2007, regarding a categorical exemption package for the Chino II Expansion:

"*Categorical exemptions are identified in Section 15300 of the State CEQA Guidelines as "a list of classes of projects which have been determined not to have a significant effect on the environment and which shall, therefore, be exempt from the provision of CEQA." To determine whether a project is categorically exempt from CEQA, certain findings must be made for a project to verify that it qualifies for a specific exemption class and that it can appropriately be exempted from the requirement to prepare a more detailed environmental document. My analysis of these requirements for the proposed project follows.*

The first step in this exemption process is to determine whether a specific project conforms with the criteria outlined in one or more of the exemption classes. After careful review of the various classes, I have concluded and recommend to the WMWD that the expansion of the Chino II Desalter as proposed meets the criteria for a Class 1 Exemption. Class 1 consists of "Existing Facilities," outlined under Section 15301 of the State CEQA Guidelines. Class 1 exemptions consist of "operation, repair, maintenance…or minor alteration of existing public or private structures, facilities, mechanical equipment…involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination." This includes "(b) Existing facilities of both investor and publicly-owned utilities used to provide electric power, natural gas, sewerage, or other public utility services."

The proposed project will affect only highly disturbed areas at the Chino II Desalter facility site. The key criteria that are met by this project include:

1. *The proposed expansion does not change the use of the project site and includes installing new facilities that will enhance the production of product water for delivery to area water purveyors within highly disturbed areas where no serious or major disturbance to environmental resources will result from project implementation.*

2. *The volume of treated raw water will be increased by 2.5 MGD above the approved treatment capacity, but no change in the use of the facility beyond that existing at the present time will result from these activities.*

3. *Project implementation will provide alternative, assured source of water during the current drought allowing the area water purveyors to meet standards for public water health and safety.*

Proceeding with this analysis under the assumption that the Chino II Desalter Expansion project qualifies for a Class 1 exemption, the next, and final, set of criteria to be evaluated for the applicability of this exemption are a set of exception issues (Section 15300.2), which should be considered for this category of exemptions. The exception issue are cited in the referenced Section and consist of locational, cumulative impact, significant effect, scenic highway, hazardous waste sites and historical resource limitations on the use of categorical exemptions. These are addressed in the order presented above.

A. *Location: The Chino II Desalter facility has been at its present location for several years and in operation since 2006. Adjacent land uses include the freeway, industrial uses and local roadways. No fundamental operations will change at the Desalter as a result of the proposed project, but these operations will produce more project water for area water purveyors. No site specific physical changes in the environment or any locational impacts are forecast to result from implementing the proposed project.*

B. *Cumulative Impact: The purpose of the project is to provide potable water while contributing to the regional goal of hydraulic control of the lower Chino Groundwater Basin. The extraction of approximately 40,000 afy of high TDS/contaminated groundwater was evaluated in the Optimum Basin Management Program Environmental Impact Report (OBMP PEIR) and determined to not cause significant cumulative adverse impacts on the environment. Thus, this project's contribution to meeting this goal is not forecast to contribute to any cumulatively considerable effects if implemented.*

C. *Significant Effect: Construction and operation of the expanded Chino II Desalter facility has no known potential significant adverse environmental effects associated with its implementation. The whole of the Desalter site is already disturbed and no significant adverse environmental effects are forecast to result from project implementation.*

D. *Scenic Highway: No roadways in the vicinity of the project site are considered to be local, County or State scenic highways. Therefore, no potential to adversely effect such highways can occur from implementing the proposed project.*

E. *Hazardous Waste Sites: There are no known hazardous waste sites at or adjacent to the Desalter site. The treatment process generates a brine (not hazardous) that is transported by the SARI line to an Orange County treatment plant and after treatment to the ocean. This issue does not pose a significant hazard to either employees or contractors.*

F. *Historical Resources: As noted above, all of the Chino II Desalter site has been previously disturbed (excavated, graded and/or paved) in the past, so no historical resources with any integrity remain on the project site.*

Based on the evaluation presented above, it is my recommendation that the proposed Chino II Desalter Expansion project qualifies for a Categorical Exemption, Class 1. Therefore, when the WMWD is ready to approve this project for implementation (construction contract or budget), I recommend noticing it as a Categorically Exempt from CEQA for the reasons outlined above and have the District adopt and file the attached Notice of Exemption with the Riverside County Clerk and Recorders Office and then file the

conformed copy of the Notice of Exemption with the State Clearinghouse after it makes a decision on the project. This will initiate a 35-day statute of limitations for anyone seeking to challenge the project in court."

Based on Mr. Dodson's recommendation, WMWD should issue a Notice of Exemption to the Riverside County Clerk and Recorders Office prior to issuing the construction contract.

1.5 SANTA ANA REGIONAL INTERCEPTOR

1.5.1 General Description, History and Construction of the SARI Line

The Santa Ana Watershed Project Authority (SAWPA) owns, either capacity in or the pipeline itself, approximately 93 miles of 16" to 84" SARI pipeline. SAWPA owns pipeline capacity rights in the SARI line below Prado Dam (in Orange County) and the pipeline upstream of Prado Dam (Riverside and San Bernardino Counties). SAWPA shares in the cost of maintaining the SARI in Orange County and is solely responsible for operation and maintenance activities in Riverside and San Bernardino Counties.

The SARI System was first envisioned in the early 1970's as a way to remove salt from the watershed and to collect and transport non-reclaimable industrial brine that could not be effectively treated at local treatment facilities. Most of the pipeline was constructed over 20 years in a series of reaches or sections. Reach I, II, and III parallel the Santa Ana River in Orange County and are owned by Orange County Sanitation District (OCSD). Above the Riverside County line, Reaches IV and V are owned and operated by SAWPA. Reach IV (which is subdivided into Reaches IV-A through IV-E) provides service to areas roughly bounded by the Cities of Riverside, Chino, and San Bernardino. Reach V lies along Temescal Wash and terminates near the City of Lake Elsinore.

SAWPA owns, operates, and maintains the SARI line within Riverside and San Bernardino Counties from the Orange/Riverside County line to the terminus points with each member agency/discharger. In general, these points are defined by the flow meter at the lateral or connection. SAWPA owns, operates, and maintains the flow meters and associated vault. Maintenance of the line above these terminus points is the responsibility of the respective member agency/discharger. Inland Empire Utilities Agency (IEUA) maintains Reach IV-A upstream of the meter under an Operations and Maintenance (O&M) agreement with SAWPA.

1.5.2 Available Capacity and Ownership

In general, capacity in the SARI line is owned by SAWPA and by four of the five SAWPA member agencies. San Bernardino Valley Municipal Water District (SBVMWD), Eastern Municipal Water District (EMWD), IEUA, and WMWD all own capacity in the line. Orange County Water District (OCWD) is the only SAWPA agency that does not own SARI

capacity. The pipeline capacity can be sold by individual member agencies to other entities requiring capacity and having discharges that meet specific SAWPA discharge requirements. The sale of capacity is made by individual agencies, not SAWPA.

The expansion of the Chino II Desalter will require additional SARI capacity for disposal of the RO concentrate and ion exchange system regenerant. A detailed discussion of the available and required SARI capacity is presented in Section 5.3 of the *Chino Desalter Phase 3 Comprehensive Predesign Report*.

BASIS OF DESIGN

2.1 CHINO II DESALTER WELL FIELD

A total of eight (8) groundwater extraction wells supply raw water to the Chino II Desalter water treatment plant. The wells have been located to provide hydraulic control in the overall Chino basin in order to control migration of nitrate contaminant plumes. Additionally, salt management of the basin is an objective of the desalters, which remove total dissolved solids (TDS) from the groundwater. The potable product that results serves a water supply need in the region and the salt is transported out of the region and into the ocean via the Santa Ana Regional Interceptor (SARI).

Location of the wells relative the Chino II Desalter is presented in Figure 2.1.1. Nominal flowrates for the existing wells are presented in Table 2.1.1.

Table 2.1.1 Chino II Wellfield - Nominal Well Capacity
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Well	Nominal Flowrate (gpm)[1]
II-1	2,000
II-2	2,000
II-3	2,000
II-4	2,000
II-6	2,000
II-7	1,500
II-8	1,500
II-9A	2,000
Total Wellfield Capacity (gpm):	**15,000**

Notes:
1. Wellfield capacity as reported in Table 2.1 of the *Chino Desalter Phase 3 Comprehensive Predesign Report*
2. Potential reduction in wellfield capacity to control drawdown related issues per JCSD.

The well casing depths range from approximately 225-ft to 500-ft below the ground surface. Stainless steel pumps are installed at each well site and PVC pipelines are routed from the individual wells to the Chino II Desalter. Four of the eight well pumps have variable frequency drives (VFDs), which enables supply to the Chino II Desalter at a constant pressure. As designed, the well field operates to supply a minimum inlet pressure to the Chino II Desalter of 50 pounds per square inch (psig).

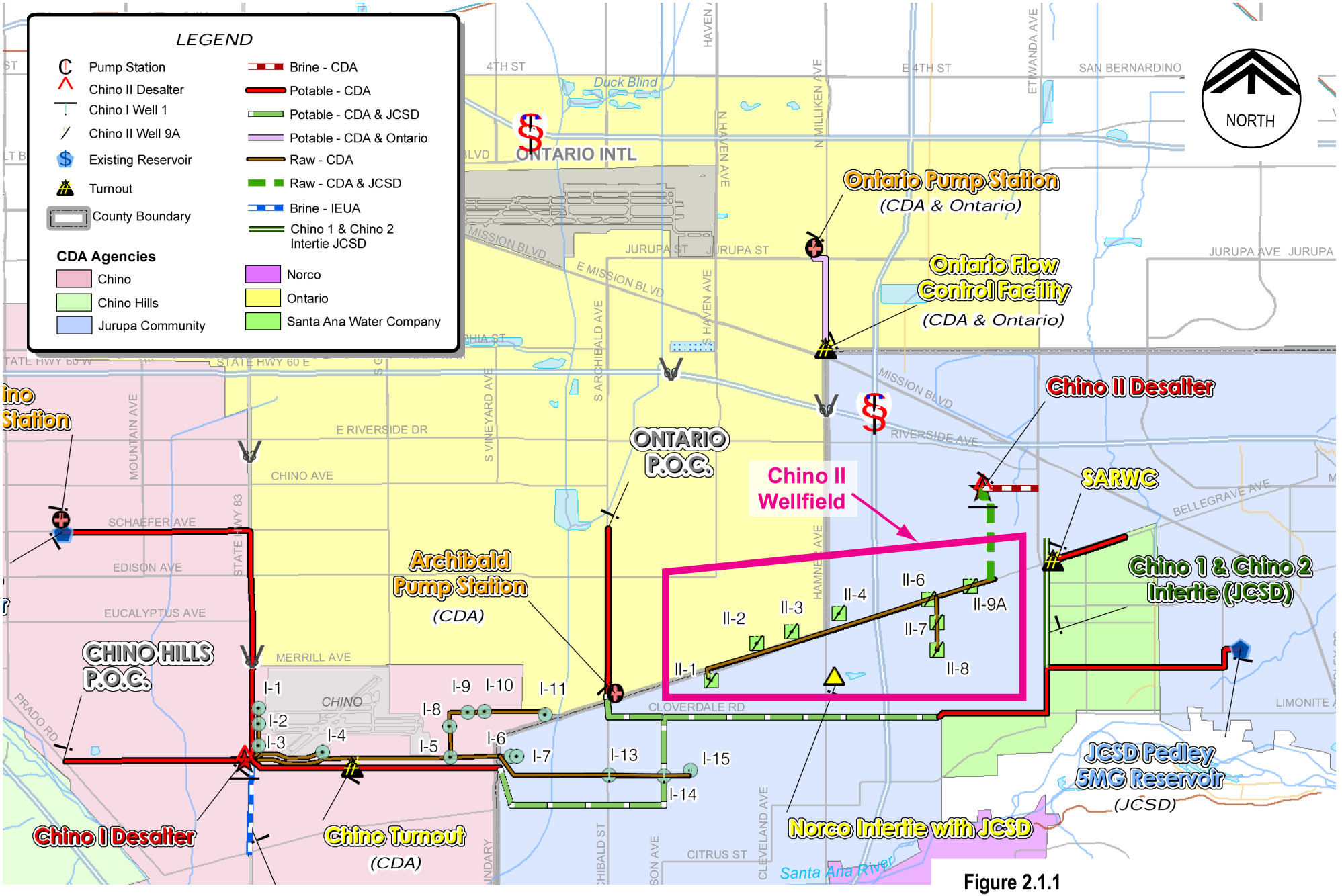


Figure 2.1.1
Chino II Wellfield
CHINO II DESALTER EXPANSION PRELIMINARY ENGINEERING REPORT
WESTERN MUNICIPAL WATER DISTRICT

2.2 FUTURE RAW WATER WELLS

As shown in Table 2.2.1, the raw water requirement for the expanded Chino II Desalter, even at the maximum RO system recovery, exceeds the current available wellfield capacity of 15,000 gpm. Therefore, additional well field capacity will be required. The following considerations must be included in the location, depth, and capacity of the future wells.

- New wells shall be of similar or better quality with respect to total dissolved solids. If the raw water TDS, when blended with the existing wells, exceeds approximately 850 mg/L, the capacity of the Chino II Desalter will be reduced because of finished water quality restrictions.
- New wells shall be of similar or better quality with respect to silica. If the raw water silica concentration increases in the raw water, the corresponding RO system recovery will decrease. Lower recovery equates to increased raw water and concentrate disposal volume requirements.
- New wells shall provide sufficient redundancy to maintain operation of the Chino II Desalter during well maintenance and rehabilitation.
- New wells must be free of turbidity or other RO fouling agents that would require pretreatment in addition to what is currently provided (cartridge filtration and chemical scale prevention).

The raw water well field planning and design is described in detail in Section 2 of the *Chino Desalter Phase 3 Comprehensive Predesign Report*.

Table 2.2.1 Capacity Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	75% RO Recovery	83.5% RO Recovery	85% RO Recovery
Raw Water Flow	gpm (MGD)	17,212 (24.8)	16,033 (23.1)	15,850 (22.8)
RO Feed Water Flow	gpm (MGD)	11,573 (16.7)	10,395 (14.97)	10,212 (14.7)
RO Permeate Flow	gpm (MGD)	8,680 (12.5)	8,680 (12.5)	8,680 (12.5)
RO Concentrate Flow	gpm (MGD)	2,893 (4.17)	1,715 (2.47)	1,532 (2.2)
Ion Exchange Feed Flow	gpm (MGD)	5,639 (8.12)	5,639 (8.12)	5,639 (8.12)
Ion Exchange Effluent Flow[1]	gpm (MGD)	5,555 (8.0)	5,555 (8.0)	5,555 (8.0)
Ion Exchange Regeneration Flow	gpm (MGD)	83 (0.12)	83 (0.12)	83 (0.12)
Finished Water Flow	gpm (MGD)	14,235 (20.5)	14,235 (20.5)	14,235 (20.5)

Note:
1. Ion exchange system capacity is rated for higher flowrates. However, finished water supply requirements currently do not require flows in excess of 8-MGD.

2.3 RAW WATER QUALITY

The raw water quality presented in Table 2.3.1 is a blend of the water from the existing eight wells at ratios corresponding to the well capacities listed in Table 2.1.1. Well water was sampled in October 2007 and the results were provided by the JCSD. The well water quality sampling results are presented in Appendix B.

In addition to the current water quality, a "worst case" water quality was developed by increasing the individual ions by 50 percent proportionally to achieve a raw water quality of approximately 850 mg/L. The 850-mg/L TDS parameter is the maximum raw water quality that can be treated without violating the 350-mg/L TDS finished water quality goal.

Table 2.3.1 Raw Water Quality
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Parameter	Design Water Quality[3]	Worst Case Water Quality[3]
Calcium (Ca^{2+})	122	183
Magnesium (Mg^{2+})	15	22
Sodium (Na^{+})	40	61
Potassium (K^{+})	2.6	3.9
Barium (Ba^{2+})	0.156	0.23
Strontium ($Sr2^{+}$)	Not Available	-
Iron (Fe^{2+})	0.0	0.0
Manganese (Mn^{2+})	0.0	0.0
Ammonium (NH_4^{+})	Not Available	-
Bicarbonate (HCO_3^{-})	248	371
Sulfate (SO_4^{2-})	54	81
Chloride (Cl^{-})	85	128
Fluoride (F^{-})	0.1	0.2
Carbonate (CO_3^{2-})	0.4	1.0
Nitrate (NO_3^{-})	99	148
Silica (SiO_2)	31.7	35
Color (units)	0.0	0.0
pH (units)	7.40	7.60
Alkalinity (mg/l as $CaCO_3$)	203	304
Hardness (mg/l as $CaCO_3$)	367	550

Table 2.3.1 Raw Water Quality
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Parameter	Design Water Quality[3]	Worst Case Water Quality[3]
CO_2	14.3	12.9
Conductivity (μmho/cm)[1]	931	1,396
TOTAL IONS + SiO_2	697	1,046
Turbidity (NTU)	<0.1	<0.1
Silt Density Index (SDI)	<1	<1
TDS by Ion Summation[2]	571	857
Temperature (^oC)	17.2	17.2
Empirical Factor (TDS/COND)	0.61	0.61

Notes:
1. Estimated based on TDS and Empirical Factor.
2. Includes total ions (no silica) and 49 percent of the bicarbonate concentration.
3. All units are in mg/L unless otherwise stated.

2.4 FINISHED WATER QUALITY

Because the RO membrane process removes calcium and bicarbonate/carbonate ions, the resulting permeate has unacceptably low levels of calcium hardness and alkalinity. Without additional treatment, the RO permeate would be unappealing aesthetically, poorly buffered against changes in pH, and corrosive. Indicators of corrosivity include the calcium carbonate precipitation potential (CCPP) and Langelier Saturation Index (LSI). Recommended values for these indices are CCPP of 4 to 10 mg/L as $CaCO_3$ and LSI greater than zero. Rendering the degasified RO permeate suitable for distribution requires the addition of calcium, carbonate alkalinity, and adjustment of the pH.

There are two basic sources of supplemental calcium and carbonate for post membrane treatment of the RO permeate.

- The native calcium carbonate hardness in the raw water supply
- Chemical addition of calcium carbonate, for example through use of a calcium carbonate dissolver system (e.g., limestone contactor)

The most economical source of calcium carbonate for post treatment of RO permeate is through raw water bypass blending to achieve a post treatment blend with the desired water quality characteristics. At the Chino II Desalter, the raw water nitrate concentration requires treatment by ion exchange before blending can occur. However, with the design water

quality presented in Table 2.3.1, not all of the bypassed water must be treated with ion exchange and a portion can be directly bypassed into the finished water. However, if the finished water nitrate goals are lowered or the nitrate concentration increases significantly, the entire bypass blend flow may require treatment with ion exchange.

Table 2.4.1 presents the following parameters:

- RO membrane permeate water quality, based on predictive models for the membrane operation assuming the design feedwater at 83.5 percent recovery.
- Permeate water quality after decarbonation, assuming a final CO_2 concentration of 5 mg/L.
- RO permeate after post treatment caustic soda addition
- Ion exchange effluent, assuming 96 percent nitrate removal and only a chloride/nitrate exchange
- Ion exchange effluent blended with post treated RO permeate
- Blended product after sodium hypochlorite addition.

Table 2.4.2 presents the same information as Table 2.4.1, but assumes that 3.83-MGD of the total 8-MGD of blend water bypasses the ion exchange system.

2.5 CAPACITY

The design flows for the Chino II Desalter are presented in Table 2.2.1. The Chino II Desalter currently operates at an RO recovery of 83.5 percent, which is limited by the silica concentration in the raw water. Advances in threshold inhibitors and ongoing pilot testing may allow the RO systems to operate at higher recoveries. However, the existing RO trains are limited to a maximum recovery of 85 percent due to the two stage, seven element per vessel array. Recovery rates beyond this with the current array will yield individual membrane element recoveries that exceed the manufacturer's approved operating conditions.

The new RO trains will maintain the configuration of the current RO systems, but will be expanded at the same ratio of stage one to stage two vessels. The Chino II Desalter expansion design will accommodate operation at RO recovery rates between 75 and 85 percent; however, the design will be optimized for 83.5 percent recovery because of the current successful operation at this recovery. The design criteria presented throughout this section show applicable criteria for both 75 and 85 percent recovery, and at the design recovery of 83.5 percent.

Table 2.4.1 Finished Water Quality - No Raw Water Blending, Design Water Quality
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Parameter	RO Permeate[1]	Decarbonated RO Permeate[2]	RO Permeate After Caustic Soda Addition[2]	Ion Exchange Effluent[2]	RO/Ion Exchange Blend After Transfer Pump Station[2]	Finished Water[2,3]
Flowrate (gpm)	8,680	8,680	8,680	5,555	14,235	14,235
Flowrate (MGD)	12.50	12.5	12.5	8.0	20.5	20.5
Calcium (mg/L)	0.6	0.7	0.7	122	48	48
Magnesium (mg/L)	0.1	0.1	0.1	15	6	6
Sodium (mg/L)	1.4	1.6	11	40	22	23
Chloride (mg/L)	0.4	0.5	0.5	139	55	55
Nitrate (mg/L)	3.7	4.4	4.4	4	4.3	4.3
Alkalinity (mg/L as $CaCO_3$)	1.4	1.6	20.9	203	84	86
Calcium Hardness (mg/L as $CaCO_3$)	1.5	1.8	1.8	305	120	120
Magnesium Hardness (mg/L as $CaCO_3$)	0.3	0.4	0.4	62	24	24
Total Hardness (mg/L as CaCO3)	1.8	2.2	2.2	367	145	145
Total Dissolved Solids (mg/L)	8.4	9	24	530	217	230
Carbon Dioxide (mg/L)	14.5	4.7	0.0	14.2	1.5	0.9
PH	5.32	5.9	10.5	7.4	8.0	8.2
CCPP	-37.85	-14.6	-2.3	20.1	2.1	4.0
LSI	-5.9	-5.4	0.4	0.3	0.2	0.4

Notes:
1. Water quality estimated using Dow FilmTec ROSA v6.1 RO design software.
2. Water quality estimated using Rothberg, Tamburini & Winsor Model for Corrosion Control and Process Chemistry®.
3. Assumes 1.5 mg/L sodium hypochlorite addition.

Table 2.4.2 Finished Water Quality - Raw Water Blending, Design Water Quality
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Parameter	RO Permeate[1]	Decarbonated RO Permeate[2]	RO Permeate After Caustic Soda Addition[2]	Ion Exchange Effluent[2]	RO/Ion Exchange Blend After Transfer Pump Station[2]	RO/Ion Exchange/ Raw Water Blend	Finished Water[2,3]
Flowrate (gpm):	8,680	8,680	8,680	2,896	11,576	14,235	14,235
Flowrate (MGD):	12.5	12.5	12.5	4.17	16.7	20.5	20.5
Calcium (mg/L):	0.6	0.7	0.7	122	31	48	48
Magnesium (mg/L):	0.1	0.1	0.1	15	4	6	6
Sodium (mg/L):	1.4	1.6	8.7	40	17	21	22
Chloride (mg/L):	0.4	0.5	0.5	139	35	45	45
Nitrate (mg/L):	3.7	4.4	4.4	4	4.3	22	22
Alkalinity (mg/L as $CaCO_3$):	1.4	1.6	17	203	59	90	91
Calcium Hardness (mg/L as $CaCO_3$):	1.5	1.8	1.8	305	78	120	120
Magnesium Hardness (mg/L as $CaCO_3$):	0.3	0.4	0.4	62	16	24	24
Total Hardness (mg/L as CaCO3):	1.8	2.2	2.2	367	93	145	145
Total Dissolved Solids (mg/L):	8.4	9	21.7	530	146	225	240
Carbon Dioxide (mg/L):	14.5	4.7	0.0	14.2	0.1	1.8	1.1
pH:	5.32	5.89	10.36	7.40	8.92	7.96	8.16
CCPP	-37.9	-14.6	-2.9	20.1	5.4	2.3	4.1
LSI	-5.9	-5.4	0.2	0.3	0.8	0.2	0.4

Notes:
1. Water quality estimated using Dow FilmTec ROSA v6.1 RO design software.
2. Water quality estimated using Rothberg, Tamburini & Winsor Model for Corrosion Control and Process Chemistry®.
3. Assumes 1.5 mg/L sodium hypochlorite addition.

DESIGN CRITERIA

3.1 PROCESS OVERVIEW

The process flow diagram for the Chino II Desalter is presented as a single-sheet summary in Figure 3.1.1. The schematic shows the following major process elements:

- Raw water supply
  - Eight existing wells with submersible pumps
  - Future wells
- Reverse Osmosis Treatment System
  - Cartridge filter to remove residual sand and other particulates
  - Acid and threshold inhibitor addition for scale control
  - RO membrane feed pumps for boosting the RO feed pressure
  - RO membrane trains for removing dissolved solids and nitrates
  - Decarbonators for post treatment pH adjustment and stabilization
- Ion (Anion) Exchange System
  - Bag filters to remove residual sand and other particulates
  - Anion exchange system for nitrate removal
- Finished water facilities including:
  - Transfer pump station for conveying finished water to the 3 million gallon clearwell
  - Post treatment pH adjustment (caustic soda) and disinfection (sodium hypochlorite)
  - 3 MG clearwell to provide finished water storage prior to distribution
  - Product water pumps to transfer finished water to the distribution systems

Each of these process elements is presented with detailed design criteria in the Section 4.

3.2 HYDRAULIC PROFILE

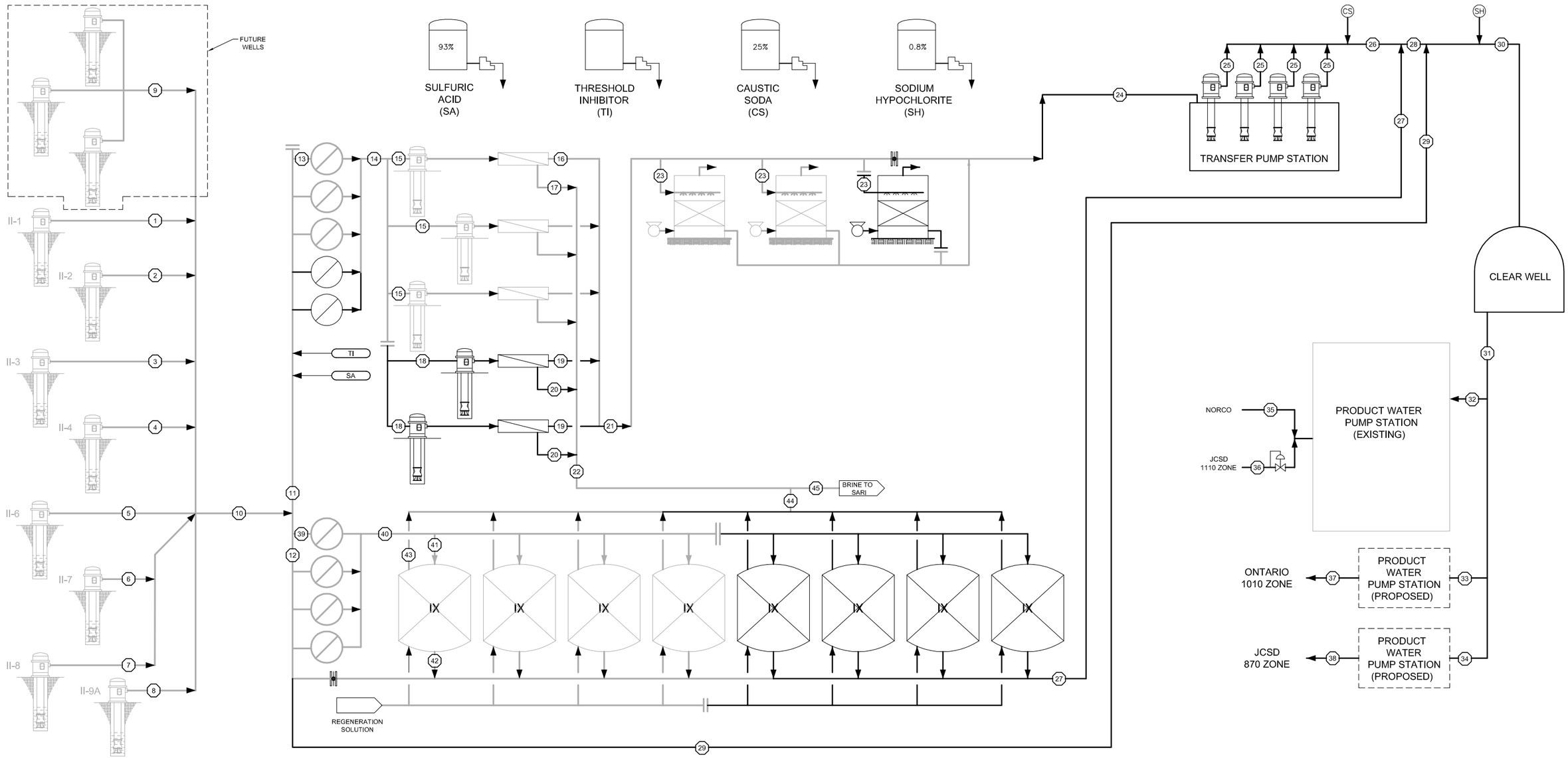
The proposed hydraulic profile for the Chino II Desalter process is shown in Figure 3.2.1, The hydraulic profile includes the membrane process, decarbonators, ion exchange system, transfer pump station, blending, and ground storage. The hydraulic profile was assuming the design water quality, an RO system recovery of 83.5 percent, 5-yr membrane age, and an assumed ion exchange system pressure drop of 15 psi.

Section 5.3 of the *Chino Desalter Phase 3 Comprehensive Predesign Report* presents the results of the Chino II brine line hydraulic investigation. Based on the results of this investigation, no new concentrate disposal facilities will be required to accommodate the expanded flows from the Chino II Desalter. An air gap is provided between the concentrate flow originating from the RO membranes and the point of disposal into the SARI to eliminate potential cross connection with the other flows in the SARI.

3.3 SITE PLAN

A site plan for the Chino II Desalter is presented in Figure 3.3.1. Major facilities shown on the site plan include:

- New cartridge filters
- New RO feed pumps
- New RO trains
- New decarbonator
- New ion exchange vessels
- New softened water storage tanks
- New salt storage tank
- New bag filters
- Replacement transfer pumps
- Existing product water pump station
- New product water pump stations
- Existing clearwell
- New storage/electrical building



Flow and Mass Balance - Design Water Quality with Raw Water Bypass Blending

Process Line Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Criteria	Units	Well II-1	Well II-2	Well II-3	Well II-4	Well II-6	Well II-7	Well II-8	Well II-9A	Future Wells	Combined Raw Water Flowrate	RO Feedwater	IX Feedwater/Raw Water Bypass	Cartridge Filter Inlet	Combined RO Feed	RO Trains 1, 2, and 3 Feed	RO Trains 1, 2, and 3 Permeate	RO Trains 1, 2, and 3 Concentrate	RO Trains 4 and 5 Feed	RO Trains 4 and 5 Permeate	RO Trains 4 and 5 Concentrate	Combined RO Permeate	Combined RO Concentrate	Decarbonator Feed Per Tower	Combined Decarbonator Effluent	Transfer Pump Discharge	Combined Transfer Pump Station Discharge	IX Effluent	RO Permeate/IX Effluent Blend	Raw Water Bypass Blend	Finished Water	Total Distribution Flow	Existing Product Water Pump Station Feed	New Product Water Pump Station - City of Ontario	New Product Water Pump Station - WMWD/JCSD	Existing Product Water Pump - Norco Delivery	Existing Product Water Pump - JCSD Delivery	New Product Water Pump Station - City of Ontario Delivery	New Product Water Pump Station - WMWD/JCSD Delivery	IX Bag Filter Feed	Combined IX Feed	IX Feed Per Vessel	IX Effluent Per Vessel	IX Waste Regenerant Per Vessel	Total IX Waste Regerant	Combined IX and RO Waste to SARI
Flow Rate	(gpm)	2,000	2,090	2,100	2,000	2,000	1,500	1,500	2,000	844	16,034	10,395	2,979	2,599	10,395	1,663	1,389	274	2,703	2,257	446	8,680	1,715	2,893	8,680	2,893	8,680	2,896	11,576	2,660	14,235	14,235	6,944	2,430	6,944			2,430	6,944	993	2,979	496	483	14	83	1,799
Flow Rate	(mgd)	2.88	3.01	3.02	2.88	2.88	2.16	2.16	2.88	1.22	23.1	15.0	4.29	3.74	14.97	2.40	2.00	0.40	3.89	3.25	0.64	12.50	2.47	4.17	12.50	4.17	12.50	4.17	16.67	3.83	20.50	20.50	10.00	3.50	10.0	0.0	0.0	3.5	10.0	1.4	4.3	0.72	0.70	0.02	0.12	2.59
Water Quality1,3,4																																														
TDS	(mg/L)	534	446	448	440	555	620	820	793		572	571	572	572	572	572	9	3343	572	9	3343	9	3343	9	9	9	22	530	146	572	240	240	240	240	240	240	240	240	240	572	572	572	530	530	25000	4346
Calcium Hardness	(mg/L as CaCO3)	250	230	230	238	300	350	450	450		305	305	305	305	305	305	1.8	1842	305	1.8	1842	1.8	1842	1.8	1.8	1.8	1.8	305	78	305	120	120	120	120	120	120	120	120	120	305	305	305	305	0	0	1756
Total Hardness	(mg/L as CaCO3)	349	300	283	276	345	399	516	520		367	367	367	367	367	367	2.2	2213	367	2.2	2213	2.2	2213	1506	2.2	2.2	2.2	367	93	367	145	145	145	145	145	145	145	145	145	367	367	367	367	0	0	2111
pH		7.40	7.50	7.60	7.60	7.40	7.40	7.20	7.30		7.40	7.40	7.40	7.40	7.40	7.40	5.39	7.93	7.40	5.39	7.93	5.39	7.93	5.39	5.89	5.89	10.36	7.40	8.92	7.40	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	8.16	7.40	7.40	7.40	7.40	7.40	7.40	8
CO2	(mg/L)	16.3	10.3	8.1	7.7	14.8	13.3	30.2	17.2		10.8	10.79	10.79	10.79	10.79	10.79	16.18	18.87	10.79	16.18	18.87	16.18	18.87	16.18	4.68	4.68	0.00	14.2	0.13	10.8	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	10.79	10.79	10.79	14.25			18
Nitrates (as NO3)	(mg/L)	95	69	88	95	110	67	89	170		99	99	99	99	99	99	4.4	577	99	4.4	577	4.4	577	4.4	4.4	4.4	4.4	4.0	4.3	99	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	98.9	98.9	98.9	4.0	3400	3400	708
Chlorides	(mg/L)	64	57	54	51	72	120	150	140		85	85	85	85	85	85	0.5	513	85	0.5	513	0.5	513	0.5	0.5	0.5	0.5	139	35	85	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	44.5	85.0	85.0	85.0	139.3	15000	15000	1184
CCPP2	(mg/L)	-18.0	-13.5	-9.8	-9.6	-16.3	-15.0	-24.7	-18.3		59.7	59.7	59.7	59.7	59.7	59.7	-37.9	669.9	59.7	-37.9	669.9	-37.9	669.9	-37.9	-14.9	-14.9	-2.9	20.1	5.4	59.7	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	59.7	59.7	59.7	20.1			639

NOTES:
1. Water quality based onthe best avallable water quality data from existing raw water supply wells.
2. CCPP = Calcium Carbonate Precipitation Potential. Target finished water range = 4 -10 mg/L.
3. Water quality and chemical dosing estimated using Rothberg, Tamburini & WInsor Model for Corrosion Control and Process Chemistry®)
3. Permeate quality estimated using ROSA v6.1 projection software from FILMTEC (Dow).

