
CHINO DESALTERS**4.1 INTRODUCTION**

Phases 1 and 2 of the Chino Desalter Project included construction of two water treatment facilities: Chino I and Chino II. It has been previously determined (Carollo, 2007) that the most economical alternative for the Chino Phase 3 expansion is to increase the capacity of Chino II. The Chino II Desalter was designed for easy expansion; for example, the existing facilities include a building large enough to accommodate expansion of the RO process and there are existing foundation pads and conduit in place for expansion of the IX process. An expansion of Chino II by 10.5 mgd product water capacity is required by the Phase 3 project.

There is no need to expand Chino I above nameplate capacity (14.2 mgd) as part of the Phase 3 desalter capacity expansion project; however, Chino I has never operated at nameplate capacity and a portion of the operating capacity of Chino II is currently used to make up the deficit in Chino I production. This is possible because Chino II is capable of operating at product water flows greater than the 10 mgd RO and IX nameplate capacity by using the raw water bypass. Three options for the Phase 3 expansion of desalter capacity are presented in Section 8. Two of the options (Options B and C) require that Chino II continues to make up the capacity deficit at Chino I, the other option (Option A) requires modification of Chino I to allow production at nameplate capacity.

This section of the PDR addresses the following issues regarding the Chino Desalters:

- Chino I:
 - Recommendations to bring facilities to nameplate capacity, if necessary.
 - Effects of CCWF raw water quality on Chino I treatment process.
- Chino II:
 - Recommendations for expansion by 10.5 mgd.
 - Effects of Chino II well expansion raw water quality on Chino II treatment processes.

The recommended modifications and expansions of Chino I and Chino II are presented in Section 8, together with estimated costs and recommended cost sharing.

4.2 WATER QUALITY

Raw water quality and treated water objectives determine treatment process requirements. Therefore, every discussion of water treatment processes should include a statement of the raw water quality and the treatment objectives. The blended treated water from the desalter (including bypass flow) is referred to as product water in this report and the well water supply is referred to as raw water.

4.2.1 Sources

All raw water supplies treated by the Chino Desalters originate in groundwater wells. There is no reported evidence that any of the existing Chino Desalter wells are under the direct influence of surface water, as defined by current water quality regulations; however, as a result of natural geology and long-term human activity, the Chino Desalter wells require treatment prior to use. The principle raw water contaminants that govern the selection of treatment process are nitrates, TDS, and VOCs. At the present time, three different categories of wells furnish raw water to the Chino Desalters:

- Chino I VOC Air Stripper Supply Wells: The primary supply for these four wells is the deep alluvial aquifer (Layer 2). Although one of these wells (CDA I-4) is currently extremely impaired for nitrates, these wells are not treated for removal of nitrate and TDS; however, contamination of the Layer 2 aquifer by the Chino Airport contaminant plume results in a requirement for VOC removal. These wells are characterized by low capacity (typically less than 500 gpm).
- Chino I RO/IX Supply Wells: These ten wells are influenced more by the shallow alluvial aquifer (Layer 1) and require treatment for removal of TDS and nitrates—all of these wells are classified as extremely impaired for nitrates. No VOCs have been identified in these wells at the present time. Well capacity ranges from less than 500 gpm to more than 2,000 gpm.
- Chino II RO/IX/Bypass Supply Wells: These eight wells are screened in both the Layer 1 and Layer 2 aquifer zones. Although the quality is better than the Chino I RO/IX wells, treatment is still required for removal of TDS and nitrates. One of the wells (CDA II-9A) is extremely impaired for nitrates but bypass of the RO/IX treatment (i.e., raw water blending) is permitted. No VOC treatment is required at the present time or anticipated in the future.

The CCWF groundwater quality is unknown at the present time. GEOSCIENCE reports that the TDS levels in wells near the CCWF range from 176 to 1,350 mg/L (see Appendix A.4, page 9). The drilling of the first two wells (CCWFA-4 and 6) is expected in the near future, which will help determine the CCWF water quality. Until actual water quality data are available it is assumed in this report that quality will be similar to the shallow Chino I wells such as CDA I-5 through 8, the most westerly of the Chino I RO/IX Supply Wells, with TDS = 1,400 mg/L and nitrate = 250 mg/L. Screening the CCWF wells primarily in Layer 2 would result in water quality more similar to the VOC air stripper supply wells, CDA I-1 through 4, but this would reduce the usefulness of the CCWF wells in supporting Watermaster's objective to achieve hydraulic control of the groundwater basin.

4.2.2 Nitrate

More than a century of intensive agriculture with applications of fertilizers and operation of cattle feedlots has resulted in groundwater nitrate levels within the Chino Desalter well fields that are among the highest in the country. Nitrate is currently regulated with a federal

MCL of 10 mg/L as nitrogen, which is equivalent to 44.3 mg/L as NO_3^- . In California, the MCL is 45 as NO_3^- . All nitrate levels in this report are given as mg/L of NO_3^- . CDA agency agreements require that the Desalter product water nitrate level is less than or equal to 25 mg/L as NO_3^- , which is more stringent than the MCL.

CDPH Policy Memo 97-005 provides guidelines and requirement for use of extremely impaired water supplies. A supply is defined as extremely impaired when it contains contaminant levels that exceed 10 times a MCL/action level for chronic health effects or that exceed 3 times an MCL/action level for acute health effects. Nitrate is regulated based on acute health effects; therefore, sources with nitrate levels in excess of 135 mg/L are classified as extremely impaired.

Figure 4.1 shows the maximum, minimum, and average nitrate levels for the Chino Desalter wells. The graphic also shows the well capacities in order to illustrate the relative contributions of flow as part of the raw water supply. The graphic presents the wells in a generally west (left) to east (right) alignment. Specific well locations can be viewed in Figure 2.1, presented previously.

4.2.3 TDS

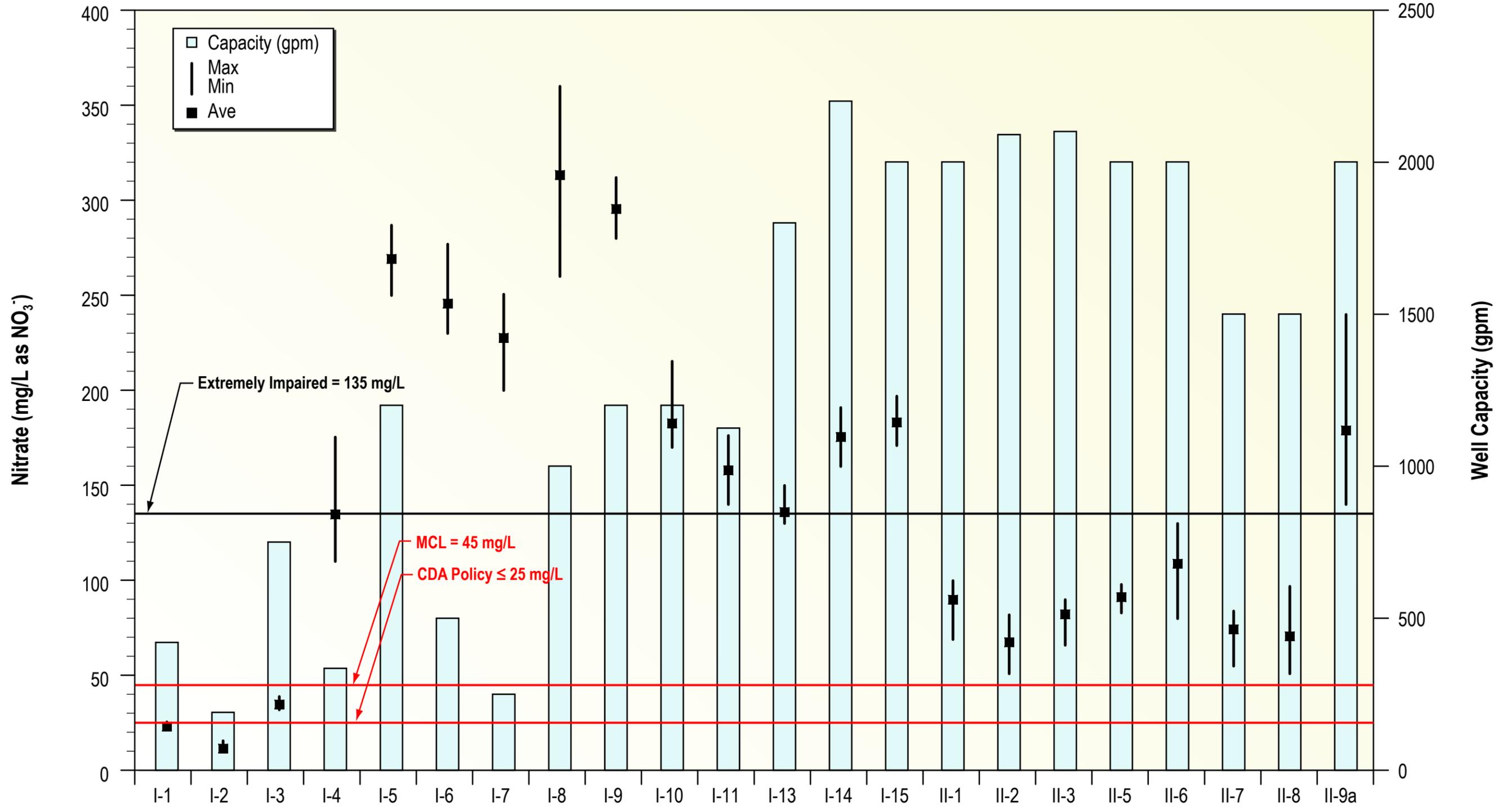
Nitrate ions are a component in the level of TDS in water. Other major constituents contributing to TDS include sodium and chloride (salt), calcium and magnesium (hardness), and other constituents such as silica, sulfate, and carbonate system ions. The federal secondary (aesthetic) standard for TDS is 500 mg/L; however, California has established 500 mg/L as an enforceable standard for community water systems. The CDA agency agreements require that the TDS level of Desalter product water is less than or equal to 350 mg/L, which is more stringent than the MCL.

Figure 4.2 shows the TDS levels for all Chino Desalter Wells. The format is similar to the previous graphic and includes both TDS level and well capacity.

4.2.4 VOCs

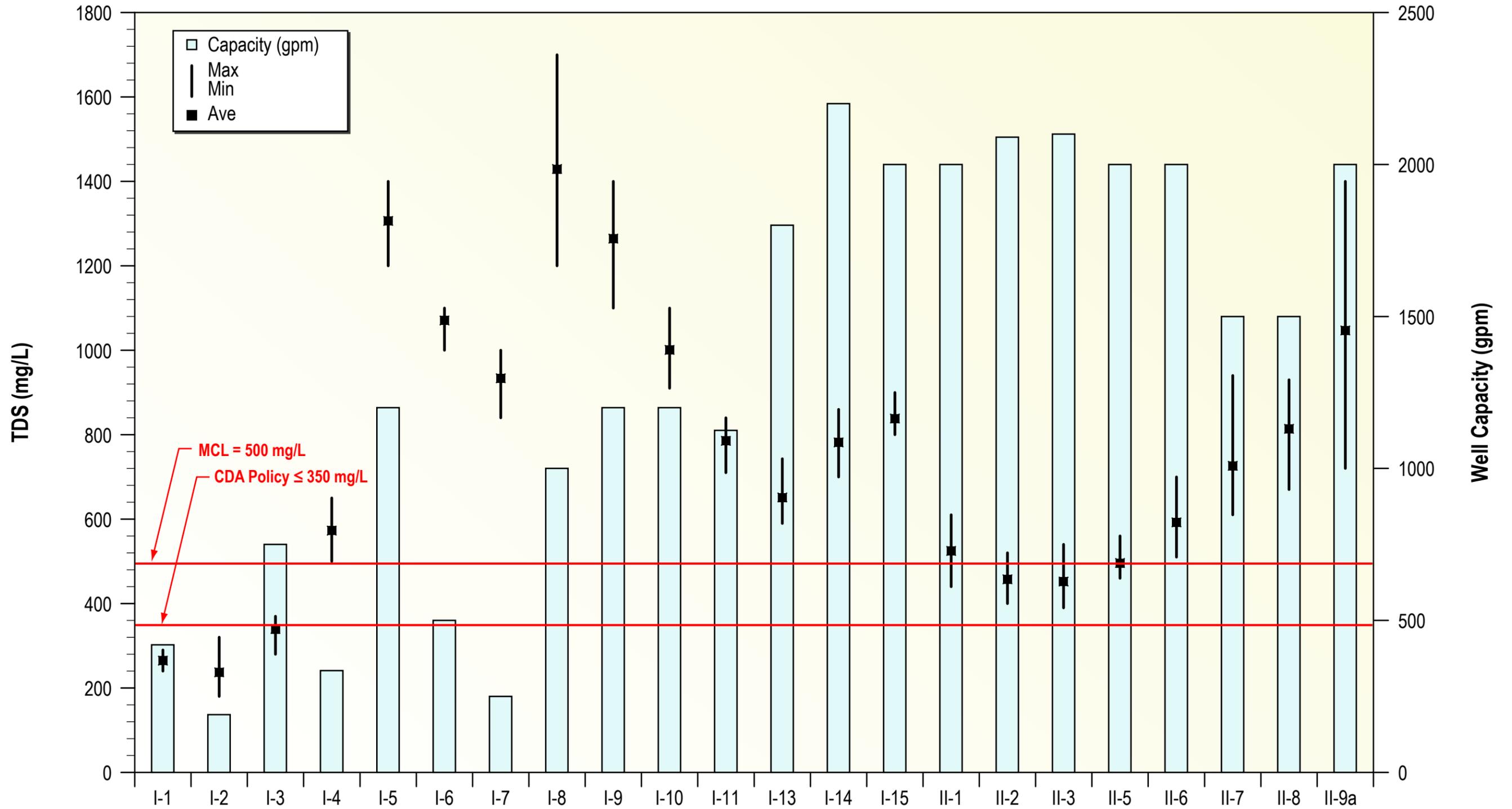
VOCs from several contaminant plumes (principally the Chino Airport plume), have been identified within the Chino Desalter well field. VOCs have been detected in wells CDA I-2 and 3, which are treated for VOC removal through an air stripping tower together with the two other deep wells (CDA I-1 and 4). Collectively, these wells are referred to herein as the VOC air stripper supply wells, because they are all treated through the Chino I VOC air stripping tower.

