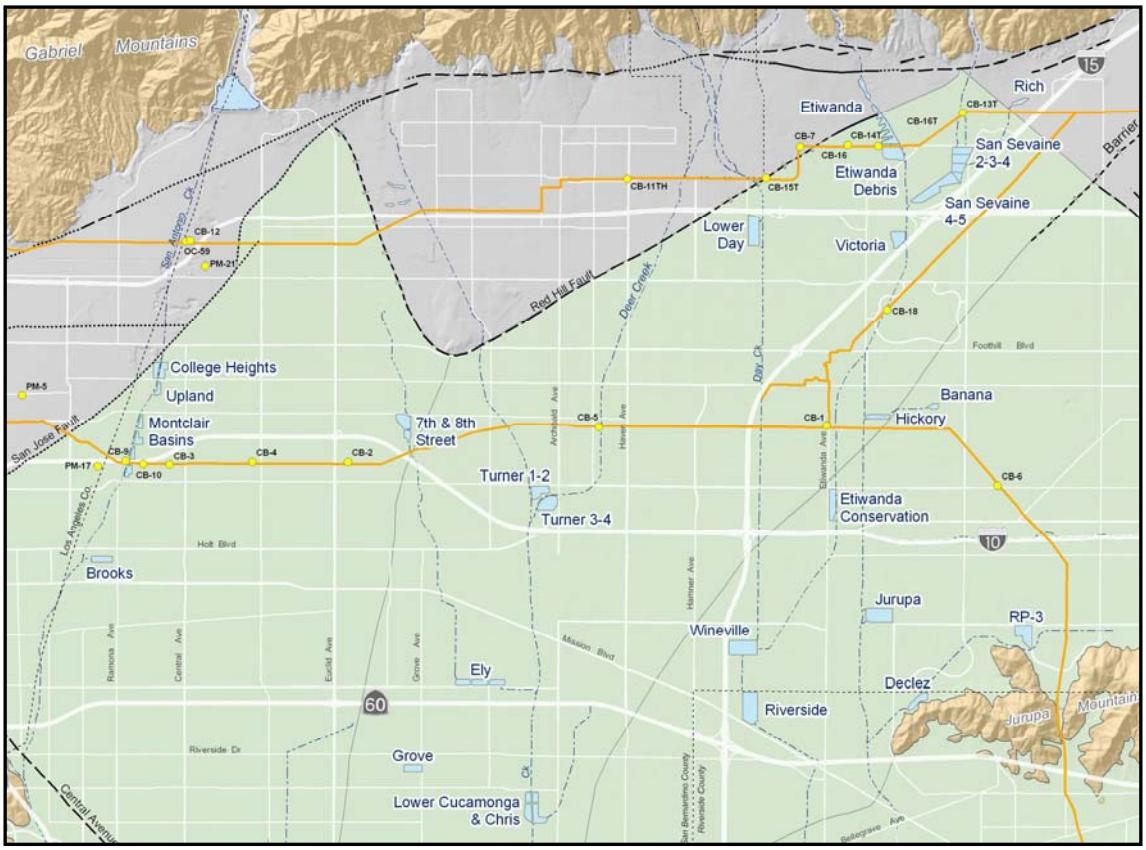
Chino Basin Recycled Water Groundwater Recharge Program

Annual Report
2006



Prepared by:

Inland Empire Utilities Agency

and

WILDERMUTH ENVIRONMENTAL INC.

May 1, 2007

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Patrick O. Sheilds
Executive Manager of Operations

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May 1, 2007

Regional Water Quality Control Board, Santa Ana Region
Attention: Mr. Gerard Thibeault
3737 Main Street, Suite 500
Riverside, California 92501-3348

Subject: Chino Basin Recycled Water Recharge Program
Transmittal of the Annual Report 2006

Dear Mr. Thibeault,

The Inland Empire Utilities Agency (IEUA) and the Chino Basin Watermaster (Watermaster) hereby submit the *Annual Report 2006* regarding the *Recycled Water Groundwater Recharge Program* being implemented by IEUA and Watermaster. This document is submitted pursuant to requirements in Order No. R8-2005-0033 and Monitoring and Reporting Program No. R8-2005-0033:

- California Regional Water Quality Control Board, Santa Ana Region. Order No. R8-2005-0033. Water Recycling Requirements for Inland Empire Utilities Agency and Chino Basin Watermaster. Phase 1 Chino Basin Recycled Water Groundwater Recharge Project, San Bernardino County. Order: April 2005.
- California Regional Water Quality Control Board, Santa Ana Region. Monitoring and Reporting Program No. R8-2005-0033 for Inland Empire Utilities Agency and Chino Basin Watermaster. Phase 1 Chino Basin Recycled Water Groundwater Recharge Project, San Bernardino County.

ACTIVITIES, FINDINGS, AND CONCLUSIONS

The following bullets summarize the principal activities, findings, and conclusions of the *Recycled Water Groundwater Recharge Program* for 2006:

- There are 21 recharge basins described in the OBMP Recharge Master Plan, Phase II Report. Three of the eight Phase I Basins had work associated with the Recycled Water Groundwater Recharge Program conducted during the 2006 calendar year. These basins were Banana, Hickory, and the Turner Basins. Of the permitted Phase I recharge basins, only Banana Basin, Hickory Basin, and the Turner Basins were used for the recharge of recycled water in 2006. No recycled water was recharged in the remaining Phase I basins (RP3 and Declez Basins).

- Electrical conductivity (EC) was used as a tracer or indicator of the source of water, since there are consistent and substantial difference in EC values for recycled water, State Water Project (SWP) water and stormwater/local runoff.
- All lysimeters in the basins (except Turner Basin 4 25 and 35 feet bgs lysimeters) are representative of recharged water (i.e. there appears to be no geologic features that would cause anomalous results: preferential pathways or lenses of fine grained materials). The 25-foot bgs lysimeter was selected to be the compliance point lysimeter at all basins, except Turner Basin 4 where the 15 foot bgs lysimeter proved to be the most representative of recycled water.
- The soil aquifer treatment is quite effective and there appears to be additional reduction of TOC with increasing depth.
- Although not explicitly called for in its permit, IEUA will include in each Annual Report a Recycled Water Management Plan for each recharge site. The Recycled Water Management Plan is a necessary tool to demonstrate how IEUA will meet a recharge site's RWC following a site's startup period. The Recycled Water Management Plan will be updated regularly and presented annually to reflect current conditions. The Recycled Water Management Plan for Banana and Hickory Basins shows temporary excursions above the current RWC limit and that by 60 months of operations, the RWC limit is met.
- In light of the generally encouraging trends seen in the lysimeter data, IEUA recommends a reduced first year lysimeter monitoring plan. Furthermore, sampling would only be conducted when recycled water is shown to be in the basin or in the lysimeters, based on basin operations and EC. Compliance sampling for total nitrogen would be conducted on the treatment plant effluent.
- All monitoring wells continue to show background EC. Based on estimated travel times in the Title 22 Engineering Report, the travel time to BH-1, T-1, and T-2 is approximately six months. IEUA began recharging recycled water in Banana Basin in July 2005 and 4Q05 EC results suggest that this well might have been affected by recycled water recharge, however current data indicates background concentrations of EC.
- There are currently insufficient data to establish blending that is occurring in the aquifer. Changes in groundwater elevation and groundwater chemistry have not been observed within the closest downgradient monitoring wells. As such, a comparison of observed data with the flow and transport model's flow paths cannot be made. Enough data should be compiled by the next annual report to perform this analysis.
- IEUA monitors all well drilling activities within 500 feet of the recharge basins and Watermaster issues quarterly letters to the RWQCB certifying the absence of groundwater production wells within 500 feet of the recharge basins. No potable supply wells exist within the 500 foot buffer zone. IEUA is working closely with the County of San Bernardino's Department of Environmental Health Services (DEHS) in its well permitting activities. IEUA has provided DEHS with maps that show – to the Township/Range/Quarter Section level – which quarter sections are located within the 500-foot buffer zone. DEHS is utilizing these maps to screen well permits.

DECLARATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments thereto; and that, based on my inquiry of the individuals immediately responsible for obtaining the information, I believe that the information is true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Executed on the 1st day of May 2007 at IEUA's office in Chino, California

Patrick O. Sheilds.
Executive Manager of Operations

Kenneth Manning
Chief Executive Officer

Chino Basin

Recycled Water Groundwater Recharge Program

Annual Report 2006

Reviewed and Approved by:

Mark J. Wildermuth, P.E.
President/Principal Engineer

Prepared by:

Inland Empire Utilities Agency

and

WILDERMUTH ENVIRONMENTAL INC.