Figure 3.1.1
PROCESS FLOW DIAGRAM
WMWD / JCSD / CITY OF ONTARIO

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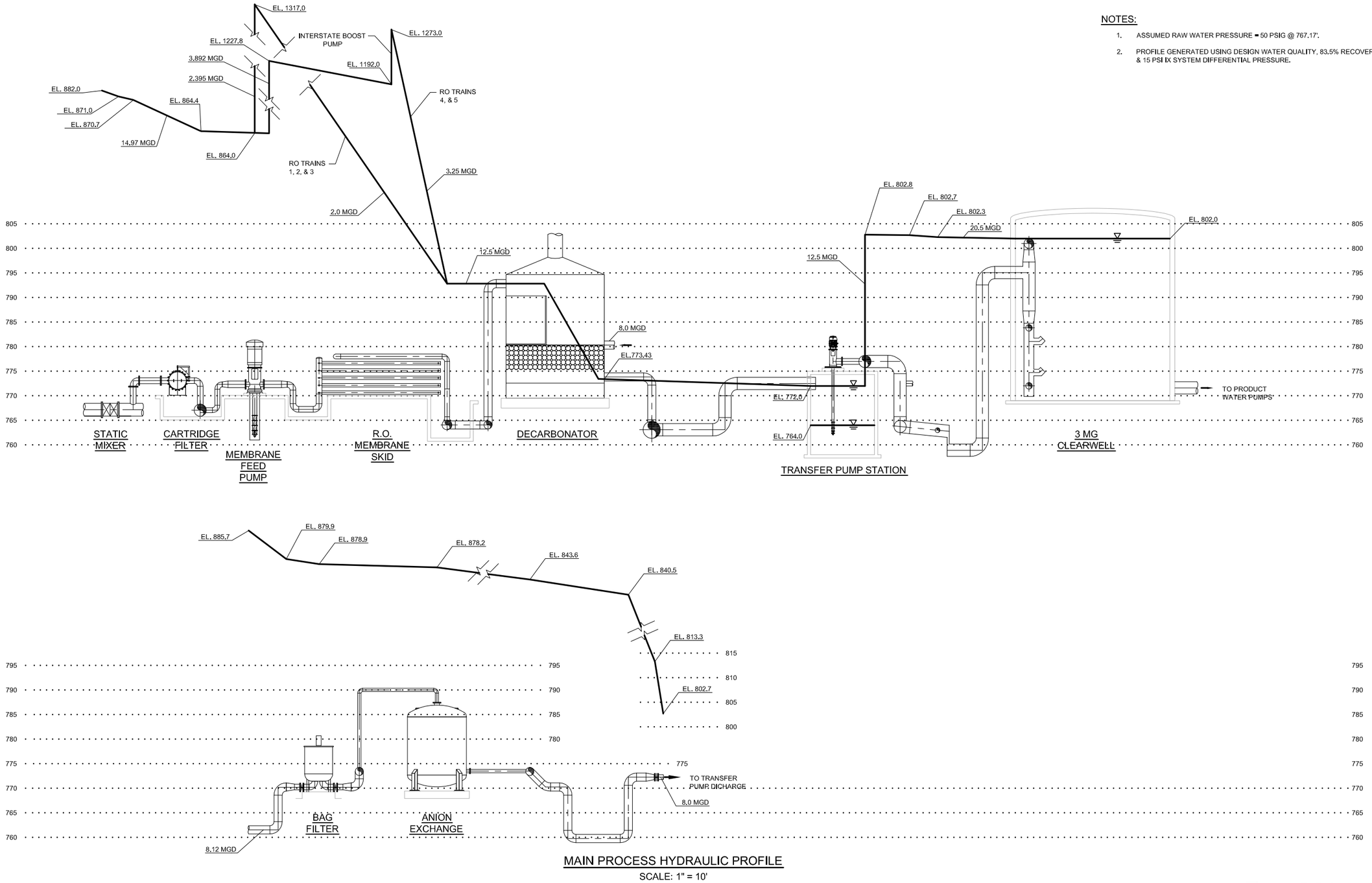
Last Saved By: TAS 7-28-08 10:14am

C:\pw_working\projectwise\astanwood\dms27232\FIG. 3.1.1 10-13-09 03:54pm AStanwood XREFS: FIG_BDR



MAIN PROCESS HYDRAULIC PROFILE

SCALE: 1" = 10'

NOTES:

1. ASSUMED RAW WATER PRESSURE = 50 PSIG @ 767.17'.
2. PROFILE GENERATED USING DESIGN WATER QUALITY, 83.5% RECOVERY, 5-YR MEMBRANE AGE, & 15 PSI IX SYSTEM DIFFERENTIAL PRESSURE.

Figure 3.2.1
HYDRAULIC PROFILE
WMWD / JCSD / CITY OF ONTARIO

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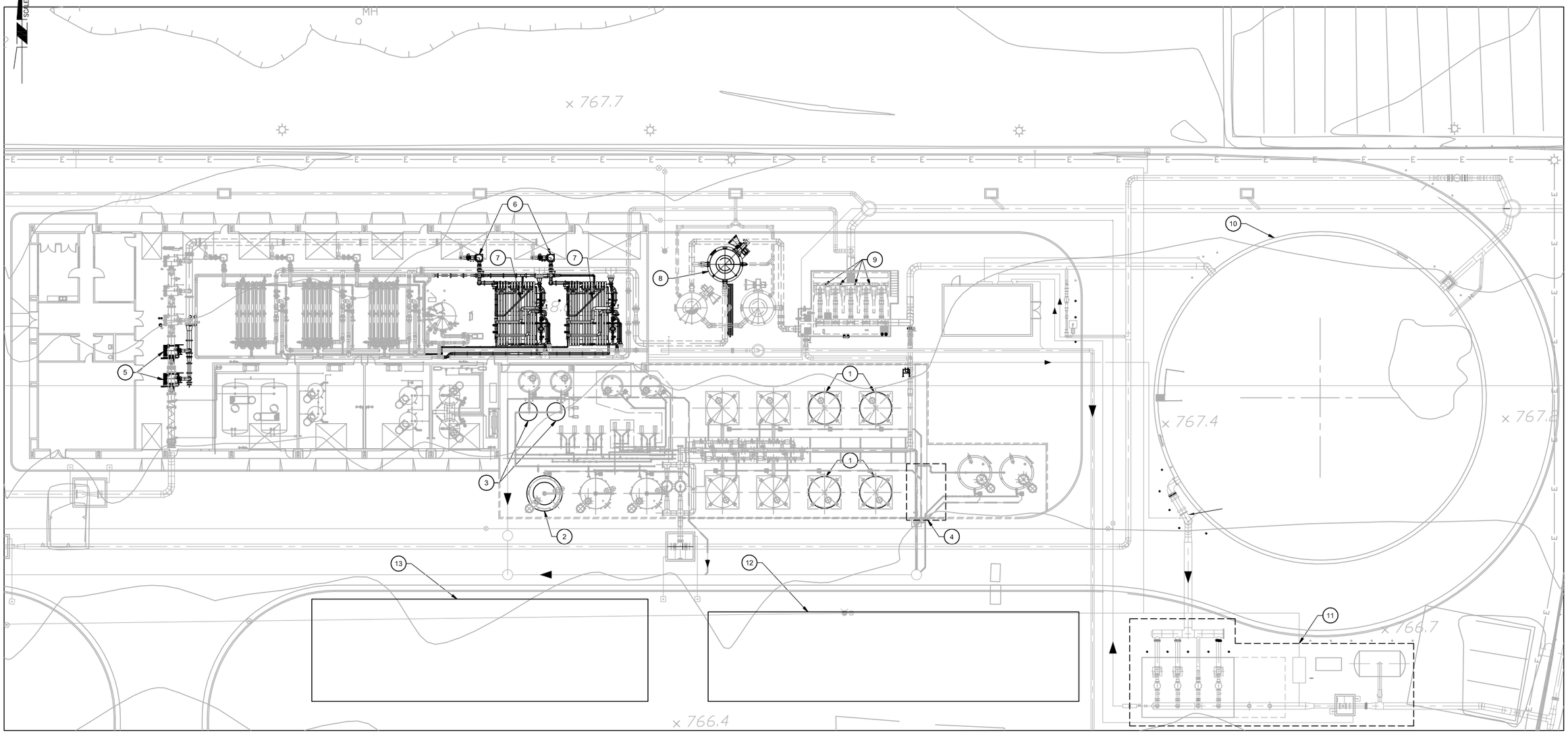
SCALE: 1"=20'



1. NEW IX VESSELS
2. NEW SALT STORAGE TANK
3. NEW SOFTENED WATER STORAGE TANKS
4. NEW BAG FILTERS (CONFIGURATION BY HUNGERFORD AND TERRY)
5. NEW CATRIDGE FILTERS
6. NEW RO FEED PUMPS
7. NEW RO TRAINS
8. NEW DECARBONATOR
9. NEW SST TRANSFER PUMPS (EXISTING MOTORS)
10. 3 MG CLEARWELL
11. EXISTING PRODUCT WATER PUMP STATION
12. NEW PRODUCT WATER PUMP STATION (S)
13. NEW STORAGE / ELECTRICAL BUILDING

Figure 3.3.1
SITE PLAN
WMWD / JCSD / CITY OF ONTARIO

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3.4 REVERSE OSMOSIS PRETREATMENT

3.4.1 Chemical Conditioning

The raw water from the well field is treated with threshold inhibitor and sulfuric acid after entering the trench in the process building. As water is pushed through the RO membranes, sparingly soluble salts of calcium, barium, strontium, and silica are concentrated and can precipitate on the membrane surface. The pretreatment chemicals allow operation at supersatured conditions, which in turn allows the RO systems to operate at higher system recovery. Higher recovery operation reduces the raw water requirement and the volume of waste concentrate for disposal.

The chemicals are injected into a 30-in diameter static mixer similar to that shown in Figure 3.4.1.1.

Figure 3.4.1.1 Static Mixer (Komax Systems, Inc. Website - www.komax.com)

3.4.2 Cartridge Filters

Cartridge filters are provided as a protective measure to prevent solids from reaching the RO membrane process. Solids, such as fine sands or silts, will result in RO membrane fouling and may cause serious mechanical damage to the RO membranes. The cartridge filters are provided as the final barrier to protect the valuable RO membranes against fouling or damage from particulates. A picture of one of the existing cartridge filter vessels is presented in Figure 3.4.2.1.

The cartridge filters vessels share a common inlet manifold as well as a common outlet manifold. Therefore, a single cartridge filter vessel provides redundancy for the entire system if one cartridge filter vessel is out of service for maintenance or replacement of cartridges. Design criteria for the cartridge filter vessels are shown in Table 3.4.2.1.

Figure 3.4.2.1 Existing Cartridge Filter Vessel

Table 3.4.2.1 Raw Water Cartridge Filters Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Vessel Orientation: Horizontal				
Cartridge Filter Type: Melt Blown				
Cartridge Filter Material: Polypropylene				
Cartridge Filter End Connection: Single Open End, Double O-Ring				
Cartridge Filter Rating	micron	5	5	
Cartridge Filter Length	inches	40	40	
Cartridge Filter Loading Rate[1]				
At 75 Percent Recovery	gpm/10-inch	3.95	4.11	
At 83.5 Percent Recovery	gpm/10-inch	3.54	3.69	
At 85 Percent Recovery	gpm/10-inch	3.48	3.63	
Maximum Pressure Drop				
Clean Filter	psig	3	3	
Dirty Filter	psig	15	15	
Vessels (Total)	No.	3	5	
Vessels (Reliability)	No.	1	1	

Table 3.4.2.1 Raw Water Cartridge Filters Design Criteria Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
Description	**Units**	**Existing**	**Expansion**	**Total**
Flow per Vessel (Firm Capacity)				
At 75 Percent Recovery	gpm (MGD)	2,778(4.0)	2,893(4.17)	
At 83.5 Percent Recovery	gpm (MGD)	2,495(3.59)	2,599(3.74)	
At 85 Percent Recovery	gpm (MGD)	2,451(3.53)	2,553(3.68)	
Cartridge Filters per Vessel	No.	176	176	176
Total Number of Cartridges	No.	528	352	880

Note:
1. Assumes one unit out of service.

3.4.3 RO Feed Pumps

The purpose of the RO feed pumps is to provide the energy to overcome osmotic pressure and dynamic head losses through the RO system. Each RO feed pump is dedicated to a single RO membrane train. The RO feed pumps are multistage vertical turbines, mounted in cans with both the suction and discharge flanges on the pump head. The RO feed pumps are located in the process room with roof hatches for crane access to the pumps (maintenance). A picture of one of the existing RO feed pumps is presented in Figure 3.4.3.1.

Design criteria for the RO feed pumps are shown in Table 3.4.3.1.

3.5 RO MEMBRANE TRAINS

The RO membrane trains are the primary process for TDS removal, including nitrates. The existing and proposed trains have two stages, each stage containing seven RO elements in series per pressure vessel. The RO trains receive pressurized feedwater from the RO feed pumps. The pressure “pushes” water through the membranes while salt is rejected. The rejected salts are concentrated into a small percentage of the flow and exit the system as waste. For the Chino II Desalter, the current operational recovery is 83.5 percent, controlled by the raw water silica concentration. As new water supply wells are constructed for the Chino II Desalter, the parameters controlling recovery may change. Therefore, the new RO trains are being designed to operate across a recovery range of 75 to 85 percent. As mentioned previously, two stage systems with seven RO membranes per vessel typically do not operate above 85 percent because the individual element recovery exceeds the manufacturer-defined operational range.

Figure 3.4.3.1 Existing RO Feed Pump

Table 3.4.3.1 RO Feed Pumps
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Type: Vertical Turbines in Closed Bottom Cans				
Number of Membrane Feed Pumps				
In-Service	No.	3	2	5
Reliability	No.	0	0	0
Total	No.	3	2	5
Capacity (Per Pump)				
At 75 Percent Recovery	gpm (MGD)	1,852(2.67)	3,010(4.33)	
At 83.5 Percent Recovery	gpm (MGD)	1,663(2.40)	2,703(3.89)	
At 85 Percent Recovery	gpm (MGD)	1,634(2.35)	2,655(3.82)	
Suction Pressure				
Minimum	ft H_2O (psig)	69(30)	69(30)	
Design	ft H_2O (psig)	116(50)	116(50)	
Maximum	ft H_2O (psig)	139(60)	139(60)	

Table 3.4.3.1 RO Feed Pumps
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Discharge Pressure[1]				
Clean Membrane (Year 0)	ft H2O (psig)	476(206)	446(193)	
Fouled Membrane (Year 5)	ft H2O (psig)	541(234)	511(221)	
Worst Case[2]	ft H2O (psig)	557(241)	520(225)	
Total Dynamic Head (TDH)				
Minimum	ft H_2O (psig)	337(146)	307(133)	
Design	ft H_2O (psig)	425(184)	395(171)	
Maximum	ft H_2O (psig)	488(211)	451(195)	
Motor Horsepower				
Per Pump	hp	450	600	
Total (In-Service)	hp	1,350	1,200	2,550
Drive		VFD	VFD	

Notes:
1. Pressures determined using Dow Filmtec ROSA RO design software assuming the design water quality at 83.5% recovery.
2. Pressures determined using Dow Filmtec ROSA RO design software assuming the "worst case" water quality at 83.5% recovery and a 5-yr membrane age.

The Chino II Desalter was originally designed for expansion to 18-MGD, including two additional RO trains, each with a capacity of 2.50-MGD. Increases in potable water demands have led to a revision of capacity requirements for the Chino II Desalter to 20.5-MGD. Therefore, the new RO trains have been increased in size to 3.25-MGD each.

The proposed configuration of the membrane trains, together with pertinent design criteria are shown in Table 3.5.1.

Table 3.5.1 RO System Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Type: Reverse Osmosis (RO)				
Number of Membrane Trains				
In-Service	No.	3	2	5
Reliability	No.	0	0	0
Total	No.	3	2	5
Permeate Flow per Train	gpm (MGD)	1,389(2.0)	2,257(3.25)	
Train Flux Rate	Gfd	14.9	14.9	
Recovery (Permeate/Feed Flow)				
Minimum	percent	75	75	
Design	percent	83.5	83.5	
Maximum	percent	85	85	
Number of Array Stages per Train	No.	2	2	
1st Stage				
Pressure Vessels per Train	No.	32	52	
Elements per Pressure Vessel	No.	7	7	
2nd Stage				
Pressure Vessels per Train	No.	16	26	
Elements per Pressure Vessel	No.	7	7	
Number of Elements				
Per Train	No.	336	546	
Total (In-service)	No.	1,008	1,092	2,156
Manufacturer		Dow Filmtec	Dow Filmtec	
Model				
Stage 1		BW30-400	BW30-400	
Stage 2		BW30-400	BW30-400	
Membrane Area				
Per Element	sq. ft.	400	400	
Per Train	sq. ft.	134,400	218,400	
Total (In-service)	sq. ft.	403,200	436,800	840,000

In addition to the expanded capacity, several modifications are proposed for the new RO trains to improve operability, maintenance, and performance monitoring. These features and their advantages are presented in Table 3.5.2.

Table 3.5.2 RO Train Design Features and Advantages
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Feature	Reason For Modification	Advantages
Stage 2 Permeate Flowmeter	Existing trains have no method for individual stage permeate flowrates	• Allows for performance monitoring and data normalization per ASTM D4516-00(2006)e1 - Standard Practice for Standardizing Reverse Osmosis Performance Data
Interstage Booster Pump	Unbalanced flux causes increased stage one fouling and higher TDS permeate	• Allows for individual stage permeate flowrate control • Lower permeate TDS • More energy efficient (most efficient pressure and flow at each stage)
In-line Instrumentation	Current instruments are installed on side streams that continually drain to the trench.	• Eliminates continuous flow into the trench • No scaling of drain lines or other maintenance hassles
Stage 2 Permeate Conductivity Instruments	Only manual sampling is available for monitoring stage two permeate conductivity	• Continuous stage two conductivity monitoring can help provide early warning of scaling • Allows for automated performance monitoring and data normalization per ASTM D4516-00(2006)e1 - Standard Practice for Standardizing Reverse Osmosis Performance Data
Fiberglass Support Frames	Painted steel frames are rusting and will eventually become maintenance issues	• Frames will not rust, even if paint is damaged
Multiporting of Pressure Vessels	Current style will not allow expansion trains to fit in designated areas of the RO building	• Reduced footprint due to more efficient vessel packing and elimination of feed and concentrate headers - allows larger trains to fit in existing spaces without dramatic increase in height • Significantly reduced number of grooved couplings
Above Grade Valves and Instruments	Current configuration has all of the valves and flowmeters in the trench. Although the trench is not a confined space, operations staff must still enter the trench to service these components. Additionally, the trench can flood, which jeapordizes the electric actuators and other instruments	• No trench entry to service equipment. • All instruments and valves are above the finished floor and no higher than 6-ft.

As discussed in Table 3.5.2, flux balance between the first and second stage of the RO train is controlled using an interstage booster pump. The piping is configured on the RO trains to allow for operation of the system with the interstage boost pump out of service. Because of the relatively low TDS levels in the raw water supply, energy recovery devices, such as an interstage turbocharger or feed-concentrate pressure exchanger (PX) are not economically feasible for the Chino II Desalter.

Design criteria for the inter-stage booster pumps is shown in Table 3.5.3

Table 3.5.3 RO Train Interstage Booster Pumps
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Expansion
Type: Inline Centrifugal (Vertical)		
No. of Pumps per Train	No.	1
Flow Rate		
At 75 Percent Recovery	gpm	1,500
At 83.5 Percent Recovery	gpm	1,190
At 85 Percent Recovery	gpm	1,143
TDH		
At 75 Percent Recovery	ft H_2O (psig)	109(47)
At 83.5 Percent Recovery	ft H_2O (psig)	92(40)
At 85 Percent Recovery	ft H_2O (psig)	92(40)
Motor Size	hp	60
Total (In-service)	hp	120
Drive:		VFD

Note:
1. VFD = Variable Speed Drive

3.5.1 Interstage Boost Pump Economic Analysis

As mentioned previously, Carollo Engineers has proposed several features for the new RO trains to improve upon the design of the three existing RO trains. Some of these features include:

- Fiberglass reinforced plastic support frames to eliminate corrosion
- Pressure vessel multi-porting to reduce train footprint, manifolds, and grooved couplings
- Configuration of valves and instruments to allow service without entering the pipe trench

- Use of in-line instruments instead of a side stream configuration thereby eliminating continuous draining of sample water into the trench
- Interstage boost pumping to allow for flux balancing

The inclusion of interstage boost pumps and the associated economic and performance implications are described in the following sections.

3.5.1.1 Benefits of Flux Balancing

For a two stage RO system, such as those utilized at the Chino II Desalter, balancing of the flux rate (gpm/sq. ft. or membrane area) is important to reduce stage one fouling, improve permeate quality, and provide improved flow control within the RO array. Flux imbalance in a two-stage RO system results from two things:

- Pressure drop through the individual stages caused by the membrane feed-concentrate spacers, fouling, and piping, which leaves less driving pressure for permeate production in the second stage.
- Osmotic pressure increase as the TDS in the concentrate stream increases through the system, which increases the required pressure to produce permeate in the second stage.

The existing Chino II RO trains have neither individual stage flow monitoring nor a method for accomplishing flux balancing between stages. This is a very atypical design and does not represent the industry standard for two stage brackish RO systems. To improve upon this, Carollo Engineers has proposed the use of interstage boost pumps and second stage flow measurement for flux balancing.

Several methods for flux balancing are available in addition to interstage boost pumps and include:

- Stage one permeate throttling
- Interstage boost energy recovery turbochargers
- Hybrid membrane arrays (different membrane types in each stage)

Stage one permeate throttling is the least expensive method for flux balancing, but is also the most inefficient method for flux balancing because it creates artificial headloss to restrict permeate production in the first stage. Interstage boost energy recovery turbochargers transfer the residual concentrate pressure to the interstage flow. However, these turbochargers are typically only beneficial at higher TDS levels, do not provide enough boost to balance flux rates (especially at lower TDS levels), require modulating bypass valves for proper control, do not operate at very high efficiency, and are expensive. Hybrid membrane arrays provide passive flux balancing, but do not offer flux control without other flux management tools (i.e. stage 1 permeate throttling) and do not provide membrane interchangeability between stages. Interstage boost pumps provide the most control capability and the lowest energy usage for a two-stage system with balanced flux. By tailoring the feed pressure to each stage, the energy consumption is minimized.

Based on the current operation and water quality, stage one fouling does not appear to be problematic at the Chino II Desalter. However, future wells will be required to complete the expansion and the new water supply wells may produce raw water more prone to fouling. While stage one fouling currently is not an issue, permeate quality is important. The higher the nitrate and TDS removal, the more raw water can be routed around the ion exchange system and blended before exceeding the nitrate and TDS finished water goals of 25 mg/L and 350 mg/L, respectively. If the new wells have a higher TDS concentration, the flux imbalance within the system will become more dramatic and will further increase the TDS of the permeate.

Because of the high silica concentrations in the raw water, it is likely that silica fouling will occur in the second stage over time, even with carefully controlled operation. As the permeability of the second stage is reduced, more of the permeate production will move to the first stage. The interstage boost pump will allow the membrane life to be extended while maintaining permeate production and avoiding an excessive flux imbalance condition (obviously, the increase in energy usage will eventually warrant membrane replacement instead of continued higher pressure operation).

3.5.1.2 Economic Analysis

In order to compare the costs of installing an interstage boost pump versus a system without this feature, an analysis was prepared using the design RO feedwater from the Preliminary Engineering Report at a recovery of 83.5 percent. A system with unbalanced flux, such as the current RO systems at the Chino II Desalter, will always have lower capital and energy costs than that of a balanced flux system. The price of the performance benefits of flux balancing is the increased energy and capital cost. When demonstrating the improved efficiency of a system with interstage pumping, the energy usage must be compared with an identical system with balanced flux. For this analysis, stage one permeate throttling was used to balance the flux for the system without an interstage pump as this represents the least expensive alternative flux balancing option. Additionally, the energy usage for a system without flux balancing, similar the current Chino II Desalter RO trains, was provided for comparison.

To develop energy usage, the following information was used:

- Pressure Requirements:
  - Pressure requirements were developed using ROSA membrane projection software by Filmtec.
  - Water quality was taken from the design water quality presented in Table 2.3.1
  - First stage permeate throttling was used to develop a non-boosted balanced flux scenario.
  - Pump Efficiency:
  - Pump curves for the existing and proposed RO feed pumps and the interstage boost pumps where used to project pump efficiency.

  - Pump speed was adjusted per affinity laws as required to achieve the proper combination of flow and pressure. The efficiency was adjusted correspondingly from the full speed efficiency reported on the pump curves.

- Energy Costs:
  - Baseline scenarios were performed using and electrical cost of $0.125/kWh.
  - Additional scenarios were performed using energy costs of $0.14/kWh and $0.15/kWh to demonstrate the sensitivity of the payback period to increasing costs.
- Additional Scenarios
  - To demonstrate the sensitivity to RO system recovery, a comparison was developed at 80 percent recovery using the design raw water quality
  - To demonstrate sensitivity to increasing TDS, a comparison was developed at 83.5 recovery using the “worst case” water quality, as reported Table 2.3.1.

Three options were developed for the economic analysis. These options are:

- Option 1 - Proposed option using interstage boost pumping for flux balancing
- Option 2 - Lowest capital cost flux balancing option using stage one permeate throttling
- Option 3 - No flux balancing (existing RO trains)

The projected operational conditions for each option and water quality condition are presented in Table 3.5.1.2.1.

In addition to the energy costs developed from the operational conditions presented in Table 3.5.1.2.1, capital costs for implementing Options 1 and 2 were estimated and are presented in Table 3.5.1.2.2. The capital costs were used to estimate the payback period resulting from the energy savings. Option 3 has no capital cost impact because it represents the baseline condition with no interstage pumping and no mechanism for flux balancing. Stage two permeate flowmeters were not included in the capital cost, as they are required to monitor performance regardless of the which option is considered.

Table 3.5.1.2.1 Projected Operational Conditions
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

	Units	Design Water Quality 83.5 Percent Recovery	Design Water Quality 80 Percent Recovery	Worst Case Water Quality 83.5 Percent Recovery
Option 1				
	gpm	2,703	2,821	2,703
RO Feed Pump[1]	ft	377	381	387
	%	78.9	78.1	79.1
	gpm	1,190	1,309	1,190
Interstage Boost Pump[1]	ft	86	89	98
	%	65.7	66.2	68.3
Option 2[2]				
	gpm	2,703	2,821	2,703
RO Feed Pump[1]	ft	471	479	494
	%	81.1	80.4	81.6
Option 3[3]				
	gpm	2,703	2,821	2,703
RO Feed Pump[1]	ft	408	411	408
	%	79.7	78.9	79.7

Notes:
1. Motor efficiency = 92.5%
2. First stage permeate throttling used for flux balancing.
3. No flux balancing (existing condition)

Table 3.5.1.2.2 Estimated Capital Costs
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

	Option 1	Option 2
Pump Capital Cost	$90,000	$0
Suction Valve Cost	$8,000	$0
Discharge Valve Cost	$8,000	$0
Miscellaneous Piping Modifications	$20,000	$0
Control System Modifications	$10,000	$5,000
VFDs	$80,000	$0
Permeate Throttling Valve and Actuator	$0	$30,000
Concrete Base	$10,000	$0
Total Capital Cost[1]	**$226,000**	**$35,000**

Note:
1. Capital costs are total for RO Trains 4 and 5

The total annual power costs for all three options and all water quality conditions, assuming a unit energy cost of $0.125/kW, are presented in Table 3.5.1.2.3.

Table 3.5.1.2.3 Total Power Costs ($0.125/kWh)[1]
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

	Units	Design Water Quality 83.5 Percent Recovery	Design Water Quality 80 Percent Recovery	Worst Case Water Quality 83.5 Percent Recovery
Option 1 - Interstage Boost Pumping	$/yr	$645,260	$691,971	$665,419
Option 2 - Stage 1 Permeate Throttling	$/yr	$699,870	$749,297	$729,548
Option 3 - No Flux Balancing	$/yr	$616,906	$655,148	$635,682

Note:
1. Yearly power costs assume 100 percent operating factor.

The energy cost savings of Option 1 (interstage boost pump option) versus Option 2 (flux balancing via stage one permeate throttling) are presented in Table 3.5.1.2.4 for all analyzed operating conditions and power costs.

Table 3.5.1.2.4 Power Cost Savings For Option 1 Versus Option 2[1]
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Power Cost	Units	Design Water Quality 83.5 Percent Recovery	Design Water Quality 80 Percent Recovery	Worst Case Water Quality 83.5 Percent Recovery
$0.125/kWh	$/yr	$54,610	$57,326	$64,130
$0.140/kWh	$/yr	$61,163	$64,205	$71,825
$0.150/kWh	$/yr	$65,532	$68,791	$76,956

Note:
1. Yearly power cost savings assume 100 percent operating factor.

The payback period based on the energy cost savings presented in Table 3.5.1.2.4 are listed in Table 3.5.1.2.5.

Table 3.5.1.2.5 Payback Period For Option 1 Versus Option 2[1]
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Power Cost	Units	Design Water Quality 83.5 Percent Recovery	Design Water Quality 80 Percent Recovery	Worst Case Water Quality 83.5 Percent Recovery
$0.125/kWh	yrs	4.1	3.9	3.5
$0.140/kWh	yrs	3.7	3.5	3.1
$0.150/kWh	yrs	3.4	3.3	2.9

Note:
1. Yearly power cost savings assume 100 percent operating factor.

Figure 3.5.1.2.1 graphically demonstrates how the payback period is shortened as power costs and raw water TDS increase. Regardless of power costs and water quality, the payback period is less than five years for the installation of interstage boost pumps versus the least expensive alternative method of flux balancing.

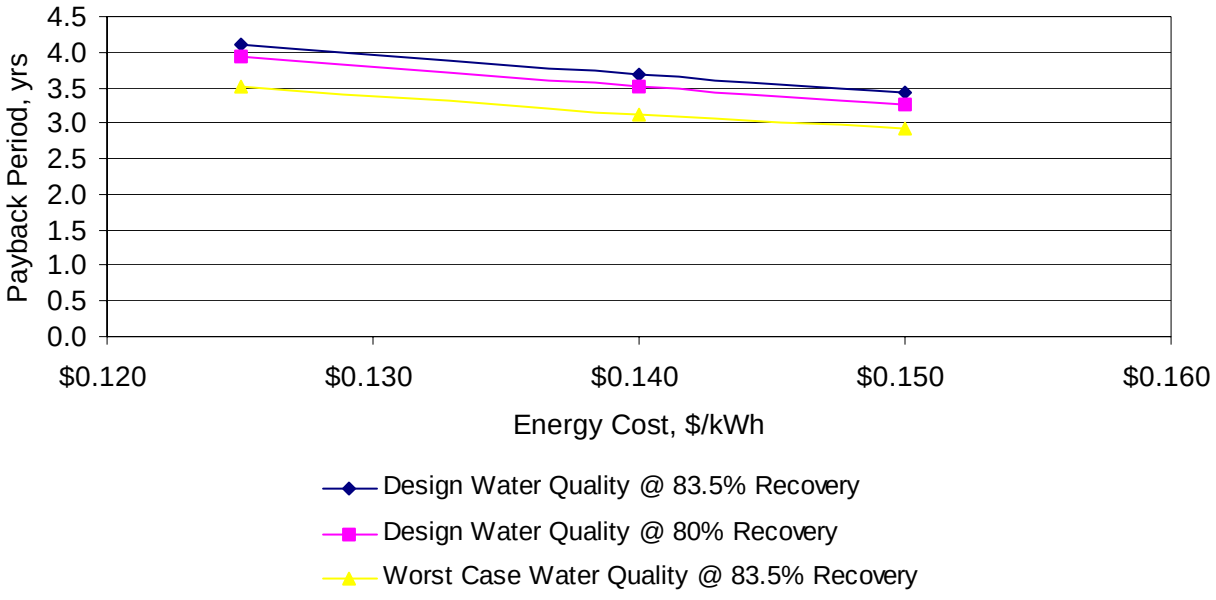


Figure 3.5.1.2.1 Payback Period for Option 1 Versus Option 2

3.6 CONCLUSIONS

As previously mentioned, balancing flux rates within a two-stage RO system requires additional capital expenditures and higher energy usage when compared to a system operating without flux balancing. However, balancing flux offers operational benefits that include improved permeate quality, reduced stage one fouling, and optimum flow control within the RO array. As the comparison between Option 1 and Option 2 demonstrates, an interstage boost is the most cost effective long term method for flux balancing and becomes more attractive as power costs and raw water TDS increases.

3.7 MEMBRANE CLEAN IN PLACE (CIP) SYSTEM

The CIP system is used to chemically clean and remove foulants (e.g., particles, mineral scale, and biology) from the RO membranes. Foulants result in additional headloss and increased energy requirements to maintain production flow rates. Additionally, foulants may result in a deterioration of permeate water quality.

The CIP system circulates cleaning chemicals to the RO membrane trains. The CIP system is permanently connected to the membrane skid piping in order to avoid the labor, time, and safety issues involved in connecting and disconnecting hoses or pipe spools. For the new RO trains, CIP connections to the permeate side of the RO membrane will have block valves and removable spool pieces to insure that the treated water is isolated from the cleaning solution while in service.