The Chino I VOC air stripper supply wells are tested annually for all regulated VOCs. The following contaminants have been identified or are of concern. Since 2002, all Chino I wells have been tested approximately twice a year for these contaminants; wells CDA I-2 and 3 are tested monthly. Since January 2008, the Chino I VOC air stripping tower effluent and the combined Chino I product water are also tested monthly for these three VOCs.



* Source: Chino I Lab Data, January - December 2008 (weekly samples)
 Chino II Lab Data, January 2007 - June 2009 (weekly samples)

Figure 4.1
Chino Desalter Well Field Nitrate Levels
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD



* Source: Chino I Lab Data, January - December 2008 (weekly samples)
 Chino II Lab Data, January 2007 - June 2009 (weekly samples)
 ** Well II-3 Datapoint for 02/07/08 was deleted as an outlier (840 mg/L)
 Well II-7 Datapoint for 06/04/08 was deleted as an outlier (360 mg/L)
 Well II-9 Datapoint for 09/03/08 was deleted as an outlier (240 mg/L)

Figure 4.2
Chino Desalter Well Field TDS Levels
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

- Trichloroethylene (also known as trichloroethene, or TCE): used as a solvent in metal degreasing, textile processing and dry cleaning. It is slightly soluble in water and readily air strippable. The federal MCL is 5 µg/L. TCE is regulated as a chronic health risk; therefore, under DPH 97-005 the extremely impaired source level is 50 µg/L. The limit of detection for reporting (LDR) is 0.50 µg/L.
- Tetrachloroethylene (also known as tetrachloroethene, perchloroethylene, or PCE): used as a solvent in metal degreasing, textile processing and dry cleaning. It is slightly soluble in water and readily air strippable. The federal MCL is 5 µg/L. PCE is regulated as a chronic health risk; therefore, under DPH 97-005 the extremely impaired source level is 50 µg/L. The LDR is 0.50 µg/L.
- 1,2,3-trichloropropane (TCP): used as a cleaning and maintenance solvent, TCP is not readily air strippable. Currently, there is no California or Federal Drinking Water Standard for TCP. In 1999, CDPH established a drinking water notification level for TCP at 0.005 µg/L, which is also the LDR. The CDPH response level is 0.5 µg/L. As a chronic health risk, the extremely impaired source limit is 0.5 µg/L.

PCE and TCE have a high volatility in water and are readily removed in the existing VOC air stripping towers at Chino I. Although TCE has been identified in the raw water supply it has not been detected in the Chino I product water and the plant meets the MCL for this contaminant. PCE has not been detected in the Chino I raw water supply at levels above the LDR (0.50 µg/L). Recommendations for TCE treatment are proposed in Section 4.2.6.1.

TCP is not readily removed by air stripping; Chino I data show approximately 60 to 70 percent removal across the VOC air stripping process. The Chino I product water has exceeded the TCP drinking water notification level of 0.005 µg/L, which is also the detection limit for reporting. If TCP levels in the product water exceed the CDPH response level (0.5 µg/L) then CDPH recommends removing the source from service. To date, Chino I product water TCP levels have not exceeded the response level. Recommendations for future TCP treatment are proposed in Section 4.2.6.2.

Table 4.1 summarizes regulatory limits and VOC data at Chino I. Tabulations of TCE, PCE, and TCP data for all Chino I wells are included in Appendix C.1. The following observations summarize the Appendix C.1 data.

- Of the four Chino I VOC air stripper supply wells, VOCs have been detected in wells CDA I-2 and 3 but not in wells CDA I-1 or I-4.
- No PCE contamination greater than the limit of detection has been detected in any Chino I well (limit of detection for reporting is 0.50 µg/L).
- Besides wells CDA I-2 and 3, the only other Chino I wells where TCE has been detected are:

Table 4.1 Summary of Chino I VOC Levels Chino Desalter Phase 3 PDR JCSD/Ontario/WMWD			
	TCE^a (µg/L)	PCE^b (µg/L)	TCP^c (µg/L)
CDPH			
Notification Level	–	–	0.005
Response Level	–	–	0.5
MCL	5	5	–
Well CDA I-2 (Raw Water)			
Minimum	<0.5	<0.5	<0.005
Average	<4.0	<0.5	<0.25
Maximum	16	<0.5	0.59
Well CDA I-3 (Raw Water)			
Minimum	<0.5	<0.5	<0.005
Average	<27	<0.5	<0.89
Maximum	55	<0.5	2.5
Chino I VOC Air Stripping Tower Effluent			
Minimum	<0.5 ^d	<0.5	0.10
Average	<2 ^d	<0.5	0.13
Maximum	8.4 ^d	<0.5	0.17
Chino I Blended Product Water			
Minimum	<0.5	<0.5	0.015
Average	<0.5	<0.5	0.021
Maximum	<0.5	<0.5	0.030
Notes:			
a. TCE detection limit for reporting is 0.50 µg/L. Raw water data are April 2000 to June 2009 (typically monthly). Chino I data are January 2008 to June 2009 (monthly).			
b. PCE detection limit for reporting is 0.50 µg/L. Raw water data are April 2000 to June 2009 (typically 3-4 samples per year). Chino I data are January 2008 to June 2009 (4 samples). PCE is reported as non-detected (<0.5 µg/L) for all samples.			
c. TCP detection limit for reporting is 0.005 µg/L. Raw water data are April 2000 to June 2009 (typically monthly). Chino I data are January 2008 to June 2009 (monthly).			
d. Four samples show non-detect for TCE (0.50 µg/L) and one sample (2/10/09) shows 8.4 µg/L.			

- CDA I-9: TCE levels ranging from 0.51 to 0.55 µg/L were reported in four samples. All reported sample levels are less than the MCL of 5 µg/L.
- CDA I-10: TCE levels ranging from 0.76 to 0.99 µg/L were reported in ten samples. All reported sample levels are less than the MCL of 5 µg/L.
- CDA I-11: A TCE level of 9.7 µg/L was reported for the March 3, 2004 sample. The six previous samples and the eight subsequent samples from this well reported non-detect levels for TCE (less than 0.50 µg/L).
- Besides wells CDA I-2 and 3, the only other Chino I well where TCP has been detected is:
 - CDA I-11: A TCP level of 0.22 µg/L was reported for the March 3, 2004 sample. The two previous samples and the seven subsequent samples from this well reported non-detect levels for TCP (less than 0.005 µg/L).

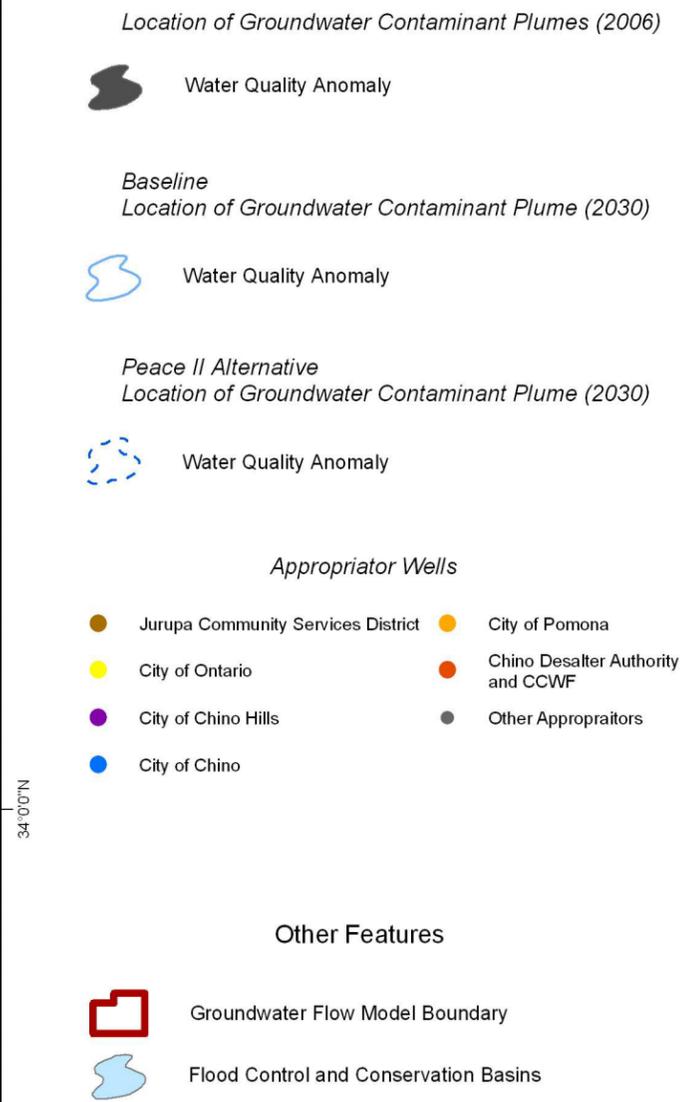
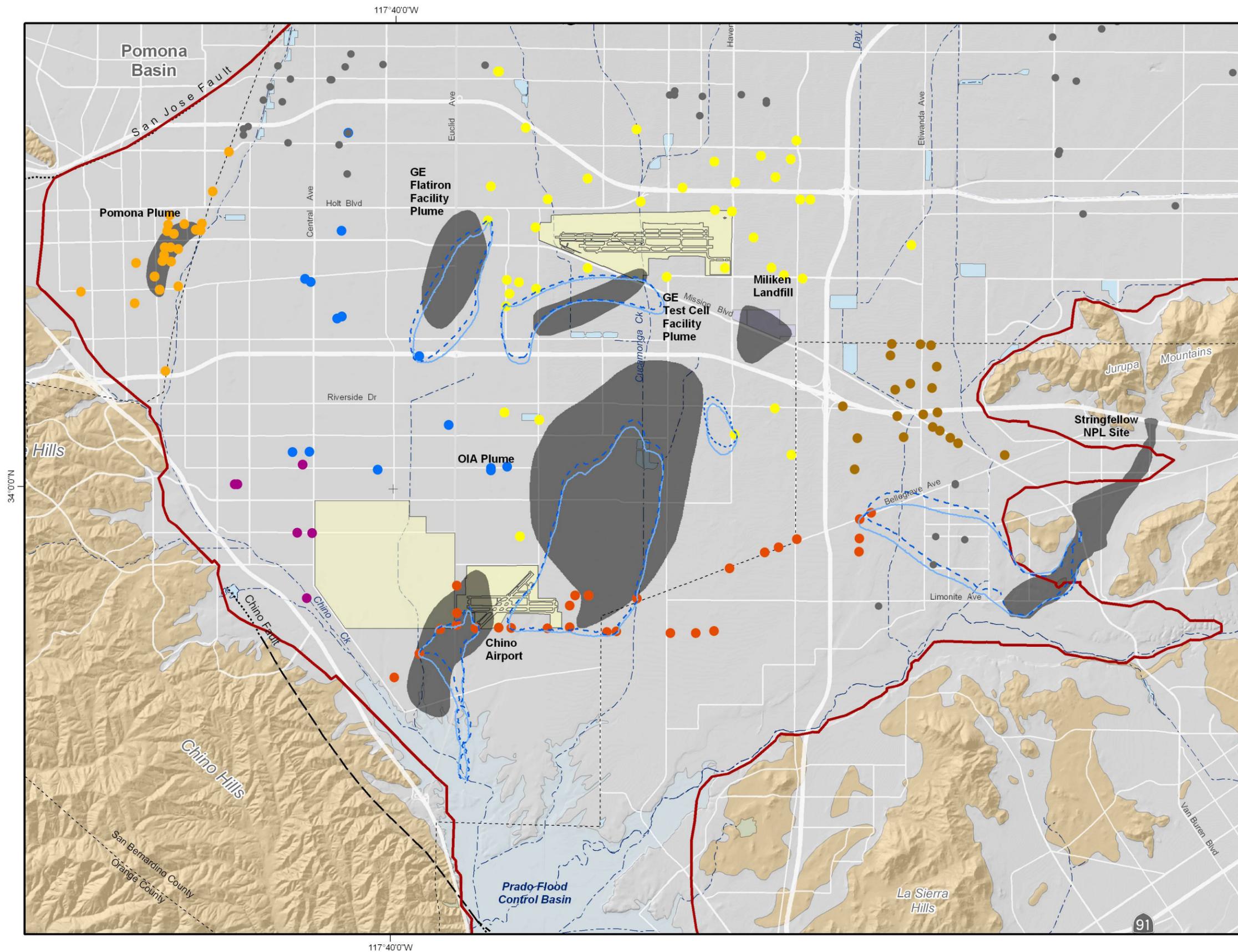
4.2.5 VOC Modeling

Figure 4.3a (source Wildermuth, 2007) illustrates the current and projected locations of groundwater contaminant plumes in the Chino Basin. Figure 4.3b indicates the VOC constituents of the plumes. The groundwater contaminant plume model was prepared as part of the proposed expansion of the Dry-Year Yield Program (DYYP). The figure shows plume locations at the beginning of the DYYP project planning period (2006) and estimated plume locations at the end of the planning period (2035).