May 1, 2007

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1. INTRODUCTION

This document is the Annual Report for recycled water groundwater recharge operations in the Chino Groundwater Basin for the 2006 calendar year. This report documents the recharge activities for the phase I basins receiving recycled water during this period, namely Banana, Hickory, and Turner Basins.

During the 2006 calendar year Banana and Hickory Basins completed their start-up period and Turner Basin began its start-up period on July 6, 2006. No recycled water was recharged in the remaining Phase I basins (RP3, and Declez).

The Chino Basin Recycled Water Groundwater Recharge Program is a comprehensive water supply program to enhance water supply reliability and improve groundwater quality in drinking water wells throughout the Chino Groundwater Basin by increasing the recharge of stormwater, imported water, and recycled water.

1.1 Requirements of Order No. R8-2005-0033

This Recycled Water Groundwater Recharge Program, operated by Inland Empire Utilities Agency (IEUA) and Chino Basin Watermaster (Watermaster), is subject to the following requirements:

- California Regional Water Quality Control Board, Santa Ana Region. Order No. R8-2005-0033. Water Recycling Requirements for Inland Empire Utilities Agency and Chino Basin Watermaster. Phase 1 Chino Basin Recycled Water Groundwater Recharge Project, San Bernardino County. April 15, 2005.
- California Regional Water Quality Control Board, Santa Ana Region. Monitoring and Reporting Program (M&RP) Order No. R8-2005-0033 for Inland Empire Utilities Agency and Chino Basin Watermaster. Phase 1 Chino Basin Recycled Water Groundwater Recharge Project, San Bernardino County. April 15, 2005.

The M&RP (RWQCB, 2005b) describes the requirements for the Annual Reports. The following is an excerpt from Section VI of the M&RP:

> VI. Reporting Requirements
>
> B. Annual Monitoring Reports
>
> 1. By May 1 of each year, the users shall submit an annual report to the Board. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous calendar year. The users shall discuss the compliance record and a summary of corrective actions taken as a result of violations, suspensions of recharge, detections of monitored constituents and any observed trends, information on the travel of the recycled water, description of any changes in operation of any unit processes or facilities, and description of any anticipated changes, including any impacts on other unit processes.
>
> 2. The annual report shall be prepared by a qualified engineer registered in California and experienced in the field of water reclamation for groundwater recharge regarding the operation of the Phase I Recharge Project and the results of the monitoring and investigations of the impacts of recycled water recharge at the Phase I recharge basins.
>
> 3. The annual report shall include the following:
>
> a. A list of the analytical methods employed for each test and associated laboratory quality assurance/quality control procedures. The report shall restate, for the record, the laboratories used by the users to monitor compliance with this Order and their status of certification. Upon request by Regional Board staff, the users shall also provide a summary of performance.

b. A mass balance to ensure that blending is occurring in the aquifer at each recharge basin. Recharge water groundwater flow paths shall be determined annually from groundwater elevation contours and compared to the flow and transport model's flow paths, travel of recharge waters, including leading edge of the recharged water plume, any anticipated changes. The flow and transport model shall be updated to match as closely as possible the actual flow patterns observed within the aquifer if the flow paths have significantly changed.

c. A summary of corrective actions taken as a result of violations, suspensions of recharge, detections of monitored constituents and any observed trends, information on the travel of the recycled water (estimated location of the leading edge), description of any changes in operation of any unit processes or facilities, and description of any anticipated changes, including any impacts on other unit processes.

d. A summary of calibration records for equipments, such as pH meters, flow meters, turbidity meters, and lysimeters.

e. All downgradient public drinking water systems. A summary discussion on whether domestic drinking water wells extracted water within the buffer zone defined by the area less than 500 feet and 6 months underground travel time from the recharge basins, including the actions/measures that were undertaken to prevent reoccurrence. If there were none, a statement to that effect shall be written.

f. Prior to start-up of the IEUA Phase I Recharge Project, tracers will need to be identified

4. At least one year after the blended recharged water has reached at least one groundwater monitoring well, the users shall submit a report to the CDHS and Regional Board evaluating the compliance with the minimum underground retention time, distance to the nearest point of extraction, blending, and the maximum RWC requirements. The annual report shall include water quality data on turbidity, coliform, total nitrogen, dissolved oxygen, regulated contaminants, TOC, and non-regulated contaminants compliance.

1.2 Organization of the Annual Report

Section 2 summarizes the recharge operations. Sections 3 discuss lysimeter sampling and monitoring results. Section 4 reports the groundwater monitoring results and travel time estimates. Section 5 describes the recycled water contribution determination and Recycled Water Management Plans for basins with completed Start-Up Period Reports. Section 6 provides the compliance record and corrective actions. Section 7 discusses the analytical methodology and Section 8 provides the references.

2. RECHARGE OPERATIONS

IEUA's Groundwater Recharge Coordinator recorded the volume of water delivered to Banana, Hickory, and Turner Basins. The delivered volumes included State Water Project (SWP) water, local runoff, stormwater, and recycled water.

The 2006 quarterly reports (WEI, 2006a through 2006d) describe and list the daily water deliveries to the all the basins. Figures showing the location of the active basins are also included in the 2006 quarterly reports (WEI, 2006a through 2006d).

Source of Recharged Water	Units	Banana	Hickory	Turner
SWP Water: 2006	AF	469	194	311
Local Runoff/ Storm Flow: 2006	AF	232	487	282
Recycled Water: 2006	AF	834	703	838

Start-up periods for Banana and Hickory Basins were completed during 2006, the results and conclusions from the start-up periods have been reported in Start-Up Period Reports dated October 27, 2006 and February 15, 2007.

Additionally, the start-up period for the Turner Basin was initiated in July 2006. The Start-Up Period for Turner Basin has been extended beyond 6 months and into 2007 due to unscheduled maintenance work on the delivery pipeline.

3. LYSIMETER SAMPLING AND MONITORING RESULTS

As recommended in the Start-Up Period Reports for Banana and Hickory Basins and the Start-Up Protocol for the Turner Basins, monitoring and sampling schedules for the Banana, Hickory, and Turner Basins and the respective lysimeter sampling when recycled water is being recharge is as follows:

- EC: once per week
- TOC: once per weekly
- Nitrate-Nitrogen: once per week
- Nitrite-Nitrogen: once per week
- Ammonia: once per week
- Total Kjeldahl Nitrogen (TKN): once per week
- Total Nitrogen (TN) – by Addition: once per week

During 2006 Banana, Hickory, and the Turner Basins recharged recycled water and were monitored by the schedule above. The complete summary of data including TOC and Nitrogen Species for the Banana, Hickory, and Turner Basins and all associated lysimeters are provided in the 2006 quarterly reports (WEI, 2006a through 2006d). Table 3-1 details the EC, TOC, and rolling average results for the compliance point lysimeter samples from Banana Basin and Hickory Basin. The compliance point for Turner Basin has not yet been determined and will be following the completion of its start-up period.

Table 3-1 contain values that are shaded to indicate samples collected from the lysimeters that are predominately of recycled water origin (greater than or equal to 75 percent). This analysis is based on a comparison of diluent water and recycled water EC concentrations. Table 3-2 details the EC concentrations for the various sources of recharge water.

Figures 3-1 through 3-4 provide the time histories of TOC values for surface water in the basins and lysimeter samples. In the upper part of the graph, the period when various sources of water were diverted into the basins are recorded as bars across given periods. The 20-sample rolling averages are 1.3 mg/L (Banana Basin) and 1.6 mg/L (Hickory Basin); the rolling average is also shown on the TOC time history graphs Figures 3-1 and 3-2, respectively. Additionally the rolling average for each basin is less than what was reported at the end of the start-up period; therefore the maximum TOC (calculated from the recommended maximum recycled water contribution (RWC) for each basin) is in compliance.

Figure 3-5 details the total nitrogen (TN) for the recycled water effluent at RP-1 and RP-4. The TN data for RP-1 and RP-4 is reported in the 2006 quarterly reports (WEI, 2006a through 2006d). Based on data reported in the quarterly reports for RP-1, RP-4, surface water in the basins, and the lysimeter samples, the recycled water recharge operations are in compliance for TN. The compliance level for TN is 10 mg/L.

