CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board
Division of Drinking Water

RTD-220

July 21, 2015

System No. 3910012

Mr. Antonio Tovar
Assistant Director of Water Resources Planning
City of Stockton
11373 N. Lower Sacramento Road
Lodi, CA 95242

CITY OF STOCKTON – TRANSMITTAL OF A NEW WATER SUPPLY PERMIT (NO. 01-10-15P-001)

The State Water Resources Control Board, acting by and through its Division of Drinking Water (Division) and the Deputy Director for the Division is issuing a new permit (No. 01-10-15P-001) to the City of Stockton (City) water system. This permit will supersede the existing full permit issued by the Division in March 1983. There have been many changes in the City's water system and in the regulations governing drinking water systems since the issuance of the last permit. Therefore, a new full permit is needed to reflect these changes. The new permit along with an Engineering Report is being sent to you under the cover of this letter.

Please acknowledge in writing by August 28, 2015, receipt of this permit and your willingness to comply with the permit conditions. Note that this permit supersedes all previous permits issued by the Division to the City of Stockton water system.

If you have any questions regarding the permit or the findings, please contact Tahir Mansoor by email at Tahir.Mansoor@Waterboards.ca.gov or by phone at (209) 948-3879.

Bhupinder S. Sahota, P.E.
District Engineer, Stockton District
NORTHERN CALIFORNIA BRANCH
DRINKING WATER FIELD OPERATIONS

Enclosures
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State Water Resources Control Board
Division of Drinking Water

STATE OF *CALIFORNIA*

DOMESTIC WATER SUPPLY PERMIT

Issued To

City of Stockton

Public Water System No. 3910012

By The

State Water Resources Control Board

Division of Drinking Water

PERMIT NUMBER: 01-10-15P-001 **DATE: July 21, 2015**

WHEREAS:

1. The City of Stockton (City) operates the domestic water system and supplies potable water to the residents of the City. The City submitted a permit application dated February 19, 2015, to the State Water Resources Control Board, Division of Drinking Water (Division), to accommodate recent improvements made to the City's public water system. The applications were submitted in accordance with California Health and Safety Code, Section 116525.

2. This public water system is known as the City of Stockton Domestic Water System, which is managed by the City's Municipal Utilities Department located at 11373 N. Lower Sacramento Road, Lodi, CA 95242.

3. The legal owner of the City's Domestic Water System is the City of Stockton. The City, therefore, is responsible for compliance with all statutory and regulatory drinking water requirements and the conditions set forth in this permit.

4. The public water system for which the permit application has been submitted is briefly described below (a more detailed description of the permitted system is described in an Engineering Report, which is attached to this Permit):

   The City's domestic water system is being operated by the City under a water supply permit issued by the Division on March 17, 1983. The permit was later amended several times. That permit does not reflect the current operational status of some of the water system's sources, storage tanks, and treatment facilities and, therefore, is outdated. Since issuance of the last permit in 1983, the City has made several modifications to its domestic water system. Several new ground water wells were drilled and added to the water system. Several wells were abandoned and destroyed. A new 30 million gallon (MG) Delta Water Supply Project (DWSP) water treatment plant was constructed that came online in May 2012. The City wants to use chloramines as a method of disinfecting several of the City's wells and the treated surface water from DWSP and Stockton East Water District (SEWD) plants. To accommodate the above-mentioned changes in the domestic water supply permit, the Division has decided to issue a full permit to the City.

   Also, the review and update of the permit was necessary since the existing permit does not adequately describe the system and the changes in the laws and regulations governing water supply systems.

5. The service area of the City's Domestic Water System is shown on the service area map available to the Division

AND WHEREAS:

1. The City of Stockton has submitted all of the required information relating to the operation of the City's Domestic Water System.

2. The Division of Drinking Water has evaluated all of the information submitted by the City of Stockton and has conducted a physical investigation of the City's Domestic Water System.

3. The State Water Resources Control Board, acting by and through its Division of Drinking Water (Division) and the Deputy Director for the Division, has the authority to issue domestic water supply permits pursuant to Health and Safety Code, Section 116540.

THEREFORE:

The Division of Drinking Water has determined the following:

1. The City of Stockton Domestic Water System meets the criteria for and is hereby classified as a community water system.

2. The applicant has demonstrated that the City's Domestic Water System has sufficient source capacity to serve the anticipated water demand of its customers.

3. The design of the water system complies with the Water Works Standards and all applicable regulations.

4. The applicant has demonstrated adequate technical, managerial, and financial capacity to operate the water system reliably.

5. Provided the water system is operated properly and the following conditions are complied with, the City's Domestic Water System should be capable of providing water to its consumers that is pure, wholesome, and potable and in compliance with statutory and regulatory drinking water requirements at all times.

THE CITY OF STOCKTON IS HEREBY ISSUED THIS DOMESTIC WATER SUPPLY PERMIT TO OPERATE THE CITY'S DOMESTIC WATER SYSTEM.

The City's Domestic Water System shall comply with the following permit conditions:

The Division finds that the DWSP and the ground water wells are adequate for delivery of safe, wholesome, and potable water to the City of Stockton customers. Issuance of a new full domestic water supply permit by the Division to the City of Stockton is recommended subject to the following provisions:

1. The status and primary station codes of the sources permitted for this system are listed below:

Source	Status	Primary Station Codes
Well No. SSS2	Active	3910012-003
Well No. SSS3	Active	3910012-083
Well No. SSS8	Active	3910012-089SS8R
Well No. SSS9	Active	3910012-055SS9R
Well No. 9	Active	3910012-029
Well No. 18	Active	3910012-037
Well No. 19	Active	3910012-038
Well No. 20	Active	3910012-039
Well No. 21	Active	3910012-040
Well No. 25	Active	3910012-044
Well No. 27	Active	3910012-046
Well No. 28	Active	3910012-084
Well No. 29	Active	3910012-087029R
Well No. 30	Active	3910012-092RW30
Well No. 31	Active	3910012-094RW31
Well No. 32	Active	3910012-096RW32
Well No. 3R	Active	3910012-098RW3R
Well No. 10R	Active	3910012-100
SEWD Treated	Active	3910012-048
Delta Raw	Active	3910012-102
WID Canal Raw	Active	3910012-103
DWSP Treated	Active	3910012-104

No changes, additions, or modifications shall be made to the sources mentioned in Condition No. 1 unless an amended water permit has first been obtained from the Division.

2. All water supplied by the water system for domestic purposes shall meet all MCLs established by the Division of Drinking Water. If the water quality does not comply with the California Drinking Water Standards, treatment shall be provided to meet standards.

   In addition, the City shall comply with all the requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code and any regulations, standards or orders adopted thereunder.

3. All personnel who operate the distribution facilities shall be certified in accordance with Title 22, Section 63770, CCR. The City's distribution system is classified as a D5 distribution system. As such, the minimum grade required for the Chief Operator is D5 and the minimum grade required of the Shift Operator is D3.

4. All personnel who operate the treatment facilities shall be certified in accordance with Title 22, Section 63765, CCR. The City's DWSP surface water treatment plant has been classified as T5 facility. As such, the minimum grade required for the DWSP Chief Operator is T5 and the minimum grade required for the Shift Operator is T3.

5. The City shall continuously disinfect all active wells. The chlorination point for all wells shall be downstream of the check valve. At no time shall the City introduce un-chlorinated water to the distribution system.

6. All wells shall be monitored monthly for coliform contamination to assure that contamination that may occur in the wells will not go undetected. The samples collected for bacteriological examination shall be collected from points at the well sites that represent raw water before the addition of any chlorine. A monthly wellhead coliform monitoring summary shall continue to be submitted to the Division within 10 days of the end of each month.

<u>Surface Water Treatment Facility</u>

7. The City shall comply with the following conditions pertaining to the DWSP plant:

   A. The City is permitted to use the Delta and WID canal as sources of raw water supply for the new surface water treatment facility.

   B. The City's surface water treatment plant is permitted for operation at a maximum flow rate of **30** MGD with all **10** membrane skids in service.

   C. The L20N membranes are approved to operate at a flux of up to **155** gallons per square foot per day (gfd) and a transmembrane pressure (TMP) of up to **22** psi @ $\leq 30^{\circ}C$ or **17** psi @ $>30^{\circ}C$.

   D. The City shall operate the DWSP plant in accordance with the DWSP Operations Plan that has been approved by the Division. The City shall update its DWSP Operations Plan, on a regular basis, to reflect current practices. The City shall submit an updated DWSP Operations Plan to the Division every time the plan is updated with current information.

E. The City shall monitor the raw surface water sources at least five days per week for total coliform and E. coli bacteria. The coliform tests shall be performed using a density analytical method and the results reported in units of MPN per 100mL. The results from the source monitoring shall be submitted monthly to the Division by the 10th day of the following month.

F. The combined plant effluent turbidity shall be 0.1 NTU or less in at least 95 percent of the readings every month and shall not exceed 0.5 NTU at any time. If there is a failure with the continuous turbidity monitoring system or interruptions due to system maintenance, the City shall conduct grab sampling no less than once every hour in lieu of continuous monitoring. However, continuous monitoring shall be reinitiated for the combined filter effluent within 48 hours of turbidity monitoring system failure or maintenance interruption.

G. The Division has credited the Siemens (L20N) ultrafiltration membrane technology with 4-log *Giardia lamblia* removal, 4-log Cryptosporidium removal, and 1-log virus removal credit. At all times, the City shall treat its raw water supply to reliably provide a minimum total reduction of **4**-log *Giardia lamblia* and **5**-log viruses through the filtration and disinfection processes. An additional 0.5-log reduction of *Giardia lamblia* and 4-log virus shall be maintained through the disinfection process at the plant. Verification of the *Giardia lamblia* log reduction shall be demonstrated by calculating the CT achieved immediately following the 4.0 MG clearwell. The appropriate operational changes shall be made immediately if a minimum of 0.5-log *Giardia lamblia* reduction is not achieved

H. The clearwell is credited with a T_{10}/T (baffling factor) of **0.2**, for purposes of calculating actual CT.

I. Pressure decay integrity tests of the membranes shall be conducted at least once every day.

J. The City shall notify the Division by telephone of any exceedance of any MCL in the combined effluent of the treatment plant, failure to meet CT requirements, or whenever the turbidity of the combined filter effluent exceeds 0.5 NTU at any time. Notification shall occur within 24 hours of the City becoming aware of such an incident. If the Division's office is closed at the time, it shall be notified by telephone before 8:15 a.m. of the next business day. The water shall not be supplied to the distribution system until such incidents are corrected.

K. The City shall submit monthly filtration plant monitoring reports to the Division by the 10th day of the following month. The reports shall contain the information that has been previously requested by the Division and specified in the plant operations plan.

8. The City must ensure that the WID Canal is patrolled while it is being used as a source of supply. The WID Canal must be patrolled daily from Harney Lane to the DWSP SWTP and a minimum of one time per week from the diversion structure at WID's office to the DWSP SWTP. The City must maintain records of the canal patrols and report all reportable events and significant events to the Division within 24 hours of discovery.

<u>Chloramination Treatment Facilities (North System Only)</u>

9. The effluent water from the storage tank shall be chloraminated at all times to control the formation of Disinfection By-Products. If short periods of operation of the system with a free chlorine residual are found to be necessary to control nitrification in the distribution system, the City shall file a request with the Division to utilize free chlorination, stating the reason for the need, the date of initiation of the free chlorination, and the duration of each period of use of free chlorine as disinfectant.

10. All monitoring requirements related to chloramination process shall be conducted according the Water Quality Monitoring Program listed in Tables 3-1, 3-2, and 3-3 in Section D3 of this report. Particular attention shall be given to the results related to the chloraminated water to assure that nitrification does not occur.

11. The operators of the City's surface water treatment plant shall be trained in the proper operation of the chloramination facilities to optimize the chloramination practice and satisfaction of the customers with the water produced by the treatment process. The chloramination shall be performed in accordance with an approved operations plan.

12. Following one year of operation with chloramines, the City shall submit a report summarizing the effectiveness of the change from chlorine to chloramines. This report should include data from the pre and post chloramination monitoring program to indicate the changes in water quality. This report should discuss the City's compliance with the Disinfection By-Products rule. This report shall provide details of the City's plan if City is not able to achieve compliance with the TTHM and HAA5 MCLs with this change from chlorine to chloramines.

13. The City should notify hospitals, dialysis centers, acute care centers, and other facilities of the planned use of chloramines as a distribution system residual disinfectant. All clinic, hospital, and home treatment units may not provide for removal of chloramines. Therefore, everyone involved with

the treatment of dialysis patients must be alerted. The City has the overall responsibility to assure that adequate notification is provided.

The City shall provide notification of the impending change and its consequences to all consumers and all chronic and acute care dialysis facilities within its service area. In addition, the City should also notify owners of the pet fish, pet and fish shops, and other business and industries that may be affected by chloramines.

The notification process should take place in two stages. In the first stage, the City shall advise each facility of the proposed conversion to chloramines. Approximately one month prior to commencing chloramines disinfection, the City should contact all facilities again to confirm that these facilities are prepared to treat chloraminated water. Confirmation may be carried out by written correspondence or by documented on-site visits to the facilities. The City shall advise the Division when this has been completed.

14. The City must establish a plan to notify new customers of the presence of chloramines in the water. This plan should also include future dialysis facilities, future pet and fish shops, and future business and industries that may be affected by chloramines in the City's water system.

15. The City shall submit monthly reports to the Division by the 10th day of the following month. Report based on all monitoring conducted according the Water Quality Monitoring Program listed in Tables 3-1, 3-2, and 3-3 in Section D3 of this report.

16. The City shall always maintain a minimum disinfectant residual of at least 0.2 mg/L in the water delivered to the distribution system. The City shall also always maintain a detectable disinfectant residual throughout the distribution system.

<u>Standby Sources</u>

17. The use of all standby sources is subject to the following conditions:

Standby Sources	Status	Capacity (gpm)	Primary Station Codes
Well No. SSS1	Standby	1,000	3910012-001
Well No. 15	Standby	1,805	3910012-034
Well No. 26	Standby	1,970	3910012-045

A. Standby wells shall be monitored a minimum of once every nine years for all inorganic, organic, and radiological MCLs, unless a waiver has been granted by the Division.

B. Standby wells shall be used for short-term emergencies of five consecutive days or less, and for less than a total of fifteen calendar days in a year.

C. Within 3 days after the short-term emergency use of a standby source, the water supplier shall notify the Division. The notification shall include information on the reason for and duration of the use.

D. The City shall notify the public within 30 days whenever the water from standby wells is delivered to the distribution system.

E. A standby source which has previous monitoring results indicating nitrate or nitrite levels equal to or greater than 50 percent of the MCL shall collect and analyze a sample for nitrate and nitrite annually. In addition, upon activation of such a source, a sample shall be collected, analyzed for these chemicals and the analytical results reported to the Division within 24 hours of activation.

F. The City shall meter the standby source's monthly production and submits the results to the Division by the 10th day of the next month.

G. The City shall count any part of a day as a full day for purposes of determining compliance with Section 64414(c).

H. Provides public notice prior to use of the standby source by electronic media, publication in a local newspaper, and/or information in the customer billing, if the situation is such that the water system can anticipate the use of the source (e.g., to perform water system maintenance).

I. The City shall takes corrective measures such as flushing after the standby source is used to minimize any residual levels of the constituent in the water distribution system.

This permit shall be effective as of the date shown below.

FOR THE STATE WATER RESOURCES CONTROL BOARD, DIVISION OF DRINKING WATER

Bhupinder S. Sahota, P.E.,
District Engineer
Stockton District
Northern California Branch
Drinking Water Field Operations

July 21, 2015
Date

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STATE WATER RESOURCES CONTROL BOARD
DIVISION OF DRINKING WATER

WATER PERMIT NO. 01-10-15P-001

CITY OF STOCKTON
DOMESTIC WATER SYSTEM
SAN JOAQUIN COUNTY
SYSTEM NO. 3910012

July 2015

ENGINEERING REPORT PREPARED BY:

TAHIR MANSOOR
SANITARY ENGINEER

ENGINEERING REPORT APPROVED BY:

BHUPINDER S. SAHOTA, P.E.
DISTRICT ENGINEER

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LIST OF ABBREVIATIONS AND UNITS

acfm ....actual cubic feet per minute
ACH.......................Aluminum Chloro Hydrate
Af..........................acre feet
AHT.......................Air Hold Test
C°..........................degrees Celsius
CCR.......................Consumer Confidence Report
CEQA.....................California Environmental Quality Act
cfs..........................cubic feet per second
CIP.........................Clean in-Place
CT..........................Contact Time
DBPR.....................Disinfection By-products Rule
DWSAP..................Drinking Water Source Assessment Protection
DWSP....................Delta Water Supply Project
DWT.......................Deep Well Turbine
EDT.......................Electronic Data Transfer
F°...........................degrees Fahrenheit
fpm ....feet per minute
fps...........................feet per second
ft^2..........................square feet
FTW.......................Filter-to-Waste
gfd..........................gallon per square foot per day
gpd..........................gallons per day
gph ....gallons per hour
gpm ....gallons per minute
HAA5......................Haloacetic Acid
hp ....horse power
HPC........................Heterotrophic Plate Count
IDSE.......................Initial Distribution System Evaluation
IPS.........................Intake Pump Station
lb............................pounds
LOX........................Liquid Oxygen
LRV........................Log Removal Value
MCL........................Maximum Contaminant Level
MDD.......................Maximum Day Demand
MF......................... .Membrane Filtration
MG..........................Million Gallons
mg/L ....milligrams per liter
MGD ....Million Gallons per Day
MIT..........................Membrane Integrity Test
MW..........................Membrane Wash
NSPAF.....................North Stockton Pipeline Ammonia Facility
NTU ....Nephelometric Turbidity Units
pCi/L.......................pico Curies per liter
PCS.........................Process Control System
PDT.........................Pressure Decay Test
PLC . ...Programmable Logic Controller
ppb..........................parts per billion
psi...........................pounds per square inch
PVDF......................Polyvinylidene Fluoride
RAA.........................Running Annual Average
SCADA....................Supervisory Control and Data Acquisition
scfm.........................standard cubic feet per minute

SCM......................Streaming Current Detector
SEWD....................Stockton East Water District
Sf..........................square feet
SOC.......................Synthetic Organic Carbon
SWTR.....................Surface Water Filtration and Disinfection Treatment Regulation
TDH........................Total Dynamic Head
TDS........................Total Dissolved Solids
TMP.......................Transmembrane Pressure
TOC.......................Total Organic Carbon
TTHM.....................Total Trihalomethane
ug/L ....micrograms per liter
UPS.......................Uninterruptible Power Supply
USEPA ....United States Environmental Protection Agency
VOC.......................Volatile Organic Carbon
WID........................Woodbridge Irrigation District
WWTP....................Waste Water Treatment Plant

LIST OF APPENDICES

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Appendix B:	Vicinity and Service Area Map
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Engineering Report

For Consideration of a Permit for the
City of Stockton
Public Water System No. 3910012
San Joaquin County

State Water Resources Control Board
Division of Drinking Water
Project Engineer: Tahir Mansoor

July 2015

A. INTRODUCTION

1. Purpose of Report

The City of Stockton's (City) domestic water system is being operated by the City under a water supply permit (No. 83-008) issued by the State Water Resources Control Board, Division of Drinking Water (Division) on March 17, 1983. The permit was later amended several times. That permit does not reflect the current operational status of some of the water system's sources, storage tanks, and treatment facilities and, therefore, is outdated. Since issuance of the last permit in 1983, the City has made several modifications to its domestic water system. Several new ground water wells were drilled and added to the water system. Several wells were abandoned and destroyed. New storage tanks were constructed. A new 30 million gallon per day (MGD) Delta Water Supply Project (DWSP) water treatment plant was constructed that came online in May 2012. The City wants to use chloramines as a method of disinfecting several of the City's wells in the North System and the treated surface water from DWSP and Stockton East Water District (SEWD) plants. To accommodate the above-mentioned changes in the domestic water supply permit, the Division has decided to issue a full permit to the City. A copy of the permit application dated February 19, 2015, submitted by the City is attached (Appendix A).

This Engineering Report describes the City's existing domestic water supply system facilities, operational procedures, and improvements to the system since issuance of the last full permit in 1983.

2. Brief Description of System

The City of Stockton is located in the San Joaquin County, approximately 45 miles south of Sacramento and has a resident population of approximately 325,000. The City of Stockton domestic water system is owned and operated by the City of Stockton Municipal Utilities Department. The City serves approximately 50 percent of the City's population. Most of the areas served by the City are located to the north of the Calaveras River, including the Spanos Ranch east and west subdivisions, known as the North Stockton System. The north system service area lies north of Calaveras River and serves majority of the area within the City north of the River except for small parcels that are served by California Water Service Company (Cal Water).

In the south side, the City serves the Diamond Walnut Plant (Walnut Plant System), and the South Stockton System, which comprises of the City airport, the industrial park, the County Hospital, the County Jail, and the new Weston Ranch subdivision. The Cal Water serves all the remaining areas in the south side and some areas in the north side; the San Joaquin County's Utility Maintenance District (SJMUD) serves the Lincoln Village and Colonial Heights subdivisions in the North side.

The City supplies water to approximately 184,000 people through 47,921 service connections (per 2014 Annual Report to the Division) in North Stockton, South Stockton, and the Walnut Plant water systems.

The primary sources of supply in the North System is purchased water from SEWD surface water treatment plant located to the east of the City and a new 30 MGD DWSP water treatment plant that came online in May 2012. Supplemental supply is provided by 13 active groundwater wells located within the North System service area. In addition, there are two standby wells in the North System.

All of the water supply for the Walnut Plant system is obtained from the California Water Service via three interconnections.

The source of supply for the South System is purchased surface water from SEWD and groundwater obtained from four active wells in the airport and the industrial park areas. In addition, there is one standby well in the South System. The storage capacity in the North System is 16.29 million gallons and is provided by five ground level storage reservoirs. The South System has two 3-MG ground level storage reservoirs. A vicinity and service area map for North, South, and Walnut Plant's distribution systems is included in Appendix B.

Nine wells are on inactive list, seven of those are in the North System and two are in the South System.

More details about the wells are provided in Section 3.3 below.

All groundwater wells are disinfected routinely prior to pumping water to the distribution system. Additionally, sequestration was practiced at wells where elevated levels of iron and/or manganese occur. However, all the wells with elevated iron or manganese levels have been designated as either standby or inactive sources and can only be used for emergencies. Therefore, sequestering treatment is no longer practiced at any of the active wells.

3. Geology

As mentioned above the City currently receives water from three sources: groundwater pumped from the underlying groundwater basin, and treated surface water from SEWD and DWSP.

According to the United States Geological Survey (USGS), the geological formations underlying the Stockton area include the pre-Cretaceous metamorphic and igneous rocks of the Sierra Nevada block, which extends beneath the Valley fill, and is overlain by consolidated and semi-consolidated Cretaceous and Tertiary sediments and unconsolidated continental sediments of Pleistocene and recent age. The sedimentary rocks are of marine and continental origin and include undifferentiated basal Eocene and Cretaceous marine sediments overlain by the Valley springs and Mehrten formations.

The groundwater basin underlying the City's service area is part of the contiguous Central Valley aquifer system. The thickness of the unconfined alluvial aquifer ranges from around 100 feet on the eastern end of the county to over 3,000 feet on the southwestern end; the thickness underlying the City's service area is approximately 1,000 feet.

For the City, adverse impacts of a lowered water table include increasing saline intrusion, increasing pumping depths (higher pumping costs, reduced well yields, and the need to deepen some wells), and potentially land subsidence.

4. Permit Status

The City currently operates its water supply system under a permit issued by the Division on March 17, 1983, and permit amendments issued in 1986, 1989, 1993, 2002, 2004, 2005, 2006, 2008, and 2011.

Past Water Supply Permit Summary

Date	Type	Number	Description
3/17/83	Full	83-008	Full permit issued by the Division for operation of the water system
5/14/86	Amendment	None	To add additional water supply and to add distribution system facilities
1/31/89	Amendment	None	To add two wells (Nos. 26 and SSS1) and to add sequestering agent at various well sites
9/17/93	Amendment	None	Incorporate the Southern Water system into the City system and add a new well (No. 27) and storage reservoirs to the system

8/27/02	Amendment	03-10-02PA-022	Add Wells Nos. 28, 29, SSS3, and SSS8
4/06/04	Amendment	03-10-04PA-006	Well WP 01 status change to standby
7/20/04	Amendment	03-10-04PA-016	Add new Well No. SSS9
9/24/04	Amendment	03-10-04PA-020	Well No. 10 status change to standby
5/27/05	Amendment	03-10-05PA-005	Add new Well No. 30
10/12/05	Amendment	03-10-05PA-016	Add new Wells Nos. 31 and 32
4/13/06	Amendment	03-10-06PA-004	Change status of Wells Nos. 22 & SSS4 from active to standby and Wells Nos. 10 & WP 01 from standby to destroyed
5/21/08	Amendment	03-10-08PA-001	Add new well 3R and Change status of Wells Nos. 1, 4, 5, 11, 15, 16, 23, SSS5, and WP 03 from active to standby
10/16/08	Amendment	03-10-08PA-010	Well No. 12 status change to standby
05/20/11	Amendment	03-10-11PA-006	Add a 3 MG tank; new Well No. 10R; change status of Wells Nos. 2, 5, 10, 12, WP 1, WP 2, and WP 3 to destroyed; Wells Nos. SSS4 and SSS5 to inactive; Well No. 26 to standby; add new interconnection

5. Recent Changes in the System

The new DWSP 30 MG water treatment plant came online in May 2012 and has been in operation since. The City has added chloramination treatment facilities at several of the well sites in the North System. In addition variable frequency drives (VFDs) for pumps and Supervisory Control and Data Acquisition (SCADA) upgrades were made. The status of several wells with high iron and manganese were either changed to standby or inactive.

6. Consumer and Production Data (From the Annual Reports to DDW)

Production and Consumption Summary

		2014	**2013**	**2012**
Population		181,993	173,242	171,687
Service Connections	Total	48,110	47,924	47,501
Annual Production (MG)	Well Water	2,355	1,246	1,106
	Surface Water (DWSP + SEWD)	7,946	10,657	10,983
	Total (MG)	**10,301**	**11,903**	**12,089**

Maximum Monthly Production (MG)	Well Water	390	117	117
	Surface Water (DWSP + SEWD)	908	1,401	1,467
	Total (MG)	**1,298**	**1,518**	**1,584**
Maximum Day Demand (MG)	Well Water	13.50	2.8	5.7 (Max month daily average*1.5)
	Surface Water (DWSP + SEWD)	32.13	51.42	71 (Max month daily average*1.5)
	Total (MG)	**45.63**	**54.2**	**76.7***
Peak Hour Demand (MG)=1.5*MDD	**Total (MG)**	68.45	81.3	115

*Since the maximum day data was not provided by the City, the average day usage during the maximum month times 1.5 was used to determine the maximum day demand.

	2011 Data	**2010 Data**	**2009 Data**
Total Number of Service Connections	47,414	47,010	46,626
Approximate Population Served	171,459	169,963	186,142
Total Annual Water Consumption – MG	10,997.22	10,860.97	11,289.24
Max. Day Consumption – MG	NA	57.63	51.57
Max. Month Consumption – MG	1,430.60 (July)	1,494.82 (July)	1,446.20 (August)
Annual Water Production – MG	1,496.37	1,783.94	2,434.08
Average Use Per Capita - gpd/p	175.7	175.1	166.2
Max. Use Per Capita - gpd/p	NA	339	277
Average Usage Per Connection - gpd/conn.	635.5	633	663.4
Max. Usage Per Connection - gpd/conn.	NA	1,225.91	1,106
Average Usage During Max. Month - gpd/conn.	973.3	1,025.7	1,000.5

	2008 Data	2007 Data	2006 Data
Total Number of Service Connections	45,630	46,119	46,390
Approximate Population Served	158,113	157,394	155,193
Total Annual Water Consumption – MG	11,354.66	11,527.79	11,763.77
Max. Day Consumption – MG	58.51	57.74	57.26
Annual Water Production – MG	3,623.65	3,740.86	4,254.37
Average Use Per Capita - gpd/p	197	201	208
Max. Use Per Capita - gpd/p	370	367	369
Average Usage Per Connection - gpd/conn.	682	685	695
Max. Usage Per Connection - gpd/conn	1,282	1,252	1,234
Average Usage During Max. Month - gpd/conn.	1,002	1,028	1,106

	2005 Data	2004 Data	2003 Data
Total Number of Service Connections	45,739	42,735	39,869
Approximate Population Served	137,300	128,481	119,600
Total Annual Water Consumption – MG	11,299.71	10,471.71	9,516.99
Max. Day Consumption – MG	53.4	46.34	53.32
Annual Water Production – MG	4,701.72	4,794.33	4,415.09
Average Use Per Capita - gpd/p	225	223	218
Max. Use Per Capita - gpd/p	389	360	446
Average Usage Per Connection - gpd/conn.	677	671	654
Max. Usage Per Connection - gpd/conn.	1,167	1,084	1,337
Average Usage During Max. Month - gpd/conn.	1,034	1,031	996

The latest 2014 data was not used in the in calculations below. Instead, 2012 data was used because that represents the highest use of water during the last 10 years.

During 2012, the City produced about 8 percent of its water supply from the wells. The remaining 92 percent of the water supply came from the Stockton's new DWSP water treatment plant and from SEWD. The maximum day usage in 2012 was not provided by the City, therefore, the Division calculated the maximum day demand (MDD) using the method stated in the regulations, i.e., 1.5 times the maximum month daily average. The MDD for 2012 was calculated to be 76.7 MG. The City also did not provide the MDD for 2011. The 2012 maximum day usage (1,614 gal/conn) was about 135 percent higher than the usage on an average day 697 gpd/conn in 2012 (633 gpd/conn. in 2011). The maximum month usage occurred in July 2012, with an average usage of 1,076 gpd/conn (973.3 gpd/conn in 2011), an increase of about 54 percent over an average day (697 gpd/conn) and is most likely due to increased landscape irrigation. The water consumption experienced by the City is much higher in comparison to usage in other similar communities.

7. System Capacity

A combined 45 MGD of treated surface water is currently available to the City from surface water sources. The City-owned DWSP plant can produce 30 MGD of treated water. In addition, the City is entitled to receive 15 MGD of treated surface water from the SEWD surface water treatment plant. The City's ground water wells (in South and North systems) can produce a combined 45 MGD of water. **The total drinking water (90 MGD) available to the City is more than enough to meet the maximum day demand of 77 MGD calculated for 2012** that was the highest demand experienced by the City in a single day in the last 10 years. Comparatively, the MDD in 2013 was 54 MGD; and in 2014, it was 45.6 MGD. The City has sufficient capacity to meet the City's existing and growing potable water demand in the future provided the City continue to receive its allotted amount of treated water from SEWD and there are no cutbacks to the DWSP due to drought.

Normally the maximum day water demands are met by wells, SEWD, and DWSP while the peak hour demands and fire demands in excess of the well's output are met by the distribution system storage reservoirs. The City has a total storage of 22.29 million gallons.

B. SOURCE WATER INFORMATION

1. Drinking Water Source Assessment and Protection

In 2001, the Division, in cooperation with the City of Stockton, completed the Drinking Water Source Assessment Protection (DWSAP) for the City's ground water sources. For the surface water sources, Delta and Woodbridge Irrigation District (WID) canal, the DWSAP was completed in 2012.

The reports show that the sources are vulnerable to following potential contaminating activities.

1.1 Ground Water Wells DWSAP

The sources are considered most vulnerable to the following activities not associated with any detected contaminants:

- Automobile - Gas Stations
- Plastics/synthetics producers
- Automobile - repair shops
- Fleet/truck/bus terminals
- Airports-Maintenance/fueling areas
- Underground storage tanks - Confirmed leaking tanks
- Chemical/Petroleum processing/storage
- NPDES/WDR permitted discharges
- Photo processing/printing
- Housing - high density
- Agricultural drainage

The sources are considered most vulnerable to the following activities associated with contaminants detected in the water supply:

- Metal plating/finishing/fabricating activities can be associated with the detected aluminum and tetrachloroethylene. Aluminum can occur naturally in the environment as well.
- Sewer collection systems, septic systems (high density) and animal operations can be associated with nitrate detection.
- Electrical/electronic manufacturing activities can be associated with aluminum contaminants detected in the water supply.

1.2 Delta Source DSWAP

The Delta water source is considered most vulnerable to the following activities:

Underground storage tanks-confirmed leaking tanks, wastewater treatment plants and disposal facilities, agricultural drainage, dredging, grazing large animals, illegal activities/unauthorized dumping, mining (sand/gravel), NPDES/WDR permitted discharges, recent [<10 years] burn areas, recreational area (surface water source), salt water intrusion, septic systems, fertilizer/pesticide/herbicide application, transportation corridor, herbicide use areas, etc.

1.3 WID Canal Source DWSAP

The WID canal is considered most vulnerable to the following activities:

Illegal activities/unauthorized dumping, lagoons/liquid wastes, NPDES/WDR permitted discharges, recreational area-surface water source, construction/demolition staging areas, fertilizer/pesticide/herbicide application, storm drain discharge points, storm water detention facilities, etc.

2. Interconnections

The system has a total of 17 interconnections with neighboring water systems. A summary of these interconnections and their status is presented in the following table.

Interconnection Summary

Location	Diameter (inches)	Status	Between
Thornton	16	Active	North & Colonial Heights
Portola Avenue	6	Active	North & Colonial Heights
Hammer	4	Emergency	North & Colonial Heights
Balboa	8	Active	North & Colonial Heights
Greeley/Lincoln	4	Active	North & Lincoln Village
Pershing (So. of Ben Holt)	10	Active	North & Lincoln Village
Plymouth/Rutledge	4	Active	North & Lincoln Village
Swain/Grigsby	6	Emergency	North & Lincoln Village
Pershing/Long view	10	Emergency	North & Cal Water Serv.
El Dorado (So. of March)	12	Emergency	North & Cal Water Serv.
El Dorado (So. of March)	12	Emergency	North & Cal Water Serv.
Miner/Filbert	12	Active	Walnut Plant & Cal Water Serv.
Marsh/Filbert	12	Emergency	Walnut Plant & Cal Water Serv.
Diamond/Charter	12	Active	Walnut Plant & Cal Water Serv.
Airport Way/Sperry	12	Emergency	South & Cal Water Serv.
Airport Way/Industrial	12	Emergency	South & Cal Water Serv.
Harlan/Roth	12	Emergency	South & Lathrop

Six of these interconnections are used actively to wheel water to the SJUMD systems (three for Colonial Heights and three for Lincoln Village). The remaining three interconnections are available for emergency use. The water supplied to the SJUMD facilities could be groundwater, surface water, or a combination of both depending on the SEWD and DWSP water production and the City's well operation in north Stockton. Approximately 20 percent of Colonial Height's and

100 percent of Lincoln Village's water demands are met from the City system. In winter months, SEWD and DWSP plants meet almost all of the City's water supplies, thus water supplied to the SJUMD systems may be all treated surface water.

The City also has a total of eight interconnections with the California Water Service system. Two of these interconnections actively serve the Diamond Walnut Plant system. The California Water Service also serves a mix of groundwater and treated surface water obtained from SEWD. The remaining six interconnections are used solely for emergency purposes. Three of these are located in the North system, one in the Walnut Plant system, and two by Metro Airport in the South system. There is one additional emergency interconnect with the City of Lathrop, north of the intersection of Roth and Harlan Roads.

The City also has the ability to transfer water from the North System to the South System via the SEWD supply pipeline.

3. Water Sources

The City has both groundwater and treated surface water supplies in the north and south system, and the walnut plant system is supplied by California Water Service Company.

In the north system, the City uses all the treated water supply that is made available by SEWD and DWSP. The wells are used only to supplement the surface water supply. This is to prevent over-drafting of the groundwater supply. Normally during the winter months, the supply from SEWD and DWSP is sufficient to meet the system demands; however, during the warmer months some of the wells may have to be used to meet the high water demands. In May 2012, City's new 30 MG capacity DWSP water treatment plant was put online. This treatment plant is serving the City's North system. With the new DWSP treatment plant, the City may not need the wells even during summer months. However, the City plans to use the wells on a regular basis to keep them operational.

Year	Percentage of Supply from Groundwater Wells	Percentage of Supply from SEWD and DWSP
2013	10%	90%
2012	8%	92%

Year	Percentage of Supply from Groundwater Wells	Percentage of Supply from SEWD
2011	14%	86%
2010	16%	84%
2009	22%	78%
2008	29%	71%
2007	30%	70%
2006	38%	62%
2005	42%	58%
2004	40%	60%
2003	41%	59%
2002	42%	58%
2001	42%	58%
2000	38%	62%
1999	40%	60%
1997	35%	65%
1996	34%	66%
1995	36%	64%
1994	41%	59%
1993	60%	40%

As indicated in the above table the surface water usage has increased from 40 percent in the years prior to 1993, to approximately 90 percent during 2013. This has been mostly due to the increase in production capacity at SEWD as well as due to additional treated water available from the City's own DWSP treatment plant. The City intends to use as much surface water as available in the future years. The above figures are not representative for individual service areas and are based on production and consumption for the entire system.

3.1 Surface Water Supply from SEWD

The SEWD obtains raw water from the Calaveras and Stanislaus Rivers. The raw water is treated at the conventional filtration type surface water treatment plant located a short distance east of the Stockton City limits and operated by SEWD. The treated water is delivered to the North System via a 30-inch-diameter water main. The turnout is located near March lane. The treated water is delivered to the South System via South Stockton Aqueduct (5.3 mile, 36 – 42 inch transmission waterline from SEWD to South Stockton). The SEWD's files should be referred to for additional information regarding the treatment provided.

3.2 Surface Water Supply from DWSP

The DWSP obtains raw water from the Delta and WID. The raw water is treated at the 30.0 MGD capacity membrane filtration treatment plant located in north Stockton. The DWSP is owned and operated by the City. The City was granted a permit (No. 21176) by the State Water Resource Control Board for the diversion of water from the Delta to the maximum of 33,600 acre-feet/year. The City also entered into a water purchase agreement with the Woodbridge Irrigation District to take 6,500 acre-feet/year from the Mokelumne River during the spring months when water cannot be diverted from the Delta. The DWSP project consists of five elements: the Delta raw water intake and pumping facility, a raw water pipeline, a diversion structure from the WID's Wilkerson Lateral, a surface water treatment plant, and a treated water pipeline. The DWSP is a phased project. In the first phase, the intake pump station delivered water to the WTP and the WTP treats and delivers 30 MGD treated drinking water to the City's existing North Stockton Distribution System. The first phase came online in May 2012. In the second phase, the intake pumps will be upsized and the WTP will be expanded to deliver 60 MGD. At full build-out capacity, a second intake structure and additional raw water and treated water pipelines will be constructed, and the WTP will be expanded to achieve an ultimate capacity of 160 MGD.

3.3 Ground Water Sources

The City system has a total of 17 active wells, 4 in South System and 13 in North System. In addition, there are 3 standby wells, 1 in South System and 2 in North System. Nine wells are on inactive list. A summary of the groundwater sources in the City of Stockton water system is given below.

Active South Wells

Source	Status	Capacity (gpm)	Primary Station Codes
Well No. SSS2	Active	1,295	3910012-003
Well No. SSS3	Active	1,895	3910012-083
Well No. SSS8	Active	2,000	3910012-089SS8R
Well No. SSS9	Active	2,160	3910012-055SS9R
	Total for South:	*7,350*	

Active North Wells

Source	Status	Capacity (gpm)	Primary Station Codes
Well No. 18	Active	654	3910012-037
Well No. 19	Active	1,780	3910012-038
Well No. 20	Active	1,800	3910012-039
Well No. 21	Active	1,880	3910012-040
Well No. 25	Active	1,600	3910012-044
Well No. 27	Active	2,235	3910012-046
Well No. 28	Active	1,600	3910012-084
Well No. 29	Active	2,100	3910012-087029R
Well No. 30	Active	2,090	3910012-092RW30
Well No. 31	Active	1,960	3910012-094RW31
Well No. 32	Active	2,040	3910012-096RW32
Well No. 3R	Active	2,160	3910012-098RW3R
Well No. 10R	Active	2,500	3910012-100
	Total for North:	***24,399***	

Standby (South & North) Wells

Source	Status	Capacity (gpm)	Primary Station Codes
Well No. SSS1	Standby	1,000	3910012-001
Well No. 15	Standby	1,805	3910012-034
Well No. 26	Standby	1,970	3910012-045

Inactive (South & North) Wells

Source	Status	Capacity (gpm)	Primary Station Codes
Well No. SSS4	Inactive	---	3910012-004
Well No. SSS5	Inactive	---	3910012-005
Well No. 1	Inactive	525	3910012-021
Well No. 4	Inactive	588	3910012-024
Well No. 7	Inactive	483	3910012-027
Well No. 9	Inactive	453	3910012-029

Well No. 11	Inactive	1,200	3910012-031
Well No.16	Inactive	1,280	3910012-035
Well No. 24	Inactive	430	3910012-043

All Destroyed (South & North) Wells

Source	Status	Comments
Well No. SSS7	Destroyed	
Well No. SSS1A	Destroyed	
Well No. 2	Destroyed	
Well No. 3	Destroyed	
Well No. 5	Destroyed	
Well No. 6	Destroyed	
Well No. 8	Destroyed	
Well No. 10	Destroyed	
Well No. 12	Destroyed	
Well No. 13	Destroyed	Destroyed in 2013
Well No. 22	Destroyed	Destroyed in 2014
Well No. 23	Destroyed	Destroyed in 2014
Stockton Police Well	Destroyed	
Walnut Plant Well No. 1	Destroyed	
Walnut Plant Well No. 2	Destroyed	
Walnut Plant Well No. 3	Destroyed	
Walnut Plant Well No. 4	Destroyed	

Most of the North system wells are located in residential neighborhoods with a few located in commercial and industrial neighborhoods. In the South System, Well No. SSS2 is located on the frontage road of Highway 99, and Wells Nos. SSS1, SSS3, and SSS9 are located in the Business Park. Well No. SSS1 is located adjacent to the United States Postal Distribution Center and Well No. SSS3 is located in the premises of a freight storage facility of a trucking company. Well No. SSS8 is located in the premises of a park site on Logan Lane and Wausa Way. Well No. SSS9 is located just north of Little John Creek and west of B Street in South Stockton.

Some of the wells are equipped with submersible pumps while the remaining wells are equipped with deep well turbine (DWT) pumps. Almost all DWT pumps are water lubricated.

All DWT pumps, except SSS2, and a small portion of the submersible pumps are housed in wooden or concrete structures, and all the remaining submersible pumps are housed in above grade concrete vaults with metal covers. Well SSS2 does not have an enclosure. The pump houses at all well sites are properly fenced. The chlorination facilities, if provided, are housed in separate fiberglass reinforced plastic structures with heating elements and vent fans. Only exceptions to this are Wells Nos. 27, 28, 29, 30, 31, 32, 3R, 10R, SSS3, SSS8, and SSS9, which have the chlorination facilities located in separate rooms and attached to the pump house. All well sites have similar piping arrangement, which include a check valve and a number of isolation valves to facilitate pumping to the system or to waste. All of the wells have sampling taps upstream of the chlorine injection stations to facilitate well sampling ahead of chlorine injection. Six of the well sites (five of them are inactive) have pressure tanks and most of them have air compressors to maintain tank pressure.

The majority of the well pumps are operated automatically while a few are operated manually. Those that are operated automatically are activated based on the system pressure and controlled via the centralized SCADA system. The City is currently attempting to use surface water from DWSP and SEWD to meet all of the water demand. All wells are automatically activated in accordance to system pressure.

The City has been monitoring the groundwater levels since 1961. All wells are being sounded once a year. The average static water level varied from about 30 feet below grade to about 75 feet below grade.

The tables below summarize the system's wells based on information provided by the City and collected from the well logs and datasheets available in the Division's files.

Those wells that have iron and/or manganese levels in excess of the secondary maximum contaminant levels in the most recent sample have been identified by Fe & Mn > MCL, Fe > MCL, or Mn > MCL in the comments column. The wells with pressure tanks are identified with PT≈10K or PT≈5K, and so on in which PT stands for pressure tank and the digit 'K' represents 1,000 gallons size. Also the wells with standby generators have been identified (standby gen.) in the summary.

Active South Wells

Source	Year Constructed (feet)	Total Depth (feet)	Pump Setting (feet)	Sanitary Seal Depth (feet)	Equipment	Comments
Well No. SSS2	1954	320	276	NA	100 HP/DWT/elct.	PT≈15K
Well No. SSS3	1990	660	631	135	200 HP/SUB/elct.	

Well No. SSS8	2000	410	400	144	200 HP/SUB/elct.	
Well No. SSS9	2003	454	364	130	200 HP/SUB/elct.	

NA: Not available: DWT – Deep Well Turbine, SUB - Submersible

Active North Wells

Source	Year Constructed (feet)	Total Depth (feet)	Pump Setting (feet)	Sanitary Seal Depth (feet)	Equipment	Comments
Well No. 18	1961	232	232	unknown	60 HP/SUB/elct.	
Well No. 19	1977	500	500	60	200 HP/SUB/elct.	
Well No. 20	1982	600	545	70	200 HP/DWT/Gas	Standby gen.
Well No. 21	1982	600	500	60	200 HP/SUB/elct.	
Well No. 25	1984	610	590	75	225 HP/DWT/Gas	Standby gen.
Well No. 27	1989	575	575	85	200 HP/SUB/elct.	
Well No. 28	1997	560	540	180	150 HP/SUB/elct.	
Well No. 29	2000	374	364	136	200 HP/SUB/elct.	Standby gen.
Well No. 30	2003	418	408	150	200 HP/SUB/elct.	Standby gen.
Well No. 31	2004	390	380	140	200 HP/SUB/elct.	Standby gen.
Well No. 32	2004	475	465	220	200 HP/SUB/elct.	Standby gen.
Well No. 3R	2008	486	486	144	200 HP/SUB/elct.	Standby gen.
Well No.10R	2008	510	498	140	300 HP/SUB/elct.	Standby gen.

Standby (South & North) Wells

Source	Year Constructed (feet)	Total Depth (feet)	Pump Setting (feet)	Sanitary Seal Depth (feet)	Equipment	Comments
Well No. SSS1 (Standby)	1985	370	370	65	250 HP/DWT/Gas	Fe> MCL, Standby gen.
Well No. 15 (Standby)	1973	600	600	80	150 HP/SUB/elct.	Mn>MCL
Well No. 26 (Standby)	1986	450	450	75	250 HP/DWT/Gas	Standby gen.