The DYYP Expansion Baseline Alternative shown in Figure 4.3 includes the expansion of the Chino Desalters, reoperation, and the 100,000 acre-feet DYYP (Black and Veatch, 2008). Reoperation refers to withdrawal of 400,000 acre-feet of groundwater through the Chino Desalters (Wildermuth, 2007). According to Wildermuth, the Ontario Airport VOC Plume is the only contaminant plume that could potentially impact the Chino II Desalter well field over a 30 year time frame and, based upon modeling completed by Wildermuth, migration of the Ontario Airport Plume to the Chino II Desalter well field, including CDA I-13, 14, and 15 is not anticipated.

TCP is the focus of discussion about VOC treatment in this report for the following reasons:

- The only other VOCs that have been identified or are of concern (TCE and PCE) are readily removed by air stripping at the Chino I Desalter, either through the VOC air stripping tower or through the post-RO decarbonators.
- Modeling by Wildermuth predicts that TCE levels will continue to decline from present levels until the raw water level is less than the MCL by the year 2015 (Carollo, September 2008, see Figures 3.8 and 3.9).
- Unlike TCE and PCE, TCP is not readily removed by air stripping.
- Although there is no MCL for TCP at the present time, the Chino I product water currently exceeds the CDPH notification level for TCP.

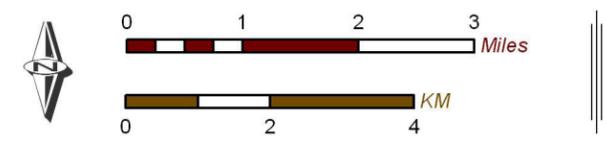


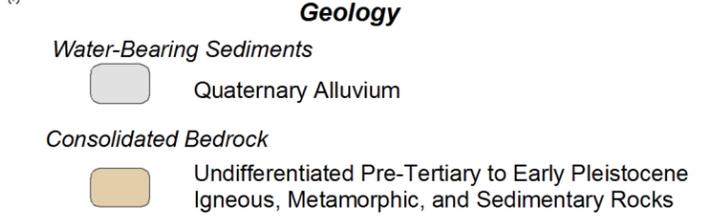
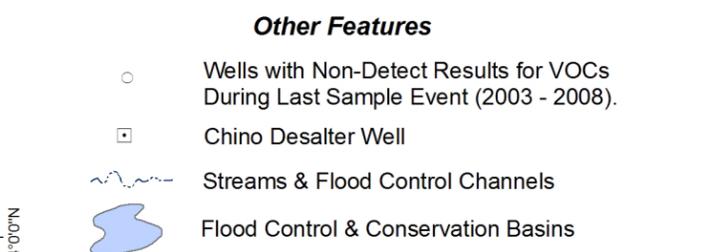
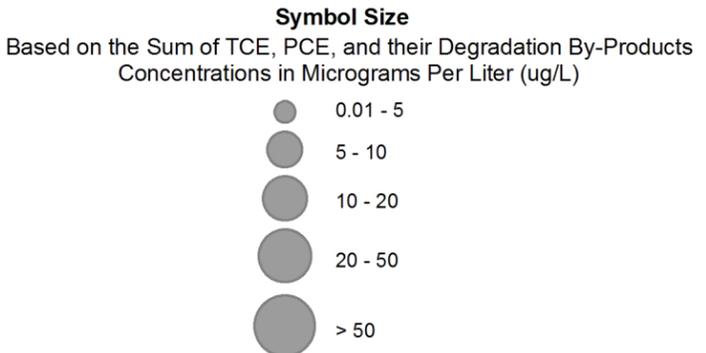
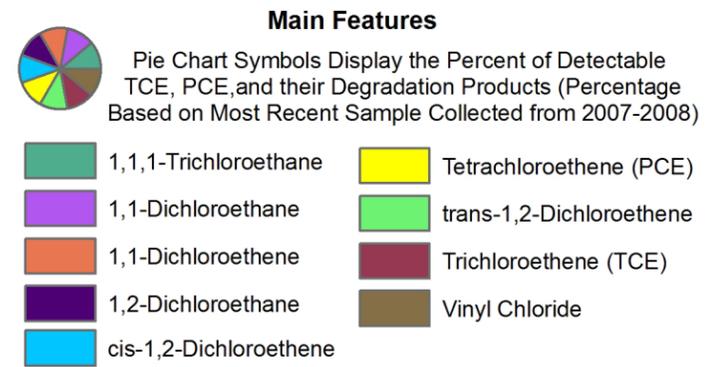
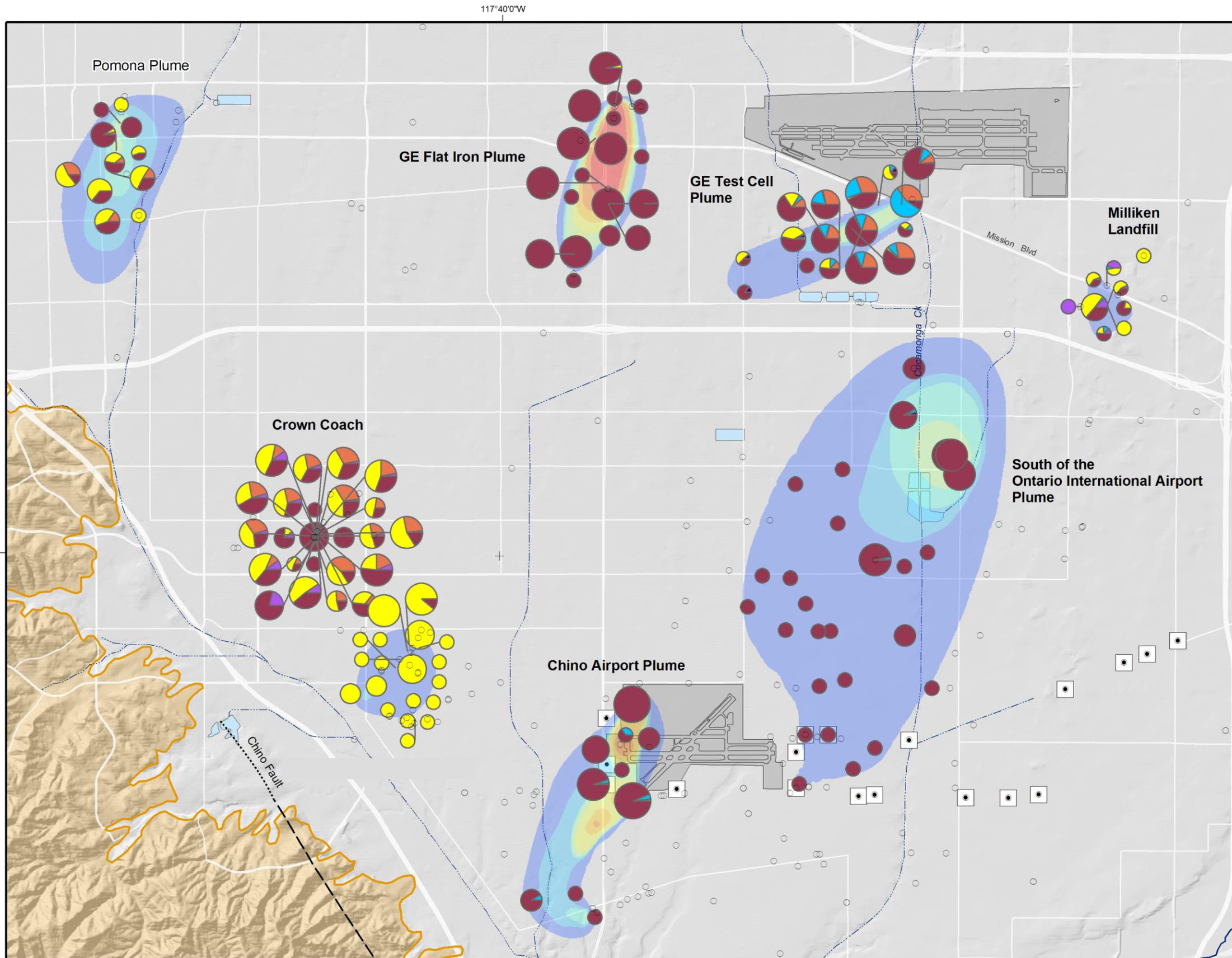
Source: Figure 4-17a from Wildermuth, "2009 Production Optimization and Evaluation of the Peace II Project Description - Final Report," Prepared for the Chino Basin Watermaster.

Figure 4.3a
Estimated Location of Water Quality Anomalies in 2008 and Their Projected Location in 2030 for the Baseline and Peace II Alternatives
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

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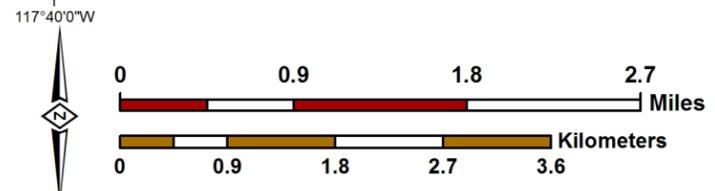




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Source: Figure 4-19. Chino Basin Watermaster "2008 State of the Basin Report, Groundwater Quality"

Figure 4.3b
VOC Pie Chart Comparison Map
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

The Wildermuth groundwater quality model predicts that TCP levels in wells CDA I-2 and 3 are declining over the short term. Historical data and short-term model predictions for wells CDA I-2 and 3 are shown in Figure 4.4. Although there appears to be a declining trend in historical data the actual rates of decline appear to lag behind the model predictions.

Long-term water quality model projections (Wildermuth, 2007) predict that TCP levels in the existing Chino I wells will continue to decline until the year 2040. TCP levels are projected to drop below the notification level by the year 2015 and remain below the notification level until the year 2050, at which time levels will rise in a secondary peak as shown in Figure 4.5.

The existing VOC air stripper supply wells withdraw groundwater primarily from the Layer 2 aquifer whereas the proposed CCWF wells will withdraw groundwater from the Layer 1 aquifer. The Wildermuth groundwater quality model predicts that the CCWFA wells will have a different response to the Chino Airport Plume than the existing VOC air stripper supply wells, as shown by the model projections displayed in Figure 4.6. This figure indicates that TCP production from the CCWFA wellfield will peak around the year 2025 and decline thereafter. The majority of TCP production is predicted to occur in only three of the proposed six CCWFA wells: CCWFA-3, 4, and 5.

4.2.6 VOC Treatment Recommendations

The following recommendations apply to compliance with regulatory standards for TCE and TCP at the Chino I Desalter. Although PCE has not been detected at levels above the reporting limit of detection, it would fall under the same recommendations as TCE, if found at higher levels in the future.

4.2.6.1 TCE Treatment Recommendations

Operational data from Chino I show that high raw water TCE levels (ranging from 30 to 40 µg/L in Well CDA I-3) are reduced to less than the level of detection (0.50 µg/L) through the VOC air stripping tower. Unless the regulatory limit for TCE (currently the MCL is 5 µg/L) changes significantly, the current air stripping treatment will continue to be adequate for TCE removal in the future, particularly in view of the declining VOC levels projected over the next 40 years. Continued practice of exhausting air-stripping towers to atmosphere will also continue to be feasible unless air quality regulations change.