4. GROUNDWATER MONITORING

4.1 Groundwater Sampling and Monitoring Results

Groundwater quality within the vicinity of the Banana and Hickory Basins is monitored by sampling a network of six wells, including one nested monitoring well down gradient of Hickory Basin. Groundwater quality within the vicinity of the Turner Basin is monitored by sampling a network of five wells, including two nested wells. Figures showing the location of monitoring wells for the active basins are included in the 2006 quarterly reports (WEI, 2006a through 2006a).

All constituents analyzed from the monitoring wells during 2006 were below their respective maximum contaminant levels (MCLs). Groundwater monitoring results are presented in the 2006 quarterly reports (WEI, 2006a through 2006d). Based on the Title 22 Engineering Report (CH2M-Hill, 2003), the travel times to wells BH-1, T-1, and T-2 were all approximately 6 months. EC is used as an indicator of recycled water presence at the monitoring wells.

4.2 Travel Time Estimates

The estimated travel time to BH-1/2 is approximately 6 months. The IEUA began recharging recycled water in Banana Basin in July 2005 and the 4Q05 increase in EC results indicated that BH-1 may have received some recycled water, indicating a travel time of 5 months to this location. However, the 1Q06 EC data for BH-1/2 showed a decrease in EC and, thus, did not indicate continued recycled water at the well. Groundwater quality results for 4Q06 at BH-1/2, T-1, and T-2 show a background condition for EC as do the other area monitoring wells. As such, the travel times from Turner Basin to these monitoring wells is greater than 6 months.

4.3 Aquifer Blending and Flow and Transport Modeling

Section 4.B.3.b of the M&RP (RWQCB, 2005a) requires the inclusion of:

> A mass balance to ensure that blending is occurring in the aquifer at each recharge basin. Recharge water groundwater flow paths shall be determined annually from groundwater elevation contours and compared to the flow and transport model's flow paths, travel of recharge waters, including leading edge of the recharged water plume, any anticipated changes. The flow and transport model shall be updated to match as closely as possible the actual flow patterns observed within the aquifer if the flow paths have significantly changed.

There are currently insufficient data to describe blending that is occurring in the aquifer. Significant changes in groundwater elevation and groundwater chemistry have not been observed within the closest downgradient monitoring wells. As such, a comparison of observed data with the flow and transport model's flow paths cannot be made. Groundwater elevation contour maps for the Chino Basin are prepared approximately every 2 years for the State of the Basin Report. The 2003 groundwater elevation contour map prepared for the 2004 State of the Basin Report is included in Appendix A. A 2006 groundwater elevation contour map is being prepared for the 2006 State of the Basin Report and will be included in the next annual report.

4.4 Downgradient Drinking Water Wells

Finding 16 of the Order (RWQCB, 2005a) states:

> CDHS has determined that it is necessary to provide a retention time of at least 6 months for the recycled water in the groundwater basin before the water is extracted for drinking purposes and a minimum of 500 feet horizontal separation distance between all drinking water wells and recharge basins. CDHS found that the closest existing domestic supply wells downgradient from the Phase I recharge basins satisfy these minimum retention and horizontal distance separation requirements. Also, new drinking water wells must be

> constructed outside the areas required to achieve the minimum retention times and horizontal separation distance identified by CDHS. To implement the relevant CDHS Condition (Attachment A, Condition 17), this Order requires the users to implement measures to assure that the County of San Bernardino Department of Environmental Health Services, the lead permitting agency for construction of all public and private domestic supply wells in the project area, adopt ordinances restricting the drilling of wells within 500 feet of the recharge basins and where extracted water would not have at least 6 months underground residence time. Further, IEUA is required to use best efforts to closely monitor the well permitting activities of the County of San Bernardino Department of Environmental Health Services to assure that domestic supply wells are situated outside the soil aquifer treatment zone near the recharge basins.

In compliance with the above finding, IEUA monitors all well drilling activities within 500 feet of the recharge basins and Watermaster issues quarterly letters to the RWQCB certifying the absence of groundwater production wells within 500 feet of the recharge basins. No potable supply wells exist within the limits established in Finding 16 of the Order. IEUA is working closely with the County of San Bernardino's Department of Environmental Health Services (DEHS) in its well permitting activities. IEUA has provided DEHS with maps that show – to the Township/Range/Quarter Section level – which quarter sections are located within the 500-foot buffer zone. DEHS is utilizing these maps to screen well permits.

5. RWC Determination and Recycled Water Management Plan

Finding 8 of the Order (RWQCB, 2005a) states:

> This Order limits the maximum average recycled water contribution (RWC) at each basin, based on a 60-month running average, to 20 percent, unless a higher percentage is approved in advance by CDHS and the Regional Board. Diluents will be stormwater and imported State Project Water from Northern California that is purchased from Metropolitan Water District of Southern California. Stormwater will be local captured runoff originating from the watersheds along the southern extent of the San Gabriel Mountains and from the developed and undeveloped areas below the mountains.

Tables 5-1 and 5-2 list the diluent water history prior to initiation of recycled water delivery to Banana Basin and Hickory Basin and the volumes of diluent water and recycled water that were recharged since. The column with the heading "RWC" provides a calculation of the percent recycled water infiltrated based on a 60-month rolling average.

As discussed in Section 3, the 20-sample rolling averages are 1.3 mg/L for Banana Basin and 1.6 mg/L for Hickory Basin. Based on the rolling average TOC concentration at the end of the 2006, the RWC at the Banana and Hickory Basins was 38 and 30 percent, respectively. Additionally, the rolling average for each basin is less than what was reported at the end of the start-up period; therefore based on the maximum TOC (calculated from the recommended maximum recycled water contribution (RWC) for each basin) the recharge operations are in compliance.

Additionally, Tables 5-1 and 5-2 show a Recycled Water Management Plan that forecasts deliveries of recycled water and recharge of diluent water for the first 60 months of recycled water recharge. Although not explicitly called for in its permit, IEUA will include in each Annual Report a Recycled Water Management Plan for each recharge site. The Recycled Water Management Plan is a necessary tool to demonstrate how IEUA will meet a recharge site's RWC following a site's startup period. Small excursions above the initial RWC of 20 percent are occasionally required during the start-up period, based on diluent water availability for basins with little historical diluent recharge. The Recycled Water Management Plan will be updated regularly and presented annually to reflect current conditions. The Recycled Water Management Plan included in Tables 5-1 and 5-2 and Figures 5-1 and 5-2 show temporary excursions above the RWC current limit and that by 60 months of operations, the RWC limit is met.

6. Compliance Record and Corrective Actions

6.1 Regional Plants RP-1 and RP-4

No compliance issues or corrective actions occurred during 2006 that impacted the recycled water groundwater recharge program operations.

6.2 Recharge Operations

Recharge operations were in compliance during 2006. During the third quarter of 2006 recycled water recharge at the Turner Basins were temporarily suspended to investigate sand and construction debris that was identified in the water supply pipeline. The pipeline was cleaned and returned to service in the fourth quarter of 2006.

6.3 Lysimeter Sampling

Limited sample recovery volume occurred on occasion from some lysimeters. The water monitoring result tables found in the 2006 quarterly report and Table 3-1 indicate with the notation "IV" when and where an insufficient sample volume prevented the full scheduled analytical testing.

6.4 Monitoring Well Sampling

During the fourth quarter of 2005 and the first quarter of 2006, the California Speedway 1 Well (CBWM ID 3601364) was not functioning properly, hence was not sampled. This well was removed from the sampling program, and California Speedway 2 Well (CBWM ID 3601365) was selected as the alternative.

7. ANALYTICAL METHODOLOGY

7.1 Laboratory Certification

The IEUA and MWH Laboratories were utilized for the analytical testing required during the recycled water recharge program. Both of the laboratories are California State certified environmental testing laboratories, pursuant to the California Environmental Laboratory Improvement Act. The IEUA laboratory certification is valid thru October 2008 and the MWH laboratory certification was valid thru January 2008.

7.2 Analytical Methodologies and QA/QC Procedures

To ensure the quality and reliability of test measurements and results, specific programs and procedures have been developed by both the IEUA and MWH Laboratories. The previous Annual Report contained an electronic copy the QA/QC manual from each laboratory, including analytical methodologies; this information has not changed since last reported.