Each stage on the membrane train is cleaned separately to deliver the required cleaning flow velocities to each pressure vessel in the array. Because the new RO trains are larger than those originally planned, the existing CIP pump is not large enough to clean the entire first stage at one time. Therefore, the first stage of the new trains has been divided into two sections, each with 26 vessels, to assure that adequate cleaning flowrates can be achieved with the existing CIP pump.

Although no modifications are proposed, the criteria for the existing CIP system is presented in Table 3.6.1.

Table 3.6.1 Membrane Clean-in-Place (CIP) System
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

	Units	Existing RO Trains	New RO Trains
Pressure Vessel Cleaning Flow Rate			
Stage 1 (Each)	gpm	50	50
Vessels Cleaned Per Cycle	No.	32	26
Total Stage 1 Cleaning Flowrate	gpm	1,600	1,300
Stage 2 (Each)	gpm	50	50
Vessels Cleaned Per Cycle	No.	16	26
Total Stage 1 Cleaning Flowrate	gpm	800	1,300
CIP Chemical Tank			
Number	No.	2	
Volume (Each)	gallons	6,000 (nominal)	
Tank Heater			
Type: Immersion			
Number of Units	No.	2	
Size			
Each	kW	200	
Total	kW	400	
CIP Recirculation Pump			
Type: SST End Suction Centrifugal			
Number	No.	1	
Flow	gpm	1,600	
TDH	ft H_2O (psig)	140	(61)
Motor Load	hp	100	
Drive:		CS	

Note: CS = Constant Speed Drive

3.8 DECARBONATORS - RO PERMEATE

The decarbonation process is designed to reduce the concentration of carbon dioxide in the membrane permeate water. Removal of carbon dioxide raises the pH, lowers alkalinity, and reduces the amount of post treatment caustic soda required for finished water pH adjustment. The existing decarbonators are forced draft countercurrent type, with plastic packing media to increase the air-water interface zones and improved carbon dioxide transfer. Additionally, each decarbonator has a sodium hypochlorite chemical injection point on the inlet pipe to allow for periodic disinfection and cleaning of the media and tower interior. A third tower of identical size and features is proposed to accommodate the full RO permeate flowrate. A picture of one of the existing decarbonators is presented in Figure 3.7.1.

Figure 3.7.1 Existing Decarbonator

Design criteria for the decarbonator system are shown in Table 3.7.1.

Table 3.7.1 Decarbpnator Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Type: Packed Tower Air Strippers				
Number of Decarbonators				
In-Service	No.	2	1	3
Reliability	No.	0	0	0
Total	No.	2	1	3
Flow per Decarbonator	gpm (MGD)	2,083(3.0)	2,893(4.17)	
Diameter	ft	12	12	
Area per Decarbonator (Net Footprint)	sq ft	113	113	
Loading Rate (Per Footprint Area)	gpm/sq ft	18	26[1]	
Air Flow Rate per Decarbonator	scfm	8,400	8,400	
Air/Water Loading	scfm/gpm	4.0	2.2	
Blowers				
In-Service	No.	2	1	3
Reliability	No.	0	0	0
Total	No.	2	1	3
Capacity Per Blower	cfm	8,400	8,400	
Blower Motor Horsepower				
Each	hp	10	10	
Total (In-Service)	hp	20	10	30
Drive:		CS	CS	
CO_2 Removal				
Inlet CO_2[2]	mg/L	12 - 17	12 - 17	
Outlet CO_2	mg/L	<5	<5	
Removal Efficiency	percent	>50	>50	
Inlet Water Quality				
PH		5.2 - 5.4	5.2 - 5.4	
Temperature	°C (°F)	17.2(63)	17.2(63)	

Notes:
1. Manufacturer has confirmed as an acceptable loading rate.
2. Assumes elimination of raw water acid addition.

3.9 NITRATE REMOVAL ION EXCHANGE SYSTEM

Because the RO membrane systems remove nearly all of the dissolved solids from the raw water, a portion of the Chino II raw water can be routed around the RO system and blended with the RO permeate. However, because of the high nitrate levels in the raw water, ion (anion) exchange must be used on some or all of the flow that is routed around the RO system to reduce the nitrate levels prior to blending with the RO permeate. The process consists of passing water across fixed bed anion exchange media contained in vertical pressure vessels. As the nitrate anion is adsorbed onto the media, a chloride anion is released into the flowstream. Periodically, the vessels are backwashed and regenerated with a sodium chloride (salt water) solution. Regeneration sequences are triggered by nitrate breakthrough in the ion exchange effluent. The spent regeneration solution, which is high in nitrates, is discharged to the SARI. Although the ion exchange system has been designed for the specific anion removal of nitrates, other anions, such as sulfates and bicarbonate, are also removed in the process.

3.9.1 Existing Ion Exchange System

The existing system was designed and installed by Hungerford and Terry and includes the following fundamental components:

- Pretreatment bag filters for removing sand or other particles that might periodically enter the facility
- Four (4) nitrate removal pressure vessels with resin
- Brine saturators and brine holding tanks for storage of salt and preparation of regeneration solution
- Water softeners to prevent calcium sulfate scaling during regeneration of the ion exchange media and also to prevent scaling in the on-site sodium hypochlorite generator (a small portion of softened water and brine from the ion exchange facilities is delivered to the nearby onsite generation chlorine system for overall treatment plant disinfection)
- Air block blowers for retaining the ion exchange media during backwashing and regeneration
- Process pumps for performing regenerations and solution transfer
- Rinse reclaim storage tanks for storage and recycle of rinse water following regeneration cycles
- Waste storage tanks to store spent regenerant prior to disposal to the SARI.

The existing ion exchange system was designed for a minimum inlet pressure upstream of the bag filters of 50 psig and is rated to operate at 4-MGD with three nitrate removal vessels online and one in standby/regeneration mode. In theory, the ion exchange system operates by treating water through a vessel until breakthrough occurs, which is defined as

an effluent nitrate level above 20 mg/L (as NO_3). When breakthrough occurs, the vessel undergoes a two-hour regeneration cycle (counter-current flow with air blocking for media retention), which removes the adsorbed nitrate, bicarbonate, and sulfate ions from the resin and replaces them with chloride ions. Once regenerated, the vessel is ready to be placed back into service.

Each of the four (4) nitrate removal vessels continuously cycles through the following sequence:

1. Online mode, during which the vessels is producing treated effluent
2. Regeneration mode, during which the vessel media is backwashed, regenerated with sodium chloride solution, and rinsed
3. Standby mode, during which the vessel remains offline until another vessel is taken offline.

The online cycle time for each vessel depends upon the raw well water quality from the well field supply. Since the Chino II Desalter well field nitrate concentration varies significantly, cycle times for the nitrate removal vessels also vary. The online nitrate analyzers take into account the varying raw well water quality to aid in optimizing the nitrate removal vessel online time. The current system cycles the nitrate removal vessels offline based upon a treated volume of water. Because control is volume based and not controlled by nitrate breakthrough in this mode, a vessel can go offline prior to reaching nitrate breakthrough or after resin breakthrough, depending on the influent nitrate concentration. The operators estimate a breakthrough volume based on water quality and enter the flow setpoint into the ion exchange control system. An alternative control strategy would be to trigger regeneration based upon effluent water nitrate concentrations, which would reduce the risk of exceeding the finished water nitrate goal of 25 mg/L as nitrate.

During operation, the individual vessel effluent water quality varies throughout the online mode. At the beginning of the online cycle, the bicarbonate is reduced significantly, higher TDS concentrations are experienced, and the pH of the effluent is lower than the incoming raw well water. Approximately halfway through the online vessel cycle, the bicarbonate, pH, and TDS levels are roughly equivalent to the incoming raw well water values. Near the end of the online mode, nitrate adsorption sites are exhausted and the nitrate levels in the effluent water increase rapidly. Since each of the vessels produce varying effluent water quality they must be staggered to produce a combined effluent water that represents that of the well water with reduced nitrates and sulfates. With several nitrate removal vessels online, the varying individual vessel water quality will be dampened to produce a more constant combined water quality. The combined ion exchange effluent water quality will vary, but the range is minimized when multiple nitrate removal vessels are online. With the addition of four new vessels for the expansion, the amount of ion exchange effluent variability will be reduced, resulting in more consistent ion exchange effluent quality (contingent upon the number of vessels online).

As previously mentioned, the existing ion exchange system is based upon treating a volume of well water through an individual nitrate removal vessel, with the volume controlled by an effluent nitrate level of 20 mg/l (as nitrate). The nitrate removal resin removes almost all of the nitrates from the supply well water throughout the online time, with a quick spike in the nitrate concentration at resin breakthrough. Due to this type of nitrate treatment, the combined effluent nitrate concentration typically is much less than 20 mg/l (as nitrate) and approximately ranges from 2 to 10 mg/l (as nitrate).

3.9.2 Ion Exchange System Expansion

The current ion exchange nitrate removal system has a capacity of 955 gpm/per vessel. Normal operation is for one vessel to be in regeneration/standby mode while the remaining three vessels are online. This yields a system capacity of 4-MGD. Currently, the existing vessels are being re-rated for higher flowrates. However, with the expansion of the system to eight vessels as proposed, the existing vessel capacity will be sufficient to provide the required
8-MGD with two vessels in regeneration/standby mode.

Several items were built-in to the original system to allow for future expansion. These items include:

- Concrete pedestals for nitrate removal vessels and the third brine saturator
- Electrical instrumentation facilities, including valve control master stations and nitrate analyzers/sequencers
- The overall piping size and configuration.

The ion exchange expansion will take advantage of the items that have been built into the current 4-MGD system and will also improve the system by incorporating new features to allow for more efficient operation. The new items that will be included in the expansion include:

- Four (4) new nitrate removal vessels (NRV), similar to the existing four NRV's.
- One new brine saturator.
- Additional softened water capacity.
- Hardness analyzers for the softened water system to optimize the online time and reduce excessive brine usage and waste disposal.
- A new regeneration system for the water softeners that will use the regenerate from the nitrate removal vessels to also regenerate the softeners. This feature reduces the overall salt required and the amount of regenerate brine waste.
- Expansion of the regeneration system to allow for regeneration of two vessels simultaneously.
- Additional pretreatment bag filters.

- New rinse reclaim system with adequately sized rinse reclaim pumps for the range of inlet well pressures upstream of the bag filters.
- Waste storage modifications and disposal.

The expanded ion exchange treatment system for nitrate removal will double the nominal ion exchange effluent capacity from 4-MGD to 8-MGD. Continuous operation at 10-MGD will be possible, if necessary.

The proposed configuration of the ion exchange system, together with pertinent design criteria are shown in Table 3.8.2.1.

Table 3.8.2.1 Nitrate Removal Ion Exchange System Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Ion Exchange Vessels				
Type: Fixed bed vertical pressure vessel				
Resin: Rohm and Haas Amberjet 440 CI Strong Base Anion Resin				
Number of Vessels				
In Service	No.	3	3	6
Reliability	No.	1	1	2
Total	No.	4	4	8
Vessel Diameter	ft	12	12	
Vessel Straight Shell Height	ft	11	11	
Flow per Vessel	gpm (MGD)	955 (1.38)	955 (1.38)	
Total Flowrate[1]	gpm (MGD)	2,865 (4.13)	2,865 (4.13)	5,730 (8.25)
Nitrate Removal Efficiency	%	>90	>90	>90
Influent Nitrate	mg/L as NO_3	100 - 150	100 - 150	100 - 150
Effluent Nitrate	mg/L as NO_3	2 - 10	2 - 10	2 - 10
Feedwater Bag Filters				
Vessel Orientation: Vertical				
Vessel Material: 316 SST				
Bag Filter Material: Polypropylene				
Bag Filter Rating:	micron	50	50	
Number of Bags				
Per Vessel	No.	23	23	
Total	No.	46	46	92
Maximum Pressure Drop				
Clean Bag	psi	1	1	
Dirty Bag	psi	15	15	

Table 3.8.2.1 Nitrate Removal Ion Exchange System Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Vessels (Total)	No.	2	2	4
Vessels (Reliability)	No.	0	1	1
Flowrate per Vessel[1]	gpm (MGD)	1,910 (2.75)	1,910 (2.75)	
Total Flowrate	gpm (MGD)	3,820 (5.50)	1,910 (2.75)	5,729 (8.25)
Brine Saturators				
Type: Fiberglass Reinforced Plastic				
Orientation: Vertical				
Number of Tanks				
In Service	No.	2	1	3
Total	No.	0	1	1
Capacity				
Per Tank	tons of salt	96.5	96.5	
Total	tons of salt	193	96.5	289.5
Brine Holding Tanks				
Type: Fiberglass Reinforced Plastic				
Orientation: Vertical				
Number of Tanks				
In Service	No.	2	0	2
Total	No.	2	0	2
Capacity				
Per Tank	gal	3,000	0	
Total	gal	6,000	0	6,000
Water Softeners				
Type: Cation Exchange				
Configuration: Duplex, Lined Steel				
Number of Tanks				
In Service	No.	2	0	2
Total	No.	2	1	3
Capacity				
Per Vessel	gpm	130	130	
Total	gpm	260	130	390

Table 3.8.2.1 Nitrate Removal Ion Exchange System Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Softener Brine Reclaim/Makeup Tank				
Type: Fiberglass Reinforced Plastic				
Orientation: Vertical				
Number of Tanks				
In Service	No.	0	1	1
Total	No.	0	1	1
Capacity				
Per Tank	gal	0	3,000	
Total	gal	0	3,000	3,000
Nitrate Exchanger Rinse Reclaim Tanks				
Type: Fiberglass Reinforced Plastic				
Orientation: Vertical				
Number of Tanks				
In Service	No.	1	0	1
Total	No.	1	0	1
Capacity				
Per Tank	gal	16,000	0	
Total	gal	16,000	0	16,000
Nitrate Exchanger Brine Waste Tanks				
Type: Fiberglass Reinforced Plastic				
Orientation: Vertical				
Number of Tanks				
In Service	No.	1	0	2
Total	No.	2	0	2
Capacity				
Per Tank	gal	16,000	0	
Total	gal	32,000	0	32,000
Softener Feed Pumps				
Type: ANSI End-Suction Centrifugal				
Number of Pumps (Total)				
In Service	No.	1	1	2
Reliability	No.	1	0	1
Total	No.	2	1	3
Flow	gpm	175	175	
TDH	ft H_2O (psig)	50 (22)	50 (22)	

Table 3.8.2.1 Nitrate Removal Ion Exchange System Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Motor Size	hp	5	5	
Total (In-service)	hp	5	5	10
Drive Type[2]		CS	CS	
Softener Reclaim Brine Feed Pumps				
Type: ANSI End-Suction Centrifugal				
Number of Pumps (Total)				
In Service	No.	0	1	1
Reliability	No.	0	1	1
Total	No.	0	2	2
Flow	gpm	0	49	
TDH	ft H_2O (psig)	0 (0)	45 (20)	45 (20)
Motor Size	hp	0	2	
Total (In-service)	hp	0	2	2
Drive Type[2]		-	CS	
Brine Transfer Pumps				
Type: ANSI End-Suction Centrifugal				
Number of Pumps (Total)				
In Service	No.	1	0	1
Reliability	No.	1	0	1
Total	No.	2	0	2
Flow	gpm	40	0	
TDH	ft H_2O (psig)	10 (4)	0 (0)	
Motor Size	hp	1	0	
Total (In-service)	hp	1	0	1
Drive Type[2]		CS	-	
Softener Fresh Brine Feed Pumps				
Type: ANSI End-Suction Centrifugal				
Number of Pumps (Total)				
In Service	No.	0	1	1
Reliability	No.	0	1	1
Total	No.	0	2	2

Table 3.8.2.1 Nitrate Removal Ion Exchange System Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Flow	gpm	0	17	
TDH	ft H_2O (psig)	0 (0)	45 (20)	
Motor Size	hp	0	1.5	
Total (In-service)	hp	0	1.5	1.5
Drive Type[2]		-	CS	
Brine Feed Pumps				
Type: ANSI End-Suction Centrifugal				
Number of Pumps (Total)				
In Service	No.	1	1	2
Reliability	No.	1	1	2
Total	No.	2	2	4
Flow	gpm	43	43	
TDH	ft H_20 (psig)	45 45	45 (19)	
Motor Size	hp	2	2	
Total (In-service)	hp	2	2	4
Drive Type[2]		CS	CS	
Rinse Reclaim Pumps[4]				
Type: ANSI End-Suction Centrifugal				
Number of Pumps (Total)				
In Service	No.	1	1	2
Reliability	No.	1	0	1
Total	No.	2	1	3
Flow	gpm	100	100	
TDH	ft H_20 (psig)	95 (41)	150 (65)	
Motor Size	hp	10	15	
Total (In-service)	hp	10	15	30
Drive Type[2]		CS	CS	
Air Block Blowers	No.			
Type: Centrifugal				
Flow	cfm	95	95	
Discharge Pressure	ft H_2O	23	23	
Number of Blowers (Total)				
In Service	No.	1	1	2
Reliability	No.	1	1	2
Total	No.	2	2	4

Table 3.8.2.1 Nitrate Removal Ion Exchange System Design Criteria Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
Description	**Units**	**Existing**	**Expansion**	**Total**
Motor Size	hp	10	10	
Total (In-service)	hp	10	10	20
Drive Type[2]		CS	CS	

Notes:
1. Assumes that spare vessel(s) are out of service.
2. CS = Constant speed
3. Existing pumps will be replaced.
4. Existing pumps will be upgraded to match new pumps.

3.10 TRANSFER PUMPING

Product transfer pumps are required to raise the hydraulic grade line from the effluent of the decarbonators to the maximum water surface elevation in the storage tank. The existing Chino II Desalter transfer pump station is configured to convey RO permeate and a portion of the ion exchange system effluent to the 3-MG storage tank. Blending of ion exchange effluent and the addition of caustic soda in the transfer pump station serve to protect the cast iron transfer pumps from corrosion by achieving a positive Langlier Saturation Index (LSI). In order to achieve a positive LSI and the target pH in the final plant product (including raw water blending and the balance of the ion exchange effluent), the pH in the transfer pump station is elevated to a point where softening occurs, which is causing calcium carbonate scale to form on the pump station walls and inside the pumps themselves.

An economic analysis was performed to compare the following options:

1. Expansion of the facility based on the existing operational philosophy, addition of a second permanent caustic soda injection point, and installation of a new pH meter
2. Replacement of the existing transfer pumps with 316 stainless steel pumps (existing motors would remain), elimination of the ion exchange blend and re-pump in the transfer pump station, relocation of existing caustic soda injection point to transfer pump discharge right before the ion exchange blend.

Option 2 has many benefits:

- No new caustic soda pumps and chemical piping will be required, except for that required to move the injection point to the transfer pump discharge.
- Re-pumping of ion exchange effluent is avoided - the energy savings will pay for the new pumps.
- Chemical feed control is simplified - one point of application.

- The new pH analyzer is not required.
- If the blending of ion exchange effluent with RO permeate is continued, the transfer pump station should have the firm capacity to pump the entire combined flow of 20.5-MGD. To provide firm capacity, replacement of one of the existing transfer pumps and the addition of a fifth transfer pump is needed. If only RO permeate is pumped, as is the case with the proposed scenario (no ion exchange blending), the additional larger transfer pumps are not needed.
- Only minor control modifications are required for the existing caustic soda feed system.

3.10.1 Economic Analysis

An economic analysis was performed to estimate the payback period for replacing the existing transfer pumps. In developing this estimate, the hydraulics of the existing system were modeled using AFT Fathom®. The following assumptions were made when developing the model:

- Existing pump curves provided by Afton Pumps
- Piping arrangement, materials, and valve C_v values taken from the Chino II Desalter Record Drawings and valve literature.
- Water surface elevations and piping centerlines taken from Chino II Desalter Record Drawings.

The proposed scenario, which involves elimination of the ion exchange blend in the transfer pump station, was modeled with flowrates (after Chino II expansion) shown in Figure 3.9.1.1 and serves as the baseline for the economic analysis.

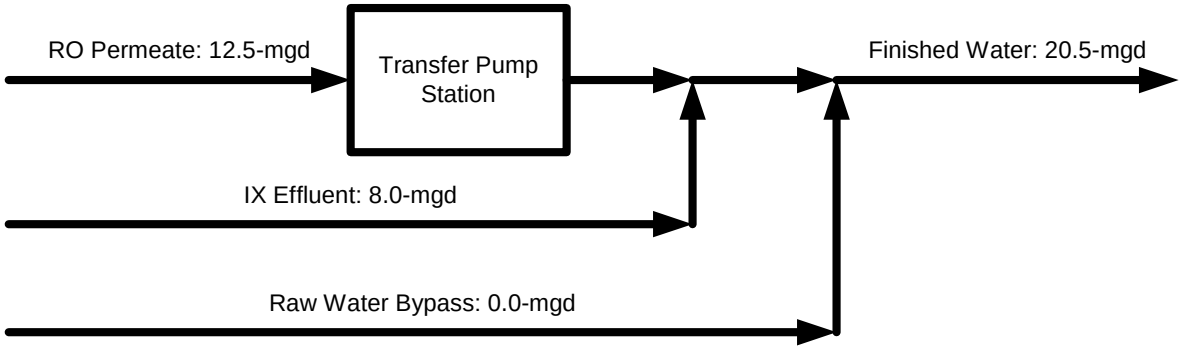


Figure 3.9.1.1 Proposed Scenario (No IX Blending) - Process Flows

To evaluate continuation of the existing operational philosophy, two scenarios were developed where ion exchange effluent blending was utilized and compared against the proposed scenario (no ion exchange blending).

- **Scenario 1 (Continued Ion Exchange Blending)** - Blending of ion exchange effluent in the transfer pump station at the same ratio as is currently used.
- **Scenario 2 (Continued Ion Exchange Blending)** - Blending of the entire ion exchange effluent with the RO permeate prior to entering the transfer pump station.

The flowrates used for Scenarios 1 and 2 are presented in Figures 3.9.1.2 and 3.9.1.3, respectively.

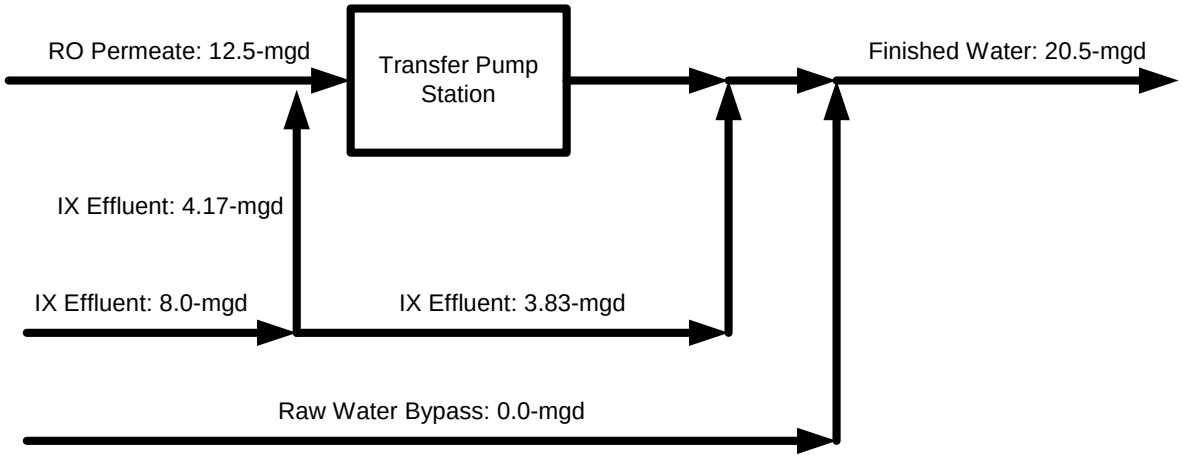


Figure 3.9.1.2 Scenario 1 (Continued IX Blending) - Process Flows

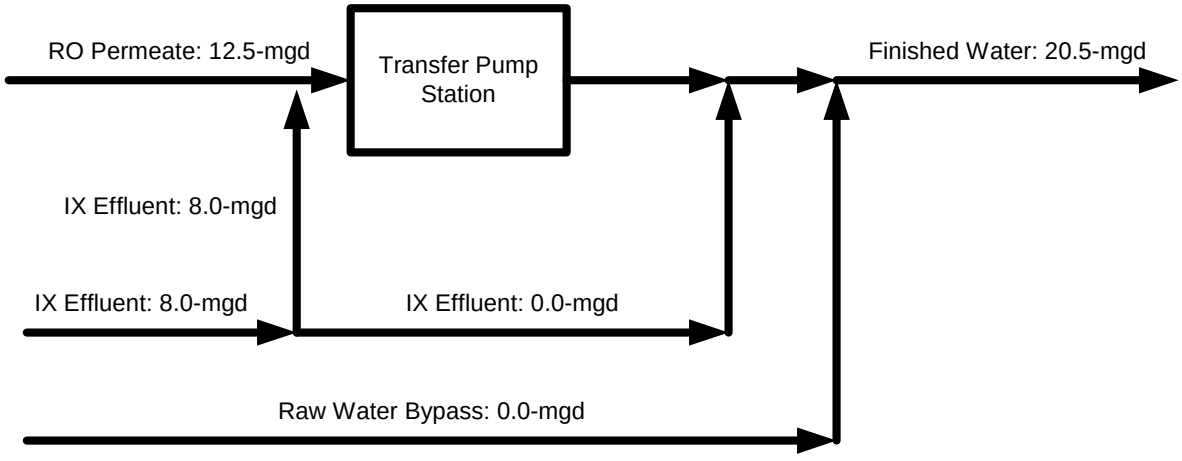


Figure 3.9.1.3 Scenario 2 (Continued IX Blending) - Process Flows

The economic analysis compared the energy savings from the proposed scenario (no ion exchange blending) to the cost of implementation. The implementation cost is the difference in cost between the proposed scenario (no ion exchange blending) and the Scenarios 1 and 2 (continued ion exchange blending). The net cost to implement the proposed scenario (no ion exchange blending) is the difference between replacing the four existing pumps and making the modifications necessary to continue operating per the current operational philosophy.

Capital cost components for the proposed scenario (no ion exchange blending) and their estimated costs are presented in Table 3.9.1.1.

Table 3.9.1.1 Proposed Scenario (No IX Blending) Capital Cost Components
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Item	Quantity	Installed Unit Cost	Total Installed Cost
Pump Capital Cost	4	$125,000	$500,000
Discharge Butterfly Valve Cost	4	$3,500	$14,000
Discharge Check Valve Cost	4	$5,000	$20,000
Miscellaneous Piping Modifications	1	$50,000	$50,000
Control System Modifications	1	$10,000	$10,000
		Total Installed Cost:	**$594,000**

Note: No salvage value was included for the existing transfer pumps.

Capital cost components for the Scenario 1 and 2 (continued ion exchange blending) and their estimated costs are presented in Table 3.9.1.2.

Table 3.9.1.2 Scenario 1 and 2 (Continued IX Blending) Capital Cost Components
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Item	Quantity	Installed Unit Cost	Total Installed Cost
Pump Capital Cost[1]	2	$100,000	$200,000
Discharge Butterfly Valve Cost[1]	1	$3,500	$3,500
Discharge Check Valve Cost[1]	1	$5,000	$5,000
Variable Speed Drives[1]	2	$50,000	$100,000
New Chemical Feed System Modifications[2]	1	$205,000	$205,000
Control System Modifications[2]	1	$19,000	$19,000
Chino II Expansion Pre-Purchase Project Costs:			$308,500
Cost of Modifications to Continue Existing Operational Philosophy:			$224,000
		Total Installed Cost:	**$532,500**

Notes:
1. Items required for the Chino II Expansion Pre-Purchase Project if expansion via the current operational philosophy were adopted
2. Cost of modifications to continue the current operational philosophy
3. No salvage value was included for the existing transfer pumps.

Based on the information in Tables 3.9.1.1 and 3.9.1.2, the estimated net cost of implementation of the proposed scenario (no ion exchange blending) is $61,500. Therefore, the payback period was defined by the number of years of energy savings necessary to offset the additional $61,500 in capital costs associated with the proposed scenario (no ion exchange blending).

Energy usage was calculated based on the flow, total dynamic head, and pump efficiencies derived from the hydraulic model. Table 3.9.1.3 shows the operation conditions for each pump in each of the three operational scenarios.

Table 3.9.1.3 Transfer Pump Station Operational Conditions
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Item	Proposed Scenario No Ion Exchange Blending (Baseline Condition)	Scenario 1 Continued Ion Exchange Blending	Scenario 2 Continued Ion Exchange Blending
Transfer Pump No. 1	3,163 gpm 42-ft TDH 84.7% Efficiency 100% Speed	3,157 gpm 42-ft TDH 84.6% Efficiency 100% Speed	3,151 gpm 42-ft TDH 84.6% Efficiency 100% Speed
Transfer Pump No. 2	3,163 gpm 42-ft TDH 84.7% Efficiency 100% Speed	3,157 gpm 42-ft TDH 84.6% Efficiency 100% Speed	3,151 gpm 42-ft TDH 84.6% Efficiency 100% Speed
Transfer Pump No. 3	2,354 gpm 41-ft TDH 78.5% Efficiency 93% Speed	3,157 gpm 42-ft TDH 84.6% Efficiency 93% Speed	3,151 gpm 42-ft TDH 84.6% Efficiency 100% Speed
Transfer Pump No. 4[1]	Spare	2,114 gpm 41-ft TDH 74.6% Efficiency 91% Speed	4,793 gpm 47-ft TDH 84.6% Efficiency 98% Speed
Transfer Pump No. 5	Not Installed	Spare	Spare

Notes:
1. For Scenarios 1 and 2, the existing transfer pump is assumed to be replaced with a larger pump.
2. Motor efficiency for all cases was assumed to be 92.5%

Based on these performance parameters, the yearly energy usage was calculated (assuming a 100 percent operating factor) for each scenario. The energy costs were developed at $0.125/kWh, $0.135/kWh, $0.145/kWh, and $0.155/kWh to demonstrate the payback period sensitivity to rising energy costs.

The costs and resulting payback periods are presented in Table 3.9.1.4 and shown graphically in Figure 3.9.1.4.

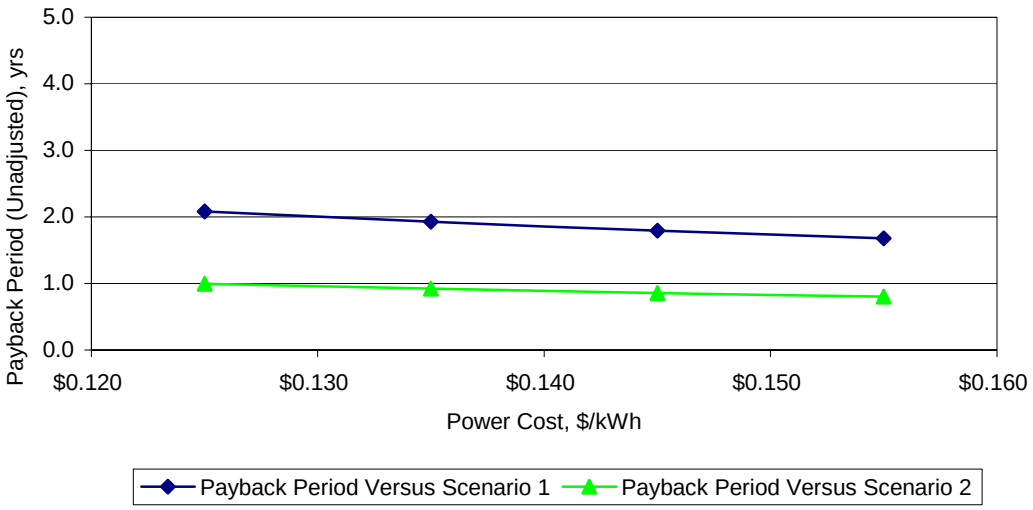


Figure 3.9.1.4 Payback Period for Replacement of Existing Transfer Pumps

Table 3.9.1.4 Power Costs and Payback Periods
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Unit Power Cost ($/kWh)	$0.125	$0.135	$0.145	$0.155
Total Proposed Scenario Power Cost ($/yr)	$103,056	$111,301	$119,545	$127,790
Proposed Scenario Energy Savings Versus Scenario 1 ($/yr)	$29,532	$31,894	$34,257	$36,619
Proposed Scenario Energy Savings Versus Scenario 2 ($/yr)	$61,783	$66,726	$71,668	$76,611
Payback Period Based on Energy Difference Scenario 1 (yrs)	2.08	1.93	1.80	1.68
Payback Period Based on Energy Difference Scenario 2 (yrs)	1.00	0.92	0.86	0.80

Using the power and capital costs for the proposed scenario (no ion exchange blending) and Scenarios 1 and 2 (continued ion exchange blending), the present value at each power cost was developed and presented for comparison in Table 3.9.1.5.

Table3.9.1.5 Present value Costs and Comparisons[1] Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
Unit Power Cost ($/kWh)	$0.125	$0.135	$0.145	$0.155
Proposed Scenario (No Ion Exchange Blending) Present Value ($)	$1,776,047	$1,870,611	$1,965,174	$2,059,738
Scenario 1 (Continued Ion Exchange Blending) Present Value ($)	$2,053,273	$2,174,934	$2,296,596	$2,418,258
Scenario 2 (Continued Ion Exchange Blending) Present Value ($)	$2,423,195	$2,574,451	$2,725,706	$2,876,962
Present Value Difference Between Proposed Scenario (No Ion Exchange Blending) and Scenario 1 ($)	$277,226	$304,324	$331,422	$358,520
Present Value Difference Between Proposed Scenario (No Ion Exchange Blending) and Scenario 2 ($)	$647,148	$703,840	$760,532	$817,224

Note:
1. Present value calculated for 20-yrs at 6% rate. No yearly escalation of power costs was assumed.

3.10.2 Conclusions From Economic Analysis

The economic analysis clearly indicated that the proposed scenario, elimination of the ion exchange blending and replacement of the existing pumps with stainless steel models was the most beneficial from a long term cost perspective. Based on the costs of the two options, which differ by less than $100,000, the maximum payback period is 25 months or less, after which the energy savings lead to a direct reduction in operating costs. With proper maintenance, it is reasonable to assume that the pumps will last at least 10 to 15 years, if not longer. Additionally, the proposed scenario (no ion exchange blending) simplifies control of the post treatment chemical feed and requires only minor changes to existing chemical feed system. As a result of this analysis, the CDA elected to replace the existing cast iron pumps with stainless steel pumps.

3.10.3 Design Criteria - Transfer Pumps

Design criteria for modification to the existing transfer pumps are presented in Table 3.9.3.1.