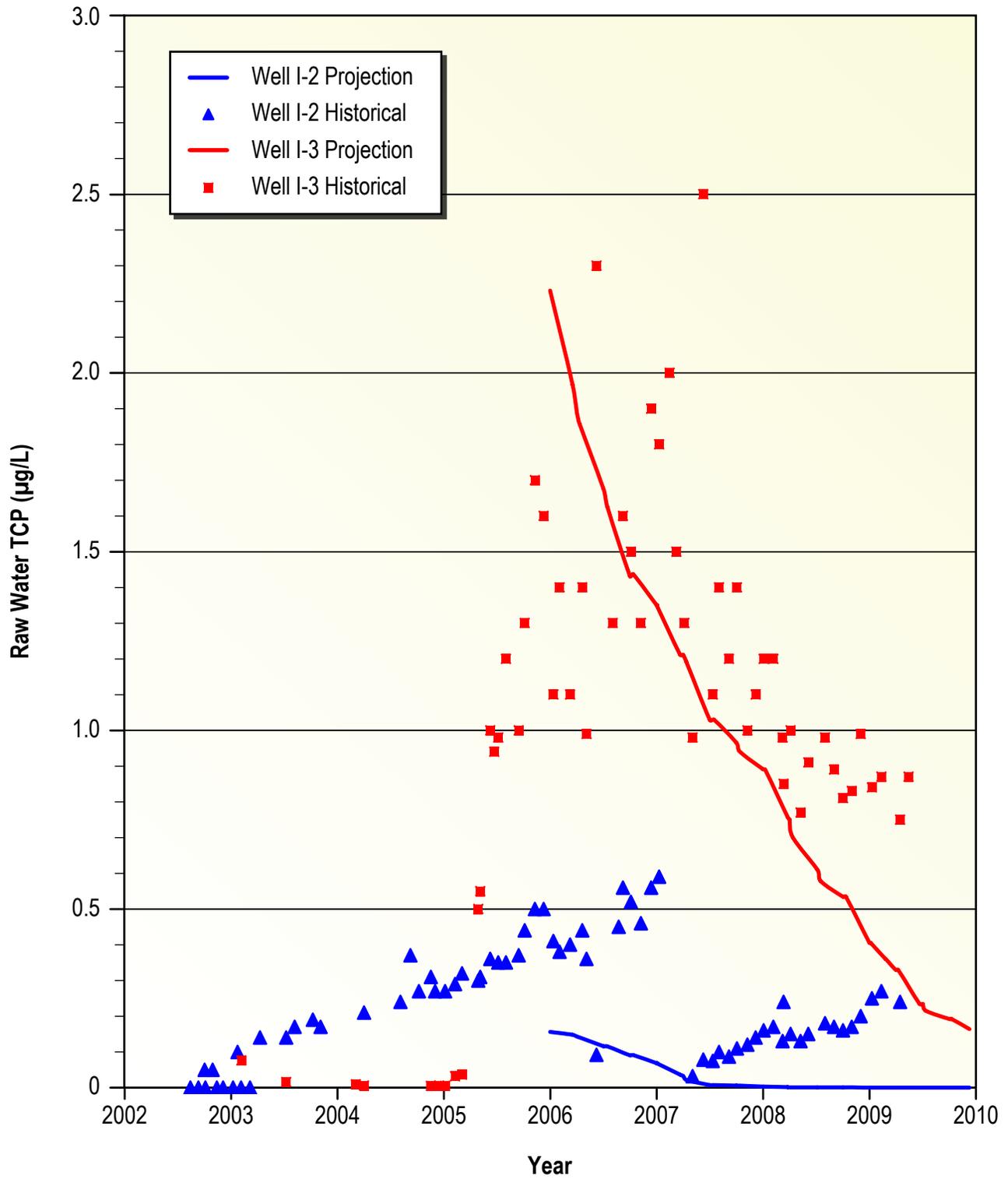
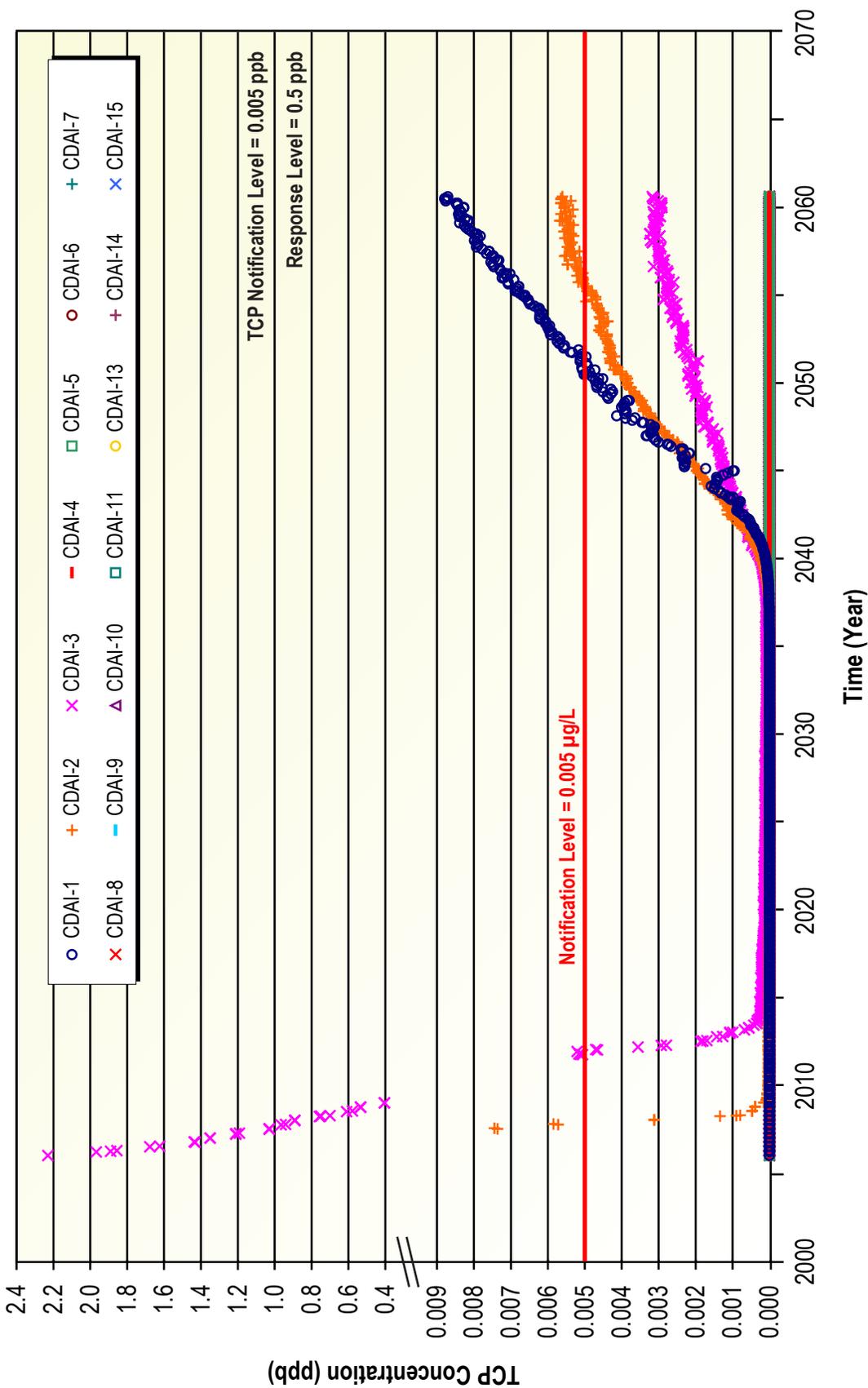


Figure 4.4
Short-Term Modeled and Historical Raw Water TCP Levels
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD



* Source: Widermuth Environmental, Inc.

Figure 4.5
 Projected TCP Concentrations in Existing Chino I Desalter Wells
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/MMWD



*Source: Wildermuth Environmental, Inc.

Figure 4.6
 Projected TCP Concentrations in Chino Creek Well Field A
 CHINO DESALTER PHASE III PDR
 JCSD/ONTARIO/MMWD

4.2.6.2 TCP Treatment Recommendations

It should be emphasized that at the present time there is no federal or California MCL for TCP. CDPH has determined that TCP is a good candidate for a future regulation establishing an enforceable MCL and, as a preliminary step, CDPH requested a public health goal (PHG) from the Office of Environmental Health Hazard Assessment (OEHHA) in July 2004. In September 2007, OEHHA released a draft PHG and in January 2009 a revised draft PHG for TCP of 0.0007 µg/L. An MCL for TPC will likely not be promulgated for several years, if ever, and CDPH continues to use the notification level to provide information to local governing agencies and consumers about TCP in drinking water supplies.

The highest concentrations of TCP in the existing CDA wellfields are seen at Well CDA I-3, which is the well most affected by groundwater containment plumes containing VOCs. Achieving TCP levels below the notification level (0.005 µg/L) at Chino I is difficult because TCP removal through air stripping is low (60 to 70 percent) and the historic raw water concentration (2.5 µg/L maximum in CDA I-3) is approximately 500 times greater than the notification level. A blending ratio of approximately 200:1 between CDA I-3 and all other Chino I wells would be required to produce product water with a TCP level below the notification level (0.005 µg/L).

At the present, this level of blending is not possible at Chino I because the capacity of CDA I-3 (historically, 300 – 500 gpm) is approximately 1/20th of the nameplate capacity of the Chino I Desalter (14.2 mgd), which is an order of magnitude too high to meet the TCP notification level standard by blending. Additionally, blending is not a viable long-term strategy for complying with the TCP notification level, as shown in Figure 4.7, which depicts the projected Chino I product water TCP concentration based upon predicted water quality modeling.

In addition, it is assumed herein that shutting off affected CCWF wells is not a viable TCP control strategy in view of Watermaster's goal to achieve hydraulic control, which implies establishing a cone of depression around the CCWF wells, and because the VOC plume will migrate to active wells.



Figure 4.7
 Historical and Projected Chino I Product Water TCP Concentrations
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

There are three basic options to achieve Chino I product water TCP levels less than the notification level. Again, it should be emphasized that there is no regulatory requirement at the present time to reduce TCP to below the notification level; however, these options can be considered in terms of a potential, future MCL for TCP at or below the notification level:

- Option 1: Co-mingle the CCWF wells affected by the VOC plume with the other wells requiring RO/IX treatment and treat the entire flow for TCP removal at Chino I. This option requires sizing the TCP treatment facilities for the capacity of the entire RO/IX product water flow. This option has the highest cost (because facilities are sized for the largest flow) but it provides low risk, because all wells will receive treatment for TCP removal.
- Option 2: Segregate the CCWF wells affected by the VOC plumes and convey the raw water from affected wells to Chino I separately from the existing RO/IX raw water wells. This option allows sizing the TCP treatment at Chino I for the capacity of the affected wells only; however, it requires installing pipes now based upon groundwater quality model projections. It has a lower cost than Option 1 but a higher risk because parallel CCWF raw water pipelines would be installed based on model predictions.
- Option 3: Treat for TCP removal at the wellhead, which requires acquiring CCWF well sites large enough for GAC pressure vessels sized for individual well flow. The option has the lowest cost because facilities are sized only for treatment of the affected wells and it has the lowest risk because treatment is installed in the future only after water quality demonstrates the necessity.

Table 4.2 summarizes the three VOC treatment options at Chino I that would bring product water levels TCP to below the notification level.

Table 4.2 Summary of Chino I TCP Treatment Options Chino Desalter Phase 3 PDR JCSD/Ontario/WMWD			
	Capital Cost	Relative Cost	Relative Risk
Option 1: Commingled Treatment at Chino I ^a	\$12,000,000	Highest	Low
Option 2: Segregated Treatment at Chino I ^b	\$7,410,000	Middle	High
Option 3: Well Head Treatment ^c	\$4,800,000	Lowest	Low
Notes:			
a. Costs include GAC contactors for 14.2 mgd capacity (Carollo, September 2008, Table 7.1 adjusted for flow).			
b. Costs include separate pipelines to wells CCWFA-3, 4, 5 and CDA I-1 with 3 mgd treatment capacity at Chino I (Carollo, September 2008, Table 6.1),			
c. Costs include two GAC vessels (40,000 lb GAC) at wells CCWFA-3, 4, 5. ³			

We recommend wellhead treatment (Option 3) for several reasons.

- As long as TCP remains a contaminant without an enforceable regulation (i.e., no MCL) then no treatment for TCP removal is required. Therefore, the option that can defer any expenditures until required is the best option.
- Option 3 defers any treatment expenses to the future when decisions can be made based on accurate information regarding both actual (future) raw water quality and future regulations.
- Option 1 also defers the decision for TCP treatment; however, it would force the centralized treatment of the entire RO/IX raw water flow and is a more expensive future alternative than Option 3.
- Option 2 requires immediate decisions on which CCWF wells to segregate by installation of pipelines as part of the Chino Phase 3 Project; it also entails the highest risk because decisions made now are based upon water quality modeling predictions.

In summary, we recommend acquiring well sites for Chino I that are large enough to support granular activated carbon (GAC) pressure vessels for wellhead removal of TCP in the future, if required. At the present time, GAC is designated as the best available technology (BAT) for TCP; however, if better technologies (e.g., smaller footprint or lower cost) are available in the future, they can be used instead of GAC treatment.

If GAC is used for wellhead treatment, it will be necessary to take certain precautions to protect the RO membrane elements against potential fouling from GAC particles and from the biological activity that may occur within the GAC media. At a minimum, future wellhead treatment facilities may include the following.

- Disposable bag filters to remove GAC particles at the well site.
- Disinfection facilities (e.g., sodium hypochlorite storage and metering) at the well site.
- Dechlorination facilities (e.g., sodium bisulfite storage and metering) at the Chino I Desalter site.

4.2.7 Other Water Quality Contaminants

Wildermuth has provided a summary of water quality data (maximum, minimum, and average) for all existing wells in the Chino Basin within a 10-year travel time of the proposed CCWF wells. The complete data are included in Appendix C.2 and summarized in Table 4.3, which includes all water quality contaminants within the 10-year travel horizon that exceed a current MCL or regulatory limit. The table indicates that the current treatment processes at Chino I will adequately treat other potential contaminants.