Inactive (South & North) Wells

Source	Year Constructed (feet)	Total Depth (feet)	Pump Setting (feet)	Sanitary Seal Depth (feet)	Equipment	Comments
Well No. SSS4 (Inactive)	1978	425	422	180		
Well No. SSS5 (Inactive)	1978	429	425	180		
Well No. 1 (Inactive)	1954	268	268	None	40 HP/DWT/elct.	Mn>MCL, PT≈10K
Well No. 4 (Inactive)	1965	602	602	30	100 HP/DWT/elct.	Mn>MCL, PT≈5K
Well No. 7 (Inactive)	1969	238	238	36	40 HP/DWT/elct.	PT≈5K
Well No. 9 (Inactive)	1955	290	290	32	50 HP/DWT/elct.	PT≈10K
Well No. 11 (Inactive)	1958	317	304	32	75 HP/DWT/elct.	Mn>MCL, PT≈10K
Well No. 16 (Inactive)	1978	600	570	65	200 HP/DWT/Gas	Fe & Mn>MCL
Well No. 24 (Inactive)	1982	520	500	60	125 HP/SUB/elct.	Fe>MCL

C. TREATMENT

1. Sources and Intake and Conveyance Description

1.1 Delta Raw Water Source

Over 40 years ago, the City began investigations to increase existing capacity and find new sources of water. Potential sources focused on the Delta, increasing groundwater pumping, water transfers from the New Hogan and Melones Reservoirs, increasing capacity of the SEWD WTP that draws water from the Calaveras and Stanislaus Rivers, and water rights from the Mokelumne River via the WID-owned irrigation channel Wilkerson Lateral. The City settled on the Delta as the most feasible option for providing large volumes of surface water and the Mokelumne River as a supplement during the spring months when Delta water cannot be diverted.

The Delta is fed from the San Joaquin River and the Sacramento River watersheds. The San Joaquin River originates on the western slopes of the Sierra Nevada and continues in a northerly direction through the Central Valley to the southern part of the Delta. The Sacramento River originates near Mount Shasta and flows south through the Sacramento Valley into the northern part of the Delta. Several tributaries and reservoirs feed into both rivers. The Delta is under the influence of tidal action and reverses flow about four times a day so flow from both rivers intermingles throughout the Delta. The confluence of the Sacramento and San Joaquin Rivers occurs in the western part of the Delta or the San Francisco Bay-Delta estuary. About 75 to 85 percent of the freshwater flow comes from the Sacramento River, followed by the San Joaquin River and other tributaries. The daily tidal inflow and outflow is 170,000 cubic feet per second (cfs). Several diversions and storage of tributaries within the Sacramento-San Joaquin River watersheds affect the Delta hydraulics. The Stockton source water intake is located near the confluence and has water rights to pump up to 32,308 acre-feet/year or 30 MGD. A DWSP intake vicinity map for Delta source is included in Appendix C.

1.2 Mokelumne River (WID) Raw Water Source

The Mokelumne River Watershed is tributary to the Sacramento-San Joaquin River Watershed. The Mokelumne River originates in the Sierra Nevada and in the upper watershed, is impounded by the Pardee Dam and in the foothills by the Camanche Dam. In the valley, the river is impounded by the Woodbridge Dam creating Lodi Lake. The Woodbridge Dam regulates delivery of water into the WID canal system. The Mokelumne River water is transported via WID-owned canals located in the western end of the City of Lodi for irrigation to surrounding vineyards and farms. The Woodbridge Dam outflow is operated by WID with weir gates that control an inflatable bladder system from March through November. The remainder of the year the canal system is dry. Water is routed through six miles of open irrigation canals (both unlined and concrete lined) where it can then be diverted from the canal located just to the west of the WTP's property. The City has water rights to divert 6,500 acre-feet/year of water. The supply will occur mainly during spring months when the diverted flows from the Delta are curtailed and cease. A DWSP intake vicinity map for WID canal system is included in Appendix C.

2. Watershed Sanitary Surveys

The more recent watershed sanitary surveys were conducted on the Delta and the Lower Mokelumne River watersheds in 2015. A report of the surveys dated April 2015, prepared by Brown and Caldwell on behalf of the City is available to the Division. The previous surveys were completed in May and November 2008. A summary of the findings and recommended actions from the 2008 watershed sanitary survey report are described below. The City is considering the recommended actions.

2.1 Water Quality Sampling for Surveys

As part of the survey, the City conducted water quality sampling on the Delta source and also on the WID canal source from April 2007 to September 2008 to determine treatment implications for meeting performance requirement of disinfection by-products (DBPs) and taste and odor. This data is provided in the technical report prepared by CDM Smith for DWSP plant. The most recent bacteriological quality monitoring data is summarized below in Section E.

Additionally, the City collected four quarters (from 2010 to 2011) of Title 22 water quality monitoring of the raw water sources. Cryptosporidium sampling was also completed. The data was submitted to Division separately.

Starting from April 2015, under the Long Term 2 Enhanced Surface Water Treatment Rule, the City will monitor its surface water source for Cryptosporidium, E. coli and turbidity once a month for 2 years.

2.2 Delta Potential Contaminating Activities

The raw water source (Sacramento-San Joaquin River Watersheds) is considered most vulnerable to the following activities associated with contaminants detected in the water supply:

- Wastewater Discharges from 18 wastewater treatment plants can add organic carbon content, salts/total dissolved solids (TDS), bromide, turbidity, pathogens and indicator organisms, metals, and emerging contaminants, and spills of raw sewage into the Delta posing a medium to high level of concern.
- Dredging of the Stockton Deep Water Ship Channel can stir up and re-suspend toxic sediments such as arsenic, barium, cadmium, copper, lead, mercury and nickel poses a medium to high level of concern.

- Invasive species that include quagga and zebra mussels may grow near the intake poses a medium to high level of concern.
- A planned project (Delta conveyance facility) is in conceptual planning to separate export water from the Delta. The impacts of this facility have yet to be determined; however, there appears to be agreement that the facility would worsen central Delta water quality, posing a high level of concern.
- Stormwater and dry weather urban runoff can add pathogens and indicator organisms, nitrate, total nitrogen and ammonia from fertilizers, metals, and turbidity into the Delta posing a medium to high level of concern.
- Mining runoff and flooding from levee breaks can increase sediment loads into the Delta, posing a medium to high level of concern.
- Agricultural cultivation can add nutrients, animal waste, sediments, suspended solids, organic carbon, salts, and trace pesticides into the Delta poses a medium to high level of concern.
- Pesticides/herbicides applied to rights-of-way and median strips can add pesticides such as sulfur, copper hydroxide, 1,3-dichloropropene, petroleum distillates, and glyphosate into the Delta.
- Underground leaking storage tanks (957 cases in San Joaquin County). The impact is currently unknown, but could potentially be high level of concern.

Because the NPDES regulations permit municipalities to discharge treated wastewater effluent into source waters, concerns with respect to concentration of total organic carbon (TOC), total dissolved solids, and metals were found. TOC is a precursor to DBP. High TOC levels not only facilitate formation of DBPs, but also increase the concentration of disinfectant required to achieve adequate disinfection. Urban runoff was found to contain high levels of coliform bacteria. Some of the towns in the DWSP study area discharge their urban runoff directly to receiving waters (the City of Lathrop storm water system discharges directly into the San Joaquin River; the City of Rio Vista discharges urban runoff into the Sacramento River). While many of the larger cities and towns have a storm water management program in place, others either have had their plan approved recently (City of Rio Vista), or do not yet have a program (City of Jackson, City of Escalon). Contamination from agricultural land use is a concern since agriculture is a major part of the economy in the study area.

Below are potential contaminating activities and actions recommended on how to improve the water quality.

- The Central Valley Regional Water Quality Control Board (CVRWQCB) has identified the Delta waterways as impaired for several contaminants associated with agricultural runoff that include chlorpyrifos, DDT, diazinon, and Group A Pesticides. However there has been a downward trend towards pesticide use by the San Joaquin farmers, indicating that if this trend continues, significant threats to water quality may be reduced.

Recommended Action: *Monitor concentrations of TOC, turbidity levels, coliform bacteria, and pesticides in the study area to determine the impact of wastewater discharges, and urban and agricultural runoff in the study area.*

- The Stockton Regional Wastewater Control Facility has a history of poor management and a related record of spills. The change in management of the plant, and the efforts in the last few years by the City of Stockton to improve the operation of the plant and collection system through facility up-keep and the hiring of additional staff have resulted in the prevention of spills and improved record-keeping. These improvements to the facility have been positively noted by CVRWQCB staff working closely with the City to make additional needed improvements.

  Recommended Action: *Continue to make physical improvements to the Stockton Regional Wastewater Control Facility to prevent spills, and continue to improve the City's record-keeping of wastewater treatment plant and collection system spills.*

- Several open cases involving leaking underground storage tanks were found in the study area; however, information on whether any of these open cases pose an immediate threat to the surface water in the study area could not be found.

  Recommended Action: *Conduct a survey to determine whether any cases involving leaking underground storage tanks pose an immediate threat to the surface water in the study area.*

- Dredging in the Stockton Deep Water Ship Channel stirs up and re-suspends toxic sediments in the deep water channel which threaten fisheries and human health, thereby. The dredge water effluent from dredging operations revealed that total metal concentrations for arsenic, barium, cadmium, copper, lead, mercury, and nickel exceeded water quality objectives. Part of the dredge water effluent is pumped directly into the San Joaquin River.

  Recommended Action: *Review the dredge water analytical results from monitoring conducted during dredging operations, including metal and nitrite concentrations, and monitor the concentrations in the intake raw water.*

- There is a high cost for controlling invasive species that include quagga and zebra mussels. The growth of these species around the Intake would pose a significant water quality and operational issue for the City.

  Recommended Action: *Prepare a detailed report describing an action plan for controlling quagga and zebra mussels in the study area.*

Additional Recommended Actions:

1. *The City should monitor the activities and progress regarding development of a new Delta conveyance facility because of the severity and likelihood of negative water quality impacts to the DWSP source water.*
2. *Effective source protection requires continued water quality monitoring in the watershed to identify constituents of concern and any deterioration in source quality over time. The City could implement a monitoring program at the intake site to establish baseline water quality data and identify any current constituents of concern. Regulated chemicals should be monitored at least yearly. Sampling for contaminants such as pesticides and herbicides should occur during periods of their application in the watershed. Sampling for fuel additives should occur during periods of boating and recreation in the watershed.*
3. *Coliform data could be collected more frequently to evaluate treatment requirements and identify source control needs, especially during periods where untreated sewage is discharged upstream.*
4. *The City could evaluate the presence or potential sources of contaminants on the United States Environmental Protection Agency (USEPA) Contaminant Candidate List, as well as other emerging contaminants, such as endocrine disrupting compounds.*

2.3 WID Potential Contaminating Activities

The WID raw water source is considered most vulnerable to the following activities associated with contaminants detected in the water supply:

- Dairy Farm lagoon waste, if it overflowed can add raw sewage into the source.
- Construction discharges can contribute debris, total suspended solids, pathogens, etc., into the source.
- Urban stormwater discharges from detention facilities, discharge pipes into canals, and NPDES permitted discharges can contribute debris, total suspended solids, pathogens, oils, etc., into the source.

A report on the City's Stormwater Management Program identified weak erosion control requirements for construction projects, which are inadequate to protect receiving water (City of Lodi, 2003). Increased recent attention by the City of Lodi, including passage of a more rigorous Stormwater Protection Ordinance, should reduce the concentration of contaminants discharged to the canal via the City of Lodi's stormwater pumping stations.

Recommended Action: *Periodically monitor the progress of the City of Lodi with respect to improving their stormwater control measures.*

- There is a potential for City of Lodi stormwater to comprise significant percentages of WID canal flows. Given the types and levels of contaminants that are typically found in both dry weather and stormwater discharges, this is a significant concern.

  Recommended Action: *Request the City of Lodi to expand their Storm Drain Detectives program to include canal sites downstream of the Shady Acres and Beckman pump station outlets. Also request the City of Lodi to share the stormwater volumes pumped at the Shady Acres and Beckman pump stations once the new SCADA system is operational.*

- The dairy that is located approximately 10 yards west of the Wilkerson Lateral is of particular concern because the wastewater elevation in the dairy's lagoons is higher than the elevation of the water in the lateral. Therefore, failure of the dairy lagoon berms could lead to extensive microbial contamination in the lateral.

  Recommended Action: *Continue plans to pipe the canal through the dairy property to protect their drinking water source from a dairy lagoon berm failure.*

  Additional Recommended Actions:

  1. *Request that WID notify the City of Stockton if there is a noticeable increase in illegal recreational or other activities adjacent to and within their canals.*
  2. *Based on the microbiological water quality data, the occasional recreational use of canal water, and the influence of other recreational areas upstream of the canals, the City could collect microbiological data (total and fecal coliforms, E. coli, Cryptosporidium and Giardia) more frequently to provide insight into treatment requirements and to determine source control needs, especially during the summer months when water temperature increases and recreational use of water occurs.*
  3. *Temperature data were not available at any of the sampling locations; temperature is a significant parameter in the assessment of water quality because it can serve as an indicator of microbial growth potential and algal blooms. The City could collect water temperature measurements in the canal.*

2.4 2015 Watershed Sanitary Survey

Brown and Caldwell prepared the 2015 Watershed Sanitary Survey Report for the City. Some of the recommendations made in that report that were not addressed in the 2008 report are listed below.

- There are no communication procedures in place for the City of Stockton to be notified by the City of Lodi regarding hazardous spill in the areas of Lodi that discharge storm water to the WID Canal. The City of Stockton should set up procedures with the City of Lodi so that Stockton is immediately notified of a hazardous materials spill.

- There are no communication procedures in place for the Office of Emergency Services (OES) to notify the City of Stockton when there is a hazardous spill that has reached waterways in the Delta. The City of Stockton should set up procedures with the OES so that Stockton is immediately notified of a hazardous materials spill in the Delta.

3. Source Water Quality

3.1 Delta Water Quality

The watershed for the Sacramento-San Joaquin Delta includes the local Delta watershed area and the Sacramento River and San Joaquin River watersheds that drain into it. The local Delta watershed area (1,330 square miles) includes the Cities of Sacramento, Stockton, Tracy and Pittsburgh. The Sacramento River watershed starts at Mount Shasta and extends through the Sacramento Valley basin (22,210 square miles) to the northern part of the Delta. The Sacramento River supplies 80 percent of the fresh water flow to the Delta. The San Joaquin River watershed starts in the eastern San Joaquin Valley (15,880 square miles) and extends to the southern part of the Delta. Most of the fresh water flow from the San Joaquin River watershed is diverted to the Friant-Kern Canal.

The Environmental Impact Report summarizes the Delta's water quality and states the following: "The Delta estuary's primary source of fresh water comes from the Sacramento and San Joaquin rivers. Seawater enters the Bay-Delta from the Pacific Ocean via tides. Because the Delta is at sea level, water levels vary greatly during each tidal cycle. During the tidal cycle, flows can also vary in direction and amount. Because of tidal fluctuation, the seasonal flow and quality variations of contributing rivers, the impact of return flows (agricultural drains, wastewater treatment plants, etc.) and export pumping at Clifton Court (i.e. start of the California Aqueduct), water quality varies widely throughout the Delta. Variations in the hydrologic cycle affect Delta water quality. Water quality generally improves in wet years, although there are exceptions, such as turbidity, where wet year values are higher than dry year. In general, water quality improves traveling downstream on the San Joaquin River, (northwesterly direction) downstream of the City. This is due primarily to dilution from the higher flows and quality of the Sacramento River, which is pulled south to Clifton Court pumping plants. Higher TDS tend to occur in dry rather than wet years. In dry years, there is less flow into the Delta from the Sacramento and San Joaquin Rivers. This results in more seawater intrusion into the Delta and less dilution of agricultural return flows, resulting in higher TDS."

3.2 WID Water Quality

The WID operates the Woodbridge Dam from April through November. The remainder of the year the canal system is dry. The drainage area below Camanche Dam is mostly agricultural and urbanized land. The City of Lodi is the only incorporated city in the watershed. Other communities include Acampo, Lockeford, Clements, Victor, and Woodbridge. No wastewater treatment plants are located on the Mokelumne River between Camanche Dam and the WID canal diversion. Outside the urban areas, agricultural use predominates in the watershed from Camanche Reservoir to Lodi. Estimated agricultural use trends are 51 percent vineyard, 31 percent dairy/grazing, 9 percent orchard, 8 percent annual cropland, and 1 percent idle. Cattle, both beef and dairy; turkeys; chickens; sheep and other livestock are found in the watershed.

4. Capacity of Facilities (Intake, Conveyance, Diversion Structure and WTP)

The City is taking a 3-phased approach to meeting the current and future water demand. Full build-out could occur by 2050. The City of Stockton plans to supply up to 30 MGD of drinking water from the new WTP in the first phase. The second phase will expand the WTP to 60 MGD and upsize the Intake pumps. Full build-out of the WTP will supply up to 160 MGD. At full build-out, a second Intake structure will be built with a new raw water transmission pipeline to the WTP and the WTP will be expanded and a new treated water pipeline connected to the distribution system.

4.1 WTP Operations, Monitoring and Control

The North Stockton system is a single pressure zone, with ground surface elevations varying from +44 feet to -1 foot. The WTP site is at approximately +23 feet. The City operates the distribution system to maintain a minimum pressure of 45 pounds per square inch (psi) and a maximum pressure of 75 psi at any point in the system. In the North Stockton Distribution System, the pressure is regulated by variable frequency drive pumps pulling from above-ground storage reservoirs, or by pressure sustaining valves refilling the reservoirs from the system. When the storage reservoirs are filling, the pressure sustaining valves are active, regulating the system pressure. When the storage reservoirs are emptying, the pressure sustaining valves are closed with the pressure regulated by the booster pumps with VFDs.

As discussed previously, the City will operate the WTP to meet the average daily demand in the North Stockton system, with system reservoirs contributing stored water when demands exceed average, and with reservoirs being refilled during periods of the day when demand is less than average.

For more details about the WTP processes and their operations, monitoring and control, see Section 6 below.

4.2 Selection of Raw Water Supply Source

The City of Stockton's permit for Delta water use constrains withdrawals during the period February 15 through June 15. Delta water pumping is partially restricted between February 15 and March 15, and between May 21 and June 15. Delta water pumping is not allowed at all between March 15 and May 20. During the February 15 to March 15 and May 21 to June 15 periods, Delta water can be used up to a maximum rate of 15 MGD.

The City has contracted with the Woodbridge Irrigation District for an alternative source of raw water during the Delta curtailment period. This water is available in the period March 1 through July 30. The operators must select the raw water source of supply for the plant based on the following schedule:

- From February 15 through March 15, Delta water pumping and WTP production will be limited to a maximum of 15 MGD.
- From March 1 through March 15, WID water can be blended with Delta water, or WID water can be used exclusively, to meet the full raw water needs up to the plant production capacity of 30 MGD.
- Between March 15 and May 21, no Delta water may be pumped, and the raw water needs of the plant must be met exclusively from the WID source.
- From May 21 to June 15, Delta water can be blended with WID water, or WID water can be used exclusively, to meet the full raw water needs up to the plant production capacity of 30 MGD.
- From June 15 to July 30, either Delta water or WID water can be used exclusively to meet the raw water needs of the plant up to the production capacity of 30 MGD, or a blend of the two sources may be used.
- Between July 30 and February 15, the Delta water source may be used to meet the raw water needs up to the plant production capacity of 30 MGD.

The City has a "use or pay" type supply contract with WID. Consequently, it will likely be in the best financial interest of the City to preferentially use WID water over Delta water during the curtailment period.

5. Facility Design

This section summarizes the basic design criteria of the DWSP plant.

5.1 Delta Intake Pump Station Layout

The Intake Pump Station building sit atop the wet well and levee. The building is 4,000 square feet, one-story, and has 16-feet high, split-face concrete masonry units and metal roof with skylights. The building has a mechanical room (for HVAC equipment), a storage room, an electrical room (MCC, VFDs, RVSSs, lighting panels, and UPS system), a control room, an office, a restroom, and a pump room. Electrical equipment such as the generator, switchgear, diesel fuel tank and load bank are located outside with a 10-foot wall surrounding it. The site layout reserves area for future mechanical and electrical equipment.

Water from the Delta in this area is pumped by the Intake Pump Station (IPS) to the new WTP located 12 miles away. The IPS consists of an intake with fish screens, a pump station building and a new back-up levee. The Intake screens are located in the side of a levee embankment that runs along the edge of the channel. The pump station building sits at an elevation above the top of levee. When the IPS is active, the Delta water is diverted through the fish screens. The fish screens are inclined flat panels, 1.75 mm openings, with a vertical traveling brush cleaning system. The opening size, as required by the Department of Fish and Game, is based on an approach velocity of less than 0.2 feet per second. The Delta water levels vary greatly during each tidal cycle. During dry and critical years, the lowest minimum level occurs typically in August, at 0.8 foot above mean sea level. The intake screens are designed to operate below that elevation. Flow passes through the fish screens and enters into the pump station wet well. The wet well has a sedimentation suspension system that consists of a 1,400 gpm submersible pump and 24 eductors located on the floor that will agitate the water. The IPS pumps are vertical turbine pumps, 250 hp, 3 duty/1 standby, each with a capacity of 10 MGD at 90 feet total dynamic head. Two of the pumps have VFDs and the other two have reduced voltage soft starters (RVSS). They are housed inside the IPS building that sits atop the wet well and levee. The total capacity of the pump station is 30 MGD. The design criteria for the Intake Pump Station is summarized in the table below.

Intake Pump Station Design Criteria		
Description	**Units**	**Criteria**
Pumps		
Pump Type		Vertical turbine
Control		2 Variable frequency drives, 2 Reduced Voltage Soft Start
Number, duty		3
Number, standby		1
Capacity, each	gpm	6,945
Capacity, each	MGD	10.0
Head, each	feet	90
Horsepower, each	hp	250

5.2 Delta Conveyance Pipelines Layout

The Delta water is pumped from the IPS through 62,000 feet of raw water conveyance pipeline to the WTP and has a working pressure of up to 100 psi. The raw water conveyance pipeline is 54-inch AWWA C200 welded steel pipe with a cement-mortar coating and lining. The steel piping has a cathodic protection system to provide corrosion protection. The cathodic protection system will protect the pipe from deterioration due to corrosive soils or stray currents. The exterior coating system will protect from a corrosive soil environment and also mechanically protect the pipe from damage. Buried anodes provide further cathodic protection in addition to the coating system. Where the pipeline is trenchless construction by micro tunneling or jacking, the casing pipe is AWWA C300 Reinforced Concrete Cylinder Pipe. The pipeline runs parallel with the raw water conveyance pipeline from the WTP connecting to Stockton's existing water distribution system at two locations, at the intersection of Eight Mile Road and Trinity Parkway and at the intersection of Davis Road and Whistler Way.

5.3 WID Lateral Diversion Structure

The WTP is designed to include an alternate raw water supply source from the WID. The WID-owned canal that runs along the west side of the WTP is called the Wilkerson Lateral and is concrete-lined. Flow is diverted from the canal in a concrete Diversion Structure located to the far northwest of the WTP. A stainless steel canal gate in the east wall of the Diversion Structure controls the diversion of flow to the WTP. The gate is normally closed except when the plant is using the WID supply. A lifting/lowering canal overshot gate on the south side of the structure, is normally lowered to allow water to continue downstream in the canal when the WTP is not using this supply. It is lifted during the diversion of water to the WTP.

Water from the Diversion Structure flow by gravity through 1,300 feet of raw water piping. The raw water piping is 48-inch AWWA C200 steel, cement-mortar-lined-and-coated. It runs from the Diversion Structure along the north side of the Solids Settling and Drying Basins, turns south and runs down the Plant Loop Road to the WID Supply Screening and Pumping Station. The Screening and WID Pumping Station is integral with the Reclaimed Water Pump Station referred to as the WID/Reclaimed Pump Station. The pump station is a concrete structure below ground, with top deck approximately three feet above ground surface. The pipeline delivers water from the canal to an inlet basin in the structure that splits into three channels. One channel is fitted with a powered, automatically self-cleaning fine screen. A second channel is reserved for a second powered screen in the future. A third channel is fitted with a backup manual fine screen. Screened materials from the powered duty screen will be continuously and automatically raked and discharged to a hopper that sits on the deck.

Water flows through the screens and turns to the east into the WID Pump Station wet well. The WID pumps are vertical turbine mixed-flow pumps with VFDs, 3 duty/1 standby each with a capacity of 10 MGD at 25 feet total dynamic head. Total pump station capacity is 30 MGD. The WID pump discharge header pipeline (42-inch steel-cement-mortar-lined-and-coated) runs south down the

Plant Loop Road, behind the Ozone Building and connects into the 54-inch Raw Water Pipeline coming from the IPS.

The table below summarizes the design criteria for the WID Diversion Structure.

WID Supply Diversion Structure Design Criteria		
Description	**Units**	**Criteria**
Flow capacity	MGD	50
Outlet gate diameter	feet	4
WID Pipeline		
Diameter	Inches	48
Flow velocity At 30 MGD At 50 MGD	 ft/sec ft/sec	 3.7 6.2
Canal Overshot Gate Dimensions	ft	4 (H) x 4'-6" (W)

5.4 WID Supply Screening and Pump Station

WID supply water flowing through the fine screens enters the WID pump station wet well. Vertical pumps boosts the WID supply from the wet well to the hydraulic grade-line in the raw water pipeline upstream of the raw water ozone feed point. Due to the low lift, optimal pump type is vertical turbine mixed-flow. The table below summarizes the design criteria of the WID Diversion Pump Station.

WID Diversion Pump Station Design Criteria		
Description	**Units**	**Criteria**
Capacity	MGD	30
Pipeline diameter	inches	48
Fine Screens		1 powered duty, 1 manual standby
WID Pumps Type Control		 Vertical turbine pump Variable frequency drive
Number	no.	3 duty, 1 standby
Capacity, each Flow Head	 MGD ft	 10 25

6. TP Overall Process Description

The WTP process is shown schematically on the process flow diagram and general site area plan (see Appendix D). The WTP uses a treatment process consisting of:

- Pre-oxidation using ozone
- Coagulation using aluminum chlorohydrate (ACH). Ferric chloride is an option but is not currently used
- Tapered flocculation in three stages
- Sedimentation using inclined-plate settlers
- Microfiltration using hollow-fiber pressure membranes
- Disinfection with free chlorine
- pH adjustment and corrosion control using caustic soda and corrosion inhibitor
- Addition of ammonia for residual disinfection using chloramine
- Solids settling and drying in shallow basins

Raw water from either the Delta Intake Pump Station or the WID Diversion Structure and Pump Station is piped under pressure to the WTP. A small flow stream of reclaimed water tee into the raw water feed line at the head of the plant. The combined flow is metered, pre-treated with chemical addition (sodium hypochlorite and ammonia for bromate control if needed) and ozone, and runs to the flocculation/sedimentation basin. An inline static mixer is provided upstream of the flocculation basins with injection ports for sodium hypochlorite, caustic soda, and aluminum chlorohydrate or ferric chloride addition in order to achieve uniform distribution of the chemicals into the raw water stream. Feed pumps at the microfiltration membrane building boost settled water from the basins through the individual membrane units. The filtered water out of the membrane units flows under pressure into the above-ground treated water storage reservoir.

Filtered water also has an inline static mixer with injection ports for caustic soda (for pH adjustment) and sodium hypochlorite (for primary disinfection) upstream of the treated water storage reservoir. Water leaving the tank runs through another inline static mixer with injection ports for ammonia (to form chloramine for secondary disinfectant residual) and an orthophosphate corrosion inhibitor. Treated water is boosted and sent to the City's distribution system by the treated water pump station through the treated water conveyance pipeline.

Sludge collected at the bottom of the sedimentation basins is flushed to the solids settling and drying basins. Waste backwash water from the membrane filtration system is conveyed to the solids settling and drying basins. During the summer seasons, solids settling and drying basins will be isolated, decanted, and converted to drying beds to dewater the accumulated solids. Dried solids will be loaded out of the drying beds and trucked away for disposal. Clarified supernatant (reclaimed water) from the basins will be conveyed to a wet well, where it will be boosted back into the raw water pipeline by the Reclaimed Water Pump Station.

The surface water treatment train (including chlorine, chloramine, and distribution system) related datasheets are included in Appendix E.

6.1 Pretreatment

Ozone is used by many utilities treating Delta water and has been reported to be very effective in removing taste and odor and reducing customer complaints. Ozone provides treatment benefits in addition to removing taste and odor compounds. It is effective in reducing the concentration of organic contaminants such as herbicide and pesticides. It also is effective in removing some pharmaceutical and personal care products. Ozone improves coagulation and reduces the required coagulant dose and sludge that is generated. Ozone is an effective disinfectant and the operator has the option programmed in the plant control system (PCS) to supplement the chlorine disinfection and receive additional Giardia/viruses log inactivation credit.

Ozone is created by passing oxygen through an electric field which dissociates the O_2 molecule to elemental oxygen, and allow some of the oxygen atoms to reform as the O_3 ozone molecule. The ozone-in-oxygen gas stream is then applied to the water, where the ozone is transferred into solution. Ozone gas is highly reactive and decays rapidly, and so must be generated on-site.

Liquid oxygen (LOX) is stored on site and vaporized using ambient vaporizers to create the gaseous oxygen supply for ozone generation. The ozone-in-oxygen gas stream is educted into a side-stream flow of raw water. The side stream flow with high ozone concentration is injected into the main raw water flow under pressure, to mix and create uniform ozone residual in the raw water pipeline. The ozone injection point is downstream of the reclaimed water connection to the Delta water supply pipeline. An off-gas collection system is provided downstream of the injection point to remove oxygen and un-reacted ozone gasses that bubble out of the raw water, and route these gasses to an excess ozone destruction system. Design criteria for the raw water ozonation system is summarized below.

Design Criteria for Raw Water Ozonation Facilities		
Description	**Units**	**Criterion**
LOX System		
Storage		
Type		Cryogenic Tank
Number	no.	1
Capacity	gallons	9,000

Storage at maximum conditions Storage at average conditions	days days	14 26
Ozone Generators (Ozone)		
Number	no.	2 (1 duty, 1 standby for normal maximum conditions; 2 duty, no standby for extreme maximum conditions)
Capacity, each	pounds per day	650 at 10% concentration 450 at 12% concentration
Ozone Dose Average Normal maximum Extreme maximum	mg/L mg/L mg/L	2.0 2.5 3.5
Sidestream Pumping Type Number Capacity, each Head	no. gpm feet	Horizontal centrifugal 2 (1 duty, 1 standby) 455 135
Eductors	dimensionless	
Type		Venturi
Number	no.	2
Ozone capacity	scfm (ppd)	73 (876)
Pipeline Contactor Detention Time Diameter Length	minutes inch feet	2.9 at 30 MGD 54 520

6.2 Coagulation

Coagulation is the process that destabilizes particles to form settleable and filterable particles. Aluminum chlorohydrate (ACH) serves as the coagulant and is mixed with the influent raw water using a static in-line mixer. Storage and feed equipment is compatible with use of ferric chloride as a coagulant alternative. The static mixer configuration consist of three fixed mixing elements which rotate the flow radially in opposing directions as the flow moves axially through the mixer to provide complete mixing for the range of flows. The static mixer has three injection nozzles preceding the elements for adding coagulant and the optional addition of sodium hypochlorite and caustic soda.

The coagulated water flows from the static mixer to the flocculation inlet channel on each basin via two 24-inch pipes from a tee shortly after the static mixer. The pipes to each basin are symmetrical to hydraulically split the flow evenly to each basin, and a motorized butterfly valve on each pipe provides additional control. At the start of each flocculation basin is a short inlet channel to diffuse the water across the flocculation basin width ahead of the flocculators.

Overflow for the facility is provided by an overflow weir in the settled water basin with high level opening in the wall between the sedimentation basins and settled water basin to prevent overtopping of the flocculation and sedimentation basins.

Design Criteria for Coagulant Mixing Unit				
Description	**Units**	**Criterion at Flow**		
		6 MGD	**20 MGD**	**30 MGD**
Type	-	Static In-Line Mixer - Statiflo		
Material	-	FRP (fibre re-inforced plastic)		
Diameter	inches	36		
Length	inches	144		
Velocity through Mixer	feet per second	1.3	4.4	6.6
Reynolds Number	dimensionless	1.2×10^5	4.1×10^5	6.1×10^5
Pressure Drop	psig	0.1	0.5	1.6

6.3 Flocculation Basins

Two flocculation basins, each consisting of three stages of mixing, provides gentle mixing of the coagulated water to promote the agglomeration of particulates and organic matter. The three stages of mixing in each basin is divided by ported baffle walls as well as the wall separating the flocculation basin from the sedimentation basin.

Mixing energy is determined by setting the speed of the vertical shaft mixers using variable speed drives for each individual mixer. Variable frequency drives provides the operating staff with the greatest flexibility to address water quality variation with the seasons and between the Delta and WID sources. Each mixer includes a high-efficiency hydrofoil that is sized to mix the contents of the basin and keep the coagulated particulates suspended without shearing floc. At conventional treatment plants, tapered flocculation (i.e., progressively lower mixing energy in successive stages of mixing) provides the optimal formation of floc particles for effective settling. Basins are drained to solids settling and drying basins mostly by gravity and the bottom third is pumped by the dewatering pump station. Design criteria for the flocculation basins are summarized in a table below. Values dependent on plant flow are based on a nominal process flow of 15 MGD through each basin (maximum calculations based on 15.64 MGD to account for plant recycle flows).

Design Criteria for Flocculation Basins		
Description	**Units**	**Criterion**
Overflow capacity	MGD	30 (in settled water basin)
Type	-	Horizontal, plug-flow
Basins		
Number	no.	2
Stages per Basin	no.	3
Inside Dimensions		
Length	feet	50
Width	feet	48
Water Depth	feet	17
Volume		
Each Stage	gallons	97,660
Each Basin	gallons	292,980
Total	gallons	585,950
Detention Time		(at max flow of 31.28 MGD)
Each Stage	minutes	9
Each Basin	minutes	27
Mixers		
Type	-	Vertical shaft, hydrofoil, variable speed
Number per Stage	no.	3
Number per Basin	no.	9
Total	no.	18
Mixer Cells		
Width	feet	16
Length	feet	16
D:T	Dimensionless	0.35 – 0.45
Ratio	feet/minute	3 -10

Superficial Velocity Turnover Rate	min^{-1}	0.25 – 2.0
Motor Size Stage 1 Stage 2 Stage 3	 horsepower horsepower horsepower	 1.5 1 1
Velocity Gradient, G Stage 1 Stage 2 Stage 3	sec-1	 50-70 30-50 10-30
GT (G x detention time, sec)	dimensionless	
Stage 1		27,000 – 38,000
Stage 2		16,000 – 27,000
Stage 3		5,000 – 16,000

6.4 Sedimentation Basins

Each of the two flocculation basins provides flow to the corresponding sedimentation basin. Flow exits the flocculation basins and enter the sedimentation basins through ported baffle walls. Two horizontal, plug-flow sedimentation basins are provided to clarify the water before membrane filtration. High-rate clarification is provided by the use of stainless steel plate settlers. The plates are inclined 55-degrees to the horizontal which provides a greater effective settling area over conventional clarification. The distance between the plates is designed so that the upflow velocity is lower than the settling velocity of the solids, allowing the solids to settle on the plates, agglomerate, and settled to the bottom of the basin.

Clarified water flows over V-notch weirs into launders that convey the water to a settled water channel at the end of the basins. The settled water basin collects settled water from the two trains and provides flow balancing for membrane operations. The basin normal operation maximum water level is elevation 33.50 feet. Gates are provided at each launder to isolate individual sedimentation basins from the settled water channel.

Residuals that settle in the basins are collected using a cable-driven vacuum collection system that eliminates the need to construct collection troughs on the basin floor. The residuals are vacuumed on a periodic basis, with flow controlled by valves in the dual outlet lines from each train. The sludge then flow by gravity to the solids settling and drying basins. Modulated sludge flow rate capacity is provided by a flow meter and control valve common to each basin. Design criteria for the sedimentation facilities are summarized in a table below. Values dependent on plant flow are based on a nominal process flow of 15 MGD through each basin plus process recycle flow. The facility's maximum flow is approximately 32 MGD.

Design Criteria for Sedimentation Basins		
Description	**Units**	**Criterion**
Basins		
Type	-	Horizontal, plug-flow
Number	no.	2
Inside Dimensions		
Length, inside	feet	75
Width, inside	feet	48
Height	feet	18.5
Water Depth, Average	feet	17
Volume		
Each Basin	gallons	468,000
Total	gallons	936,000
Detention Time	minutes	44
Effective Loading Rate (80% of Projected Settling Area)	gpm/ft^2	0.32
Settled Water Basin Volume	gallons	160,000
Sludge Removal		
Type	-	Cable-driven Vacuum
Number per Basin	No.	2

6.5 Pressure Membrane Filtration

The pressure membrane filtration (MF) system provides a physical barrier for removal of turbidity and pathogens. The membranes provide a surface with a maximum pore size of 0.1 micron. Water is forced through this micro-porous material by applying pressure, leaving contaminants trapped on the surface. The MF system includes:

- Membrane system feed pumps
- Feed water strainers
- Membrane units
- Control valves
- Maintenance Wash/Clean-in-Place system equipment and tanks
- Day storage tanks for chemicals MW/CIP cleaning and neutralization chemicals
- Chemical transfer pumps in the MF building

- Blowers, air compressors and air receivers
- Membrane system control hardware and software

Settled water from the sedimentation basin is pumped through the membranes, and the filtered water continue on to the treated water storage reservoir. The pressure membrane system has three main subsystems: the feed pumps and feed water strainers, the pressure membrane units, and the membrane backwash and cleaning system, each of which is summarized in this section.

6.5.1 Membrane Feed Pumps

The membrane feed pumps boost the pressure of the settled water in order to meet the pressure losses through the strainers, piping, membranes, control valves, and the backpressure from the water surface elevation in the treated water storage tank. The membrane feed pumps are horizontal split-case pumps, located inside the south wall of the membrane building. The table below summarizes the design criteria of the feed pumps.

Design Criteria for Membrane Feed Pumps		
Description	**Units**	**Criteria**
Type		Horizontal end suction pumps
Control		Variable frequency drive
Number, duty		3
Number, standby		1
Capacity, each	gpm	8,400
Capacity, each	MGD	12
Head	feet	100

6.5.2 Membrane Feed Strainers

The water from the membrane feed pumps to the membrane units passes through strainers ahead of the membrane units to screen out large particles and suspended material that could clog or damage the membrane fibers. The strainers are motorized, self-backwashing type to automatically remove accumulated debris. The strainers are located adjacent to the feed pumps (one strainer after each feed pump). The table below summarizes the design criteria of the strainers.

Design Criteria for Membrane Feed Strainers		
Description	**Units**	**Criteria**
Type		Automatic self-backwashing
Strainer opening size	Microns	250

Number, duty		3
Number, standby		1
Capacity, each	gpm	8,400
Capacity, each	MGD	12
Maximum head loss	psi	2

6.5.3 Pressure Membranes

An Update: The MF system installed in 2012 at the City of Stockton's new DWSP WTP consisted of 10 Siemens Model CP204 units. Each unit had 204 L20V modules of Polyvinylidene fluoride (PVDF) hollow fiber membranes. The MF system has had a successful first year of operation. However, in 2013, the MF system began to experience issues requiring an increasing number of the installed modules to be isolated and removed from service. The MF system continued to experience fiber failures, pinning, and module replacement at an excessive rate that was deemed un-sustainable. The primary problem driving excessive module replacement was found to be cracked and failing potting. Siemens reported similar experiences at other installations using their L20V module in California and elsewhere.

To address these issues, Siemens developed and tested a replacement membrane module, the L20N. The improvements made were to the membrane module internals only, and do not affect the module dimensions or connections within the skids, the skid design or operational details, or any other system components or operations.

The main differences of the new L20N module are:

- New potting material with improved oxidation resistance and mechanical stability
- New fiber that does not require processing aid
- Improved fiber durability – greater abrasion resistance
- Higher permeability – increased operating flux and lower fouling rate

The L20N module is now Siemens standard product. The new L20N module received conditional approval from the Division in the fall of 2013. All skids at the Stockton WTP were retrofitted with the L20N modules in 2014. The Siemens L20N membranes are approved under the Division's alternative filtration technologies and a conditional acceptance letter from the Division for the use of these membranes is included in Appendix G.

The table below provides the pathogen removal credit assigned by the Water Treatment Committee of the Division to the L20N ultrafiltration membrane module.

Pathogen Removal Credit	
Target Organism	**Removal Credit**
Giardia lamblia oocyst	4-log [1]
Cryptosporidium oocyst	4-log
Virus	At least 1-log [1,2]

1. To adhere to multi-barrier treatment, each plant is required to provide a minimum of 0.5-log inactivation of *Giardia* cyst and 4-log inactivation of viruses through disinfection.
2. The WTC has accepted this membrane as demonstrating at least 1-log virus removal. However, membrane integrity testing does not have the resolution to detect virus removal. Thus, a minimum of 4-log inactivation of viruses through disinfection is required.

The table below presents the operating and quality control values that the membrane system cannot exceed as a condition of this acceptance.

System Operating & Quality Control Parameters	
Operating Parameter	**Maximum Value**
Flux (at 20°C)	263 L/m^2·hr (155 gal/ft^2·day); outside surface area
Flow (at 20°C)	153 L/min (40.4 gpm) per L20N module
Transmembrane Pressure (TMP)	1.52 bars (22 psi) @ ≤30 °C (86 °F) 1.17 bars (17 psi) @ >30 °C (86 °F)
Turbidity Performance Standards	0.1 NTU based on 95% of monthly measurements; Not to exceed 0.5 NTU anytime
Upper Control Limit (UCL) [3]	Site determination – variable
Membrane Integrity Test (MIT) Ending Pressure to Maintain a Resolution of 3 μm or less	≥ 0.835 bar (12.1 psi); θ = 50° where θ = liquid-membrane contact wetting angle
Quality Control Release Value (QCRV)	6 sec/mL (for L20N)

3. This is the maximum UCL allowed to achieve a minimum log removal value (LRV) of *Cryptosporidium* based on operational parameters (TMP, Flux rate, temperature and MIT parameters).

Specifications for the Siemens L20N membrane module are provided in the table below.

Siemens L20N Membrane Specifications	
Parameter	**Value/Units**
Manufacturer	Siemens Industry, Inc.
Membrane Classification	Ultrafiltration

Membrane Element ID Number(s)	L20N
Fiber – Dimensions and Construction	
Nominal Pore Size	0.04 µm
Absolute Pore Size	0.1 µm
Membrane Material	Polyvinylidene fluoride (PVDF)
Membrane Surface Chemistry	Hydrophilic; Negative Surface Charge
Membrane Type	Hollow Fiber
Membrane Flow Path	Outside-In
Fiber Inner Diameter	0.54 mm
Fiber Outer Diameter	1.03 mm
Active Fiber Length	1,600 mm (63 in)
pH tolerance (cleaning operations)	2.0 – 10.0
Max chlorine concentration during cleaning	1,000 mg/L
Module – Dimensions and Construction	
Fibers per Module	6,728
Membrane Area (based on outer diameter)	35 m^2 (375 ft^2)
Potting Material	Polyurethane (PU)
Casing Material	Nylon
Module Diameter	119 mm (4.7 in)
Module Length	1,800 mm (70.9 in)
Membrane Operational Parameters	
Filtration Mode	Dead-End
Maximum Certified Flux at 20°C	263 $L/m^2 \cdot hr$ (155 $gal/ft^2 \cdot day$)
Maximum Certified Flow at 20°C	153 L/min (40.4 gpm)
Maximum Housing Pressure	5.17 bars (75 psi)
Maximum Transmembrane Pressure	1.52 bars (22 psi) @ ≤30 °C (86 °F) 1.17 bars (17 psi) @ >30 °C (86 °F)
Membrane Integrity Test (MIT) Parameters	
Starting Pressure Decay Test (PDT)	15.0 psi (1.04 bars)
Max Backpressure during MIT	177 mBar (70.9 in)
Membrane Diffusion Rate (@ 10°C)	None Established

Potting Depth	90 mm (3.54 in)
Liquid-Membrane Contact Angle (θ)	50°
Pore Shape Correction Factor	1 (most conservative)
Membrane Hold-up Volume per module	2.8 liters
MIT Holding Time	2 minutes
Volumetric Concentration Factor (VCF)	1 (dead-end-mode of operations

The membrane filtration operation is split into two trains of 5 skids, or 10 skids total. Each skid contains 208 membrane element, for a total of 2,080 elements, and has a capacity to filter 3 MGD of water.

The pressure membranes are configured as highly efficient, hollow fiber systems. Water is forced under pressure through the micro-porous walls of the fibers, leaving contaminants trapped on the outside. Thousands of parallel hollow fibers are bundled together in cylindrical modules. Dozens of cylindrical membrane modules are mounted together with permanent piping and supporting frames to create membrane filtration units.

The membrane system has a dedicated programmable logic controller (PLC) control system that automates backwashing and flow control. Each membrane unit is equipped with a control valve and a set of flow meters to allow control of the permeate production rate. Membrane modules are integrity testable in-place on the unit using daily pressure hold tests that measure the rate of pressure decay. Initial integrity testing was conducted every four hours for at least two years and then later changed to once a day in July 2014 upon Division's approval.

The initial total nominal treated water capacity of the microfiltration system is 30 MGD. The actual permeate production capacity shall be greater than the nominal capacity so as to account for additional permeate production capacity to produce water for cleaning of the membranes, utility water, and other incidental plant water, while still providing a firm treated water capacity of 30 MGD available for introduction into the City's drinking water distribution system.

The membrane filtration units and associated cleaning system equipment are located in the membrane building. The membrane units are fed by a common supply header and send permeate to a common filtered water header. The membrane building has a separate room to house the electrical gear feeding all membrane system equipment and a room to house the supporting air compressors and blowers. The table below summarizes the design criteria for the membrane units.

Design Criteria for Membrane Units		
Description	**Units**	**Criteria**
Type		Cylindrical hollow-fiber, outside-in flow
Performance *Giardia* *Cryptosporidium* Viruses		Log removal credit 4.0 4.0 1.0
Maximum Flux Rate	gfd	57*
Number		10 skids
Capacity, each skid	MGD	3.64 (design)
Trans-membrane pressure	psi	**22** psi @ ≤30°C or **17** psi @ >30°C

*The MF units have additional spare capacity, since the design flux rate of 57 gfd is less than the rate of 155 gfd approved by the Division for this membrane. While not planned to operate at the approved rate, this provides a margin of 270 percent above the design rate, if needed.

6.5.4 Air Hold Test

An air hold test (AHT) commonly known as membrane integrity test (MIT) is manually or automatically conducted daily for each membrane skid in service. Under normal operating conditions, each operating skid undergoes an AHT once daily for duration of approximately 12 minutes. The pressurized air is applied to the lumen side of the membrane fibers and the subsequent pressure decrease inside of the module over time is measured and correlated to a Log Reduction Value (LRV).

The integrity test requires that a unit be temporarily taken off-line. The valves on the selected unit position themselves to allow the membrane modules to be pressurized with air from the Compressed Air System. The decay of pressure in the modules is monitored for a set time period. If the air pressure decays too far, it indicates that a membrane fiber(s) is broken and needs to be located and isolated.

Decay rate is monitored closely with this system and the LRV is constantly being re-calculated during production, unlike the GE Zenon membranes (at South San Joaquin Irrigation District) which give a fixed LRV value for 24 hours. The AHT is performed every 24 hours assuming the unit is not out of service for repair or maintenance, if it has been out of service, it will not be put back into production until it passes AHT.

MITs are conducted on one skid at a time, with all membrane elements in that skid tested in parallel. The AHT consists of pressurizing the inside of the membrane fibers with clean air. The AHT uses two different pressures to evacuate water and stabilize the air pressure in the membrane modules. The first stabilization pressurizes to 15 psi maximum or for two minutes, whichever is reached first. The first stabilization ensures that the skid is completely de-watered for the second pressurization. The second stabilization pressurizes the membranes to 14 psi maximum or two minutes, again whichever is reached first.