Table 3.9.3.1 Transfer Pump Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Description	Units	Existing	Expansion	Total
Type: Sump Mounted Vertical Turbines				
Number of Pumps				
In-Service	No.	3[1]	3	
Reliability	No.	1[1]	1	
Total	No.	4[1]	4	4
Pump Flow Rate	gpm (MGD)	3,500(5.04)	3,500(5.04)	
Total Dynamic Head (TDH)	ft H_2O	39	39	
Motor Horsepower[2]				
Per Pump	hp	60		
Total	hp	240		240
Drive[2]		VFD		

Notes:
1. Existing pumps to be replaced with new stainless steel pumps.
2. Existing motors and drives to be used for new SST pumps. VFD = Variable Frequency Drive.

3.11 GROUND STORAGE TANKS

The ground storage tanks provide storage of finished water for flow equalization between the treatment plant process and the fluctuating demands of the distribution system. In addition to minimizing changes to the treatment plant process flow rate, the ground storage reservoirs also provide emergency storage for the distribution system.

The existing tank is a circular, welded steel tank with a capacity of 3 million gallons. The inlet pipe from the treatment process is designed to mix the tank contents and avoid dead zones and decay of disinfectant residual. To allow for disposal of startup water to the Day Creek, a diversion line will be installed upstream of the isolation butterfly valve on the inlet to the clearwell. Depending on the projected use of this flow diversion, electric actuators may be added to automate the diversion process. The maintenance necessary to maintain

the actuators will offset any benefit to automating the process if the diversion is used only a few times per year or less.

3.12 PRODUCT WATER PUMP STATION

The expansion of the Chino II Desalter results in an additional 10.5-MGD of product water capacity, to be divided equally between WMWD, the City of Ontario, and JCSD (the three agencies sponsoring the expansion). Section 6 of the *Chino Desalter Phase 3 Comprehensive Predesign Report* provides a detailed discussion of pump station sizing, facility layouts, and hydraulic conditions.

3.13 CHEMICAL FEED SYSTEMS

3.13.1 Sulfuric Acid

Calcium carbonate scale is controlled by lowering feedwater pH with sulfuric acid, which results in a lower concentrate Langlier Saturation Index (LSI). Historically, an LSI of +1.8 in the concentrate with the addition of threshold inhibitors was the baseline for acid dosing. However, advances in threshold inhibitors have allowed for successful operation at concentrate LSIs up to 2.5.

Currently, silica scaling controls the RO system recovery at the Chino II Desalter. Silica solubility is a function of temperature and pH. The maximum theoretical silica concentration can be calculated based on the Equation 3.12.1.1:

$$SiO_{2\,(mas)} = SiO_{2\,(pH\,7.5)} * pH\,Correction\,Factor \qquad \text{(Equation 3.12.1.1)}$$

Where:
$SiO_{2\,(max)}$ = maximum soluble silica concentration at design pH for the given temperature
$SiO_{2\,(pH\,7.5)}$ = maximum soluble silica concentration at pH 7.5 for the given temperature
pH Correction Factor is derived from Figure 3.12.1.1

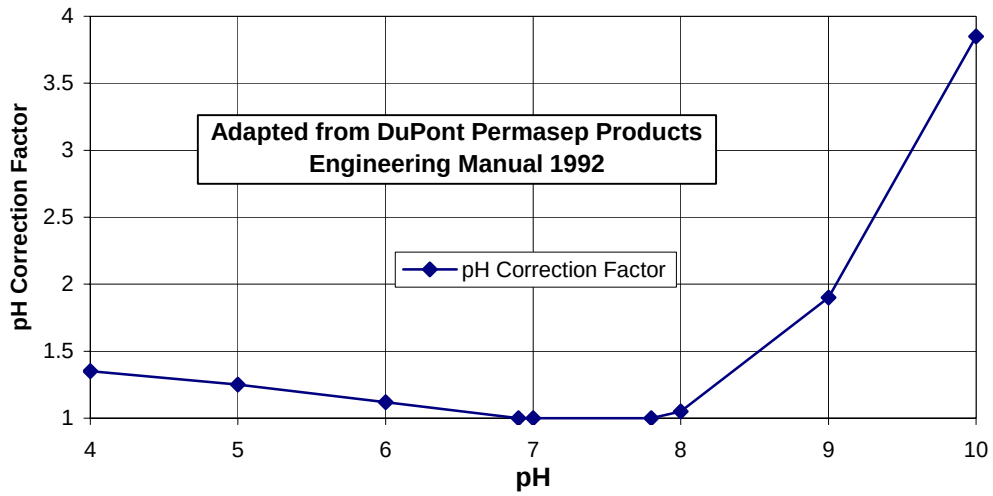


Figure 3.12.1.1 pH Correction Factor for Calculating Maximum Silica Solubility

Equation 3.12.1.1 and Figure 3.12.1.1 show that silica solubility is not affected in pH ranges from 7 to 8. Based on the design water presented in Table 2.3.1 and RO performance projections at 83.5 percent recovery, the concentrate LSI with no acid addition is approximately 2.1. Assuming that calcium carbonate scaling is controlled by threshold inhibitors alone at this concentrate LSI, silica will remain the recovery limiting constituent, regardless if acid is added or not. Therefore, the capability to eliminate acid is plausible, and will be confirmed through pilot testing.

Pilot testing is planned at the Chino II Desalter to determine if acid can be eliminated as a pretreatment chemical. Regardless of the conclusions drawn from the pilot testing, the sulfuric acid system should remain in place in the event that future water quality from the expanded wellfield or scaling in the concentrate line warrants re-introduction of raw water pH adjustment.

3.13.1.1 Existing System

Sulfuric acid is delivered in bulk to the site at a 93 percent concentration. The current sulfuric acid system consists of two 10,500-gal steel tanks, a recessed secondary containment area, two diaphragm-type metering pumps, double containment chemical piping, and a single injection quill installed in the Raw water line. With the exception of the chemical piping to the injection point and the injection quill, the complete system is located within the sulfuric acid room in the RO process building.

The existing system storage volume is limited because the volume of the secondary containment area is less than the volume held by one sulfuric acid tank. Due to this restriction and the small amount of acid used at the existing capacity (10-MGD), only one acid tank is in service at a time and is only filled to a level that corresponds to the volume of the secondary containment area.

3.13.1.2 Recommended Improvements

No modifications to the acid system are proposed for this project. However, the design of the system was reviewed to ensure its capability to adjust pH across the range of flowrates, recovery, and water quality.

3.13.1.3 Design Criteria

The design criteria for the existing system is presented in Table 3.12.1 .3.1

Table 3.12.1.3.1 Sulfuric Acid (SA) Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Sulfuric Acid Characteristics:
Concentration: 93 Percent
Specific Gravity: 1.8
Solution Strength: 13.96 lb of acid /gal

Parameters	Units	Min[1]	Avg[2]	Max[3]
Chemical Usage				
Location: Raw Water				
Process Flow	MGD	7.06	14.97	16.67
Chemical Dose	mg/L	10	20	40
Chemical Usage	lb/day	589	2,497	5,560
Chemical Feed Rate	gpd	42	179	398
Chemical Feed Rate	gph	1.8	7.5	16.6
Bulk Storage Tanks				
Number of Tanks	No.		2	
Tank Capacity, each	gal		10,500	
Tank Capacity, total[4]	gal		21,000	
Storage Time	days		117	
Delivery Truck Full Load	gal		4,000	
Parameters	**Units**	**Min[1]**	**Avg[2]**	**Max[3]**
Time Between Delivery	days		22	
Metering Pumps				
Pump Type: Hydraulic Diaphragm				
Motor: AC w/ VFD Drive				
Metering Pump Capacity	gph		80	
Maximum Motor Speed	strokes/ min		144	
Minimum Motor Speed	strokes/ min		15	
Turndown (motor speed only)	ratio		10:1	

Table 3.12.1.3.1 Sulfuric Acid (SA) Design Criteria Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
Stroke Position	percent	10	20	30
Max Adjusted Capacity	gph	8.0	16	24
No. of Standby Pumps		1	1	1
No. of Pumps in Service		1	1	1
Feed Rate Per Pump	gph	1.8	7.5	16.6
Pump Speed Required	percent	22	47	69
Pump Speed	strokes/min	32	67	100

Notes:
1. Design water quality at 85 percent recovery and 6-MGD or RO permeate.
2. Design water quality at 83.5 percent recovery and 12.5-MGD or RO permeate
3. Worst case water quality at 75 percent recovery and 12.5-MGD or RO permeate.
4. The actual storage capacity is less than the tank capacity because of insufficient secondary containment area volume.

3.13.2 Threshold Inhibitor

Threshold inhibitor (TI) is added to prevent the precipitation of sparingly soluble salts that may foul the membranes as the feed water becomes a concentrated byproduct. As the RO membrane system feed water becomes more concentrated, the saturation limit of sparingly soluble salts (e.g., $CaCO_3$, $CaSO_4$, $BaSO_4$, $SrSO_4$, CaF_2, and SiO_2) may be surpassed and precipitation of these salts may occur on the RO membranes. This type of fouling is referred to as scaling. Scale formation will result in increased operating costs (i.e., higher pumping pressures and chemical cleaning to dissolve the scale and restore membrane productivity) and a deteriorated permeate water quality.

3.13.2.1 Existing System

The existing threshold inhibitor system consists of two storage tanks, two metering pumps, a recessed secondary containment area, two diaphragm-type metering pumps, double containment chemical piping, and a single injection quill installed in the Raw water line. With the exception of the chemical piping to the injection point and the injection quill, the complete system is located within the threshold inhibitor room in the RO process building.

3.13.2.2 Recommended Improvements

The design of the system was reviewed to ensure its capability to feed chemicals across the range of flowrates, recovery, and water quality. The current storage and delivery system is adequate for the expansion; however, a portion of the storage tank volume is not usable because the metering pump suction elevation is several feet above the bottom of the tank. The pumps lose prime when the level draws below the pump suction elevation. In order to

improve the usable volume of the storage tanks, taller equipment pads will be installed to raise the bottom of the tanks above the elevation of the metering pump suction line.

3.13.2.3 Design Criteria

The design criteria for the existing system is presented in Table 3.12.2.3.1

Table 3.12.2.3.1 Threshold Inhibitor (TI) Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Threshold Inhibitor Characteristics:

Manufacturer/Product: King Lee Technologies/Pretreat Plus™ Y2K

Concentration: 100 Percent

Specific Gravity: 1.06

Solution Strength: 8.84 lb of TI/gal

Parameters	Units	Min[1]	Avg[2]	Max[3]
Chemical Usage				
Location: Raw Water				
Process Flow	MGD	7.06	14.97	16.67
Chemical Dose	mg/L	0.5	4.0	5
Chemical Usage	lb/day	29	500	695
Chemical Feed Rate	gpd	3.3	57	79
Chemical Feed Rate	gph	0.14	2.36	3.28
Bulk Storage Tanks				
Number of Tanks	No.		2	
Tank Capacity, each	gal		2,000	
Tank Capacity, total	gal		4,000	
Parameters	**Units**	**Min[1]**	**Avg[2]**	**Max[3]**
Storage Time	days		71	
Delivery Truck Full Load	gal		4,000	
Time Between Delivery	days		71	
Metering Pumps				
Pump Type: Hydraulic Diaphragm				
Motor: AC w/ VFD Drive				
Metering Pump Capacity	gph		4.0	
Maximum Motor Speed	strokes/ min		72	
Minimum Motor Speed	strokes/ min		7	
Turndown (motor speed only)	ratio		10:1	

Table 3.12.2.3.1 Threshold Inhibitor (TI) Design Criteria Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
Stroke Position	percent	10%	100%	100%
Max Adjusted Capacity	gph	0.40	4.00	4.00
No. of Standby Pumps		1	1	1
No. of Pumps in Service		1	1	1
Feed Rate Per Pump	gph	0.14	2.36	3.28
Pump Speed Required	percent	35%	59%	82%
Pump Speed	strokes/min	25	42	59

Notes:
1. Design water quality at 85 percent recovery and 6-MGD or RO permeate.
2. Design water quality at 83.5 percent recovery and 12.5-MGD or RO permeate
3. Worst case water quality at 75 percent recovery and 12.5-MGD or RO permeate.

3.13.3 Caustic Soda

Caustic soda is added to adjust the finished water pH and produce a condition that is slightly precipitating with respect to calcium carbonate. Controlled calcium carbonated precipitation forms a protective film on pipe walls and provides a physical barrier between metallic pipe and water, thereby helping to prevent corrosion. A qualitative measure of calcium carbonate precipitation is the Langlier Saturation Index (LSI), with slightly positive values indicating a tendency to deposit calcium carbonate scale. A quantitative (and preferred) measure of calcium carbonate precipitation is the Calcium Carbonate Precipitation Potential (CCPP). The recommended finished water ranges for LSI and CCPP is greater than zero and 4 to 10 mg/L as $CaCO_3$, respectively.

3.13.3.1 Existing System

Caustic soda is delivered in bulk to the site as a 50 percent solution. The current sodium hydroxide system consists of two storage tanks, two metering pumps, a recessed secondary containment area, three diaphragm-type metering pumps, double containment chemical piping, an injection quill installed in the influent mixing box at the transfer pump station, and an injection quill at the reverse osmosis clean-in-place system. With the exception of the chemical piping to the injection points and the injection quills, the complete system is located within the caustic soda room in the RO process building.

3.13.3.2 Recommended Improvements

As discussed in Section 3.7, the current caustic injection point will be moved to the transfer pump discharge to improve control and prevent scaling in the transfer pump station sump and pumps. Currently, a temporary caustic soda injection system is located near the 3 MG storage tank providing a secondary caustic soda injection using temporary equipment. However, this system will be decommissioned after the existing chemical injection point is relocated.

The existing system does not include any heat tracing or heating equipment for the caustic soda room. At 50 percent solution, the freezing point of caustic soda is 52 to 54 degrees Fahrenheit. During the winter, exterior chemical lines without heat tracing may be subject to clogging and freezing. Therefore, any new above ground caustic soda piping will be insulated and heat traced to maintain a fluid temperature of at least 65 degrees Fahrenheit.

Because of the increased flow, the existing caustic soda metering pumps are not sufficiently sized. Therefore, replacement of the existing pumps with new 30 gal/hr pumps is required to meet the dosage requirements at the increased flowrates and worst-case water quality conditions.

A portion of the storage tank volume is not usable because the metering pump suction elevation is several feet above the bottom of the tank. The pumps lose prime when the level draws below the pump suction elevation. In order to improve the usable volume of the storage tanks, taller equipment pads will be installed to raise the bottom of the tanks above the elevation of the metering pump suction line.

3.13.3.3 Design Criteria

The design criteria for the existing system is presented in Table 3.12.3.3.1.

Table 3.12.3.3.1 Caustic Soda (CS) Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Caustic Soda Characteristics:
Concentration: 50 Percent
Specific Gravity: 1.53
Solution Strength: 6.35 lb of caustic soda /gal

Parameters	Units	Min[1]	Avg[2]	Max[3]
Chemical Usage				
Location: Raw Water				
Process Flow	MGD	6.0	12.5	12.5
Chemical Dose	mg/L	10	15	35

Table 3.12.3.3.1 Caustic Soda (CS) Design Criteria Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
Actual Finished Water Dose[4]	mg/L	6.0	9.1	21
Chemical Usage	lb/day	501	1,565	3,651
Chemical Feed Rate	gpd	78.9	246	575
Chemical Feed Rate	gph	3.3	10.3	24.0
Bulk Storage Tanks				
Number of Tanks	No.		2	
Tank Capacity, each	gal		3,000	
Tank Capacity, total[4]	gal		6,000	
Storage Time	days		24	
Delivery Truck Full Load	gal		4,000	
Time Between Delivery	days		16	
Metering Pumps				
Pump Type: Hydraulic Diaphragm				
Motor: AC w/ VFD Drive				
Metering Pump Capacity5	gph		30	
Maximum Motor Speed	strokes/ min		144	
Minimum Motor Speed	strokes/ min		15	
Turndown (motor speed only)	ratio		10:1	
Stroke Position	percent	50%	50%	100%
Max Adjusted Capacity	gph	15.00	15.00	30.00
No. of Standby Pumps		1	1	1
No. of Pumps in Service		1	1	1
Feed Rate Per Pump	gph	3.3	10.3	24.0
Pump Speed Required	percent	22%	68%	80%
Pump Speed	strokes/min	32	99	115

Notes:
1. Design water quality at 85 percent recovery and 6-MGD or RO permeate.
2. Design water quality at 83.5 percent recovery and 12.5-MGD or RO permeate
3. Worst case water quality at 75 percent recovery and 12.5-MGD or RO permeate.
4. The caustic soda is added to the RO permeate before blending with the ion exchange effluent and raw water bypass. The Actual Finished Water Dose = Chemical Dose * (RO Permeate Flow/Total Plant Flow).
5. New pumps installed in existing spaces.

3.13.4 Sodium Hypochlorite

Sodium hypochlorite is fed into the finished water to provide a free chlorine residual disinfectant in the distribution system. Sodium hypochlorite is fed periodically into the decarbonator influent to control biofouling of the packing media. Sodium hypochlorite is generated onsite using salt water and electricity per equation 3.12.4.1

$$NaCl + H_2O + 2e = NaOCl + H_2 \qquad \text{(Equation 3.12.4.1)}$$

As shown in equation 3.12.4.1, the products of the reaction are sodium hypochlorite (at 0.8 percent solution) and hydrogen gas. The hydrogen gas is carefully vented to avoid explosions in the generator and storage tanks.

3.13.4.1 Existing System

The current sodium hypochlorite system consists of:

- 600 lb/day generator
- Salt and brine storage tanks (shared with ion exchange system)
- Two (2) Hydrogen off-gas blowers
- Two (2) sodium hypochlorite storage tanks
- Two (2) gear pumps for chemical feed
- A recessed secondary containment area
- Double containment chemical piping to the injection points
- An injection quill installed in the influent mixing box at the transfer pump station,
- An injection quill installed on the 3MG clearwell effluent line to the product water pump stations, and
- Injection quills on the decarbonator influent lines

The brine and salt storage tanks are located outside in the ion exchange area. The rest of the system, except for the chemical piping to the injection points and the injection quills, is located within the sodium hypochlorite room in the RO process building.

3.13.4.2 Recommended Improvements

The design of the system was reviewed to ensure its capability to feed chemicals across the range of flowrates. The current storage and delivery system is adequate for the expansion; however, a portion of the storage tank volume is not usable because the gear pump suction elevation is several feet above the bottom of the tank. The pumps lose prime when the level draws below the pump suction elevation. In order to improve the usable volume of the storage tanks, taller equipment pads will be installed to raise the bottom of the tanks above the elevation of the metering pump suction line.

3.13.4.3 Design Criteria

The design criteria for the existing system is presented in Table 3.12.4.3.1.

Table 3.12.4.3.1 Sodium Hypochlorite (SH) Design Criteria
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Sodium Hypochlorite Characteristics:
Concentration: 0.8 Percent
Solution Strength: 0.07 lb of chlorine/ gal (15 gal/lb of chlorine)

Parameters	Units	Min	Avg	Max
Chemical Usage				
Location: Raw Water				
Process Flow	MGD	10.0	20.5	20.5
Chemical Dose	mg/L	1.0	1.5	2.0
Chemical Usage	lb/day	83	257	342
Chemical Feed Rate	gpd	1,252	3,849	5,132
Chemical Feed Rate	gpm	0.9	2.7	3.6
Salt Usage				
Salt Requirements	lbs NaCl/lb Cl_2		3.0	
Total Salt Usage	lbs/day	250	770	1,026
Total Salt Usage	tons/day	0.1	0.4	0.5
On-Site Generator				
Make: Clortec				
Model: CT-600				
Capacity	lbs/day		600.0	
Runtime	hrs/day	3.3	10.3	13.7
Power	DC/kWh/day	165	515	685
Bulk Storage Tanks				
Storage Tanks	No.		2	
Tank Capacity, each	tons		96.5	
Tank Capacity, total	tons		193	
Parameters	**Units**	**Min**	**Avg**	**Max**
Storage Time[1]	days		501	
Gear Pumps				
Metering Pump Capacity	gpm		4.0	
Maximum speed	rpm		1800	
Minimum speed	rpm		400	

Table 3.12.4.3.1 Sodium Hypochlorite (SH) Design Criteria Chino II Desalter Preliminary Engineering Report WMWD/JCSD/City of Ontario				
No. of Standby Pumps	No.	1	1	1
No. of Pumps in Service	No.	1	1	1
Actual Chemical Feed Rate	gpm	0.9	2.7	3.6
Estimated Pump Speed	rpm	391	1203	1604

Note:
1. Assumes use for sodium hypochlorite generator only. Ion exchange system uses same brine tanks for regeneration

3.14 RAW WATER BYPASS FACILITIES

As water quality (specifically nitrates and TDS) permits, a portion of the raw water can be bypassed around the ion exchange and RO systems and blended prior to disinfection. Bypassed raw water is the least expensive water because it requires minimal treatment. The existing bypass line is a 12-in diameter pipe that reduces to 8-in diameter for a flowmeter, increases to a 10-in pipe for the flow control valve, and then increases back to 12-in diameter before blending with the blended ion exchange and RO product water.

The Chino II Desalter operations staff indicated the line size at the flowmeter and control valve was restricting the available bypass flow. Based on a hydraulic analysis across a range of flowrates from 3- to 6-MGD, increasing the line size downstream of the flowmeter will reduce the pressure rop by almost 50 percent (control valve was assumed fully open for the analysis). The results of this analysis are presented in Figure 3.13.1.the analysis).

Since the maximum differential pressure in the 10-in section of piping is less than 25 psi and the raw water pressure is consistently around 50 psi, the existing piping arrangement should be more than sufficient for at least 6-MGD of raw water bypass flow, if not more. Pressure drop across the 8-in section of piping and the flowmeter is less than one psi at 6-MGD, so there is no benefit to replacing this section of piping. Therefore, modifications to the raw water bypass piping are not recommended, assuming that the raw water pressure is at least 30 to 50 psi coming into the plant site.

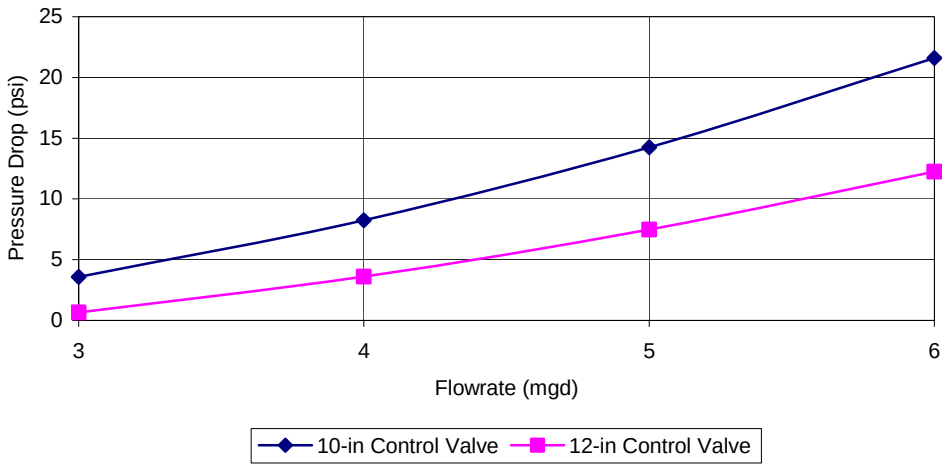


Figure 3.13.1 Raw Water Bypass Line Pressure Drop Versus Flowrate

3.15 ELECTRICAL POWER SYSTEM

3.15.1 Southern California Edison Electrical Service Requirements

The projected electrical demand for the RO and ion exchange system expansions were evaluated to determine any additional electrical requirements. Based on the existing system and proposed additional electrical loads from the ion exchange and RO system expansions, the existing service and switchgear is sufficient. However, a new electrical service will be required for the new product water pump station. (Size of service will be determined when pump station sizing is confirmed based on Webb Associates hydraulic modeling)

3.15.2 Power Distribution

Power for the RO feed pumps and interstage boost pumps is delivered from LC-RO in the RO process building electrical room. Power for the decarbonator blower is delivered from MCC-AUX in the RO process building electrical room. Power for the transfer pumps is delivered from MCC-TRF in the East electrical building. Since the transfer pump motors and drives will remain, no modifications to MCC-TRF are proposed. Power to the product water pumps is delivered from LC-HSP in the East electrical building. As part of the expansion, one of the existing soft starters will be replaced with a VFD to improve distribution system pressure and flow control.

The new product water pump stations will be powered from a new electrical room located to the west of the pump stations. The electrical room will have a new SCE service.

Figures 3.14.2.1 and 3.14.2.2 show the electrical one-line diagrams and load center/motor control center elevations for the expansion components within the existing electrical rooms. Table 3.14.2.1 summarizes the major plant electrical loads.

Table 3.14.2.1 Major Electric Load Summary
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

				Existing		Expansion	
Load Description	**Location**	**Units**	**Unit Load**	**No.**	**Connected Load**	**No.**	**Connected Load**
RO Feed Pumps, Existing	RO Process Building	hp	450	3	1,350	3	1,350
RO Feed Pumps, New	RO Process Building	hp	600	0	0	2	1,200
Interstage Boost Pumps	RO Process Building	hp	60	0	0	2	120
Decarbonator Blowers	RO Process Building	hp	10	2	20	3	30
CIP Recirculation Pump	RO Process Building	hp	100	1	100	1	100
CIP Solution Heaters	RO Process Building	hp	268	2	536	2	536
Onsite Generator System	RO Process Building	hp	80	1	80	1	80
Metering Pumps	RO Process Building	hp	0.5	8	4	8	4
			Subtotal (hp):		2,090		3,420
Transfer Pumps	East Electrical Building	hp	60	4	240	4	240
Product Water Pumps - 1110 Zone	East Electrical Building	hp	450	3	1,350	3	1,350
			Subtotal (hp):		1,590		1,590
Product Water Pumps - 870 Zone	New Electrical Building	hp	150	0	0	1	150
Product Water Pumps - 1010 Zone	New Electrical Building	hp	400	0	0	3	1,200
			Subtotal (hp):		0		1,350
Ion Exchange System	Ion Exchange Stand Alone Enclosure	hp			75		125
			Subtotal (hp):		75		125
Grand Total [1]					**3,755**		**6,485**

Note:
1. Does not include HVAC, lighting, or receptacles.

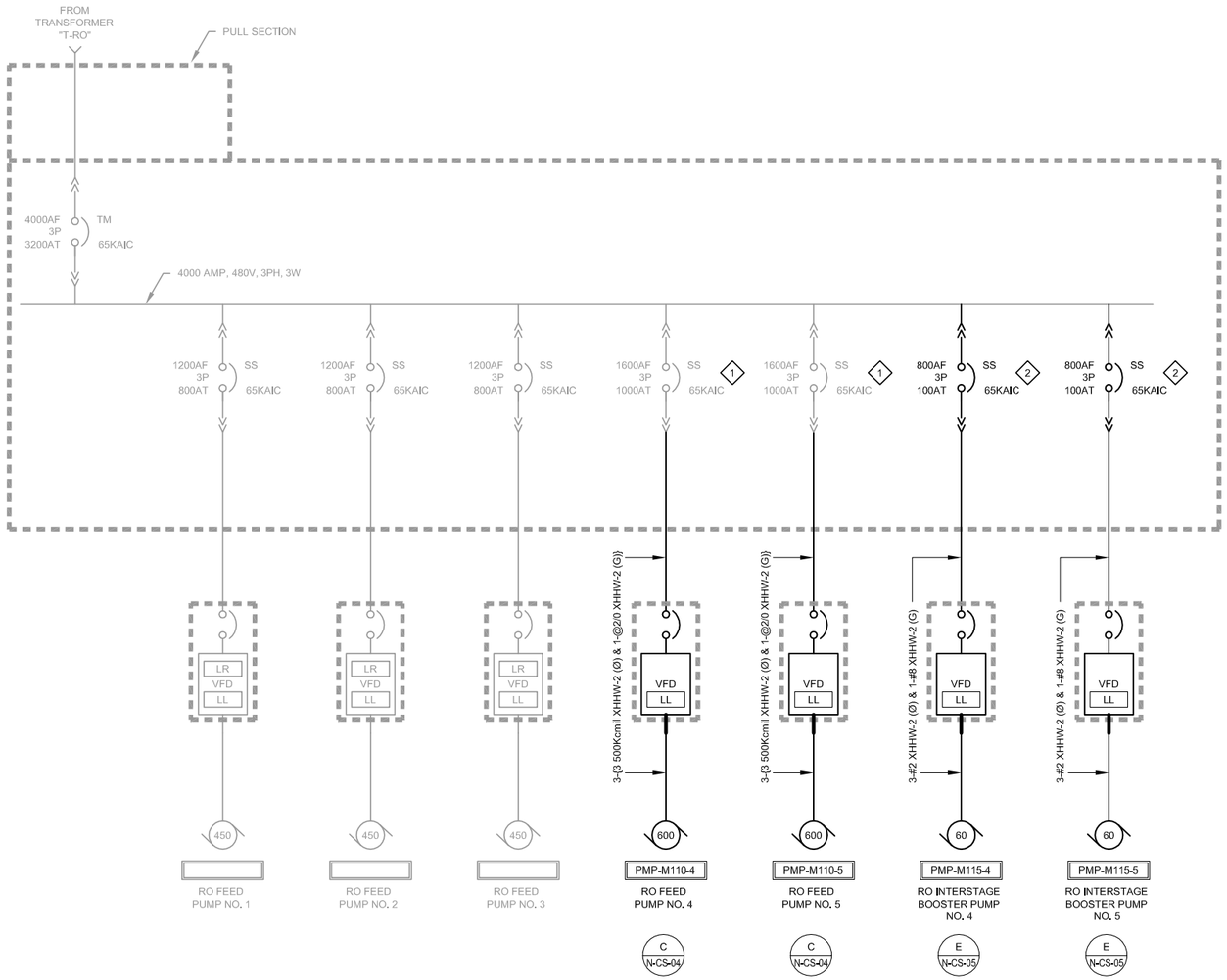
GENERAL NOTES:

1. LC-RO SWITCHGEAR IS GE TYPE AKD-10.

KEY NOTES:

(1) EXISTING WAVEPRO BREAKER. PROVIDE UPGRADED RATING PLUG AS DETERMINED BY CONTRACTOR'S PROTECTION & COORDINATION STUDY.

(2) PROVIDE NEW WAVEPRO BREAKER IN EXISTING SPACE. VERIFY ANY ADDITIONS / MODIFICATIONS REQUIRED FOR EQUIPMENT INSTALLATION.



LOAD CENTER LC-RO

PULL SECTION	METERING	SPACE	SPACE	SPACE	VFD M115-5 FEEDER (2)
		SPACE	SPACE	SPACE	VFD M115-4 FEEDER (2)
	MAIN BREAKER	SPACE	SPACE	SPACE	VFD M110-5 FEEDER (1)
		VFD M110-1 FEEDER	VFD M110-2 FEEDER	VFD M110-3 FEEDER	VFD M110-4 FEEDER (1)

LC-RO ELEVATION

Figure 3.14.2.1
LC-RO SINGLE LINE DIAGRAM
WMWD / JCSD / CITY OF ONTARIO

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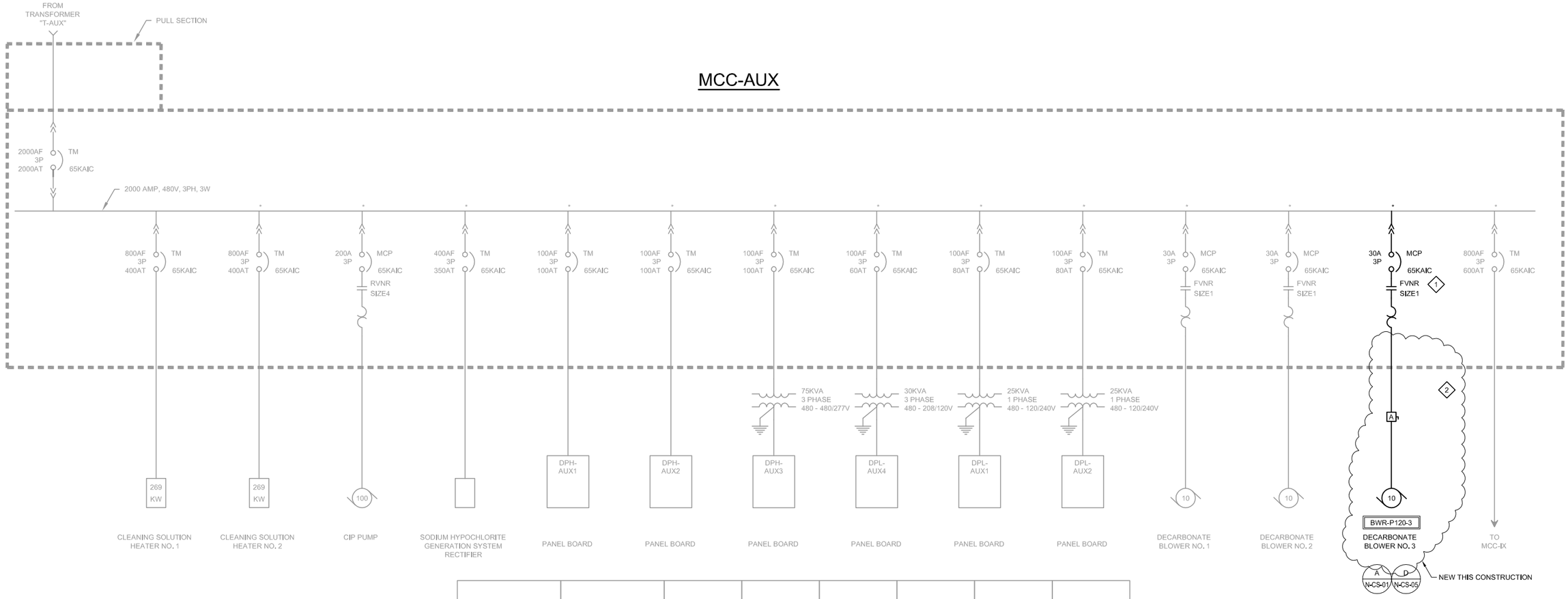
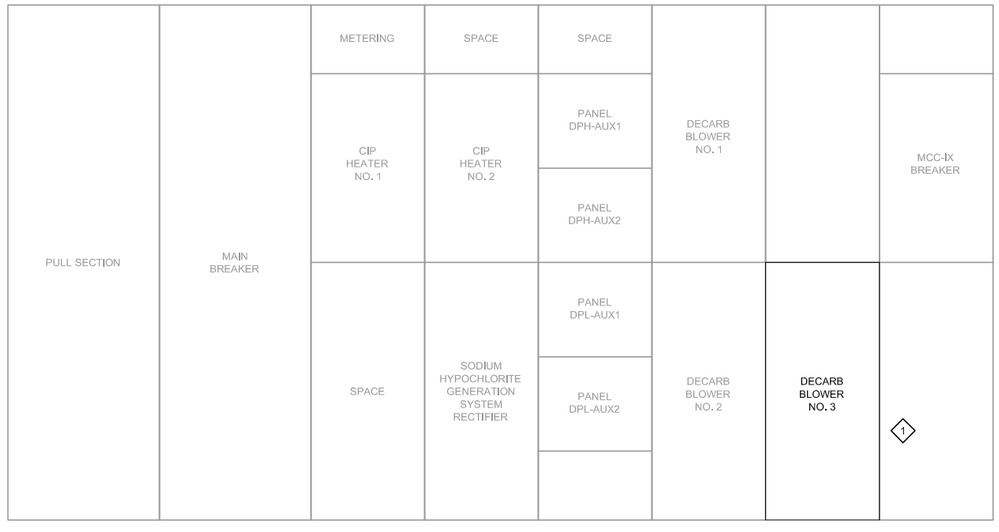
MCC-AUX





MCC-AUX ELEVATION

KEY NOTES:

1. EXISTING STARTER. VERIFY ANY ADDITIONS / MODIFICATIONS REQUIRED FOR EQUIPMENT INSTALLATION.
2. EXISTING CONDUIT IN SLAB. VERIFY CONDITION OF CONDUITS. IF ANY ARE FOUND TO BE UNUSABLE PROVIDE NEW CONDUITS.