Table 4.3 Water Quality and Treatment Process Alternatives Chino Phase 3 Alternatives Evaluation Western Municipal Water District and City of Ontario					
Water Quality Constituent	Suitable Water Treatment Process				
	Reverse Osmosis	Ion Exchange	Air Stripping	Adsorption	Oxidation
1,1-Dichloroethylene			X	X	
1,2,3-Trichloropropane (TCP)			Limited	X	X
1,2-Dichloroethane			X	X	
Boron	X				
Chloride	X				
Chromium	X				
Cis-1,2-Dichloroethylene			X	X	
Color	X	X		X	X
Di (2-Ethylhexyl) Phthalate	X			X	X
Gross Alpha	X				
Gross Beta	X				
Iron	X	X			X
Manganese	X				X
Naphthalene				X	X
Nitrate-Nitrogen	X	X			
Nitrite-Nitrogen	X	X			
Odor Threshold				X	X
Specific Conductance	X	X			
Sulfate	X	X			
Tert-butyl Alcohol	X			X	X
Tetrachloroethylene (PCE)			X	X	X
Total Dissolved Solids	X	X			
Total Nitrate as N	X	X			
Trichloroethylene (TCE)			X	X	X
Trichlorofluoromethane			X	X	

4.3 CHINO I DESALTER

The Chino I Desalter began operation in 1999 as an 8.4 mgd RO facility. In 2005, construction work was completed to expand desalter product water capacity by adding IX nitrate removal facilities, and also a VOC air stripping tower to bypass the RO/IX treatment with raw water from wells CDA I-1, 2, 3, and 4. Although the 2005 construction brought nameplate capacity to 14.2 mgd, the desalter was unable to operate at this capacity.

In order to improve RO performance, the number of membrane elements was increased 17 percent by adding more pressure vessels to each membrane train, with the work completed in 2007. The pressure vessel expansion project resulting in an average RO flux rate decrease from 16.6 to 14.2 gallons per day per square foot (gfd). At the present time, Chino I is still unable to operate at nameplate capacity.

4.3.1 Existing Process Facilities

The design capacity (nameplate) criteria of the Chino I Desalter's three separate treatment processes and total plant capacity are as follows:

- RO permeate nameplate capacity = 6.7 mgd. RO capacity is limited by feed pump capacity and membrane flux; existing pressure vessels and membrane elements provide an average flux rate of 14.2 gfd at nameplate capacity.
- IX treated water nameplate capacity = 4.9 mgd. Capacity is limited by TDS objectives in the blended product water; therefore, IX capacity is controlled by TDS levels in RO/IX feed water, RO permeate, and VOC air stripper supply wells.
- VOC treated water nameplate capacity = 2.6 mgd. Typically, the blended raw water quality from wells CDA I-1, 2, 3, and 4 meets product water objectives for nitrate and TDS. VOC treatment capacity is currently limited by well capacity.
- Total Chino I product water nameplate capacity = 14.2 mgd. This is the sum of the nameplate capacities of the three treatment process trains. Total product water capacity is limited by the capacities of the three individual treatment processes.

Figure 4.8 shows the frequency distribution of the actual production flow rates of Chino I treatment processes, compared to nameplate capacities, from daily plant records from January 2008 (post-completion of the pressure vessel expansion project) through June 2009. The graphic shows that the RO process operates at nameplate capacity (6.7 mgd), or greater, 53 percent of the time with a 90th percentile capacity of 6.9 mgd. The IX and VOC processes never operate at nameplate capacity and have 90th percentile capacities of 4.1 mgd and 1.9 mgd, respectively. The nameplate capacities of the IX and VOC processes are 4.9 and 2.6 mgd, respectively.

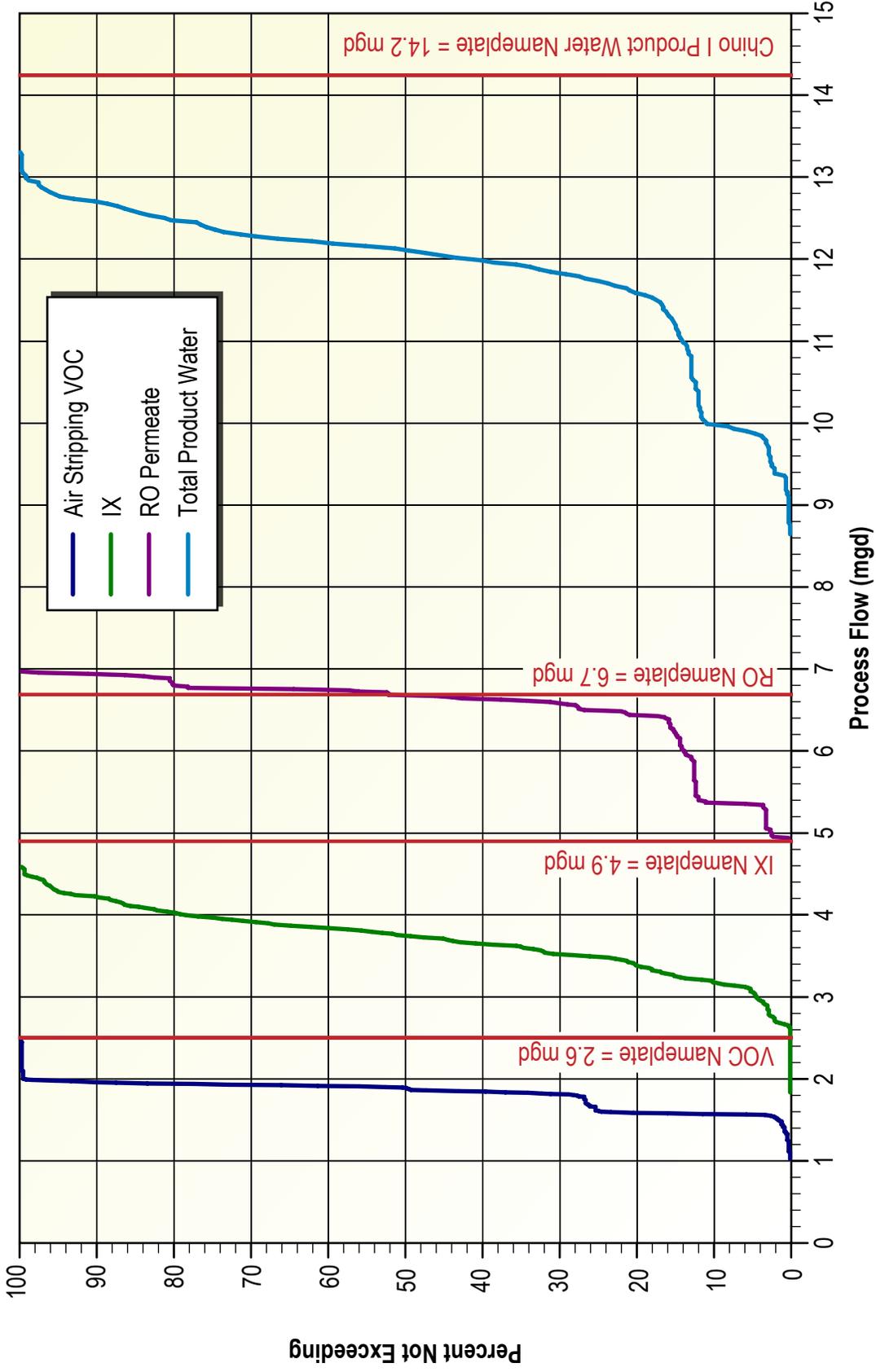


Figure 4.8
 Chino I Process Flow Frequency Distributions
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

Currently, the greatest limitation on Chino I product water capacity is not the RO process capacity but the VOC well capacity and the amount of RO bypass through the IX nitrate removal process. The two contaminants of interest for the IX treatment train are nitrate and TDS levels in the blended product water, shown in Table 4.4, which indicates that the limiting product water parameter in determining the IX flow rate is TDS.

Table 4.4 Chino I Product Water Nitrate and TDS Levels Chino Desalter Phase 3 PDR JCSD/Ontario/WMWD		
	Nitrate (mg/L as NO₃⁻)	TDS (mg/L)
MCL	45 ^a	500 ^b
CDA Objective ^c	25	350
Chino I Product Water ^d		
Maximum	24	480
Average	15	363
Minimum	10	290
Notes:		
a. State primary MCL= 45 mg/L as NO ₃ ⁻ .		
b. The secondary MCL for TDS (500 mg/L) shall not be exceeded in water supplied to the public by community water systems (California Code, Title 22, §64449).		
c. Minimum water quality standard unless an individual purchaser waives the requirement or the CDA Board approves a lesser standard (CDA Joint Powers Agreement Amendment No. 2).		
d. Chino I lab data for January 2008 through June 2009 (weekly samples).		

The data show that Chino I product water consistently exceeds the TDS objective but not the nitrate objective; therefore, the constraint on the IX treatment capacity is the blended product water TDS. Because the IX process removes nitrate but not TDS, the IX process capacity is determined by the IX raw water TDS. Reportedly, the Chino I Desalter experiences a 10-15 percent increase in TDS through the IX process¹. The VOC air stripping process also bypasses the RO but is currently limited by well capacity, not TDS.

The relationship between RO/IX raw water TDS levels and Chino I product water capacity is shown in Figure 4.9, which is based upon the following assumptions.

- RO and VOC processes operate at nameplate capacities:
 - RO permeate flow = 6.7 mgd.
 - VOC air stripping tower flow = 2.6 mgd.

¹ See comment Log No. 315 response for further discussion.

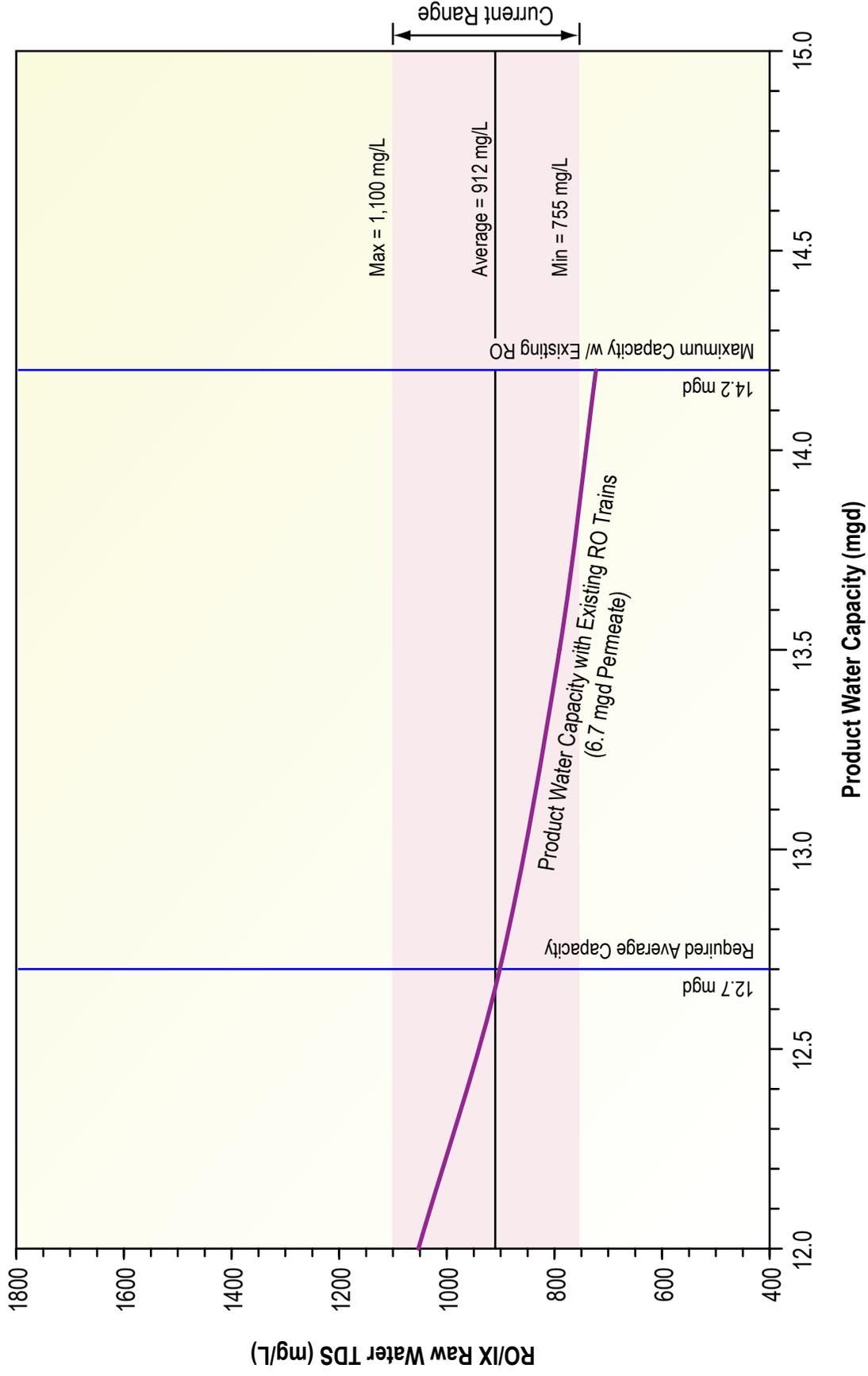


Figure 4.9
 Effect of Raw Water TDS on Existing Chino I Capacity
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

- TDS levels are historical averages (January 2008 through June 2009) and as follows:
 - RO permeate TDS level = 26 mg/L.
 - VOC TDS = 346 mg/L.
 - Product water TDS = 350 mg/L.
 - IX effluent TDS = RO/IX raw water x 1.1 (based on information received from CDA staff).

Figure 4.9 shows that the existing Chino I facilities cannot reach 14.2 mgd nameplate capacity unless the TDS of the RO/IX raw water (i.e., blended wells CDA I-5 through 15) is less than 720 mg/L. From January 2008 through June 2009, RO/IX raw water TDS levels ranged from 755 to 1,100 mg/L with an average of 912. The frequency distribution of RO/IX feed water is shown in Figure 4.10, which indicates that RO/IX raw water TDS always exceeds 720 mg/L.