The air supply system comprises an oil-free compressor, pressure regulator, safety relief valve, a pressure gauge, air filter and an air dryer.

The pressure is allowed to stabilize to ensure that all of the water inside the membrane fibers has been displaced by air. The flow of air is turned off and the decay in pressure is measured over a predetermined time period.

The major steps involved in conducting a MIT are as follows:

1. Water level is dropped to just above the membrane fibers and the inside of the membrane fibers (membrane lumens) are pressurized using clean air. The air displaces water from the fibers.

2. After two minutes or 14 psi is reached, decay rate is measured as 0.01 psi/min. The pressure decay rate is measured over two minutes (or until the pressure reaches 12.7 psi in which case the test is failed). Note that the air hold test is measuring decay rate over the 2-minute period, if the pressure falls below 12.7 in a static state, the decay rate has become too great, meaning there is a leak at a valve, O-ring or excessive fiber breakage. The leak or leaks would then be found by trouble shooting the skid, by Sonic Testing. The decay rate (psi/min) is then plugged into a formula to come up with theoretical LRV, giving real time membrane integrity during operation.

3. The PLC calculates the log removal value (LRV) based on the results of the decay rate (psi/min). The calculated value of the LRV determines pass or fail of the test, giving real time membrane integrity during operation.

4. The Total AHT/MIT time, including evacuation and refilling of water, is approximately 12 minutes.

The DWSP plant alert (Low LRV alarm set point is 4.5. While the Low Low LRV set point is 4.3 and will shut the entire skid down. If a skid fails MIT it is taken off line and a sonic test will be immediately performed on the skid. Leaky modules will be isolated. Any isolated module showing pinning is required (indicated by the sonic test), pinning will be performed. After said work, the skid will be refilled and placed through another AHT before being placed back into service.

If a skid indicates low LRV it will immediately be taken out of service and placed into an acid CIP, followed with a hypo CIP. A sonic test, pinning and an AHT/MIT will also be performed before being placed back into service.

7. Filtered Water Turbidity, Flow, and Chlorine Residual

The filtered water out of the membrane units flows into a header pipe under pressure that runs across the yard to the above-ground treated water storage reservoir. The pipeline ahead of the reservoir is brought above ground for turbidity measurement, flow metering and chemical addition.

7.1 Turbidity Monitoring

The filtered water out of each membrane unit is monitored for turbidity using HACH 1720E online turbidimeter. A high level of turbidity triggers an alarm and shutdown of the unit. The filtered water out of the membrane units flows into a header pipe under pressure that runs across the yard to the above-ground treated water storage reservoir. The pipeline ahead of the reservoir is brought above ground for turbidity measurement, flow metering, and chemical addition. A sample line taps off the pipe ahead of the flow meter and runs over to a water quality cabinet where a turbidimeter measures the turbidity of the combined membrane skids filtered effluent. Effluent turbidity shall be 0.1 NTU or less in at least 95 percent of the readings every month and shall not exceed 0.5 NTU anytime.

7.2 Flow Monitoring

Magnetic flow meters are located on the feed lines to each membrane unit. A magnetic flow meter is provided on the combined filtered water effluent to continuously measure flow out of the Membrane System and into the Reservoir. The meter and static mixer is sized for 30 MGD and should be switched out for a larger size if the plant is upgraded. Flanges are provided on each end of the above-ground piping for the replacement of the static mixer and meter.

7.3 Chlorine Residual

An inline static mixer (ME-7-001) downstream of the meter provides injection ports for caustic soda (for pH adjustment) and sodium hypochlorite (for primary disinfection). An online HACH chlorine residual analyzer and pH meter are located downstream (>10 pipe diameters) of the mixer to continuously measure the chlorine concentration and pH. At this location, the chemical addition should be fully mixed. The PCS alarms if the chlorine concentration is less than 0.35 mg/L in the clearwell effluent.

8. Backwash And Cleaning Systems

8.1 Backwash

The flux rate of the membrane units is maintained by frequent backwashing and periodic cleaning. Each membrane unit is typically backwashed once every 28 minutes and a complete backwash cycle lasts approximately four minutes. A backwash typically involves a period of agitation of the membrane fiber bundles within the modules with compressed air and flushing the outer surface of the fibers with feed water. Waste wash water from the membrane units is discharged to the solids settling and drying basins.

8.2 Maintenance Wash

Maintenance Wash (MW) system is provided to routinely clean away fouling materials from the membranes. Cleanings differ from backwashes in that the membrane fibers are allowed to soak in a static chemical solution. A complete MW cycle lasts approximately 45 minutes and includes a backwash, followed by chemical dosing, recirculation of solution through membranes, soaking, rinsing, and filter-to-waste. MW regimens include cleanings every 36 hours with hypochlorite and every 72 hours with sulfuric acid, for each skid in operation.

The MW system also includes sodium bisulfite and caustic soda for waste neutralization. The MW system consists of chemical day tanks, chemical transfer pumps, process water tanks (named CIP heating tanks), process feed/circulation pumps (named CIP pumps), neutralization tanks, and neutralization tank mixing/transfer pumps. All system components are located in the membrane building with the exception of bulk storage of sodium hypochlorite and caustic soda, which is in the Chemical Facility. Sulfuric acid and sodium bisulfite is delivered by partial load delivery by chemical trucks and pumped into their respective day tanks in the MF building. All components of the MW system are also used for CIPs.

8.3 Chemical Clean-In-Place

A chemical clean-in-place (CIP) system is provided to periodically clean away fouling materials from the membranes. It is the most rigorous wash of the membranes. The CIP cleaning sequence is the same as a Maintenance Wash sequence, except cleaning solutions are heated, and recirculation and soak sequences are longer. A complete CIP cycle lasts approximately 2.5 hours for each of the two chemical cleans, which are performed back-to-back. The CIP regimen includes cleanings on a monthly basis (one CIP per skid every 30 days).

8.4 Chemical Waste Neutralization System

The rinse water, MW, and CIP chemical cleaning solutions and filter-to-waste (FTW) water are drained to one of three neutralization tanks depending on the chemical used.

- Sulfuric Acid and Rinse Citric Acid Waste Neutralization tank, T-3-009 (sulfuric acid cleaning solution, rinses and FTW, Citric Acid rinses and FTW) – 10,000 gal
- Sodium Hypochlorite Waste Neutralization tank, T-3-008 (hypochlorite cleaning solution , rinses and FTW) - 10,000 gal

- Citric Acid Waste Neutralization tank, T-3-010 (sulfuric acid and citric acid cleaning solutions) - 10,000 gal

Caustic soda is used to neutralize the spent acid cleaning solutions. The Neutralization pump circulates the waste in a loop while caustic soda is added inline at the neutralization pump discharge. The pumps continue to circulate and mix the tank solution, and the chemical is added until the pH of the solution reaches a neutral range. Using the same process, sodium bisulfite is used to de-chlorinate spent sodium hypochlorite cleaning solution.

Each neutralization tank has dual pumps, constant speed, each (one duty/one standby) that circulate first the neutralizing chemical that is added inline at the neutralization pump discharge. Neutralization of waste is automatic. Sending neutralized waste to the backwash line or a waste truck is accomplished manually. Pumping rate is 190 gpm and only one tank at a time may discharge to the backwash line. Pumping out a neutralization tank will likely coincide with backwashes. It takes approximately 40 minutes to pump out one tank.

Each neutralization tank has 10,000 gallons of working capacity. The total volume produced for one MW or one CIP is 4,000 gallons. Rinse water following MW or CIP is sent directly to the backwash drain line. Each train can only have one MW or CIP at a time. A MW on one train and a CIP on the other train can occur simultaneously. Only one acid/hypochlorite CIP can occur in a day. The operator will need to schedule cleanings so that both trains are not producing a CIP simultaneously. The number of MWs and CIPs vary from day to day, but the monthly total is consistent under normal operating conditions. The total amount of washes is as follows, per month, including all ten skids: 200 hypochlorite MWs, 10 hypochlorite CIPs, 100 sulfuric acid MWs, 10 citric acid CIPs. In one day, the minimum number of batches of spent hypochlorite cleaning solution is 3 and the maximum is 10 (a batch is one MW or one CIP). In one day, the minimum number of batches of spent sulfuric acid cleaning solution is 1 and the maximum is 6. In one day, the minimum number of batches of spent citric acid cleaning solution is 0 and the maximum is 1.

Membrane System Cleaning Chemicals Design Criteria		
Design Criteria	**Unit**	**Values**
Sodium Hypochlorite (12.5% Concentration, tank is filled from the Chem Feed Facility)		
Storage Tank Capacity	Gal	360
Days of Supply @ average dose	Days	21
Caustic (25% Concentration, tank is filled from the Chem Feed Facility)		
Storage Tank Capacity	Gal	360
Days of Supply @ average	Days	11

dose		
Citric Acid (50% Concentration)		
Storage Tank Capacity	Gal	360
Days of Supply @ average dose	Days	45
Sulfuric Acid (50% Concentration)		
Storage Tank Capacity	Gal	360
Days of Supply @ average dose	Days	35
Sodium Bisulfite (38% Concentration)		
Storage Tank Capacity	Gal	360
Days of Supply @ average dose	Days	49
Citric Acid Solution		
CIP Dose	%	0.5
Sodium Hypochlorite Solution		
MW Dose	mg/L	100
CIP Dose	mg/L	600
Sulfuric Acid Solution		
CIP & MW Dose	%	0.6

8.5 CIP Recycle

The Stockton DWSP water treatment plant uses both sodium hypochlorite and citric acid for "clean-in-place" (CIP) operations of the UF membranes. There is no municipal sewer line in the vicinity of the new WTP, so discharge of spent CIP solutions to the sewer is not currently an option. The MF system's spent and diluted CIP solutions are collected in dedicated tanks at the WTP and neutralized. The neutralization tanks have been configured so that the neutralized volume can be either pumped to the solids settling and drying beds, for further dilution and pumped to a truck loading station for off-haul and disposal at the City's wastewater treatment plant.

9. Backwash Recovery and Solids Drying

Suspended solids are naturally present in the surface water supplies to the WTP, and are removed by sedimentation and membrane filtration processes. The addition of aluminum chlorohydrate to the raw water induces suspended particulates to coagulate in the flocculation basins and settle out of the water in the sedimentation basins. Periodically, a waste stream with approximately 0.2%

to 0.5% solids is flushed from the sedimentation basins and conveyed to the solids settling and drying basins.

Membrane filtration further treats the water by removing fine suspended solids and pathogens. Excess buildup of material on the membrane surface must be removed to maintain the flux across the membrane within acceptable pressure limits. The membrane is regularly backwashed to maintain its capacity. Backwash water contains solids and bacteria, and is sent to the solids settling and drying basins. Solids in the backwash water settle out in the basins before the supernatant is pumped through the Reclaimed Water Pump Station to the head of the raw water treatment process upstream of ozonation.

9.1 Waste Wash Water Recovery and Reclaimed Water Pumping

The sedimentation basin sludge disposal, flocculation basin and Reservoir overflow, membrane waste wash water, and solids settling and drying basins form a hydraulically linked system. The membrane waste wash water and the sedimentation basin sludge flow in a common line to the solids settling and drying basin inlets. The large diameter overflow line from the flocculation basin inlet channel along with the treated water storage reservoir overflow, are part of the header connecting the clarified supernatant from the solids settling and drying basins to the wet well of the reclaimed water pump station.

The waste wash water and sludge solids sent to the solids settling and drying basins from the membrane system and the sedimentation basins are less than 5% by weight of the total flow stream. As the solids settle in the bottom of the basins, clarified water near the surface flow through an outlet structure at a near constant rate and by gravity to the wet well of the reclaimed water pump station. The solids settling and drying basins provide volume to equalize the inflow surges, and allow the reclaimed water to be pumped to the raw water line at the head of the plant at a constant rate, to avoid rapid fluctuations in raw water quality.

The pipeline from the solids settling and drying basins hydraulically link the basins and the wet well, so that a common water surface elevation is maintained, and the volume of water in the basins helps equalize the waste wash water flow. Under an overflow condition from the flocculation basins or treated water storage reservoir, the lines convey overflow water back through the clarified water outlet structure and piping to the solids settling and drying basins taking advantage of storage capacity within the basins. The table below summarizes the design criteria of the waste wash water and reclaimed water system.

Design Criteria for Reclaimed Water System		
Description	**Units**	**Criteria**
Waste Wash water Flow Maximum instantaneous		

flow Daily average flow	gpm gpm	2,000 600
Sludge Flow Maximum instantaneous flow Daily average flow	 gpm gpm	 200 60
Clarified water return flow	gpm	660
Solids settling and drying basin Volume, each Solids holding capacity, each	gallons months	3,675,000 6
Wet well volume Total	 gallons	 56,000
Reclaimed Water Pumps Type Control Number Capacity, each Flow Head	 no. gpm feet	 Vertical turbine pump Variable frequency drive 2 duty, 1 standby 700 25

9.2 Solids Settling and Drying Basins

Sludge is flushed from the sedimentation basin sludge hoppers to the solids settling and drying basins multiple times per day. These sudden inflows are equalized by the volume in the basins, establishing a quiescent condition for the solids to further separate from the supernatant water. Over time, a layer of consolidating solids will develop over the basin floor area. Due to the limited hydraulic load presented by the sludge flow, the solids holding capacity of the basins governs the sizing.

The solids settling and drying basins are sized based on the calculated solids load and the number of months of flow each basin would receive per year. The anticipated basin operation cycles are six-month cycles covering summer and winter, the "dry" and "wet" seasons typical for the Stockton area. The summer months are most effective for drying sludge, and drying can be completed in less than two months. Therefore, all basins go through a drying cycle each summer. Typically, one basin is in the duty (receiver) cycle at any given time. In the winter, typically one basin is empty and one basin (that received solids the summer before) will be in a "hold" cycle. This operational mode provides for drying and emptying of each basin each year, and for standby basin capability on an as-needed basis.

Only three basins were constructed in the first phase. The design criteria of the solids settling and drying basins are summarized in the table below

Design Criteria - Solids Settling and Drying Basins		
Description	**Units**	**Value**
Solids loading rate	lbs/ft^2/loading cycle	12
Loading cycle, each basin	months	6
Average plant flow	MGD	20
Average aluminum chlorohydrate dose	mg/L	15
Average Turbidity	NTU	10
Solids Production, dry	lb/day	3,500
Solids Production, wet	lb/day	980,784
Solids Production, wet	gal/day	117,600
Surface area per basin	ft^2	74,580
Basin Length (at grade)	ft	312
Basin Width (at grade)	ft	192
Basin Depth	ft	7
Typical Water Depth	ft	4
Volume of 1 basin Solids/clarification volume Overflow volume	 gallons gallons	 2,025,000 1,650,000
Number of Basins At 30 MGD plant capacity At 60 MGD plant capacity		 3 6

10. Treated Water Reservoir, Treated Water Pump Station, and Treated Water Pipeline

10.1 Treated Water Reservoir (Clearwell)

The treated water storage reservoir provides operational volume to balance variations in plant production and plant pumping rates. In addition to buffering changes in production rate, the reservoir is operated to maintain a volume that can provide a minimum detention time for 0.5-log inactivation of *Giardia*. A nominal reservoir capacity of 4.0 MG is provided. Maximum water surface elevation is at approximately 18 feet above the bottom of the tank.

Sodium hypochlorite solution is added to the filtered water at a static mixer downstream of the membrane building and upstream of the treated water reservoir to establish a free-chlorine residual. Disinfection credit received depends on residual concentration, water temperature, water pH, and flow rate and effective volume, which determine the contact time. The tank inlet and outlet and internal baffling configuration will achieve a t_{10}/T ratio of approximately 0.20, as approved by the Division. The City does not plan to conduct tracer tests.

The City's consultant, CDM Smith, analyzed the residual chlorine concentration to water depth in the treated water storage reservoir to achieve, when necessary, the 0.5-log inactivation credit at various combinations of flow and temperature. Water above the minimum depth maintained for disinfection is available to balance variability in plant production and pumping. The balancing volume available at the plant rated capacity of 30 MGD varies from a minimum of 0.4 MG (top 1.75 feet) at 5°C and a residual chlorine concentration of 0.8 mg/L, to as much as 3.5 MG (top 15.5 feet) at 25°C and a residual chlorine concentration of 1.6 mg/L.

In the event disinfection capabilities need to be boosted, the ozone system can be increased and chlorine feed in the reservoir can be increased. The ozone system (with sodium hypochlorite injection backup) at the head of the plant is anticipated to be capable of providing a 0.5-log inactivation of Giardia. Dosage at the storage tank is expected to be somewhere between 1.2 mg/L to less than 2 mg/L under these circumstances. The table below summarizes the design criteria of the treated water storage tank.

Design Criteria for Treated Water Storage Tank		
Description	**Units**	**Criteria**
Type		Above-ground, wire-wrapped pre-stressed concrete
Number		1
Volume	gallons	4,000,000
Diameter	ft	195
Inside Height	ft	20
Maximum water surface	ft	18
Overflow water surface	ft	19
Disinfection (*Giardia*)	Log inactivation credit	0.5

10.2 Treated Water Pumping

The treated water pumps boost the pressure of the treated water from the treated water storage tank in order to satisfy the pressure losses through the 54-inch treated water piping and meet the pressure needs in the North Stockton Distribution System. The treated water pumps are designed to maintain the target system pressure range of 45 psi to 75 psi in the distribution system. The treated water pumps are vertical turbine pumps. The pumps are installed on a concrete base slab, and are provided with an acoustic wall around most of the station to achieve maximum noise levels at the project property lines. The treated water pump station also includes a surge control system, consisting of a hydro-pneumatic tank with associated air compressors for maintaining the air cushion. The size of the surge tank is 12,000 gallons. The table below summarizes the design criteria of the treated water pump station.

Design Criteria for Treated Water Pump Station		
Description	**Units**	**Criteria**
Treated Water Pumps		
Type		Vertical turbine can pump
Control		2 with variable frequency drive, 2 @ constant speed
Number, duty		3
Number, standby		1
Capacity, each	gpm	7,000
Capacity, each (nominal)	MGD	10
Head	ft	225
Surge Control System		
Type		Hydro-pneumatic
Control		Automatic
Number of tanks		1
Tank capacity	gallons	12,000
Number, compressors		2
Compressor capacity, each	scfm	TBD

10.3 Treated Water Pipeline

The treated water is carried via 24,000 feet of 30-, 36-, 42-, and 54-inch pipeline. The treated water pipeline transports water from the treatment plant to two discharge points and has a working pressure of approximately 70 psi. The treated water pipeline conveys flow from the WTP connecting to Stockton's existing water distribution system at two locations, at the intersection of Eight Mile Road and Trinity Parkway and at the intersection of Davis Road and Whistler Way. The treated water pipeline runs parallel with the raw water pipeline from the WTP, along the WID canal, Gateway Road, Davis Road and tees at Eight Mile Road.

11. Chemical Feed System

This section describes the design criteria for the proposed treatment process chemical systems except those chemical systems specifically associated with the membrane system. The treatment process chemical systems, except those for the membranes include:

11.1 Liquid Oxygen

Liquid oxygen is a cryogenic liquid that is stored in one pressurized, 9,000 gallon tank and is supplied to one of three vaporizers depending on the vaporizer's operating status. The air outside the vaporizers is much warmer than the LOX. As LOX passes through the vaporizer, the warmer temperatures on the outside of the vaporizer heat up the LOX and it changes from its liquid to gas state.

The LOX storage tank's external oxygen economizer system directs excess oxygen gas from the storage tank to the common vaporizer outlet manifold. The oxygen gas piping out of the vaporizers is at a high pressure. The pressure must be reduced to prevent damaging the ozone generators downstream. A Pressure Reducing Station is provided. There are two pressure reducing valves mounted in parallel. Only one valve is normally in service at a time. After the gas line is pressure adjusted, it must be filtered. A gas filter station is located on the piping downstream of the Pressure Reducing Valve Station and is designed to remove 99.9 percent of particles one micron or larger and 98 percent of particles 0.4 microns or larger. Differential pressure is measured across the gas filter.

11.2 Ozone

Ozone gas is highly reactive and decays rapidly. Due to ozone's short half-life (the time required for half the initial concentration to decompose), ozone must be generated on site at the treatment facility. The following describes how ozone is generated:

Liquid oxygen is delivered by truck, stored on site, and vaporized using ambient vaporizers to create the gaseous oxygen supply for ozone generation. A supplemental nitrogen boost system is provided to add nitrogen-in-air to the oxygen gas stream to improve the performance of the ozone-generating equipment. Ozone is created by passing the oxygen gas stream through an electric-field ozone generation system which dissociates the O_2 molecule to elemental oxygen, and allow some of the oxygen atoms to reform as the O_3 ozone molecule. The ozone-in-oxygen gas stream is then educted by a side-stream injection system into the ozone contactor system, where the ozone is transferred into solution. The side-stream flow with high ozone concentration, injected into the main raw water flowing through the contactor under pressure, mixes and creates uniform ozone residual in the raw water pipeline. The ozone injection point is downstream of the reclaimed water connection to the Delta water supply pipeline and chemical pre-treatment. An off-gas collection system is provided downstream of the injection point to remove oxygen and un-reacted ozone gasses that bubble out of the raw water, and route these gasses to an excess ozone destruction system. The ozone generators and their power supply units (PSUs) generate excess heat in operation. A cooling water system is provided to remove this excess heat from the ozone generation system equipment.

Oxygen and ozone gasses are hazardous chemicals that can cause significant damage to humans if exposed at elevated levels. An oxygen/ozone safety system inside the Ozone Building is provided and interlocked with the LOX system and the ozone generation system to shut down under emergency scenarios.

11.3 Sodium Hypochlorite (Chlorine)

Sodium hypochlorite is used for:

- Pre-treatment of raw water entering the plant upstream
- Basin shocking of the flocculation/sedimentation basins
- Disinfection of the filtered water added upstream and downstream of the Treated Water Storage
- Transferred to day tanks in the MF Building for cleaning of the membranes

Sodium hypochlorite (typically 12.5% - can vary from 10 to 15%) is stored in three 10,000 gallon storage tanks. Each storage tank has two discharge pipes with control valves, one to the metering pump header and one to the transfer pump header. The transfer pumps can also act as recirculation pumps to keep the tank contents mixed by recirculation if needed. Each tank is piped so it can feed any of the chemical metering pumps or transfer pumps. Meter and transfer pumps can operate at the same time. Softened water (carrier water) is added to the metering pump discharge line to boost the feed velocity to the injection points. Water flow rate is adjusted manually by the operator.

There are six metering pumps with variable speed drive units, two pumps dedicated to each injection point (one duty/one standby). There are two constant speed transfer pumps, one for transferring chemical to the MF Building day tank and one for recirculating the chemical in the tank for mixing.

11.4 Aluminum chlorohydrate

Aluminum chlorohydrate (ACH) is used on the raw water to form a floc in the Floc/Sed Basin. ACH is stored in two 10,000 gallon storage tanks. Each storage tank has one discharge pipes with control valves to the metering pumps. There are three metering pumps with variable speed drive units, two duty/one standby. Each pump can pump back into the storage tank to recirculate chemical in the tank. The option to use ferric chloride is also available.

11.5 Caustic Soda

Caustic Soda (Sodium Hydroxide) is used for:

- pH adjustment of the raw water at the Floc/Sed basin
- pH adjustment of the filtered water upstream of the Treated Water Reservoir
- Transferred to day tanks in the MF Building for neutralization of the membrane cleaning washes

Caustic Soda is stored in two 10,000 gallon storage tanks. Each storage tank has two discharge pipes with control valves, one to the metering pumps and one to the transfer pumps. The transfer pumps can also act as recirculation pumps to keep the tank contents mixed by recirculation if needed. Each tank is piped so it can feed any of the chemical metering pumps or transfer pumps. Meter and transfer pumps can operate at the same time. Softened water (carrier water) is added to the metering pump discharge line to boost the feed velocity to the injection points. Water flow rate is adjusted manually by the operator. There are two metering pumps with variable speed drive units, one pump to the filtered water line upstream of the Treated Water Reservoir and one pump to the reclaimed water line at the Floc/Sed basin. There are two constant speed transfer pumps, one for transferring chemical to the MF building day tank and one for recirculating the chemical in the tank for mixing.

11.6 Ammonia (Aqueous form)

Aqueous (Aqua) ammonia (AA) is added to the chlorinated, treated water for chloramine formation. It can be fed at two different points in the process – on the treated water line downstream of the treated water storage reservoir and on the raw water line upstream of the plant flow meter. Aqua ammonia is stored in one 7,700 gallon storage tank. There are three metering pumps with variable speed drive units. Two metering pumps can accommodate the design range of feed rates; the third pump is a standby. Either of the metering pumps can individually or jointly pump to the feed points. Each pump can pump back into the storage tank to recirculate chemical in the tank.

11.7 Corrosion Inhibitor

Corrosion Inhibitor is used to inhibit corrosion in the distribution system. The City uses CP-25 monosodium orthophosphate provided by Sterling Water

Technologies LLC. It is used during periods treating WID or a combination of WID and Delta waters. When treating 100% Delta the water is pH adjusted but because of higher alkalinity and hardness levels, the City does not need to use the CP-25.

The monosodium orthophosphate is stored in one 2,600 gallon storage tank. The storage tank has one discharge pipe with control valve to the metering pumps. There are two metering pumps with variable speed drive units, one duty/one standby. Each pump can pump back into the storage tank to recirculate chemical in the tank.

All chemicals mentioned above are provided with storage capacity of approximately 30 days at average dose and average flow or seven days under peak conditions (i.e., maximum flow and maximum dose), whichever is greater. In some cases, storage tank size may be increased to support minimum delivery truck capacity.

Chemical Addition Points		
No.	**Chemical**	**Location**
1	Ozone	Raw Water Header at the head of the plant
2	Sodium Hypochlorite	Static Mixer upstream of Flocculation Basin Raw Water Header upstream of ozonation Filtered Water Static Mixer Upstream of the Treated Water Storage Reservoir Treated Water Static Mixer downstream of the Treated Water Storage Reservoir
3	Aluminum chlorohydrate or Ferric Chloride	Static Mixer upstream of Flocculation Basin
4	Caustic Soda	Static Mixer upstream of Flocculation Basin Filtered Water Static Mixer Upstream of the Treated Water Storage Reservoir
5	Aqueous Ammonia	Raw Water Header upstream of ozonation Treated Water Static Mixer downstream of the Treated Water Storage Reservoir
6	Corrosion Inhibitor	Treated Water Static Mixer downstream of the Treated Water Storage Reservoir

The table below presents design criteria for the chemical systems at the DWSP WTP. The minimum, average, and maximum plant flows are 6, 20, and 30 MGD, respectively. Chemical feed rates correlate with the design dosages at minimum, average, and maximum flow.

Chemical Feed Design Criteria		
Design Criteria	**Unit**	**Value**
Liquid Oxygen and Ozone System		
Design Dose		
Minimum	mg/L	1.5
Average	mg/L	2.00
Maximum	mg/L	3.50
Ozone Generation Concentration	percent	8 -12
Ozone Feed System Requirements		
Minimum	lbs/day	75
Average	lbs/day	334
Maximum	lbs/day	876
LOX Storage Facilities		Bulk Cryogenic Tank
Storage Capacity	gallons	9,000
Days of supply @ avg. dose	days	26
Sodium Hypochlorite		
Design Dose (Raw Water Header or Floc Basin Static Mixer for Iron and Manganese Oxidation)		
Minimum	mg/L	1.0
Average	mg/L	2.0
Maximum	mg/L	3.0
Design Dose (Floc Basin Static Mixer for Coagulation Enhancement)		
Minimum	mg/L	0.5
Average	mg/L	0.5
Maximum	mg/L	1.0
Design Dose (Floc Basin Static Mixer for Basin Cleaning)		
Minimum	mg/L	4.0
Average	mg/L	6.0
Maximum	mg/L	10.0
Design Dose (Primary Disinfection at Static Mixer between MF and Treated Water (TW) Reservoir)		
Minimum	mg/L	1.0
Average	mg/L	2.0
Maximum	mg/L	4.0

Design Dose (Residual Chlorine Level Adjustment at Static Mixer Downstream of TW Reservoir After CT Compliance is Demonstrated)		
Minimum	mg/L	0.5
Average	mg/L	1.0
Maximum	mg/L	2.0
Feed System Requirements Raw Water Treatment (Based on Iron and Manganese Oxidation) (1)		
Minimum	gal/hr	2.1
Average	gal/hr	13.9
Maximum	gal/hr	31.3
Feed System Requirements Filtered Water (Primary Disinfection)		
Minimum	gal/hr	2.1
Average	gal/hr	13.9
Maximum	gal/hr	41.7
Feed System Requirements Filtered Water (Chlorine Residual Level Adjustment)		
Minimum	gal/hr	1.0
Average	gal/hr	7.0
Maximum	gal/hr	20.9
Storage Tank	No.	3
Storage Capacity (Per Tank)	gal	10,000
Days of supply @ avg. dose	days	34
Aluminum Chlorohydrate		
Design Dose		
Minimum	mg/L	5.0
Average	mg/L	12.0
Maximum	mg/L	25.0
Bulk Chemical Concentration	percent	11
Feed System Requirements		
Minimum	gal/hr	0.9
Average	gal/hr	7.4
Maximum	gal/hr	23.2
Storage Tank	No.	2
Storage Capacity (Per Tank)	gallons	10,000
Days of supply @ avg. dose	days	112

Caustic Soda		
Design Dose		
Minimum	mg/L	5.0
Average	mg/L	10.0
Maximum	mg/L	20.0
Bulk Caustic Soda Concentration	percent	25
Feed System Requirements		
Minimum	gal/hr	3.9
Average	gal/hr	25.7
Maximum	gal/hr	77.2
Storage Tank	No.	2
Storage Capacity (Per Tank)	gallons	10,000
Days of supply @ avg. dose	number	32
Aqueous Ammonia		
Design Dose (residual Chloramine formation)		
Minimum	mg/L	0.40
Average	mg/L	0.44
Maximum	mg/L	0.67
Design Dose (Raw Water Bromate Control)		
Minimum Average Maximum	mg/L mg/L mg/L	0.5 1.0 1.5
Bulk Chemical Concentration	percent	19
Feed System Requirements (residual chloramines formation)		
Minimum	gal/hr	0.6
Average	gal/hr	2.1
Maximum	gal/hr	4.8
Feed System Requirements Raw Water Treatment (Raw Water Bromate Control)		
Minimum	gal/hr	0.75
Average	gal/hr	4.8
Maximum	gal/hr	10.7
Storage Tank	No.	1

	Storage Capacity	gallons	7,700
	Days of supply @ avg. dose	days	47
Corrosion Inhibitor (monosodium orthophosphate)			
Design Dose			
	Minimum	mg/L	0.5
	Average	mg/L	1.0
	Maximum	mg/L	1.5
Bulk Chemical Concentration		percent	100
Feed System Requirements [(2)]			
	Minimum	gal/hr	0.1
	Average	gal/hr	0.66
	Maximum	gal/hr	1.49
Storage Tank		No.	1
	Storage Capacity (minimum)	gallons	2,600
	Days of supply @ avg. dose	number	164

(1) Will most likely be necessary but not often. Design based on treatment operations. Shocking ability of 104.3 gal/hr is provided but does not dictate design.
(2) Storage volumes and feed rates are based on a feed solution concentration of 100% of either sulfate or chloride type inorganic orthophosphate.

12. Reliability

12.1 Control Modes

The process control system (PCS) includes PLC control and local hardwired control. The PCS offers both remote manual and full automatic modes for all major plant equipment. Each major process area is provided with a PLC that contains all control logic and on/off for a particular process area.

The control system allows control from only one location at a time (e.g. simultaneous control from two separate locations shall not be possible). All process controls are only through the PCS and PLCs. The operator machine interface software, server computers and server workstations will not be allowed to make changes to the process controls. The operators are able to adjust the set points from the PCS system. Adjustment of set points is password protected. Redundant PCS servers are implemented to maintain supervisory control and monitoring should one PCS server fail.

12.2 General Alarm and Monitoring Criteria

The hardware for the PLC system utilizes the Allen Bradley product line. All alarms are routed through the PCS system. During normal plant operational hours, the operator acknowledges alarms at the PCS system. Outside of normal operational hours, when reduced staffing is in effect, alarms are routed to an auto-dialer system that notifies on-call personnel if not resolved by staff on site. The PCS includes a remote monitoring feature to permit authorized personnel access to the system using a laptop computer and phone line connection. Access is limited to supervisory system control and monitoring.

The table below lists important plant components that have associated alarms to warn or shutdown the plant in the event a previously set limit is reached or exceeded during the operation of the plant. All set points can be easily changed by the operator/manager with the assigned security level privileges.

Parameter	Low Low		Low		High		High High		Shut-down if Triggered
	Set point	Delay	Set point	Delay	Set point	Delay	Set point	Delay	(highlight denotes trigger)
Delta Water Turbidity	n/a	n/a	n/a	n/a	25 NTU	5 sec	30 NTU	5 sec	No
WID Water Turbidity	n/a	n/a	n/a	n/a	20 NTU	10 sec	30 NTU	10 sec	No
Recycled Water Turbidity	0 NTU	5 sec	0.3 NTU	5 sec	2 NTU	10 sec	20 NTU	10 sec	No
Combined Influent Turbidity	0 NTU	5 sec	0 NTU	5 sec	20 NTU	10 sec	30 NTU	10 sec	No
Sedimentation Basin Effluent Turbidity	n/a	n/a	n/a	n/a	0.6 NTU	10 sec	1 NTU	10 sec	No
Settled Water Basin Level	8 ft	30 sec	11 ft	30 sec	15	5 sec	16 ft	5 sec	Yes
Membrane Skid #1 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #1 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #2 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #2 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #3 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes

Skid #3 LRV								
Membrane Skid #4 Turbidity	n/a	n/a	n/a	n/a	0.7 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #4 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #5 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #5 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #6 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #6 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #7 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #7 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #8 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #8 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #9 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #9 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Membrane Skid #10 Turbidity	n/a	n/a	n/a	n/a	0.07 NTU	1 sec	0.08 NTU	1 sec	Yes
Membrane Skid #10 LRV	4.3	5 sec	4.5	30 sec	n/a	n/a	n/a	n/a	Yes
Combined Effluent Turbidity	0 NTU	5 sec	0.01 NTU	1 sec	0.08 NTU	1 sec	0.4 NTU	1 sec	Yes
Cl_2 Residual Combined Effluent	0.5 ppm	5 sec	0.8 ppm	5 sec	3.6 ppm	5 sec	3.8 ppm	5 sec	No
Cl_2 Residual Clearwell Effluent	0.35 ppm	5 sec	0.8 ppm	5 sec	1.8 ppm	5 sec	2 ppm	5 sec	Yes
Clearwell Level	7 ft	5 sec	9 ft	5 sec	17 ft	5 sec	17.5 ft	5 sec	Yes

Upon loss of plant utility power, an Uninterruptible Power Supply (UPS) system provides power to the critical PCS equipment (including servers, workstations, and PLCs and other appurtenances necessary to keep the PCS system operable) and select critical instrumentation until a diesel engine powered standby generator is online.

12.3 Standby Power Supply

The UPS will provide power to the life safety systems and process control components. Critical PCS components including the Operator Work Stations, programmable logic controllers (PLC), Local Operator Panels and select critical instrumentation will also be powered from a UPS system sized to provide a minimum 15 minutes emergency power backup time (to allow adequate time for standby engine generator system start-up).

The standby engine generator system is powered by diesel fuel and provided with adequate on site fuel storage for a minimum of 24 hours operation of the treatment plant at connected load.

12.4 Unit Process Monitoring

The water treatment plant utilizes instruments that are connected to the SCADA system to monitor the operation and performance of all of the individual unit processes. In addition sample taps are provided on the raw water piping, settled water piping, filtered water ahead of the clearwell and the finished water leaving the clearwell. A listing of the instruments that monitor each unit process, are summarized below.

Online Instruments				
Type	**Manufacturer**	**Model**	**Sample Location**	**Cabinet**
Turbidimeters	Hach	1720E	Settled Water (Membrane Feed)	Settled Water
	Hach	1720E	Combined Filtrate Effluent	WAC 1
	Hach	1720E	Individual Membrane Skids	Skids 1 - 10
	Hach	Surface Scatter 7	Reclaimed Water	WAC 5
	Hach	Surface Scatter 7	Raw WID Influent	WAC 4
	Hach	Surface Scatter 7	Raw Combined Influent	WAC 2
	Hach - Solitax sc	LXG423.54.10000	IPS Influent	IPS WQP
PH Analyzers	Hach	DPD1P1	Raw WID Influent	WAC 4
	Hach	DPD1P1	Reclaimed Water	WAC 5
	Hach	DPD1P1	Raw Combined Influent	WAC 2
	Hach	DPD1P1	Ozonated Water	OAC 1

	Hach	DPD1P1	Floc/Sed influent	WAC 8
	Hach	DPD1P1	Settled Water (Membrane Feed)	Settled Water
	Hach	DPD1P1	Combined Filtrate Effluent	WAC 1
	Hach	DPD1P1	Clearwell	WAC 7
	Hach	DPD1P1	Finished Water	WAC 6
	Hach	DPD1R1	IPS Influent	IPS WQP
	Hach	PD2P1	CIP Train 1	MF CIP Line
	Hach	PD2P1	CIP Train 2	MF CIP Line
	Hach	PD2P1	Chlorine Waste Tank	MF Recirc Line
	Hach	PD2P1	Citric Waste Tank	MF Recirc Line
	Hach	PD2P1	Sulfuric Acid Waste tank	MF Recirc Line
ORP meter	Hach	RD2P5	CIP Train 1	In Line
	Hach	RD2P5	CIP Train 2	In Line
	Hach	RD2P5	Chlorine Waste Tank	In Line
Conductivity Meters	Hach	3400 digital	Raw WID Influent	WAC 4
	Hach	3400 digital	Reclaimed Water	WAC 5
	Hach	3400 digital	Raw Combined Influent	WAC 2
	Hach	D3725E2t-WDMP	IPS Influent	IPS WQP
Streaming Current Analyzer	Chemtrac	SCM2500	Floc/Sed influent	WAC 8
Free Chlorine Residual Analyzers	Chemtrac	CRA3500 0-5F	Ozonated Water	OAC 1
	Chemtrac	CRA3500 0-5F	Combined Filtrate Effluent	WAC 1
	Chemtrac	CRA3500 0-5F	Clearwell	WAC 7
Total Chlorine Residual Analyzers	Chemtrac	HA300 0-5T	Combined Filtrate Effluent	WAC 1
	Chemtrac	HA300 0-5T	Clearwell	WAC 7
	Chemtrac	HA300 0-5T	Finished Water	WAC 6
Ozone Residual Analyzers	Rosemont	1056	Ozonated Water	OAC 1
	Rosemont	1056	Ozone Pipeline	OAC 2
	Rosemont	1056	Ozone Pipeline	OAC 3
	Rosemont	1056	Ozone Pipeline	OAC 4
	Teledyne	465H	Ozone Generator 1	Ozone Generato r 1
	Teledyne	465H	Ozone Generator 2	Ozone Generato

				r 2
	Teledyne	465H	Sidestream header	Sidestream on Strut
	Teledyne	465M	destruct off-gas	East Wall Ozone
Temperature Transmitters	Dwyer	106-W-LCD	Raw WID Influent	WAC 4
	Dwyer	106-W-LCD	Reclaimed Water	WAC 5
	Dwyer	106-W-LCD	Raw Combined Influent	WAC 2
	Dwyer	106-W-LCD	Finished Water	WAC 6
	Hach	DPD1P1	Combined Filtrate Effluent	WAC 1
	Hach	DPD1P1	Clearwell	WAC 7
	Hach	DPD1P1	Settled Water (Membrane Feed)	Settled Water
	Hach	DPD1P1	Floc/Sed influent	WAC 8
	Hach	DPD1P1	Ozonated Water	OAC 1
Ambient Ozone Monitors	Teledyne	465L	Ozone West Wall	Outside Electrical Room
	Teledyne	465L	Ozone South Wall	Ozone South Wall
	Teledyne	465L	Ozone East Wall	Near Destruct
Ambient Oxygen Monitors	Teledyne	3350	Ozone West Wall	Outside Electrical Room
	Teledyne	3350	Ozone South Wall	Ozone at Nitrogen skid
% Oxygen Monitor	Teledyne	3000PB	Sidestream header	Sidestream on Strut

Field/Lab Instruments			
Type	**Manufacturer**	**Model**	**Equipment Location**
Turbidimeters	Hach	2100N	Lab/Benchtop
	Hach	2100Q	IPS/Portable
pH Analyzers	Hach	HQ440D	Lab/Benchtop
	Hach	HQ11D	Portable
	Hach	HQ11D	Portable
	Hach	MP-6p	IPS / Portable
	Hanna	Hi98127	Portable
Conductivity Meter	Hach	HQ440D	Lab/Benchtop
	Hach	MP-6p	IPS / Portable

Toc Analyzer	GE	Sievers 5310C	Lab/Benchtop
Organics Analyzer	Hach	DR5000	Lab/Benchtop
Chlorine Residual Analyzers	Hach	DR5000	Lab/Benchtop
	Hach	DR890	Portable
	Hach	DR890	Portable
	Hach	DR890	Portable
Salinity	Hach	MP-6p	IPS / Portable
Hypochlorite Test Kit	Hach	CN-HRDT	Lab/Benchtop
Hardness Test Kit	Hach	HA-4P	Lab/Benchtop
Temperature	Oaktron	Acorn Temp 5	Portable
	Hach	HQ440D	Lab/Benchtop
	Hach	HQ11D	Portable
	Hach	HQ11D	Portable
	Hach	MP-6p	IPS / Portable

Instrumentation

DWSP plant utilizes instrumentation to continuously monitor and control the treatment process. Bacteriological sampling and testing required for reporting purposes is done by the Stockton Wastewater Treatment Facility. All on-site monitoring and sampling is performed only to ensure the plant is obtaining treatment standards with the exception of turbidity, which is also used for reporting purposes. There are five different analytical instruments used to continuously monitor the treatment process.

Turbidimeters

Turbidimeters measure the "clarity" or amount of suspended matter in the water. Thus, they are used as an indicator of the treatment process' effectiveness. The measurement is made by shining a light into a sample and measuring the amount of light scattered by the particles within. Turbidity readings are made in Nephelometric Turbidity Units (NTU). The turbidimeters are calibrated monthly (Individual filters quarterly) with formazine solution.

Turbidity is monitored throughout the treatment process. Raw water turbidity is monitored continuously with a Hach Surface Scatter 7. Surface scatter turbidimeters are used due to the wide range of raw water turbidity.

In addition, Hach turbidimeters (1720E) are used to continuously monitor Membrane Combined Filter Effluent (Filtrate), Settled Water (Feed Water), Reclaimed Water and Individual Filter Effluent. The staff seeks to maintain <0.10 NTU CFE turbidity at least 95% of the readings never to exceed 0.5 NTU. Effluent turbidity is logged in the computer at minimum every 15 minutes with four hours intervals recorded daily and reported to the state monthly. The average of these entries is used to determine the plant's daily treated water turbidity.

A Hach 2100N turbidimeter is used daily to verify all online turbidimeters except individual filters which are verified weekly using the Hach Quick Check-FT660Sc.

pH Analyzer

pH is sampled at various points to control the treatment process. Monitoring raw water pH helps optimize coagulation. The optimum pH for coagulation is between 5.5 and 7.5. However, the addition of ACH (coagulant) could lower the water's alkalinity. This in turn could adversely affect the pH. Soda Ash can be added to raise the pH lowered by the addition of ACH. This keeps the pH at an optimum level between 8.5 and 9.0.

The filter effluent pH is used to compute disinfection contact time or the CT value. The effectiveness of chlorine as a disinfectant improves with lower pH. Therefore, the CT value decreases as the pH increases.

The pH is analyzed at the raw water inlet and finished water using an Hach SC200 pH sensor and is recorded into the SCADA system at minimum every 15 minutes.

Streaming Current Monitor

Coagulation and flocculation is a charge neutralization process. Colloidal solids in raw water or sludge normally have a negative surface charge which causes them to repel each other. This is what keeps them in suspension and does not allow them to settle in a reasonable period of time. The Streaming Current Monitor (SCM) measures this process by converting the charge to a value.

The addition of positively charged chemicals, such as ACH, partially neutralizes these charges which allows "attractive forces" (kind of like gravity) to overcome the repelling forces. The solids now begin to come together *(coagulate)* and grow in size. The DWSP plant will create "Pin Floc" allowing the membrane system to effectively filter the larger particles.

The operators, in conjunction with tradition jar testing, will use the SCM as a tool to optimize coagulation and set target values to maintain plant proficiency. Jar Testing is performed periodically to ensure optimal SCM value.

Conductivity Analyzer

The conductivity (or specific conductance) of an electrolyte solution is a measure of its ability to conduct electricity. The SI unit of conductivity is siemens per meter (S/m). Conductivity measurements are used routinely in many industrial and environmental applications as a fast, inexpensive and reliable way of measuring the ionic content in a solution. Conductivity has a strong correlation to the TDS in the water and is an acceptable way to estimate the TDS.

Raw water is continuously monitored for conductivity using an Hach SC200 online sensor. Data is recorded at a minimum every 15 minutes.

Residual Chlorine Analyzer

Residual chlorine analyzers measure the amount of chlorine remaining after contact time in the clearwell. Under normal conditions, a residual entering the clearwell of 0.9 to 2.2 mg/L will ensure that not less than 0.2 mg/L is maintained throughout the distribution system. The dose at this point is minimized to deter formation of Trihalomethanes (THMs). Chlorine is added to the filter effluent to provide disinfection contact time (CT value) required for treatment and to obtain a residual in the distribution system.

The plant uses Chemtrac CR5300 Chlorine Analyzers to continuously monitor residuals. The filter effluent residual chlorine analyzer monitors the concentration of chlorine entering the clearwell. The disinfection contact time is provided in the clearwell after which the distribution chlorine analyzer measures the residual. The distribution analyzer is used to determine the CT value and measure the residual entering the distribution system. Data is recorded at a minimum every 15 minutes.

A DPD method using Hach DR890 or a Hach DR6000 Spectrometer is used daily to verify the chlorine residual readings from the online analyzers.

Maintenance

The instruments are cleaned and calibrated monthly or by manufacture's recommendation to maintain accuracy. Grab samples are used daily to check process instrumentation and to measure parameters not otherwise tested with online instrumentation. The minimum sampling and calibration frequency is shown in the table below:

Sample	Grab Sample	Calibration
Temperature	Daily	Monthly
pH	Daily	Monthly
Chemical Doses	Daily	Monthly
Alkalinity	Daily	Monthly
Individual Filter Turbidity	Weekly	Monthly
Combined Filter Turbidity	Daily	Monthly
Chlorine Residual	Daily	Monthly

All calibration records are maintained at the DWSP plant.

13. Giardia and Virus Inactivation Requirements

The water treatment plant is designed to provide reliable disinfection (inactivation) and removal of microbial contaminants (i.e. virus, Cryptosporidium, Giardia). The plant will provide the maximum removal of microbial contaminants required by Division for "impaired" water sources. This is 5-log (99.999 percent) removal/inactivation of virus, 4-log (99.99%) removal/inactivation of Giardia, and 2-log (99%) removal/inactivation of Cryptosporidium.