Figure 3.14.2.2
MCC-AUX SINGLE LINE DIAGRAM
WMWD / JCSD / CITY OF ONTARIO

carollo
Engineers...Working Wonders With Water™

3.16 INSTRUMENTATION AND AUTOMATIC CONTROL SYSTEMS

The existing Chino II Desalter supervised control and data acquisition system (SCADA) allows for complete operation and monitoring of the entire facility from the RO process building control room. The expansion components will be integrated into the existing system and will have similar control capability. Modifications are required for the new RO trains to accommodate the operation of the interstage boost pumps and to perform automated data normalization. Data from RO trains 1 through 3 cannot be automatically normalized due to the lack of necessary instrumentation, such as a stage 2 permeate flowmeter and stage 2 permeate conductivity meter.

3.16.1 Instrument and Control System Manufacturers

In order to match existing components, instruments and hardware required for the expansion will be identical to the existing systems. Some of the major items include:

- Bristol ControlWave PLCs
- Rotork valve actuators with Pakscan P3 master stations
- 3D Instruments Accu-Drive Pressure Indicators
- SOR Pressure Switches
- Foxboro Pressure Indicating Transmitters
- Rosemount Conductivity Meters and Transmitters
- Foxboro Flowmeters

3.16.2 Programmable Logic Controllers (PLC)

The existing PLCs in the RO process building, PLC-Main and PLC-RO, are at or very near capacity. Therefore, the new RO trains will each have their own PLC and will communicate with the control system via fiber optic Ethernet connections. This concept, as shown on the SCADA block diagram presented in Figure 3.15.2.1, simplifies integration of the new systems. In addition, having new dedicated PLCs for the RO systems lowers risk because only minor modifications are required to PLC-Main to incorporate I/O for the new decarbonator.

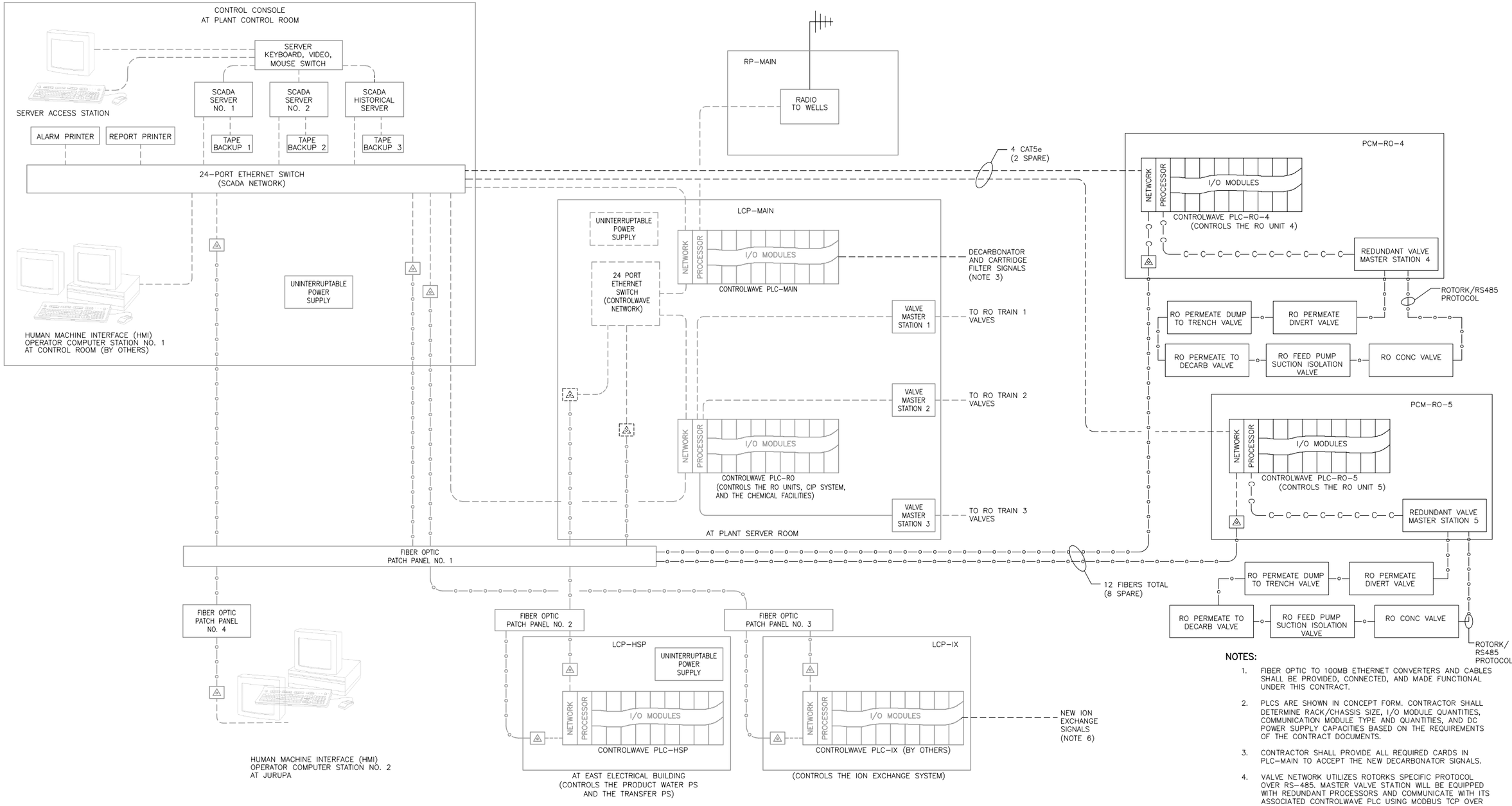
3.16.3 Programming

Programming of the PLCs and integration of the new systems into the existing SCADA system will be delegated to the CDA's programmer, Rutter-Hinz. Each of the expansion construction contracts will contain an allowance for the CDA to hire Rutter-Hinz as an owner-supplied subcontractor. Rutter-Hinz performed the original control programming and is intimately familiar with the current system.

3.17 HVAC

The Chino II Desalter record drawings contains the Title 24 compliance forms for the existing HVAC design. The current HVAC design listed the heat loads from the equipment in the RO Process Building electrical room as 139,576 BTU/hr (excluding safety factor). Based on a calculation of the heat loads for the installed equipment, the actual existing heat load for the RO Process Building Electrical Room is 267,939 BTU/hr, nearly twice the design heat load for the existing equipment. The two 7.5 ton (62,280 BTU/hr) chillers supplied for the RO Process Building electrical room are significantly undersized.

Table 3.16.1 presents the existing and future heat loads for the Chino II Desalter Expansion. Table 3.16.2 shows the deficiency of the current system and the requirement for additional chiller capacity.



NOTES:

1. FIBER OPTIC TO 100MB ETHERNET CONVERTERS AND CABLES SHALL BE PROVIDED, CONNECTED, AND MADE FUNCTIONAL UNDER THIS CONTRACT.
2. PLCS ARE SHOWN IN CONCEPT FORM. CONTRACTOR SHALL DETERMINE RACK/CHASSIS SIZE, I/O MODULE QUANTITIES, COMMUNICATION MODULE TYPE AND QUANTITIES, AND DC POWER SUPPLY CAPACITIES BASED ON THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.
3. CONTRACTOR SHALL PROVIDE ALL REQUIRED CARDS IN PLC-MAIN TO ACCEPT THE NEW DECARBONATOR SIGNALS.
4. VALVE NETWORK UTILIZES ROTORKS SPECIFIC PROTOCOL OVER RS-485. MASTER VALVE STATION WILL BE EQUIPPED WITH REDUNDANT PROCESSORS AND COMMUNICATE WITH ITS ASSOCIATED CONTROLWAVE PLC USING MODBUS TCP OVER ETHERNET.
5. CONTRACTOR TO PROVIDE NTRON 320MC MEDIA CONVERTORS AND NTRON 908TX ETHERNET SWITCH IN EACH RO CABINET
6. ALL ION EXCHANGE WORK AND EQUIPMENT SHALL BE PROVIDED BY OTHERS.
7. ALL SCADA AND PLC PROGRAMMING SHALL BE PROVIDED UNDER SEPERATE CONTRACT.

Figure 3.15.2.1
SCADA BLOCK DIAGRAM
WMWD / JCSD / CITY OF ONTARIO

Engineers...Working Wonders With Water™

Table 3.16.1 RO Process Building Electrical Room Heat Loads
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Item	Description	Unit Wattage	Existing		Expansion	
			No. of Units	Total Watts	No. of Units	Total Watts
LC-RO						
	1600A breakers	1,000	3	3,000	5	5,000
	800A breakers	400		-	2	800
	3200A breaker	2,400	1	2,400	1	2,400
VFDs				-		-
	450hp	18,000	3	54,000	3	54,000
	600hp	24,000		-	2	48,000
	60hp	2,400		-	2	4,800
MCC-AUX				-		-
	size 1 starter	39	2	78	3	117
	size 4 starter	124	1	124	1	124
	structures	200	7	1,400	7	1,400
Transformers				-		-
	75kVA	1,200	1	1,200	1	1,200
	30kVA	850	1	850	1	850
	25kVA	800	2	1,600	2	1,600
Misc				-		-
	Panels	300	6	1,800	6	1,800
		Total (W):		**66,452**		**122,091**
		Additional Heat Load (W):				**55,639**

Table 3.16.2 RO Process Building HVAC Requirements
Chino II Desalter Preliminary Engineering Report
WMWD/JCSD/City of Ontario

Heat Source	Record Drawings Sheet AC3 (BTU/hr)	Calculated Heat Load Based on Existing Equipment (BTU/hr)	Calculated Heat Load Based on Existing and New Equipment (BTU/hr)
Electrical	112,629	226,744	416,592
Envelope	13,386	13,386	13,386
Lighting	4,811	4,811	4,811
People	500	500	500
Outdoor Air	8,250	22,499	39,901
Total Loads	139,576	267,939	475,190
Existing Deficiency (BTU/hr):			**128,363**
Total Deficiency (BTU/hr):			**335,614**

Appendix A

ARRA GRANT FUNDING AGREEMENT

WESTERN MUNICIPAL WATER DISTRICT

and

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

PROJECT FINANCE AGREEMENT

STATE REVOLVING FUND PROJECT NO. C-06-6954-110

AGREEMENT NO. 08-336-550

Dated as of December 18, 2008

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TABLE OF CONTENTS

This Project Finance Agreement (including all exhibits and attachments hereto, this "Agreement") is dated as of the date set forth on the first page of this Agreement, by and between the State Water Resources Control Board, an administrative and regulatory agency of the State of California (the "State Water Board"), and the Recipient identified on the first page of this Agreement:

WITNESSETH:

WHEREAS, the United States of America, pursuant to Title VI of the federal Water Pollution Control Act (as such has been and may be amended from time to time, the "Clean Water Act") requires each State to establish a water pollution control revolving fund to be administered by an instrumentality of the State as a condition to receipt of capitalization grants under the Clean Water Act; and

WHEREAS, the State of California (the "State") has established a Clean Water State Revolving Fund ("CWSRF") pursuant to Chapter 6.5 of Division 7 of the California Water Code (the "State Act") to be used for purposes of the Clean Water Act; and

WHEREAS, the American Recovery and Reinvestment Act of 2009 (ARRA) provides funding through the CWSRF for the purpose of projects that will preserve and create jobs and promote economic recovery, assist those most impacted by the recession, invest in environmental protection infrastructure that will provide long-term economic benefits; and

WHEREAS, ARRA authorizes subsidization for ARRA funds in the CWSRF over and above that authorized by the Clean Water Act, specifically principal forgiveness and interest rate savings; and

WHEREAS, the State Water Board will lose its ARRA allocation for the CWSRF if time schedule requirements set forth in ARRA are not met; and

WHEREAS, the State Water Board has the responsibility to administer the CWSRF and to provide financial assistance from the CWSRF to recipients for the construction of eligible projects, as provided in the State Act; and

WHEREAS, the State Water Board is responsible under the Clean Water Act and the State Act for determining the eligibility of projects for financial assistance from the CWSRF, determining a reasonable schedule for financing and construction of projects, and for ensuring compliance with the Clean Water Act and the terms and conditions of an applicable project finance agreement; and

WHEREAS, the Recipient has submitted to the State Water Board an application for financial assistance from the CWSRF, for the purpose of financing or refinancing the Project described below, and the State Water Board has reviewed and approved said application; and

WHEREAS, the Recipient has or will incur costs incurred in connection with the planning, design, acquisition, construction and installation of the project or projects described in Exhibit A hereto (such projects being herein collectively referred to as the "Project"); and

WHEREAS, the Recipient understands that the terms of its obligation to repay this financial assistance depend significantly on compliance with the time schedule set forth in this Agreement; and

WHEREAS, on the basis of the Recipient's application and the representations and warranties set forth herein, the State Water Board proposes to assist in the financing of the costs of the Project and/or to refund outstanding bonds, notes or other debt obligations of the Recipient, if any, issued to finance the Project, and the Recipient desires to participate as a recipient of financial assistance from the CWSRF and evidence its obligation to repay, upon the terms and conditions as hereinafter set forth in this Agreement, all pursuant to the Clean Water Act and ARRA;

NOW, THEREFORE, in consideration of the premises and of the mutual representations, covenants and agreements herein set forth, the State Water Board and the Recipient, each binding itself, its successors and assigns, do mutually promise, covenant and agree as follows:

ARTICLE I DEFINITIONS

1.1 Definitions.

Unless otherwise specified, each capitalized term used in this Agreement (including the Exhibits hereto) has the following meaning:

"Additional Payments" means the Additional Payments described in Section 3.1(c) of this Agreement.

"Agreement" means the Project Finance Agreement, dated as of the date set forth on the first page hereof, by and between the State Water Board and the Recipient, including all exhibits and attachments thereto.

"Allowance" means an amount to help defray the planning, design, and construction engineering and administration costs of the Project.

"Authorized Representative" means the duly appointed representative of the Recipient. For all authorized representatives, a certified original of the authorizing resolution that designates the authorized representative, by title, must accompany the first payment request, and any other documents or requests required or allowed under this Agreement.

"Completion of Construction" means the date, as determined by the Division after consultation with the Recipient, that the work of building and erection of the Project is substantially complete. “Construction” includes, for expanded use projects, implementation (but not planning and design) of the Project.

“CWSRF” means Clean Water State Revolving Fund.

"Division" means the Division of Financial Assistance of the State Water Board, or any other segment of the State Water Board authorized to administer the CWSRF.

"Fiscal Year" means the period of twelve (12) months terminating on June 30 of any year, or any other annual period hereafter selected and designated by the Recipient as its Fiscal Year in accordance with applicable law.

"Force Account" means the use of the Recipient's own employees or equipment for construction of the Project.

"Initiation of Construction" means the date that notice to proceed with work is issued for the Project, or, if notice to proceed is not required, the date of commencement of building and erection of the Project or, for expanded use projects, any implementation of the Project other than planning or design.

"Operations and Maintenance Costs" means, so long as outstanding System Obligations [other than the Obligation] are outstanding, the definition of such term as defined therein, and thereafter, the reasonable and necessary costs paid or incurred by the Recipient for maintaining and operating the System, determined in accordance with generally accepted accounting principles, including all reasonable expenses of management and repair and all other expenses necessary to maintain and preserve the System in good repair and working order, and including all reasonable and necessary administrative costs of the Recipient that are charged directly or apportioned to the operation of the System, such as salaries and wages of employees, overhead, taxes (if any), the cost of permits, licenses and charges to operate the

System and insurance premiums; but excluding, in all cases depreciation, replacement and obsolescence charges or reserves therefor and amortization of intangibles.

"Policy" means the State Water Board's "Policy for Implementing the State Revolving Fund for Construction of Wastewater Treatment Facilities," as most recently amended, the State Water Board's "Strategy for Implementing State Revolving Fund for Expanded Use Projects," and Board Resolution No. 2009-0027.

"Project" means the Project as described in Exhibit A and in the documents thereby incorporated by reference.

"Project Completion" for the purposes of a wastewater or water recycling project, means the date, as determined by the Division after consultation with the Recipient, that operation of the Project is initiated or is capable of being initiated, whichever comes first. For the purposes of all other projects, "Project Completion" means the date that all tasks in Exhibit A are completed to the reasonable satisfaction of the Division. This date shall be synonymous with the date specified in the "Initiation of Operation" form submitted as part of the Approval of Award package, if any.

"Project Costs" for the purposes of a wastewater or water recycling project, means the incurred costs of the Recipient which are eligible for financial assistance from the CWSRF under the federal Clean Water Act, which are allowable costs as defined under the Policy and which are reasonable, necessary and allocable by the Recipient to the Project under generally accepted accounting principles, plus capitalized interest. For the purposes of all other projects, "Project Costs" means those costs incurred by the Recipient for the planning, design, and implementation of the project as set forth in Exhibit A; this includes any monitoring, reporting, education and outreach, or direct administrative costs associated with these tasks and deemed necessary by the Division.

"Project Funds" means funds disbursed by the State Water Board to the Recipient for purposes of this Agreement.

"Recipient" means the recipient of Project Funds, as identified on the front page of this Agreement.

"State" means State of California.

"State Water Board" means the State Water Resources Control Board, an administrative and regulatory agency of the State of California.

"System" means for the purposes of a wastewater project, all wastewater collection, transport, treatment, storage and disposal facilities, including land and easements thereof, owned by the Recipient, including the Project, and all other properties, structures or works hereafter acquired and constructed by the Recipient and determined to be a part of the System, together with all additions, betterments, extensions or improvements to such facilities, properties, structures or works or any part thereof hereafter acquired and constructed. For the purposes of a water recycling project, "System" means all wastewater, water recycling, and/or potable water collection, transport, treatment, storage and/or disposal facilities, including land and easements thereof, owned by the Recipient, including the Project, and all other properties, structures or works hereafter acquired and constructed by the Recipient and determined to be a part of the System, together with all additions, betterments, extensions or improvements to such facilities, properties, structures or works or any part thereof hereafter acquired and constructed. For the purposes of all other projects, "System" means all nonpoint source control or estuary enhancement facilities, including land and easements thereof, owned by the Recipient, including the Project, and all other properties, structures or works hereafter acquired and constructed by the Recipient and determined to be a part of the System, together with all additions, betterments, extensions or improvements to such facilities, properties, structures or works or any part thereof hereafter acquired and constructed.

1.2 Exhibits and Appendices Incorporated.

All exhibits and appendices to this Agreement, including any amendments and supplements hereto, are hereby incorporated herein and made a part of this Agreement.

ARTICLE II REPRESENTATIONS AND WARRANTIES

2.1 General Recipient Commitments.

The Recipient accepts and agrees to comply with all terms, provisions, conditions, and commitments of this Agreement, including all incorporated documents, and to fulfill all assurances, declarations, representations, and commitments made by the Recipient in its application, accompanying documents, and communications filed in support of its request for financial assistance.

2.2 Completion of Project.

The Recipient agrees to expeditiously proceed with and complete construction of the Project in substantial accordance with Exhibit A.

2.3 Project Certification.

For wastewater or water recycling projects, one (1) year after initiation of operation, the Recipient shall certify to the State Water Board whether or not the Project, as of that date, meets applicable design specifications and effluent limitations. If the Recipient cannot certify that the Project meets such specifications and limitations at that time, the Recipient shall submit a corrective action report. The corrective action report shall include an estimate of the nature, scope, and cost of the corrective action, and a time schedule to expeditiously make all needed corrections, at the Recipient's expense, to allow affirmative certification for the Project.

For all other projects, the Recipient shall prepare a Project Certification that includes information collected by the Recipient in accordance with the Project monitoring and reporting plan, a determination of the effectiveness of the Project in preventing or reducing pollution, and the results of the monitoring program. The Project Certification shall follow the general format provided by the Program Manager.

Failure to submit a Project Certification, an affirmative certification, or a corrective action report that meets the above requirements and is satisfactory to the Division within fifteen (15) months of the Project Completion date will cause the State Water Board to stop processing any pending or future applications for new financial assistance, withhold payments on any existing financial assistance, and begin administrative proceedings pursuant to sections 13267 and 13268 of the Water Code.

2.4 Award of Construction Contracts.

(a) The Recipient agrees to award the prime construction contract no later than the date specified in Exhibit A. Failure to meet this date will have serious consequences, as specified in Exhibit B.

(b) The Recipient agrees to promptly notify the Division in writing both of the award of the prime construction contract for the Project and of Initiation of Construction of the Project.

(c) The Recipient agrees to make all reasonable efforts to complete construction in substantial conformance with the terms of the contract by the Completion of Construction date established in Exhibit A. Such date shall be binding upon the Recipient unless modified in writing by the Division upon a showing of good cause by the Recipient. The Recipient shall deliver any request for extension of the Completion of Construction date no less than ninety (90) days prior to the

Completion of Construction date. The Division will not unreasonably deny such a timely request, but the Division will deny requests received after this time.

2.5 Notice.

The Recipient agrees to promptly notify the Division in writing of:

(a) Any substantial change in scope of the Project. The Recipient agrees that no substantial change in the scope of the Project will be undertaken until written notice of the proposed change has been provided to the Division and the Division has given written approval for such change;

(b) Cessation of all major construction work on the Project where such cessation of work is expected to or does extend for a period of thirty (30) days or more;

(c) Any circumstance, combination of circumstances, or condition, which is expected to or does delay Completion of Construction for a period of ninety (90) days or more beyond the estimated date of Completion of Construction previously provided to the Division;

(d) Discovery of any potential archeological or historical resource. Should a potential archeological or historical resource be discovered during construction of the Project, the Recipient agrees that all work in the area of the find will cease until a qualified archeologist has evaluated the situation and made recommendations regarding preservation of the resource, and the Division has determined what actions should be taken to protect and preserve the resource. The Recipient agrees to implement appropriate actions as directed by the Division;

(e) Discovery of any unexpected endangered or threatened species, as defined in the federal Endangered Species Act. Should a federally protected species be unexpectedly encountered during construction of the Project, the Recipient agrees to promptly notify the Division. This notification is in addition to the Recipient's obligations under the federal Endangered Species Act;

(f) Any monitoring, demonstration, or other implementation activities such that the State Water Board and/or Regional Water Quality Control Board (Regional Water Board) staff may observe and document such activities;

(g) Any public or media event publicizing the accomplishments and/or results of this Agreement and provide the opportunity for attendance and participation by state and federal representatives with at least ten (10) working days notice; and,

(h) Completion of Construction of the Project, and actual Project Completion.

2.6 Project Access.

The Recipient agrees to insure that the State Water Board, the Governor of the State, the United States Environmental Protection Agency (USEPA), the Office of Inspector General, any member of Congress, the President of the United States, or any authorized representative of the foregoing, will have suitable access to the Project site at all reasonable times during Project construction and thereafter for the life of the Project. The Recipient acknowledges that the Project records and locations are public records.

2.7 Project Completion; Initiation of Operations.

Upon Completion of Construction of the Project, the Recipient agrees to expeditiously initiate Project operations. The Recipient agrees to make all reasonable efforts to meet the Project Completion date established in Exhibit A. Such date shall be binding upon the Recipient unless modified in writing by

the Division upon a showing of good cause by the Recipient. The Recipient shall deliver any request for extension of the Project Completion date no less than ninety (90) days prior to the Project Completion date. The Division will not unreasonably deny such a timely request, but the Division will deny requests received after this time.

2.8 Continuous Use of Project; Lease or Disposal of Project.

The Recipient agrees that, except as provided in the Agreement, it will not abandon, substantially discontinue use of, lease, or dispose of the Project or any significant part or portion thereof during the useful life of the Project without prior written approval of the Division. Such approval may be conditioned as determined to be appropriate by the Division, including a condition requiring repayment of all Project Funds together with accrued interest and any penalty assessments which may be due.

2.9 Reports.

(a) Quarterly Reports. The Recipient agrees to expeditiously provide status reports no less frequently than quarterly. At a minimum the reports will contain the following information: a summary of progress to date including a description of progress since the last report, percent construction complete, percent contractor invoiced, and percent schedule elapsed; a listing of change orders including amount, description of work, and change in contract amount and schedule; any problems encountered, proposed resolution, schedule for resolution, status of previous problem resolutions, and number of jobs created or preserved due to the Project.

(b) As Needed Reports. The Recipient agrees to expeditiously provide, during the term of this Agreement, such reports, data, and information as may be reasonably required by the Division, including but not limited to material necessary or appropriate for evaluation of the CWSRF Program or to fulfill any reporting requirements of the federal government.

2.10 Federal Disadvantaged Business Enterprise (DBE) Reporting.

The Recipient agrees to report DBE utilization to the Division on the DBE Utilization Report, State Water Board Form DBE UR334. Reports must be submitted to the Division semiannually within ten (10) calendar days following April 1 and October 1 until such time as the "Notice of Completion" is issued.

2.11 Records.

(a) Without limitation of the requirement to maintain Project accounts in accordance with generally accepted accounting principles the Recipient agrees to:

(1) Establish an official file for the Project which shall adequately document all significant actions relative to the Project;

(2) Establish separate accounts which will adequately and accurately depict all amounts received and expended on the Project, including all assistance funds received under this Agreement;

(3) Establish separate accounts which will adequately depict all income received which is attributable to the Project, specifically including any income attributable to assistance funds disbursed under this Agreement;

(4) Establish an accounting system which will accurately depict final total costs of the Project, including both direct and indirect costs;

(5) Establish such accounts and maintain such records as may be necessary for the State to fulfill federal reporting requirements, including any and all reporting requirements under federal tax statutes or regulations; and

(6) If a Force Account is used by the Recipient for any phase of the Project, other than for planning, design and construction engineering, and administration provided for by allowance, accounts will be established which reasonably document all employee hours charged to the Project and the associated tasks performed by each employee.

(b) The Recipient shall be required to maintain books, records and other material relative to the Project in accordance with generally accepted accounting principles. The Recipient shall also be required to retain such books, records, and other material for each subcontractor who performed work on this project for a minimum of six (6) years after repayment of Project Funds, if any, or six (6) years after Project Completion if no repayment is required. The Recipient shall require that such books, records, and other material be subject at all reasonable times (at a minimum during normal business hours) to inspection, copying, and audit by the State Water Board, the Bureau of State Audits, the USEPA, the Office of Inspector General, or any authorized representatives of the aforementioned, and shall allow interviews during normal business hours of any employees who might reasonably have information related to such records. The Recipient agrees to include a similar right regarding audit, interviews, and records retention in any subcontract related to the performance of this Agreement.

2.12 Audit.

(a) The Division, at its option, may call for an audit of financial information relative to the Project, where the Division determines that an audit is desirable to assure program integrity or where such an audit becomes necessary because of federal requirements. Where such an audit is called for, the audit shall be performed by a certified public accountant independent of the Recipient and at the cost of the Recipient. The audit shall be in the form required by the Division.

(b) Audit disallowances will be returned to the State Water Board.

2.13 Signage.

The Recipient shall place a sign at least four (4) feet tall by eight (8) feet wide made of three-fourths (¾) inch thick exterior grade plywood or other approved material in a prominent location on the Project site. The sign shall include the following color logos:

(logos available from the Division) and the following disclosure statement:

Funding for this project has been provided in full or in part by the American Recovery and Reinvestment Act of 2009 and the Clean Water State Revolving Fund, through an agreement with the State Water Resources Control Board.

The Project sign may include another agency's required promotional information so long as the above logos and disclosure statement are equally prominent on the sign. The sign shall be prepared in a professional manner.

Include the following disclosure statement in any document, written report, or brochure prepared in whole or in part pursuant to this Agreement:

> Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board. The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use. (Gov. Code, § 7550, 40 CFR § 31.20.)

ARTICLE III FINANCING PROVISIONS

3.1 Amounts Payable by the Recipient.

(a) Contingent Obligation to Repay Project Funds. The Recipient's obligation to repay Project Funds is forgiven contingent on meeting the requirements of ARRA and Exhibit A. Failure to meet these requirements for any reason whatsoever, within or outside the control of the Recipient, will result in automatic suspension and termination of this Agreement and immediate repayment of all disbursed Project Funds plus interest at the highest legal rate due immediately whether or not the System or any part thereof is operating or operable or has been completed, or its use is suspended, interfered with, reduced or curtailed or terminated in whole or in part.

Where repayment is required, the Recipient as a whole is obligated to make all payments required by this Agreement to the State Water Board, notwithstanding any individual default by its constituents or others in the payment to the Recipient of fees, charges, taxes, assessments, tolls or other charges ("Charges") levied or imposed by the Recipient. The Recipient shall provide for the punctual payment to the State Water Board of all amounts which become due under this Agreement and which are received from constituents or others in the payment to the Recipient. In the event of failure, neglect or refusal of any officer of the Recipient to levy or cause to be levied any Charge to provide payment by the Recipient under this Agreement, to enforce or to collect such Charge, or to pay over to the State Water Board any money collected on account of such Charge necessary to satisfy any amount due under this Agreement, the State Water Board may take such action in a court of competent jurisdiction as it deems necessary to compel the performance of all duties relating to the imposition or levying and collection of any of such Charges and the payment of the money collected therefrom to the State Water Board. Action taken pursuant hereto shall not deprive the State Water Board of, or limit the application of, any other remedy provided by law or by this Agreement.

Interest on any funds disbursed to the Recipient shall begin to accrue as of the date of each disbursement.

(b) Project Costs. The Recipient agrees to pay any and all costs connected with the Project including, without limitation, any and all Project Costs. If the Project Funds are not sufficient to pay the Project Costs in full, the Recipient shall nonetheless complete the Project and pay that portion of the Project Costs in excess of available Project Funds, and shall not be entitled to any reimbursement therefor from the State Water Board.

(c) Additional Payments. In addition to any repayment required to be made by the Recipient, the Recipient shall also pay to the State Water Board the reasonable extraordinary fees and expenses of the State Water Board, and of any assignee of the State Water Board's right, title and interest in and to this Agreement, in connection with this Agreement, including all expenses

and fees of accountants, trustees, attorneys, litigation costs, insurance premiums and all other extraordinary costs reasonably incurred by the State Water Board or assignee of the State Water Board.

Additional Payments may be billed to the Recipient by the State Water Board from time to time, together with a statement executed by a duly authorized representative of the State Water Board, stating that the amounts billed pursuant to this section have been incurred by the State Water Board or its assignee for one or more of the above items and a copy of the invoice or statement for the amount so incurred or paid. Amounts so billed shall be paid by the Recipient within thirty (30) days after receipt of the bill by the Recipient.

3.2 No Obligation of the State.

Any obligation of the State Water Board herein contained shall not be an obligation, debt or liability of the State and any such obligation shall be payable solely out of the moneys in the CWSRF made available pursuant to this Agreement.

3.3 Disbursement of Project Funds; Availability of Funds.

(a) Except as may be otherwise provided in this Agreement, disbursement of Project Funds will be made as follows:

(1) Upon execution and delivery of this Agreement, the Recipient may request immediate disbursement of any eligible incurred planning and design allowance as specified in Exhibit B from the Project Funds through submission to the State Water Board of the Disbursement Request Form 260, or any amendment thereto, duly completed and executed.

(2) The Recipient may request disbursement of eligible construction and equipment costs consistent with the budget amounts referenced in Exhibit B.

(3) Additional Project Funds will be promptly disbursed to the Recipient upon receipt of Disbursement Request Form 260, or any amendment thereto, duly completed and executed by the Recipient for incurred costs consistent with this Agreement, along with receipt of status reports due under Section 2.9 above.

(4) The Recipient agrees that it will not request disbursement for any Project Cost until such cost has been incurred and is currently due and payable by the Recipient, although the actual payment of such cost by the Recipient is not required as a condition of disbursement request.

(5) Recipient shall spend Project Funds within thirty (30) days of receipt. Any interest earned on Project Funds shall be reported to the State Water Board and may be required to be returned to the State Water Board or deducted from future disbursements.

(6) Recipient shall request its final disbursement no later than six (6) months after Completion of Construction unless prior approval is granted by the Division. If the Recipient fails to do so, then the undisbursed balance of this Agreement will be deobligated. Notwithstanding any other provision of this Agreement, no disbursement shall be required at any time or in any manner which is in violation of or in conflict with federal or state laws, policies, or regulations.

(7) The Recipient agrees that it shall not be entitled to any interest on undisbursed Project Funds.

(b) The State Water Board's obligation to disburse Project Funds is contingent upon the availability of sufficient funds to permit the disbursements provided for herein. If sufficient funds are not available for any reason, including but not limited to failure of the federal or State government to appropriate funds necessary for disbursement of Project Funds, the State Water Board shall not be obligated to make any disbursements to the Recipient under this Agreement. This provision shall be construed as a condition precedent to the obligation of the State Water Board to make any disbursements under this Agreement. Nothing in this Agreement shall be construed to provide the Recipient with a right of priority for disbursement over any other agency. If any disbursements due the Recipient under this contract are deferred because sufficient funds are unavailable, such disbursement will be made to the Recipient when sufficient funds do become available.

3.4 Withholding of Disbursements.

The State Water Board may withhold all or any portion of the funds provided for by this Agreement in the event that:

(a) The Recipient has materially violated, or threatens to materially violate, any term, provision, condition, or commitment of this Agreement; or

(b) The Recipient fails to maintain reasonable progress toward completion of the Project.