7.3 Calibration of Field Instruments

The field instruments used during the recycled water field sampling include the following:

- Myron L Ultrameter II
- QED MP20 Multiparameter Meter with flow cell.

Field parameters, temperature, pH, conductivity, and total dissolved solids, were recorded during surface water sampling from recharge basins using the Myron L Ultrameter. Additionally, field parameters were collected from basin monitoring wells using a QED MP20 Multiparameter Meter. This instrument utilizes a flow-cell to allow purge water to flow through the meter chamber without exposure to the atmosphere. The QED meter monitors temperature, pH, conductivity, dissolved oxygen, and oxidation/reduction potential (ORP).

Field analytical instruments used throughout this project were maintained and calibrated each day of use. Calibration was conducted according to instructions provided by the instrument manufacturer. Meters were calibrated for instrument appropriate parameters including pH, dissolved oxygen, and conductivity. Calibration logs indicating the meter readings before and after calibration are stored in our field office for review and confirmation.

8. REFERENCES

California Regional Water Quality Control Board, Santa Ana Region. 2005a. Order No. R8-2005-0033. Water Recycling Requirements for Inland Empire Utilities Agency and Chino Basin Watermaster. Phase 1 Chino Basin Recycled Water Groundwater Recharge Project, San Bernardino County. April 15, 2005.

California Regional Water Quality Control Board, Santa Ana Region. 2005b. Monitoring and Reporting Program No. R8-2005-0033 for Inland Empire Utilities Agency and Chino Basin Watermaster. Phase 1 Chino Basin Recycled Water Groundwater Recharge Project, San Bernardino County. April 15, 2005.

DDB Engineering, Inc. and Wildermuth Environmental, Inc. 2006. Phase II Chino Basin Groundwater Basin Recycled Water Groundwater Recharge Project. Title 22 Engineering Report. Prepared for the Inland Empire Utilities Agency. March 2006.

Wildermuth Environmental, Inc. 2005a. Chino Basin Optimum Basin Management Program. State of the Basin Report – 2004. Prepared for the Chino Basin Watermaster. July 2005.

Wildermuth Environmental, Inc. and the Inland Empire Utilities Agency. 2006a. Chino Basin Recycled Water Recharge Program. Quarterly Monitoring Report January through March 2006. May 11, 2006.

Wildermuth Environmental, Inc. and the Inland Empire Utilities Agency. 2006b. Chino Basin Recycled Water Recharge Program. Quarterly Monitoring Report April through June 2006. August 15, 2006.

Wildermuth Environmental, Inc. and the Inland Empire Utilities Agency. 2006c. Chino Basin Recycled Water Recharge Program. Quarterly Monitoring Report July through September 2006. November 15, 2006.

Wildermuth Environmental, Inc. and the Inland Empire Utilities Agency. 2006d. Chino Basin Recycled Water Recharge Program. Quarterly Monitoring Report October through December 2006. February 15, 2007.

Table 3-1
Basin and Lysimeter Compliance Monitoring: EC, TOC, and Rolling Average

Date	Banana Basin			Hickory Basin		
	EC	TOC	Rolling Average	EC	TOC	Rolling Average
01/03/2006	205	1.2	--	IV	1.2	--
01/10/2006	215	1.2	--	IV	1.3	--
01/17/2006	280	1.2	--	IV	1.1	--
01/24/2006	700	1.0	1.0	765	1.1	1.1
01/31/2006	770	1.2	1.1	IV	1.1	--
02/07/2006	790	1.2	1.1	770	1.2	1.1
02/14/2006	830	0.9	1.1	870	1.3	1.2
02/21/2006	750	1.0	1.0	850	2.2	1.5
02/28/2006	145	1.0	--	805	2.2	1.6
03/03/2006	IV	--	--	--	--	--
03/07/2006	125	1.1	--	IV	1.8	--
03/14/2006	115	0.9	--	755	1.7	1.6
03/21/2006	94	1.0	--	695	1.4	1.6
03/28/2006	100	1.2	--	640	1.4	1.6
06/30/2006	710	--	--	--	--	--
07/04/2006	685	0.9	1.0	--	--	--
07/07/2006	725	--	1.0	--	--	--
07/11/2006	690	0.8	1.0	--	--	--
07/14/2006	715	--	1.0	--	--	--
07/18/2006	710	1.2	1.0	IV	1.9	--
07/25/2006	640	0.9	1.0	705	2.5	1.7
08/01/2006	--	--	--	670	2.0	1.7
08/03/2006	--	--	--	--	--	--
08/08/2006	--	--	--	730	1.4	1.7
08/15/2006	--	--	--	750	1.8	1.7
08/17/2006	--	--	--	--	--	--
08/22/2006	--	--	--	715	2.2	1.7
08/29/2006	725	1.7	1.1	680	1.8	1.7
08/31/2006	--	--	--	--	--	--
09/06/2006	730	2.1	1.1	--	--	--
09/12/2006	730	1.7	1.2	--	--	--
09/14/2006	--	--	--	--	--	--
09/19/2006	730	2.0	1.3	--	--	--
09/26/2006	735	1.6	1.3	--	--	--
09/28/2006	--	--	--	--	--	--
10/03/2006	730	1.6	1.3	--	--	--
10/10/2006	540	1.8	--	--	--	--
10/12/2006	--	--	--	--	--	--
10/17/2006	305	1.4	--	--	--	--
10/24/2006	--	--	--	800	1.1	1.7
10/26/2006	--	--	--	--	--	--
10/31/2006	--	--	--	765	1.7	1.7
11/07/2006	--	--	--	765	1.3	1.7
11/09/2006	--	--	--	--	--	--
11/14/2006	--	--	--	835	1.0	1.6
11/21/2006	--	--	--	815	1.3	1.6
11/22/2006	--	--	--	--	--	--
11/28/2006	--	--	--	--	--	--
12/05/2006	--	--	--	--	--	--
12/07/2006	--	--	--	--	--	--
12/12/2006	--	--	--	--	--	--
12/19/2006	--	--	--	--	--	--
12/21/2006	--	--	--	--	--	--

Notes:
EC: Electrical Conductivity (mmhos/cm)
TOC: Total Organic Carbon (mg/L)
IV: Insufficient Volume for Analytical Test
--: Sample was not collected for the corresponding date
(1) Turner Basin rolling average will be reported in the Start-Up Period Report following the completion of it's start-up period

Indicates that the sampled water is >75 percent recycled water, based on:

SWP = 343 umhos/cm RW = 727 umhos/cm	75 percent recycled water would have an EC of 630 umhos/cm or greater.
RW = 727 umhos/cm Local Runoff = 130 umhos/cm	75 percent recycled water would have an EC of 578 umhos/cm or greater.

Table 3-2
EC Concentrations for Various Sources of Recharge

Statistic	EC (µmhos/cm)			
	SWP[1]	RP-1[1]	RP-4[1]	Stormwater[2]
Minimum	319	700	735	
Maximum	375	710	750	
Mean	343	704	750	130
Standard Deviation	23	5	6	
Mean + 2*SD	297	694	730	
Mean + 2*SD	390	713	755	

[1]WEI and IEUA, 2005; WEI and IEUA, 2006; MWD 2005 and MWD 2006

[2]WEI, 2005a

Table 5-1

Recycled Water Management Plan for Banana Basin[1]