Per Division's request, the City sampled for Cryptosporidium at the Delta intake and WID supply locations. The sampling began in June 2010. The sampling yielded the following results:

- No Cryptosporidium was detected in sampling of the WID source in two locations between June and October 2010. The WID supply was off-line between November and April.
- No Cryptosporidium was detected in sampling of the Delta intake location in 2010.
- Cryptosporidium was detected at low levels in sampling of the Delta intake location in the first four months of 2011.
- Twenty samples were taken at the Delta intake location. The arithmetic mean of these individual samples was 0.047/L.
- The arithmetic mean value of 0.047/L supports the Bin 1 classification.

Log Removal/Inactivation Credits

Treatment Process	Potential Log removal/inactivation credit		
	Giardia	Cryptosporidium	Viruses
Membrane Filtration	4.0	4.0	At least 1-log
Treated Water Free Chlorine Disinfection	0.5-1.0	-	>>4
Total	4.5-5	4	>>4
Requirement	4	2	5

14. Operations Plan

The SWTR requires that all treatment facilities be operated in accordance with an approved operations plan that enables the operators to produce the optimal water quality from the treatment process. The operations plan was submitted by the City as a separate report to Division in 2012. The operations plan includes the staffing plan and requirements, the process controls, startup and shutdown, monitoring and reporting, preventative maintenance, standard operating procedures, and the emergency response plans.

The City shall review the operations plan on an annual basis to ensure all the included information is correct. If operation procedures, equipment, or any other components of the plant has changed, the City shall submit a revised operations plan to the Division.

The City shall also develop and maintain an operations plan for the chloramination facilities. A draft operations plan dated May 2014 has already been provided to DDW.

15. Sequestration

Status of City's eight wells that exceeded secondary maximum contaminant levels for iron or manganese has been changed from active to standby or inactive and therefore currently no sequestering is practiced at any of the City's active wells. In case of emergencies, if the City needed to use any of these standby wells then the City is required to provide public notification and also notify the Division.

D. DISINFECTION

1. Chlorination:

The City chlorinates the well water since it is mixed with the surface water, which needs to have detectable levels of chlorine residual. Chlorine is fed at doses adequate to keep free chlorine residual of 0.2 ppm at the far ends of the distribution system. The City presently uses gaseous chlorine for disinfection of well water. At some of the sites the City is feeding chlorine at the bowls. The gas chlorination system at each well site include a Wallace and Tiernan dual scale, Scaletron scale or Capital Controls Model 1362 scale, one or two Superior CL-1 chlorinators, one or two 150 pound chlorine cylinder(s), and a booster pump. None of the chlorination systems has automatic cylinder switchover features; therefore, the cylinders at all stations have to be manually replaced before becoming empty. The chlorination systems are kept in a fiberglass reinforced plastic enclosures with vent fans, and heating elements, with the exception of a few locations where a metal housing is provided or a separate room is available. A majority of the chlorination systems have chlorine gas detectors and alarms. The chlorination system operation is tied to the well pump operation via a contact switch located under the arm of the weighted or spring loaded check valve. When the check valve is in closed position, the contact in the switch is open thus deactivating the booster pump and vice versa.

The chlorination at the DWSP plant is used for pre-treatment of raw water entering the plant upstream, basin shocking of the flocculation/sedimentation basins, disinfection of the filtered water added upstream and downstream of the treated water storage, and for cleaning of the membranes

See Section 11.3 above for information about the chlorination system being used at the DWSP plant.

2. Chloramination

Currently all the surface water and groundwater supplies use free chlorine as the residual disinfectant in the distribution system.

The City is proposing to change the residual disinfectant from free chlorine to monochloramine in the North System only. Chloramination will provide two major benefits in the North System:

- Reduce the concentrations of halogenated disinfection byproducts (e.g., trihalomethanes and haloacetic acids)
- Provide a more persistent and stable disinfectant residual in storage tanks and areas of the North System with extended water ages or reduced flows

The chloramine conversion is scheduled to occur this year (2015) and will consist of the addition of aqua ammonia to chlorinated waters at the facilities identified below. Chloramination locations and datasheets can be found in Appendix F.

2.1 DWSP Water Surface Water Treatment Plant

The DWSP plant has a design capacity of 30 MGD supplying the North Stockton water system. Influent water undergoes ozone oxidation and disinfection, membrane filtration with free chlorine added as a residual disinfectant. DWSP is designed to provide a 4-log removal of Cryptosporidium, 4-log removal of Giardia and a 1-log removal of viruses via membrane filtration. The residual disinfection system provides up to 0.5-log removal of Giardia and 4-log removal of the viruses out of the total.

Aqua ammonia storage/feed equipment was installed at the DWSP WTP, but free chlorine has been used exclusively as the residual disinfectant since the plant was commissioned approximately two and a half years ago. Aqua ammonia will be added to the treated (chlorinated) water before it is pumped into the North System.

Aqua ammonia facilities have been constructed to provide a chloramine residual (at a ratio of 5:1 $(Cl_2{:}NH_3)$. The sodium hypochlorite system consists of 3 storage tanks, six metering pumps, two transfer pumps and static mixers at the injection points into the Treated Water Line. The aqua ammonia system consists of one storage tank, three metering pumps and an ammonia vent scrubber. Design criteria and the layout of the DWSP disinfection system are shown below:

Sodium Hypochlorite		
	Units	**Value**
Residual Chlorine Design Dose		
Minimum	mg/L	0.5
Average	mg/L	1
Maximum	mg/L	2
Feed System Requirements		
Minimum	gph	1
Average	gph	2
Maximum	gph	20.9
Storage Tanks	No.	3
Storage Capacity (Per Tank)	Gallons	10,000
Days of supply @ avg. dose	Days	34
Aqua Ammonia		
	Units	**Value**
Design Dose		
Minimum	mg/L	0.4
Average	mg/L	0.44
Maximum	mg/L	0.67
Feed System Requirements		
Minimum	gph	0.6
Average	gph	2.1
Maximum	gph	4.8
Storage Tank	No.	1
Storage Capacity (Per Tank)	Gallons	7,700
Days of supply @ avg. dose	Days	47

2.2 North Stockton Pipeline Ammonia Facility (NSPAF)

New Melones and New Hogan Reservoir water is treated by, and imported from the SEWD. Water is delivered through a 48-inch North Stockton Pipeline, with the NSPAF designed and built to inject aqua ammonia into the line. The NSPAF has been constructed next to the existing River Bend and Calaveras River Stormwater Pump Station and is awaiting startup. Flow varies seasonally and daily based on the availability and management of the City's water supplies; and typically range between 5 and 45 MGD. The NSPAF is located at the site of the existing Riverbend Stormwater Pump Station.

The NSPAF has been designed and built to deliver ammonia to the chlorinated treated water in the North Stockton Pipeline. Mixing in the line will form a chloramine, and providing disinfection residual. Process equipment is housed in a 20-foot x 30-foot building, with an injection vault built around the North Stockton Pipeline. The ammonia injection system includes an ammonia storage tank, vent scrubber, aqua ammonia metering pumps, carriage water pumps, water softening system, chlorine analyzers and instrumentation.

Stockton Ammonia Facilities - NSPAF Aqua Ammonia Design Criteria	
Criteria Description	**Present Scenario**
Feed Point(s) and Function	
Minimum Chemical Feed Requirements	
Dosage (mg/L)	0.12
Minimum SEWD Pipeline Flow Rate (MGD)	6
Feed Rate (lb./day)	6.0
Solution Feed Rate (gpd)	4.1
Solution Feed Rate (gph)	0.17
Average Chemical Feed Requirements	
Dosage (mg/L)	0.22
Average SEWD Pipeline Flow Rate (MGD)	15.5
Feed Rate (lb./day)	28.7
Solution Feed Rate (gpd)	19.5
Solution Feed Rate (gph)	0.8
Maximum Chemical Feed Requirements	
Dosage (mg/L)	0.5
Maximum WTP Flow Rate (MGD)	25
Feed Rate (lb./day)	104
Solution Feed Rate (gpd)	71
Solution Feed Rate (gph)	3.0
Storage Tank(s)	
Number of Storage Tanks	1

Stockton Ammonia Facilities - NSPAF Aqua Ammonia Design Criteria	
Criteria Description	**Present Scenario**
Feed Point(s) and Function	
Capacity required (gallons)	586
Selected Storage Tank Capacity (gallons)	1,300
Number of Days of Storage Available At	
Minimum Pipeline Flow Rate & AA dose	318
Average Pipeline Flow Rate & AA dose	67
Maximum Pipeline Flow Rate & AA dose	18
Feed Equipment	
Number of Metering Pumps	2
Maximum Capacity per Pump (gph)	5.0
Turndown of High : Low Feed Rates For Selected Metering Pumps	29.4
Total Pumping Capacity with Largest Pump Out of Service (gph)	5

The SCADA system includes alarms for ambient ammonia leaks, high and low level in the ammonia feed tank as well as fault warnings for the metering pumps. Alarms are displayed locally, as well as at the City's existing SCADA system. The facility has a Free Chlorine and redundant Total Chlorine analyzers tied to the control system; adjusting the aqua ammonia flow rate accordingly. Two identical metering pumps are installed, with one in operation and one on standby in case of failure. Similar to the DWSP, a flow meter is installed on the aqua ammonia line, tied to the control loop adjusting the pumps' speed and stroke volume, based on the treated water flow rate and chlorine concentration in the water. Two carriage water pumps are provided, with one in operation and one in standby, enabling redundant chloramine mixing capabilities.

2.3 Groundwater Wells Nos. 3-R, 10-R, 29, 30, 31, and 32

The City of Stockton operates 13 active groundwater wells and two standby wells in the North Stockton Water System. Wells Nos. 3-R, 10-R, 29, 30, 31 and 32 were built between 1977 and 2011, and housed in 24-foot by 24-foot structures. Each well system houses a vertical turbine pump, discharging into a 12-foot line. Existing facilities include chlorine gas storage and injection, a carriage water pump, and electrical system.

Well No.	Capacity (gpm)	Pump (hp)	Generator
3-R	2,000	200	Yes
10-R	2,500	200	No
29	3,200	200	Yes
30	2,200	200	Yes
31	2,000	200	Yes
32	2,000	200	Yes

Ammonia injection facilities have been being constructed at Wells Nos. 3-R, 10-R, 29, 30, 31, and 32. Aqua ammonia blends with chlorine, which is injected into the well discharge line, creating a chloramine residual. Each well system consists of an aqua ammonia storage tank, vent scrubber, chemical metering pumps, carriage water pumps, water softening systems, analyzers, electrical, instrumentation and control systems. System design criteria are presented below:

Ammonia storage and feed system		250 gallon vertical steel tank; 10 gallon scrubber tank; two 1.0 gph metering pumps;					
Ammonia chemical		19% aqueous ammonia; specific gravity: 0.93					
Ammonia injection carriage water system		3/4 hp (5-10 gpm) pump, 1-inch piping; twin-tank water softeners; brine tank to automatically regenerate water softeners					
Chlorine:Ammonia Ratio		4:1-5:1					
Chlorine residual	Min	0.7	mg/L				
	Average	1.0	mg/L				
	Max	2.0	mg/L				
Ammonia dose	Min	0.14	mg/L				
	Average	0.25	mg/L				
	Max	0.67	mg/L				
Ammonia metering pump capacity		1.0	gph				

The SCADA systems includes alarms for ambient ammonia leaks, high and low level in the ammonia feed tank as well as fault warnings for the metering pumps. Alarms are displayed locally, as well as at the City's existing SCADA system. Backup power for each well system is provided by an onsite generator (with the exception of 10-R). Free and Total Chlorine as well as pH and Temperature are monitored with in-line analyzers. Aqua ammonia is supplied through dual metering pumps; one in operation and the other in standby. The flow rate of aqua ammonia is manually calibrated by plant staff, based on the observed chlorine concentration in the treated water. Flow totalizers are installed on the metering pumps, ensuring sufficient ammonia is being added to the well water stream. Two carriage water pumps are provided, with one in operation and one in standby, enabling redundant chloramine mixing capabilities.

2.4. Groundwater Wells Nos. 19, 21, 25, 26, 27, and 28

Wells Nos. 19, 21, 25, 26, 27 and 28 were constructed prior to 1997.

Well No.	Capacity (gpm)	Pump (hp)	Generator
19	2,000	200	No
21	2,000	200	No
25	2,200	200	No
26	2,400	200	No
27	2,000	200	No
28	2,000	200	Yes

The City is also currently advancing the design of new aqua ammonia facilities for Wells Nos. 19, 21, 25, 26, 27, and 28. The City anticipates that new ammonia facilities at these well sites will be constructed one to two wells per year beginning in 2015. The construction at Wells Nos. 21, 25, 26, and 27 is expected to be completed by the end of 2015. Wells Nos. 19 and 28 are planned to be equipped with the ammonia facilities in 2016/2017 fiscal year.

Aqua ammonia processes have been designed for Groundwater Wells Nos. 19, 21, 25, 26, 27, and 28. Similar to the other wells with ammonia facilities, these units will be provided with an aqua ammonia storage tank, vent scrubber, chemical metering pumps, carriage water pumps, water softening systems, analyzers, electrical, instrumentation and control systems. The existing facilities housing the wells and chlorine systems are not large enough to accommodate the new aqua ammonia processes; new pre-fabricated buildings will be built. The design criteria for the aqua ammonia systems are shown below:

Ammonia storage and feed system		250 gallon vertical steel tank; 10 gallon scrubber tank; two 1.0 gph metering pumps;						
Ammonia chemical		19% aqueous ammonia; specific gravity: 0.93						
Ammonia injection carriage water system		3/4 hp (5-10 gpm) pump, 1-inch piping; twin-tank water softeners; brine tank to automatically regenerate water softeners						
Chlorine:Ammonia Ratio		4:1-5:1						
Chlorine	Min	0.7	mg/L					

residual	Average	1.0	mg/L				
	Max	2.0	mg/L				
Ammonia dose	Min	0.14	mg/L				
	Average	0.25	mg/L				
	Max	0.67	mg/L				
Ammonia metering pump capacity		1.0	gph				

The SCADA systems is designed with alarms for ambient ammonia leaks, high and low level in the ammonia feed tank as well as fault warnings for the metering pumps. Alarms are displayed locally, as well as on the City's existing SCADA system. Free and total chlorine as well as pH and temperature will be monitored with in-line analyzers. Dual aqua ammonia metering pumps are designed, with one in operation and the other in standby. The flow rate of aqua ammonia is to be manually calibrated by plant staff, based on the observed chlorine concentration in the treated water. Flow totalizers are installed on the metering pumps, ensuring sufficient ammonia is added to the well water stream. Two carriage water pumps are designed, with one in operation and one in standby, enabling redundant chloramine mixing capabilities. A backup generator will be constructed at Well 28.

3. Proposed Pre- and Post-Conversion Monitoring Plan

Monitoring drinking water constituents is needed to determine the efficacy of the current and proposed disinfection systems. Pre-conversion testing is needed to develop baseline water quality parameters. Post-conversion testing will be undertaken to ensure that the new chloramination systems provide pathogen removal and to prevent the production of disinfection byproducts. Excess ammonia which does not react with free chlorine may be metabolized by Ammonia Oxidizing Bacteria. This produces nitrite, a contaminant regulated by the Division. Therefore it is necessary to monitor the distribution system to ensure that this and other regulated constituents are not being produced.

3.1 Pre-Conversion Monitoring

As required by Division, weekly samples were taken from 13 sample points in the distribution system, 5 reservoirs, as well as the SEWD and DWSP water treatment plants. Warm water weekly testing was completed in September of 2013, and cold water pre-conversion testing was completed in January of 2014. The results of the pre-conversion testing may be seen in the updated 2014 technical report for the plant prepared by CDM Smith. The distribution system testing schedule and constituents of concern are shown in Table 3-1 below. Table 3-2 documents the distribution system testing locations. The testing schedule and constituents of concern for the DWSP and SEWD water treatment plants are shown in Table 3-3.

Table 3-1. Distribution Chloramine Conversion Monitoring Program

Test	Location	Frequency
Total Trihalomethanes	DBP Sample Points & 5 Reservoirs	Quarterly
Coliform Bacteria	DBP Sample Points & 5 Reservoirs	Weekly
Heterotrophic Plate Count	DBP Sample Points & 5 Reservoirs	Weekly
Free Chlorine Residual	DBP Sample Points & 5 Reservoirs	Weekly
Combined Chlorine Residual	DBP Sample Points & 5 Reservoirs	Weekly
Temperature	DBP Sample Points & 5 Reservoirs	Weekly
Turbidity	DBP Sample Points & 5 Reservoirs	Weekly
Odor (TON)	DBP Sample Points & 5 Reservoirs	Weekly
Taste	DBP Sample Points	Weekly
pH	DBP Sample Points & 5 Reservoirs	Weekly
Nitrite	DBP Sample Points & 5 Reservoirs	Weekly
Lead and Copper	Existing distribution system lead and copper sites	At least once

Table 3-2. Chloramine Conversion Plan Monitoring Points

DBP Sample Points Reservoirs	Reservoirs
3131 Auto Center Cir Northwest 1	Northwest 1
9498 Glacier Point Northwest 2	Northwest 2
142 Marilyn Northwest 3	Northwest 3
8420 Galloway Dr. Fourteen Mile 1	Fourteen Mile 1
1415 Chelsea Fourteen Mile 2	Fourteen Mile 2
10481 River Oaks	
5703 Westchester	
3102 Valley Forge	
7339 Parkwoods Dr.	
5376 Feather River	
4046 Pine Lake Cir	
2161 Canyon Creek	
5151 Pacific (Delta College)	

Table 3-3. DWSP/SEWD Water Treatment Plants Chloramine Conversion Monitoring Program

Test	Location	Frequency
Total Trihalomethanes	Finished Water	Quarterly
Coliform Bacteria	Raw & Finished Water	Weekly
Heterotrophic Plate Count	Raw & Finished Water	Weekly
Free Chlorine Residual	Finished Water	Weekly
Combined Chlorine Residual	Finished Water	Weekly
Temperature	Finished Water	Weekly
Turbidity	Finished Water	Weekly
Odor (TON)	Finished Water	Weekly
Taste	Finished Water	Weekly
pH	Finished Water	Weekly
Nitrite	Raw & Finished Water	Weekly
Ammonia Nitrogen	Finished Water	Weekly

3.2 Post-Conversion Monitoring

Once chloramination conversion has been completed, weekly testing as listed in the table above will be required as long as chloramination is practiced, per Division requirements.

4. Initial Chloramination of North Stockton Distribution System

The ammonia system at the DWSP has been installed, and is ready for startup and commissioning. Construction on the North Stockton Pipeline Ammonia Facility is complete. Startup and commissioning will take place concurrently over the required one to two month period. Commissioning includes operator training, and performance testing of individual system components. Operator training has already been executed by CDM Smith personnel, and equipment vendors. The startup process includes O&M procedures for the DWSP, NSPAF and Well systems. The commissioning process includes training on the chemical metering pumps, Human-Machine interface screens and instrumentation. The startup procedures include performance tests for the static mixers, chemical feed and other process equipment as well as the electrical generators and automatic transfer switches. Once startup activities are completed, the systems will undergo a 30 day Acceptance Test, ensuring that all equipment and instrumentation are available (i.e. producing potable water per Division requirements) greater than 99.5 percent of the time. Post-Chloramination monitoring as discussed in Section 3, and will begin concurrently with the Acceptance Test. Once chloramination facilities are operational, the City will no longer use free chlorine as a disinfectant. Well production will only occur as needed to supplement the City's surface water supply.

5. Public Notification

5.1 Chloramine Conversion Public Notification

This section describes the City's outreach program to notify the public of the planned 2015 conversion from free chlorine to chloramines in the drinking water supply. Key activities for the 12-month program are described below.

The City began public outreach activities for the chloramine conversion in July 2013. Customers were notified of the changes to the disinfection process through newsletters included with their monthly water bills. Information on the upcoming conversion was posted to a dedicated page on the City's web site, and a hotline phone number was established in July 2013. The web page contains special sections for dialysis patients and aquatic pet owners. Contact has been made to several residents through the hotline. A newsletter will be included in the water bill announcing the tentative date for the conversion at least two months prior.

5.2 Dialysis Centers/Patients

Notification letters were sent to all dialysis clinics within San Joaquin County in September 2013 and January 2014. All the clinics in the area of the conversion have responded stating that they are prepared for the change. Another letter will be sent in the future notifying the clinics of the date for the conversion. The City staff met with representatives from a clinic which specializes in home dialysis. Home dialysis patients are not affected by the conversion as they receive their dialysis solution by mail in a bag and do not connect to public water systems.

5.3 Aquatic Animals

Notification letters were sent to all pet stores within the Stockton/Lodi area along with informational brochures in English and Spanish for the stores to hand out to customers in October 2013. In addition, a letter and brochure were sent to businesses which keep live seafood such as bait shops and Asian markets. The City will continue to notify the public on regular basis by adding necessary language about the chloramines in the annual Consumer Confidence Report (CCR) and via City's website. A letter will be sent in the future notifying the businesses of the date of the conversion.

6. Nitrification Response Plan for the North System

Nitrification is a microbiological process by which reduced nitrogen compounds (primarily ammonia or NH_3), are sequentially oxidized to nitrite (NO_2^-) and nitrate

(NO_3^-). Nitrification can be problematic in potable water systems that use chloramines for residual (secondary, or distribution system) disinfection.

The City has already prepared a Nitrification Response Plan.

For the North System, operators will have varying degrees of control over the chloramine residual for the three sources of supply:

- Delta Water Supply Project Water Treatment Plant: Control of the chlorine doses, application points and residuals (typically 2.0 to 2.5 mg/L as chloramines); and control of ammonia application to the treated water (i.e., Cl_2:NH_3-N).
- North Stockton Pipeline Ammonia Facility: No control of chlorine doses in water treated by the Stockton East Water District (SEWD) with free chlorine residuals typically ranging from approximately 0.7 to 1.0 mg/L; and control of ammonia application at the NSPAF (i.e., Cl_2:NH_3-N).
- North System Wells: Control of chlorine doses and residuals typically limited to approximately 0.8 mg/L; and control of ammonia applications (i.e., Cl_2:NH_3-N) at the wells.

When loss of disinfectant residual or any unusual change in water quality occurs in a chloraminated system, operators must determine if the cause is nitrification and respond in an effective manner.

6.1 Monitoring and Identification of Nitrification

For one month before and continuously after the conversion from free chlorine to chloramines, operators will be collecting weekly water quality samples at the DWSP WTP, treated water reservoirs, pipeline connecting the SEWD supply to the North System and other locations throughout the North System. The chloramine monitoring program was approved by the Division and is provided in Section 3 above.

The chloramine monitoring program requires sampling in addition to the routine distribution water quality sampling required for the Total Coliform Rule and the periodic sampling for the compliance with regulations for disinfection and corrosion byproducts. The monitoring program provides a baseline for water quality before the conversion, and allows the City to monitor changes, develop a baseline for water quality after the conversion, identify potential nitrification episodes, and measure the effectiveness of corrective actions.

Identification of nitrification in the distribution system includes:

- Low total chlorine residual
- High nitrite concentration
- High free ammonia concentration
- Low free ammonia concentration
- Increased nitrate concentration
- High HPC (heterotrophic plate count) counts
- Low pH
- Increased temperature (not a direct indicator of bacterial activity, but some systems may use it as an indicator of nitrification potential and alter operations, e.g., summer versus winter operation)

Interpreting water quality data to determine if nitrification is or will occur can be difficult for systems with limited operating history with chloramines. Operators can refer to table below for examples of water quality characteristics typical of various stages of nitrification. For the North System, operators can anticipate variability in chlorine residuals, temperature, pH, TDS, TOC, and other characteristics due to the different sources, treatment practices, and seasonal or storm event changes inherent to the system.

Examples of Water Quality Characteristics of Various Stages of Nitrification

Parameter	Background (No Nitrification)	Beginning of Nitrification	Incomplete Nitrification (NOB not active)	Complete Nitrification (NOB active)
Total chlorine (mg/L Cl_2)	>1.5	0.5-1.5	<0.5	0
Nitrite (mg/L N)	0-0.010	0.010-0.050	>0.050	0
Free ammonia (mg/L N)	0-0.1	>0.1	0	0
HPCs R2A (cfu/mL)	<500	1,000	>1,000	>1,000
Temperature (°C)	<15	15-20	15-20	>20
pH (units)	Normal	Normal	Less than target	Less than target

Note: HPC-heterotrophic plate count; NOB-nitrite-oxidizing bacteria.

6.2 Determining the Causes of Nitrification

After it has been determined that nitrification is occurring, it is important to respond in a timely and effective manner. However, to prevent, or at the very least minimize, recurring nitrification, it is also important to identify the cause of the nitrification. Determining the cause of nitrification requires utilities to examine existing data and create new data, where necessary, to assess the impacts of the following on nitrification:

- Distribution system monitoring
- Finished water quality
- Treatment plant operation
- Distribution system operation
- Storage tank and reservoir management
- Infrastructure (distribution piping)

6.3 Nitrification Alert and Action Levels

The development of nitrification alert and action levels will help operators understand the potential that nitrification will occur or is occurring in the North System, and the urgency in which to implement additional monitoring and/or corrective actions. Changes in raw water supplies and/or quality, treatment practices, distribution system operations and infrastructure create suggest that the City develop unique alert and action levels. Considerations for these levels include but are not limited to:

- Raw water supplies, quality and variability
- Treated water quality and variability
- Regulatory standards
- Size and complexity of the distribution/storage system
- Infrastructure materials, condition and water age
- Monitoring and operational capabilities
- Operations and maintenance practices
- Operating history with free chlorine and chloramines

The Table 6-1 presents preliminary alert and action levels developed for the North System based on experience of other California utilities that apply chloramines as residual disinfectant to waters of similar quality. These suggested values are intended to be used only as a guide, while the City further develops a historical database of system-specific water quality characteristics, operating conditions and operational procedures.

As discussed previously, operators can anticipate variability in chlorine residuals, temperature, pH, TDS, TOC, and other characteristics due to the different sources, treatment practices, and seasonal or storm event changes inherent to the North System. Therefore, the City must continually assess the water quality and operating conditions during the initial months and years following the conversion to chloramines, and periodically update the alert and action levels to enhance operations and water quality.

Table 6-1. Preliminary Nitrification Alert and Action Levels

Parameter	Target at Reservoir Inlets	Target at TCR Sampling Stations	Action Level 1 (Alert Level)	Action Level 2 (Operational Responses Required)
Total chlorine (mg/L)	>0.80	>0.80	<0.50	<0.20
Nitrite-N (mg/L)	<0.01	<0.01	>0.02	>0.03
HPC-R2A (cfu/mL)	<100	<100	>100	>200
Free ammonia-N (mg/L)	<0.10	<0.15	>0.15	>0.20

Note: cfu-colony-forming units; HPC-heterotrophic plate count; TCR-Total Coliform Rule.
*Use 1.0 for TCR sampling stations representative of low flow in the pipes.
†Not applicable. Assumes free ammonia-N has been converted to nitrite-N.

When there is indication that nitrification is occurring or that conditions are right for nitrification to occur, it is important to respond in a timely manner. Delaying response can result in further deterioration of water quality. However, it is also important that a response be well planned and coordinated to prevent spreading the problem and exacerbating the effects of nitrification. It is equally important for the response to be effective. In instances when the first response is ineffective, it is critical to understand the causes of nitrification and the possible reason(s) the response may not have been effective. It is counterproductive to repeatedly apply measures that do not result in long-term solutions to nitrification (e.g., increasing chloramine in a nitrifying tank without improving turnover rates or to repeatedly breakpoint chlorinate an area of the system without taking steps to reduce water age in that area of the system).

7. Reliability Features

With the goal of providing a safe supply of potable water for City of Stockton residents, this section describes the reliability features of the proposed chloramination systems. These components of the design allow for a consistent production of chloraminated water in the event of mechanical, electrical or control failures.

- The PCS enables operators to run the plant in manual or automated control. Process alarms wired through the PCS include process start/stop, and mechanical fault, and items involving personnel safety.
- The DWSP has a 2,000 kW generator providing backup power, programmed to automatically start up in the event of a power failure. Uninterruptible power

supplies systems are in place to power PLCs and other process control equipment.

- DWSP has in-line chlorine analyzers monitoring the residual before and after the Treated Water Reservoir.
- The aqua ammonia flow rate is measured through a flow meter. This is part of a control loop adjusting the pump speed and stroke volume, based on the plant flow rate and respective ammonia concentration in the treated water stream.
- Three trains of sodium hypochlorite are designed to provide a residual disinfectant. Each train has a pair of chemical injection pumps, one duty and one in standby.
- The aqua ammonia system has three metering pumps, with two in operation and one in standby.

E. SURFACE WATER TREATMENT RULE REQUIREMENTS AND COMPLIANCE

1. Surface Water Treatment Rule Reduction and Inactivation Requirements

The Surface Water Filtration and Disinfection Treatment Regulations (SWTR) require a minimum of 99.9% (3.0 log) reduction of *Giardia* cysts and 99.99% (4.0 log) reduction of viruses through filtration and disinfection for sources in which the median coliform levels are less than or equal to 1,000 MPN/100mL of total coliform and 200 MPN/100mL of fecal coliform. For sources exceeding the 1,000 MPN/100 mL total coliform levels and/or 200 MPN/100 mL fecal coliform levels, a higher level of treatment is required. A recent summary, from January 2014 through December 2014, of the raw water total coliform and E. coli levels is included below:

Monthly Total Coliform and E. Coli Levels

Delta					
Date	**Total Coliform (MPN/100 ml)**			**E. Coli (MPN/100 ml)**	
	Min	Max		Min	Max
01/2014	131	>2419		<1.0	12.0
02/2014	62.7	1413		<1.0	14.4
03/2014	offline	offline		offline	offline
04/2014	offline	offline		offline	offline
05/2014	offline	offline		offline	offline
06/2014	offline	offline		offline	offline
07/2014	>2,419	>2,419		1.0	18.5
08/2014	1,199	>2,419		1.0	21.6

09/2014	387	>2,419		1.0	20.9
10/2014	1,413	>2,419		1.0	31.3
11/2014	1,299	>2,419		4.1	27.9
12/2014	1,986	>2,419		8.5	83.6

WID					
Date	**Total Coliform (MPN/100 ml)**			**E. Coli (MPN/100 ml)**	
	Min	Max		Min	Max
01/2014	offline	offline		offline	offline
02/2014	offline	offline		offline	offline
03/2014	>2,419	>2,419		3.1	209.8
04/2014	>2,419	>2,419		290	>2,419
05/2014	>2,419	>2,419		14.2	231
06/2014	1,732	>2,419		6.3	547.8
07/2014	>2,419	>2,419		31.1	191.8
08/2014	1,986	>2,419		3.1	686.7
09/2014	>2,419	>2,419		3.0	>2,419
10/2014	1,413	>2,419		13.4	85.7
11/2014	offline	offline		offline	offline
12/2014	offline	offline		offline	offline

Since the average monthly coliform concentrations exceed 1,000 MPN/100mL, the minimum level of treatment that is required for the Delta and WID source is a 4-log reduction of *Giardia* cysts, and a 5-log reduction of viruses through filtration and disinfection.

A 0.5-log reduction of *Giardia lamblia* shall be maintained through the disinfection process at the plant. Verification of the *Giardia lamblia* log reduction shall be demonstrated by calculating the CT achieved immediately following the 4.0 MG clearwell.

2. Treatment Plant Optimization

The Division has credited the Siemens (L20N) membrane technology with 4-log *Giardia lamblia* removal, 4-log Cryptosporidium removal, and 0.5-log virus removal credit. At all times, the City shall treat its raw water supply to reliably provide a minimum total reduction of 4-log *Giardia lamblia* and 5-log viruses through the filtration and disinfection processes. The treatment requirements and removal credits are summarized below:

Treatment Requirements and Removal Credits	
Total Reduction Requirements Through Filtration and Disinfection	4-log *Giardia 5-log virus*
Assigned Removal Credit for Siemens Membranes (L20N)	4-log Giardia 0.5-log virus
Disinfection (CT) Inactivation Requirements	**0.5-log Giardia 4.5-log virus**

The Siemens (L20N) membrane technology will receive the above mentioned removal credits provided that the following performance standards are met:

Performance Standards
CFE 0.1 NTU 95% of the time
CFE never > 0.5 NTU at any time

The combined plant effluent turbidity shall be 0.1 NTU or less in at least 95 percent of the readings every month and shall not exceed 0.5 NTU at any time. If there is a failure with the continuous turbidity monitoring system or interruptions due to system maintenance, the City shall conduct grab sampling no less than once every hour in lieu of continuous monitoring. However, continuous monitoring shall be reinitiated for the combined filter effluent within 48 hours of turbidity monitoring system failure or maintenance interruption.

The SWTR performance standards for disinfection require a minimum disinfectant residual greater than or equal to that required to meet the minimum inactivation requirements. The point at which the DWSP plant must comply with this requirement is at the point of discharge from the clearwell to the distribution system. The City shall provide a daily chlorine residual measurement from the clearwell effluent in the WTP Monthly Summary Report. Disinfection process (CT) data must also be determined daily and reported to the Division monthly.

The SWTR also requires that the disinfectant residual of all samples collected in the distribution system shall be detectable in at least 95% of the samples taken in a month. A heterotrophic plate count of less than or equal to 500 cfu/mL is considered the equivalent of a detectable residual.

The DWSP plant has been in operation since June 2012 and the operational data show that the plant has been in compliance with the SWTR. The last 12 months of performance data is summarized in the following table:

DWSP Performance Data*

	Max	Min	Avg	01/14	02/14	03/14	04/14	05/14	06/14	07/14	08/14	09/14	10/14	11/14	12/14
Max Peak Raw Turbidity, NTU	163	8.87	42.94	8.87	30.38	66.99	54.21	25.69	18.86	27.08	40.34	39.80	19.07	21	163
Avg. Influent Turbidity, NTU	18.47	3.67	8.42	3.67	4.45	11.13	18.47	11.95	10.92	5.47	6.69	5.32	5.40	4.74	12.82
Max Peak Settled Turbidity, NTU	3.02	0.04	1.12	1.10	0.76	0.67	0.95	0.60	0.76	0.70	3.02	1.64	1.35	0.99	1.78
Avg. Influent Settled Turbidity, NTU	0.35	0.02	0.24	0.29	0.24	0.32	0.35	0.27	0.35	0.21	0.33	0.34	0.19	0.11	0.22
Max Peak Recycled Turbidity, NTU	322	2.92	40.81	9.71	5.49	4.94	56.76	4.97	2.92	9.34	4.95	5.04	6.15	57.42	322
Avg. Influent Recycled Turbidity, NTU	4.20	1.32	2.00	1.86	1.59	2.38	2.18	1.72	1.99	1.73	1.72	1.75	1.57	1.32	4.20
Max CFE Turbidity, NTU	0.11	0.03	0.05	0.04	0.07	0.03	0.04	0.04	0.04	0.11	0.04	0.04	0.04	0.04	0.07
Avg. CFE Turbidity, NTU	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
95th Percentile Turbidity, NTU	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.03
Turbidity Reduction, %	99.90	99.1	99.68	99.6	99.7	99.8	99.9	99.8	99.8	99.7	99.7	99.7	99.5	99.1	99.8
Max Raw pH	8.91	8.48	8.71	8.82	8.57	8.48	8.88	8.81	8.91	8.90	8.61	8.66	8.76	8.53	8.55
Min Raw	23.44	9.09	17.08	9.09	11.28	14.62	14.58	20.49	22.82	23.41	23.44	21.02	18.98	14.51	10.67

Temp. (°C)															
Avg. CT Ratio	9.77	3.75	6.65	3.75	4.63	4.27	4.51	4.88	7.01	9.13	9.77	7.09	6.94	9.10	8.77
Min CT Ratio	7.79	2.12	4.53	3.70	2.60	2.12	2.44	3.15	5.17	5.65	6.03	4.74	4.49	7.79	6.45

*Using Raw Water (Delta or WID), Settled Water, Recycled Water, combined SWTR, and CT monthly forms.

3. Contact Time (CT) Compliance

Disinfection credit received depends on residual concentration, water temperature, water pH, and flow rate and effective volume, which determine the minimum contact time. The City is using a baffling factor 0.20 as approved by the Division.

Water volume levels above the minimum depth calculated to meet the CT required can be used to balance variability in filtered water production rate and plant production rate. Depending on pH and temperature of the raw water source, the balancing volume available at the plant rated capacity of 30 MGD can range from a minimum of 0.4 MG (top 1.75 feet) at 5°C and a residual chlorine concentration of 0.8 mg/L, to as much as 3.5 MG (top 15.5 feet) at 25°C and a residual chlorine concentration of 1.6 mg/L. Under a typical maximum production day where pH and temperature are relatively constant, the balance volume required would typically be up to 0.4 MG. An ultrasonic level sensor in the tank measures the water level elevation. The PCS calculates the required disinfection volume and the actual volume.

A chlorine residual analyzer and pH meter are located on the outlet pipe of the reservoir. This location is a critical water quality measuring point and represents the actual chlorine residual concentration and pH in the reservoir. These measured values are used to calculate the disinfection credit. It can also be compared by the operator with the chlorine residual measurements upstream of the reservoir to identify if the chlorine feed set point needs to be adjusted. The PCS will alarm if the chlorine concentration is less than 0.8 mg/L and will alarm and shutdown the plant if the chlorine residual is 0.35 mg/L or less.

In the event disinfection capabilities need to be boosted, the operator can adjust the set points at the PCS for the ozone system and chlorine feed system. As described earlier, ozone is mainly intended for pre-treatment of taste and odor.

The only raw water properties anticipated on having significant change throughout the season is the temperature of the water (up to 20°C during the summer and as low as 5°C during the winter).

The membranes are approved for 4-log *Giardia, 4-log Cryptosporidium*, and 1-log viruses. Based on the Division's policy, even though the membranes meet the *Giardia* and *Cryptosporidium* log reduction requirements, an additional 0.5-log

Giardia and 4-log viruses inactivation with chlorine disinfection is required as a multiple barrier treatment.

Required Chlorine Disinfection CT Values

Water Condition	Temperature (°C)	Maximum Finished Water pH	Required CT Value (mg-min/L)[a]	
			0.5 Log *Giardia* Removal	4.0 Log Virus Removal[b]
Summer	20	8	14	4
Winter	5	8	36	10

(a) Reference: EPA Guidance Manual – *Disinfection Profiling Benchmarking*, Appendix C (Aug 1999)
(b) Extrapolated from CT Values for Inactivation of Virus Removal by Free Chlorine, pH 6.0 – 9.0

Equation used for calculating the achieved contact time (CT, mg/L*min) at the DWSP plant is below:

$$CT_{achieved} = \text{Chlorine Residual (mg/L)} \times F_{sc} \times V/Q$$

Where,
F_{sc} = Short Circuiting Factor (also referred to as T_{10}/T)
V = Minimum volume (gallons)
Q = Peak flow rate (gpm)

Per Division guidance, the F_{sc} was assumed to be 0.2 since a tracer study had not yet been conducted inside the clearwell.

An analysis of the last 12 months of average CT required and average CT achieved is included in the table below:

Summary of Required and Achieved CT

	Avg. CT Required	Avg. CT Achieved
01/2014	28	106
02/2014	25	117
03/2014	17	70
04/2014	15	65
05/2014	13	60
06/2014	9	65
07/2014	10	86
08/2014	10	97
09/2014	11	81
10/2014	13	91
11/2014	18	162
12/2014	22	189

The City has been provided with a CT calculator spreadsheet. The calculator must be used each day to determine that adequate CT is being provided for the specific conditions that occur on each day.

Since viruses are relatively easily inactivated by chlorine, the inactivation of the Giardia controls the conditions needed to meet the minimum inactivation requirements. Daily calculation of the CT or the CT ratio allows operators to determine if adequate disinfection is being performed. Monthly reports indicate that adequate CT is being consistently provided.

4. Long Term-2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

Based on population, the City of Stockton water system is a Schedule 1 for the implementation of the second round of the LT2ESWTR. By January 1, 2015, three months prior to beginning source water monitoring, Schedule 1 systems were required to submit to the Division a sampling schedule and description of sample location(s), and/or provide a notice stating their plan to submit grandfathered data, or a notice that they intend to provide additional treatment rather than monitor source water. In accordance with the LT2ESWTR, in December 2014, the City submitted a sampling schedule that specified the dates of Cryptosporidium, E. coli, and turbidity sample collection and the location of sampling for the initial 24 months of bi-weekly (Delta and WID) source water monitoring.

Actual sampling will begin in April 2015 at a frequency of once every two weeks as per the City's sampling schedule and will conclude in April 2017. At the end of 24-month monitoring period the City will submit a report to the Division. Based on the highest Cryptosporidium 12-month average, the raw source water will be placed in a bin to determine any additional treatment for *Cryptosporidium* beyond the 4-log.

F. CRYPTOSPORIDIUM ACTION PLAN

The Cryptosporidium Action Plan provides for increased turbidity goals, increased alarm and public notification requirements, and more frequent sanitary survey updates. Given that Cryptosporidium is very resistant to disinfection by chlorine, and that consistent removal of Cryptosporidium is the only reliable barrier for the protection of public health, every effort should be made to optimize the coagulation and sedimentation processes for the removal of Cryptosporidium, per 63 Federal Register § 69482 (December. 16, 1998).

Below is a summary of the design features incorporated into the Stockton DWSP plant to meet the objectives of the California Cryptosporidium Action Plan Goals.

Summary of DWSP Cryptosporidium Action Plan Goals

Goal	Design Features for Compliance
Filtered Effluent Turbidity ≤ 0.1 NTU 95% of the time	Siemens Membranes (L20N) rated for ≤0.1 NTU 95% of the time. Not to exceed 0.5 NTU.
Effluent Settled Water ≤ 2 NTU	The DWSP uses alternate filtration technology and does have a traditional sedimentation basin. The plant can remove raw water turbidity effectively.
Reclaimed Water ≤ 2 NTU	Reclaimed water turbidity is continuously monitored. Typically, the reclaimed water turbidity runs between 1 – 2 NTU. High alarm is set at 2 NTU and high-high at 20 NTU. No shut down is associated with the reclaimed water turbidity alarms.
Reclaimed Water flow rate ≤ 10 % of Raw Water Flow	There is no flow control or alarm in place to prevent flow from exceeding the 10% rate. Operators have the ability to set the reclaimed water flow rate to automatically adjust with the plant flow rate but it is not fail safe.
80% solids removal for Reclaimed Water	All reclaimed water travels through the drying basins and achieve at least 80% removal prior to returning to the plant headwork.

Currently the shift operator monitors the drying bed level via SCADA and in person and adjusts the reclaim flow accordingly. There is no flow control or alarm in place to keep the flow from exceeding 10% requirement. There is a SCADA flow mode where the operator could put in a percentage of flow, which would then calculate the desired flow against the WTP flow. It is, however, not fail safe. All of the filter backwash travels through the drying bed, before it returns to the front of the WTP, resulting in turbidity of 1-2 NTU on regular basis. The plant do have alarms (high alarm at 2 NTU and high-high at 20 NTU) associated with reclaimed water turbidity and the operators will verify it in the event of an alarm. If needed, the operator will investigate the problem and temporarily shut the system off, make outflow adjustments to try and improve effluent water quality, reduce flow if possible. Since drying bed storage is limited, complete long term shutdown of the plant typically is not an option. If the City is close to the scheduled drying bed switch, it will switch early to a new bed. In the event of a false turbidity alarm, the operators collect grab samples and manually analyze for turbidity and documents the grab readings and flush/clean sample lines and the turbidimeter.

The raw water, settled water, and recycled water turbidities for the year 2014 are summarized in the table below. These results directly relate to the Cryptosporidium action plan goals noted above.

Month	Raw Water Turbidity Average (NTU)	Settled Water Turbidity Average (NTU)	Recycled Water Turbidity Average (NTU)
01/2014	4.0	0.41	2.7
02/2014	5.1	0.32	2.1
03/2014	7.6	0.42	3.0
04/2014	28	0.48	2.6
05/2014	15	0.33	2.2
06/2014	13	0.47	2.2
07/2014	6.7	0.29	1.9
08/2014	6.5	0.47	1.9
09/2014	9.0	0.46	2.0
10/2014	4.4	0.28	2.0
11/2014	5.1	0.13	2.4
12/2014	15	0.29	18*
Average	**9.95**	**0.36**	**2.27**

*The turbidity spiked temporarily in between switching from dry basin to another.

The settled water turbidities show an average value of 0.36 NTU for 2014. The recycled water turbidities show an average value of 2.27 NTU for the year 2014. The average value is near 2.0 NTU if we disregard the December 2014 value that was not representative of the overall recycled water turbidity as seen in the previous 11 months.

G. STORAGE DATA

The City has seven active storage reservoirs in the distribution system with a total storage capacity of about 22.29 MG. All of the seven active tanks are at ground level. All storage reservoirs are constructed of steel. Five of the seven ground level tanks are located in the North Stockton system west of Interstate 5 freeway and two are located in the South Stockton system in the Weston Ranch subdivision, also located west of Interstate 5. The elevated tank in the Walnut Plant System was taken out of service and is scheduled for demolition in the near future.

The reservoirs have had Grid Bee mixers installed in 2014 to improve mixing and decrease water age, resulting in improved residuals and overall water quality. It is anticipated the mixers will reduce the potential of nitrification occurring within the reservoirs.

The ground level reservoirs in the north area are located at two locations with one location having two reservoirs and the second location having three reservoirs. The older reservoirs are called Fourteen Mile Reservoirs and the newer reservoirs are called Northwest Reservoirs. Both locations have pressure and chlorine booster stations. The storage tanks have altitude valves to control the inflow to the tanks. Each reservoir has a properly screened vent on the roof and an interior overflow pipe. The overflow pipe manifolds into the tank drainpipe downstream of the isolation valve. A summary of the active storage reservoirs in the City's water system is given below.

SUMMARY OF STORAGE TANKS

Reservoir	Material	Year Installed	Zone	Capacity
Fourteen Mile-North	Steel	1975	North	3 MG
Fourteen Mile-South	Steel	1981	North	3 MG
Northwest-North	Steel	1994	North	3.43 MG
Northwest-South	Steel	1994	North	3.43 MG
Northwest No. 3	Steel	2008	North	3.43 MG
Weston Ranch North	Steel	1990	South	3 MG
Weston Ranch South (new)	Steel	2010	South	3 MG

The pressure booster station for the Fourteen Mile Reservoirs consists of five Allis Chalmers, horizontal splitcase, and centrifugal pumps. Two of the five pumps are 150 HP and are equipped with variable frequency drives. The rest of the pumps are 125 HP with constant speed drives. These constant speed pumps are operated as lag pumps. The larger pumps have a name plate rating of 3,300 gpm at 132 feet total dynamic head (TDH) and the smaller pumps have a name plate rating of 2,650 gpm at 132 TDH. The pressure booster station has a surge tank to minimize pressure surges. The chlorine booster station consists of a 150 pound cylinder mounted on a Wallace & Tiernan dual scale, equipped with a Superior CL-1 chlorinator capable of feeding 25 pounds per day. The City is capable of chlorinating influent, effluent or both to maintain a free chlorine residual of about 0.2 ppm. The pressure booster system and the chlorine booster system are housed in two separate rooms of the same concrete block building.