3.5 Withholding Pending Project Completion.

Notwithstanding any other provision of this Agreement, the Recipient agrees that the State Water Board may retain an amount equal to ten percent (10%) of the financial assistance specified in this Agreement until completion of the Project to the reasonable satisfaction of the State Water Board. Any retained amounts due to the Recipient will be promptly disbursed to the Recipient, without interest, upon Project Completion.

3.6 Accounting Standards and Federal Single Audit Act.

The Recipient agrees to comply with federal standards for financial management systems. The Recipient agrees that, at a minimum, its fiscal control and accounting procedures will be sufficient to permit preparation of reports required by the federal government and tracking of Project funds to a level of expenditure adequate to establish that such funds have not been used in violation of federal or state law or the terms of this Agreement. To the extent applicable, the Recipient agrees to be bound by and to comply with, the provisions and requirements of the federal Single Audit Act of 1984 (Pub. L. 98-502) Office of Management and Budget (OMB) Circular No. A-133, and updates or revisions thereto. The Recipient will maintain separate Project accounts in accordance with generally accepted accounting principles. The Recipient shall comply with "Standards for Audit of Governmental Organizations, Programs, Activities and Functions" promulgated by the U.S. General Accounting Office. (40 CFR § 35.3135(*l*).

ARTICLE IV MISCELLANEOUS PROVISIONS

4.1 Timeliness.

TIME IS OF THE ESSENCE IN THIS AGREEMENT.

4.2 Amendment.

No amendment or variation of the terms of this Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or agreement not incorporated in this Agreement is binding on any of the parties.

4.3 Assignability.

This Agreement is not assignable by the Recipient, either in whole or in part, without the consent of the State in the form of a formal written amendment.

4.4 Bonding.

Where contractors are used, the Recipient shall not authorize construction to begin until each contractor has furnished a performance bond in favor of the Recipient in the following amounts: faithful performance (100%) of contract value; labor and materials (100%) of contract value. This requirement shall not apply to any contract for less than $20,000.00.

4.5 Compliance with Law, Regulations, etc.

(a) The Recipient agrees that it will, at all times, comply with and require its contractors and subcontractors to comply with all applicable federal and state laws, rules, guidelines, regulations, and requirements. Without limitation of the foregoing, the Recipient agrees that, to the extent applicable, the Recipient will:

(1) Comply with the provisions of the adopted environmental mitigation plan for the term of this Agreement;

(2) Comply with the State Water Board's "Policy for Implementing the State Revolving Fund for Construction of Wastewater Treatment Facilities," as amended from time to time;

(3) Comply with and require its contractors and subcontractors on the Project to comply with federal disadvantaged business enterprise (DBE) requirements; and

(4) Comply with and require its contractors and subcontractors to comply with the list of federal laws certified to by the Recipient.

4.6 Conflict of Interest.

The Recipient certifies that it is in compliance with applicable state and/or federal conflict of interest laws.

4.7 Damages for Breach Affecting ARRA Compliance.

In the event that any breach of any of the provisions of this Agreement by the Recipient shall result in the failure of Project Funds to be used pursuant to the provisions of ARRA, or if such breach shall result in an obligation on the part of the State Water Board to reimburse the federal government, the Recipient shall immediately reimburse the State Water Board in an amount equal to any damages paid by or loss incurred due to such breach.

4.8 Disputes.

(a) Any dispute arising under this Agreement which is not otherwise disposed of by agreement shall be decided by the Division Deputy Director, or his or her authorized representative. The decision shall be reduced to writing and a copy thereof furnished to the Recipient and to the State Water Board's Executive Director. The decision of the Division shall be final and conclusive unless, within thirty (30) calendar days after mailing of the Division decision to the Recipient, the Recipient mails or otherwise furnishes a written appeal of the decision to the State Water Board's Executive Director. The decision of the State Water Board's Executive Director shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not

supported by substantial evidence. In connection with any appeal under this clause, the Recipient shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Recipient shall continue to fulfill and comply with all the terms, provisions, commitments, and requirements of this Agreement.

(b) This clause does not preclude consideration of legal questions, provided that nothing herein shall be construed to make final the decision of the State Water Board, or any official or representative thereof, on any question of law.

(c) The Recipient shall continue with the responsibilities under this Agreement during any dispute.

4.9 Governing Law.

This Agreement is governed by and shall be interpreted in accordance with the laws of the State of California.

4.10 Income Restrictions.

The Recipient agrees that any refunds, rebates, credits, or other amounts (including any interest thereon) accruing to or received by the Recipient under this Agreement shall be paid by the Recipient to the State, to the extent that they are properly allocable to costs for which the Recipient has been reimbursed by the State under this Agreement.

4.11 Independent Actor.

The Recipient, and its agents and employees, if any, in the performance of this Agreement, shall act in an independent capacity and not as officers, employees or agents of the State Water Board.

4.12 Non-Discrimination Clause.

(a) During the performance of this Agreement, Recipient and its contractors and subcontractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, sexual orientation, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status, and denial of family care leave.

(b) The Recipient, its contractors, and subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment.

(c) The Recipient, its contractors, and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code, § 12990 (a-f) et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full.

(d) The Recipient, its contractors, and subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other Agreement.

(e) The Recipient shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

4.13 No Third Party Rights.

The parties to this Agreement do not create rights in, or grant remedies to, any third party as a beneficiary of this Agreement, or of any duty, covenant, obligation or undertaking established herein.

4.14 Operation and Maintenance; Insurance.

The Recipient agrees to properly staff, operate and maintain all portions of the Project during its useful life in accordance with all applicable state and federal laws, rules and regulations.

The Recipient will procure and maintain or cause to be maintained insurance on the System with responsible insurers, or as part of a reasonable system of self-insurance, in such amounts and against such risks (including damage to or destruction of the System) as are usually covered in connection with systems similar to the System. Such insurance may be maintained by the maintenance of a self-insurance plan so long as any such plan provides for (i) the establishment by the Recipient of a separate segregated self-insurance fund funded in an amount determined (initially and on at least an annual basis) by an independent insurance consultant experienced in the field of risk management employing accepted actuarial techniques and (ii) the establishment and maintenance of a claims processing and risk management program.

In the event of any damage to or destruction of the System caused by the perils covered by such insurance, the net proceeds thereof shall be applied to the reconstruction, repair or replacement of the damaged or destroyed portion of the System. The Recipient shall begin such reconstruction, repair or replacement as expeditiously as possible, and shall pay out of such net proceeds all costs and expenses in connection with such reconstruction, repair or replacement so that the same shall be completed and the System shall be free and clear of all claims and liens.

4.15 Permits, Subcontracting, Remedies and Debarment.

The Recipient shall procure all permits and licenses necessary to accomplish the work contemplated in this Agreement, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. Signed copies of any such permits or licenses shall be submitted to the Division before construction begins.

Any subcontractors, outside associates, or consultants required by the Recipient in connection with the services covered by this Agreement shall be limited to such individuals or firms as were specifically identified and agreed to during negotiations for this Agreement, or as are specifically authorized by the State Water Board’s Project Representative during the performance of this Agreement. Any substitutions in, or additions to, such subcontractors, associates, or consultants, shall be subject to the prior written approval of the Division.

The Recipient shall not subcontract with any party who is debarred or suspended or otherwise excluded from or ineligible for participation in federal assistance programs under Executive Order 12549, "Debarment and Suspension." The Recipient shall not subcontract with any individual or organization on USEPA's List of Violating Facilities. (40 CFR, Part 31.35, Gov. Code, § 4477)

The Recipient certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any federal department or agency;

(b) Have not within a three (3) year period preceding this Agreement been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission

of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state or local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and

(d) Have not within a three (3) year period preceding this application/proposal had one or more public transactions (federal, state or local) terminated for cause or default.

4.16 Prevailing Wages.

The Recipient agrees to be bound the provisions of the Davis-Bacon Act, as identified in Exhibit G and agrees to be bound by all the provisions of Labor Code section 1771 regarding prevailing wages. The Recipient shall monitor all agreements subject to reimbursement from this Agreement to assure that the prevailing wage provisions of Labor Code section 1771 are being met.

4.17 Recipient's Responsibility for Work.

The Recipient shall be responsible for all work and for persons or entities engaged in work performed pursuant to this Agreement, including, but not limited to, contractors, subcontractors, suppliers, and providers of services. The Recipient shall be responsible for any and all disputes arising out of its contracts for work on the Project. The State Water Board will not mediate disputes between the Recipient and any other entity concerning responsibility for performance of work.

4.18 Related Litigation.

Under no circumstances may a Recipient use funds from any disbursement under this Agreement to pay costs associated with any litigation the Recipient pursues against the State Water Board or any Regional Water Board. Regardless of the outcome of any such litigation, and notwithstanding any conflicting language in this Agreement, the Recipient agrees to complete the Project funded by this Agreement or to repay all of the disbursed funds plus interest.

4.19 Rights in Data.

The Recipient agrees that all data, plans, drawings, specifications, reports, computer programs, operating manuals, notes, and other written or graphic work produced in the performance of this Agreement are subject to the rights of the State as set forth in this section. The State shall have the right to reproduce, publish, and use all such work, or any part thereof, in any manner and for any purposes whatsoever and to authorize others to do so. If any such work is copyrightable, the Recipient may copyright the same, except that, as to any work which is copyrighted by the Recipient, the State reserves a royalty-free, nonexclusive, and irrevocable license to reproduce, publish, and use such work, or any part thereof, and to authorize others to do so, and to receive electronic copies from the Recipient upon request. (40 CFR §§ 31.34, 31.36)

4.20 State Reviews and Indemnification.

The parties agree that review or approval of Project plans and specifications by the State Water Board is for administrative purposes only and does not relieve the Recipient of its responsibility to properly plan, design, construct, operate, and maintain the Project. To the extent permitted by law, the Recipient agrees to indemnify, defend and hold harmless the State Water Board against any loss or liability arising out of any claim or action brought against the State Water Board from and against any and all losses, claims, damages, liabilities or expenses, of every conceivable kind, character and nature whatsoever arising out of, resulting from, or in any way connected with (1) the System or the Project or the conditions, occupancy, use, possession, conduct or management of, work done in or

about, or the planning, design, acquisition, installation or construction, of the System or the Project or any part thereof; (2) the carrying out of any of the transactions contemplated by this Agreement or any related document; (3) any violation of any applicable law, rule or regulation, any environmental law (including, without limitation, the Federal Comprehensive Environmental Response, Compensation and Liability Act, the Resource Conservation and Recovery Act, the California Hazardous Substance Account Act, the Federal Water Pollution Control Act, the Clean Air Act, the California Hazardous Waste Control Law and California Water Code section 13304, and any successors to said laws), rule or regulation or the release of any toxic substance on or near the System; or (4) any untrue statement or alleged untrue statement of any material fact or omission or alleged omission to state a material fact necessary to make the statements required to be stated therein, in light of the circumstances under which they were made, not misleading with respect to any information provided by the Recipient for use in any disclosure document utilized in connection with any of the transactions contemplated by this Agreement. To the fullest extent permitted by law, the Recipient agrees to pay and discharge any judgment or award entered or made against the State Water Board with respect to any such claim or action, and any settlement, compromise or other voluntary resolution. The provisions of this section shall survive the term of this Agreement.

4.21 State Water Board Action; Costs and Attorney Fees.

The Recipient agrees that any remedy provided in this Agreement is in addition to and not in derogation of any other legal or equitable remedy available to the State Water Board as a result of breach of this Agreement by the Recipient, whether such breach occurs before or after completion of the Project, and exercise of any remedy provided by this Agreement by the State Water Board shall not preclude the State Water Board from pursuing any legal remedy or right which would otherwise be available. In the event of litigation between the parties hereto arising from this Agreement, it is agreed that each party shall bear its own filing costs and attorney fees.

4.22 Termination; Immediate Repayment; Interest.

(a) This Agreement will automatically terminate without written notice if the Recipient fails to meet the timelines in Exhibit A and the ARRA provisions of Exhibit E. Under such circumstance, the Recipient shall immediately repay all Project Funds received under this Agreement, at the highest legal rate of interest.

(b) Additionally, this Agreement may be terminated by written notice during construction of the Project, or thereafter at any time prior to complete repayment by the Recipient, at the option of the State Water Board, upon violation by the Recipient of any material provision of this Agreement after such violation has been called to the attention of the Recipient and after failure of the Recipient to bring itself into compliance with the provisions of this Agreement within a reasonable time as established by the Division. In the event of such termination, the Recipient agrees, upon demand, to immediately repay to the State Water Board an amount equal to Installment Payments due hereunder, including accrued interest, and all penalty assessments due. In the event of termination, interest shall accrue on all amounts due at the highest legal rate of interest from the date that notice of termination is mailed to the Recipient to the date of full repayment by the Recipient.

4.23 Unenforceable Provision.

In the event that any provision of this Agreement is unenforceable or held to be unenforceable, then the parties agree that all other provisions of this Agreement have force and effect and shall not be affected thereby.

4.24 Useful Life of the Project.

The useful life of the Project, commencing at Project Completion, is at least equal to the term of this Agreement, as set forth in Exhibit B hereto.

4.25 Venue.

The State Water Board and the Recipient hereby agree that any action arising out of this Agreement shall be filed and maintained in the Superior Court in and for the County of Sacramento, California, or in the United States District Court in and for the Eastern District of California.

4.26 Waiver and Rights of the State Water Board.

Any waiver of rights by the State Water Board with respect to a default or other matter arising under the Agreement at any time shall not be considered a waiver of rights with respect to any other default or matter.

Any rights and remedies of the State Water Board provided for in this Agreement are in addition to any other rights and remedies provided by law.

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

WESTERN MUNICIPAL WATER DISTRICT

By:_____
Name: Jack Safely
Title: Director of Water Resources

Date:_____

STATE WATER RESOURCES CONTROL BOARD

By:_____
Name: Barbara L. Evoy
Title: Deputy Director, Division of Financial Assistance

Date:_____

EXHIBIT A – SCOPE OF WORK

1. The Recipient agrees to initiate construction no later than October 31, 2009. TIME IS OF THE ESSENCE. FAILURE TO MEET THIS DATE WILL RESULT IN AUTOMATIC TERMINATION OF THIS AGREEMENT AND IMMEDIATE REPAYMENT OF ANY FUNDS DISBURSED HEREUNDER.

2. Completion of Construction date is hereby established as January 31, 2011.

3. The Project Completion date is hereby established as June 30, 2011.

4. The Project, commonly known as Chino II Desalter Ultimate Expansion**,** generally consists of pumping groundwater for hydraulic control and treating groundwater for salts and nitrate removal to improve water quality, as more particularly described in the financial assistance application of the Agency and the accepted plans and specifications for the Project, if any.

5. Certain funds disbursed pursuant to this Agreement are intended to replace grant funds previously awarded, but not disbursed, to the Recipient under Agreement No. 06-180-558 (Previous Grant Agreement). Pursuant to the Previous Grant Agreement, the Recipient shall submit a fully supported invoice documenting all costs incurred on or before December 17, 2008. Once the Division has accepted the invoice and disbursed those funds, the Previous Grant Agreement shall automatically terminate and any of the remaining grant funds will be deobligated. The Recipient's obligations to complete the Project shall continue pursuant to this Agreement. If the Recipient fails to submit a timely invoice pursuant to this paragraph, this Agreement shall terminate and all funds disbursed hereunder shall be repaid to the State Water Board, due immediately at the highest legal rate of interest.

   Any and all tasks contained within the Previous Grant Agreement which are not included in this Agreement (Previous Grant Tasks) have not been included because of the Recipient's representation that it has completed the Previous Grant Tasks. By signing this Agreement, the Recipient certifies that it has completed the Previous Grant Tasks. Completion of all Previous Grant Tasks shall constitute a condition precedent to receipt of any funds pursuant to this Agreement. Further, failure to complete any Previous Grant Tasks in a timely manner as determined by the Division shall constitute a breach of a material provision of this Agreement and may result in termination of this Agreement.

6. All projects are required to comply with the California Environmental Quality Act (CEQA). No work that is subject to the California Environmental Quality Act (CEQA) or National Environmental Policy Act (NEPA) may proceed under this Agreement until documents that satisfy the CEQA/NEPA process are received by the Project Manager and the State Water Board has given environmental clearance. No work that is subject to an Environmental Impact Report or a Mitigated Negative Declaration may proceed until and unless approved by the Deputy Director of the Division. Such approval is fully discretionary and shall constitute a condition precedent to any work for which it is required. Proceeding with work subject to CEQA and/or NEPA without environmental clearance by the State Water Board shall constitute a breach of a material provision of this Agreement.

7. Work to be Performed by the Recipient

7.1 PLANNING AND DESIGN

7.1.1 Re-evaluate the environmental documents and issue a public notice explaining the results of the re-evaluation. Provide copy of document to Project Manager.

7.1.2 Finalize the Water Purchase Agreement. Finalize and submit legal agreements for water purchase and related Term Sheets to purchase desalted treated water to the Project Manager.

7.1.3 Engineering Design Documents

7.1.3.1 Prepare pre-design thirty-five percent (35%), sixty percent (60%), and ninety-five percent (95%), and final design documents to document the progress of the Project.

7.1.3.2 Submit final plans and specifications to the Project Manager.

7.2 CONSTRUCTION

7.2.1 Prepare a construction schedule and submit it to the Project Manager. The initial phase of construction will be submittal review and contractor mobilization.

7.2.2 Prepare a “Written Notice to Proceed” and submit to the Project Manager for signature prior to construction.

7.2.3 Conduct pre- construction photo documentation and submit to the Project Manager.

7.2.4 Construct the Chino II Desalter Expansion from ten (10) million gallons per day (mgd) to twenty and five-tenths (20.5) mgd.

7.2.5 Conduct post-construction photo documentation of the pipeline alignment, wells, and the Chino II Desalter Expansion and submit it to the Project Manager.

7.2.6 Prepare “As-built” drawings including annotations, callouts, contractor notes, and documentation of field conditions during construction and submit them to the Project Manager.

7.2.7 At the completion of this Project, complete and submit electronically a Natural Resource Projects Inventory (NRPI) Project Survey Form http://www.ice.ucdavis.edu/nrpi. Notify the Project Manager when NRPI is completed.

7.2.8 Annually submit Non Point Source Pollution Reduction Project Follow-up Survey Form to the Project Manager.

TABLE OF ITEMS FOR REVIEW

DESCRIPTION	CRITICAL DUE DATE	ESTIMATED DUE DATE
PLANS AND COMPLIANCE REQUIREMENTS		
Global Positioning System information for Project site and monitoring locations		Completed
Project Assessment Evaluation Plan (PAEP)		Completed
Non Point Source Pollution Reduction Project Follow-up Survey Form		Annually, each December
Copy of CEQA/NEPA re-evaluation	10/1/09	
Applicable Permits		Completed
Legal Agreements for Water Purchase and Related Term Sheets		10/09
Final Plans and Specifications		Completed
Provide a copy of environmental re-evaluation document.		10/31/09
Construction Schedule		10/09
Written Notice to Proceed	10/31/09	
Pre-construction Photos		09/09
Post-construction Photos		03/11
“As built” Drawings		03/11
INVOICING		Quarterly
Grant Summary Form		Completed
Progress Reports by the twentieth (20^{th}) of the month following the end of the calendar quarter (March, June, September, and December)		Quarterly
Natural Resource Projects Inventory (NRPI) Project Survey Notification		Before final invoice
Draft Project Certification	March 31, 2011	
Final Project Certification	May 31, 2011	

EXHIBIT B – PROJECT FINANCING AMOUNT

1. Estimated Reasonable Cost. The estimated reasonable cost of the total Project, including associated planning and design costs is TWENTY-SEVEN MILLION, EIGHT HUNDRED EIGHTY THOUSAND DOLLARS AND NO CENTS ($27,880,000).

2. Project Funding. Subject to the terms of this Agreement, the State Water Board agrees to provide Project Funds in the amount of FOUR MILLION, FOUR HUNDRED SEVENTY-NINE THOUSAND, THREE HUNDRED TWENTY-SIX DOLLARS AND NO CENTS ($4,479,326).

3. Contingent Principal Forgiveness. Contingent on the Recipient's performance of its obligations under Exhibits A and E, the State Water Board agrees to forgive all of the principal due under this Agreement. If, for any reason whatsoever within or outside the Recipient's control, or any combination thereof, the Recipient fails to satisfy the conditions under these exhibits, the Recipient will be considered to have breached this Agreement, no principal will be forgiven, and the Recipient agrees to repay all Project Funds IMMEDIATELY at the highest legal rate of interest.

4. The term of this agreement is from the date specified on the first page of this document to June 30, 2011.

5. Budget costs are as follows:

	CWRSF-ARRA	MATCH	TOTAL
Professional and Consultant Services	$479,326	$0	$479,326
Construction (Contracted Services)	$4,000,000	$6,970,000	$10,970,000
TOTAL	$4,479,326	$6,970,000	$11,449,326

6. Line Item Adjustment(s). Subject to the prior review and approval of the State Water Board's Grant Manager, adjustments between existing line item(s) may be used to defray allowable direct costs up to fifteen percent (15%) of the total ARRA financing amount including any amendment(s) thereto. Line item adjustments in excess of fifteen percent (15%) shall require a formal Agreement amendment.

EXHIBIT C – CWSRF PAYMENT SCHEDULE

No payments due, contingent on Recipient's timely performance of its obligations under Exhibits A and E.

If Recipient fails to timely perform its obligations under Exhibits A and E, complete repayment will be due IMMEDIATELY at the highest legal rate of interest.

EXHIBIT D — SPECIAL CONDITIONS

1. Data Management. This Project includes appropriate data management activities so that Project data can be incorporated into appropriate statewide data systems.

2. Supplemental Environmental Projects. The Recipient shall not use funds disbursed pursuant to this Agreement for supplemental environmental projects required by Regional Water Boards.

3. Travel and Per Diem. Any reimbursement for necessary travel shall be at rates not to exceed those set by the Department of Personnel Administration. These rates may be found at http://www.dpa.ca.gov/personnel-policies/travel/hr-staff.htm. Reimbursement will be at the State travel and per diem amounts that are current as of the date costs are incurred by the Recipient. No travel outside the State of California shall be reimbursed unless prior written authorization is obtained from the Project Manager.

4. Watershed Management Plan Consistency. The Recipient certifies that any watershed protection activity undertaken as part of this Project will be consistent with the applicable, adopted, local watershed management plans and the applicable Water Quality Control Plan (Basin Plan) adopted by a Regional Water Board, where such plans exist. Any such activity occurring in the San Gabriel and Los Angeles watersheds shall be consistent with the San Gabriel and Los Angeles River Watershed and Open Space Plan as adopted by the San Gabriel and Lower Los Angeles Rivers and Mountain Conservancy and the Santa Monica Mountains Conservancy.

5. The Recipient certifies that it has a Labor Compliance Program (LCP) in place or has contracted with a third party that has been approved by the Director of the Department of Industrial Relations (DIR) to operate an LCP pursuant to Labor Code, section 1771.5 and section 16423 of title 8 of the California Code of Regulations. Current DIR requirements may be found at http://www.dir.ca.gov/lcp.asp.

6. The Recipient certifies that it is one of the following: a city, county, city and county, district, or a 501(c)(3) nonprofit organization.

7. The Recipient hereby warrants that this Project is intended to protect the beneficial uses of water throughout the state through the control of nonpoint source pollution.

8. The Recipient hereby warrants and represents that this Project is capable of sustaining water quality benefits for a period of twenty (20) years.

9. This Project has a defined water quality or beneficial use goal of a permanent solution to reduce and control nitrate levels and total dissolved solids (TDS) that threaten groundwater resources.

10. Notwithstanding any other provision of this Agreement, the Recipient agrees to submit a monitoring and reporting plan that will do all of the following:

a. Identify one or more nonpoint sources of pollution

b. Describe the baseline water quality of the water body impacted

c. Describe the manner in which the proposed practices or measures are implemented

d. Determine the effectiveness of the proposed practices or measures in preventing or reducing pollution.

11. Notwithstanding any other provision of this Agreement, the Recipient agrees to submit a Project Certification to the State Water Board at the completion of the Project that summarizes completed activities and indicates whether the purposes of the Project have been met. The certification shall include information collected by the Recipient in accordance with the Project monitoring and reporting plan, including but not limited to, a determination of the effectiveness of the best management practices or management measures implemented as part of the Project in preventing or reducing nonpoint source pollution.

12. The Recipient certifies that this Project addresses at least one of the State Water Board or Regional Water Boards' priorities as identified in Appendix G to the 2005-06 Consolidated Grants Program Guidelines.

13. The Recipient hereby certifies that it has not received any funding for this Project under Water Code §§ 79148-79148.16 (Proposition 13 Coastal Nonpoint Source).

EXHIBIT E – FEDERAL ARRA CONDITIONS

1. ARRA Special Conditions.

   (a) ARRA Requirements. The Recipient understands and acknowledges that financing pursuant to this Agreement is provided according to the American Recovery and Reinvestment Act of 2009 (ARRA). The Recipient agrees to perform its obligations under this Agreement in compliance with the letter and the spirit of ARRA. **The Recipient understands and agrees that failure to comply with ARRA will automatically terminate this Agreement and repayment of any and all Project Funds disbursed to the Recipient will be due and payable immediately.**

   (b) Timeline Absolute. The Recipient understands that, for any reason whatsoever, foreseeable or unforeseeable, negligent, intentional, or due to any factor outside the Recipient's control, should the Recipient fail to start construction prior to the date specified in Exhibit A, this Agreement will automatically terminate and repayment of any and all Project Funds disbursed to the Recipient will be due and payable immediately.

   (c) Buy American. Unless the Recipient has obtained a waiver from USEPA on file with the State Water Board, the Recipient shall not use Project Funds to purchase iron, steel, and manufactured goods produced outside of the United States. Unless the Recipient has obtained a waiver from USEPA on file with the State Water Board, the Recipient hereby certifies that all iron, steel, and manufactured goods used in the Project were produced in the United States.

   (d) Waste, Fraud, & Abuse. The Recipient shall prevent fraud, waste, and the abuse of Project Funds.

   (e) Whistleblower Rights Notice. The Recipient shall post notice of the rights and remedies provided to state and local government and contractor whistleblowers as set forth in Section 1553 of ARRA. The Recipient shall ensure that its contractors and subcontractors post such notices.

   (f) Reports. In addition to the reports specified in this Agreement, the Recipient may be asked for weekly reports related to the goals of ARRA, including jobs created or saved. The Recipient agrees to provide such reports in an expeditious fashion.

   (g) Land or Easement Acquisition. The Recipient shall not use Project Funds for the purchase of land, easements, or interests in land.

   (h) Davis Bacon. The Recipient agrees that all laborers and mechanics shall be paid not less than federal prevailing wages. (State prevailing wage requirements found elsewhere in this Agreement may be higher.)

2. Implementation of Recommendations. Notwithstanding any other provision of this Agreement, the Recipient agrees that the State Water Board may make necessary amendments to this Agreement upon the request of the USEPA or the recommendation of the Recovery Accountability and Transparency Board as set forth in Section 1523 of ARRA.

EXHIBIT F – ARRA SECTION 1511 CERTIFICATION

By entering into this Agreement, the authorized representative of the State Water Board and the authorized representative of the Recipient hereby certify, and/or affirm previous certification(s), that this Project has received the full review and vetting required by law and that such representative accepts responsibility that the Project is an appropriate use of taxpayer dollars. Subject to the provisions of this Agreement, the following general description is provided in order to comply with Section 1511 of ARRA:

- Project description: The Project, commonly known as Chino II Desalter Ultimate Expansion**,** generally consists of pumping groundwater for hydraulic control and treating groundwater for salts and nitrate removal to improve water quality, as more particularly described in the financial assistance application of the Recipient and the accepted plans and specifications for the Project, if any.

- Estimated total cost of the Project: The estimated reasonable cost of the total Project, including associated planning and design costs is twenty-seven million, eight hundred eighty thousand dollars and no cents ($27,880,000).

- Type of assistance: full principal forgiveness.

- Estimated amount of ARRA funds to be used: Four million, four hundred seventy-nine thousand, three hundred twenty-six dollars and no cents ($4,479,326).

EXHIBIT G – DAVIS-BACON ACT COMPLIANCE

(a) The Recipient shall include in full in any of its Project contracts or subcontracts in excess of $2,000 entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work the following clauses (or any modifications thereof to meet the particular needs of the Recipient, provided, that such modifications are first approved by the United States Department of Labor):

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii) (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S.

Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The Western Municipal Water District shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Western Municipal Water District may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937,or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such

worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Western Municipal Water District if the Western Municipal Water District is a party to the contract, but if the Western Municipal Water District is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the State Water Resources Control Board, or the United States Environmental Protection Agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the State Water Resources Control Board or the United States Environmental Protection Agency if the agency is a party to the contract, but if such agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the State Water Resources Control Board or the United States Environmental Protection Agency, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a ``Statement of Compliance,'' signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
(1) That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions

have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the ``Statement of Compliance'' required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State Water Resources Control Board, the State of California, the United States Environmental Protection Agency, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal or state agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination

for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the State Water Resources Control Board, United States Environmental Protection Agency, federal Office of Management and Budgets, and/or federal Department of Labor may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. The Recipient shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any Project contract or subcontract in an amount in excess of $100,000. These clauses shall be inserted in addition to the clauses required above. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Western Municipal Water District shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained above, in any Project contract or subcontract, the Recipient shall cause or require the contracting officer to insert a clause requiring that any contractor or subcontractor on this Project shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Recipient shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the State Water Resources Control Board, the State of California, the United States Environmental Protection Agency, and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

Appendix B

CHINO II WELLFIELD WATER QUALITY

Table B.1 Existing Chino II Well Water Quality
Chino II Desalter Preliminary Engineering Report
Western Municipal Water District

Parameter	Well 1	Well 2	Well 3	Well 4	Well 6	Well 7	Well 8	Well 9a
Calcium (Ca^{2+})	100	92	92	95	120	140	180	180
Magnesium (Mg^{2+})	24	17	13	9	11	12	16	17
Sodium (Na^{+})	41	33	33	30	37	40	62	53
Potassium (K^{+})	2.0	1.9	2.6	2	2.3	3.3	4.1	3.5
Barium (Ba^{2+})	0.2100	0.1500	0.1300	0.1200	0.1300	0.1400	0.2100	0.1700
Iron (Fe^{2+})	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Manganese (Mn^{2+})	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bicarbonate (HCO_3^{-})	281	220	220	208	256	232	342	244
Sulfate (SO_4^{2-})	34	34	26	24	49	95	120	78
Chloride (Cl^{-})	64	57	54	51	72	120	150	140
Fluoride (F^{-})	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Carbonate (CO_3^{2-})	0.42	0.40	0.51	0.48	0.39	0.36	0.35	0.31
Nitrate (NO_3^{-})	95.0	69.0	88.0	95.0	110.0	67.0	89.0	170.0
Silica (SiO_2)	36.0	34.0	31.0	32.0	28.0	29.0	31.0	32.0
Color	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pH (units)	7.40	7.50	7.60	7.60	7.40	7.40	7.20	7.30
Alkalinity (mg/l as $CaCO_3$)	230	180	180	170	210	190	280	200
Hardness (mg/l as $CaCO_3$)	349	300	283	276	345	399	516	520
CO_2	16.3	10.3	8.1	7.7	14.8	13.3	30.2	17.2
Conductivity (μmho/cm)	890	730	720	740	920	1000	1300	1300
TOC (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL IONS + SiO_2	677	558	560	546	686	739	994	918
Turbidity (NTU)	0	0	0	0	0	0	0	0
TDS (SUM)[1]	534	446	448	440	555	620	820	793
TDS (EVAP)	550	460	470	490	570	700	890	1000
Temperature (^{o}F)	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Temperature (^{o}C)	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Evaporation/Summation Ratio	1.03	1.03	1.05	1.11	1.03	1.13	1.09	1.26
Empirical Factor (TDS(SUM)/COND)	0.60	0.61	0.62	0.59	0.60	0.62	0.63	0.61
Ion Balance Deviation (%)	0.7	2.9	0.4	-0.2	-2.7	-2.3	-2.5	1.8

Notes:

1. Includes total ions (no silica) and 49 percent of the bicarbonate concentration.
2. Samples taken in October 2007.

E.S.BABCOCK&Sons,Inc.
Environmental Laboratories est 1906

GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/31 Sample ID No. A7J1496-01
Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem
Name of Sampler: Danny Cobb Employed By: JCSD
Date/Time Sample Collected: 07/10/16 10:50 Date/Time Sample Received @ Lab: 07/10/16 14:00 Date Analyses Completed: 07/10/25

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083
Name or Number of Sample Source: WELL II-1

User ID: WAT Station Number: 3310083-002
Date/Time of Sample: 07/10/16 10:50 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)
Date Analyses Completed: 07/10/25
Submitted by: _____ Phone # _____

CL		REPORTING UNITS	CHEMICAL		ENTRY #		ANALYSES RESULTS	DLR
		mg/L	Total Hardness		00900		360	
		mg/L	Calcium		00916		100	
		mg/L	Magnesium		00927		24	
		mg/L	Sodium		00929		41	
		mg/L	Potassium		00937		2	
Total Cations			Me/L Value	8.83				
		mg/L	Total Alkalinity		00410		230	
		mg/L	Hydroxide		71830	<	3	
		mg/L	Carbonate		00445	<	3	
		mg/L	Bicarbonate		00440		280	
*		mg/L+	Sulfate		00945		34	0.50
*		mg/L+	Chloride		00940		64	
45		mg/L	Nitrate		71850		95	2.0
2	**	mg/L	Fluoride		00951		0.2	0.1
Total Anions			Me/L Value	8.64				
9		Std.Units	pH		00403		7.4	
***		umho/cm	Specific Conductance		00095		890	
****		mg/L+	Total Dissolved Solids		70300		610	
		Units	Color		00081	<	3	
3		TON	Odor		00086	<	1	1.0
		NTU	Turbidity		82079	<	0.2	
0..		mg/L+	MBAS		38260		0.06	

mailing P.O. Box 432 | location 6100 Quail Valley Court | P 951 653 3351 F 951 653 1662 | NELAP no. 02101CA CA ELAP no. 1156

Page 2 of 4- Mineral, Physical and Inorganic Chemicals Form

Sample ID No. A7J1496-01

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		210	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		11	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12
Sample ID No. A7J0224-01
Laboratory Name: E.S. Babcock & Sons, Inc.
Project Manager: Gail A. Traynor For Humaira Saleem
Name of Sampler: Danny Cobb
Employed By: Jurupa Community SD
Date/Time Sample Collected: 07/10/02 11:45
Date/Time Sample Received @ Lab: 07/10/02 15:48
Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2
System Number: 3310083
Name or Number of Sample Source: WELL II-1