In summary, although the Chino I nameplate capacity is 14.2 mgd, the desalter has never achieved nameplate capacity. In order to produce 14.2 mgd, Chino I must meet all of the following conditions simultaneously:

- All equipment must be operational (i.e., there is no treatment process or equipment redundancy at nameplate capacity).
- Well fields must produce required flows:
 - Combined flow from RO/IX supply wells must be ≥ 13.4 mgd, assuming RO recovery ≥ 80 percent and IX efficiency ≥ 98 percent.
 - Combined flow from VOC air stripper supply wells must be ≥ 2.6 mgd. Historically, this condition was never met between January 2008 to June 2009; the 10th percentile flow is only 1.5 mgd during this period.
- RO/IX raw water TDS must be less than 720 mg/L; this condition is never met, based on historical data.

The required annual average flow (12.7 mgd) to meet the Chino I CDA member entitlements is approximately 90 percent of the nameplate capacity (14.2 mgd); in other words, the operation factor for Chino I is 90 percent. In order to produce the 14,200 AF/yr of product water required to meet CDA member agency entitlements from Chino I, the desalter must meet all of the above conditions at least 90 percent of the time. Figure 4.8 shows that since the pressure vessel expansion project, the desalter capacity has been less than the entitlement average annual flow 90 percent of the time and the desalter has never achieved nameplate capacity.

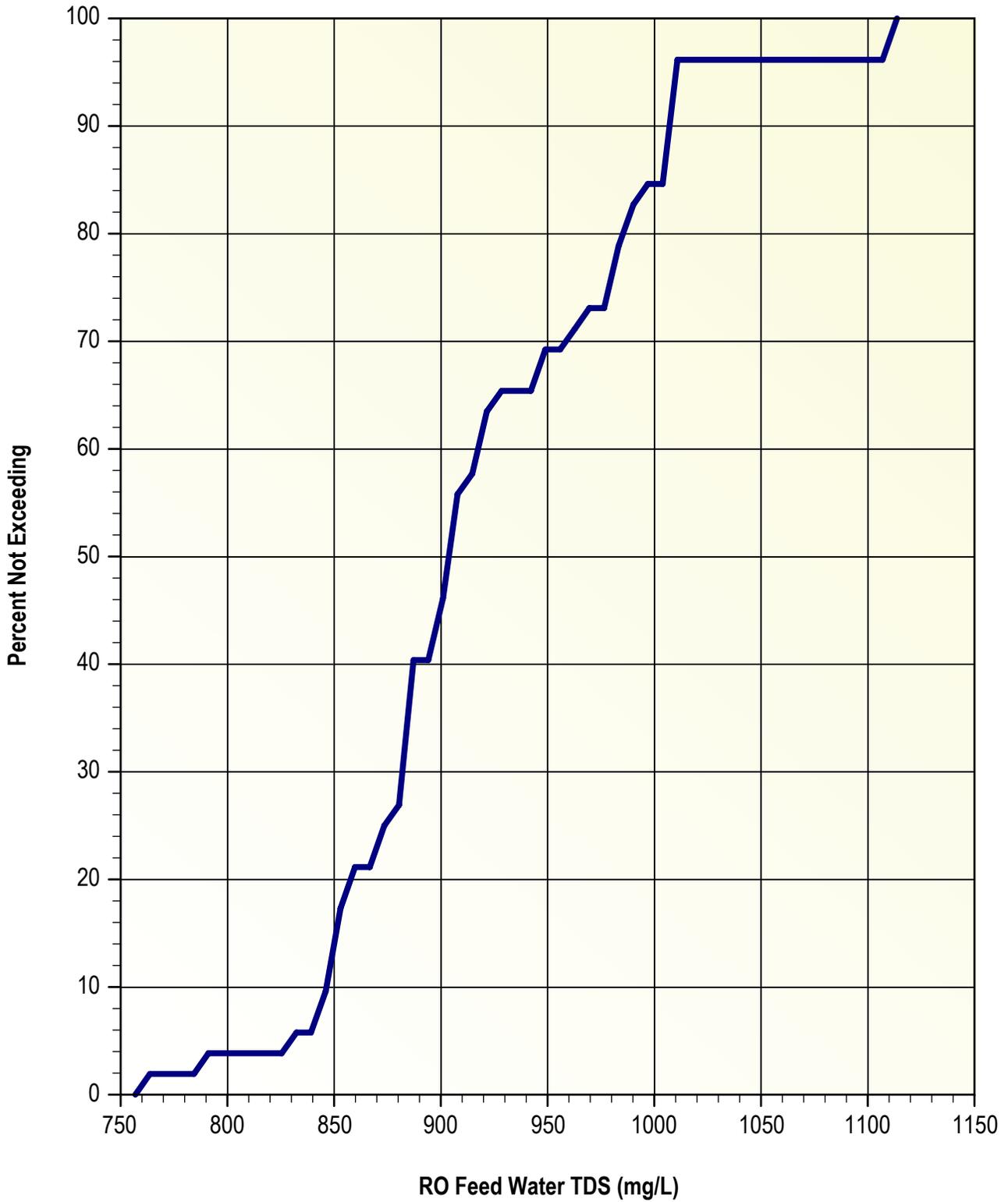


Figure 4.10
 Frequency Distribution of Chino I RO/IX Raw Water TDS
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

4.3.2 Process Facility Modifications

In general, Chino I capacity is controlled by the product water TDS level. The only process at Chino I that is capable of TDS removal is RO treatment; therefore, achieving nameplate capacity of 14.2 mgd requires one or more of the following modifications to increase the IX treatment flow that can be blended in the product water while still meeting TDS level objectives:

- Increase the RO capacity, which directly increases product water capacity and also allows increased IX flow. This is the only option that, by itself, can succeed in bringing Chino I to nameplate capacity.
- Decrease the TDS level in the RO system permeate to allow increased IX flow. This measure alone is insufficient to make up the entire product water deficiency.
- Decrease the RO/IX raw water TDS level to allow increased IX flow. As discussed below, adding the CCWF is unlikely to decrease the raw water TDS level.

The raw water quality of wells CCWFA-1 through 6 is unknown at the present time; however, it is unlikely that the addition of the CCWF supply will decrease the Chino I RO/IX raw water TDS level. In order to promote Watermaster's hydraulic control objective, the CCWF wells will withdraw water from the shallow alluvial aquifer, which tends toward higher TDS levels than the deeper alluvial aquifer.

It is likely that the CCWF TDS levels will be less similar to the nearby deep VOC air stripper supply wells (CDA I-1 through 4), which have average TDS levels ranging from 265 to 575 mg/L, and more similar to the nearest shallow RO/IX supply wells (CDA I-5 through 8), which have average TDS levels ranging from 930 to 1430 mg/L. The CCWF well drilling program will result in test pumping that will help establish actual TDS levels; the first two wells are scheduled for drilling in 2010.

It is unlikely that the addition of the CCWF wells will allow Chino I to meet its current nameplate capacity by lowering the blended raw water TDS. To meet existing nameplate capacity with current well supply TDS levels will require the addition of RO capacity. The effect of additional RO capacity at Chino I is shown in Figure 4.11, which is based upon the same assumptions stated previously for Figure 4.9. Figure 4.11 demonstrates the following (for the stated assumptions).

- The addition of one RO train (1.67 mgd), with the same capacity as each of the existing RO trains, is required to provide 14.2 mgd of product water capacity within the range of RO/IX raw water TDS levels historically experienced at Chino I.
- The addition of two RO trains (1.67 mgd each), each with the same capacity as the existing RO trains, is required to provide 14.2 mgd of product water capacity if the RO/IX raw water TDS level exceeds the historical range at Chino I.

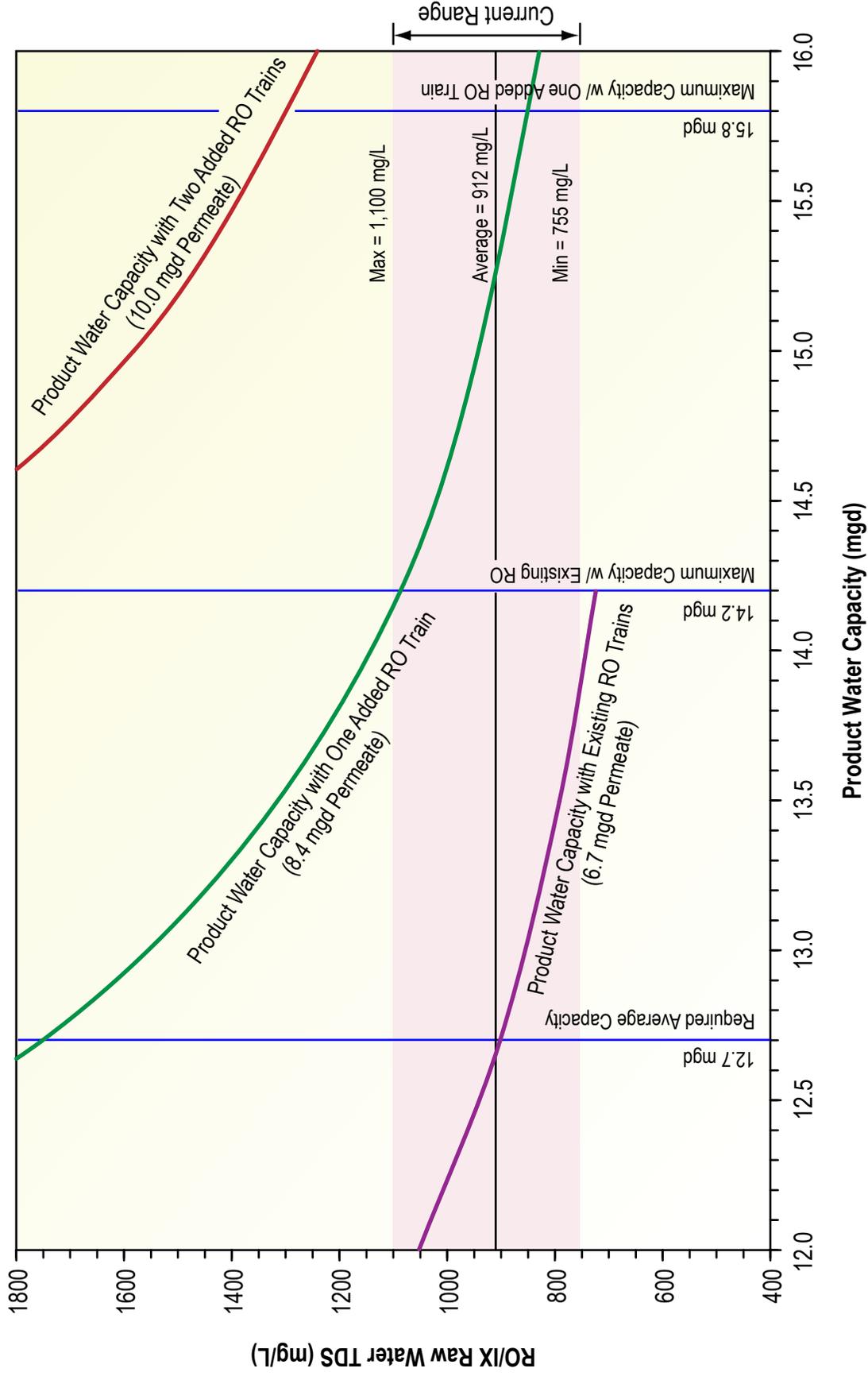


Figure 4.11
Effect of Raw Water TDS on Chino I Capacity
with Additional RO
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

- In addition to the TDS constraint on Chino I capacity, there is also an issue with the capacity of the VOC air stripper raw water supply. The combined design capacity of the pumps installed in the VOC air stripper supply wells (CDA I-1, 2, 3, and 4) is 1,800 gpm, or 2.6 mgd. The nameplate capacities of the RO and IX processes (6.7 and 4.9 mgd, respectively) assume that all four VOC air stripper supply wells are operating at design capacity in order to achieve Chino I nameplate capacity of 14.2 mgd.

In fact, the VOC air stripper supply wells have never operated at a combined design capacity of 2.6 mgd since January 2008 and the 10th percentile combined flow from these wells is only 1.5 mgd, creating a 1.1 mgd deficit in product water capacity that must be made up by the IX or RO processes. The 10th percentile flow capacity is considered a reliable flow value because it is equivalent to the 90 percent operating factor used for design of the desalter facilities.

In order to reliably supply 14.2 mgd of product water (i.e., 90 percent of the time), an expansion of the Chino I RO capacity must also make up the 1.1 mgd supply deficit from the VOC air stripper supply wells. This is shown graphically in Figure 4.12, which uses all the previous assumptions for similar figures, except that Figure 4.12 assumes the VOC process capacity is 1.5 mgd (the 10th percentile VOC well capacity) instead of the 2.6 mgd VOC nameplate capacity.

Figure 4.12 depicts the product water capacity available from one or two added RO trains, together with the required IX process flow to deliver a given product water capacity at a given raw water TDS level. This analysis results in the following information, assuming VOC process operation at 1.5 mgd (historical 10th percentile flow) instead of the 2.6 mgd nameplate capacity.