The pressure booster station for the Northwestern Reservoirs consists of four horizontal splitcase, centrifugal pumps. Two of the four pumps are rated 200 HP and each is capable of pumping 5,000 gpm at 132 feet total TDH. These two pumps have variable frequency drives to facilitate the operation of the pumps in a wide pumping range. The remaining two pumps are rated 150 HP and each is capable of pumping 3,800 gpm at 127 feet TDH. The chlorine booster station for these reservoirs consists of Capitol Controls Model 1362 scale, with Ecometrics

Series 2000 regulator. Both the influent and effluent of these storage reservoirs are being chlorinated to maintain a free chlorine residual of 0.2 mg/L.

1. Description of Weston Ranch Reservoir and Pump Station Upgrades

The Weston Ranch Reservoir and Pump Station Upgrade Project consisted of a new 3.0 million gallon treated water reservoir and two 125-HP pumps with a pumping capacity of 3,000 gpm each. The Weston Ranch Reservoir South is a newly constructed 3.0 million gallon at-grade steel storage reservoir, manufactured by Chicago Bridge & Iron Company. The new Reservoir has a diameter of about 135 feet and a height of about 30 feet. With the completion of these improvements, total storage capacity at this site is 6.0 million gallons and total pumping capacity is 18,000 gpm. The reservoir was designed, constructed, and disinfected in 2011 in accordance with the American Water Works Association Standards. The new reservoir also meets all the requirements of the California Waterworks Standards.

Treated water enters the reservoir from the eastern 30-inch diameter waterline. The reservoir has a 30-inch diameter overflow pipe that discharges excess water into the storm drain catch basin. The overflow line is separated from the catch basin by an air gap equivalent to two times the diameter of the drain line (60-inches). The treated water exits the reservoir through the western 30-inch diameter waterline and enters the distribution system. The inlet and outlet are located on opposite sides of the reservoir to minimize the potential for short-circuiting and stagnation of the water flow through the reservoir. There is a sample tap adjacent to the outlet to enable representative sampling of the water in the reservoir that enters the distribution system. The tap is imbedded directly onto the reservoir wall and is therefore unlikely to freeze. To protect from unauthorized access, the sample tap is protected by a steel enclosure that remains locked at all times while not in use. The 26-inch vent located at the center of the tank roof is covered with a weather cap and stainless steel insect and bird screens. The reservoir is equipped with five access points; one roof hatch and four wall hatches. To prevent unauthorized access the four wall access points are designed to not open while the reservoir is in operation due to the hydrostatic pressure on the access covers, while the roof hatch has a lock.

The project site has a pressure booster station and a chlorine booster station. With the addition of 2 new pumps, the pressure booster station consists of six 125-HP horizontal centrifugal pumps. The chlorine booster station consists of a 150 pound cylinder mounted on a Capital Controls Model 1362 scale, equipped with a Capitol Controls model 200 regulator capable of feeding 50 pounds per day. The chlorine injectors are setup to chlorinate the storage reservoir influent, effluent, or both. The pressure booster system and the chlorine booster system are housed in two separate rooms within the same concrete block building.

The project site is located within a gated fence, which remains locked at all times. The sample tap, roof hatch, and ladder are locked all the time. In addition, there is a security system in place to monitor any potential unauthorized access. Secure locks and intrusion alarms are provided for the doors to pump station building. Lighting is provided on all sides of the building. Certified operators perform daily checks of the reservoirs and pump stations. Following items are checked by operators during daily visits: chlorination system, SCADA alarms, and pump operations, surge tank air levels, chlorine residuals in the tanks, and check tanks and building for unauthorized entry or damage.

The City shall conduct routine regular external and internal inspections of all reservoirs and implement corrective actions as necessary. External inspections shall evaluate effectiveness of any physical site and reservoir security measures and the physical integrity of the vent screens and reservoir appurtenances and the structure itself. Internal inspections shall include visual evaluation of the stored water quality including looking for any signs of debris or oil floating on the surface, and observation of any sediment buildup on the reservoir bottom. Corrective actions may include testing, cleaning, flushing, overflowing, or scheduling of repairs, or bypassing the reservoir completely, so it can be drained for a thorough physical inspection.

The City's tank maintenance program requires inspections of the interior condition of tanks by professional divers every five years. During these inspections tank coatings, internal tank structures, and cathodic protection systems are examined and recorded via video taping. The tanks are also cleaned of sediment during these inspections. Exterior tank inspections of tank vents, other exterior structures and external tank coatings are performed annually. Cathodic protection systems are also inspected by corrosion control engineers. The City uses Avantis Computerized Maintenance Management System to schedule and track inspections.

The following table summarizes inspection and cleaning dates for the storage tanks.

Reservoir	Last Inspection	Last Cleaning	Comments/defects
Fourteen Mile-North	2013	2013	Spot cleaned in 2015 and inspected interior
Fourteen Mile-South	2013	2013	Spot cleaned in 2015 and inspected interior
Northwest-North	2014	2014	Cleaned and inspected interior
Northwest-South	2014	2014	Cleaned and inspected interior
Northwest No. 3	2014	2014	Installed in 2008
Weston Ranch North	2013	2013	Spot cleaned in 2015 and inspected interior

Weston Ranch South	2010	2010	Installed in 2010

City personnel routinely clean and inspect the reservoirs every 3-5 years and reports are prepared by the inspection teams based on the findings of the inspections. All tanks should be cleaned and inspected at least every five years.

H. DISTRIBUTION SYSTEM

1. Pressure Zones

The City's domestic water system is divided between into three different systems. Each system is comprised of a single pressure zone. The pressures in all the systems vary between 30 to 65 psi depending on the source of water supply and season. When the City receives 100% or near 100% of its North system water supply from the Stockton East Water District and new DWSP plant, few wells in the North system operate. The removal of wells from auto operation causes the water pressures in certain areas to drop to as low as 30 psi during the peak hour demands. When most of the wells are in auto operation, the pressure usually ranges between 45 to 60 psi.

2. Water Mains

SUMMARY OF WATER MAINS

Material	Amount	Size (inches)	Class/Gage	Condition
AC	25%	4"-24"	150	Good
DIP	6%	24"-48"	N/A	Good
Steel	1%	24"-30"	N/A	Good
PVC	68%	4"-18"	C-900	Good

The City has approximately 590 miles of pipe in the distribution system. The City uses ductile iron pipe or cement coated steel pipe for large diameter trunk mains, and PVC C-900 for the smaller diameter pipes. All AC pipes in the system are in the older areas, and the City is no longer using the AC pipes for new lines. The City follows the sewer and water main separation standards.

I. WATER QUALITY AND MONITORING

1. Distribution System Monitoring

a) Bacteriological

The bacteriological quality of the water supply is required to be monitored in the distribution system on an ongoing basis, in accordance with a bacteriological sample siting plan. Samples are required to be examined for total coliform bacterial contamination and for fecal coliform or E. coli, if positive for total coliforms. The frequency of sampling and number of samples to be examined is based on the service population and service connections, whichever results in higher requirements. The bacteriological sample siting plan is required to be maintained current and submitted to the Division. The water system is operated as three different zones, North system, South system, and Walnut Plant system.

Bacteriological Monitoring Requirements for the City of Stockton

System	Service Connections.*	Population	Minimum Required Sampling
North	41,727	137,699	30 per week
Walnut Plant	237	782	1 per month
South	6,762	22,315	6 per week

*Data as of February 2015.

According to the City's current Bacteriological Sample Siting Plan dated July 2012, to determine the population served by the City's domestic water system, the City multiplies the number of service connections by a factor of 3.3 as per Section 64412, Title 22, CCR, which states:

(a) The number of persons served by a community water system shall be determined by the water system using one of the following methods:
(2) Multiplying the number of service connections served by the water system by 3.3 to determine the total population served;

The City has 30 monitoring sites located in the North system, 1 in the Walnut Plant system, and 6 in the South system. The sampling frequency in the plan is weekly for the North system, weekly for the South system and monthly for the Walnut Plant system. An updated system map of sampling sites has been provided to the Division that shows the new sites that have been added for monitoring.

The most current bacteriological sample siting plan available to the Division is dated July 2012.

Bacteriological Monitoring Summary (2014)

SYSTEM	Minimum Required	Total Samples Collected	Avg./ week	T.C. Pos.	F.C. Pos.	Violations
North	30 per week	1,578	30.3	6	0	None
Walnut Plant	1 per month	12	1.0 per month	0	0	None
South	6 per week	312	6	1	0	None

In year 2014, the City had only six total coliform positive samples in the North system and one total coliform positive sample in the South System, and none total coliform positive sample in Walnut Plant system. All the bacteriological quality standards were met in all the systems during this time period.

California Groundwater Rule (GWR):

The State of California has adopted the Groundwater Rule to provide increased protection against microbial pathogens in groundwater. All public water systems serving groundwater in California will be subject to the requirements under this rule.

On October 1, 2009, the City submitted an Acknowledgement of Type of Triggered Source Monitoring under the GWR. The City elected the option of representative triggered source monitoring when a routine distribution bacteriological sample shows the presence of total coliform bacteria. The City also submitted an addendum to its bacteriological sample siting plan that identifies which wells will be considered representative of serving each routine site. The City also included a map showing the zones and the associated well(s) to be sampled for each routine sample site. The City's source water triggered monitoring plan is adequate. The City shall perform the source water triggered monitoring per this plan whenever a distribution bacteriological sample is tested positive for bacteria.

b) Lead and Copper

The 90th percentile action levels for lead and copper are 15 ug/L and 1,300 ug/L, respectively. All community public water systems are required to conduct tap sampling for lead and copper contamination in the distribution system.

LEAD AND COPPER SUMMARY (ug/L or ppb)

Date	Category	Samples analyzed	90th % Pb (ug/L)	90th % Cu (ug/L)
Aug-92	1st Initial	85	4.1	469
Dec–92	2nd Initial	74	2.2	268
Oct-93	1st Annual	37	2.8	376
Sep-94	2nd Annual	36	3.7	247
Sep-95	3rd Annual	33	< 5	350
Sep-98	1st Triennial	50	< 5	150
Sep-01	2nd Triennial	52	< 5	120
Jun-04	3RD Triennial	52	< 5	170
Aug-07	4th Triennial	50	< 5	130
Aug-10 Sep-10	5th Triennial	52	0.00	110

Aug-12	6th Triennial	50	0.0	70
Next Due in 2015	7th Triennial			

The City of Stockton system serves a population of about 173,000 people.

The City completed the first two initial rounds of lead and copper monitoring in 1992. The first and second annual rounds were completed in October of 1993 and September of 1994 respectively. To this date, three rounds of annual and six rounds of triennial monitoring have been completed by the City and the 90th percentile concentrations for both lead and copper have continued to stay below the action levels in all additional rounds of monitoring. In the 1998 sampling round, the number of samples were increased to 50 due to the increase in service population to >100,000. It is noted here that 2013 testing for lead and copper was completed a year earlier in 2012 to coincide with the operation of the DWSP plant that came online in summer of 2012. The last triennial lead and copper monitoring was completed in the summer of 2012. The next triennial monitoring for lead and copper will be due between June to September in 2015. If the City elects to start chloramination in Fall 2105, the City will be required to conduct another round of lead and copper testing in summer of 2016.

c) **Disinfection By-products Rule (DBPR)**

Stage 2 DBP Monitoring:

Based on its population, the City's water system was on Schedule-1 for the implementation of the Stage-2 DBPR.

As per the Initial Distribution System Evaluation (IDSE) standard monitoring plan, the City conducted TTHM and HAA5 monitoring (6 rounds) from October 2007 through August 2008 by collecting total trihalomethanes (TTHM) and haloacetic acids (HAA5) samples at 19 sites every sixty days. As per the Division's requirements, the City prepared a report based on the IDSE standard monitoring data that was collected from October 2007 through August 2008 at 19 sites. This report also included City's Stage-2 compliance monitoring plan. The City selected 13 sites (eight in the North, four in the South, and one in the Walnut Plant System) based on its populations in each system for Stage-2 compliance monitoring. Sites were selected based on IDSE standard monitoring data and Stage-1 DBP monitoring data. On December 29, 2008, the City submitted an IDSE report for Standard Monitoring to the Division. This report was submitted to the EPA on December 14, 2008. The City started Stage-2 compliance monitoring in January 2012. Until then the City was performing Stage-1 DBP monitoring. The City's plan was discussed and finalized in a meeting with the Division. The Division approved the plan after City made some requested changes to the plan. The plan submitted on December 29, 2008, included all the changes and was considered final. This plan was updated in July 2012 to add six additional monitoring sites in the north system due to the startup of the City's new DWSP water treatment plant.

As per its most recent monitoring plan dated July 2012, the City is currently monitoring at 14 locations in the North system, four locations in the South system and one location in the Walnut Plant system. The last four quarter results are summarized below.

	TTHM (ppb)							
	Monitoring Periods				LRAA (TTHM)	Meets Standard? (Y/N)	OEL (TTHM)	Exceed OEL (Y/N)
	MP1	MP2	MP3	MP4 (Current Qtr)				
Sample Date (month/date/year):	***4/16/14***	***7/16/14***	***10/15/14***	***1/14/15***				
3131 Auto Center Cir.	31	3.3	31	41	27.00	Y	29.00	N
9498 Glacier Point Dr.	26	0	47	20	23.00	Y	22.00	N
142 Marilyn Avenue	27	19	36	45	32.00	Y	36.00	N
7339 Park Woods Dr.	35	12	34	43	31.00	Y	33.00	N
5376 Feather River Dr.	41	71	58	61	58.00	Y	63.00	N
4046 Pine Lake Circle	41	62	43	61	52.00	Y	57.00	N
2161 Canyon Creek Cir.	27	21	27	37	28.00	Y	31.00	N
5151 Pacific Avenue	29	31	25	48	33.00	Y	38.00	N
8420 Galloway Ct. B	25	10	38	41	29.00	Y	33.00	N
1415 Chelsea Way	19	13	24	62	30.00	Y	40.00	N
10481 River Oaks Dr.	18	74	20	62	44.00	Y	55.00	N
5703 Westchester Cir.	52	88	33	81	64.00	Y	71.00	N
10004 Trinity Parkway	40	91	46	88	66.00	Y	78.00	N
3102 Valley Forge Dr.	25	73	41	70	52.00	Y	64.00	N
1050 Diamond Street	39	28	29	36	36.00	Y	38.00	N
500 W. Hospital Road	34	23	32	35	35.00	Y	40.00	N

750 French Camp Road	40	36	42	45	45.00	Y	50.00	N
3350 Nautical Court	38	33	35	36	36.00	Y	36.00	N
1976 Universal Street	36	31	40	39	39.00	Y	42.00	N

	HAA5 (ppb)							
	Monitoring Periods				LRAA (HAA5)	Meets Standard? (Y/N)	OEL (TTHM)	Exceed OEL (Y/N)
	MP1	MP2	MP3	MP4 (Current Qtr)				
Sample Date (month/date/year):	***4/16/14***	***7/16/14***	***10/15/14***	***1/14/15***				
3131 Auto Center Cir.	15	6.6	10	20	13.00	Y	14.00	N
9498 Glacier Point Dr.	13	0	34	8.1	14.00	Y	13.00	N
142 Marilyn Avenue	16	7.9	18	20	15.00	Y	16.00	N
7339 Park Woods Dr.	15	3.3	19	22	15.00	Y	17.00	N
5376 Feather River Dr.	26	11	16	21	19.00	Y	17.00	N
4046 Pine Lake Circle	27	11	24	25	22.00	Y	21.00	N
2161 Canyon Creek Cir.	16	9.4	13	18	14.00	Y	15.00	N
5151 Pacific Avenue	16	11	10	22	15.00	Y	16.00	N
8420 Galloway Ct. B	14	4.7	29	17	16.00	Y	17.00	N
1415 Chelsea Way	9	5.9	25	25	16.00	Y	20.00	N
10481 River Oaks Dr.	10	29	20	23	21.00	Y	24.00	N
5703 Westchester Cir.	22	30	28	30	28.00	Y	30.00	N
10004 Trinity Parkway	26	14	17	38	24.00	Y	27.00	N
3102 Valley Forge Dr.	15	20	30	27	23.00	Y	26.00	N
1050 Diamond Street	14	11	10	17	13.00	Y	14.00	N
500 W. Hospital Road	15	8.1	11	24	15.00	Y	17.00	N
750 French Camp Road	15	13	17	34	20.00	Y	25.00	N
3350 Nautical Court	14	12	12	16	14.00	Y	14.00	N

1976 Universal Street	16	12	15	21	16.00	Y	17.00	N

TTHM MCL Exceedance in 2013:

The LRAA of the analytical results submitted to the Division for the 1st quarter of 2013 have exceeded the TTHM MCL at four monitoring locations (two in the North Stockton service area and one each in the South Stockton and Walnut Plant service areas). The TTHM MCL compliance, as monitored pursuant to section 64534.2(d), Title 22, CCR, shall be determined as follows: For systems monitoring quarterly, the LRAA computed quarterly, shall not exceed the MCLs specified in Section 64533 at all of the monitoring locations. The City was in violation of the TTHM MCL for the 1st quarter of 2013. The following is a summary of TTHM monitoring results for the four quarters at the four monitoring locations that exceeded the TTHM MCL.

Sample Location	**Service Area**	**Sample Date**				**LRAA (TTHM)**
		04/18/2012	**07/18/2012**	**10/08/2012**	**01/17/2013**	
5376 Feather River Dr.	North Stockton	110 ug/L	46 ug/L	82 ug/L	90 ug/L	**82 ug/L**
4046 Pine Lake Cir.	North Stockton	100 ug/L	68 ug/L	84 ug/L	130 ug/L	**96 ug/L**
1050 Diamond St.	Walnut Plant	98 ug/L	48 ug/L	73 ug/L	110 ug/L	**82 ug/L**
750 French Camp Rd.	South Stockton	88 ug/L	63 ug/L	45 ug/L	130 ug/L	**82 ug/L**

The Stage-2 DBPR monitoring results listed in the above table clearly indicates that the compliance monitoring conducted at four locations in 2012/2013 yielded LRAA levels ranging from 82 ug/L to 96 ug/L. Since the LRAA exceeded the 80 ug/L TTHM MCL, the City was in violation of the MCL for TTHM. Specifically, the City exceeded the TTHM MCL as specified in Section 64533 (a), Title 22, California Code of Regulations (CCR).

In response to this violation, the Division issued a Compliance Order No. 03-10-13R-001 dated March 7, 2013, to the City.

<u>Stage-1 DBP Monitoring</u>:

Since January 1, 2002, mandatory TTHM and HAA5 monitoring was required for systems serving populations of greater than 10,000 as per the Stage-1 DBPR. TTHM and HAA5 monitoring was required under the Federal EPA regulations for systems with service populations greater than 10,000 that chlorinate their groundwater supplies and/or use treated surface water supplies. Four samples were required to be analyzed each quarter. The MCL for TTHMs is 80 ug/L and for HAA5, it is 60 ug/L and compliance was based on the running annual average of the last four quarters of monitoring.

The City was monitoring TTHM and HAA5 concentration in the distribution system on a quarterly basis at eight different locations. Five of the locations were in the North system, one in Walnut Plant system, and two in the South system.

The City started receiving surface water in December 2005 in the South system from SEWD, therefore, the City started collecting at least four samples per quarter in the South system.

The City continued TTHM and HAA5 monitoring as per Stage-1 DBPR until fourth quarter of 2011 and started Stage-2 DBPR monitoring in the first quarter of 2012. The running annual average concentrations have been well below the respective MCLs of TTHM and HAA5.

d) Asbestos

Systems that contain asbestos mains are considered vulnerable to asbestos contamination due to the potential for the release of asbestos fibers into the water under water quality conditions that are conducive. Normally, waters not saturated with calcium and aggressive indices less than 11.5 units are known to provide conducive conditions for the leaching of asbestos fibers. Therefore, monitoring for such systems is required to be performed in the distribution system at least once every compliance cycle (nine years). The sample is to be collected from a location served by an asbestos cement pipe.

The average aggressive indices of the City wells, SEWD treated water, and DWSP treated water supply are 12, 10.7, and 10 respectively, based on monitoring performed from 2009 through 2014. These numbers indicate that the waters are moderately aggressive.

Aggressive Index Summary

Parameters - Average values	Groundwater	SEWD treated	DWSP treated
pH	Avg. 7.75	8.2	7.5
Total Alkalinity (mg/L as $CaCO_3$)	Range (110-210) Avg. 167	30	29
Ca (mg/L)	Range (25-81) Avg. 51	6	4.1
Ca Hardness (mg/L as $CaCO_3$)	Range (120-350) Avg. 226	23.2	16
Aggressive Index	12 (Average from WQI	10.7 (from WQI as per	10 (from WQI as per

	as per last monitoring for all wells)	6/10/14 monitoring on treated water)	6/11/14 monitoring on treated water)

The City of Stockton water distribution system is comprised of approximately 25 percent asbestos cement pipelines. Therefore, the City examined a sample collected from the distribution system for asbestos contamination. The sample was collected from "Marilyn Hard Site", on March 11, 1996, and subsequently on March 20, 2002. The last asbestos monitoring was conducted on May 9, 2011, at the 142 Marilyn Avenue site. The concentrations of asbestos fibers were less than the detection level of 0.2 MFL in this sample. The asbestos monitoring is current. The next distribution system asbestos monitoring will be due in 2020.

e) <u>Other Monitoring</u>

The City also monitors chlorine residuals in the distribution area. The residuals are measured when the system bacteriological samples are collected. According to the City's monthly reports, the chlorine residuals have been detectable in all the samples tested for, in the period January 2010 through January 2015.

<u>TDS, TOC, and Bromate</u>:

The City monitors for TOC and bromate monthly. Based on the data, the Mokelumne River is an excellent water source that has low TDS (Range: 23 - 69 mg/L) and TOC concentrations (Range: 1.8 – 3.8 mg/L). The average TOC of the Mokelumne River is normally around 2.0 mg/L.

Delta water on the other hand is high in TDS (Range: 30 – 410 mg/L) and TOC concentrations (Range: 1.7 – 6.9 mg/L).

The plant has the ability to add coagulant to remove TOC, if needed to reduce formation of HAA5 or TTHM. TOC in the treated water has ranged between 0.6 - 4.5 mg/L. TDS in the treated water has ranged between 36 – 420 mg/L. It is anticipated that practicing post filtration chloramination will limit DBPs to well below the MCLs for these constituents.

Bromate in the treated water has ranged between <1 – 0.036 mg/L. The average running annual average (RAA) for bromate at the end of May 2015 was 0.002 mg/L below the required RAA of 0.010 mg/L.

2. Chemical Groundwater Source Monitoring

City of Stockton Last Sample Date Summary for Active Wells							
Well No.	**GM/GP**	**Inorganic Chemicals**	**Nitrate**	**Gross Alpha**	**VOC**	**SOC (Atrazine & Simazine)**	**SOC (DBCP & EDB)**
18	Aug-12	Aug-12	Aug-14	Feb-11	Aug-13	Aug-14	May-14
19	Aug-12	Aug-12	Aug-14	Feb-11	Aug-13	Aug-14	May-14
20	Aug-12	Aug-12	Aug-14	Feb-10	Dec-13	Aug-14	May-14
21	Aug-12	Aug-12	Aug-14	Feb-14	Aug-13	Aug-14	May-14
25	Aug-13	Aug-13	Aug-13	Feb-09	Aug-13	May-05	May-14
27	Aug-13	Aug-13	Aug-14	Feb-12	Aug-13	Aug-14	May-14
28	Aug-12	Aug-12	Nov-14	Feb-10	Nov-14	Nov-14	Dec-14
29	Aug-12	Aug-12	Aug-14	Feb-11	Aug-13	Aug-14	May-14
30	Aug-13	Aug-13	Aug-14	Feb-14	Aug-13	Aug-14	May-14
31	Aug-14	Aug-14	Aug-14	May-14	Jun-14	Aug-14	May-14
32	Aug-14	Aug-14	Aug-14	Feb-11	Aug-13	Aug-14	May-14
3R	Aug-13	Aug-13	Aug-14	Feb-14	Aug-13	Aug-14	May-14
10R	Aug-13	Aug-13	Aug-14	Dec-11	Aug-13	Aug-14	May-14
SSS2	Aug-13	Aug-13	Aug-14	Feb-14	Aug-13	Aug-14	May-14
SSS3	Aug-14	Aug-14	Aug-14	Feb-12	Aug-13	Aug-14	May-14
SSS8	Aug-13	Aug-13	Aug-14	May-08	Aug-13	Aug-14	May-14
SSS9	Aug-12	Aug-12	Aug-14	Feb-10	Aug-13	Aug-14	May-14
Delta-Raw	Jul-14	Jul-14	Jul-14	Jun-12	Jul-14	Jul-14	Jul-14
WID-Raw	Jun-14	Jun-14	Jun-14	Sep-12	Jun-14	Jun-14	Jun-14

All highlighted monitoring dates are delinquent.

City of Stockton Last Sample Date Summary for Standby Wells

Well No.	GM/GP	Inorganic Chemicals	Nitrate	Gross Alpha	VOC	SOC (Atrazine & Simazine)	SOC (DBCP & EDB)
SSS1 **(STBY)**	Aug-13	Aug-13	Aug-14	Feb-13	Aug-13	Aug-14	May-14
15 **(STBY)**	Aug-13	Aug-13	Aug-13 (0.0 mg/L)	Feb-13	Aug-13	Aug-14	May-14
26 **(STBY)**	Aug-10	Aug-10	Aug-10 (17 mg/L)	Feb-08	Aug-10	May-05	May-08

Summary of Delinquent Routine Monitoring

Active Wells				
Contaminant/Group	**Well Nos.**	**Last Sample Date**	**Frequency (months)**	**Next Sample Due Date**
Nitrate	25	8/13	12	8/14 (overdue now)
SOC (Atrazine & Simazine)	25	5/05	108	5/14 (overdue now)

Standby Wells				
Contaminant/Group	**Well Nos.**	**Last Sample Date**	**Frequency (months)**	**Next Sample Due Date**
SOC (Atrazine & Simazine and DBCP & EDB)	26 (Standby)	5/05 and 5/08	108	5/14 (overdue now)

For the delinquent wells monitoring needs to be completed as soon as possible. If the City's records indicate that more recent monitoring has been performed, then the monitoring results must be submitted to the Division by Electronic Data Transfer (EDT) system to get credit for the monitoring conducted. It is noted here that Well No. 25 is out of service and is being rehabilitated. This well must be tested for any delinquent chemicals after the well has been rehabbed but prior to its use.

General Physical and General Mineral:

Routine general mineral and general physical monitoring is required every three years for active wells and every nine years for standby wells, and must include analyses for aluminum, color, Copper, corrosivity, foaming agents (MBAS), iron, manganese, odor, silver, turbidity, zinc, TDS, specific conductivity, chloride, sulfate, pH bicarbonate, carbonate, alkalinity, calcium, magnesium, sodium, and total hardness. Special monitoring is required for any contaminants that exceed their MCLs.

As indicated in the Last Sample Date Summary Table above general mineral and general physical routine monitoring is presently current for all the wells and the surface water sources.

Physical Quality:

Physical Quality Summary (From 2013 CCR)

Date	**Specific Conductivity** (micromhos)	**TDS** (mg/L)	**Hardness as $CaCO_3$** (mg/L)	**Alkalinity** (mg/L)
Secondary Standard	900-1600-2200	500-1000-1500		
SEWD	55	83	23	30
DWSP	223	125	15	19
G/W Wells	526	349	226	167

All data listed in the above table is average of all results in the period Jan. – Dec. 2013.

The well waters are moderately hard waters with average total hardness of 226 mg/L as $CaCO_3$. However, the water supply from DWSP and SEWD is soft and has an average hardness of only 15 mg/L and 23 mg/L respectively as $CaCO_3$. The average total dissolved solids concentration for all sources is well below the 500 mg/L level. The average specific conductance of the well water is also fairly low (526 umho/cm), indicating minimal salt-water intrusion.

Iron and manganese:

Several of the existing City's wells have elevated iron and/or manganese concentrations. Status of all wells with elevated levels of iron or manganese was changed to either inactive or standby. The inactive wells will eventually be destroyed and have been physically separated from the distribution system. However, the standby wells can be used only for emergencies and the City shall follow the public notification and other requirements listed in the permit conditions.

Iron and Manganese Summary

Well	Last Manganese sample	Manganese Conc., (ug/L)	Last Iron sample	Iron Conc., (ug/L)
18	Aug-12	ND	Aug-12	ND
19	Aug-12	ND	Aug-12	ND
20	Aug-12	ND	Aug-12	ND
21	Aug-12	ND	Aug-12	ND
25	Aug-13	ND	Aug-13	ND
27	Aug-13	ND	Aug-13	ND
28	Aug-12	ND	Aug-12	ND
29	Aug-12	24	Aug-12	ND
30	Aug-13	ND	Aug-13	ND
31	Aug-14	ND	Aug-14	ND
32	Aug-14	ND	Aug-14	ND
3R	Aug-13	ND	Aug-13	ND
10R	Aug-13	ND	Aug-13	ND
SSS2	Aug-13	ND	Aug-13	ND
SSS3	Aug-14	20	Aug-14	ND
SSS8	Aug-13	ND	Aug-13	170
SSS9	Aug-12	ND	Aug-12	ND
Delta-Raw	Jul-14	30	Jul-14	170
WID-Raw	Jun-14	ND	Jun-14	360

ND – not detected

Well	Last Manganese sample	Manganese Conc., (ug/L)	Last Iron sample	Iron Conc., (ug/L)
SSS1 **(STBY)**	Aug-13	ND	May-14	570
15 **(STBY)**	Aug-13	93	Aug-13	1,200
26 **(STBY)**	Aug-10	ND	Aug-10	<100

Inorganic Chemicals:

Routine monitoring is required every three years for active wells and every nine years for standby wells for the inorganic chemicals. Nitrate monitoring requirements are discussed in the following section. The sources are waived from asbestos and cyanide monitoring, due to their non-vulnerability. However, asbestos monitoring is required in the distribution system if asbestos mains are present.

As indicated in the Last Sample Date Summary Table above the inorganic monitoring is presently current for all the wells and the surface water sources.

Arsenic:

The table below shows the arsenic levels in all active and standby wells. Only two wells (Nos. 4 and 22) exceeded the arsenic MCL of 10 ug/L. Well No. 4 is now inactive and Well No. 22 has been destroyed. All active wells meet the arsenic standard.

Summary of last Arsenic Monitoring

Well	Last Sample Date	Arsenic (ug/L)
18	Aug-12	5.1
19	Aug-12	3.7
20	Aug-12	4.1
21	Aug-12	4.2
25	Aug-13	3.9
27	Aug-13	3.6
28	Aug-12	2.7
29	Aug-12	6.0
30	Aug-13	6.0
31	Aug-14	0.0
32	Aug-14	0.0
3R	Aug-13	4.6
10R	Aug-13	3.6
SSS2	Aug-13	6.0
SSS3	Aug-14	6.9
SSS8	Aug-13	6.1
SSS9	Aug-12	7.4
Delta-Raw	Jul-14	4.3
WID-Raw	Jun-14	0.0

Standby Wells

Well	Last Sample Date	Arsenic (ug/L)
SSS1 (STBY)	Aug-13	7.8
15 (STBY)	Aug-13	7.0
26 (STBY)	Aug-10	2.2

Perchlorate:

For several wells either initial perchlorate monitoring was completed in 2008 or the City had historical data from 2001. Some wells were monitored in 2008 and 2009 to comply with the initial monitoring requirements. For new Well 10R, initial monitoring was conducted in 2011. The perchlorate monitoring frequency is once every three years during the months of May through September.

City of Stockton Perchlorate Monitoring Summary

Well	Last Sample Date	Perchlorate (ug/L)
18	Aug-12	0.0
19	Aug-12	0.0
20	Aug-12	0.0
21	Aug-12	0.0
25	Aug-13	0.0
27	Aug-13	0.0
28	Aug-12	0.0
29	Aug-12	0.0
30	Aug-13	0.0
31	Aug-14	0.0
32	Aug-14	0.0
3R	Aug-13	0.0
10R	Aug-13	0.0
SSS2	Aug-13	0.0
SSS3	Aug-14	0.0
SSS8	Aug-13	0.0
SSS9	Aug-12	0.0
Delta-Raw	Jul-14	0.0
WID-Raw	Jun-14	0.0

Standby Wells

Well	Last Sample Date	Perchlorate (ug/L)
SSS1 (STBY)	Aug-13	0.0
15 (STBY)	Aug-13	0.0
26 (STBY)	Aug-10	0.0

Chromium-6:

A maximum contaminant level (MCL) for Chromium-6, or hexavalent chromium, of 10 ug/L has been adopted by the State of California effective July 1, 2014. The City has already completed the initial chromium-6 monitoring in August 2014 for all wells except Well No. 25 and the surface water sources. Well No. 25 is currently being rehabilitated and must be monitored for chromium-6 before putting it online. The surface water sources must also be tested for chromium-6 as soon as possible. All wells are in compliance with chromium-6 MCL.

City of Stockton Chromium-6 Monitoring Summary

Well	Last Sample Date	Chromium-6 (ug/L)
18	Aug-14	3.0
19	Aug-14	5.3
20	Aug-14	5.2
21	Aug-14	6.1
25	Aug-01	3.1
27	Aug-14	1.7
28	Aug-14	4.5
29	Aug-14	0.0
30	Aug-14	3.3
31	Aug-14	5.8
32	Aug-14	5.8
3R	Aug-14	2.7
10R	Aug-14	5.8
SSS2	Aug-14	4.0
SSS3	Aug-14	3.9
SSS8	Aug-14	0.0
SSS9	Aug-14	1.9
Delta-Raw	Did not monitor	

WID-Raw	Did not monitor	

Standby Wells

Well	Last Sample Date	Chromium-6 (ug/L)
SSS1 (STBY)	Aug-14	01.6
15 (STBY)	Aug-14	0.0
26 (STBY)	Nov-2001	5.8

Standby well (No. 26) is due for chromium-6 monitoring and must be monitored as soon as possible.

Nitrate and Nitrite:

Groundwater wells in the central valley area are vulnerable to high nitrate contamination and all active wells are required to be monitored annually due to the acute toxicity effects related to the consumption of water with elevated nitrate concentrations. The MCL for nitrate (as NO_3) is 45 mg/L. Wells with nitrate concentrations greater than 22.5 mg/L are required to be monitored quarterly (for at least a year) to determine the seasonal variations in the nitrate levels.

The following is a summary of the most recent nitrate monitoring of the City's wells.

Well	Last Sample Date	Nitrate (ug/L)
18	Aug-14	24
19	Aug-14	14
20	Aug-14	16
21	Aug-14	23
25	Aug-13	12
27	Aug-14	3.6
28	Nov-14	16
29	Aug-14	6.3
30	Aug-14	15
31	Aug-14	14
32	Aug-14	4.9
3R	Aug-14	4.2
10R	Aug-14	11
SSS2	Aug-14	26

SSS3	Aug-14	22
SSS8	Aug-14	4.2
SSS9	Aug-14	14
DWSP-Raw	Jul-14	0.0
WID-Raw	Jun-14	0.0

<u>Standby</u>

The Division's records indicate that routine annual nitrate monitoring is current for all wells except Well No. 25. This well is being rehabilitated. The City must test this well for nitrate before bringing it online.

Well	Last Sample Date	Nitrate (ug/L)
SSS1 (STBY)	Aug-14	15
15 (STBY)	Aug-13	0.0
26 (STBY)	Aug-10	17

Historically only Wells Nos. 18, 21, 31, SSS2, and SSS3 had high nitrate levels greater than 23 mg/L but less than 45 mg/L. These wells were required to be monitored quarterly. The data submitted to the Division indicates no seasonal variations in the nitrate levels. Therefore after reviewing data for several quarters, the City was allowed to reduce the monitoring frequency to annually for Wells Nos. 18, 21, 31, SSS2, and SSS3.

Summary of Wells with Elevated Nitrate Levels (mg/L)

Well No.	18	21	31	SSS2	SSS3
Mar-06			28		
Aug-06	22	14	19	22	20
Aug-07	12	24	18	24	29
Nov-07				25	0.0
Feb-08				24	0.0
May-08				21	25
Aug-08	24	15	17	27	26
Aug-09	27	14	16	25	25
Aug-10		24	14	24	24
Aug-11	26	27	14	27	24
Aug-12	23	27	20	25	23

Aug-13	20	25	----	27	22
Aug-14	24	23	14	26	22

Volatile Organic chemicals (VOCs):

Regulated VOC monitoring is required every three years for existing wells and annually for surface water sources.

As indicated in the last sample date summary above, routine VOC monitoring is presently current for all the wells.

Past monitoring data indicates that majority of the City's wells are non-vulnerable to VOC contamination. Well 31 had a detection of monochlorobenzene (3/2006), and Well SSS9 had a detection of tetrachloroethylene (PCE) (2/2005). However, follow up monitoring conducted by the City did not confirm these detections.

Well No. 31: Monochlorobenzene was reported as detected in a sample collected from Well No. 31 on March 15, 2006. The analytical result was 0.61 ug/L. The MCL for monochlorobenzene is 70 ug/L. As required by the regulations, the City collected two confirmation samples on April 12, 2006, and April 13, 2006. Monochlorobenzene was not detected in either of these two confirmation samples. Therefore, as per regulations initial finding was disregarded because two additional samples did not show the presence of monochlorobenzene. The future monitoring is once every three years.

Well No. SSS9: PCE was reported as detected in a sample collected from Well SSS9 on February 8, 2005. The analytical result was 5.1 ug/L. The MCL for PCE is 5 ug/L. As required by the regulations, the City collected two confirmation samples on February 25, 2005 and March 8, 2005. PCE and vinyl chloride were not detected in either of these two confirmation samples. Therefore, as per regulations initial finding was disregarded because two additional samples did not show the presence of PCE. The future monitoring is once every three years.

Synthetic Organic Chemicals (SOCs):

For existing, previously monitored wells, routine monitoring is required once every three years for DBCP & EDB and once every nine years for atrazine & simazine. This monitoring is required annually for surface water sources.

All wells (except Well No. 25) were monitored for DBCP and EDB in May 2014, and for atrazine and simazine in August 2014. The raw surface water (Delta and WID) was monitored in June and July 2014 with non-detect results.

DBCP & EDB

DBCP was detected in the past in Wells Nos. 23 and 28, and EDB was detected in Well No. 23. Well No. 23 was destroyed in 2014.

Well No. 28: Well No. 28 was required to be monitored annually for DBCP, as the well detected with DBCP in May 2002 at a concentration of 0.02 ug/L. Quarterly monitoring was performed per the regulations and DBCP was not detected. Well No. 28 had a detection of EDB in May 2004 at a concentration of 0.022 ug/L. However the follow-up monitoring conducted on July 8, 2004, and July 15, 2004, did not show the EDB detection. Therefore no accelerated monitoring was required for EDB. Latest DBCP and EDB monitoring conducted in May 2008, May 2011, and May 2014 did not show any detections.

Radiological:

Monitoring for gross alpha particle activity may be substituted for measurement of radium and uranium. If gross alpha is less than or equal to 5 pCi/L, no monitoring for uranium and radium is required, except that every source shall be monitored for one year for radium-228 to provide occurrence data to EPA. Also, if the gross alpha is over 5 pCi/L and uranium monitoring is performed, the uranium results are subtracted from the gross alpha results to give an adjusted gross alpha value. If the adjusted gross alpha value is 5 pCi/L or less, no radium monitoring is required; however, if the adjusted gross alpha is greater than 5 pCi/L, monitoring for combined radium-226 and -228 must be performed.

The data submitted to the Division indicate that all of the wells except Wells Nos. 25 and standby Well 26 have current monitoring results for gross alpha particle activity. The data indicate that the gross alpha activity in most of the wells is less than 5 pCi/L.

The new California Radionuclide Rule states that for gross alpha of less than 3 pCi/L, subsequent monitoring frequency is one sample every nine years. For gross alpha levels of $\geq$3 and $\leq$7.5 pCi/L, the monitoring frequency is one sample every 6 years. For gross alpha levels of >7.5 and $\leq$15 pCi/L, the monitoring frequency is one sample every 3 years.

Wells Nos. 18, 19, 20, 21, 25, 28, 29, 30, 31, 3R, 10R, and SSS2 were detected with average gross alpha particle activity between 3 and 7.5 pCi/L in the most recent monitoring. **These wells are now required to be tested for gross alpha once every six years**. All these wells were monitored for uranium and the uranium levels (gross alpha plus 0.84 counting error minus uranium is less than 5 pCi/L for all wells) in these wells indicate compliance with radiological standards and do not warrant any special radium monitoring.

Wells Nos. 27, 32, SSS3, SSS8, SSS9, Delta Raw and WID were detected with gross alpha particle activity below 3 pCi/L in the most recent monitoring. **These wells and the raw surface water sources are now required to be tested for gross alpha once every nine years.**

Standby Well No. 26 is also required to be tested for gross alpha once every nine years.

Last Gross Alpha Monitoring for City of Stockton's Active Wells

Well	Last Monitoring	Gross Alpha (pCi/L)	Monitoring Frequency	Next Monitoring Due
18	2/22/11	6.89 pCi/L	6-yr	1 sample in 2017
19	2/11	7.33 pCi/L	6-yr	1 sample in 2017
20	2/10	6.35 pCi/L	6-yr	1 sample in 2016
21	2/18/14	6.07 pCi/L	6-yr	1 sample in 2020
25	2/09	5.14 pCi/L	6-yr	1 sample in 2015
27	2/12	0.4 pCi/L	9-yr	1 sample in 2021
28	2/10	5.84 pCi/L	6-yr	1 sample in 2016
29	2/11	4.87 pCi/L	6-yr	1 sample in 2017
30	2/19/14	4.97 pCi/L	6-yr	1 sample in 2020
31	5/14	6.62 pCi/L	6-yr	1 sample in 2020
32	2/11	2.02 pCi/L	9-yr	1 sample in 2020
3R	2/18/14	4.42 pCi/L	6-yr	1 sample in 2020
10R	3/11, 6/11, 9/11, 12/11	5.33 pCi/L	6-yr	1 sample in 2017
SSS2	2/19/14	3.86 pCi/L	6-yr	1 sample in 2020
SSS3	2/12	1.67 pCi/L	9-yr	1 sample in 2021
SSS8	5/08	1.95 pCi/L	9-yr	1 sample in 2017
SSS9	2/10	1.27 pCi/L	9-yr	1 sample in 2019
Delta	6/4/12	0.98 pCi/L	9-yr	1 sample in 2021
WID	9/4/12	0.43 pCi/L	9-yr	1 sample in 2021

All highlighted monitoring dates are delinquent.

Standby Wells

Well	Last Monitoring	GA	Next Monitoring Due
SSS1 (STBY)	2/26/13	5.2 pCi/L	1 sample in 2019
15 (STBY)	2/12/13	0.77 pCi/L	1 sample in 2022
26 (STBY)	2/08	6.46 pCi/L	1 sample in 2017

City of Stockton Summary of Natural Radioactivity Monitoring

Well No.	Sampling Round	Gross Alpha Dates and Av. Results (pCi/L)	Uranium Dates and Av. Results (pCi/L)	Radium 228 Dates and Av. Results (pCi/L)
18	Initial Monitoring	2/05, 5/05, 8/05, 11/05 (6.03 pCi/L)	2/05, 5/05, 8/05, 11/05 (6.66 pCi/L)	2/05, 5/05, 8/05, 11/05 (0.68 pCi/L)
	Subsequent Monitoring	2/11 (6.89 pCi/L)	2/11 (7.45 pCi/L)	
	Next Monitoring	1 sample in 2017	1 sample in 2017	
19	Initial Monitoring	2/05, 5/05, 8/05, 11/05 (4.91 pCi/L)	2/05, 5/05, 8/05, 11/05 (3.89 pCi/L)	2/05, 5/05, 8/05, 11/05 (0.47 pCi/L)
	Subsequent Monitoring	2/11 (7.33 pCi/L)	2/11 (7.58 pCi/L)	
	Next Monitoring	1 sample in 2017	1 sample in 2017	
20	Initial Monitoring	2/04, 5/04, 8/04, 11/04 (5.03 pCi/L)	2/04, 5/04, 8/04, 11/04 (5.54 pCi/L)	2/04, 5/04, 8/04, 11/04 (1.38 pCi/L)
	Subsequent Monitoring	2/10 (6.35 pCi/L)	2/10 (5.71 pCi/L)	
	Next Monitoring	1 sample in 2016	1 sample in 2016	
21	Initial Monitoring	2/05, 5/05, 8/05, 11/05 (2.13 pCi/L)		2/05, 5/05, 8/05, 11/05 (0.98 pCi/L)
	Subsequent Monitoring	2/14 ((6.07 pCi/L)	2/14 (5.1 pCi/L)	
	Next Monitoring	1 sample in 2020	1 sample in 2020	
25	Initial Monitoring	2/03, 6/03, 9/03, 11/03 (3.85 pCi/L)	2/03, 6/03, 9/03, 11/03 (4.83 pCi/L)	12/06 (0.14 pCi/L)
	Subsequent Monitoring	2/09 (5.14 pCi/L)	2/09 (4.61 pCi/L)	
	Next Monitoring	1 sample in 2015	1 sample in 2015	

27	Initial Monitoring	2/03, 6/03, 9/03, 10/ 03 (2.73 pCi/L)		2/06, 5/06, 8/06, 11/06 (0.17 pCi/L
	Subsequent Monitoring	2/12 (0.40 pCi/L)		
	Next Monitoring	1 sample in 2021		
28	Initial Monitoring	2/04, 5/04, 8/04, 11/04 (3.3 pCi/L)		2/04, 5/04, 8/04, 11/04 (1.21 pCi/L)
	Subsequent Monitoring	2/10 (5.84 pCi/L)	2/10 (5.19 pCi/L)	
	Next Monitoring	1 sample in 2016	1 sample in 2016	
29	Initial Monitoring	2/05, 5/05, 8/05, 11/05 (5.06 pCi/L)	2/05, 5/05, 8/05, 11/05 (4.4 pCi/L)	2/05, 5/05, 8/05, 11/05 (1.2 pCi/L)
	Subsequent Monitoring	2/11 (4.87 pCi/L)	2/11 (4.41 pCi/L)	
	Next Monitoring	1 sample in 2017	1 sample in 2017	
30	Initial Monitoring	3/05, 6/05, 9/05, 12/05 (1.7 pCi/L)	3/05, 6/05, 9/05, 12/05 (2.47 pCi/L)	3/05, 6/05, 9/05, 12/05 (0.64 pCi/L)
	Subsequent Monitoring	2/14 (4.97 pCi/L)	2/14 (4.0 pCi/L)	
	Next Monitoring	1 sample in 2020	1 sample in 2020	
31	Initial Monitoring	6/05, 9/05, 12/05, 3/06 (14.03 pCi/L)	6/05, 9/05, 12/05, 3/06 (14.05 pCi/L)	9/05 (0.84 pCi/L) 12/05 (0.57 pCi/L)
	Subsequent Monitoring	2/08 (5.96 pCi/L)	2/08 (6.27 pCi/L)	
	Subsequent Monitoring	1 sample in 2014	1 sample in 2014	
32	Initial Monitoring	6/05, 9/05, 12/05, 3/06 (4.7 pCi/L)	6/05, 9/05, 12/05, 3/06 (4.89 pCi/L)	9/05 (0.71 pCi/L) 12/05 (0.38 pCi/L)
	Subsequent Monitoring	2/11 (2.02 pCi/L)		
	Next Monitoring	1 sample in 2020		
3R	Initial Monitoring	5/08, 8/08, 11/08, 2/09 (6.47 pCi/L)	5/08, 8/08, 11/08, 2/09 (4.57 pCi/L)	5/08, 8/08, 11/08, 2/09 (0.26 pCi/L)
	Subsequent Monitoring	2/14 (4.42 pCi/L)		
	Next Monitoring	1 sample in 2020	1 sample in 2020	

10R	Initial Monitoring	3/11, 6/11, 9/11 12/11 (4.21 pCi/L)	3/11, 6/11, 9/11 12/11 (5.76 pCi/L)	3/11, 6/11, 9/11 12/11 (0.36 pCi/L)
	Next Monitoring	1 sample in 2017	1 sample in 2017	
SSS2	Initial Monitoring	2/05, 5/05, 8/05, 11/05 (2.03 pCi/L)		2/05, 5/05, 8/05, 11/05 (1.1 pCi/L)
	Subsequent Monitoring	2/14 (3.86 pCi/L)		
	Next Monitoring	1 sample in 2020		
SSS3	Initial Monitoring	12/03, 1/04, 5/04, 8/04 (0.49 pCi/L)		12/03, 1/04, 5/04, 8/04 (0.43 pCi/L)
	Subsequent Monitoring	2/12 (1.67 pCi/L)		
	Next Monitoring	1 sample in 2021		
SSS8	Initial Monitoring	2/05, 5/05, 8/05, 11/05 (1.88 pCi/L)		8/07, 12/07, 3/08, 5/08 (0.36 pCi/L)
	Subsequent Monitoring	5/08 (1.95 pCi/L)	5/08 (1.28 pCi/L)	
	Next Monitoring	1 sample in 2017		
SSS9	Initial Monitoring	5/04, 8/04,11/04,2/05 (3.71 pCi/L)	5/04, 8/04,11/04,2/05 (3.65 pCi/L)	5/04, 2/05 (0.67 pCi/L)
	Subsequent Monitoring	2/10 (1.27 pCi/L)		
	Next Monitoring	1 sample in 2019		
Delta	Initial Monitoring	6/10, 9/10, 12/10, 3/11 (0.89 pCi/L)	6/10, 9/10, 12/10, 3/11 (0.47 pCi/L)	6/10, 9/10, 12/10, 3/11 (0.16 pCi/L)
	Subsequent Monitoring	6/12 (0.98 pCi/L)	6/12 (2.68 pCi/L)	
	Next Monitoring	1 sample in 2021		
WID	Initial Monitoring	5/11, 3/12, 6/12, 9/12 (1.95 pCi/L)	5/11, 3/12, 6/12, 9/12 (1.43 pCi/L)	5/11, 3/12, 6/12, 9/12 (0.0 pCi/L)
	Subsequent Monitoring			
	Next Monitoring	1 sample in 2021		

All highlighted monitoring dates are delinquent

Standby Wells

Well No.	Sampling Round	Gross Alpha Dates and Av. Results (pCi/L)	Uranium Dates and Av. Results (pCi/L)	Radium 228 Dates and Av. Results (pCi/L)
15 (STBY)	Initial Monitoring	3/03, 6/03, 9/03, 11/03 (0.0 pCi/L)		2/06, 5/06, 8/06, 11/06 (0.20 pCi/L
	Next Monitoring	1 sample in 2012 (Overdue now)		
26 (STBY)	Initial Monitoring	3/02, 5/02, 8/02, 10/02 (3.34 pCi/L)		2/06, 5/06, 8/06, 11/06 (0.51 pCi/L
	Next Monitoring	2/08 (6.46 pCi/L)	2/08 (7.37 pCi/L)	
	Subsequent Monitoring	1 sample in 2017	1 sample in 2017	
SSS1 (STBY)	Initial Monitoring	2/04, 5/04, 8/04, 11/04 (2.97 pCi/L)		2/04, 5/04, 8/04, 11/04 (1.28 pCi/L)
	Subsequent Monitoring	1 sample in 2013 (Overdue now)		

All highlighted monitoring dates are delinquent

Radium-228: The City has monitored all wells and the surface water sources for radium-228 more than once. The results were below the radium-228 MCL of 2 pCi/L.