User ID: WAT
Station Number: 3310083-002
Date/Time of Sample: 07/10/02 11:45 (YY MM DD TTTT)
Laboratory Code: 4790 (YY MM DD)
Date Analyses Completed: 07/10/10
Submitted by: _____
Phone # _____

'CL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	94	2.0
	umho/cm	Specific Conductance	00095	880	
****	mg/L+	Total Dissolved Solids	70300	550	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	36	

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/31 Sample ID No. A7J1496-02
Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem
Name of Sampler: Danny Cobb Employed By: JCSD
Date/Time Sample Collected: 07/10/16 11:45 Date/Time Sample Received @ Lab: 07/10/16 14:00 Date Analyses Completed: 07/10/25

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083
Name or Number of Sample Source: WELL II-2

User ID: WAT Station Number: 3310083-003
Date/Time of Sample: 07/10/16 11:45 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)
Date Analyses Completed: 07/10/25
Submitted by: _____ Phone # _____

CL		REPORTING UNITS	CHEMICAL		ENTRY #		ANALYSES RESULTS	DLR
		mg/L	Total Hardness		00900		300	
		mg/L	Calcium		00916		92	
		mg/L	Magnesium		00927		17	
		mg/L	Sodium		00929		33	
		mg/L	Potassium		00937		1.9	
Total Cations			Me/L Value	7.50				
		mg/L	Total Alkalinity		00410		180	
		mg/L	Hydroxide		71830	<	3	
		mg/L	Carbonate		00445	<	3	
		mg/L	Bicarbonate		00440		220	
*		mg/L+	Sulfate		00945		34	0.50
*		mg/L+	Chloride		00940		57	
45		mg/L	Nitrate		71850		69	2.0
2	**	mg/L	Fluoride		00951		0.1	0.1
Total Anions			Me/L Value	7.04				
9		Std.Units	pH		00403		7.5	
***		umho/cm	Specific Conductance		00095		690	
****		mg/L+	Total Dissolved Solids		70300		500	
		Units	Color		00081	<	3	
3		TON	Odor		00086	<	1	1.0
		NTU	Turbidity		82079	<	0.2	
		mg/L+	MBAS		38260	<	0.05	

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 Sample ID No. A7J1496-02

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		150	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		6.6	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

* 250-500-600 ** 0.6-1.7 *** 900-1600-2200 **** 500-1000-1500 + Indicates Secondary Drinking Water Standards

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-02

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 12:10 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-2

User ID: WAT Station Number: 3310083-003

Date/Time of Sample: 07/10/02 12:10 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	68	2.0
	umho/cm	Specific Conductance	00095	730	
****	mg/L+	Total Dissolved Solids	70300	460	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	34	

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/11/06 Sample ID No. A7J1787-01

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: JCSD

Date/Time Sample Collected: 07/10/18 11:00 Date/Time Sample Received @ Lab: 07/10/18 14:15 Date Analyses Completed: 07/11/02

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-3

User ID: WAT Station Number: 3310083-004

Date/Time of Sample: 07/10/18 11:00 (YY MM DD TTTT) Laboratory Code: 4790

Date Analyses Completed: 07/11/02 (YY MM DD)

Submitted by: _____ Phone # _____

MCL		REPORTING UNITS	CHEMICAL	ENTRY #		ANALYSES RESULTS	DLR
		mg/L	Total Hardness	00900		280	
		mg/L	Calcium	00916		92	
		mg/L	Magnesium	00927		13	
		mg/L	Sodium	00929		33	
		mg/L	Potassium	00937		2.6	
Total Cations			Me/L Value 7.18				
		mg/L	Total Alkalinity	00410		180	
		mg/L	Hydroxide	71830	<	3	
		mg/L	Carbonate	00445	<	3	
		mg/L	Bicarbonate	00440		210	
*		mg/L+	Sulfate	00945		26	0.50
*		mg/L+	Chloride	00940		54	
45		mg/L	Nitrate	71850		88	2.0
2	**	mg/L	Fluoride	00951		0.1	0.1
Total Anions			Me/L Value 6.93				
9		Std.Units	pH	00403		7.6	
***		umho/cm	Specific Conductance	00095		720	
****		mg/L+	Total Dissolved Solids	70300		500	
		Units	Color	00081	<	3	
		TON	Odor	00086	<	1	1.0
		NTU	Turbidity	82079	<	0.2	
		mg/L+	MBAS	38260	<	0.05	

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Page 2 of 4- Mineral, Physical and Inorganic Chemicals Form Sample ID No. A7J1787-01

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		130	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		4.4	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-03

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 12:15 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-3

User ID: WAT Station Number: 3310083-004

Date/Time of Sample: 07/10/02 12:15 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	87	2.0
	umho/cm	Specific Conductance	00095	720	
****	mg/L+	Total Dissolved Solids	70300	470	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	31	

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/11/06 Sample ID No. A7J1787-02

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: JCSD

Date/Time Sample Collected: 07/10/18 11:50 Date/Time Sample Received @ Lab: 07/10/18 14:15 Date Analyses Completed: 07/11/02

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-4

User ID: WAT Station Number: 3310083-005

Date/Time of Sample: 07/10/18 11:50 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/11/02

Submitted by: _____ Phone # _____

CL		REPORTING UNITS	CHEMICAL		ENTRY #		ANALYSES RESULTS	DLR
		mg/L	Total Hardness		00900		280	
		mg/L	Calcium		00916		95	
		mg/L	Magnesium		00927		9.4	
		mg/L	Sodium		00929		30	
		mg/L	Potassium		00937		1.6	
Total Cations			Me/L Value	6.88				
		mg/L	Total Alkalinity		00410		170	
		mg/L	Hydroxide		71830	<	3	
		mg/L	Carbonate		00445	<	3	
		mg/L	Bicarbonate		00440		210	
*		mg/L+	Sulfate		00945		24	0.50
*		mg/L+	Chloride		00940		57	
45		mg/L	Nitrate		71850		95	2.0
2	**	mg/L	Fluoride		00951		0.1	0.1
Total Anions			Me/L Value	7.09				
9		Std.Units	pH		00403		7.6	
***		umho/cm	Specific Conductance		00095		740	
****		mg/L+	Total Dissolved Solids		70300		520	
		Units	Color		00081	<	3	
3		TON	Odor		00086	<	1	1.0
		NTU	Turbidity		82079	<	0.2	
0.0		mg/L+	MBAS		38260	<	0.05	

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MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		120	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		4.7	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

* 250-500-600 ** 0.6-1.7 *** 900-1600-2200 **** 500-1000-1500 + Indicates Secondary Drinking Water Standards

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-04

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 12:02 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-4

User ID: WAT Station Number: 3310083-005

Date/Time of Sample: 07/10/02 12:02 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	95	2.0
	umho/cm	Specific Conductance	00095	740	
****	mg/L+	Total Dissolved Solids	70300	490	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	32	

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/11/09 Sample ID No. A7J2242-01
Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem
Name of Sampler: Danny Cobb Employed By: JCSD
Date/Time Sample Collected: 07/10/25 11:17 Date/Time Sample Received @ Lab: 07/10/25 13:30 Date Analyses Completed: 07/11/07

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083
Name or Number of Sample Source: WELL II-6

User ID: WAT Station Number: 3310083-007
Date/Time of Sample: 07/10/25 11:17 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)
Date Analyses Completed: 07/11/07
Submitted by: _____ Phone # _____

MCL		REPORTING UNITS	CHEMICAL		ENTRY #		ANALYSES RESULTS	DLR
		mg/L	Total Hardness		00900		340	
		mg/L	Calcium		00916		120	
		mg/L	Magnesium		00927		11	
		mg/L	Sodium		00929		37	
		mg/L	Potassium		00937		2.3	
Total Cations			Me/L Value	8.58				
		mg/L	Total Alkalinity		00410		210	
		mg/L	Hydroxide		71830	<	3	
		mg/L	Carbonate		00445	<	3	
		mg/L	Bicarbonate		00440		250	
*		mg/L+	Sulfate		00945		49	0.50
*		mg/L+	Chloride		00940		72	
45		mg/L	Nitrate		71850		110	2.0
2	**	mg/L	Fluoride		00951		0.1	0.1
Total Anions			Me/L Value	8.93				
9		Std.Units	pH		00403		7.4	
***		umho/cm	Specific Conductance		00095		950	
****		mg/L+	Total Dissolved Solids		70300		630	
15		Units	Color		00081	<	3	
		TON	Odor		00086	<	1	1.0
5		NTU	Turbidity		82079	<	0.2	
		mg/L+	MBAS		38260	<	0.05	

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MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		130	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		9.3	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-07

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 11:21 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-6

User ID: WAT Station Number: 3310083-007

Date/Time of Sample: 07/10/02 11:21 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	91	2.0
	umho/cm	Specific Conductance	00095	920	
*	mg/L+	Total Dissolved Solids	70300	570	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	28	

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/11/30 Sample ID No. A7K0460-01
Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem
Name of Sampler: Danny Cobb Employed By: JCSD
Date/Time Sample Collected: 07/11/06 11:10 Date/Time Sample Received @ Lab: 07/11/06 15:10 Date Analyses Completed: 07/11/16

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083
Name or Number of Sample Source: WELL II-7

User ID: WAT Station Number: 3310083-008
Date/Time of Sample: 07/11/06 11:10 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)
Date Analyses Completed: 07/11/16
Submitted by: _____ Phone # _____

MCL		REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
		mg/L	Total Hardness	00900	400	
		mg/L	Calcium	00916	140	
		mg/L	Magnesium	00927	12	
		mg/L	Sodium	00929	40	
		mg/L	Potassium	00937	3.3	
Total Cations			Me/L Value 9.82			
		mg/L	Total Alkalinity	00410	190	
		mg/L	Hydroxide	71830	< 3	
		mg/L	Carbonate	00445	< 3	
		mg/L	Bicarbonate	00440	230	
*		mg/L+	Sulfate	00945	95	0.50
*		mg/L+	Chloride	00940	120	
45		mg/L	Nitrate	71850	67	2.0
2	**	mg/L	Fluoride	00951	0.1	0.1
Total Anions			Me/L Value 10.22			
9		Std.Units	pH	00403	7.4	
***		umho/cm	Specific Conductance	00095	1000	
****		mg/L+	Total Dissolved Solids	70300	700	
		Units	Color	00081	< 3	
		TON	Odor	00086	< 1	1.0
		NTU	Turbidity	82079	< 0.2	
		mg/L+	MBAS	38260	< 0.05	

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NELAP no. 02101CA CA ELAP no. 1156 EPA no. CA00102

Page 2 of 4- Mineral, Physical and Inorganic Chemicals Form Sample ID No. A7K0460-01

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		140	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		7.3	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
	ug/L	Vanadium	01087		6.9	3.0
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

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NELAP no. 02101CA CA ELAP no. 1156 EPA no. CA00102

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-05

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 12:30 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-7

User ID: WAT Station Number: 3310083-008

Date/Time of Sample: 07/10/02 12:30 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	78	2.0
	umho/cm	Specific Conductance	00095	1100	
****	mg/L+	Total Dissolved Solids	70300	750	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	29	

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/11/30 Sample ID No. A7K0460-02

Laboratory Name: E.S. Babcock & Sons. Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: JCSD

Date/Time Sample Collected: 07/11/06 11:50 Date/Time Sample Received @ Lab: 07/11/06 15:10 Date Analyses Completed: 07/11/16

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-8

User ID: WAT Station Number: 3310083-009

Date/Time of Sample: 07/11/06 11:50 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/11/16

Submitted by: _____ Phone # _____

MCL		REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		mg/L	Total Hardness	00900	520		
		mg/L	Calcium	00916	180		
		mg/L	Magnesium	00927	16		
		mg/L	Sodium	00929	62		
		mg/L	Potassium	00937	4.1		
Total Cations			Me/L Value 13.13				
		mg/L	Total Alkalinity	00410	280		
		mg/L	Hydroxide	71830		< 3	
		mg/L	Carbonate	00445		< 3	
		mg/L	Bicarbonate	00440	340		
*		mg/L+	Sulfate	00945	120		0.50
*		mg/L+	Chloride	00940	150		
45		mg/L	Nitrate	71850	89		2.0
2	**	mg/L	Fluoride	00951		< 0.1	0.1
Total Anions			Me/L Value 13.74				
9		Std.Units	pH	00403	7.2		
***		umho/cm	Specific Conductance	00095	1300		
****		mg/L+	Total Dissolved Solids	70300	890		
		Units	Color	00081		< 3	
		TON	Odor	00086		< 1	1.0
		NTU	Turbidity	82079		< 0.2	
		mg/L+	MBAS	38260		< 0.05	

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MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		210	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		11	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020		120	100
	ug/L	Vanadium	01087		7.3	3.0
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

* 250-500-600 ** 0.6-1.7 *** 900-1600-2200 **** 500-1000-1500 + Indicates Secondary Drinking Water Standards

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-08

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 11:15 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-8

User ID: WAT Station Number: 3310083-009

Date/Time of Sample: 07/10/02 11:15 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	72	2.0
	umho/cm	Specific Conductance	00095	1200	
* *	mg/L+	Total Dissolved Solids	70300	730	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	31	

* 250-500-600 ** 0.6-1.7 *** 900-1600-2200 **** 500-1000-1500 + Indicates Secondary Drinking Water Standards

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/11/09 Sample ID No. A7J2242-02
Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem
Name of Sampler: Danny Cobb Employed By: JCSD
Date/Time Sample Collected: 07/10/25 12:15 Date/Time Sample Received @ Lab: 07/10/25 13:30 Date Analyses Completed: 07/11/07

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083
Name or Number of Sample Source: WELL II-9A

User ID: WAT Station Number: 3310083-010
Date/Time of Sample: 07/10/25 12:15 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)
Date Analyses Completed: 07/11/07
Submitted by: _____ Phone # _____

MCL		REPORTING UNITS	CHEMICAL		ENTRY #		ANALYSES RESULTS	DLR
		mg/L	Total Hardness		00900		530	
		mg/L	Calcium		00916		180	
		mg/L	Magnesium		00927		17	
		mg/L	Sodium		00929		53	
		mg/L	Potassium		00937		3.5	
Total Cations			Me/L Value	12.81				
		mg/L	Total Alkalinity		00410		200	
		mg/L	Hydroxide		71830	<	3	
		mg/L	Carbonate		00445	<	3	
		mg/L	Bicarbonate		00440		250	
*		mg/L+	Sulfate		00945		78	0.50
*		mg/L+	Chloride		00940		140	
45		mg/L	Nitrate		71850		170	2.0
2	**	mg/L	Fluoride		00951		0.1	0.1
Total Anions			Me/L Value	12.41				
9		Std.Units	pH		00403		7.3	
***		umho/cm	Specific Conductance		00095		1300	
****		mg/L+	Total Dissolved Solids		70300		1000	
15		Units	Color		00081	<	3	
		TON	Odor		00086	<	1	1.0
5		NTU	Turbidity		82079	<	0.2	
		mg/L+	MBAS		38260	<	0.05	

mailing P.O. Box 432 Riverside, CA 92502-0432
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Page 4 of 4- Mineral, Physical and Inorganic Chemicals Form

Sample ID No. A7J2242-02

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
		INORGANIC CHEMICALS				
1000	ug/L	Aluminum	01105	<	50	50
6	ug/L	Antimony	01097	<	6	6.0
10	ug/L	Arsenic	01002	<	2	2.0
1000	ug/L	Barium	01007		170	100
4	ug/L	Beryllium	01012	<	1	1.0
5	ug/L	Cadmium	01027	<	1	1.0
50	ug/L	Total Chromium (also used for Cr+6 screen)	01034		8.7	1.0
1000	ug/L+	Copper	01042	<	50	50
300	ug/L+	Iron	01045	<	100	100
15	ug/L	Lead	01051	<	5	5.0
50	ug/L+	Manganese	01055	<	20	20
2	ug/L	Mercury	71900	<	1	1.0
100	ug/L	Nickel	01067	<	10	10
	ug/L	Selenium	01147	<	5	5.0
100	ug/L+	Silver	01077	<	10	10
	ug/L	Thallium	01059	<	1	1.0
5000	ug/L	Zinc	01092	<	50	50
	ug/L	Boron	01020	<	100	100
150	ug/L	Cyanide	01291	<	100	100
1000	ug/L	Nitrite as N	00620	<	100	100

* 250-500-600 ** 0.6-1.7 *** 900-1600-2200 **** 500-1000-1500 + Indicates Secondary Drinking Water Standards

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GENERAL MINERAL & PHYSICAL & INORGANIC ANALYSIS (9/99) EDT

Date of Report: 07/10/12 Sample ID No. A7J0224-06

Laboratory Name: E.S. Babcock & Sons, Inc. Project Manager: Gail A. Traynor For Humaira Saleem

Name of Sampler: Danny Cobb Employed By: Jurupa Community SD

Date/Time Sample Collected: 07/10/02 11:30 Date/Time Sample Received @ Lab: 07/10/02 15:48 Date Analyses Completed: 07/10/10

System Name: CHINO BASIN DESALTER AUTH. - DESALTER 2 System Number: 3310083

Name or Number of Sample Source: WELL II-9A

User ID: WAT Station Number: 3310083-010

Date/Time of Sample: 07/10/02 11:30 (YY MM DD TTTT) Laboratory Code: 4790 (YY MM DD)

Date Analyses Completed: 07/10/10

Submitted by: _____ Phone # _____

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
45	mg/L	Nitrate	71850	210	2.0
	umho/cm	Specific Conductance	00095	1500	
****	mg/L+	Total Dissolved Solids	70300	1100	
		INORGANIC CHEMICALS ADDITIONAL ANALYSES			
	mg/L	Total Silica	00955	32	

mailing P.O. Box 432 Riverside, CA 92502-0432 | *location* 6100 Quail Valley Court Riverside, CA 92507-0704 | P 951 653 3351 F 951 653 1662 www.babcocklabs.com | NELAP no. 02101CA CA ELAP no. 1156 EPA no. CA00102

Appendix C

REVERSE OSMOSIS SYSTEM PERFORMANCE PROJECTIONS

New RO Trains
Design Recovery (83.5%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 1
B.Yallaly, Carollo Engineers
9/20/2007

Project Information:

System Details

Feed Flow to Stage 1	2703.00 gpm	Pass 1 Permeate Flow	2256.61 gpm	Osmotic Pressure:			
Raw Water Flow to System	2703.00 gpm	Pass 1 Recovery	83.49 %	Feed	4.63 psig		
Feed Pressure	192.59 psig	Feed Temperature	17.2 C	Concentrate	25.79 psig		
Fouling Factor	1.00	Feed TDS	699.73 mg/l	Average	15.21 psig		
Chem. Dose (100% H2SO4)	0.00 mg/l	Number of Elements	546	Average NDP	163.33 psig		
Total Active Area	218400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	309.00 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.28 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	52	7	2703.00	187.59	0.00	1190.07	156.19	1512.93	14.96	15.00	0.00	5.36
2	BW30-400	26	7	1190.07	191.19	0.00	446.39	166.84	743.68	14.71	15.00	40.00	14.68

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.80	15.09	0.08	0.23	0.13
Na	40.00	41.71	93.68	245.69	0.83	2.43	1.36
Mg	15.00	15.00	34.01	90.46	0.04	0.13	0.07
Ca	122.00	122.00	276.65	735.79	0.35	1.05	0.58
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.36	0.95	0.00	0.00	0.00
CO3	0.46	0.46	2.57	17.06	0.00	0.00	0.00
HCO3	248.00	248.00	559.11	1465.71	1.21	2.67	1.67
NO3	99.00	99.00	221.95	580.59	2.29	6.67	3.73
Cl	85.00	85.00	192.74	512.60	0.25	0.75	0.41
F	0.10	0.10	0.23	0.60	0.00	0.00	0.00
SO4	54.00	54.00	122.52	326.13	0.10	0.31	0.17
SiO2	31.70	31.70	71.76	190.61	0.19	0.43	0.27
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.81	20.22	13.85	15.89	14.54
TDS	698.02	699.73	1581.38	4181.28	5.36	14.68	8.40
pH	7.40	7.40	7.68	7.89	5.21	5.48	5.32

New RO Trains
Design Recovery (83.5%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 1
B.Yallaly, Carollo Engineers
9/20/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.58	3.52	51.98	699.73	187.59
2	0.09	4.40	3.96	47.40	766.97	180.86
3	0.10	4.25	4.48	43.00	845.07	174.98
4	0.11	4.12	5.11	38.75	937.20	169.88
5	0.12	4.00	5.90	34.63	1047.93	165.50
6	0.13	3.91	6.92	30.63	1184.04	161.79
7	0.14	3.83	8.29	26.72	1356.12	158.70

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	4.64	7.89	45.77	1581.38	191.19
2	0.11	4.46	9.28	41.13	1758.72	185.62
3	0.12	4.29	11.06	36.67	1971.23	180.86
4	0.13	4.11	13.42	32.38	2230.07	176.84
5	0.14	3.92	16.63	28.27	2551.12	173.49
6	0.15	3.71	21.13	24.36	2957.63	170.75
7	0.17	3.48	27.67	20.65	3483.69	168.56

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.89
Langelier Saturation Index	0.12	0.12	2.09
Stiff & Davis Stability Index	0.65	0.65	1.97
Ionic Strength (Molal)	0.01	0.01	0.08
TDS (mg/l)	698.02	699.73	4181.28
HCO3	248.00	248.00	1465.71
CO2	13.93	13.93	20.21
CO3	0.46	0.46	17.06
CaSO4 (% Saturation)	1.56	1.71	24.33
BaSO4 (% Saturation)	281.36	302.20	3059.92
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.17	35.27
SiO2 (% Saturation)	28.98	28.88	170.23
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

New RO Trains

Design Recovery (83.5%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion — Case: 1
B.Yallaly, Carollo Engineers — 9/20/2007

Project Information:

System Details

Feed Flow to Stage 1	2703.00 gpm	Pass 1 Permeate Flow	2257.03 gpm	Osmotic Pressure:			
Raw Water Flow to System	2703.00 gpm	Pass 1 Recovery	83.50 %	Feed	4.63 psig		
Feed Pressure	220.81 psig	Feed Temperature	17.2 C	Concentrate	25.81 psig		
Fouling Factor	0.85	Feed TDS	699.73 mg/l	Average	15.22 psig		
Chem. Dose (100% H2SO4)	0.00 mg/l	Number of Elements	546	Average NDP	191.45 psig		
Total Active Area	218400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	350.49 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.59 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	52	7	2703.00	215.81	0.00	1190.43	184.29	1512.57	14.96	15.00	0.00	5.35
2	BW30-400	26	7	1190.43	219.29	0.00	445.97	194.81	744.46	14.73	15.00	40.00	14.61

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.80	15.11	0.08	0.23	0.13
Na	40.00	41.71	93.65	245.95	0.83	2.42	1.36
Mg	15.00	15.00	34.00	90.54	0.04	0.13	0.07
Ca	122.00	122.00	276.56	736.48	0.35	1.05	0.58
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.36	0.95	0.00	0.00	0.00
CO3	0.46	0.46	2.57	17.08	0.00	0.00	0.00
HCO3	248.00	248.00	558.94	1467.08	1.21	2.66	1.66
NO3	99.00	99.00	221.89	581.20	2.29	6.64	3.72
Cl	85.00	85.00	192.68	513.09	0.25	0.74	0.41
F	0.10	0.10	0.23	0.60	0.00	0.00	0.00
SO4	54.00	54.00	122.48	326.43	0.10	0.31	0.17
SiO2	31.70	31.70	71.74	190.79	0.19	0.43	0.27
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.81	20.24	13.85	15.89	14.54
TDS	698.02	699.73	1580.91	4185.31	5.35	14.61	8.37
pH	7.40	7.40	7.68	7.89	5.21	5.48	5.32

Permeate Quality Used for Mass Balance and Chemical Feed System Evaluation

New RO Trains
Design Recovery (83.5%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 1
B.Yallaly, Carollo Engineers
9/20/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.50	3.56	51.98	699.73	215.81
2	0.09	4.36	3.98	47.48	765.73	209.08
3	0.10	4.23	4.47	43.12	842.69	203.17
4	0.11	4.12	5.08	38.89	933.88	198.05
5	0.12	4.03	5.85	34.76	1043.97	193.64
6	0.13	3.95	6.84	30.73	1180.01	189.92
7	0.15	3.89	8.19	26.78	1352.97	186.81

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	4.55	8.01	45.79	1580.91	219.29
2	0.11	4.40	9.34	41.24	1754.09	213.72
3	0.12	4.26	11.05	36.84	1962.14	208.93
4	0.13	4.11	13.31	32.58	2216.44	204.88
5	0.14	3.95	16.37	28.47	2533.57	201.50
6	0.15	3.78	20.68	24.52	2938.24	198.74
7	0.17	3.58	26.97	20.74	3468.74	196.53

New RO Trains
Design Recovery (83.5%)
Design Water Quality
5-Yr Old Membranes

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.89
Langelier Saturation Index	0.12	0.12	2.10
Stiff & Davis Stability Index	0.65	0.65	1.97
Ionic Strength (Molal)	0.01	0.01	0.08
TDS (mg/l)	698.02	699.73	4185.31
HCO3	248.00	248.00	1467.08
CO2	13.93	13.93	20.23
CO3	0.46	0.46	17.08
CaSO4 (% Saturation)	1.56	1.71	24.36
BaSO4 (% Saturation)	281.36	302.20	3062.96
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.17	35.37
SiO2 (% Saturation)	28.98	28.88	170.39
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

New RO Trains

Maximum Recovery (85%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51

Project: Chino II Expansion — Case: 2

B.Yallaly, Carollo Engineers — 12/27/2007

Project Information:

System Details

Feed Flow to Stage 1	2655.00 gpm	Pass 1 Permeate Flow	2256.80 gpm	Osmotic Pressure:			
Raw Water Flow to System	2655.00 gpm	Pass 1 Recovery	85.00 %	Feed	4.63 psig		
Feed Pressure	192.06 psig	Feed Temperature	17.2 C	Concentrate	28.24 psig		
Fouling Factor	1.00	Feed TDS	699.73 mg/l	Average	16.43 psig		
Chem. Dose (100% H2SO4)	0.00	Number of Elements	546	Average NDP	163.31 psig		
Total Active Area	218400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	302.17 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.23 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	52	7	2655.00	187.06	0.00	1142.88	156.71	1512.12	14.95	15.00	0.00	5.42
2	BW30-400	26	7	1142.88	191.71	0.00	398.20	169.35	744.68	14.73	15.00	40.00	15.76

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.93	16.57	0.08	0.25	0.14
Na	40.00	41.71	95.78	270.01	0.85	2.61	1.43
Mg	15.00	15.00	34.79	99.57	0.05	0.14	0.08
Ca	122.00	122.00	282.94	809.95	0.36	1.14	0.62
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.37	1.05	0.00	0.00	0.00
CO3	0.46	0.46	2.69	20.19	0.00	0.00	0.00
HCO3	248.00	248.00	571.69	1610.50	1.22	2.86	1.73
NO3	99.00	99.00	226.91	637.85	2.32	7.17	3.92
Cl	85.00	85.00	197.12	564.27	0.26	0.80	0.44
F	0.10	0.10	0.23	0.66	0.00	0.00	0.00
SO4	54.00	54.00	125.31	359.03	0.10	0.33	0.18
SiO2	31.70	31.70	73.39	209.80	0.19	0.45	0.27
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.86	21.34	13.86	16.13	14.63
TDS	698.02	699.73	1617.15	4599.46	5.42	15.76	8.80
pH	7.40	7.40	7.69	7.90	5.21	5.51	5.34

New RO Trains
Maximum Recovery (85%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 2
B.Yallaly, Carollo Engineers
12/27/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.57	3.54	51.06	699.73	187.06
2	0.09	4.40	3.98	46.49	768.10	180.50
3	0.10	4.25	4.51	42.10	847.85	174.78
4	0.11	4.12	5.15	37.85	942.39	169.84
5	0.12	4.01	5.97	33.73	1056.65	165.61
6	0.13	3.91	7.03	29.73	1198.10	162.05
7	0.15	3.84	8.48	25.81	1378.47	159.09

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.11	4.65	8.13	43.96	1617.15	191.71
2	0.11	4.47	9.62	39.31	1807.19	186.47
3	0.12	4.30	11.57	34.83	2037.64	182.02
4	0.13	4.12	14.19	30.53	2322.24	178.30
5	0.15	3.93	17.83	26.41	2681.31	175.24
6	0.17	3.71	23.10	22.48	3145.24	172.77
7	0.18	3.46	30.99	18.77	3760.33	170.83

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.90
Langelier Saturation Index	0.12	0.12	2.18
Stiff & Davis Stability Index	0.65	0.65	2.02
Ionic Strength (Molal)	0.01	0.01	0.09
TDS (mg/l)	698.02	699.73	4599.46
HCO3	248.00	248.00	1610.50
CO2	13.93	13.93	21.33
CO3	0.46	0.46	20.19
CaSO4 (% Saturation)	1.56	1.71	27.59
BaSO4 (% Saturation)	281.36	302.20	3361.25
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.17	47.01
SiO2 (% Saturation)	28.98	28.88	186.35
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

New RO Trains

Maximum Recovery (85%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51

Project: Chino II Expansion — Case: 2

B.Yallaly, Carollo Engineers — 12/27/2007

Project Information:

System Details

Feed Flow to Stage 1	2655.00 gpm	Pass 1 Permeate Flow	2256.54 gpm	Osmotic Pressure:			
Raw Water Flow to System	2655.00 gpm	Pass 1 Recovery	84.99 %	Feed	4.63 psig		
Feed Pressure	220.19 psig	Feed Temperature	17.2 C	Concentrate	28.22 psig		
Fouling Factor	0.85	Feed TDS	699.73 mg/l	Average	16.43 psig		
Chem. Dose (100% H2SO4)	0.00	Number of Elements	546	Average NDP	191.35 psig		
Total Active Area	218400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	342.81 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.53 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	52	7	2655.00	215.19	0.00	1143.50	184.74	1511.50	14.95	15.00	0.00	5.41
2	BW30-400	26	7	1143.50	219.74	0.00	398.46	197.22	745.05	14.74	15.00	40.00	15.67

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.93	16.56	0.08	0.24	0.13
Na	40.00	41.71	95.73	269.87	0.84	2.60	1.42
Mg	15.00	15.00	34.77	99.51	0.05	0.14	0.08
Ca	122.00	122.00	282.79	809.44	0.36	1.13	0.61
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.37	1.05	0.00	0.00	0.00
CO3	0.46	0.46	2.69	20.16	0.00	0.00	0.00
HCO3	248.00	248.00	571.38	1609.52	1.22	2.84	1.73
NO3	99.00	99.00	226.80	637.53	2.32	7.13	3.91
Cl	85.00	85.00	197.02	563.91	0.25	0.80	0.43
F	0.10	0.10	0.23	0.66	0.00	0.00	0.00
SO4	54.00	54.00	125.24	358.80	0.10	0.33	0.18
SiO2	31.70	31.70	73.35	209.67	0.19	0.45	0.27
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.86	21.34	13.86	16.12	14.63
TDS	698.02	699.73	1616.30	4596.70	5.41	15.67	8.77
pH	7.40	7.40	7.69	7.90	5.21	5.50	5.34

New RO Trains
Maximum Recovery (85%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 2
B.Yallaly, Carollo Engineers
12/27/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.49	3.58	51.06	699.73	215.19
2	0.09	4.35	4.00	46.57	766.86	208.63
3	0.10	4.23	4.50	42.22	845.46	202.89
4	0.11	4.12	5.13	37.99	939.00	197.93
5	0.12	4.03	5.92	33.87	1052.58	193.68
6	0.13	3.95	6.96	29.83	1193.88	190.09
7	0.15	3.89	8.38	25.88	1375.03	187.13

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	4.55	8.24	43.98	1616.30	219.74
2	0.11	4.41	9.68	39.43	1801.64	214.48
3	0.12	4.27	11.54	35.02	2026.80	210.01
4	0.13	4.12	14.05	30.75	2305.75	206.26
5	0.15	3.96	17.53	26.63	2659.25	203.16
6	0.17	3.78	22.55	22.67	3119.31	200.67
7	0.19	3.57	30.13	18.89	3737.15	198.70

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.90
Langelier Saturation Index	0.12	0.12	2.19
Stiff & Davis Stability Index	0.65	0.65	2.02
Ionic Strength (Molal)	0.01	0.01	0.09
TDS (mg/l)	698.02	699.73	4596.70
HCO3	248.00	248.00	1609.52
CO2	13.93	13.93	21.33
CO3	0.46	0.46	20.16
CaSO4 (% Saturation)	1.56	1.71	27.58
BaSO4 (% Saturation)	281.36	302.20	3360.52
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.17	46.93
SiO2 (% Saturation)	28.98	28.88	186.26
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

Minimum Recovery (75%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion — Case: 3
B.Yallaly, Carollo Engineers — 12/27/2007

Project Information:

System Details

Feed Flow to Stage 1	3009.00 gpm	Pass 1 Permeate Flow	2257.06 gpm	Osmotic Pressure:			
Raw Water Flow to System	3009.00 gpm	Pass 1 Recovery	75.01 %	Feed	4.63 psig		
Feed Pressure	195.52 psig	Feed Temperature	17.2 C	Concentrate	17.44 psig		
Fouling Factor	1.00	Feed TDS	699.73 mg/l	Average	11.04 psig		
Chem. Dose (100% H2SO4)	0.00	Number of Elements	546	Average NDP	163.52 psig		
Total Active Area	218400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	358.26 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.65 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	52	7	3009.00	190.52	0.00	1498.62	152.02	1510.38	14.94	15.00	0.00	5.02
2	BW30-400	26	7	1498.62	194.02	0.00	751.94	155.88	746.67	14.77	15.00	47.00	10.56

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.15	10.09	0.07	0.17	0.10
Na	40.00	41.71	82.97	163.63	0.78	1.73	1.09
Mg	15.00	15.00	30.08	59.85	0.04	0.09	0.06
Ca	122.00	122.00	244.63	486.81	0.33	0.74	0.46
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.32	0.63	0.00	0.00	0.00
CO3	0.46	0.46	1.99	7.96	0.00	0.00	0.00
HCO3	248.00	248.00	494.98	976.65	1.16	1.99	1.42
NO3	99.00	99.00	196.63	387.16	2.13	4.75	3.00
Cl	85.00	85.00	170.43	339.14	0.23	0.53	0.33
F	0.10	0.10	0.20	0.40	0.00	0.00	0.00
SO4	54.00	54.00	108.33	215.69	0.09	0.21	0.13
SiO2	31.70	31.70	63.47	126.17	0.18	0.33	0.23
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.56	16.87	13.80	15.00	14.21
TDS	698.02	699.73	1399.18	2774.20	5.02	10.56	6.84
pH	7.40	7.40	7.64	7.83	5.20	5.39	5.27

New RO Trains
Minimum Recovery (75%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 3
B.Yallaly, Carollo Engineers
12/27/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.08	4.64	3.45	57.87	699.73	190.52
2	0.08	4.44	3.86	53.23	760.41	182.65
3	0.09	4.26	4.33	48.79	829.21	175.66
4	0.09	4.10	4.88	44.53	908.08	169.51
5	0.10	3.97	5.54	40.42	999.72	164.12
6	0.11	3.86	6.35	36.45	1107.96	159.44
7	0.12	3.77	7.36	32.59	1238.34	155.42

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.08	4.73	6.62	57.64	1399.18	194.02
2	0.09	4.51	7.58	52.90	1523.62	186.19
3	0.09	4.30	8.76	48.39	1664.76	179.27
4	0.09	4.10	10.19	44.09	1825.99	173.19
5	0.10	3.89	11.97	40.00	2011.55	167.87
6	0.10	3.69	14.21	36.10	2226.72	163.26
7	0.11	3.49	17.07	32.41	2478.22	159.28

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.83
Langelier Saturation Index	0.12	0.12	1.68
Stiff & Davis Stability Index	0.65	0.65	1.71
Ionic Strength (Molal)	0.01	0.01	0.05
TDS (mg/l)	698.02	699.73	2774.20
HCO3	248.00	248.00	976.65
CO2	13.93	13.93	16.87
CO3	0.46	0.46	7.96
CaSO4 (% Saturation)	1.56	1.71	13.85
BaSO4 (% Saturation)	281.36	302.20	2056.10
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.17	10.24
SiO2 (% Saturation)	28.98	28.88	117.11
Mg(OH)2 (% Saturation)	0.00	0.00	0.01

To balance: 1.71 mg/l Na added to feed.