- The existing Chino I facilities (6.7 mgd RO capacity) can not deliver 14.2 mgd nameplate capacity within the range of historical raw water TDS. If raw water TDS were lowered sufficiently to allow operation at nameplate capacity, then the IX process capacity must be expanded by 1.1 mgd to make up for the VOC capacity deficit.
- Adding one more RO train (8.4 mgd total RO capacity) at Chino I can deliver 14.2 mgd nameplate capacity only up to the historical average raw water TDS (approximately 900 mg/L). This means that Chino I expanded by one RO train would fall short of nameplate capacity 50 percent of the time, even with the existing RO/IX well field water quality.
- Adding two more RO trains (10.0 mgd total RO capacity) at Chino I can deliver 14.2 mgd nameplate capacity for any historical raw water TDS. Such an expansion would allow treatment of approximately 1,400 mg/L raw water TDS levels at nameplate capacity. The IX process would normally operate at less than existing 4.9 mgd nameplate capacity.

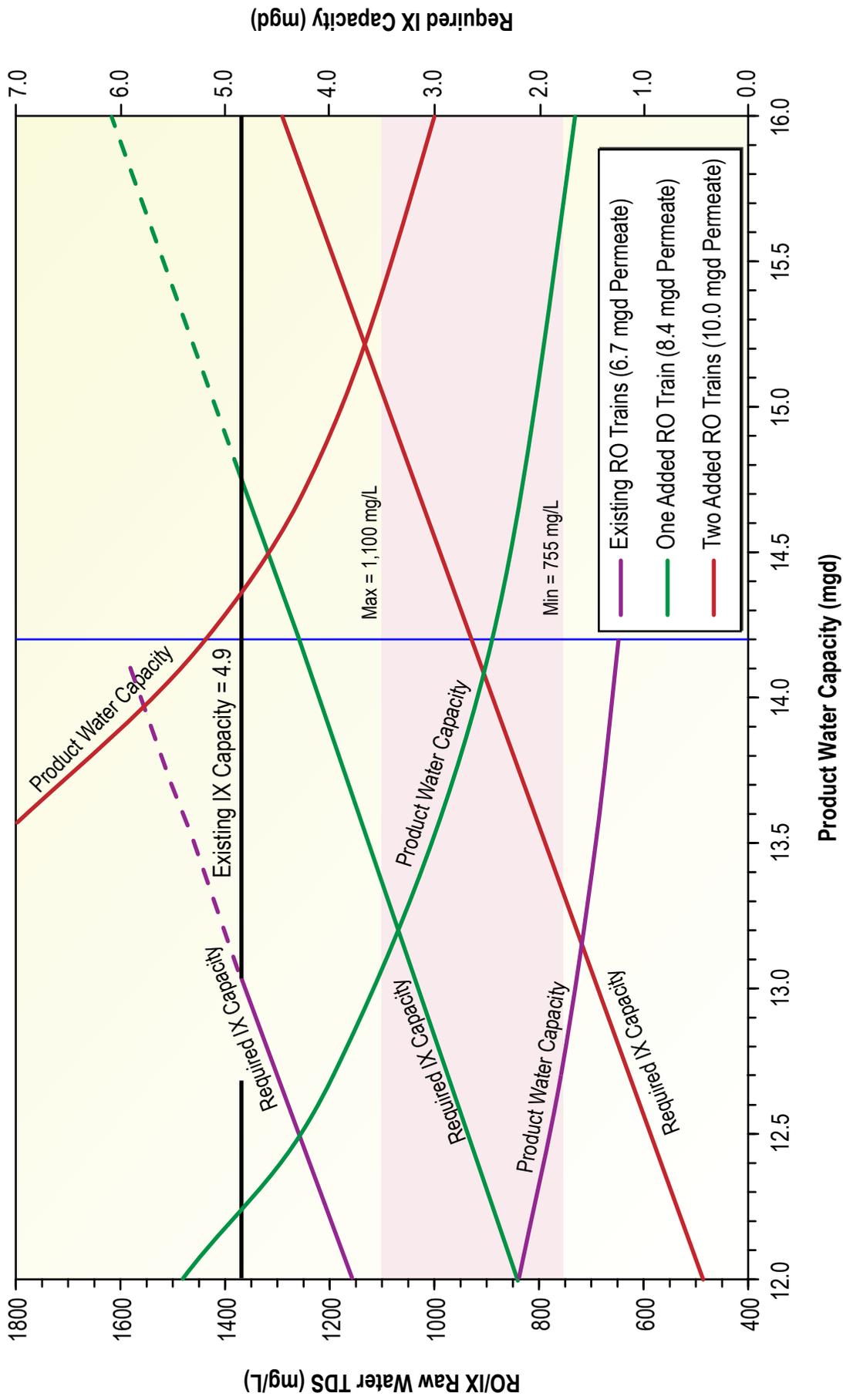


Figure 4.12
 Effect of Raw Water TDS on Chino I Capacity
 with VOC Air Stripper Supply Wells at 1.5 mgd
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

Proposed modifications and design criteria for adding two RO trains to the Chino I Desalter are shown in Appendix D.1. The proposed locations of the additional RO trains are also shown in the Appendix, together with the hydraulic profiles for each of the existing Chino I process trains.

Existing product water pumping facilities at Chino I are designed to provide reliable delivery of entitlement capacities to the individual CDA member agencies receiving product water from the desalter. Existing Chino I product water pump station criteria are tabulated in Appendix D.2. Expansion of the product water pump station facilities is not required.

Section 8 presents options for the Phase 3 project expansion of Chino II capacity that do not require the modification of Chino I to achieve nameplate capacity (14.2 mgd). If Chino I is not modified by the addition of new RO trains then it is possible that the actual capacity of the desalter will decrease if the proposed CCWF wells result in an increase in the TDS of the combined RO/IX raw water for Chino I.

Using a conservative assumption that the CCWF wells will produce raw water with TDS level = 1,400 mg/L (corresponding to an average of wells CDA I-5 through 8) then the blended RO/IX raw water TDS at Chino I will increase to 1,200 mg/L from the current average of approximately 900 mg/L. This raw water blending calculation assumes that wells CDA I-13, 14, and 15 are operating to provide raw water to Chino II. Under this condition the actual capacity of Chino I would be reduced by 1.1 mgd due to the reduction in IX effluent that could be blended while still meeting the current CDA objective of product water TDS less \leq 350 mg/L.

If the CCWF water quality increases the Chino I RO/IX blended raw water TDS and if Chino II is not modified to achieve nameplate capacity through the addition of new RO trains then the Phase 3 project should include provisions to avoid the loss of capacity at Chino I due to increased raw water TDS. The actual requirements will not be known until the CCWF wells are drilled and tested, which will begin in 2010 with the first two wells. Until that time a placeholder project is assumed, which consists of adding 1.1 mgd of additional membrane capacity at Chino I.

4.3.3 Cost Allocations

The cost allocations presented later in this report assume that Chino I is modified by addition of two new membrane trains using criteria documented in Appendix D, if operation at nameplate capacity is required. Of the three options for the Chino Desalter Phase 3 expansion presented in Section 8, one option requires operation of Chino I at nameplate capacity (Option A) and two do not (Options B and C). All capital costs associated with additional membrane trains and SARI capacity, if required at Chino I, are assumed to be shared between the Sponsors and not shared by non-Sponsor CDA members.

Design criteria and cost estimates should be updated and revised, if necessary, when CCWF raw water quality data are confirmed.

4.4 CHINO II DESALTER

The Chino II Desalter began operation in the spring of 2006 with a nameplate capacity of 10 mgd excluding the water quality dependent raw water bypass and 15 mgd including the water quality dependent raw water bypass. Wells CDA II-1, 2, 3, 4, 6, 7, 8, and 9A currently supply blended raw water to Chino II through a single pipeline. At the plant site, raw water is treated through either an RO process or an IX nitrate removal process. A bypass around the RO and IX treatment facilities allows blending of raw water directly into the product water. The use of the raw water bypass reduces the unit cost of producing product water and allows Chino II to produce in excess of the 10 mgd RO/IX nameplate capacity, thus helping to alleviate the Chino I capacity deficit.

4.4.1 Existing Process Facilities

The design capacity (nameplate) criteria of the separate treatment processes and total Chino II Desalter capacity are as follows:

- RO permeate nameplate capacity = 6.0 mgd. Capacity is limited by feed pump capacity and membrane flux; existing pressure vessels and membrane elements provide an average flux rate of 14.9 gfd at nameplate capacity.
- IX treated water nameplate capacity = 4.0 mgd. Capacity is limited by TDS objectives in the blended product water. Therefore, IX capacity is controlled by TDS levels in the raw water and RO permeate.
- Raw water bypass capacity \leq 5 mgd. The CDPH operating permit limits the raw water bypass based on meeting TDS and nitrate operating goals, with a not-to-exceed capacity of 5 mgd. Historically, the average raw water bypass flow has been 2.2 mgd and the 90th percentile has been less than 3 mgd.
- Total Chino II product water nameplate capacity is 10.0 mgd excluding the raw water bypass or 15 mgd including the raw water bypass. This is the sum of the nameplate capacities of the two treatment process trains and the raw water bypass.

The raw water bypass is used to reduce the treatment cost and to make up the capacity deficit at Chino I. Without the raw water bypass, the Chino II product water would have a higher cost of treatment but it would also have lower nitrate and TDS levels. Although CDPH has established a maximum permitted raw water bypass capacity of 5 mgd the physical capacity of the bypass is at least 6 mgd, as discussed in Appendix D.3.

Figure 4.13 shows the frequency distribution of the actual production flow rates of Chino II treatment processes, compared to nameplate capacities, from daily plant records from January 2008 through June 2009. The graphic shows that the RO process has operated at nameplate capacity (6.0 mgd), or greater, 90 percent of the time. The IX nitrate removal process operates at nameplate capacity (4.0 mgd), or greater, 90 percent of the time.

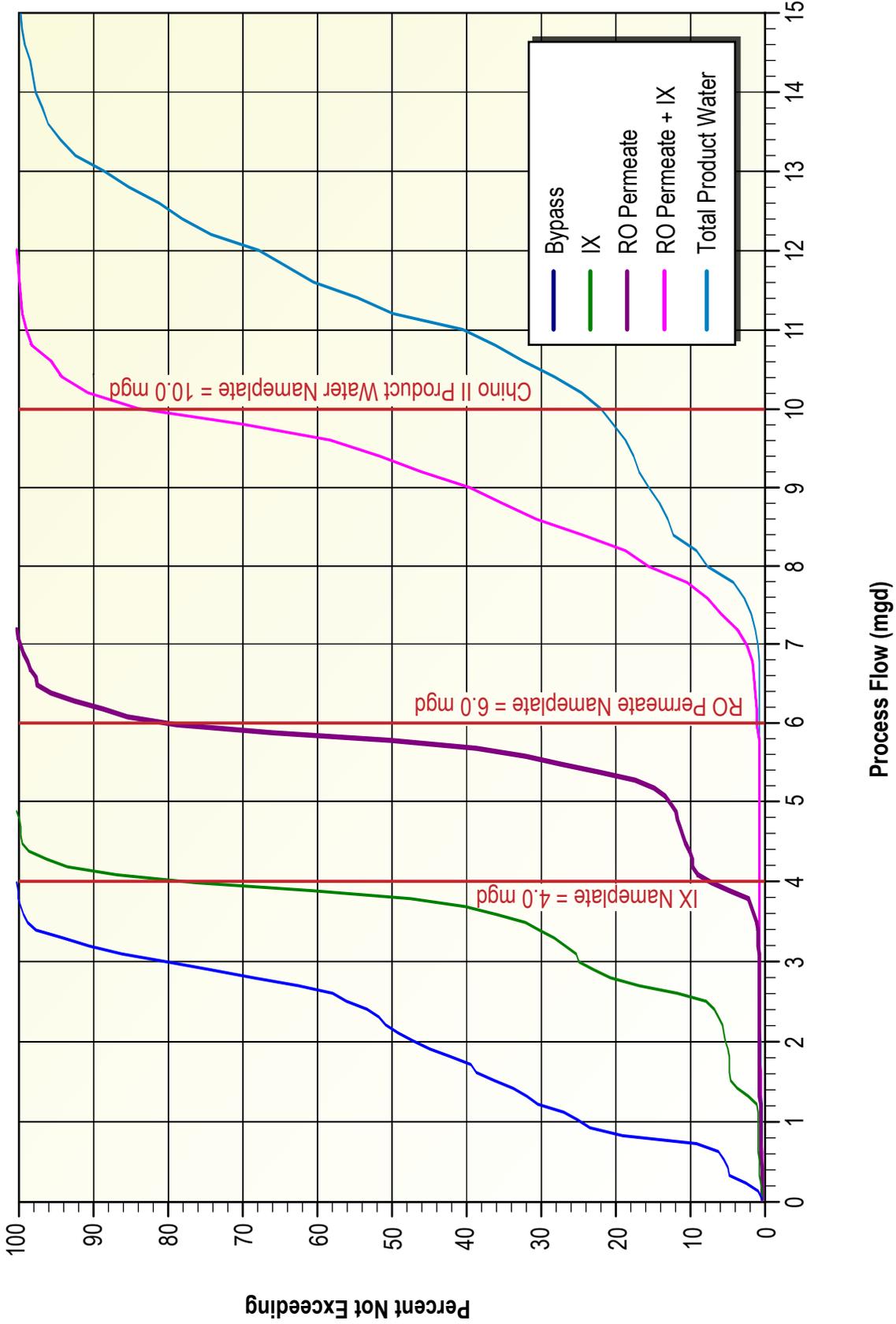


Figure 4.13
 Chino II Process Flow Frequency Distributions
 CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/WMWD

The Chino II Desalter consistently operates at flow rates greater than its 10 mgd RO/IX nameplate capacity by using the raw water bypass to the greatest extent possible. Chino II operates at more than nameplate capacity (10 mgd) 78 percent of the time with a 90th percentile capacity of 13.1 mgd. The use of the bypass is limited by both nitrate and TDS levels in the product water; the historical TDS and nitrate levels for Chino II product water are shown in Table 4.5.