J. MANAGEMENT, OPERATION AND MAINTENANCE

1. Personnel

The City's Municipal Utilities Department has always operated the domestic water systems. In August 2003, the City entered into a contract with a private company, OMI Thames Water, to operate and maintain its water system. The OMI Thames Water operated the water system for about 5 years and on March 1, 2008, the City took over the operation and maintenance of the water system once again.

The City employs several certified water treatment plant operators. The City's DWSP water treatment plant has been classified as a T5 treatment facility. As such, the requirement for the Chief Operator is to hold a T5 license. Bret Beaudreau was the first Chief Treatment Plant Operator. He resigned his position in June 2015. The City is currently searching for his replacement. One City operator has a T4 license, and four other City operators have T3 licenses. A few others have T2 and T1 licenses. The City also employs several certified water distribution operators. One of the City distribution operators has a Grade 5 distribution certification, three have Grade 3 certifications, and several others have Grade 1 and 2 distribution certification. A list of all certified treatment and distribution operators is provided below.

Certified Treatment Operators

Name	Grade of Operator	Chief or Shift (C/S)	Operator Number	Expiration Date
Richard Bauman	T3 D5	S	13224 14178	06/01/17 05/01/17
Jeremy Stevenson	T3 D3	S	28877 30866	10/01/16 11/01/15
Sinclair Yim	T3 D2	S	32691 39119	05/01/17 11/01/17
Michael Galloway	T4 D3	S	19025 33066	01/01/18 01/01/16
James Racca	T3	S	31252	09/01/15
Scott Overby	T2		35716	06/01/17
Brent Bouler	T2		31961	01/01/17
David Johnson	T2 D2		36499 44217	01/01/18 10/01/17

Certified Distribution Operators – Production (Wells)

Name	Grade of Operator	Chief or Shift (C/S)	Operator Number	Expiration Date
Tom Retzius	D2 T2		20041 19343	06/01/17 11/01/17
Ray Gomez	D2		14179	06/01/15
Ryan Morgan	D3 T2		31829 29660	06/1/2017 02/01/18

Michael MacLeod	D2 T2		41443 34110	05/01/17 06/01/17

Certified Distribution Operators

Name	Grade of Operator	Chief or Shift (C/S)	Operator Number	Expiration Date
Lance Cook	D5 T2	C	20046 12755	12/01/17 10/01/16
Paul Alejo	D2 T2		9952 17268	06/01/15 06/01/17
Rudy Quinones	D2 T2		20043 16317	10/01/14 07/01/17
Brad Campoy	D1		26130	05/01/15
Frank Jones	D2		28552	06/01/18
Nick Pauly	D3		33119	06/01/17
Josh Caine	D3 T2		36328 29032	06/01/17 09/01/17

2. System Management

The current City management appears to be well qualified to operate the water system in compliance with the requirements of the regulations in order to provide pure, wholesome, and potable water to the customers of the City. Mr. C. Mel Lytle is the Director of Municipal Utilities Department. Mr. Tony Tovar is the Assistant Director of Water Resources. Bret Beaudreau who was the first Chief Treatment Plant Operator resigned in June 2015. The City is currently searching for his replacement to oversee the operation of the DWSP treatment plant and the distribution system. Mr. Lance Cook is the Water System Supervisor and is mostly in charge of the distribution system.

3. Planning

The City makes system improvements in accordance with the California Waterworks Standards. Up-to-date distribution system maps are maintained at the City's office.

4. Cross-Connection Control Program

The City has an active cross connection control program. The City has adopted a cross connection control ordinance in the City Code. Frank Jones is the Cross-connection Control Program Coordinator. The City employs five certified cross-connection control device testers. The City tracks its backflow device testing records by using computerized Backflow Prevention Management System.

The City's Building Permit Center, reviews applications for all new permits and amendments to existing building permits. The water division is notified of all new and amended commercial and industrial services. The cross-connection personnel then survey and determine the requirements for backflow protection at these services. The annual reports to the DDW indicate that a cross-connection survey of the system is carried out on a continuous basis but not in a systematic manner. On average, each year the City performs surveys of about 70 - 80 connections based on degree of hazard and industrial/commercial areas.

The majority of the backflow prevention devices in the water system are located on the commercial or multifamily properties. One of the larger industries served by the City is the Diamond Walnut Plant, and it has a total of five devices. Two of the devices exist on the water lines to the processing buildings and three devices exist on the fire suppression systems. The majority of the North Stockton area backflow prevention devices are located on commercial installations such as veterinary clinics, restaurants, and hospitals, etc. All sewage lift stations have reduced principle backflow prevention devices on the water connections.

All initial and routine testing of backflow prevention devices is performed by the City approved certified testers.

SUMMARY OF BACKFLOW DEVICE TESTING

Year	Total Devices	Number Installed	Number Tested	Number Failed	Number Repaired/ Replaced
2014	2,734	120	2,734	149	289
2013	2,625*	68	2,625	153	191
2012	2,581	144	2,581	153	150
2011	2,461	144	2,461	145	126
2010	2,349	175	2,349	136	90
2009	2,196	131	2,105	157	157
2008	2,079	207	2,075	198	155/43
2007	1,904	212	1,903	466	146/320
2006	1,732	493	1,703	20	338

2005	1,682	90	1,170	80	
2004	1,214	88	775	58	
2003	1,126	126	1,126	29	
2002	1,000	20	1,000	79	
2001	993	78	993	127	
2000	1,149	69	875	95	

*34 devices were inactive in 2013.

Two of the City wells (Wells Nos., 20, and SSS1) are gas engine driven and have cooling jackets on the pump discharge piping for cooling of the engine water. The City instituted a pressure testing procedure in 1986 for testing the integrity of the cooling jackets. Two tests are conducted:
(1) the heat exchanger pressure test in which the heat exchanger is isolated by closing the valves. Then, water is introduced into the exchanger to 15 psi. The isolation valve is closed and the pressure is observed for 15 minutes to verify integrity.
(2) the cooling system venting/pressure relief test. In this test, a flow/pressure is introduced into the heat exchanger and overflow venting is observed into the expansion tank open to atmospheric pressure and time is recorded. In 2013, the City performed two rounds of testing for all the jackets (in spring and fall).

Additionally, all the gas engine driven wells have propane backup generators to provide power for the operation of the gas engines in a power outage. The propane generator cooling system at each site also receives water from the distribution system via a reduced pressure principle backflow prevention device. The City tests these devices annually.

The City is planning to install electrical motors at these wells in the near future along. Pump pedestals (concrete base) at these wells do not meet the standard height requirement of 18 inches. Therefore, the City needs to increase the pedestal height to at least 18 inches from finished elevation of the well lot, whenever these natural gas driven engines are replaced with electrical motors.

5. Emergency Notification Plan (ENP)

The City's water quality emergency notification plan dated July 2014 is outdated and needs to be updated due to changes in City and DDW personnel. The City has an emergency response plan. The emergency response plan was updated in February 2006.

6. Main Disinfection Program

Mains are disinfected in conformance with the AWWA specified standard methods. The City personnel use liquid chlorine for disinfecting storage facilities, chlorine tablets for new main disinfection. The contractors disinfect all new mains installed by the contractors and the City conducts bacteriological quality monitoring prior to accepting the new mains.

7. Valve Maintenance Program

The City has approximately 10,490 valves in the system. The City exercised about 463 valves in the year 2014. All valves are reported to be located on the distribution system maps, which are available to the field crew. Due to the large number of valves in the system, the City anticipates to achieve the objective of exercising the valves in 10 year cycle basis. The City's electronic database maintains the list of all valves in the system and is capable of tracking and generating reports of the valves that are exercised. All valves are identified with numbers in the database. The City can easily retrieve the number of valves tested in a specified time period.

	Size range of valves	Total Number in System	Number exercised in 2014	Frequency of valve exercise
Valves	1 - 60 inches	10,490	463	10 years

8. Flushing Program

In the recent years the City initiated a distribution system flushing program, however, it is not carried out according to the schedule and dead-ends are mostly flushed on an as-needed basis. In the future, the City's flushing plan is to perform flushing every two years depending on the staff availability.

	Total Number in System	Numbers with blowoff	Number flushed in 2014	Frequency of flushing
Dead-ends	1,282	1,282	176	As needed

9. Complaints

SUMMARY OF COMPLAINTS (RECEIVED IN 2014)

Type	Number	Comments
Taste & Odor	15	Usually caused by change in supply source, chlorine, sink traps, etc.
Color	8	due to flushing, local disturbances, construction
Turbidity	0	
Pressure	26	Usually due to on-site customer problems or leaks

Other	1	Air, oil complaint, etc.
Total	50	

SUMMARY OF SYSTEM PROBLEMS (OCCURRED IN 2014)

Type	Number	Comments
Service Connection Breaks/Leaks	245	Routine deterioration, defective materials, etc.
Main Breaks/Leaks	14	Tree roots or construction errors

The 2014 Annual Report to the Division indicates that the above listed complaints were received during the year. Reportedly corrective actions were taken expeditiously to mitigate or eliminate the causes of the problems. For more details, please see the 2014 Annual Report to the Division.

10. Distribution System Classification

Note that the City of Stockton's distribution system has been classified as a D5 system and as such, the minimum certification required of chief operator is D5 and the minimum certification of shift operator is D3. A list of all certified distribution operators is provided in Section J1 above.

11. Treatment Facility Classification

Also note that pursuant to section 64413.3 of the operator certification regulations, the City's surface water treatment plant has been classified as a T5 facility and as such, the minimum certification required of chief operator is T5 and the minimum certification required of shift operator is T3. A list of all certified treatment operators is provided in Section J1 above.

12. System Management

The current City management is well qualified to operate the water system in compliance with the requirements of the regulations in order to provide pure, wholesome, and potable water to the customers of the Stockton water system.

K. ENVIRONMENTAL COMPLIANCE

1. Surface Water Treatment Facility CEQA

The DDW as "responsible agency" pursuant to CEQA (California Environmental Quality Act) has reviewed the Final Environmental Impact Report prepared by the City of Stockton dated August 2005. The document was distributed to the public and circulated through the State Clearinghouse (SCH #2003112060) for a 45-day review period beginning on April 29, 2005, and ending on June 13, 2005. Three written comments were received during the review period. The project was adopted and approved by the City Council on November 8, 2005. The City of

Stockton filed a Notice of Determination through the State Clearinghouse on November 9, 2005.

Pursuant to the California Department of Fish and Game Code Section 711.4, a copy of the filing fee receipt is on file with the lead agency.

As a responsible agency, the Division has considered the Final Environmental Impact Report together with all comments received during the environmental review period and hereby makes the following findings for the permit amendment:

The project will not result in any significant impacts. Therefore, there are no recommended permit conditions in relation to CEQA.

Copies of the environmental clearances and notices of determination are located in **Appendix H**.

2. Chloramination Facilities CEQA

The City as a Responsible Agency under the California CEQA approved the Chloramination facilities project on April 16, 2013, and has made the following determinations regarding the project:

- A negative declaration was prepared and adopted.

A letter from the State Clearing House dated February 12, 2013, states that the City has complied with the CEQA regulations regarding this project (SC# 2013012031). The negative declaration was filed with the San Joaquin County Clerk on April 17, 2013. Copies of the environmental clearances and notices of determination are located in **Appendix H**.

L. ENGINEERING APPRAISAL OF SANITARY HAZARDS AND SAFEGUARDS

The City's water system is generally well maintained and operated, and the water system is capable of supplying safe and potable water which meets all the primary drinking water standards. The City has seen a steady population growth over the last years. During this period, the population has increased from approximately 119,600 in 2003 to 173,242 in 2013, an increase of about 40% at a rate of 3 percent per year. As with the population, the amount of service connection has also grown. To keep up with the growing demand for potable water, City management took proactive steps to expand its potable water supply. Not only has the City drilled new wells, but it has also constructed a 30 MGD membrane surface water treatment plant, which treats raw water from the Delta and Mokelumne River. Along with the treatment plant, the City has added a 4.0 MG water storage tank. The 4.0 MG water storage tank also serves as a clearwell, for CT, for the DWSP plant. As a result of these improvements to the water system, the City has plenty of potable water available and can reliably meet the needs of City residents for many years to come.

The surface water source, the Mokelumne River, is considered a good source of domestic water; however, Delta source has one of the worst quality of water. Based on water quality data, the Delta has very high TDS and TOC concentrations. Due to the high level of recreational and agricultural use in the watershed, the design of the DWSP plant included higher than usual Giardia and virus Log Removal Values than typically found at surface water treatment plants. The Siemens L20N ultrafiltration membranes incorporated into the DWSP plant are rated as an Alternative Filtration Technology by the Division and are credited with 4.0 LRV for both Giardia and Cryptosporidium, and a 1.0 LRV for viruses. The contact-time in the clearwell achieves an additional 0.5 Giardia LRV and 4.5 virus LRV. Therefore the DWSP has a combined LRV of 4.0-Log Removal for Cryptosporidium, 4.5-Log removal for Giardia, and 5.5-Log removal for viruses.

Jar testing must be performed on a regular basis. Frequent changes in raw water quality such as alkalinity, temperature, pH would warrant jar testing to ensure coagulant dosages are frequently optimized.

The DWSP is manned 24-hour a day. As described previously in this report, the plant has extensive monitoring and controls, which alert operators to operational situations that require attention.

The City shall make efforts to implement the recommendations of the latest 2015 Watershed Sanitary Survey to minimize and/or eliminate the risks of pollutants from entering its surface water sources. The City shall monitor land planning, both within its planning area and those within unincorporated access of San Joaquin County, to mitigate impacts of such developments on the Delta and Mokelumne River water quality. The City shall also monitor the recreational and agricultural uses of the Delta and Mokelumne River to prevent contamination of its watershed.

M. CONCLUSIONS AND RECOMMENDATIONS

The Division finds that the DWSP and the ground water wells are adequate for delivery of safe, wholesome, and potable water to the City of Stockton customers. Issuance of a new full domestic water supply permit by the Division to the City of Stockton is recommended subject to the following provisions:

1. The status and primary station codes of the sources permitted for this system are listed below:

Source	Status	Primary Station Codes
Well No. SSS2	Active	3910012-003
Well No. SSS3	Active	3910012-083

Well No. SSS8	Active	3910012-089SS8R
Well No. SSS9	Active	3910012-055SS9R
Well No. 9	Active	3910012-029
Well No. 18	Active	3910012-037
Well No. 19	Active	3910012-038
Well No. 20	Active	3910012-039
Well No. 21	Active	3910012-040
Well No. 25	Active	3910012-044
Well No. 27	Active	3910012-046
Well No. 28	Active	3910012-084
Well No. 29	Active	3910012-087029R
Well No. 30	Active	3910012-092RW30
Well No. 31	Active	3910012-094RW31
Well No. 32	Active	3910012-096RW32
Well No. 3R	Active	3910012-098RW3R
Well No. 10R	Active	3910012-100
SEWD Treated	Active	3910012-048
Delta Raw	Active	3910012-102
WID Canal Raw	Active	3910012-103
DWSP Treated	Active	3910012-104

No changes, additions, or modifications shall be made to the sources mentioned in Condition No. 1 unless an amended water permit has first been obtained from the Division.

2. All water supplied by the water system for domestic purposes shall meet all MCLs established by the Division of Drinking Water. If the water quality does not comply with the California Drinking Water Standards, treatment shall be provided to meet standards.

   In addition, the City shall comply with all the requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code and any regulations, standards or orders adopted thereunder.

3. All personnel who operate the distribution facilities shall be certified in accordance with Title 22, Section 63770, CCR. The City's distribution system is classified as a D5 distribution system. As such, the minimum grade required for

the Chief Operator is D5 and the minimum grade required of the Shift Operator is D3.

4. All personnel who operate the treatment facilities shall be certified in accordance with Title 22, Section 63765, CCR. The City's DWSP surface water treatment plant has been classified as T5 facility. As such, the minimum grade required for the DWSP Chief Operator is T5 and the minimum grade required for the Shift Operator is T3.

5. The City shall continuously disinfect all active wells. The chlorination point for all wells shall be downstream of the check valve. At no time shall the City introduce un-chlorinated water to the distribution system.

6. All wells shall be monitored monthly for coliform contamination to assure that contamination that may occur in the wells will not go undetected. The samples collected for bacteriological examination shall be collected from points at the well sites that represent raw water before the addition of any chlorine. A monthly wellhead coliform monitoring summary shall continue to be submitted to the Division within 10 days of the end of each month.

Surface Water Treatment Facility

7. The City shall comply with the following conditions pertaining to the DWSP plant:

   A. The City is permitted to use the Delta and WID canal as sources of raw water supply for the new surface water treatment facility.

   B. The City's surface water treatment plant is permitted for operation at a maximum flow rate of **30** MGD with all **10** membrane skids in service.

   C. The L20N membranes are approved to operate at a flux of up to **155** gallons per square foot per day (gfd) and a transmembrane pressure (TMP) of up to **22** psi @ ≤30°C or **17** psi @ >30°C.

   D. The City shall operate the DWSP plant in accordance with the DWSP Operations Plan that has been approved by the Division. The City shall update its DWSP Operations Plan, on a regular basis, to reflect current practices. The City shall submit an updated DWSP Operations Plan to the Division every time the plan is updated with current information.

   E. The City shall monitor the raw surface water sources at least five days per week for total coliform and E. coli bacteria. The coliform tests shall be performed using a density analytical method and the results reported in units of MPN per 100mL. The results from the source monitoring shall be submitted monthly to the Division by the 10^{th} day of the following month.

F. The combined plant effluent turbidity shall be 0.1 NTU or less in at least 95 percent of the readings every month and shall not exceed 0.5 NTU at any time. If there is a failure with the continuous turbidity monitoring system or interruptions due to system maintenance, the City shall conduct grab sampling no less than once every hour in lieu of continuous monitoring. However, continuous monitoring shall be reinitiated for the combined filter effluent within 48 hours of turbidity monitoring system failure or maintenance interruption.

G. The Division has credited the Siemens (L20N) ultrafiltration membrane technology with 4-log *Giardia lamblia* removal, 4-log Cryptosporidium removal, and 1-log virus removal credit. At all times, the City shall treat its raw water supply to reliably provide a minimum total reduction of **4**-log *Giardia lamblia* and **5**-log viruses through the filtration and disinfection processes. An additional 0.5-log reduction of *Giardia lamblia* and 4-log virus shall be maintained through the disinfection process at the plant. Verification of the *Giardia lamblia* log reduction shall be demonstrated by calculating the CT achieved immediately following the 4.0 MG clearwell. The appropriate operational changes shall be made immediately if a minimum of 0.5-log *Giardia lamblia* reduction is not achieved

H. The clearwell is credited with a T_{10}/T (baffling factor) of **0.2**, for purposes of calculating actual CT.

I. Pressure decay integrity tests of the membranes shall be conducted at least once every day.

J. The City shall notify the Division by telephone of any exceedance of any MCL in the combined effluent of the treatment plant, failure to meet CT requirements, or whenever the turbidity of the combined filter effluent exceeds 0.5 NTU at any time. Notification shall occur within 24 hours of the City becoming aware of such an incident. If the Division's office is closed at the time, it shall be notified by telephone before 8:15 a.m. of the next business day. The water shall not be supplied to the distribution system until such incidents are corrected.

K. The City shall submit monthly filtration plant monitoring reports to the Division by the 10th day of the following month. The reports shall contain the information that has been previously requested by the Division and specified in the plant operations plan.

8. The City must ensure that the WID Canal is patrolled while it is being used as a source of supply. The WID Canal must be patrolled daily from Harney Lane to the DWSP SWTP and a minimum of one time per week from the diversion structure at WID's office to the DWSP SWTP. The City must maintain records of

the canal patrols and report all reportable events and significant events to the Division within 24 hours of discovery.

<u>Chloramination Treatment Facilities (North System Only)</u>

9. The effluent water from the storage tank shall be chloraminated at all times to control the formation of Disinfection By-Products. If short periods of operation of the system with a free chlorine residual are found to be necessary to control nitrification in the distribution system, the City shall file a request with the Division to utilize free chlorination, stating the reason for the need, the date of initiation of the free chlorination, and the duration of each period of use of free chlorine as disinfectant.

10. All monitoring requirements related to chloramination process shall be conducted according the Water Quality Monitoring Program listed in Tables 3-1, 3-2, and 3-3 in Section D3 of this report. Particular attention shall be given to the results related to the chloraminated water to assure that nitrification does not occur.

11. The operators of the City's surface water treatment plant shall be trained in the proper operation of the chloramination facilities to optimize the chloramination practice and satisfaction of the customers with the water produced by the treatment process. The chloramination shall be performed in accordance with an approved operations plan.

12. Following one year of operation with chloramines, the City shall submit a report summarizing the effectiveness of the change from chlorine to chloramines. This report should include data from the pre and post chloramination monitoring program to indicate the changes in water quality. This report should discuss the City's compliance with the Disinfection By-Products rule. This report shall provide details of the City's plan if City is not able to achieve compliance with the TTHM and HAA5 MCLs with this change from chlorine to chloramines.

13. The City should notify hospitals, dialysis centers, acute care centers, and other facilities of the planned use of chloramines as a distribution system residual disinfectant. All clinic, hospital, and home treatment units may not provide for removal of chloramines. Therefore, everyone involved with the treatment of dialysis patients must be alerted. The City has the over-all responsibility to assure that adequate notification is provided.

    The City shall provide notification of the impending change and its consequences to all consumers and all chronic and acute care dialysis facilities within its service area. In addition, the City should also notify owners of the pet fish, pet and fish shops, and other business and industries that may be affected by chloramines.

    The notification process should take place in two stages. In the first stage, the City shall advise each facility of the proposed conversion to chloramines. Approximately one month prior to commencing chloramines disinfection, the City should contact all facilities again to confirm that these facilities are prepared to treat chloraminated water. Confirmation may be carried out by written correspondence or by documented on-site visits to the facilities. The City shall advise the Division when this has been completed.

14. The City must establish a plan to notify new customers of the presence of chloramines in the water. This plan should also include future dialysis facilities, future pet and fish shops, and future business and industries that may be affected by chloramines in the City's water system.

15. The City shall submit monthly reports to the Division by the 10th day of the following month. Report based on all monitoring conducted according the Water Quality Monitoring Program listed in Tables 3-1, 3-2, and 3-3 in Section D3 of this report.

16. The City shall always maintain a minimum disinfectant residual of at least 0.2 mg/L in the water delivered to the distribution system. The City shall also always maintain a detectable disinfectant residual throughout the distribution system.

Standby Sources

17. The use of all standby sources is subject to the following conditions:

Standby Sources	Status	Capacity (gpm)	Primary Station Codes
Well No. SSS1	Standby	1,000	3910012-001
Well No. 15	Standby	1,805	3910012-034
Well No. 26	Standby	1,970	3910012-045

A. Standby wells shall be monitored a minimum of once every nine years for all inorganic, organic, and radiological MCLs, unless a waiver has been granted by the Division.
B. Standby wells shall be used for short-term emergencies of five consecutive days or less, and for less than a total of fifteen calendar days in a year.
C. Within 3 days after the short-term emergency use of a standby source, the water supplier shall notify the Division. The notification shall include information on the reason for and duration of the use.
D. The City shall notify the public within 30 days whenever the water from standby wells is delivered to the distribution system.
E. A standby source which has previous monitoring results indicating nitrate or nitrite levels equal to or greater than 50 percent of the MCL shall collect and analyze a sample for nitrate and nitrite annually. In addition, upon activation of such a source, a sample shall be collected, analyzed for

these chemicals and the analytical results reported to the Division within 24 hours of activation.

F. The City shall meter the standby source's monthly production and submits the results to the Division by the 10th day of the next month.

G. The City shall count any part of a day as a full day for purposes of determining compliance with Section 64414(c).

H. Provides public notice prior to use of the standby source by electronic media, publication in a local newspaper, and/or information in the customer billing, if the situation is such that the water system can anticipate the use of the source (e.g., to perform water system maintenance).

I. The City shall takes corrective measures such as flushing after the standby source is used to minimize any residual levels of the constituent in the water distribution system.

R:\DDW\Stockton\Dist10\SSF\SJC\3910012\Permit\Full Permit 2015\2015 Permit Engineering Report.doc

Appendix A

STATE OF CALIFORNIA
APPLICATION
FOR
DOMESTIC WATER SUPPLY PERMIT AMENDMENT
FROM

Applicant: CITY OF STOCKTON - MUNICIPAL UTILITIES DEPARTMENT
(Enter the name of legal owner, person(s) or organization)

Address: 2500 Navy Drive, Stockton, California 95206

System Name: City of Stockton

System Number: Public Water System No. 3910012

TO:
Bhupinder Sahota, District Engineer
State Water Resoucrs Control Board
Division of Drinking Water, Stockotn Districts
31 East Channel Street, Room 270
Stockton, California 95202

Pursuant and subject to the requirements of the California Health and Safety Code, Division 104, Part 12, Chapter 4 (California Safe Drinking Water Act), Article 7, Section 116550, relating to changes requiring an amended permit, application is hereby made to amend an existing water supply permit to 1) Change the disinfection from chlorine to chloramine for the north Stockton distribution area by adding chloramination facilities to the Delta Water Supply Project Treatment Plant, Well Nos. 29, 30, 31, 32, 3-R and 10-R and a new facility for surface water from the Stockton East Water District Plant, referred to as the North Stockton Ammonia Facility (NSPAF); (2) Change the status of Well Nos. 26 in the north Stockton area and SS1 in the south Stockton area to Standby; and (3) Change the status of Well Nos. 1, 4, 7, 9, 11, 16 and 24 to Inactive.

I (We) declare under penalty of perjury that the statements on this application and on the accompanying attachments are correct to my (our) knowledge and that I (we) are acting under authority and direction of the responsible legal entity under whose name this application is made.

Signed By: [signature]

Print Name: Antonio S. Tovar, P.E., M.S.

Title: Deputy Director of Water Resources Planning

Address: 11373 North Lower Sacramento Road
Lodi, California 95242

Telephone: (209) 937-8790

Dated: February 19, 2015

DDWEM: 08/2007

STATE OF CALIFORNIA

APPLICATION

FOR

DOMESTIC WATER SUPPLY PERMIT AMENDMENT

FROM

Applicant: City of Stockton - Municipal Utilities Department

(Enter the name of legal owner, person(s) or organization)

Address: 2500 Navy Drive, Stockton, California 95206

System Name: City of Stockton

System Number: Public Water System No. 3910012

TO:

(District Engineer Name)
(Name of District) District Engineer
Drinking Water Field Operations Branch
California Department of Public Health
(Address)

Pursuant and subject to the requirements of the California Health and Safety Code, Division 104, Part 12, Chapter 4 (California Safe Drinking Water Act), Article 7, Section 116550, relating to changes requiring an amended permit, application is hereby made to amend an existing water supply permit to

Change Status of Water Well Nos. 13, 22 and 23 to Destroyed (please delete the PS codes for the water utility software).

I (We) declare under penalty of perjury that the statements on this application and on the accompanying attachments are correct to my (our) knowledge and that I (we) are acting under authority and direction of the responsible legal entity under whose name this application is made.

Signed By:

Print Name: C. Mel Lytle, Ph.D.

Title: City of Stockton Municipal Utilities Director

Address: 2500 Navy Drive
Stockton, California 95206

Telephone: (209) 937-8700

Dated: January 27, 2014

DDWEM: 08/2007

STATE OF CALIFORNIA

Department of Public Health

APPLICATION FOR

DOMESTIC WATER SUPPLY PERMIT AMENDMENT

Applicant: City of Stockton – Municipal Utilities Department

(Enter the name of legal owner, person(s) or organization)

Address: 2500 Navy Drive, Stockton, California 95206

System Name: City of Stockton

System Number: Public Water System No. 3910012

TO: Department of Public Health
Drinking Water Field Operations
Stockton District Office
31 E. Channel Street, Room 270
Stockton, California, 95202

Pursuant and subject to the requirements of the California Health and Safety Code, Division 104, Part 12, Chapter 4 (California Safe Drinking Water Act), Article 7, Section 116550, relating to changes requiring an amended permit, application is hereby made to amend an existing water supply permit to (1) Change the secondary disinfection from chlorine to chloramine for the north Stockton distribution area by adding chloramination facilities to the Delta Water Supply Project Water Treatment Plant, Well Nos. 29, 30, 31, 32, 3-R and 10-R and a new facility for treating water from the Stockton East Water District Water Treatment Plant called the North Stockton Pipeline Ammonia Facility (NSPAF); and (2) Change the status of Well Nos. 7, 9, 18, 19, 20, 21, 24, 25, 27, 28 in the north Stockton area and SS1 in the south Stockton area to standby.

I (We) declare under penalty of perjury that the statements on this application and on the accompanying attachments are correct to my (our) knowledge and that I (we) are acting under authority and direction of the responsible legal entity under whose name this application is made.

Signed By: Antonio S. Tovar

Name (Print or Type): Antonio S. Tovar, P.E., M.S.

Title: Deputy Director/Water Resources Planning

Address: 2500 Navy Drive, Stockton, California 95206

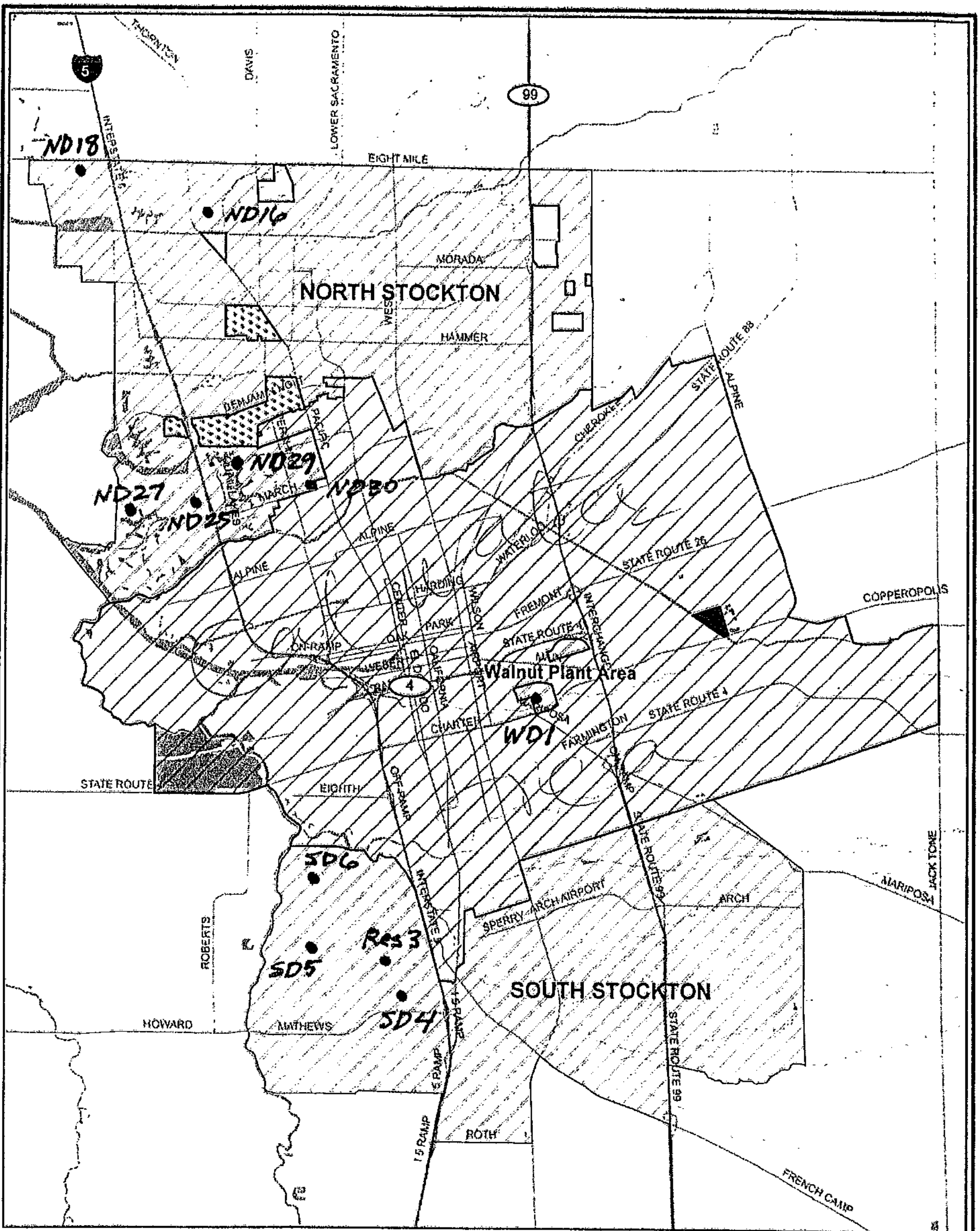
Telephone: (209) 937-8790

(Place official seal above)

Dated: 10-27-14

DDW 02/2008

Appendix B



LEGEND:

- Major Street
- COS MUD
- Lincoln Village
- Colonial Heights
- Cal Water
- County Area
- SEWD WTP
- Water Feature

N

0 0.45 0.9 1.8

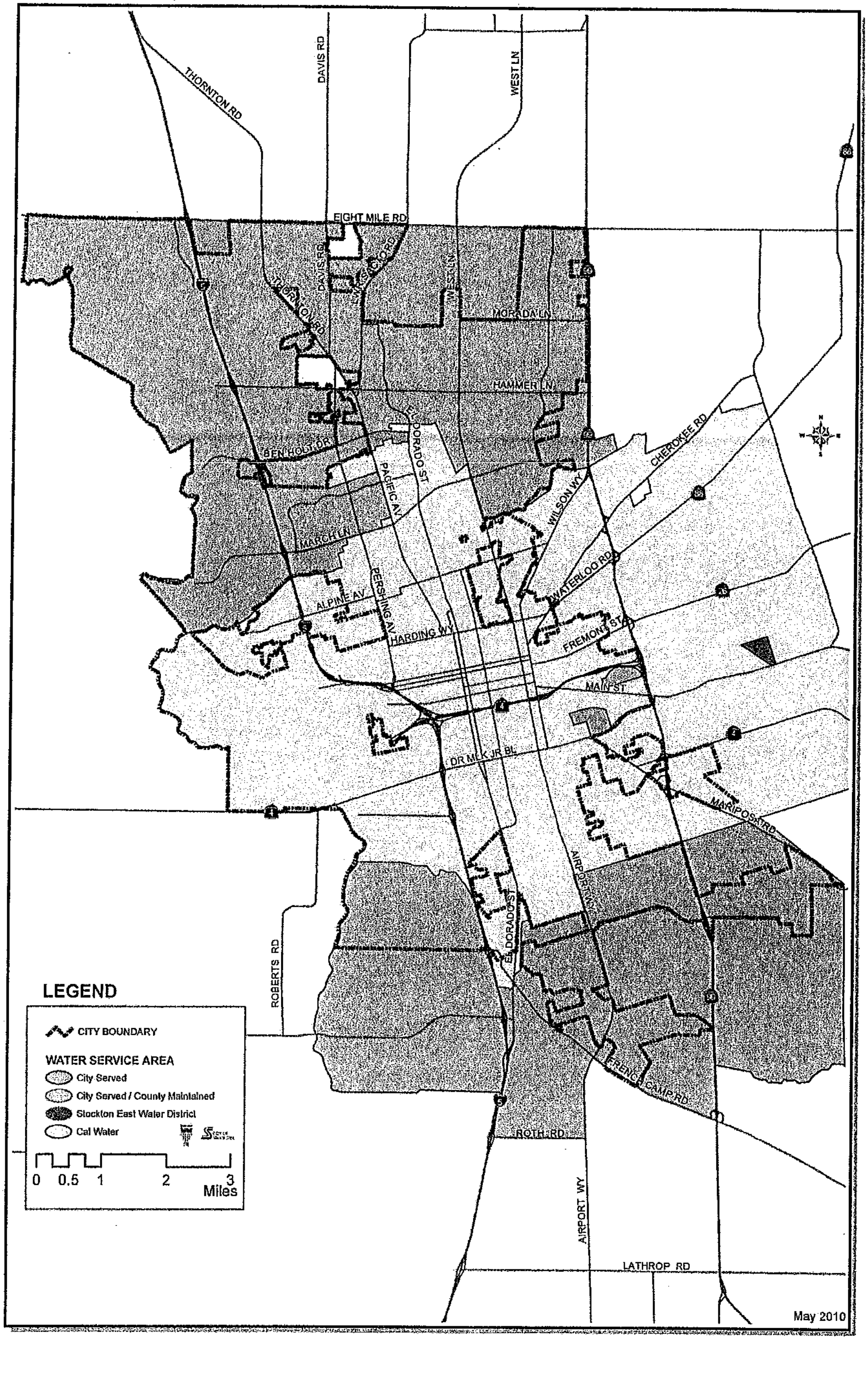
Scale in Miles

FIGURE ES-2

City of Stockton
Municipal Utilities Department
Water Master Plan Update

EXISTING SERVICE AREAS

o:\c\408\02-06-12\GIS\WMP Figures\ES\Figure ES-2_Ex. Service Areas.mxd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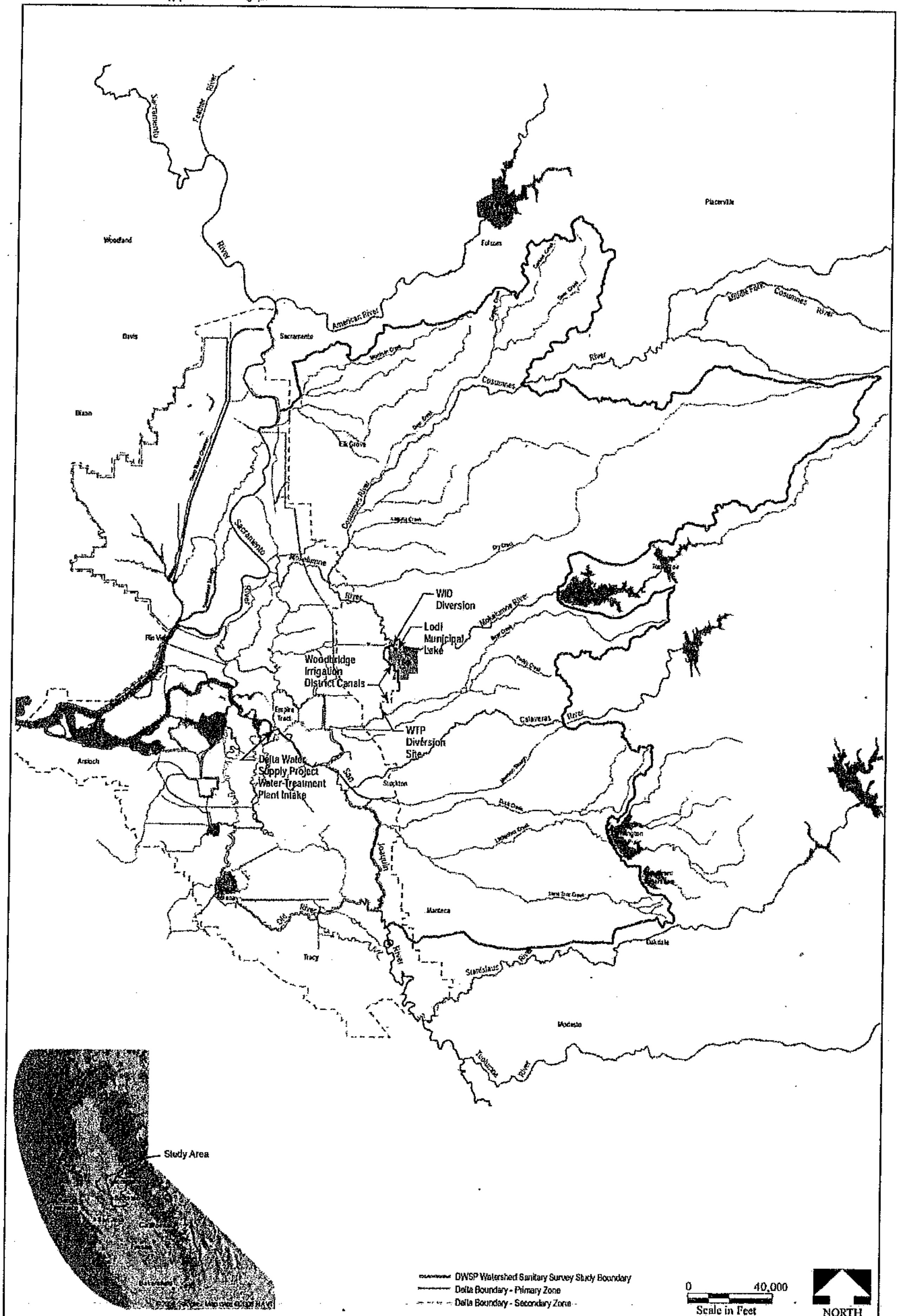
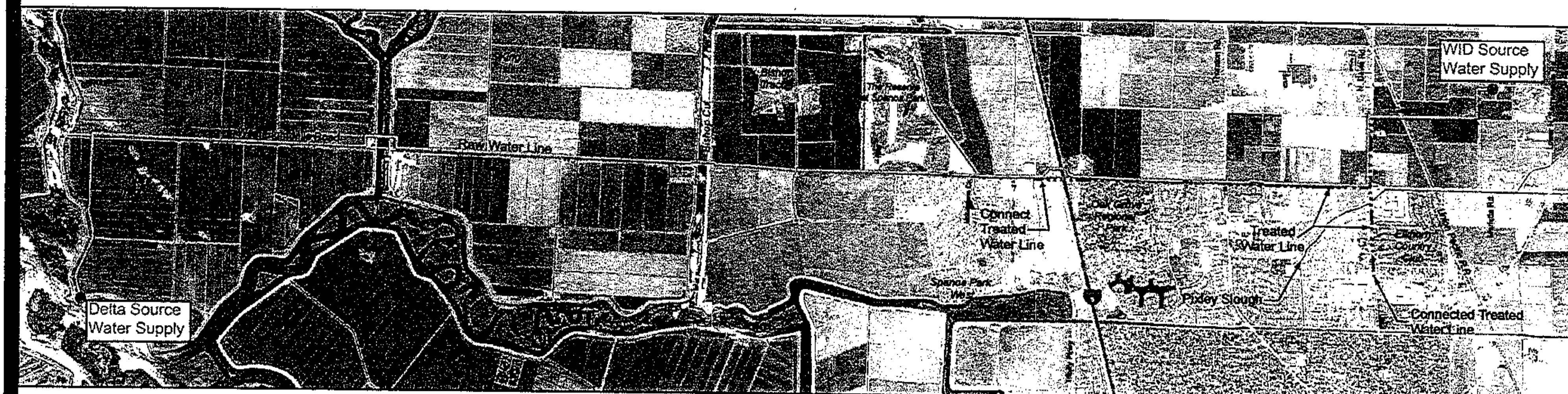
DAVIS RD
WEST LN
EIGHT MILE RD
DAVIS RD
MORADA LN
HAMMER LN
BEN HOLT DR
EL DORADO ST
PACIFIC AV
CHEROKEE RD
WILSON WY
MARCH LN
WATERLOO RD
PERSHING AV
ALPINE AV
HARDING WY
FREMONT ST
MAIN ST
DR MLK JR BL
MARIPOSA RD
AIRPORT WY
ROBERTS RD
EL DORADO ST
FRENCH CAMP RD
ROTH RD
AIRPORT WY
LATHROP RD
LEGEND
CITY BOUNDARY
WATER SERVICE AREA
City Served
City Served / County Maintained
Stockton East Water District
Cal Water
0 0.5 1 2 3
Miles
May 2010

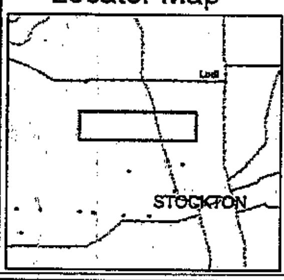


BROWN AND CALDWELL	PROJECT 134463-008	SITE CDM Delta Supply - WID Canals, Stockton, California	Figure
	DATE 11-12-08	TITLE Watershed Sanitary Survey Study Boundary	2-1

Appendix C



Locator Map



MAP LEGEND

- Raw Water Line
- Treated Water Line

This displayed map is assembled from various public domain sources as a visual display of information. CDM makes no warranty, representation or guaranty as to the content, sequence, accuracy, timeliness or completeness of any of the information displayed. CDM explicitly disclaims any representations and warranties, including, without limitation, the implied warranties of merchantability and fitness for a particular purpose. CDM shall assume no liability for any errors, omissions, or inaccuracies in the information provided regardless of how caused. CDM shall assume no liability for any decisions made or actions taken or not taken by the user of the map in reliance upon any information or data furnished hereunder.