Date		No. Mos. Since Initial RW Delivery	DW (AF)	DW 60-Month Total (AF)	RW (AF)	RW 60-Month Total (AF)	DW + RW 60-Month Total (AF)	RWC	Source
2000/01	Jul-00	-60	0.		0.				HISTORICAL DILUENT
	Aug-00	-59	0.		0.				
	Sep-00	-58	0.		0.				
	Oct-00	-57	28.3		0.				
	Nov-00	-56	12.7		0.				
	Dec-00	-55	0.		0.				
	Jan-01	-54	86.9		0.				
	Feb-01	-53	122.2		0.				
	Mar-01	-52	78.5		0.				
	Apr-01	-51	61.1		0.				
	May-01	-50	0.		0.				
	Jun-01	-49	0.		0.				
2001/02	Jul-01	-48	12.2		0.				
	Aug-01	-47	0.		0.				
	Sep-01	-46	0.		0.				
	Oct-01	-45	0.		0.				
	Nov-01	-44	39.3		0.				
	Dec-01	-43	16.7		0.				
	Jan-02	-42	50.1		0.				
	Feb-02	-41	20.9		0.				
	Mar-02	-40	31.		0.				
	Apr-02	-39	13.1		0.				
	May-02	-38	0.8		0.				
	Jun-02	-37	0.		0.				
2002/03	Jul-02	-36	0.		0.				
	Aug-02	-35	0.		0.				
	Sep-02	-34	0.		0.				
	Oct-02	-33	0.		0.				
	Nov-02	-32	38.9		0.				
	Dec-02	-31	59.3		0.				
	Jan-03	-30	0.		0.				
	Feb-03	-29	80.5		0.				
	Mar-03	-28	38.9		0.				
	Apr-03	-27	86.9		0.				
	May-03	-26	61.7		0.				
	Jun-03	-25	0.		0.				
2003/04	Jul-03	-24	0.		0.				
	Aug-03	-23	0.		0.				
	Sep-03	-22	0.		0.				
	Oct-03	-21	0.		0.				
	Nov-03	-20	34.2		0.				
	Dec-03	-19	37.1		0.				
	Jan-04	-18	4.5		0.				
	Feb-04	-17	83.5		0.				
	Mar-04	-16	28.2		0.				
	Apr-04	-15	0.3		0.				
	May-04	-14	0.		0.				
	Jun-04	-13	0.		0.				
2004/05	Jul-04	-12	0.		0.				
	Aug-04	-11	0.		0.				
	Sep-04	-10	0.		0.				
	Oct-04	-9	62.8		0.				
	Nov-04	-8	17.		0.				
	Dec-04	-7	25.3		0.				
	Jan-05	-6	93.6		0.				
	Feb-05	-5	110.8		0.				
	Mar-05	-4	24.9		0.				
	Apr-05	-3	19.3		0.				
	May-05	-2	14.6		0.				
	Jun-05	-1	0.	1496	0.	0.	1496	0%	

Table 5-1

Recycled Water Management Plan for Banana Basin[1]

Date		No. Mos. Since Initial RW Delivery	DW (AF)	DW 60-Month Total (AF)	RW (AF)	RW 60-Month Total (AF)	DW + RW 60-Month Total (AF)	RWC	Source
2005/06	Jul-05	1	192.3	1688	19.8	19.8	1708	1%	HISTORICAL
	Aug-05	2	0.	1688	253.9	273.7	1962	14%	
	Sep-05	3	0.	1688	128.7	402.4	2091	19%	
	Oct-05	4	28.8	1689	25.3	427.7	2117	20%	
	Nov-05	5	0.	1676	8.0	435.7	2112	21%	
	Dec-05	6	19.	1695	10.2	445.9	2141	21%	
	Jan-06	7	6.	1614	50.3	496.2	2111	24%	
	Feb-06	8	22.3	1514	55.2	551.4	2066	27%	
	Mar-06	9	55.1	1491	0.0	551.4	2042	27%	
	Apr-06	10	35.7	1466	0.0	551.4	2017	27%	
	May-06	11	57.	1523	0.0	551.4	2074	27%	
	Jun-06	12	0.	1523	47.0	598.4	2121	28%	
2006/07	Jul-06	13	0.	1510	64.2	662.6	2173	30%	
	Aug-06	14	0.	1510	84.7	747.3	2258	33%	
	Sep-06	15	0.	1510	378.3	1125.5	2636	43%	
	Oct-06	16	74.1	1585	49.4	1175.	2759	43%	
	Nov-06	17	234.6	1780	7.2	1182.2	2962	40%	
	Dec-06	18	201.2	1964	49.6	1231.8	3196	39%	
	Jan-07	19	331.5	2246	0.0	1231.8	3477	35%	
	Feb-07	20	73.7	2299	0.0	1231.8	3530	35%	
	Mar-07	21	53.1	2321	0.0	1231.8	3552	35%	
	Apr-07	22	35.	2342	0.0	1231.8	3574	34%	PLANNED
	May-07	23	10.	2352	0.0	1231.8	3583	34%	
	Jun-07	24	0.	2352	0.0	1231.8	3583	34%	
2007/08	Jul-07	25	0.	2352	0.0	1231.8	3583	34%	
	Aug-07	26	0.	2352	0.0	1231.8	3583	34%	
	Sep-07	27	0.	2352	0.0	1231.8	3583	34%	
	Oct-07	28	15.	2367	0.0	1231.8	3598	34%	
	Nov-07	29	20.	2348	0.0	1231.8	3580	34%	
	Dec-07	30	35.	2323	0.0	1231.8	3555	35%	
	Jan-08	31	45.	2368	0.0	1231.8	3600	34%	
	Feb-08	32	45.	2333	0.0	1231.8	3565	35%	
	Mar-08	33	35.	2329	0.0	1231.8	3561	35%	
	Apr-08	34	35.	2277	0.0	1231.8	3509	35%	
	May-08	35	80.	2295	0.0	1231.8	3527	35%	
	Jun-08	36	0.	2295	0.0	1231.8	3527	35%	
2008/09	Jul-08	37	0.	2295	0.0	1231.8	3527	35%	
	Aug-08	38	0.	2295	0.0	1231.8	3527	35%	
	Sep-08	39	0.	2295	0.0	1231.8	3527	35%	
	Oct-08	40	15.	2310	0.0	1231.8	3542	35%	
	Nov-08	41	20.	2296	0.0	1231.8	3528	35%	
	Dec-08	42	35.	2294	0.0	1231.8	3526	35%	
	Jan-09	43	45.	2335	0.0	1231.8	3566	35%	
	Feb-09	44	45.	2296	0.0	1231.8	3528	35%	
	Mar-09	45	35.	2303	0.0	1231.8	3535	35%	
	Apr-09	46	35.	2338	0.0	1231.8	3569	35%	
	May-09	47	80.	2418	0.0	1231.8	3649	34%	
	Jun-09	48	0.	2418	0.0	1231.8	3649	34%	

Table 5-1

Recycled Water Management Plan for Banana Basin[1]

Date		No. Mos. Since Initial RW Delivery	DW (AF)	DW 60-Month Total (AF)	RW (AF)	RW 60-Month Total (AF)	DW + RW 60-Month Total (AF)	RWC	Source
2009/10	Jul-09	49	0.	2418	0.0	1231.8	3649	34%	
	Aug-09	50	0.	2418	0.0	1231.8	3649	34%	
	Sep-09	51	0.	2418	0.0	1231.8	3649	34%	
	Oct-09	52	15.	2370	0.0	1231.8	3602	34%	
	Nov-09	53	20.	2373	0.0	1231.8	3605	34%	
	Dec-09	54	35.	2383	0.0	1231.8	3614	34%	
	Jan-10	55	45.	2334	0.0	1231.8	3566	35%	
	Feb-10	56	45.	2268	0.0	1231.8	3500	35%	
	Mar-10	57	35.	2278	0.0	1231.8	3510	35%	
	Apr-10	58	35.	2294	0.0	1231.8	3526	35%	
	May-10	59	80.	2359	0.0	1231.8	3591	34%	
	Jun-10	60	0.	2359	0.0	1231.8	3591	34%	
2010/11	Jul-10	61	0.	2167	0.0	1211.9	3379	36%	PLANNED
	Aug-10	62	0.	2167	0.0	958.1	3125	31%	
	Sep-10	63	0.	2167	70.0	899.3	3066	29%	
	Oct-10	64	15.	2153	70.0	944.	3097	30%	
	Nov-10	65	20.	2173	30.0	966.	3139	31%	
	Dec-10	66	35.	2189	30.0	985.8	3175	31%	
	Jan-11	67	45.	2228	30.0	965.5	3194	30%	
	Feb-11	68	45.	2251	30.0	940.3	3191	29%	
	Mar-11	69	35.	2231	30.0	970.3	3201	30%	
	Apr-11	70	35.	2230	30.0	1000.3	3231	31%	
	May-11	71	10.	2183	30.0	1030.3	3214	32%	
	Jun-11	72	0.	2183	30.0	1013.3	3197	32%	

(1) Calculation of recycled water contribution (RWC) from historical and future diluent water (DW) and recycled water (RW) deliveries
RWC = 60-month running total of recycled water / 60-month running total of all recharged water.
All recharged water includes recycled water and diluent water (imported and storm water)
RWC Limit = 0.5 mg/L / the Running Average of Total Organic Carbon (TOC)
Diluent Water is based on historical stormwater and local runoff volumes, not taking into account any imported water deliveries