New RO Trains

Minimum Recovery (75%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51

Project: Chino II Expansion — Case: 3

B.Yallaly, Carollo Engineers — 12/27/2007

Project Information:

System Details

Feed Flow to Stage 1	3009.00 gpm	Pass 1 Permeate Flow	2256.46 gpm	Osmotic Pressure:	
Raw Water Flow to System	3009.00 gpm	Pass 1 Recovery	74.99 %	Feed	4.63 psig
Feed Pressure	223.67 psig	Feed Temperature	17.2 C	Concentrate	17.43 psig
Fouling Factor	0.85	Feed TDS	699.73 mg/l	Average	11.03 psig
Chem. Dose (100% H2SO4)	0.00	Number of Elements	546	Average NDP	191.54 psig
Total Active Area	218400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	404.34 kW
Water Classification: Well Water SDI < 3				Specific Energy	2.99 kWh/kgal

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	52	7	3009.00	218.67	0.00	1499.27	180.03	1509.73	14.93	15.00	0.00	5.01
2	BW30-400	26	7	1499.27	222.03	0.00	752.54	183.68	746.73	14.77	15.00	47.00	10.51

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.14	10.08	0.07	0.17	0.10
Na	40.00	41.71	82.93	163.52	0.77	1.73	1.09
Mg	15.00	15.00	30.06	59.80	0.04	0.09	0.06
Ca	122.00	122.00	244.52	486.43	0.33	0.74	0.46
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.32	0.63	0.00	0.00	0.00
CO3	0.46	0.46	1.99	7.95	0.00	0.00	0.00
HCO3	248.00	248.00	494.77	975.90	1.16	1.99	1.42
NO3	99.00	99.00	196.55	386.89	2.13	4.73	2.99
Cl	85.00	85.00	170.36	338.88	0.23	0.53	0.33
F	0.10	0.10	0.20	0.40	0.00	0.00	0.00
SO4	54.00	54.00	108.28	215.52	0.09	0.21	0.13
SiO2	31.70	31.70	63.44	126.07	0.18	0.33	0.23
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.56	16.87	13.80	15.00	14.21
TDS	698.02	699.73	1398.58	2772.08	5.01	10.51	6.82
pH	7.40	7.40	7.64	7.83	5.20	5.38	5.27

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 3
B.Yallaly, Carollo Engineers
12/27/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.08	4.55	3.50	57.87	699.73	218.67
2	0.08	4.38	3.88	53.32	759.13	210.78
3	0.09	4.24	4.33	48.93	826.79	203.78
4	0.09	4.11	4.85	44.69	904.75	197.59
5	0.10	4.00	5.49	40.58	995.85	192.18
6	0.11	3.91	6.27	36.58	1104.12	187.47
7	0.12	3.84	7.25	32.67	1235.41	183.44

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.08	4.62	6.73	57.66	1398.58	222.03
2	0.08	4.44	7.65	53.04	1519.65	214.18
3	0.09	4.27	8.76	48.60	1657.55	207.23
4	0.09	4.10	10.11	44.34	1815.92	201.11
5	0.10	3.93	11.79	40.24	1999.46	195.75
6	0.10	3.77	13.90	36.31	2214.26	191.09
7	0.11	3.60	16.60	32.54	2468.27	187.09

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.83
Langelier Saturation Index	0.12	0.12	1.68
Stiff & Davis Stability Index	0.65	0.65	1.71
Ionic Strength (Molal)	0.01	0.01	0.05
TDS (mg/l)	698.02	699.73	2772.08
HCO3	248.00	248.00	975.90
CO2	13.93	13.93	16.86
CO3	0.46	0.46	7.95
CaSO4 (% Saturation)	1.56	1.71	13.83
BaSO4 (% Saturation)	281.36	302.20	2054.55
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.17	10.22
SiO2 (% Saturation)	28.98	28.88	117.03
Mg(OH)2 (% Saturation)	0.00	0.00	0.01

To balance: 1.71 mg/l Na added to feed.

Existing RO Trains
Design Recovery (83.5%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 4
B.Yallaly, Carollo Engineers
12/28/2007

Project Information:

System Details

Feed Flow to Stage 1	1663.00 gpm	Pass 1 Permeate Flow	1388.40 gpm	Osmotic Pressure:	
Raw Water Flow to System	1663.00 gpm	Pass 1 Recovery	83.49 %	Feed	4.63 psig
Feed Pressure	205.65 psig	Feed Temperature	17.2 C	Concentrate	25.78 psig
Fouling Factor	1.00	Feed TDS	699.73 mg/l	Average	15.21 psig
Chem. Dose	None	Number of Elements	336	Average NDP	163.76 psig
Total Active Area	134400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	185.99 kW
Water Classification: Well Water SDI < 3				Specific Energy	2.23 kWh/kgal

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	32	7	1663.00	200.65	0.00	660.25	170.47	1002.75	16.12	15.00	0.00	5.34
2	BW30-400	16	7	660.25	165.47	0.00	274.60	143.63	385.65	12.40	15.00	0.00	18.02

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	6.43	15.06	0.08	0.29	0.14
Na	40.00	41.71	103.80	245.36	0.83	3.00	1.43
Mg	15.00	15.00	37.71	90.45	0.04	0.16	0.08
Ca	122.00	122.00	306.75	735.74	0.35	1.30	0.62
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.40	0.95	0.00	0.00	0.00
CO3	0.46	0.46	3.17	17.07	0.00	0.00	0.00
HCO3	248.00	248.00	619.27	1465.53	1.21	3.21	1.73
NO3	99.00	99.00	245.89	579.66	2.28	8.24	3.93
Cl	85.00	85.00	213.71	512.56	0.25	0.93	0.44
F	0.10	0.10	0.25	0.60	0.00	0.00	0.00
SO4	54.00	54.00	135.86	326.13	0.10	0.38	0.18
SiO2	31.70	31.70	79.56	190.58	0.18	0.52	0.28
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	15.06	20.19	13.89	16.20	14.56
TDS	698.02	699.73	1752.82	4179.70	5.34	18.02	8.82
pH	7.40	7.40	7.71	7.89	5.21	5.55	5.34

Existing RO Trains
Design Recovery (83.5%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 4
B.Yallaly, Carollo Engineers
12/28/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.89	3.38	51.97	699.73	200.65
2	0.10	4.71	3.82	47.08	772.00	193.95
3	0.11	4.57	4.34	42.37	857.45	188.16
4	0.12	4.44	5.00	37.80	960.43	183.19
5	0.13	4.33	5.85	33.36	1087.43	179.00
6	0.15	4.24	7.01	29.03	1248.58	175.52
7	0.17	4.16	8.65	24.79	1460.62	172.70

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	3.95	10.07	41.27	1752.82	165.47
2	0.10	3.79	11.81	37.31	1937.06	160.65
3	0.11	3.62	14.01	33.53	2153.95	156.48
4	0.12	3.46	16.85	29.91	2412.42	152.91
5	0.12	3.29	20.57	26.45	2724.55	149.89
6	0.13	3.10	25.59	23.17	3106.89	147.38
7	0.14	2.90	32.50	20.06	3581.68	145.30

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.89
Langelier Saturation Index	0.12	0.12	2.10
Stiff & Davis Stability Index	0.65	0.65	1.97
Ionic Strength (Molal)	0.01	0.01	0.08
TDS (mg/l)	698.02	699.73	4179.70
HCO3	248.00	248.00	1465.53
CO2	13.93	13.93	20.19
CO3	0.46	0.46	17.07
CaSO4 (% Saturation)	1.56	1.56	24.33
BaSO4 (% Saturation)	281.36	281.36	3060.78
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.16	35.24
SiO2 (% Saturation)	28.98	28.98	170.15
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

Existing RO Trains

Design Recovery (83.5%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51

Project: Chino II Expansion — Case: 4

B.Yallaly, Carollo Engineers — 12/28/2007

Project Information:

System Details

Feed Flow to Stage 1	1663.00 gpm	Pass 1 Permeate Flow	1388.42 gpm	Osmotic Pressure:			
Raw Water Flow to System	1663.00 gpm	Pass 1 Recovery	83.49 %	Feed	4.63 psig		
Feed Pressure	233.90 psig	Feed Temperature	17.2 C	Concentrate	25.78 psig		
Fouling Factor	0.85	Feed TDS	699.73 mg/l	Average	15.21 psig		
Chem. Dose	None	Number of Elements	336	Average NDP	191.81 psig		
Total Active Area	134400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	211.54 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.54 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	32	7	1663.00	228.90	0.00	672.92	198.41	990.08	15.91	15.00	0.00	5.33
2	BW30-400	16	7	672.92	193.41	0.00	274.58	171.00	398.34	12.80	15.00	0.00	17.26

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	6.31	15.07	0.08	0.27	0.13
Na	40.00	41.71	101.86	245.47	0.83	2.87	1.42
Mg	15.00	15.00	37.00	90.46	0.04	0.16	0.08
Ca	122.00	122.00	300.98	735.82	0.35	1.24	0.61
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.39	0.95	0.00	0.00	0.00
CO3	0.46	0.46	3.05	17.07	0.00	0.00	0.00
HCO3	248.00	248.00	607.74	1465.71	1.21	3.09	1.71
NO3	99.00	99.00	241.31	579.95	2.28	7.88	3.88
Cl	85.00	85.00	209.69	512.62	0.25	0.89	0.43
F	0.10	0.10	0.25	0.60	0.00	0.00	0.00
SO4	54.00	54.00	133.30	326.16	0.10	0.36	0.18
SiO2	31.70	31.70	78.07	190.60	0.18	0.50	0.27
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	15.01	20.20	13.88	16.14	14.56
TDS	698.02	699.73	1719.97	4180.50	5.33	17.26	8.72
pH	7.40	7.40	7.71	7.89	5.21	5.54	5.33

Existing RO Trains
Design Recovery (83.5%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 4
B.Yallaly, Carollo Engineers
12/28/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.76	3.44	51.97	699.73	228.90
2	0.10	4.62	3.85	47.21	769.88	222.19
3	0.11	4.49	4.36	42.60	852.87	216.36
4	0.12	4.39	4.99	38.10	952.89	211.35
5	0.13	4.30	5.81	33.71	1076.21	207.10
6	0.14	4.22	6.91	29.41	1232.53	203.56
7	0.17	4.16	8.48	25.19	1437.82	200.68

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	3.99	9.78	42.06	1719.97	193.41
2	0.10	3.85	11.38	38.07	1898.62	188.44
3	0.11	3.71	13.41	34.23	2110.21	184.15
4	0.12	3.57	16.02	30.52	2364.40	180.48
5	0.13	3.42	19.47	26.95	2674.64	177.38
6	0.14	3.27	24.15	23.52	3060.09	174.80
7	0.15	3.09	30.69	20.25	3548.58	172.69

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.89
Langelier Saturation Index	0.12	0.12	2.10
Stiff & Davis Stability Index	0.65	0.65	1.97
Ionic Strength (Molal)	0.01	0.01	0.08
TDS (mg/l)	698.02	699.73	4180.50
HCO3	248.00	248.00	1465.71
CO2	13.93	13.93	20.19
CO3	0.46	0.46	17.07
CaSO4 (% Saturation)	1.56	1.56	24.34
BaSO4 (% Saturation)	281.36	281.36	3060.91
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.16	35.26
SiO2 (% Saturation)	28.98	28.98	170.18
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

Existing RO Trains
Maximum Recovery (85%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 5
B.Yallaly, Carollo Engineers
12/28/2007

Project Information:

System Details

Feed Flow to Stage 1	1634.00 gpm	Pass 1 Permeate Flow	1388.95 gpm	Osmotic Pressure:			
Raw Water Flow to System	1634.00 gpm	Pass 1 Recovery	85.00 %	Feed	4.63 psig		
Feed Pressure	205.21 psig	Feed Temperature	17.2 C	Concentrate	28.22 psig		
Fouling Factor	1.00	Feed TDS	699.73 mg/l	Average	16.43 psig		
Chem. Dose	None	Number of Elements	336	Average NDP	163.78 psig		
Total Active Area	134400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	182.36 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.19 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	32	7	1634.00	200.21	0.00	631.29	171.07	1002.71	16.11	15.00	0.00	5.42
2	BW30-400	16	7	631.29	166.07	0.00	245.05	146.14	386.24	12.41	15.00	0.00	19.40

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	6.60	16.53	0.08	0.31	0.14
Na	40.00	41.71	106.62	269.57	0.84	3.24	1.51
Mg	15.00	15.00	38.75	99.56	0.05	0.18	0.08
Ca	122.00	122.00	315.21	809.81	0.36	1.40	0.65
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.41	1.05	0.00	0.00	0.00
CO3	0.46	0.46	3.35	20.21	0.00	0.00	0.00
HCO3	248.00	248.00	636.14	1610.11	1.23	3.45	1.80
NO3	99.00	99.00	252.56	636.65	2.32	8.88	4.14
Cl	85.00	85.00	219.60	564.16	0.25	1.00	0.46
F	0.10	0.10	0.26	0.66	0.00	0.00	0.00
SO4	54.00	54.00	139.60	359.00	0.10	0.41	0.19
SiO2	31.70	31.70	81.75	209.75	0.19	0.55	0.29
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	15.14	21.30	13.90	16.48	14.65
TDS	698.02	699.73	1800.87	4597.07	5.42	19.40	9.26
pH	7.40	7.40	7.72	7.90	5.21	5.58	5.35

Existing RO Trains
Maximum Recovery (85%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 5
B.Yallaly, Carollo Engineers
12/28/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	4.88	3.40	51.06	699.73	200.21
2	0.10	4.71	3.83	46.18	773.27	193.68
3	0.11	4.56	4.37	41.47	860.62	188.05
4	0.12	4.44	5.05	36.91	966.43	183.24
5	0.13	4.33	5.93	32.47	1097.75	179.20
6	0.15	4.24	7.15	28.14	1265.75	175.86
7	0.17	4.16	8.90	23.89	1489.03	173.17

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	3.96	10.44	39.46	1800.87	166.07
2	0.11	3.80	12.32	35.50	2000.17	161.55
3	0.11	3.63	14.74	31.70	2237.67	157.68
4	0.12	3.47	17.90	28.07	2524.77	154.41
5	0.13	3.29	22.17	24.60	2877.35	151.67
6	0.15	3.10	28.05	21.30	3317.30	149.41
7	0.16	2.89	36.40	18.20	3875.98	147.59

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.90
Langelier Saturation Index	0.12	0.12	2.18
Stiff & Davis Stability Index	0.65	0.65	2.02
Ionic Strength (Molal)	0.01	0.01	0.09
TDS (mg/l)	698.02	699.73	4597.07
HCO3	248.00	248.00	1610.11
CO2	13.93	13.93	21.29
CO3	0.46	0.46	20.21
CaSO4 (% Saturation)	1.56	1.56	27.59
BaSO4 (% Saturation)	281.36	281.36	3361.63
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.16	46.96
SiO2 (% Saturation)	28.98	28.98	186.23
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

Existing RO Trains

Maximum Recovery (85%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51

Project: Chino II Expansion — Case: 5

B.Yallaly, Carollo Engineers — 12/28/2007

Project Information:

System Details

Feed Flow to Stage 1	1634.00 gpm	Pass 1 Permeate Flow	1388.90 gpm	Osmotic Pressure:			
Raw Water Flow to System	1634.00 gpm	Pass 1 Recovery	85.00 %	Feed	4.63 psig		
Feed Pressure	233.47 psig	Feed Temperature	17.2 C	Concentrate	28.22 psig		
Fouling Factor	0.85	Feed TDS	699.73 mg/l	Average	16.43 psig		
Chem. Dose	None	Number of Elements	336	Average NDP	191.85 psig		
Total Active Area	134400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	207.47 kW		
Water Classification: Well Water SDI < 3				Specific Energy	2.49 kWh/kgal		

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	32	7	1634.00	228.47	0.00	643.97	199.02	990.03	15.91	15.00	0.00	5.41
2	BW30-400	16	7	643.97	194.02	0.00	245.10	173.54	398.87	12.82	15.00	0.00	18.57

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	6.47	16.53	0.08	0.29	0.14
Na	40.00	41.71	104.54	269.64	0.84	3.09	1.49
Mg	15.00	15.00	37.99	99.54	0.05	0.17	0.08
Ca	122.00	122.00	309.01	809.72	0.36	1.34	0.64
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.40	1.05	0.00	0.00	0.00
CO3	0.46	0.46	3.22	20.20	0.00	0.00	0.00
HCO3	248.00	248.00	623.77	1609.96	1.22	3.31	1.78
NO3	99.00	99.00	247.65	636.86	2.31	8.49	4.09
Cl	85.00	85.00	215.29	564.10	0.25	0.95	0.46
F	0.10	0.10	0.25	0.66	0.00	0.00	0.00
SO4	54.00	54.00	136.86	358.95	0.10	0.39	0.19
SiO2	31.70	31.70	80.15	209.73	0.19	0.52	0.28
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	15.08	21.31	13.90	16.41	14.65
TDS	698.02	699.73	1765.62	4596.97	5.41	18.57	9.15
pH	7.40	7.40	7.71	7.90	5.21	5.56	5.35

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion — Case: 5
B.Yallaly, Carollo Engineers — 12/28/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	4.75	3.45	51.06	699.73	228.47
2	0.10	4.61	3.87	46.31	771.13	221.93
3	0.11	4.49	4.39	41.70	855.96	216.26
4	0.12	4.39	5.04	37.21	958.72	211.41
5	0.13	4.30	5.89	32.82	1086.20	207.31
6	0.15	4.23	7.04	28.51	1249.04	203.91
7	0.17	4.16	8.72	24.29	1464.99	201.17

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.10	3.99	10.12	40.25	1765.62	194.02
2	0.11	3.86	11.86	36.26	1958.47	189.37
3	0.11	3.72	14.08	32.40	2189.57	185.38
4	0.12	3.58	17.00	28.68	2471.04	182.00
5	0.14	3.43	20.95	25.10	2820.20	179.18
6	0.15	3.27	26.44	21.67	3262.51	176.86
7	0.17	3.08	34.34	18.40	3835.52	175.00

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.90
Langelier Saturation Index	0.12	0.12	2.18
Stiff & Davis Stability Index	0.65	0.65	2.02
Ionic Strength (Molal)	0.01	0.01	0.09
TDS (mg/l)	698.02	699.73	4596.97
HCO3	248.00	248.00	1609.96
CO2	13.93	13.93	21.30
CO3	0.46	0.46	20.20
CaSO4 (% Saturation)	1.56	1.56	27.59
BaSO4 (% Saturation)	281.36	281.36	3361.02
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.16	46.95
SiO2 (% Saturation)	28.98	28.98	186.23
Mg(OH)2 (% Saturation)	0.00	0.00	0.02

To balance: 1.71 mg/l Na added to feed.

Existing RO Trains

Minimum Recovery (75%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51

Project: Chino II Expansion — Case: 6

B.Yallaly, Carollo Engineers — 12/28/2007

Project Information:

System Details

Feed Flow to Stage 1	1852.00 gpm	Pass 1 Permeate Flow	1389.17 gpm	Osmotic Pressure:	
Raw Water Flow to System	1852.00 gpm	Pass 1 Recovery	75.01 %	Feed	4.63 psig
Feed Pressure	210.66 psig	Feed Temperature	17.2 C	Concentrate	17.44 psig
Fouling Factor	1.00	Feed TDS	699.73 mg/l	Average	11.03 psig
Chem. Dose	None	Number of Elements	336	Average NDP	164.11 psig
Total Active Area	134400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	212.17 kW
Water Classification: Well Water SDI < 3				Specific Energy	2.55 kWh/kgal

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	32	7	1852.00	205.66	0.00	838.52	168.66	1013.48	16.29	15.00	0.00	4.93
2	BW30-400	16	7	838.52	163.66	0.00	462.83	128.81	375.69	12.08	15.00	0.00	13.20

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.65	10.07	0.07	0.21	0.11
Na	40.00	41.71	91.21	163.47	0.76	2.19	1.15
Mg	15.00	15.00	33.08	59.84	0.04	0.12	0.06
Ca	122.00	122.00	269.07	486.72	0.32	0.93	0.49
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.35	0.63	0.00	0.00	0.00
CO3	0.46	0.46	2.42	7.96	0.00	0.00	0.00
HCO3	248.00	248.00	543.94	976.46	1.16	2.40	1.47
NO3	99.00	99.00	216.13	386.71	2.09	6.00	3.15
Cl	85.00	85.00	187.46	339.08	0.23	0.67	0.35
F	0.10	0.10	0.22	0.40	0.00	0.00	0.00
SO4	54.00	54.00	119.15	215.66	0.09	0.27	0.14
SiO2	31.70	31.70	69.81	126.14	0.17	0.42	0.24
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.75	16.86	13.83	15.20	14.22
TDS	698.02	699.73	1538.51	2773.14	4.93	13.20	7.15
pH	7.40	7.40	7.67	7.83	5.19	5.46	5.28

Existing RO Trains
Minimum Recovery (75%)
Design Water Quality
New Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 6
B.Yallaly, Carollo Engineers
12/28/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.09	5.00	3.30	57.88	699.73	205.66
2	0.09	4.80	3.69	52.88	765.50	197.81
3	0.10	4.63	4.16	48.08	841.50	190.93
4	0.10	4.48	4.73	43.46	930.58	184.94
5	0.11	4.35	5.43	38.98	1036.87	179.78
6	0.12	4.25	6.32	34.62	1166.45	175.38
7	0.14	4.17	7.50	30.37	1328.65	171.69

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.08	3.93	8.49	52.41	1538.51	163.66
2	0.08	3.73	9.72	48.47	1662.47	156.78
3	0.08	3.53	11.18	44.74	1799.96	150.63
4	0.08	3.34	12.92	41.21	1953.00	145.15
5	0.08	3.16	15.03	37.87	2123.98	140.28
6	0.09	2.98	17.59	34.71	2315.59	135.96
7	0.09	2.80	20.73	31.73	2530.86	132.16

Existing RO Trains
Minimum Recovery (75%)
Design Water Quality
New Membranes

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.83
Langelier Saturation Index	0.12	0.12	1.68
Stiff & Davis Stability Index	0.65	0.65	1.71
Ionic Strength (Molal)	0.01	0.01	0.05
TDS (mg/l)	698.02	699.73	2773.14
HCO3	248.00	248.00	976.46
CO2	13.93	13.93	16.86
CO3	0.46	0.46	7.96
CaSO4 (% Saturation)	1.56	1.56	13.85
BaSO4 (% Saturation)	281.36	281.36	2056.12
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.16	10.23
SiO2 (% Saturation)	28.98	28.98	117.07
Mg(OH)2 (% Saturation)	0.00	0.00	0.01

To balance: 1.71 mg/l Na added to feed.

Existing RO Trains
Minimum Recovery (75%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes — ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion — Case: 6
B.Yallaly, Carollo Engineers — 12/28/2007

Project Information:

System Details

Feed Flow to Stage 1	1852.00 gpm	Pass 1 Permeate Flow	1388.95 gpm	Osmotic Pressure:	
Raw Water Flow to System	1852.00 gpm	Pass 1 Recovery	75.00 %	Feed	4.63 psig
Feed Pressure	238.98 psig	Feed Temperature	17.2 C	Concentrate	17.43 psig
Fouling Factor	0.85	Feed TDS	699.73 mg/l	Average	11.03 psig
Chem. Dose	None	Number of Elements	336	Average NDP	192.13 psig
Total Active Area	134400.00 ft²	Average Pass 1 Flux	14.88 gfd	Power	240.70 kW
Water Classification: Well Water SDI < 3				Specific Energy	2.89 kWh/kgal

Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Conc Flow (gpm)	Conc Press (psig)	Perm Flow (gpm)	Avg Flux (gfd)	Perm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	32	7	1852.00	233.98	0.00	853.03	196.59	998.97	16.05	15.00	0.00	4.93
2	BW30-400	16	7	853.03	191.59	0.00	463.05	156.01	389.98	12.53	15.00	0.00	12.62

Pass Streams (mg/l as Ion)							
Name	Feed	Adjusted Feed	Concentrate		Permeate		
			Stage 1	Stage 2	Stage 1	Stage 2	Total
NH4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	2.60	2.60	5.56	10.07	0.07	0.20	0.11
Na	40.00	41.71	89.67	163.43	0.76	2.09	1.13
Mg	15.00	15.00	32.52	59.81	0.04	0.11	0.06
Ca	122.00	122.00	264.50	486.50	0.32	0.89	0.48
Sr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.16	0.16	0.34	0.63	0.00	0.00	0.00
CO3	0.46	0.46	2.34	7.95	0.00	0.00	0.00
HCO3	248.00	248.00	534.79	976.03	1.16	2.31	1.46
NO3	99.00	99.00	212.49	386.63	2.09	5.73	3.11
Cl	85.00	85.00	184.27	338.93	0.23	0.64	0.34
F	0.10	0.10	0.22	0.40	0.00	0.00	0.00
SO4	54.00	54.00	117.13	215.56	0.09	0.25	0.14
SiO2	31.70	31.70	68.62	126.08	0.17	0.40	0.24
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	13.93	13.93	14.71	16.86	13.83	15.16	14.22
TDS	698.02	699.73	1512.46	2772.05	4.93	12.62	7.07
pH	7.40	7.40	7.67	7.83	5.19	5.44	5.28

Existing RO Trains
Minimum Recovery (75%)
Design Water Quality
5-Yr Old Membranes

Reverse Osmosis System Analysis for FILMTEC™ Membranes
ROSA v6.1 ConfigDB u238786_51
Project: Chino II Expansion
Case: 6
B.Yallaly, Carollo Engineers
12/28/2007

Design Warnings

-None-

Solubility Warnings

Langelier Saturation Index > 0
Stiff & Davis Stability Index > 0
BaSO4 (% Saturation) > 100%
SiO2 (% Saturation) > 100%
Antiscalants may be required. Consult your antiscalant manufacturer for dosing and maximum allowable system recovery.

Stage Details

Stage 1 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.08	4.85	3.36	57.88	699.73	233.98
2	0.09	4.69	3.74	53.03	763.36	226.12
3	0.09	4.54	4.19	48.34	836.96	219.20
4	0.10	4.42	4.73	43.80	923.32	213.15
5	0.11	4.32	5.40	39.38	1026.42	207.92
6	0.12	4.23	6.25	35.06	1152.12	203.45
7	0.14	4.16	7.37	30.82	1309.36	199.69

Stage 2 Element	Recovery	Perm Flow (gpm)	Perm TDS (mg/l)	Feed Flow (gpm)	Feed TDS (mg/l)	Feed Press (psig)
1	0.07	3.97	8.26	53.31	1512.46	191.59
2	0.08	3.80	9.38	49.35	1633.24	184.54
3	0.08	3.63	10.70	45.55	1768.36	178.23
4	0.08	3.48	12.28	41.91	1920.43	172.62
5	0.09	3.32	14.19	38.44	2092.56	167.63
6	0.09	3.17	16.53	35.12	2288.59	163.23
7	0.09	3.01	19.41	31.95	2513.19	159.37

Existing RO Trains
Minimum Recovery (75%)
Design Water Quality
5-Yr Old Membranes

Scaling Calculations

	Raw Water	Adjusted Feed	Concentrate
pH	7.40	7.40	7.83
Langelier Saturation Index	0.12	0.12	1.68
Stiff & Davis Stability Index	0.65	0.65	1.71
Ionic Strength (Molal)	0.01	0.01	0.05
TDS (mg/l)	698.02	699.73	2772.05
HCO3	248.00	248.00	976.03
CO2	13.93	13.93	16.86
CO3	0.46	0.46	7.95
CaSO4 (% Saturation)	1.56	1.56	13.84
BaSO4 (% Saturation)	281.36	281.36	2055.15
SrSO4 (% Saturation)	0.00	0.00	0.00
CaF2 (% Saturation)	0.16	0.16	10.22
SiO2 (% Saturation)	28.98	28.98	117.03
Mg(OH)2 (% Saturation)	0.00	0.00	0.01

To balance: 1.71 mg/l Na added to feed.

CHINO II EXPANSION
SUPPLEMENTAL SPARE PARTS

Attachment A Spare Parts Schedule Section 11950				
Item	**Quantity**	**Description**	**Manufacturer**	**Model Numbers**
Conductivity Analyzer	1		Rosemount Analytical	54e C-01
pH Analyzer	1		Foxboro	870ITPH
Turbidimeter	1		Hach	1720E
Nitrate Analyzer	1		Hach	Nitrax Plus SC 2MM
D.P. Gauge	1		Precision Digital	PD692
Concentrate Control Valve	1		Dresser-Masoneilan	2" FVC-1
ABB Flowmeter	1 each		ABB	MFE151371181004 ER/NS MFF 201361181004
Sulfuric Acid Pulsation Dampener	1		Neptune	PD36AL-V
Sulfuric Pressure Relief Valve	1		Neptune	PRV050A
Tank Level Chamber, Switch & Transmitter	1 each		ISE-Magtech	LGAC-2"-150# LG6C-2"-150# LGCC-2"-150# MLS-5EX LT1-4/20
Sulfuric Pump	1		Neptune	567-S-N4
Sulfuric Motor	1		Baldor	CD3475-PTG50XP
Threshold Inhibitor Pump	1		Neptune	522-A-N3-FALP
Sodium Hydroxide Pump	1		Neptune	525-A-N3-FALP
Sodium Hydroxide Motor	1		Baldor	CDPT3330
Threshold Inhibitor Tachometer	1		Baldor	TK3400
Cl_2 Blower	1		NY Blower Co.	Compact GI 106
Cl_2 Cell	1		Severn Trent Services	600lb
Cl_2 Softener Pump	1		Burks	ES8M
Cl_2 Softener Motor	1		Baldor	EM3546T
Softener Booster Pump	1		Goulds	3196 MTX

Attachment A Spare Parts Schedule Section 11950				
Item	**Quantity**	**Description**	**Manufacturer**	**Model Numbers**
Softener Booster Motor	1		TECO-Westinghouse	MAX-E1 E0054
Brine Feed & Transfer Pump	1		Goulds	3298 1 X 1.5-6 3298 1 X 1.5-8
Brine Feed & Transfer Motor	1 each		TECO-Westinghouse	MAX-E1 E0024 MAX-E1 E0014
Pressure Gauges	1 each		3D Instruments LLC	25504-23C71 25504-26C71 25504-26C21 25504-23C21 25502-26B11
Rinse Reclaim Pump	1		Goulds	3196 MTX
Ultrasound Level Indicator	1		Endress/Hauser	Prosonic
R.O. Feed Motor	1		G.E. Industrial System	5KS511ST6475M
Cl_2 Analyzer	1		Hach	CL17
Threshold Inhibitor Flowmeter	1		Max Machinery	234-000-200
Pressure Transmitters	1 each		Invensys/Foxboro	IGP20-T22D01F-M2L1 1GP20-T22E01F-M2L1 IDP10-T22C21F-M2L1
Pressure Switches	1 each		SOR, Inc.	6NN-K3-N1-L1ATT 6NN-K3-N7-C1A-TT 6NN-K2-N7-C1A-TT 5NN-K45-N7-C1A-TT 6NN-K3-N1-J1A-TT 6NN-K5-N7-C1A-TT 6NN-K45-N7-C1A-TT
Cl2 Motor	1		Baldor	CDPT3585
Dilution Valve	1 each		Saunders	3448-11-E2 1.5-3448-11-E2

Attachment A
Spare Parts Schedule
Section 11950

Item	Quantity	Description	Manufacturer	Model Numbers
Dilution Valve	1 each		Spears	2723-010C 2723-020C
Accuators	1 each		Rotork	IQTM2000-WD IQT1000M-WD IQ12B4IW3 IQ10ML IQM10B4MOW6R
RO Membrane Cleaning Pump	1	1. Complete set of gaskets and o-ring seals 2. Complete mechanical seal 3. Complete set of case and impeller wear rings 4. Complete set of keys, dowels, pins, etc; 5. One complete set of any special tools required to dismantle the pump.	Goulds	Pump Model 3196, mechanical seal part # 794E334SL

Attachment A
Spare Parts Schedule
Section 11950

Item	Quantity	Description	Manufacturer	Model Numbers
On-Site Sodium Hypochlorite Generation System	1 each	1. Complete set of fuses 2. Automatic dilution water shut-off valve 3. Electrolytic cell level temperature switch assembly 4. Special tools required for operation and maintenance 5. Two replacement filters for hydrogen dilution blower inlet filter 6. Complete set of gaskets for all gasketed covers and connections 7. Greases and lubricants required to start operations (equivalent to one year of continuous operations)	Per Chief Plant Operator	Per Chief Plant Operator
Metering Pumps and Appurtenances	1 for each metering pump	1. Diaphragm 2. Complete set of ball check valves & seats 3. Complete set of valve o-rings 4. Pump Head gasket 5. Automatic bleed valve	Per Chief Plant Operator	Per Chief Plant Operator