N

0 0.2 0.4 0.8 1.2 Miles

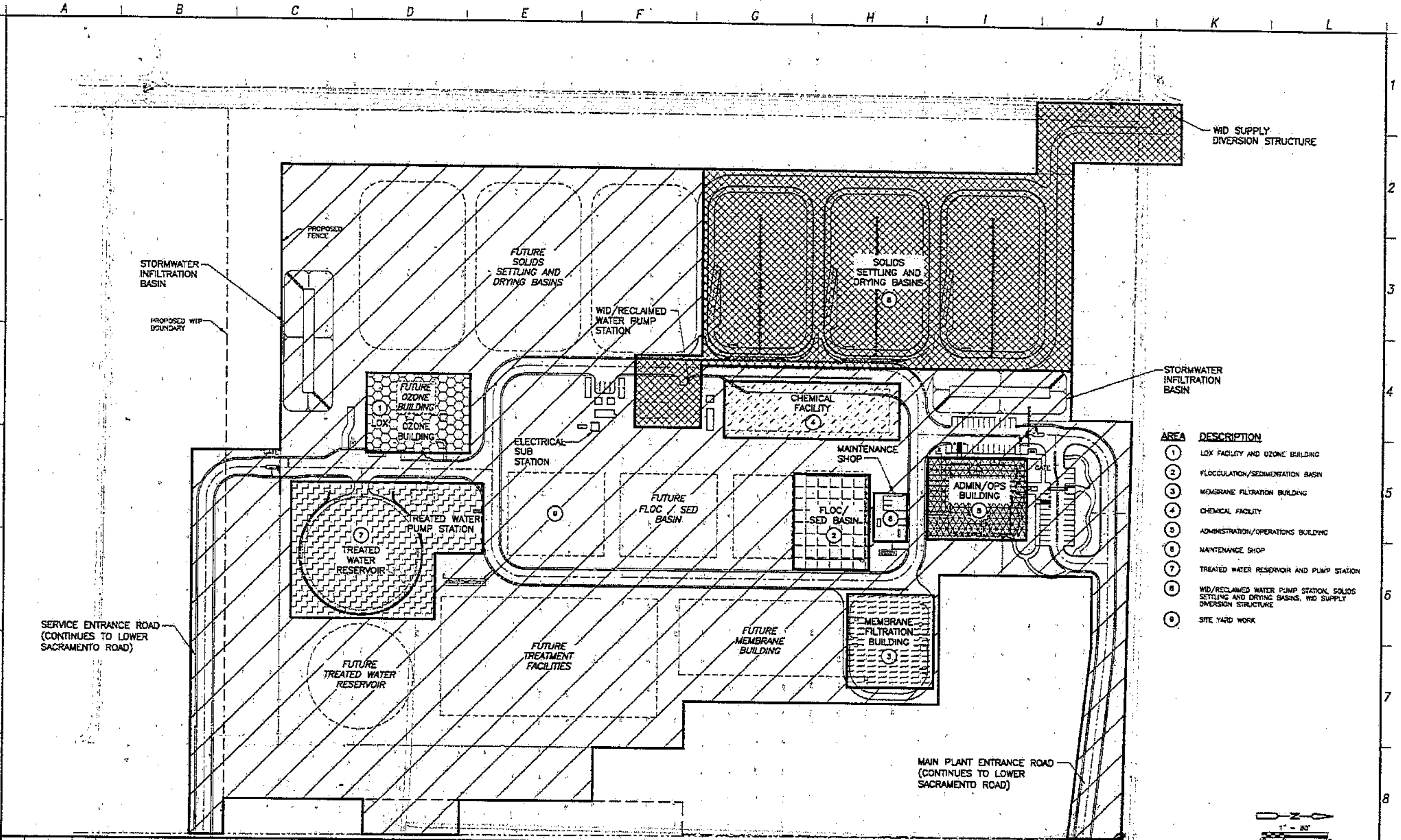
1 inch equals 3,500 feet

City of Stockton
Delta Water Supply Project
Pipeline and WTP Site Locations

VICINITY MAP

CDM
consulting · engineering · construction · operations

Appendix D



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J.NISHIMOTO
DRAWN BY: W. TALBOT
SHEET CHK'D BY: J.NISHIMOTO
CROSS CHK'D BY: G.LINDSTADT
APPROVED BY: G.LINDSTADT
DATE: APRIL 2010

CDM Camp Dresser & McKee Inc.
ONE WALNUT CREEK CENTER
100 PRINGLE AVE. SUITE 300
WALNUT CREEK, CA 94596
Tel (925) 933-2900
Fax (925) 933-4174

DEPARTMENT OF MUNICIPAL UTILITIES
CITY OF STOCKTON, CALIFORNIA

APVD BY: ______ DATE: ______
ENGINEERING MANAGER, DEPARTMENT OF MUNICIPAL UTILITIES

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN ADJUST SCALE ACCORDINGLY

No. C 44050
Exp. 6/30/2011

Delta Water Supply Project

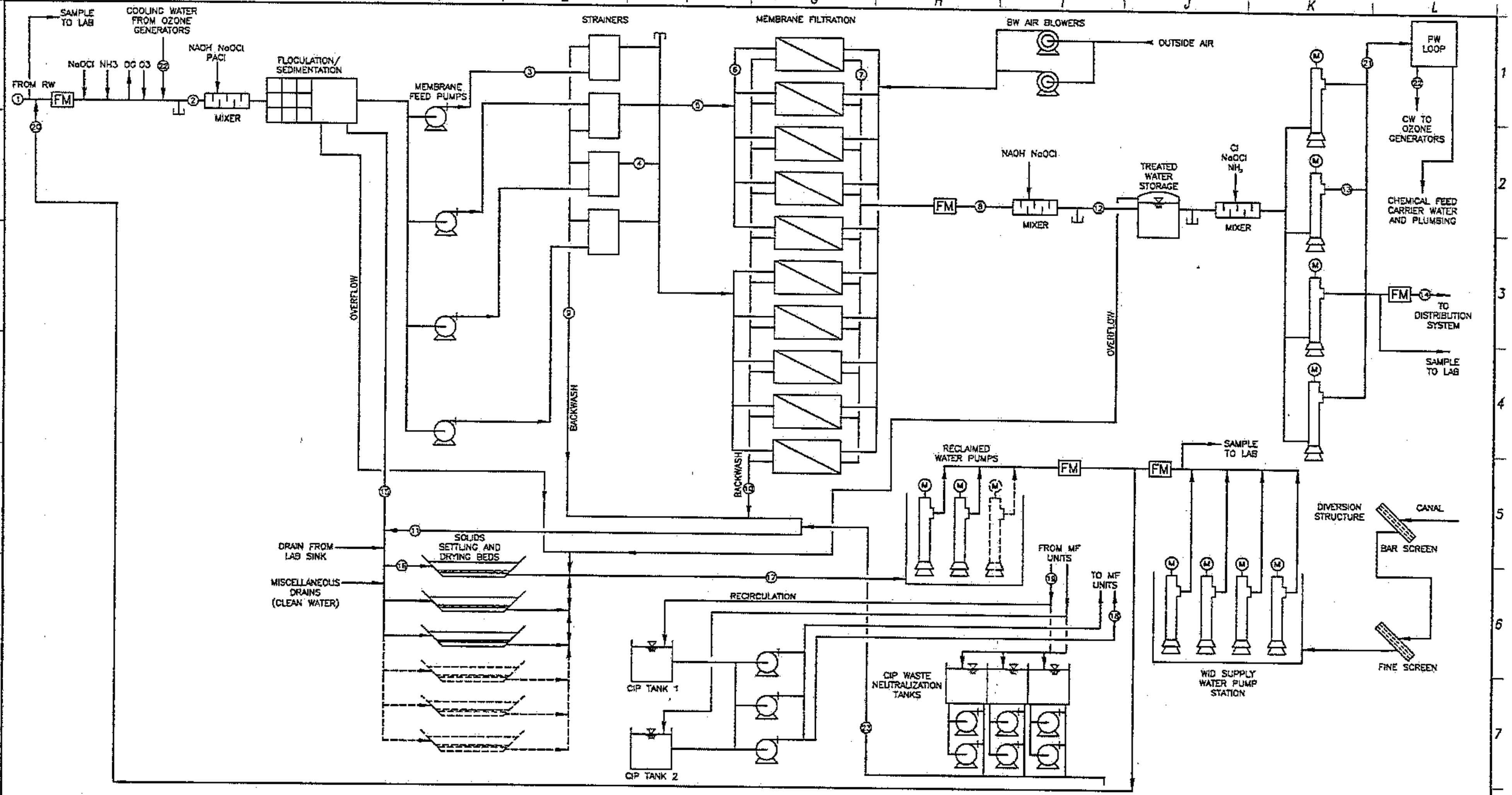
DWSP WATER TREATMENT PLANT

DELTA WATER SUPPLY PROJECT

GENERAL SITE AREA PLAN

PROJECT NO. 5000-61732
FILENAME: 61732500G006
SHEET NO.
G-6

C:\0-cad projects\5000-Stockton\61732\01-Sheets\01-gen\ 61732500G006 04/13/10 11:16 XREFS: 61732X00C101, 61732X00C114, 61732XBorder, 61732X0D25101, Co-g8, 61732X0D25101, 61732X0D6101markup



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
NAME	RW	RW	RW	RW	RW	RW	FW	FW	BW	BW	SLG	FW	TW	TW	SLG	SLG	DC/OF	CIP	CIP	WID	FW	CW	CIPD
MAXIMUM DAILY FLOW (MGD)	30.08	31.55	10.61	10.60	15.69	3.14	3.04	30.44	0.03	0.83	0.97	30.44	10.13	30.00	0.14	1.11	1.20	0.04	0.04	1.20	0.40	0.32	0.11
PIPE DIAMETER (INCHES)	54	36	20	20	24	12	12	54	8	14	16	36	24	54	8	16	16	8	8	42	12	6	4
INSTANTANEOUS FLOW (GPM)	20,889	21,911	8,400	8,400	12,600	2,520	2,444	24,443	310	2,133	1,480	24,443	7,037	20,833	220	3,161	830	1,225	1,225	20,889	1,100	220	190
VELOCITY (FT/SEC)	2.93	6.91	8.58	8.58	8.94	7.15	6.93	3.42	1.98	4.45	2.36	7.71	4.99	2.92	1.40	5.04	1.33	7.82	7.82	4.84	3.12	2.50	4.85
BURIED PIPE MTL	STL	STL	-	STL	STL	STL	STL	STL	PVC	STL	PVC	STL	-	STL	DI	DI	STL	-	STL	STL	PVC	STL	PVC
ABOVE GRADE PIPE MTL	STL	STL	STL	STL	-	STL	STL	STL	PVC	STL	-	STL	STL	-	STL	DI	-	PVC	PVC	-	-	STL	-

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. [illegible]
DRAWN BY: A. [illegible]
SHEET CHK'D BY: [illegible]
CROSS CHK'D BY: [illegible]
APPROVED BY: [illegible]
DATE: APRIL 2010

CDM Camp Dresser & McKee Inc.
ONE WALNUT CREEK CENTER
100 PRINGLE AVE. SUITE 300
WALNUT CREEK, CA 94596
Tel. (925) 933-2900
Fax (925) 933-4174

DEPARTMENT OF MUNICIPAL UTILITIES
CITY OF STOCKTON, CALIFORNIA

APV'D BY: ________ DATE: ________

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN ADJUST SCALE ACCORDINGLY

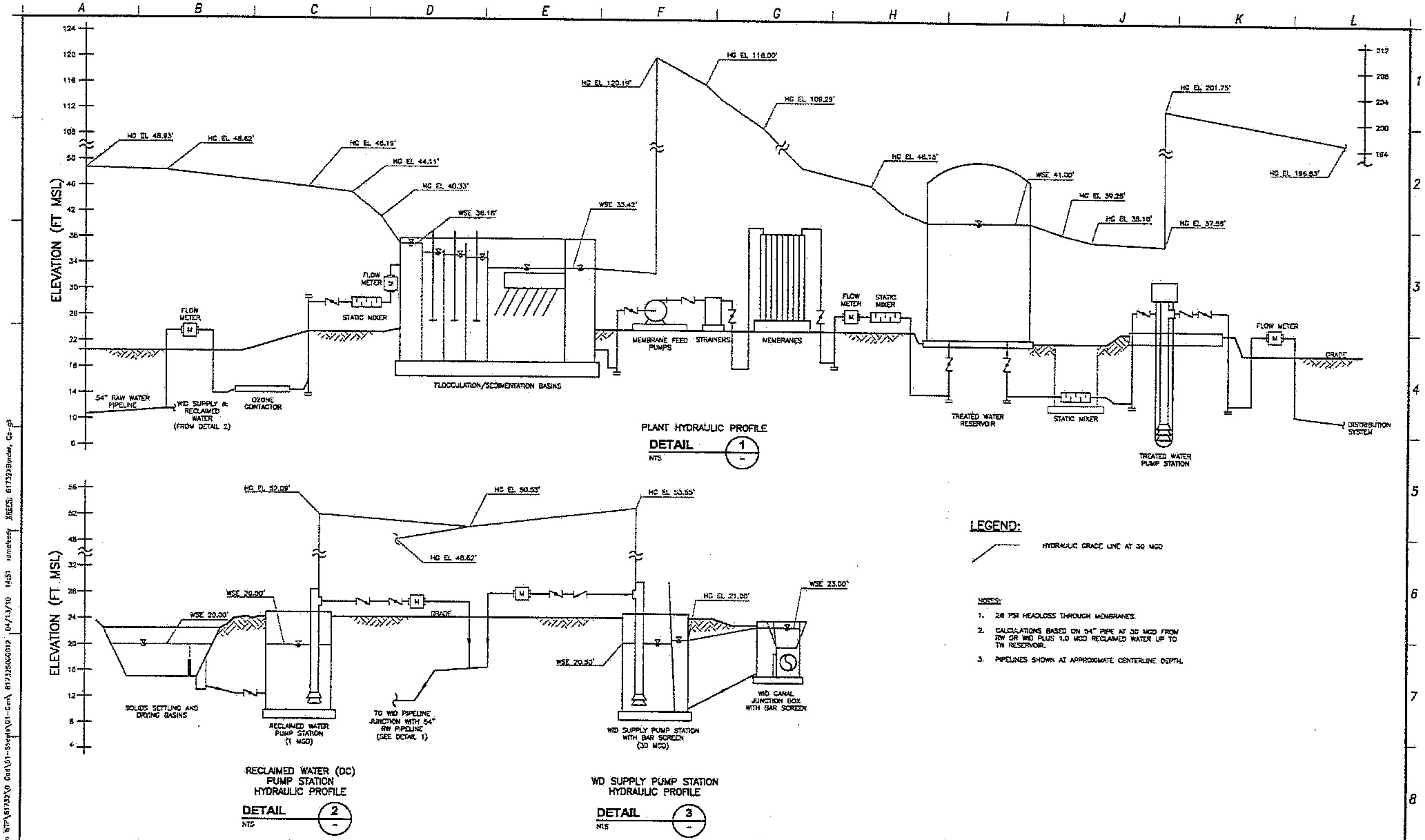
No. C 44080 Exp. 6/30/2011

Delta Water Supply Project

DWSP
WATER TREATMENT PLANT

DELTA WATER SUPPLY PROJECT
PROCESS FLOW DIAGRAM

PROJECT NO. 5000-61732
FILENAME: 61732500C011
SHEET NO.
G-11



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: K. YOKOMIZO
DRAWN BY: D. RAMALES
SHEET CHK'D BY: G. LINDSTADT
CROSS CHK'D BY: J. NISHIMOTO
APPROVED BY: G. LINDSTADT
DATE: APRIL 2010

CDM Camp Dresser & McKee Inc.
ONE WALNUT CREEK CENTER, 100 PRINGLE AVE. SUITE 300, WALNUT CREEK, CA 94596, Tel (925) 933-2900, Fax (925) 933-4174

DEPARTMENT OF MUNICIPAL UTILITIES
CITY OF STOCKTON, CALIFORNIA

IF THIS BAR DOES NOT MEASURE 1" THEN ADJUST SCALE ACCORDINGLY

Delta Water Supply Project

DWSP WATER TREATMENT PLANT

DELTA WATER SUPPLY PROJECT

HYDRAULIC PROFILE

PROJECT NO. 5000-61732
FILENAME: 61732500G012
SHEET NO. G-12

P:\5000 - Stockton WTP\61732\0 Cad\01-Sheets\01-Gen\ 61732500G012 04/13/10 14:51 XREFS: 61732Border, G0-p3

Appendix E

State of California

Department of Health Services

MEMBRANE PLANT DATA

RECEIVED
APR 10 2012
DRINKING WATER FIELD OPERATIONS BRANCH - STOCKTON

System Name: City of Stockton **System No:** 3910012

Source of Information: Delta Water Supply Project

Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/02/12

Plant Name	Delta Water Supply Project Water Treatment Plant	Year Operation Began	In construction, startup in 2012
Plant Flow & Variation	6 mgd to 30 mgd	Design Flow	30 mgd

RAW WATER SOURCE CAPACITY AND QUALITY:

Source Name & Type (GW, SW, GWUDI)	***DWSP – Delta Water Source – Raw (SW)*** ***DWSP – WID Canal Source – Raw (SW)***				
Source Capacity, gpm	>20,833 gpm				
Temperature	Max 25 deg C	Min 5.5 deg C	TDS	Max 370 mg/L	Min 70 mg/L
PH	Max 6.5	Min 8.3	Hardness	Max 92.7 mg/L	Min 42.2 mg/L
Turbidity	Max 89 NTU	Min 2 NTU	Other	Max	Min

PRETREATMENT

Type	Chemical & Manufacture	Dosage, mg/l	Type	Chemical & Manufacture	Dosage, mg/l
PH Adjustment	Caustic (as NaOH)	5.0 - 20	Sequestrant/Fouling	n/a	
Dechlorination	n/a		Antiscalant	n/a	
Taste/odor	Ozone	1.5 - 3	Bromate control	Chloramine – if required	0.5 - 2

PREFILTRATION

Type	Strainers	No. of Vessel/filters	4
Nominal Dia	20"	Power	1/4 HP
Inlet Pressure	<41 psi	Outlet Pressure	<41 psi
Describe Backwash Cycle	250 micron opening size, 12.09 mgd each, 2 psi headloss across strainer, motorized, self-backwashing type based on differential pressure		

FEED PUMPING SYSTEM

Type	Horizontal end suction	Make	Goulds
Capacity	8,400 gpm	Power	250 HP
Inlet Pressure	-4 psi	Outlet Pressure	40.9 psi

MEMBRANE FILTRATION UNITS

Type	Microfiltration - hollow fiber pressure membranes	Make	Siemens
No. of Trains	2	No. of Pr. Vessels/train	5 vessels with 204 modules each – 1,020 modules per train
Nominal Pore size (microns)	0.1 microns	Max. Operating Pr.	21.7 psi TMP
Inlet Pr.	33 psi	Energy Recovery System	none
Flow Rate per Train, gpm	2,083 gpm	Max Flow Rate per train, gpm @ design flow	2,500 gpm
Average Flux Rate, gpd/sf	45	Age of membranes	new
Percent Brine Generated	2.9% backwash waste	Percent Brine Recycled	100% of backwash recycled
Describe Brine/ Reject Disposal Practices	Backwash sent to the Solids Settling and Drying Basins. Water is settled and supernatant returned to inlet. Sludge is dried, removed, and hauled off to a landfill.		

MEMBRANE CLEANING

Membrane Cleaning Method	Maintenance Wash (EFM/ MW), MW, CIP	Time or Interval of Cleaning	MW every 36 hours with hypo, every 72 hours with sulfuric, CIP (citric acid and hypo) once a month
Cleaning Chemicals Used, dosages	Acid MW – 0.05% sulfuric acid Hypo MW – 100ppm sodium hypochlorite Acid CIP – 0.3% citric acid, 0.05% sulfuric acid Hypo CIP – 600ppm sodium hypochlorite		
Describe Cleaning Cycle	**Backwash and Cleaning Systems** The flux rate of the membrane units is maintained by frequent backwashing and periodic cleaning. Each membrane unit is typically backwashed once every 28 minutes and a complete backwash		

	cycle lasts approximately 4 minutes. A backwash involves a period of agitation of the membrane fiber bundles within the modules with compressed air and flushing the outer surface of the fibers with feed water. Waste wash water from the membrane units is discharged to the solids settling and drying basins. Maintenance Wash (MW) system routinely cleans away fouling materials from the membranes. Cleanings differ from backwashes in that the membrane fibers are allowed to soak in a static chemical solution. A complete MW cycle lasts approximately 45 minutes and includes a backwash, followed by chemical dosing, recirculation of solution through membranes, soaking, rinsing, and filter-to-waste. MW regimens include cleanings every 36 hours with hypochlorite and every 72 hours with sulfuric acid for each skid in operation. The MW system chemical waste is sent to the neutralization tanks. Sodium bisulfite and caustic soda are added to neutralize the chemical. The MW system consists of chemical day tanks, chemical transfer pumps, process water tanks (named CIP heating tanks), process feed/circulation pumps (named CIP pumps), neutralization tanks, and neutralization tank mixing/transfer pumps. All system components are located in the membrane building with the exception of bulk storage of sodium hypochlorite and caustic soda, which is in the Chemical Facility. Bulk chemical are transferred via pumps to Day tanks in the MF Bldg. Sulfuric acid and sodium bisulfite are delivered by partial load delivery by chemical trucks and pumped into their respective Day tanks in the MF building. All components of the MW system are also used for CIPs. A chemical clean-in-place (CIP) system periodically cleans away fouling materials from the membranes. The CIP cleaning sequence is the same as a Maintenance Wash sequence, except cleaning solutions are heated, and recirculation and soak sequences are longer. A complete CIP cycle lasts approximately 2.5 hours for each of the two chemical cleans, which are performed back-to-back. The CIP regimen includes cleanings on a monthly basis (one CIP per skid every 30 days).

POST-TREATMENT

Type	Chemical & Manufacturer	Dosage, mg/l	Type	Chemical & Manufacturer	Dosage, mg/l
PH Adjustment	Caustic	5-20	Corrosion Control	Corrosion inhibitor	0.5-1.5
Disinfection	Sodium hypochlorite	0.5-2	Chloramination	Aqua Ammonia	0.4-1

SURFACE WATER SOURCE DATA SHEET (Page 1 of 2)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.		
** Indicates items required for Source Water Assessment*		
	(separate multiple entries in one field with semi-colon)	Actual, Estimated or Default?
GENERAL INFORMATION		
System Name	City of Stockton	*from DHS database*
System Number	3910012	*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*	Delta Water Supply Project	
Organization Collecting Information *(DHS, County, System, other)*	CDM Smith (DWSP Consultant to the City)	
Date Information Collected/Updated		
SOURCE IDENTIFICATION		
* Source Name	DWSP - Delta Water Source - Raw	*from DHS database*
* DHS Source Identification Number (**FRDS ID No.**)	102	*from DHS database*
Source Status (Active, Standby, Inactive)	Active	*from DHS database*
SOURCE LOCATION		
Inlet Ground Surface Elevation (ft above Mean Sea Level)	13 ft	
Street or Road	private access road to pump station	
Nearest Cross Street	Eight Mile Road	
City	Stockton	
County	San Joaquin	
Site plan on file? ("YES" or "NO")		
TYPE OF SOURCE		
Type of Source: (Lake, Reservoir, River, Stream, Creek, Other)	Delta	
Production (gallons per year)	10,948,651,795	
Frequency of Use (hours/year)	7896	
LAKE/RESERVOIR DATA (If Applicable)		
Name of Lake or Impounding Reservoir	n/a	
Date Dam Constructed	n/a	
Dam Length (feet)	n/a	
Dam Height (feet)	n/a	
Dam Width - Base (feet)	n/a	
Dam Width - Top (feet)	n/a	
Surface Area when full (acres)	n/a	
Capacity (acre-feet)	n/a	
Reservoir Yield (gallons per day)	n/a	
Yield Reliability (% of time the above yield can be supplied)	n/a	
Outlet Location	n/a	
Outlet Level(s) (distance below maximum water surface) (feet)	n/a	
Multiple Outlet Depths Available? "YES" or "NO"	n/a	
Outlet Distance to Inflow (feet)	n/a	
Algae Control Measures	n/a	
Type of Recreational Activities in Reservoir *(list all that apply: boating, swimming, fishing, water skiing, etc.)*	n/a	
Distance to Nearest Sewage Facilities to Outlet (feet)	n/a	
STREAM INTAKE DATA (If Applicable)		
Name of River, Stream or Creek	San Joaquin River	
Intake Location	Stockton Ship Canal	
Stream Flow - Maximum (ft3/sec)	unknown	
Stream Flow - Minimum (ft3/sec)	unknown	
Stream Flow - Average (ft3/sec)	170,000	
Date Diversion Structure Constructed	In Construction, will be complete in 2012	
Diversion Structure Type (direct, infiltration gallery, etc.)	Direct	
Distance to Nearest Sewage Facilities to Diversion Structure (feet)	7,920	

SURFACE WATER SOURCE DATA SHEET (Page 2 of 2)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.		
** Indicates items required for Source Water Assessment*		
WATERSHED DATA		
Area of Watershed (acres)	43,090	
Area Owned or Controlled by Water System (acres)	n/a	
Primary Tributaries	San Joaquin River and Sacramento River	
Topography *(list all that apply: flat terrain, hilly, mountainous, etc.)*	flat terrain; hilly; mountainous	
Percent slopes (range)	Varied	
Geology	Varied	
Watershed prone to landslides? "YES" or "NO"	No	
Predominant Soil Types *(list all that apply: sand, loam, silt, clay, gravel, rock, fractured rock)*	sand; loam; silt; clay	
Predominant Vegetation *(list all that apply: grass, shrubs, chaparral, trees, forested, etc.)*	grass, trees, forested	
Watershed prone to erosion? "YES" or "NO"	No	
Mean Seasonal Precipitation (inches/year)	15	
Significant Ground water Recharge? "YES" or "NO"	NO	
* Neighborhood/Surrounding Area *(see Note 1)*	A	
Wastewater measures (septic systems, sewer treatment, etc.)	septic systems, treatment	
Watershed control measures	stormwater and wastewater discharge controls	
INTAKE PIPE		
Material	Intake fish screens, stainless steel, 10 screens, 5.08' x 14.75'.	
Diameter		
Length		
Depth		
Pumped or Gravity flow	gravity	
Discharges to: *(i.e., distribution system, storage, etc.)*	pump station wetwell	
INTAKE PUMP INFORMATION		
Number	4	
Make	Weir Floway	
Type	vertical turbine	
Size (hp)	250 HP	
* Capacity (gpm)	6,950 gpm	
Lubrication Type	Food grade oil	
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	
Auxiliary power available? ("YES" or "NO")	YES	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	Level in wetwell, SCADA	
REMARKS AND DEFECTS (use additional sheets as necessary)		
NOTES		
1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial, I = Industrial, Mu = Municipal, P = Pristine, O = Other		

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
GENERAL INFORMATION		
System Name	City of Stockton	*from DHS database*
System Number	3910012	*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*	Delta Water Supply Project	
Organization Collecting Information *(DHS, County, System, other)*	CDM Smith (DWSP consultant to the City)	
Date Information Collected/Updated	4/2/2012	
SOURCE IDENTIFICATION		
* Source Name	DWSP - WID Canal Source - Raw	*from DHS database*
* DHS Source Identification Number (**FRDS ID No.)**	103	*from DHS database*
Source Status (Active, Standby, Inactive)	Standby	*from DHS database*
SOURCE LOCATION		
Inlet Ground Surface Elevation (ft above Mean Sea Level)	24	
Street or Road	Private access road from WTP	
Nearest Cross Street	Lower Sacramento Road	
City	Lodi	
County	San Joaquin	
Site plan on file? ("YES" or "NO")		
TYPE OF SOURCE		
Type of Source: (Lake, Reservoir, River, Stream, Creek, Other)	Canal	
Production (gallons per year)	2,118,042,761	
Frequency of Use (hours/year)	3672	
LAKE/RESERVOIR DATA (If Applicable)		
Name of Lake or Impounding Reservoir	n/a	
Date Dam Constructed	n/a	
Dam Length (feet)	n/a	
Dam Height (feet)	n/a	
Dam Width - Base (feet)	n/a	
Dam Width - Top (feet)	n/a	
Surface Area when full (acres)	n/a	
Capacity (acre-feet)	n/a	
Reservoir Yield (gallons per day)	n/a	
Yield Reliability (% of time the above yield can be supplied)	n/a	
Outlet Location	n/a	
Outlet Level(s) (distance below maximum water surface) (feet)	n/a	
Multiple Outlet Depths Available? "YES" or "NO"	n/a	
Outlet Distance to Inflow (feet)	n/a	
Algae Control Measures	n/a	
Type of Recreational Activities in Reservoir *(list all that apply: boating, swimming, fishing, water skiing, etc.)*	n/a	
Distance to Nearest Sewage Facilities to Outlet (feet)	n/a	
STREAM INTAKE DATA (If Applicable)		
Name of River, Stream or Creek	n/a	
Intake Location	n/a	
Stream Flow - Maximum (ft3/sec)	n/a	
Stream Flow - Minimum (ft3/sec)	n/a	
Stream Flow - Average (ft3/sec)	n/a	
Date Diversion Structure Constructed	n/a	
Diversion Structure Type (direct, infiltration gallery, etc.)	n/a	
Distance to Nearest Sewage Facilities to Diversion Structure (feet)	n/a	

WATERSHED DATA

Area of Watershed (acres)	40,442	
Area Owned or Controlled by Water System (acres)	19,370	
Primary Tributaries	Mokelumne River	
Topography *(list all that apply: flat terrain, hilly, mountainous, etc.)*	flat terrain; hilly; mountainous	
Percent slopes (range)	varied	
Geology	varied	
Watershed prone to landslides? "YES" or "NO"	NO	
Predominant Soil Types *(list all that apply: sand, loam, silt, clay, gravel, rock, fractured rock)*	sand; loam; silt; clay	
Predominant Vegetation *(list all that apply: grass, shrubs, chaparral, trees, forested, etc.)*	grass, trees, forested	
Watershed prone to erosion? "YES" or "NO"	NO	
Mean Seasonal Precipitation (inches/year)	15	
Significant Ground water Recharge? "YES" or "NO"	NO	
* Neighborhood/Surrounding Area *(see Note 1)*	A	
Wastewater measures (septic systems, sewer treatment, etc.)	septic systems, sewer treatment	
Watershed control measures	stormwater and wastewater discharge controls	

INTAKE PIPE

Material	C200 steel pipe, mortar lined and coated	
Diameter	48-inch	
Length	430 ft	
Depth	varies, up to 10 feet	
Pumped or Gravity flow	gravity	
Discharges to: *(i.e., distribution system, storage, etc.)*	WID pump station wet well	

INTAKE PUMP INFORMATION

Number	4	
Make	Weir Floway	
Type	vertical turbine	
Size (hp)	100	
* Capacity (gpm)	7000 gpm	
Lubrication Type	ISO 32 oil	
Type of Power: *(i.e., electric, diesel, etc.)*	electric	
Auxiliary power available? ("YES" or "NO")	YES	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	level in wetwell, SCADA	

REMARKS AND DEFECTS (use additional sheets as necessary)

NOTES

1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial,
I = Industrial, Mu = Municipal, P = Pristine, O = Other

State of California — Department of Health Services

Filtration Plant Data

System Name:	City of Stockton
System Number:	3910012
Source of Information:	Delta Water Supply Project
Collected By:	CDM Smith (DWSP Consultant to the City) Date: 4/2/12
Name Of Water Treatment Plant:	Delta Water Supply Project Water Treatment Plant
Treatment Classification:	Bin 1
Plant Capacity:	
Design Flow (mgd):	30 mgd
Maximum Flow (mgd):	30 mgd
How Is The Flow Measured?	electromagnetic flow meters
Flow Variations:	6-30 mgd
Year Operation Began:	In construction, startup in 2012
Frequency Plant Checked:	daily shift checks, 24 hours monitoring and maintaining systems
Raw Water Pumps:	WID and Delta IPS
Type And Method Of Control:	vertical turbine, SCADA-controlled
Capacity Of Each:	
Pump #1 (250hp)	7,000 (gpm) 10 (mgd)
Pump #2 (250hp)	7,000 (gpm) 10 (mgd)
Pump #3 (250hp)	7,000 (gpm) 10 (mgd)
Pump #4 (250hp)	7,000 (gpm) 10 (mgd)
Influent Turbidity Measured Continuously?	Yes
Excessive Influent Turbidity Alarm?	Yes
What Turbidity Level Triggers Alarm?	Raw water turbidity set at 20 NTU, Settled water turbidity set at 5 NTU, MF system Filtered water turbidity >0.08 NTU (high) and 0.10 NTU (high-high), combined filtered water >0.05 NTU (high)
Automatic Shutdown At High Turbidity?	No, alarm only on raw and settled water. Individual MF skids will shutdown on high-high alarm. On a combined filtered water high alarm, operator will decide if plant should be shut down. Plant shutdown is manual, not automatic.

Chemical Data

Type:	aqueous ammonia, sodium hypochlorite, ozone, PACL, caustic, corrosion inhibitor
Purpose:	pH adjustment, raw water bromate control, taste/odor treatment, coagulation, chloramine formation, coagulation enhancement, disinfection, and corrosion control
Strength of Chemical Injected (%):	19% aqua ammonia, 12.5% sodium hypochlorite, 8-12% ozone, 11% PACL, 100% corrosion inhibitor, 25% caustic
Rate Injected Into System:	aqueous ammonia added to raw water for bromate control (0.75 to 10.7 gph), aqueous ammonia added downstream of clearwell for chloramine addition (0.6 to 4.8 gph), hypochlorite added to raw water for bromate control (2.1 to 31.3 gph), hypochlorite added to raw water for coagulation enhancement (1 to 10 gph), hypochlorite added for primary disinfection (2.1 to 41.7 gph), hypochlorite added downstream of clearwell for residual level adjustment and chloramine addition (1 to 20.9 gph), Ozone added to raw water for taste/odor (450 lbs/day @ 12% conc., 650 lbs/day @ 10% conc.), PACL added to raw for coagulation (0.9 to 30 gph), corrosion inhibitor added to treated water for corrosion protection in the distribution system (0.4 to 1.49 gph), caustic to raw and filtered water for pH adjustment (3.9 to 77.2 gph)
Dosage (mg/l):	aqueous ammonia added to raw water for bromate control (0.5 to 1.5 mg/L), aqueous ammonia added downstream of clearwell for chloramine addition (0.4 to 0.67 mg/L), hypochlorite added to raw water for bromate control (1 to 3 mg/L), hypochlorite added to raw water for coagulation enhancement (0.5 to 1 mg/L), hypochlorite added for primary disinfection (1 to 4 mg/L), hypochlorite added downstream of clearwell for residual level adjustment and chloramine addition (0.5 to 2 mg/L), Ozone added to raw water for taste/odor (1.5-3.5 mg/L), PACL added to raw for coagulation (5 to 25 mg/L), corrosion inhibitor added to treated water for corrosion protection in the distribution system (0.5 to 1.5 mg/L), caustic to raw and filtered water for pH adjustment (5 to 20 mg/L)
Is Chemical Added Continuously?	yes

Feeding and Injection Equipment

Type:	Metering Pumps
Make:	Pulsafeeder
Model:	55BF Shadow and 55BD (hypo and PACL), 55BF Shadow (caustic), 25BB Shadow (Corrosion Inhibitor and aqueous ammonia)
Capacity:	51.5 gph, 20.7, 33.9 gph (hypo), 34.9, 105 gph (PACL), 105 gph (caustic), 2.7 gph (corrosion inhibitor), 6.1 gph (aqueous ammonia)
What Determines Dose Level Used?	water chemistry of the raw water (pH, temp, conductivity, TSS) and experience in achieving target residuals or pH, jar tests
Are Jar Tests Performed?	Yes for determining the PACL dose
How Often?	when changing combined raw water makeup, when raw water quality changes significantly, as needed, at a minimum 2-3 times a year.

Chemical Storage

Capacity:	aqueous ammonia (7,700 gallons), hypchlorite (10,000 gallons), LOX (9,000 gallons), PACL (10,000 gallons), corrosion inhibitor (2,600 gallons), caustic (10,000 gallons)
Days Of Storage:	aqueous ammonia (47 days), hypchlorite (34 days), LOX (36 days), PACL (112 days), corrosion inhibitor (164 days), caustic (32 days)
Chemical Form When Added To System?	liquid
Points Of Application:	raw, filtered and treated water lines
Low Level Chemical Alarm Provided?	yes

State of California	Filtration Plant Data-(cont'd)	Department of Health Services
Flash Mixing		
Type:	static mixer	
Number:	1	
Mixing Energy (G):		
Nominal (sec^-1):	reported in terms of CoV, CoV </= 0.05 at 45 feet downstream of mixer	
Maximum (sec^-1):	reported in terms of CoV, CoV </= 0.05 at 45 feet downstream of mixer	
Nominal Mixing Time (sec):	5 seconds	
Flocculation Basins		
Number Of Basins:	2	
Stages Of Flocculation:	3	
Inside Dimensions of Each Stage (LxW in feet):		
Stage 1:	50x48	
Stage 2:	50x48	
Stage 3:	50x48	
Average Water Depth (ft):	17	
Volume Of Each Stage (ft^3):		
Stage 1:	97,660	
Stage 2:	97,660	
Stage 3:	97,660	
Volume Of Each Basin (ft^3):	292,980	
Total Volume (ft^3):	585,950	
Total Flocculation Time (sec):	1620	
Velocity Gradient (fps/ft):	50 in Stage 1, 30 in Stage 2, and 10 in Stage 3	
Type Of Flocculators:	vertical shaft, hydrofoil, variable speed	
Number Of Flocculators:		
Stage 1:	6	
Stage 2:	6	
Stage 3:	6	
Number Per Basin:	9	
Total Number:	18	
Mixing Energy (G):		
Stage 1-High:	70 (sec^-1)	Stage 1-Low: 50 (sec^-1)
Stage 2-High:	50 (sec^-1)	Stage 2-Low: 30 (sec^-1)
Stage 3-High:	30 (sec^-1)	Stage 3-Low: 10 (sec^-1)
Total GT For Flocculation Step:	38,000	
Flocculator Power (Each):		
Stage 1 (hp): 1.5	Stage 2 (hp): 1.0	
Stage 3 (hp): 1.0		
Flocculator Equipment Failure Alarm?	Yes	
Alarm Triggered By What?	VFD malfunction	

State of California | Department of Health Services

Filtration Plant Data-(cont'd)

Sedimentation	
Number Of Basins:	2
Inside Dimensions Of Each Basin (ft x ft):	75x48
Average Water Depth (ft):	18.5
Volume Of Each Basin (ft^3):	468,000
Total Sedimentation Volume (ft^3):	963,000
Horizontal Velocity (fpm):	
Average: 1.18	Maximum: 1.48
Detention Time (min):	
Average: 45 at design flow	Maximum: 110
Surface Loading Rate (gpm/ft^2):	
Average: data not available	Maximum:0.32 at design flow
Weir Overflow Rate (gpm/ft^2):	
Average:	Maximum: 1,219
Method Of Sludge Withdrawal:	Cable-driven vacuum
Filters	Membrane Microfiltration
Type:	Cylindrical hollow-fiber, outside-in flow,
Number Of Filters:	10 MF Skids, each with 204 cylindrical filter modules
Filter Inside Dimensions (ft x ft):	70.9" long x 4.7" diameter (each module)
Filter Media (N/A)	Filtration: Membrane Ultrafiltration
Anthracite Coal	
Depth (in):	Effective Size:
Uniformity Coefficient:	Specific Gravity:
Fine Sand	
Depth (in):	Effective Size:
Uniformity Coefficient:	Specific Gravity:
Coarse Sand	
Depth (in):	Effective Size:
Uniformity Coefficient:	Specific Gravity:
Gravel-Number Of Layers:	Total Depth:
Media Area Per Filter (ft^2):	Total Media Area (ft^2):
Filtration Rate at Design Flow	
All Filters In Service (gpm/ft^2):	0.03 (45 gfd)
One Filter Not In Service (gpm/ft^2):	0.03 (45 gfd)
How Is Filtration Rate Controlled?	Transmembrane Pressure
Turbidimeters At Each Filter?	yes
Do Excessive Turbidities Trigger An Alarm?	yes
At What Turbidity?	0.08 NTU (high alarm) and 0.10 (high-high alarm)
Continuous Measurement And Recording Of Finished Water Turbidity?	
Location:	downstream of Membrane System, upstream reservoir prior to chlorine addition
Type Of Device:	turbidimeter
Frequency Of Calibration:	weekly
High Turbidity Alarm:	Activated At: 0.05 (NTU)
Who Is Alerted?	plant operator

State of California | Department of Health Services

Filtration Plant Data-(cont'd)

Filter Backwash	
What Determines Backwash Interval?	TMP or Timer
Filter To Waste Capability?	yes
Source Of Backwash Water?	System feed water or settled water (post strainers)
Can Spent Backwash Water Be Visually Observed?	yes
Underdrain Type:	none
Maximum Backwash Rate (gpm/ft^2):	6.6 gpm/module
Percent Expansion During Backwash:	n/a
Backwash Duration (min):	4
Can Backwash Time Be Shortened Or Lengthend?	yes
What Determines Length Of Backwash?	programmed timer
Quantity Of Backwash Generated Each Day (mgd):	1.125
Supplemental Backwash Tank N/A	
Type:	
Volume (gal):	
Number Of Backwashes Per Volume:	
Filter Surface Wash N/A	
Type:	
Surface Wash Rate (gpm/ft^2):	
Surface Wash Rate (gpm):	
Surface Wash Rate (mgd):	
Surface Wash Duration (min):	
Waste Washwater Basins	aka Solids Settling and Drying Basins
Type:	Open basins
Number Of Basins:	3
Total Volume (MG):	1.57
Volume Of Wastewater Per Backwash (gal):	2,500
Washwater Disposal:	Settled and supernatant recycled to head of plant
Sludge Disposal:	Periodically remove dried solids from basins in drying mode
Clearwell	
Type:	wire-wrapped precast concrete tank
Capacity (MG):	4
Detention Time (Hr):	3.2
Comments	

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

CHLORINE DISINFECTION DATA

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/02/12

Location:	Upstream and downstream of the reservoir
Type of Disinfectant Used:	Sodium Hypochlorite
Application:	
Water Treated: (raw, filtered, etc.)	Filtered
Oxidant Demand Character:	Currently under study, do not expect much
Point of Application:	Static mixer upstream of the reservoir
Mixing:	
Contact Time: (minutes)	Min. operating tank volume varies depending on temperature and pH Possible range is 11 to 44 minutes
Minimum Contact Time Before Residual Test:	11 minutes
How was Contact Time Measured or Determined:	contact time = theoretical detention time x T10/T (0.2) Theoretical detention time = Minimum operating tank volume / flow rate out of tank
Water Flow Variation:	
Average Daily:	20 mgd
Maximum Daily:	30 mgd
Peak Hourly Flow:	26.4 mgd
Machine:	
Make:	Pulsafeeder
Type:	Metering Pump
Capacity:	80 gph
Condition:	New
Housing: (type)	NA
Insulation:	NA
Heating:	NA
Chemical Added: **% Available Disinfectant, Form**	Sodium hypochlorite, 12.5%
Cylinder or Crock Capacity:	NA
Stock on Hand:	30,000 gallons
Safety Features: (Locks, Lighting, Ventilation, Alarms, Etc)	NA
Operation and Maintenance:	
Spare Parts on Hand:	Yes
Ability to Make Repairs:	Yes
Equipment Inspection Frequency:	Daily
Residual Tests:	
Test Made: (DPD, etc.)	On-line amperometric probe
Type of Instrumentation:	On-line amperometric probe
Continuous/Grab:	Continuous
Where Test Made:	Multiple locations
Type: (Total, Free, Combined, Other)	Free and Total
Records:	CT required, CT achieved, pH, temperature, minimum daily tank volume, peak hourly flow rate, chlorine residual
Frequency of Equipment Calibration:	Weekly
Reliability Features:	

Auxiliary Power:	Yes
Automatic Switch-over:	Yes
Condition of Scales: (if any)	NA
Alarms: (if any)	Yes
Defects or Remarks:	

State of California | Department of Health Services

Reservoir Data

(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)

System Name:	City of Stockton
System Number:	3910012
Source of Information:	Delta Water Supply Project
Collected By:	CDM Smith (DWSP Consultant to the City) Date: 4/02/12
Reservoir Number Or Name:	T-7-001 Treated Water Reservoir/Clearwell
Location	
Cross Streets:	Lower Sacramento Road, DWSP WTP Service Entrance Road
Neighborhood:	North Stockton Area
Size Of Lot:	60 acres
Fencing:	chain link security fence around WTP
Construction	
Date Constructed/Refurbished:	2012
Purpose (Storage, Chlorine Contact, Etc.):	Chlorine Contact, Storage
Design Capacity (MG):	4
Operating Capacity (MG):	4
Construction Type:	wire-wrapped, precast concrete
Shape:	cylindrical, 195-ft diameter
Construction Materials:	concrete
Sides:	wire-wrapped, precast concrete panels
Floor:	cast-in-place concrete
Cover Or Roof:	flat, precast concrete with concrete column supports
Interior Coating Type:	none
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	195-ft diameter x 20-ft height (internal dimensions)
Tank Bottom Elevation (feet):	23
Height Of Tank (feet):	43
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	y
Cathodic Protection:	not required
Inlet Description	
Distance Above Bottom (feet):	0
Receives Water From:	membrane filtration system
Outlet Description	
Distance From Inlet (feet):	separated by a baffle wall, travel distance approximately 330-ft
Distance Above Bottom (feet):	6-inches
Delivers Water To:	North Stockton service area
Pressure Zone Served:	45-75 psi
Drain Location	
Distance Above Floor (feet):	drains out of sump in floor of tank, siphon-type drain, outlet at 1 ft above floor
Discharge Location:	to the tank overflow pipeline
Overflow Location	
Overflow Elevation (feet):	weir in tank = elevation 42
Distance Above Bottom (feet):	19
Discharge Location:	tank overflow pipeline runs to the Solids Settling & Drying Basins

State of California | Department of Health Services

Reservoir Data (Cont'd)

If Hydropneumatic Tank - N/A	
Capacity (gal)	
Site Glass	
Air Vent	
Pressure Gage	

Comments

STATE OF CALIFORNIA

DEPARTMENT OF HEALTH SERVICES

OZONE DISINFECTION DATA

SYSTEM NAME: CITY OF STOCKTON NO. 3910012.
SOURCE OF INFORMATION: DELTA WATER SUPPLY PROJECT .
COLLECTED BY: CDM SMITH (DWSP CONSULTANT TO THE CITY) DATE: 4/2/12.
TYPE OF DISINFECTION (EMERGENCY, MANDATORY, OR OPTIONAL): OPTIONAL .
WATER SOURCE : DELTA WATER SOURCE - RAW, WID CANAL SOURCE - RAW .
WATER TREATED (RAW/FILTERED ETC): RAW .
OZONE DEMAND CHARACTER: .
OZONE DOSAGE: .
POINT OF APPLICATION: RAW WATER PIPELINE UPSTREAM OF THE FLOC/SED BASIN .
MIXING: SIDE-STREAM EDUCTION SYSTEM .
CONTACT TIME BEFORE USE: IMMEDIATE .
CONTACT TIME BEFORE RESIDUAL TEST: EVERY 200 FEET ALONG PIPELINE CONTACTOR.
WATER FLOW
- VARIATION: 6 MGD-30 MGD PLANT FLOW .
- HOW MEASURED: MAGNETIC FLOWMETER ON THE RAW WATER .