Table 5-2
Recycled Water Management Plan for Hickory Basin[1]

Date		No. Mos. Since Initial RW Delivery	DW (AF)	DW 60-Month Total (AF)	RW (AF)	RW 60-Month Total (AF)	DW + RW 60-Month Total (AF)	RWC	Source
2000/01	Jul-00	-62	0.		0.				HISTORICAL DILUENT
	Aug-00	-61	0.		0.				
	Sep-00	-60	0.		0.				
	Oct-00	-59	1.7		0.				
	Nov-00	-58	0.		0.				
	Dec-00	-57	0.		0.				
	Jan-01	-56	10.4		0.				
	Feb-01	-55	12.6		0.				
	Mar-01	-54	6.1		0.				
	Apr-01	-53	6.1		0.				
	May-01	-52	0.		0.				
	Jun-01	-51	0.		0.				
2001/02	Jul-01	-50	1.5		0.				
	Aug-01	-49	0.		0.				
	Sep-01	-48	0.		0.				
	Oct-01	-47	0.		0.				
	Nov-01	-46	61.		0.				
	Dec-01	-45	2.		0.				
	Jan-02	-44	35.4		0.				
	Feb-02	-43	0.		0.				
	Mar-02	-42	3.7		0.				
	Apr-02	-41	1.5		0.				
	May-02	-40	0.1		0.				
	Jun-02	-39	0.		0.				
2002/03	Jul-02	-38	0.		0.				
	Aug-02	-37	0.		0.				
	Sep-02	-36	0.		0.				
	Oct-02	-35	0.		0.				
	Nov-02	-34	81.7		0.				
	Dec-02	-33	121.5		0.				
	Jan-03	-32	0.		0.				
	Feb-03	-31	146.3		0.				
	Mar-03	-30	105.6		0.				
	Apr-03	-29	89.		0.				
	May-03	-28	7.		0.				
	Jun-03	-27	0.		0.				
2003/04	Jul-03	-26	0.		0.				
	Aug-03	-25	0.		0.				
	Sep-03	-24	0.		0.				
	Oct-03	-23	0.		0.				
	Nov-03	-22	4.5		0.				
	Dec-03	-21	35.2		0.				
	Jan-04	-20	0.5		0.				
	Feb-04	-19	128.8		0.				
	Mar-04	-18	54.9		0.				
	Apr-04	-17	0.		0.				
	May-04	-16	0.		0.				
	Jun-04	-15	0.		0.				
2004/05	Jul-04	-14	0.		0.				
	Aug-04	-13	0.		0.				
	Sep-04	-12	0.		0.				
	Oct-04	-11	117.6		0.				
	Nov-04	-10	2.		0.				
	Dec-04	-9	39.		0.				
	Jan-05	-8	149.8		0.				
	Feb-05	-7	127.5		0.				
	Mar-05	-6	27.		0.				
	Apr-05	-5	4.1		0.				
	May-05	-4	0.		0.				
	Jun-05	-3	0.		0.				

Table 5-2
Recycled Water Management Plan for Hickory Basin[1]

Date		No. Mos. Since Initial RW Delivery	DW (AF)	DW 60-Month Total (AF)	RW (AF)	RW 60-Month Total (AF)	DW + RW 60-Month Total (AF)	RWC	Source
2005/06	Jul-05	-2	265.3		0.				HISTORICAL
	Aug-05	-1	487.1	2137	0.	0.	2137	0%	
	Sep-05	1	130.4	2267	138.8	138.8	2406	6%	
	Oct-05	2	21.8	2287	92.7	231.6	2519	9%	
	Nov-05	3	0.	2287	92.2	323.8	2611	12%	
	Dec-05	4	7.8	2295	31.6	355.4	2650	13%	
	Jan-06	5	12.6	2297	82.9	438.3	2735	16%	
	Feb-06	6	34.6	2319	79.2	517.5	2837	18%	
	Mar-06	7	26.7	2340	0.	517.5	2857	18%	
	Apr-06	8	43.5	2377	0.	517.5	2895	18%	
	May-06	9	83.2	2460	0.	517.5	2978	17%	
	Jun-06	10	30.	2490	0.	517.5	3008	17%	
2006/07	Jul-06	11	129.1	2618	182.8	700.3	3318	21%	
	Aug-06	12	47.	2665	179.6	879.9	3545	25%	
	Sep-06	13	89.3	2754	0.	879.9	3634	24%	
	Oct-06	14	43.2	2797	143.6	1023.5	3821	27%	
	Nov-06	15	58.3	2795	35.4	1058.9	3853	27%	
	Dec-06	16	84.4	2877	0.	1058.9	3936	27%	
	Jan-07	17	16.3	2858	0.	1058.9	3917	27%	
	Feb-07	18	40.3	2898	41.6	1100.5	3999	28%	
	Mar-07	19	34.6	2929	0.	1100.5	4030	27%	
	Apr-07	20	45.	2973	0.	1100.5	4073	27%	
	May-07	21	0.	2972	0.	1100.5	4073	27%	PLANNED
	Jun-07	22	0.	2972	0.	1100.5	4073	27%	
2007/08	Jul-07	23	30.	3002	38.	1138.5	4141	27%	
	Aug-07	24	30.	3032	38.	1176.5	4209	28%	
	Sep-07	25	30.	3062	38.	1214.5	4277	28%	
	Oct-07	26	45.	3107	0.	1214.5	4322	28%	
	Nov-07	27	55.	3081	0.	1214.5	4295	28%	
	Dec-07	28	60.	3019	0.	1214.5	4234	29%	
	Jan-08	29	65.	3084	0.	1214.5	4299	28%	
	Feb-08	30	65.	3003	0.	1214.5	4218	29%	
	Mar-08	31	60.	2957	0.	1214.5	4172	29%	
	Apr-08	32	45.	2913	0.	1214.5	4128	29%	
	May-08	33	30.	2936	0.	1214.5	4151	29%	
	Jun-08	34	30.	2966	0.	1214.5	4181	29%	
2008/09	Jul-08	35	30.	2996	38.	1252.5	4249	29%	
	Aug-08	36	30.	3026	38.	1290.5	4317	30%	
	Sep-08	37	30.	3056	38.	1328.5	4385	30%	
	Oct-08	38	45.	3101	0.	1328.5	4430	30%	
	Nov-08	39	55.	3152	0.	1328.5	4480	30%	
	Dec-08	40	60.	3177	0.	1328.5	4505	29%	
	Jan-09	41	65.	3241	0.	1328.5	4570	29%	
	Feb-09	42	65.	3177	0.	1328.5	4506	29%	
	Mar-09	43	60.	3182	0.	1328.5	4511	29%	
	Apr-09	44	45.	3227	0.	1328.5	4556	29%	
	May-09	45	30.	3257	0.	1328.5	4586	29%	
	Jun-09	46	30.	3287	0.	1328.5	4616	29%	
2009/10	Jul-09	47	30.	3317	38.	1366.5	4684	29%	
	Aug-09	48	30.	3347	38.	1404.5	4752	30%	
	Sep-09	49	30.	3377	38.	1442.5	4820	30%	
	Oct-09	50	45.	3305	0.	1442.5	4747	30%	
	Nov-09	51	55.	3358	0.	1442.5	4800	30%	
	Dec-09	52	60.	3379	0.	1442.5	4821	30%	
	Jan-10	53	65.	3294	0.	1442.5	4737	30%	
	Feb-10	54	65.	3232	0.	1442.5	4674	31%	
	Mar-10	55	60.	3265	0.	1442.5	4707	31%	
	Apr-10	56	45.	3305	0.	1442.5	4748	30%	
	May-10	57	30.	3335	0.	1442.5	4778	30%	
	Jun-10	58	30.	3365	0.	1442.5	4808	30%	

Table 5-2
Recycled Water Management Plan for Hickory Basin[1]