Table 4.5 Chino II Product Water Nitrate and TDS Levels Chino Desalter Phase 3 PDR JCSD/Ontario/WMWD		
	Nitrate (mg/L as NO₃)	TDS (mg/L)
MCL	45 ^a	500 ^b
CDA Objective ^c	25	350
Chino II Product Water ^d		
Maximum	29	480
Average	20	322
Minimum	10	200
Notes:		
a. State MCL=45 mg/L as NO ₃ .		
b. The secondary MCL for TDS (500 mg/L) shall not be exceeded in water supplied to the public by community water systems (California Code, Title 22, §6444S).		
c. Minimum water quality standard unless an individual purchaser waves the requirement or the CDA Board approves a lesser standard (CDA Joint Powers Agreement Amendment No. 2).		
d. Chino II lab data from January 2007 - March 2009 (weekly samples).		
e. Staff report that values > 350 mg/L represent operational issues (i.e., instrumentation) rather than process capability.		

The economic benefit of using the raw water bypass is a trade off for higher product water nitrate and TDS levels than would result from use of the RO and IX processes without the raw water bypass. Typically, the use of the raw water bypass is limited by raw water TDS levels rather than nitrate levels. The relationship between raw water TDS levels and Chino II bypass capacity is shown in Figure 4.14, which indicates that a 20 percent bypass is possible at the historical average raw water TDS level of approximately 630 mg/L. At raw water TDS levels approaching 1,000 mg/L the use of the bypass is eliminated in order to meet the 350 mg/L blended water TDS level objective.

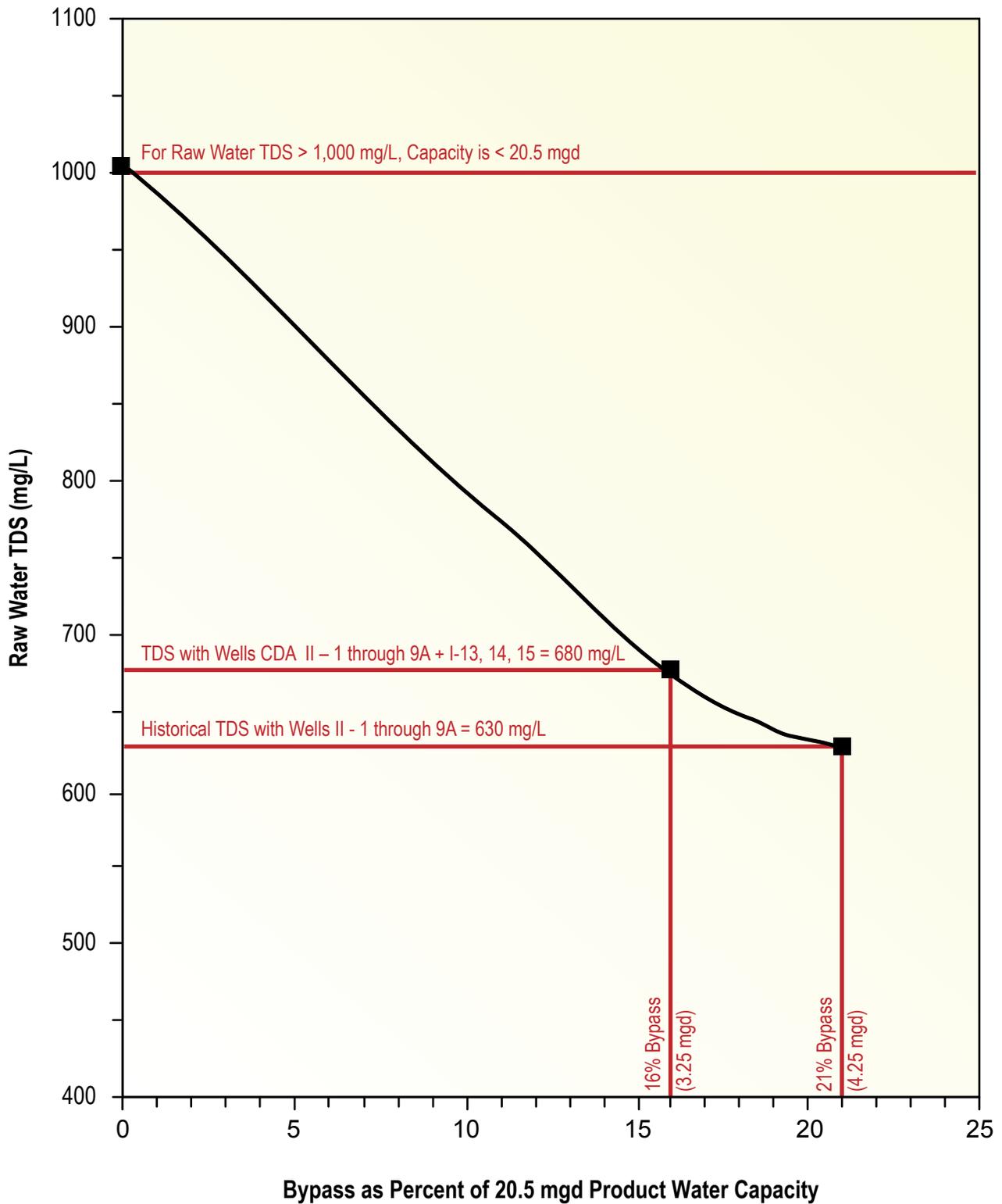


Figure 4.14
Effect of Raw Water TDS on Expanded Chino II Bypass
CHINO DESALTER PHASE 3 PDR
 JCSD/ONTARIO/MMWD

Figure 4.14 also shows the effect of increasing the average raw water TDS by incorporating wells CDA I-13, 14, and 15 into the Chino II raw water supply. These three wells have TDS levels averaging approximately 800 mg/L, which will increase the blended raw water TDS at the Chino II. In order to achieve the 350 mg/L product water TDS objective, the bypass capacity will be reduced from approximately 20 percent to approximately 15 percent. However, because of the Chino II Phase 3 expansion the actual capacity of the bypass will increase from 2 mgd (20% x 10 mgd) to over 3 mgd (15% x 20.5 mgd).

4.4.2 Process Facility Modifications

WMWD and IEUA applications have previously been approved for state grant funding for expansion of Chino II as part of the Chino Desalter Phase 3 project. Because the original grant funding required that construction expenditures begin in the fourth quarter of calendar year 2009, the Sponsors proceeded with the expansion of Chino II in advance of raw water, product water, or concentrate disposal expansion. A predesign report was prepared (Carollo, January 2008) to serve as the basis for expansion of RO and IX facilities from the existing nameplate capacity of 10 mgd to 20.5 mgd, not including raw water bypass capacity.

In order to meet the State's requirements for expenditure of grant funding on construction activities, the Sponsors released bid documents in 2008 for procurement and installation of the RO and IX equipment required for the Chino II expansion. Bids were opened on November 6, 2008; however, statewide financial problems resulted in freezing of State grant funds for the project and consequently the bids were rejected on January 20, 2009. The Sponsors reissued the Chino II expansion procurement and installation bid documents in August 2009 and a contract was awarded on October 30, 2009.

Basic criteria for the Chino II expansion are summarized in Table 4.6. The complete Chino II expansion PDR is included in Appendix D.3. Criteria for product water pumping are not included in Appendix D.3 because the configuration of the Chino II product water pump stations required to accommodate the capacity expansion are dependent upon the selection of product water delivery options. These options and alternatives for product water pumping are presented in Section 6 of this report.

4.4.3 Cost Allocations

The cost allocations used later in this report to divide capital expenses equitably between the parties receiving benefit fall into the following categories.

4.4.3.1 Costs Shared by Sponsors Only

The majority of the capital costs of the Chino II expansion are required in order to increase the plant capacity as part of the Phase 3 expansion. The additional 10.5 mgd of product water capacity resulting from the Phase 3 project will benefit the project Sponsors; therefore, the capital costs are shared between the Sponsors only and are not charged to the entire CDA membership. Costs included in this category are all costs associated with

the addition of RO, IX, and decarbonation facilities as summarized in Table 4.6 and presented in detail in Appendix D.3.

Table 4.6 Chino II Expansion Criteria Summary Chino Desalter Phase 3 PDR JCSD/Ontario/WMWD				
Description	Units	Existing	Added	Total
Product Water Capacity ^a	mgd	10.0	10.5	20.5
<u>RO Facilities</u>				
RO Trains	No.	3	2	5
Capacity (Total)	mgd	6.0	6.5	12.5
Capacity (Each Train)	mgd	2.0	3.25	
Cartridge Filters	No.	3	2	5
RO Feed Pumps	No.	3	2	5
<u>Decarbonation Facilities</u>				
Packed Tower Air Strippers	No.	2	1	3
Capacity (Total)	mgd	6.0	4.2	12.5 ^b
Capacity (Each)	mgd	3.0	4.2	
<u>IX Facilities</u>				
IX Vessels	No.	4	4	8
Capacity (One Out of Service)	mgd	4.1	4.1	8.28 ^c
Capacity (Each Vessel)	mgd	1.38	1.38	
Bag Filters	No.	2	2	4
Brine Saturators	No.	2	1	3
Brine Holding Tanks	No.	2	0	2
Water Softeners	No.	2	1	3
Rinse Reclaim Tank	No.	1	0	1
Nitrate Waste Tank	No.	2	0	2
Softener Brine Reclaim Tanks	No.	0	1	1
Soft Water Feed Pumps	No.	2	1	3
Brine Transfer Pumps	No.	2	0	2
Brine Feed Pumps	No.	2	2	4
Rinse Reclaim Pumps	No.	2	1	3
Air Block Blowers	No.	2	2	4
Note:				
a. Does not include raw water bypass capacity.				
b. Requires rerating existing decarbonators to 4.2 mgd each.				
c. With two units out of service.				

4.4.3.2 Costs Shared by All CDA Members

The Chino II expansion bid documents include some items that were requested by CDA staff in order to improve the operation of the existing Chino II Desalter. Because improved operation benefits all CDA members these costs are appropriately shared by the entire CDA membership. At the present time the only items in this category are the supplemental spare parts, which are documented in Appendix D.4.

4.4.3.3 Costs Shared by Sponsors and All CDA Members

Some capital expenditures are required by the Chino II expansion but also have a component that benefits the operation of the existing facility and should be shared among all CDA members.

Transfer Pumps

RO permeate is brought to atmospheric pressure in the decarbonators and, therefore, requires repumping to the ground storage tank through transfer pumps. IX effluent is pressurized and can be conveyed to the ground storage tank without repumping. However, the current Chino II design blends IX effluent with RO permeate upstream of the transfer pumps in order to allow use of less expensive cast iron pumps instead of the stainless steel pumps required if RO permeate alone, which is corrosive to cast iron, is conveyed through the transfer pumps.

The current configuration has produced major issues in operation because of the formation of hardness scale when the blended IX and RO permeate flow receives a caustic soda dosage high enough to provide final pH adjustment for the entire product water stream including the raw water bypass and the balance of the IX effluent not blended upstream of the transfer pumps. In addition, there is an operational cost in repumping the IX effluent flow that otherwise has enough energy for delivery to the ground storage reservoir without repumping through the transfer pumps.

To maintain the current method of operation after the expansion of Chino II requires the following modifications to the transfer pump system:

- Add new transfer pumps, with associated valves and piping, for the expansion capacity. This improvement benefits the Sponsors only.
- Add a separate caustic soda feed system with pH control feed loop to adjust the product water pH downstream of the transfer pump station. These improvement benefit the entire CDA membership.

The Chino II expansion predesign (Carollo, January 2008) proposed replacing the existing cast iron pumps with stainless steel pumps sized to transfer only the RO permeate. Stainless steel construction eliminates the need for IX effluent blending and repumping and allows product water pH adjustment at a single location downstream of the transfer pump station.

Economic analysis indicated a one to two year payback period with overall cost savings to the entire CDA membership thereafter. Using the ratio of CDA RO/IX capacity (10 mgd) and Sponsor RO/IX capacity (10.5 mgd), it is assumed that the entire CDA membership will pay 48.8 percent and the Sponsors alone will pay 51.2 percent of the actual costs of the recommended modifications.

Chemical Piping

The following cost sharing is recommended for modifications to chemical piping:

- All CDA members share the costs of the following chemical feed modifications described in the Chino II expansion predesign:
 - Threshold inhibitor improvements to allow use of the entire storage tank contents.
 - Sodium hypochlorite improvements to allow use of the entire storage tank contents.
 - Caustic soda improvements to allow use of the entire storage tank contents.
- The Sponsors only will pay the entire costs of the following chemical feed modifications:
 - Install sodium hypochlorite chemical piping and exterior containment trench to the new decarbonator added as part of the Chino II capacity expansion.

HVAC Modifications in the Existing Electrical Room

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

Using the values presented in Appendix D.3 (Table 3.16.2, page 3-66) the existing CDA cooling requirement of the Chino II expansion is 207,251 BTU/hr. Cost sharing based on these requirements would be CDA = 38 percent and Sponsors = 62 percent. HVAC improvements should be scheduled for construction at the same time as Chino II product water pumping station construction.