EQUIPMENT
- TYPE: OZONE GENERATOR .
- MAKE: OZONIA .
- MODEL: SP-73 .
- CAPACITY: 650 LBS PER DAY @ 10% AND 450 LBS PER DAY AT 12% CONC .
- CONDITION: NEW .

DISINFECTANT RESIDUAL MONITORED CONTINUOUSLY? YES (OPTIONAL FOR DISINFECTION.
LOW LEVEL RESIDUAL ALARM? ONLY IF OZONE IS USED FOR DISINFECTION .
AT WHAT LEVEL OF DISINFECTANT RESIDUAL THE ALARM IS ACTIVATED? MEASURED RESIDUAL AND CALCULATED CT DOES NOT MEET THE REQUIRED CT .
HOW OFTEN ARE RESIDUAL ANALYSES CONDUCTED? MONTHLY .
TYPE OF RESIDUAL TEST USED: THE ACVK METHOD .
HOUSING AND SAFETY FEATURES
- HOUSING: BUILDING .
- INSULATION: YES .
- HEATING: YES .
- LOCKS: YES .
- LIGHTING: YES .
- VENTILATION: YES .
- LEAK DETECTOR WITH ALARM: YES .
- SWITCHES OUTSIDE THE OZONATION ROOM: YES .
- AIR PACK OR GAS MASK: YES .

IS AN EMERGENCY PLAN OF ACTION POSTED? THIS WILL BE PROVIDED .
- OPERATION AND MAINTENANCE: YES, VENDOR O&M MANUAL AT SITE .
- LAPSE DURING CHANGES: NONE, THERE IS A STANDBY GENERATOR .
- ABILITY TO MAKE REPAIRS: YES .
- HOW OFTEN IS THE EQUIPMENT INSPECTED? DAILY .
- OPERATION RECORDS KEPT: YES .

REMARKS AND DEFICIENCIES:

State of California

Department of Health Services

DISTRIBUTION DATA (PLANT WATER LOOP)

System Name: City of Stockton **System No:** 3910012

Source of Information: Delta Water Supply Project

Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/02/12

Number of Service Connections	6 service connections on the WTP plant water loop
Pressure Range	53-75
Type of Pipe Installed (%)	
Steel-Tar Coated & Wrapped	
Steel-Cemented Lined, Cement Coated	
Steel-Cement Lined	
Ductile Iron	
Asbestos Cement	
Galvanized	
Cast Iron	
PVC	100%
ABS	
Polyethylene (PE)	
Minimum Size of New Mains	4-inch
Amount Less Than 4" Diameter	0
Condition of Mains	New
Minimum Depth of Cover (Inches)	36
Service Connections (%)	
Copper	
Plastic (Type & %)	PVC, 100%
Lead	
Distance of Mains from Sewers	10 ft
Disinfection Method – New Mains (Describe Procedure)	Clean, hydrostatic test, disinfect w/ sodium hypochlorite solution or calcium hypochlorite granules or tablets. Dechlorinate and flush. After flushing and chlorine residual is less than 3 mg/L, take at least one sample for each pipeline and each branch longer than 50 feet for bacteriological testing. Bacteriological testing must pass prior to placing the line into service
Disinfection After Repairs (Describe Procedure)	Close valves upstream and downstream of section requiring repair. Service connections connected to repair section should be closed off. Drain line. Remove spool piece on one end of section and plug the end. Add a flushing tap at end to flush line. Tap line or use a hydrant and inject chlorine on the other end. Follow the slug dose method, fill the line with chlorine by opening the flushing tap and hydrants. Close all valves and let chlorine sit for 24 hours. Test chlorine residual levels. Then open the flushing tap and hydrants and the isolation valve to allow water to flow through pipe and flush the line. Take chlorine residual samples to ensure levels have receded and take a bacteriological sample. Once both test pass, then drain line. Swab the connecting spool piece with chlorine. Remove plug, and connect the repaired section to the distribution system using the spool piece. Open a hydrant nearby to flush the line.
Infiltration Hazard (Relation to Groundwater Table)	No
Dead Ends	
How Many?	2 on the WTP plant water loop
Flushing Valves Installed?	No, operators will use the hydrants to flush the line periodically
Flushing Program (Describe)	The WTP maintenance is scheduled and tracked in a computer

	maintenance management system software. All valves City operated are scheduled for periodic exercising and the water mains are routinely scheduled for flushing. In addition, in response to customer complaints, the City may choose to flush the lines in the area where there are complaints.
Growth and Sludge in Mains	No
Valves	
Sufficient Number	Yes
Valve Maps Maintained	DWSP record drawings
Valve Exercise Program	Scheduled maintenance with rest of plant and existing distribution system
Defects and Remarks	

State of California

Department of Health Services

STREAM DIVERSION DATA

System Name: City of Stockton **System No:** 3910012

Source of Information: Delta Water Supply Project

Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/02/12

Name of Stream Delta

Location: Southwest tip of Empire Tract at the confluence of Little Connection Slough and the Stockton Deep Water Ship Channel

Flow Variations (i.e. average flow, minimum recorded): average - 170,000 cfs, minimum unknown

Tributaries: San Joaquin River and Sacramento River

Water Diversion Rights (permit, contract, other): SWRCB Permit for Diversion and Use of Water

Permit (water right permit number): 21176

Diversion Structure (i.e. infiltration, direct): direct

Watershed:

Area: >39,000 square miles

Controlled by: uncontrolled

Type: River (Sacramento and San Joaquin)

Uses: multi-purpose

Sanitation Measures: stormwater and wastewater discharge control limits

Defects and Remarks:

State of California

Aqueduct and Transmission Mains Data

Department of Health Services

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/02/12

Raw Water/Treated Water:	Raw – Delta Water Source Raw Water – WID Canal Source Treated Water
Date First Used:	In Construction, startup in 2012
Ditch, Flume or Pipe:	Pipe
Joint Material:	Butt-welded lap joints
Pipe Material:	C200 welded steel pipe, cement-mortar-lined and coated
Gravity or Pressure:	Pressure
Pressure Range:	RW – 100 psi (Delta), 10-30 psi (WID) TW – 53-75psi
Length: *(Approximate)*	RW – 63,000 linear feet
	TW – 24,000 linear feet
Sizes:	RW – 54" (Delta), 48" (WID)
	TW – 30-, 36-, 42-, 54-inch
Capacity: *(MGD)*	RW – 30 MGD initially up to 60 MGD (Delta) and 50 MGD (WID), TW – 30 MGD initially up to 60 MGD
Receives From:	Delta Water Source - Sacramento-San Joaquin River WID Canal Source - Mokelumne River via WID-owned irrigation canals
Serves: *(Delivers To)*	North Stockton Service Area
Defects and Remarks:	

State of California

Pumping Station Data

Department of Health Services

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/02/12

Number or Name:	
Date Constructed:	In construction, startup in 2012
Purpose:	IPS Delta raw water pumping
Location:	Influent Pump Station located at the Intake
Housing:	TEFC
Insulation:	Class F VPI 2000
Heating:	N/A, pumps are indoors
Pit Depth *(if any)*:	26.29 feet
Drainage	¾" NPT tap on discharge
Relation to System:	
Receives From:	Delta waterway
Delivers To:	Delta Water Supply Project Water Treatment Plant
Inlet Pressure:	9 psi
Outlet Pressure:	39 psi
Maximum Capacity:	30 mgd
Flood Hazard:	None, pumps are 5-feet above 100-yr flood elevation
Pumping Units:	
Make:	Weir Floway
Type:	Vertical Turbine
Capacity *(gpm)*:	6,950
Lubrication:	Food grade Oil
Power:	Electric, 250 HP
Auxiliary Power:	Yes, Diesel Generator
Control:	Level in wetwell, SCADA-controlled
Frequency of Use:	Continuously 24 hrs/day except during restrictive months
Defects and Remarks:	

State of California

Pumping Station Data

Department of Health Services

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP consultant to the City) **Date:** 4/2/12

Number or Name:	
Date Constructed:	In construction, startup in 2012
Purpose:	WID raw water pumping
Location:	DWSP WTP WID Pump Station, Area 8
Housing:	WPI
Insulation:	Class F
Heating:	115V 145W
Pit Depth *(if any)*:	10.50 ft
Drainage	Drains into wetwell
Relation to System:	
Receives From:	WID Canal Diversion Structure
Delivers To:	Raw water pipeline at head of WTP
Inlet Pressure:	0
Outlet Pressure:	12 psi
Maximum Capacity:	40 mgd
Flood Hazard:	None
Pumping Units:	
Make:	Weir Floway
Type:	Vertical turbine
Capacity *(gpm)*:	7,000
Lubrication:	ISO 32 Oil
Power:	Electric
Auxiliary Power:	Yes, Diesel generator
Control:	Level in wetwell, SCADA-controlled
Frequency of Use:	Only spring months during the restrictive period for the Delta source use
Defects and Remarks:	

State of California

Pumping Station Data

Department of Health Services

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP consultant to the City) **Date:** 4/02/12

Number or Name:	
Date Constructed:	In construction, startup in 2012
Purpose:	Reclaimed water pumping
Location:	Reclaimed Water Pump Station
Housing:	WPI
Insulation:	Class H
Heating:	115V 60W
Pit Depth *(if any)*:	10 feet
Drainage	Drains into wetwell
Relation to System:	
Receives From:	Solids settling and drying basins
Delivers To:	Raw water pipeline at head of WTP
Inlet Pressure:	0
Outlet Pressure:	12 psi
Maximum Capacity:	2 mgd
Flood Hazard:	None
Pumping Units:	
Make:	Weir Floway
Type:	Vertical turbine
Capacity *(gpm)*:	700
Lubrication:	ISO 32 Oil
Power:	Electric
Auxiliary Power:	Yes, Diesel generator
Control:	Level in wetwell, SCADA-controlled
Frequency of Use:	Continuously 24hrs/day
Defects and Remarks:	

State of California

Pumping Station Data

Department of Health Services

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP consultant to the City) **Date:** 4/2/12

Number or Name:	
Date Constructed:	In construction, startup in 2012
Purpose:	Membrane system feed pumping
Location:	Membrane Building, Area 3
Housing:	TEFC
Insulation:	Class F
Heating:	N/A, pumps are indoors
Pit Depth *(if any)*:	N/A
Drainage	N/A
Relation to System:	
Receives From:	Floc/sed facility settling basin
Delivers To:	Membrane skids
Inlet Pressure:	-4 psi
Outlet Pressure:	40.9 psi
Maximum Capacity:	48.4 mgd
Flood Hazard:	none
Pumping Units:	
Make:	Goulds
Type:	Horizontal End Suction
Capacity *(gpm)*:	8,400
Lubrication:	Grease
Power:	250 hp
Auxiliary Power:	Diesel Generator
Control:	Membrane System Control Panel
Frequency of Use:	24 hrs/day
Defects and Remarks:	

State of California

Pumping Station Data

Department of Health Services

System Name: City of Stockton **No:** 3910012
Source of Information: Delta Water Supply Project
Collected By: CDM Smith (DWSP consultant to the City) **Date:** 4/2/12

Number or Name:	
Date Constructed:	In construction, startup in 2012
Purpose:	Treated water pumping
Location:	Treated Water Pump Station, Area 7
Housing:	WPI
Insulation:	Class F
Heating:	115V 350W
Pit Depth *(if any)*:	n/a
Drainage	Drains to solids settling and drying basins
Relation to System:	
Receives From:	Treated Water Storage Reservoir
Delivers To:	North Stockton service area distribution system
Inlet Pressure:	20 psi
Outlet Pressure:	80 psi
Maximum Capacity:	40 mgd
Flood Hazard:	none
Pumping Units:	
Make:	Weir Floway
Type:	Vertical Turbine
Capacity *(gpm)*:	6,944
Lubrication:	ISO 32 Oil
Power:	Electric
Auxiliary Power:	Yes, Diesel Generator
Control:	SCADA-controlled
Frequency of Use:	Continuously 24 hrs a day
Defects and Remarks:	

Appendix F

State of California

Department of Health Services

CHLORAMINATION DATA

System Name: City of Stockton **System No:** 3910012

Source of Information: Delta Water Supply Project

Collected By: CDM Smith (DWSP Consultant to the City) **Date:** 4/2/12

APPLICATION:

Water Treated (raw, filtered, etc.): Filtered water

Point of Application (Attach schematic of treatment process):

Chlorine: free chlorine, static mixer upstream and downstream of the Reservoir

Ammonia: ammonia, static mixer downstream of the Reservoir

Ammonia Form When Added: liquid

Ammonia Dosage Applied: Min – 0.4 mg/L, average 0.44 mg/L, max 0.67 mg/L

Chloramine Demand Character: currently under study

Mixing: static mixer

Contact Time Before Use: less than 1 minute, closest service is the TW Pump Station hose station

Water Flow Variation: 6 – 30 mgd

How Measured? Chlorine residual analyzer on the TW pump station discharge

CHEMICAL ADDED (AMMONIA):

Chemical Name, Synonym, Official Name: Aqua Ammonia

Trade Designation or Product ID: Aqua Ammonia

Manufacturing Company's Name: TBD, not yet purchased

Address: TBD

Maximum NSF/UL Recommended Dosage (mg/1): no NSF dosage for this chemical

FEEDING AND INJECTION EQUIPMENT:

Make: Pulsafeeder (for both hypochlorite and aqua ammonia – fed at separate locations)

Type: Metering Pump, injection quill

Capacity: Hypochlorite (80 gph); aqua ammonia (12 gph)

Condition: new

Continuous Feed? Yes

What Determines the Dose that will be Applied? Free and Total Chlorine residual monitoring

Blending Ratio: 0.1 mg/L ammonia to 0.5 mg/L chlorine

How is Ratio Monitored? Chlorine residual analyzer downstream of chemical feed point

Controls to Maintain Blending Ratio: chemical feed is flow-paced programmed at the PCS

Holds Setting Well? NA

Reliability (Flow Sensors, Backup Pump, etc.): NA

FEEDING AND INJECTION EQUIPMENT: (Cont'd)

Cylinder or Crock Capacity: NA

Stock on Hand: 8,000 gallons

CT Value Determination: CT disinfection provided by free chlorine in the Reservoir, not chloramine

Required Total Log Treatment (Removal and Inactivation) for Giardia and Virus: 4 log Giardia; 5 log Virus

Chlorination Log Inactivation: 4 log Giardia; 5 log Virus

Required Log Inactivation From Chloramination: NA

Point of Chloramine Residual Measurement: TW pump station discharge header

Volume of Storage Tank/Clearwell (MG): 4

Maximum Flow Rate (MGD): 30

Contact Time (Min): NA

Critical Conditions (Summer, Winter)? NA

PH: NA Temperature: NA

Chloramine Log Inactivation: NA

Frequency of CT Parameter Monitoring: NA

Frequency of CT Verification: NA

OPERATION AND MAINTENANCE:

Lapse During Feed Changes: none

Lapse During Repairs: none – redundant pumping equipment provided

Spare Parts on Hand: All recommended by pump manufacturer

Ability to Make Repairs: yes, maintenance crews are on-call

Monitoring of Feed Equipment:

When and How Often? Pump flow calibrated periodically, grab sample checks of feed chemical solution strength, weekly calibration of chlorine residual analyzer

Distance to Travel: none, WTP staff on-site 24hours per day

Duties: lab checks of instruments, pump calibration, monitoring for alarms via SCADA

Residual Tests:

Type of Test (DPD, etc.): On-line Amperometric probe

Tester Equipment Used: On-line ChemTrac

How Often? Continuous

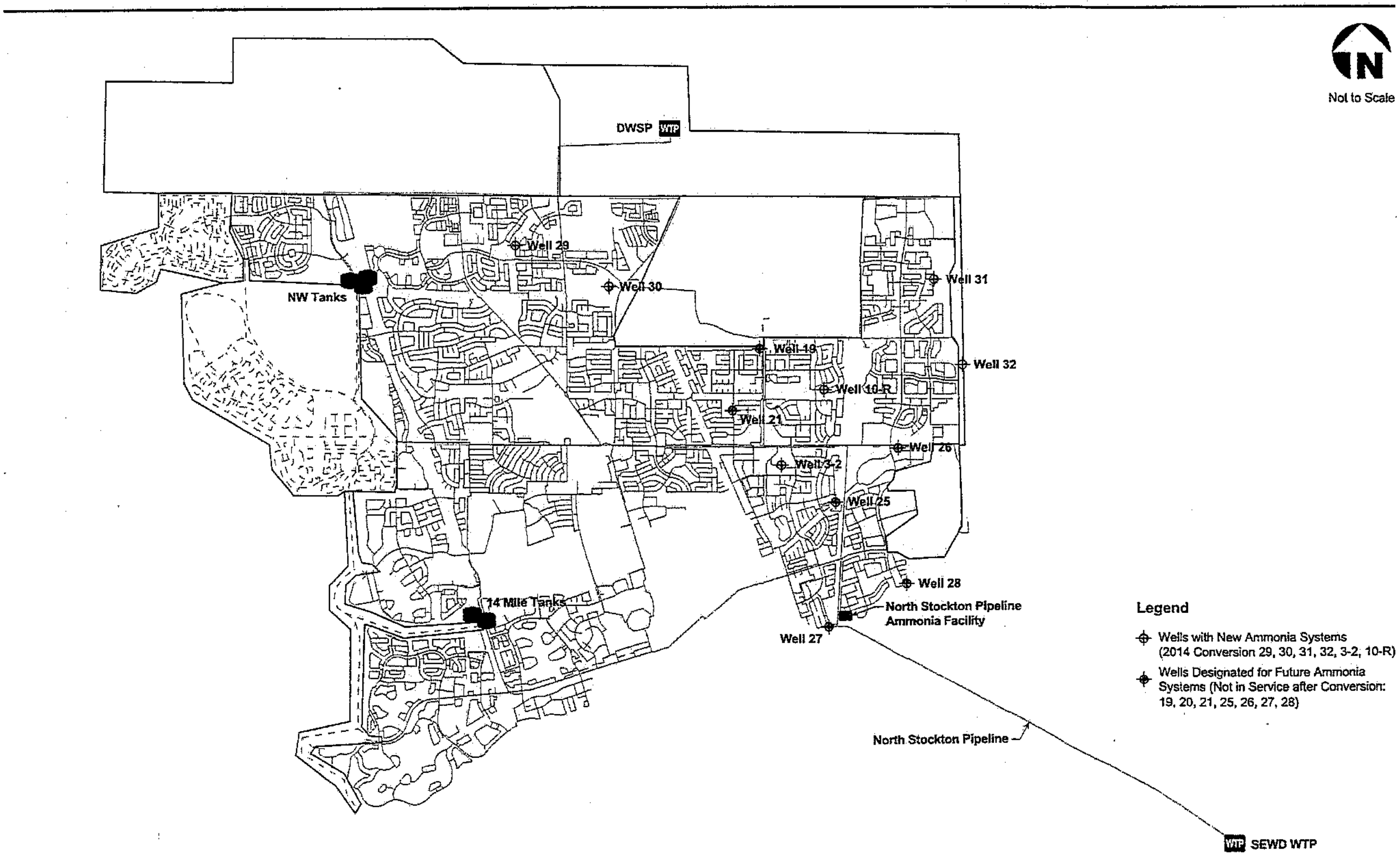
Where Test Made: On-line, Lab sample verification

Records: Monthly Operating Reports

CONDITION OF SCALES (if any): NA

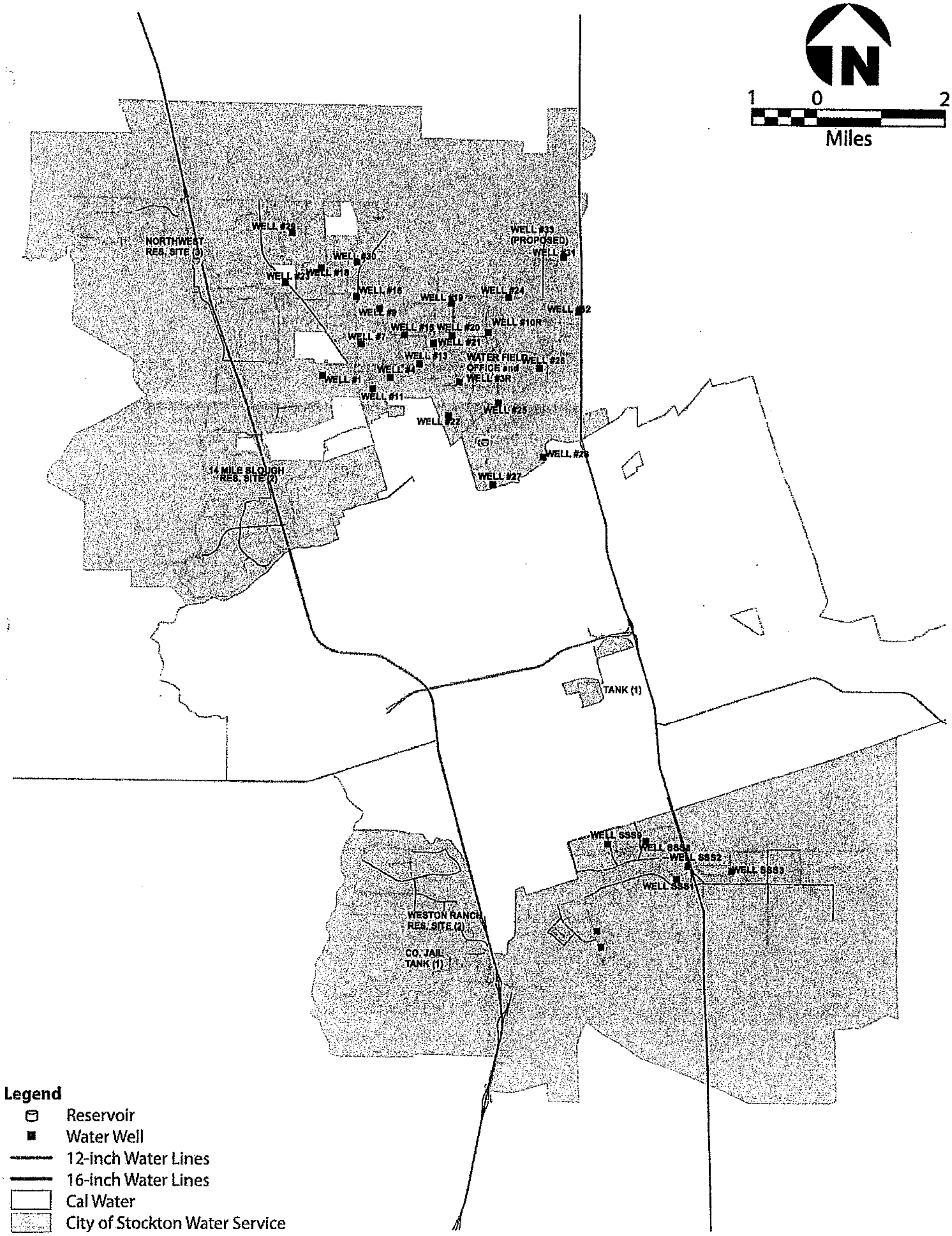
COMPLAINTS: None yet, plant startup in 2012

DEFECTS AND REMARKS:



CDM Smith

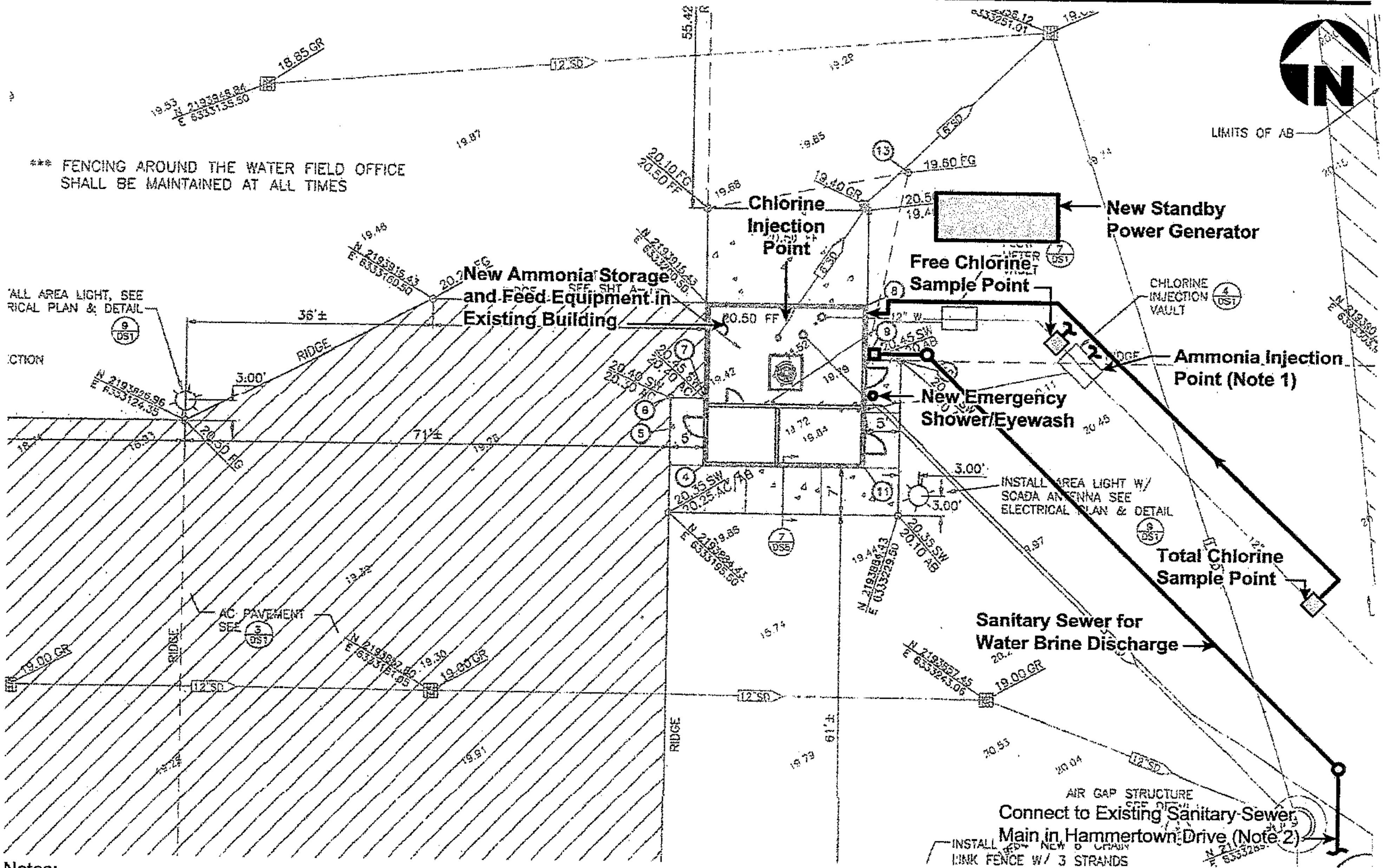
Figure 1-2
Location Map of Chloramination Facilities in the North System



W:\REPORTS\Stockton Municipal Utilities Dept\Figure 1-1_City of Stockton Drinking Water System Service Area.ai JJT 03/07/14

CDM Smith

Figure 1-1
City of Stockton Drinking Water System Service Area



Notes:

1. Existing chlorine injection point will be relocated upstream.
2. Existing sanitary sewer main to be field verified during final design.

W:\REPORTS\Stockton Municipal Utilities Dept\Figure 4-2_Well No 3-2 Site Plan.ai 03/06/14 JJT

CDM Smith

Figure 4-2
Well No. 3-R Site Plan

Appendix G

State of California—Health and Human Services Agency
California Department of Public Health

RON CHAPMAN, MD, MPH
Director & State Health Officer

EDMUND G. BROWN JR.
Governor

October 31, 2013

Aaron Balczewski
Siemens Industry, Inc.
Water Technologies Business Unit
Purified Water
725 Wooten Road
Colorado Springs, CO 80915

Dear Mr. Balczewski:

Conditional Acceptance of the Siemens Industry, Inc. L10N and L20N Ultrafiltration Membranes

On behalf of the Water Treatment Committee (WTC) of the California Department of Public Health (CDPH), Drinking Water Program (DWP), I would like to thank you for the opportunity to review test data from pathogen challenge studies on your ultrafiltration membrane modules as outlined in the report, "NSF Certification for Public Drinking Water Equipment Performance, Final Report, Siemens Industry, Inc., L10N and L20N Ultrafiltration Modules, Product-Specific Challenge Tests for *Cryptosporidium* and Virus Removal Credits under LT2ESWTR", dated September 28, 2012 prepared by NSF International. The Siemens Industry, Inc. L10N and L20N membrane modules use ultrafiltration, pressure-driven polyvinylidene fluoride (PVDF) hollow fiber membranes with direct flow (dead-end mode), outside-in operation for the filtration of surface water. The L10N and L20N modules have the same membrane fibers with the exception that the L20N module has longer fibers. All testing was conducted on the L20N modules and the test results from the L20N modules were applied to L10N modules for NSF International's equipment certification purposes.

Based on the results of laboratory based testing during May-July 2012 (by NSF International), the WTC has determined that the L10N and L20N membrane modules are accepted as alternative filtration technologies for meeting the physical removal requirements of the California Surface Water Treatment Rule (SWTR) (California Code of Regulations, Title 22, Division 4, Environmental Health Chapter 17, Article 2, Section 64653(e)), as well as the State and Federal Long Term 1 and Long Term 2 Enhanced Surface Water Treatment Rules (LT1ESWTR, LT2ESWTR), for use on any approved surface source water when used as the core of a complete and well designed, constructed and operated filtration system. The results from the virus (MS-2 bacteriophage) and *Cryptosporidium* surrogate (*Bacillus atrophaeus* endospore) challenge tests provided the WTC with valuable insight on the performance characteristics of the membrane and aided the WTC in its decision to accept your membrane modules as alternative filtration technologies.

The WTC accepts the Siemens Industry, Inc. L10N and L20N ultrafiltration membranes as alternative filtration technologies for compliance under the California SWTR, LT1ESWTR and LT2ESWTR.

In reviewing the data submitted in the September 28, 2012 product challenge technical report, and other relevant information, the WTC found that the L10N and L20N ultrafiltration membranes meet the minimum alternative technology requirements of demonstrating 2-log *Cryptosporidium*, 2-log *Giardia lamblia* and 1-log virus removal as set forth in Section 64653(e). As such, California public water systems can use your technology.

Furthermore, based on the test results conducted to remove MS-2 bacteriophage and *Bacillus atrophaeus* endospore, the WTC credits the L10N and L20N ultrafiltration membranes with the capability of removing at least 4-log *Cryptosporidium*, 4-log *Giardia lamblia* and 1-log viruses 95 percent of the time for treating surface water when operated under the same conditions at which the testing was conducted. Challenge testing was performed at the maximum temperature corrected flux of 263 $L/m^2 \cdot hr$ (155 $gal/ft^2 \cdot day$) (at 20°C) and a maximum transmembrane pressure (TMP) of 2.5 bars (22 psi) without the use of a coagulant.

Based on full scale operation of the L20N modules, the filtered water turbdity is consistently below 0.1 NTU. Water treatment plants utilizing the L10N and L20N membrane modules will be required to meet the Turbidity Performance Standard of not to exceed 0.1 NTU based on 95% of monthly measurements.

Table 1 provides the pathogen removal credit assigned by the WTC to the L10N and L20N ultrafiltration membrane modules and Table 2 presents the operating and quality control values that the membrane system cannot exceed as a condition of this acceptance.

Table 1 – Pathogen Removal Credit

Target Organism	Removal Credit
Giardia lamblia oocyst	4-log [1]
Cryptosporidium oocyst	4-log
Virus	At least 1-log [1,2]

1. To adhere to multi-barrier treatment, each plant is required to provide a minimum of 0.5-log inactivation of *Giardia* cyst and 4-log inactivation of viruses through disinfection.

2. The WTC has accepted this membrane as demonstrating at least 1-log virus removal. However, membrane integrity testing does not have the resolution to detect virus removal. Thus, a minimum of 4-log inactivation of viruses through disinfection is required.

Table 2 – System Operating & Quality Control Parameters		
Operating Parameter	**Maximum Value**	
Flux (at 20°C)	263 L/m²·hr (155 gal/ft²·day); outside surface area	
Flow (at 20°C)	93.9 L/min (24.8 gpm) per L10N module; 153 L/min (40.4 gpm) per L20N module	
Transmembrane Pressure (TMP)	1.52 bars (22 psi) @ ≤30 °C (86 °F) 1.17 bars (17 psi) @ >30 °C (86 °F)	
Turbidity Performance Standards	0.1 NTU based on 95% of monthly measurements; Not to exceed 1.0 NTU for two consecutive 15 minute discrete readings.	
Upper Control Limit (UCL) [3]	Site determination – variable	
Membrane Integrity Test (MIT) Ending Pressure to Maintain a Resolution of 3 μm or less	≥ 0.835 bar (12.1 psi); θ = 50° where θ = liquid-membrane contact wetting angle	
Quality Control Release Value (QCRV)	6 sec/mL (for L10N)	6 sec/mL (for L20N)

3. This is the maximum UCL allowed to achieve a minimum log removal value (LRV) of *Cryptosporidium* based on operational parameters (TMP, Flux rate, temperature and MIT parameters).

Based on the challenge study results, it was verified by the WTC that utilizing the membrane integrity test parameters specified in Table 3 for conducting pressure decay based MITs should provide a calculated *Cryptosporidium* log reduction value (LRV) that is a reliable conservative performance indicator for the membrane.

Specifications for the Siemens L10N and L20 membrane modules are provided in Table 3 on the following page.

Permitting Process

As part of the permitting process for each treatment facility, the parameters used for calculating the LRV will need to be available for review and verification. The parameters used in the LRV equations are system specific and dependent on the membrane unit flow rate, TMP, water and air temperature, volumetric concentration factor (VCF) and system holdup volume (V_{sys}). As an option, a conservative upper control limit (UCL) can be established based on the worst case operational variables for the membrane unit, e.g., lowest anticipated flow rate, highest VCF, and lowest air-liquid conversion ratio (ALCR) based on maximum allowable TMP and maximum anticipated water temperature. The DWP district office or local primacy agency (LPA) will determine the adequacy of the overall treatment plant based on the review of the filtration and disinfection treatment facilities and the overall integration of the two processes to provide a reliable multi-barrier treatment system.

Table 3 – Siemens L10N and L20N Membrane Specifications		
Parameter	**Value/Units**	
Manufacturer	Siemens Industry, Inc.	
Membrane Classification	Ultrafiltration	
Membrane Element ID Number(s)	L10N	L20N
Fiber – Dimensions and Construction		
Nominal Pore Size	0.04 µm	
Absolute Pore Size	0.1 µm	
Membrane Material	Polyvinylidene fluoride (PVDF)	
Membrane Surface Chemistry	Hydrophilic; Negative Surface Charge	
Membrane Type	Hollow Fiber	
Membrane Flow Path	Outside-In	
Fiber Inner Diameter	0.54 mm	
Fiber Outer Diameter	1.03 mm	
Active Fiber Length	960mm (35.4 in)	1,600 mm (63 in)
pH tolerance (cleaning operations)	2.0 – 10.0	
Max chlorine concentration during cleaning	1,000 mg/L	
Module – Dimensions and Construction		
Fibers per Module	7,330	6,728
Membrane Area (based on outer diameter)	21 m^2 (230 ft^2)	35 m^2 (375 ft^2)
Potting Material	Polyurethane (PU)	
Casing Material	Nylon	
Module Diameter	119 mm (4.7 in)	
Module Length	1,157 mm (45.5 in)	1,800 mm (70.9 in)
Membrane Operational Parameters		
Filtration Mode	Dead-End	
Maximum Certified Flux at 20°C	263 L/m^2·hr (155 gal/ft^2·day)	
Maximum Certified Flow at 20°C	93.9 L/min (24.8 gpm)	153 L/min (40.4 gpm)
Maximum Housing Pressure	5.17 bars (75 psi)	
Maximum Transmembrane Pressure	1.52 bars (22 psi) @ ≤30 °C (86 °F) 1.17 bars (17 psi) @ >30 °C (86 °F)	
Membrane Integrity Test (MIT) Parameters		
Starting Pressure Decay Test (PDT)	14.0 psi (0.97 bars)	15.0 psi (1.04 bars)
Max Backpressure during MIT	113 mBar (45.5 in)	177 mBar (70.9 in)
Membrane Diffusion Rate (@ 10°C)	None Established	
Potting Depth	90 mm (3.54 in)	
Liquid-Membrane Contact Angle (θ)	50°	
Pore Shape Correction Factor	1 (most conservative)	
Membrane Hold-up Volume per module	1.6 liters	2.8 liters
MIT Holding Time	2 minutes	
Volumetric Concentration Factor (VCF)	1 (dead-end-mode of operations)	

Conditional Acceptance

Approval for the design and use of your technology in any drinking water application will be handled on a case-by-case basis by the DWP district office or LPA and is granted through the domestic water supply permitting process. Information such as shop drawings and specifications may be requested to aid in the development of the water supply permit. A commissioning period to assess performance, integrity and membrane durability on start-up may be required in an effort to ensure that the final system functions as expected. The DWP district office or LPA is responsible for evaluating the source water quality to be treated, and it will set the overall removal and inactivation requirements that must be met for a given source water.

The minimum log removal requirements established by the SWTR, LT1ESWTR and LT2ESWTR are to be met using multiple treatment barriers. Design engineers proposing to use this alternative filtration technology should be aware that the minimum log removal requirements established by the surface water treatment rules and the water supply permit are to be met using multiple treatment barriers. Your technology is recognized as being _one_ component in this multiple barrier approach.

After any alternative filtration technology installation has been in operation for one year, the public water system must submit a report outlining the filtration system performance to the DWP district office or LPA as required by Section 64653(i). This report is due 60 days after the first year of operation. The report must include, as a minimum, results of all water quality tests performed, an evaluation of compliance with established performance standards under actual operating conditions, an assessment of problems experienced and corrective actions taken or needed, and a schedule for providing needed improvements. The report must be comprehensive, detailing problems encountered during the first year of operation as well as during startup and commissioning. Membrane equipment failures, fiber breakage rates, dates, and causes must be adequately covered in the report and should cover the period immediately following unpacking and installation (commissioning; troubleshooting) through the first year of production.

Changes to any feature, formulation, part or product used in the Siemens L10N and L20N membrane modules shall be reported (in writing) to the WTC in advance of making the changes to any production version of your membrane modules sold in California. This includes any changes in the physical attributes (including changes to the specifications for any component), manufacturing practice, or character of the membranes or modules, including quality control practices such as the quality control release value. Your written notification will be reviewed to determine if additional performance testing will be required. Therefore, the letter communicating these changes to the WTC and its appendices should provide sufficient detail for the WTC to render such a decision. Should additional testing be required, the proposed testing protocol must be submitted to the WTC, prior to starting, for review and approval. Upon reviewing the final report, the WTC will make a recommendation regarding acceptance of the identified changes to the design and/or operating criteria.

Be advised that any chemicals used in the operation and cleaning of your system will need to be certified under NSF/ANSI Standard 60. The plant-specific operations plan must assure the DWP district office or LPA that all cleaning chemicals are removed from the system before the unit is returned to production. In addition, NSF/ANSI 61 certification must be maintained for the Siemens L10N and L20N membrane modules to ensure continued acceptance of the membrane modules for new installations and as replacement modules for existing installations as required by the California waterworks standards.

Should you have any questions regarding the content of this letter, please feel free to contact me at (510) 620-3460 or eugene.leung@cdph.ca.gov

Sincerely,

Original Signed By

Eugene H. Leung, P.E.
Senior Sanitary Engineer
Technical Operations Section

cc: Water Treatment Committee

Appendix H

FILED

ASSESSOR RECORDER
COUNTY CLERK
KENNETH W. BLAKEMORE

2013 APR 17 PM 1:53

SAN JOAQUIN COUNTY

DEPUTY

CITY OF STOCKTON
NOTICE OF DETERMINATION

TO: ☒ County Clerk
San Joaquin County

☐ Office of Planning and Research
P.O. Box 3044
Sacramento, CA 95812-3044

FROM: Responsible Agency
City of Stockton
c/o Municipal Utilities Department
Engineering Division
2500 Navy Drive
Stockton, CA 95206
Contact Person: Senior Civil Engineer, Michael Callahan   Phone: (209) 937-8994

SUBJECT: NOTICE OF DETERMINATION PURSUANT TO PUBLIC RESOURCES CODE, SECTION 21152 AND CAL. CODE OF REGULATIONS, TITLE 14, SECTIONS 15075, 15091, 15093, 15094, AND/OR 15096(I)

Project Title: City of Stockton Ammonia Facility Project
City of Stockton EIR and/or IS File No(s): MUD IS# 1-13   SCH No.: 2013012031
Discretionary Application(s) File No.(s): Resolution 2013-04-16-1503   Project Applicant: City of Stockton
2500 Navy Drive, Stockton, CA 95206
Project Description/Location: 13 existing City Facilities throughout the City of Stockton

DETERMINATIONS: This is to advise that the City of Stockton as a Responsible Agency under the California Environmental Quality Act (CEQA), approved the above-described project/action April 16, 2013, and has made the following determinations regarding the project:

1. The project will have a significant effect on the environment.
2. ☐ An environmental impact report was prepared and certified for this project pursuant to the provisions of CEQA. ☒ A Negative Declaration was prepared and adopted for this project pursuant to the provisions of CEQA.
3. Findings were made pursuant to Cal. Code of Regulations, Title 14, Section (☐15091-EIR), (☒ 15074-Neg Dec) and Mitigation measures were incorporated as part of the approval of the project.
4. Mitigation Monitoring and Reporting Program was adopted for this project.
5. Statement of Overriding Considerations was not adopted for this project.
6. Pursuant to Cal. Code of Regulations, Title 14, Sections 753.5(a) or 753.5(c):
   - ☒ California Department of Fish and Game (CDFG) fees are required, as applicable, and will be filed with this Notice of Determination (NOD); or
   - ☐ This project is exempt from the CDFG fees and a Certificate of Fee Exemption has been prepared and will be filed with this NOD.
   - ☐ CDFG Fees were filed with a prior NOD for this project/proposal (see attached receipt).

This is to certify that the environmental documentation and determinations for the project/action and any related mitigation measures, monitoring provisions, findings and statements of overriding consideration have been adopted on the basis of the whole record before the City and reflect the City's independent judgment and analysis. The environmental review record and record of project approval may be examined at the above-noted Responsible Agency address.

C. MEL LYTLE
DIRECTOR OF MUNICIPAL UTILITIES

☐By: ____________________   Date: April 17, 2013
Senior Civil Engineer, Michael Callahan

AFFIDAVIT OF FILING AND POSTING

I declare that on the date stamped above, I received and posted this notice as required by California Public Resources Code Section 21152(c). Said notice will remain posted for 30 days from the filing date.

Signature: ____________________   Title: ____________________
Posting Period Ending Date: ____________________

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PRINT | CLEAR

State of California—Natural Resources Agency
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
2013 ENVIRONMENTAL FILING FEE CASH RECEIPT

RECEIPT# 000173
STATE CLEARING HOUSE # *(If applicable)* 2013012031

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY: CITY OF STOCKTON	DATE: 04/17/2013
COUNTY/STATE AGENCY OF FILING: SAN JOAQUIN COUNTY	DOCUMENT NUMBER:
PROJECT TITLE: CITY OF STOCKTON AMMONIA FACILITY PROJECT	
PROJECT APPLICANT NAME: CITY OF STOCKTON	PHONE NUMBER: (209) 937-8994
PROJECT APPLICANT ADDRESS: 2500 NAVY DRIVE; CITY: STOCKTON; STATE: CA	ZIP CODE: 95206

PROJECT APPLICANT *(Check appropriate box)*:
[X] Local Public Agency [ ] School District [ ] Other Special District [ ] State Agency [ ] Private Entity

CHECK APPLICABLE FEES:

[ ] Environmental Impact Report (EIR)	$2,995.25	$ 0.00
[X] Negative Declaration (ND)(MND)	$2,156.25	$ 2,156.25
[ ] Application Fee Water Diversion *(State Water Resources Control Board Only)*	$850.00	$ 0.00
[ ] Projects Subject to Certified Regulatory Programs (CRP)	$1,018.50	$ 0.00
[X] County Administrative Fee	$50.00	$ 50.00
[ ] Project that is exempt from fees		
[ ] Notice of Exemption		
[ ] CDFW No Effect Determination (Form Attached)		
[ ] Other ______		$ ______

PAYMENT METHOD:
[ ] Cash [ ] Credit [X] Check [ ] Other ______ TOTAL RECEIVED $ 2,206.25

SIGNATURE
X Kelley McCullough

TITLE
DEPUTY COUNTY CLERK

San Joaquin County Recorders
Kenneth W. Blakemore
44 N. San Joaquin Street, Room 260
Stockton, Ca 95202
Receipt: 0444074

Product	Name	Extended
CCA	Clerk Admin Fee	$50.00
CND	Clerk Negative Declaration	$2,156.25
Total		$2,206.25

Tender (Check) $2,206.25
Check# 1130406
Paid By CITY OF STOCKTON
Comments NOTICE OF DET

Thank You!

4/17/13 1:59 PM kmchugh

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Edmund G. Brown Jr.
Governor

Ken Alex
Director

February 12, 2013

Michael Callahan
City of Stockton
Municipal Utilities Department
2500 Navy Drive
Stockton, CA 95206

Subject: Ammonia Facilities Project
SCH#: 2013012031

Dear Michael Callahan:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on February 11, 2013, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

FEB 14 2013

Enclosures
cc: Resources Agency

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Received
FEB 13 2013
Municipal Utilities