Date		No. Mos. Since Initial RW Delivery	DW (AF)	DW 60-Month Total (AF)	RW (AF)	RW 60-Month Total (AF)	DW + RW 60-Month Total (AF)	RWC	Source
20010/11	Jul-10	59	30.	3130	38.	1480.5	4611	32%	PLANNED
	Aug-10	60	30.	2673	38.	1518.5	4192	36%	
	Sep-10	61	30.	2573	38.	1417.7	3990	36%	
	Oct-10	62	45.	2596	60.	1385.	3981	35%	
	Nov-10	63	55.	2651	60.	1352.7	4004	34%	
	Dec-10	64	60.	2703	0.	1321.1	4024	33%	
	Jan-11	65	65.	2755	0.	1238.2	3994	31%	
	Feb-11	66	65.	2786	0.	1159.	3945	29%	
	Mar-11	67	60.	2819	0.	1159.	3978	29%	
	Apr-11	68	45.	2821	60.	1219.	4040	30%	
	May-11	69	30.	2767	60.	1279.	4046	32%	
	Jun-11	70	30.	2767	60.	1339.	4106	33%	
2011/12	Jul-11	71	30.	2668	60.	1216.3	3885	31%	
	Aug-11	72	30.	2651	60.	1096.7	3748	29%	

(1) Calculation of recycled water contribution (RWC) from historical and future diluent water (DW) and recycled water (RW) deliveries
RWC = 60-month running total of recycled water / 60-month running total of all recharged water
All recharged water includes recycled water and diluent water (imported and storm water)
RWC Limit = 0.5 mg/L / the Running Average of Total Organic Carbon (TOC)
Diluent Water is based on historical stormwater and local runoff volumes, not taking into account any imported water deliveries

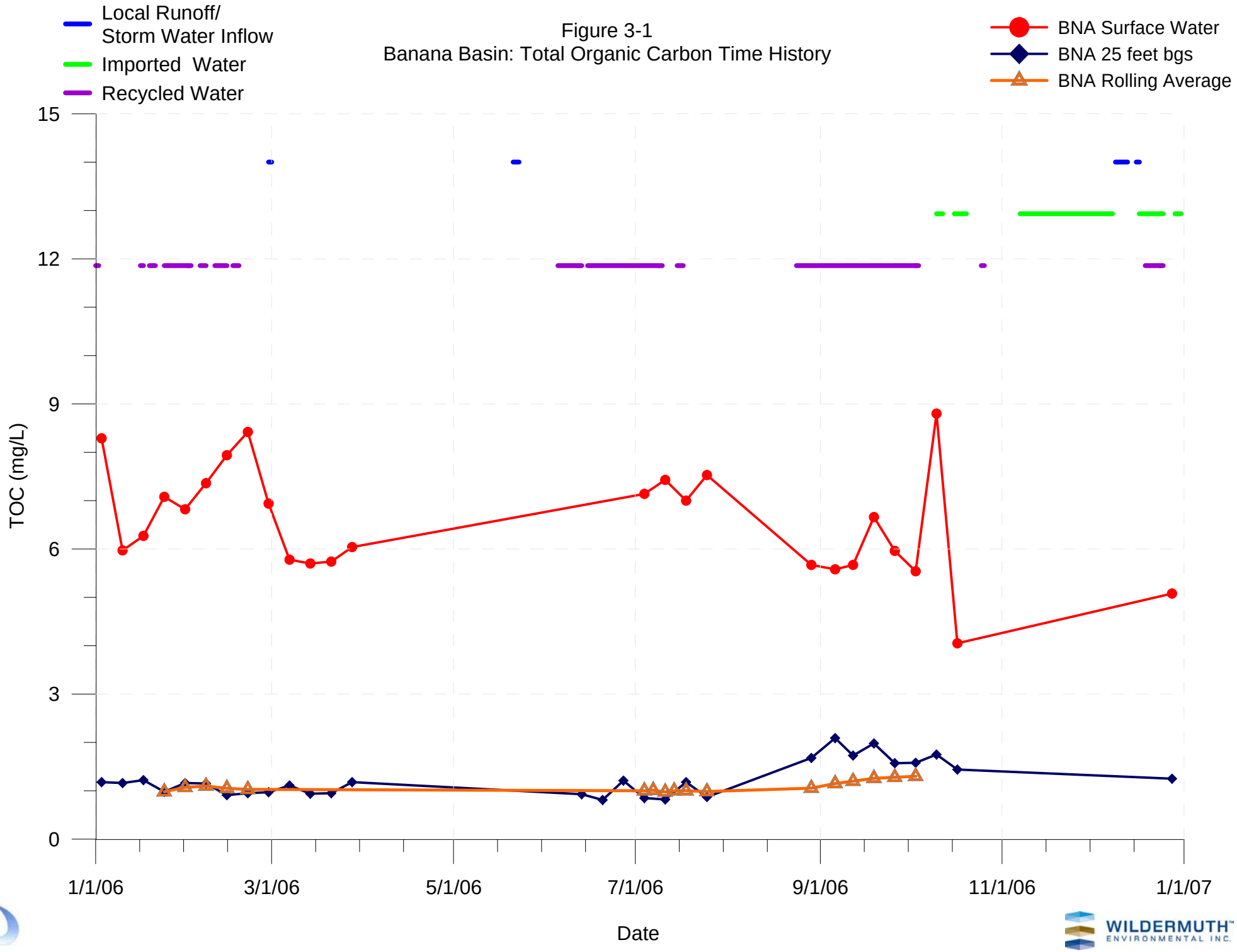

Figure 3-1
Banana Basin: Total Organic Carbon Time History

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Figure 3-2
Hickory Basin East Cell: Total Organic Carbon Time History

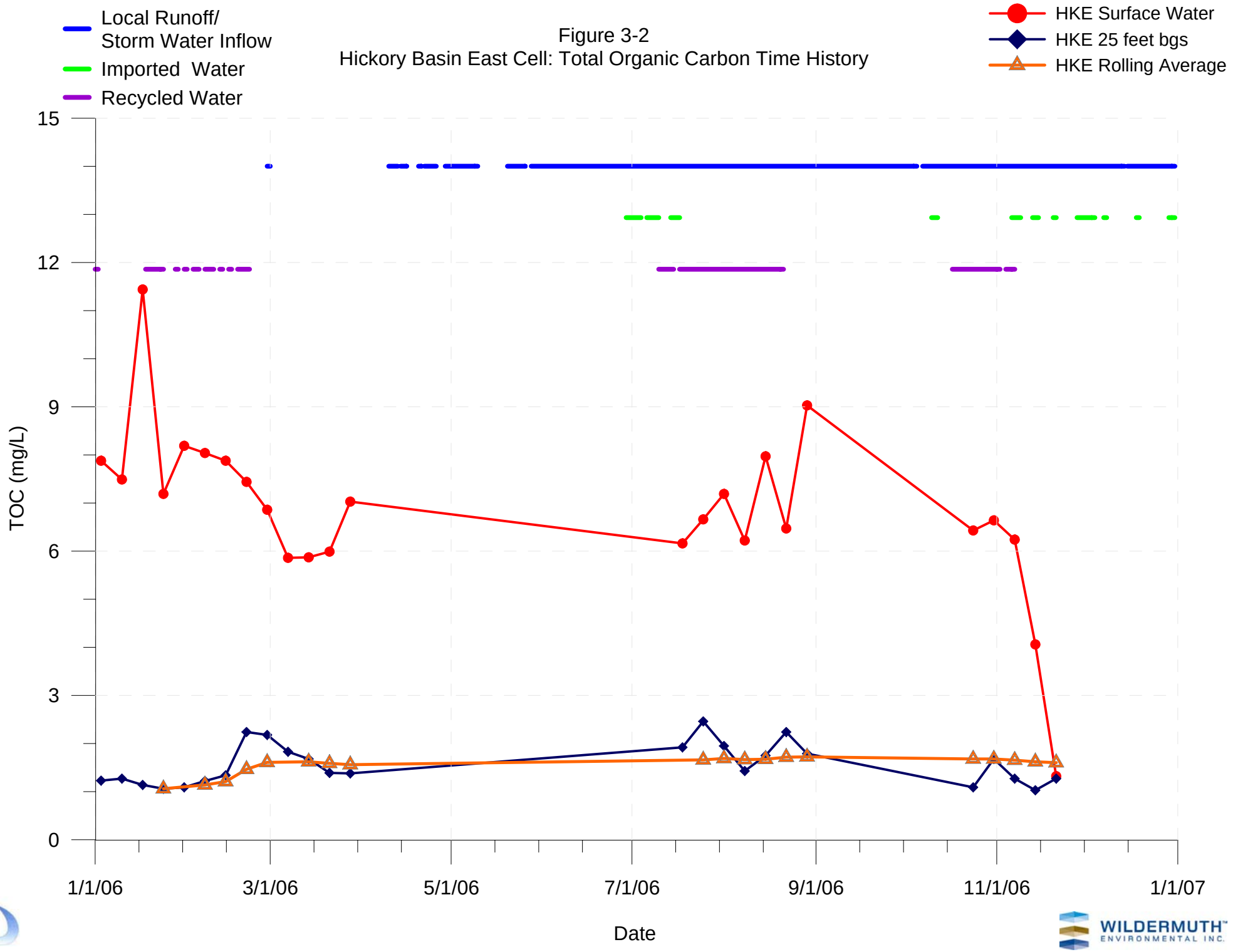

Figure 3-3
Turner Basin 1: Total Organic Carbon Time History

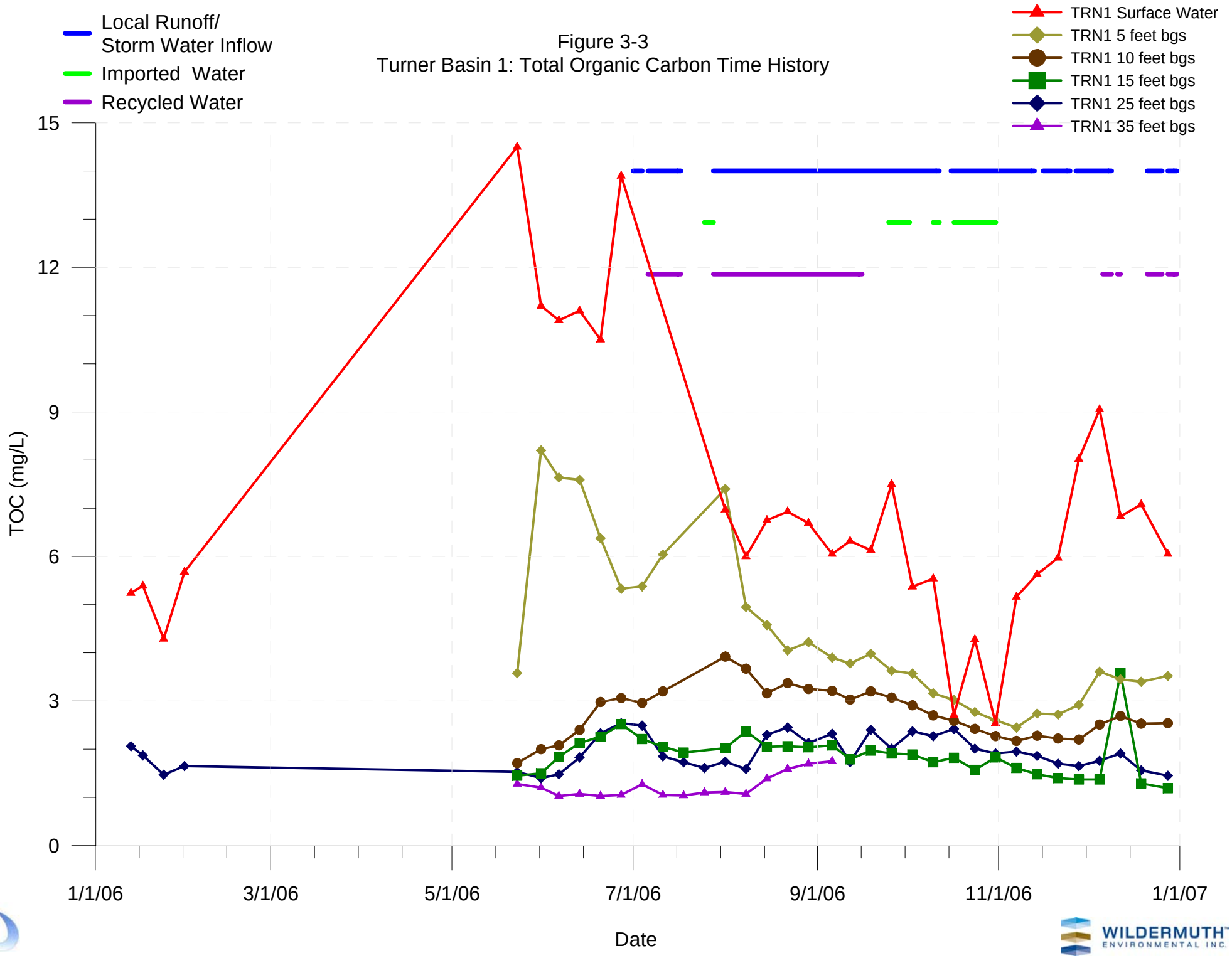

Figure 3-4
Turner Basin 4: Total Organic Carbon Time History

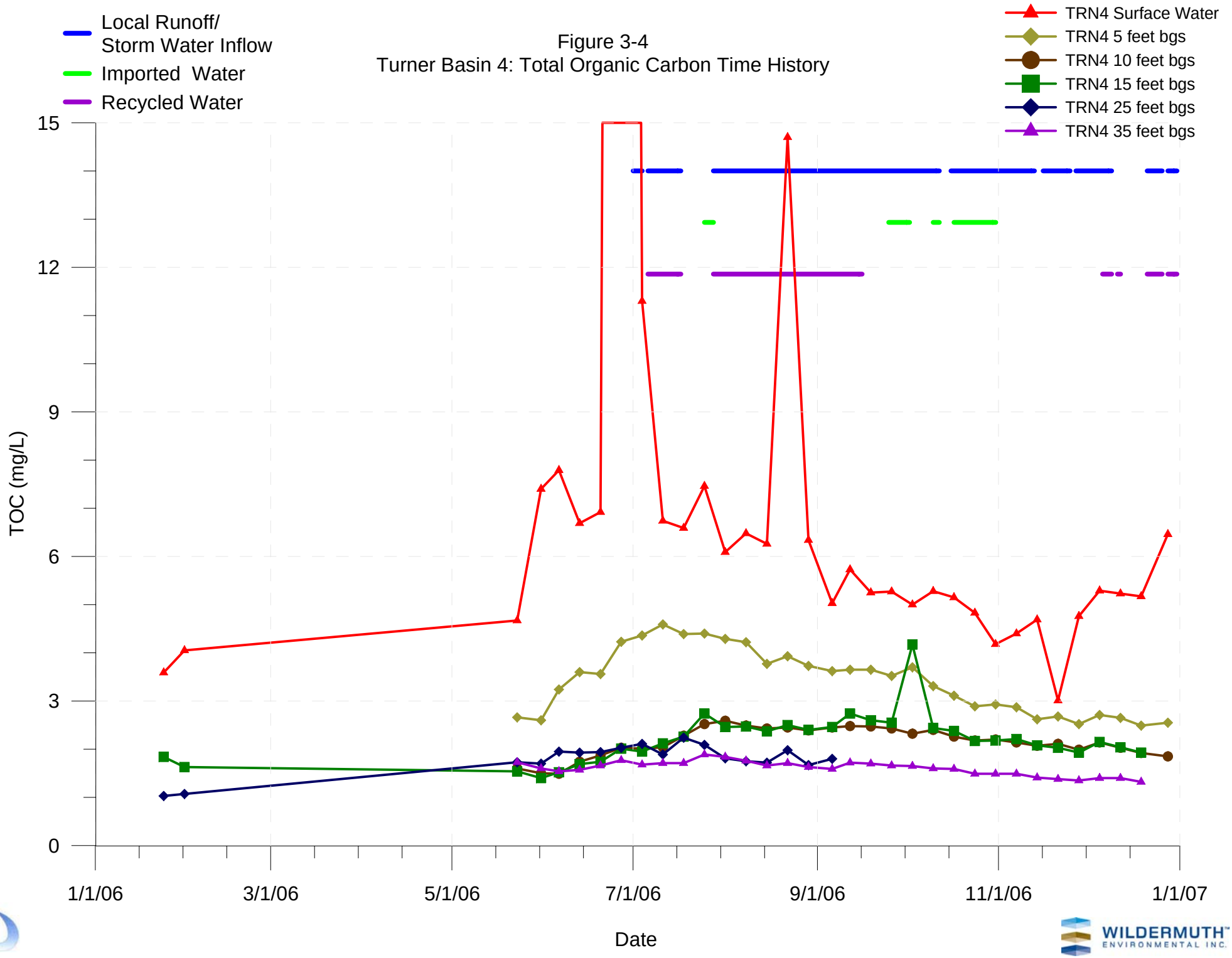

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Figure 3-5
RP-1 and RP-4 Recycled Water Effluent: TN Time History

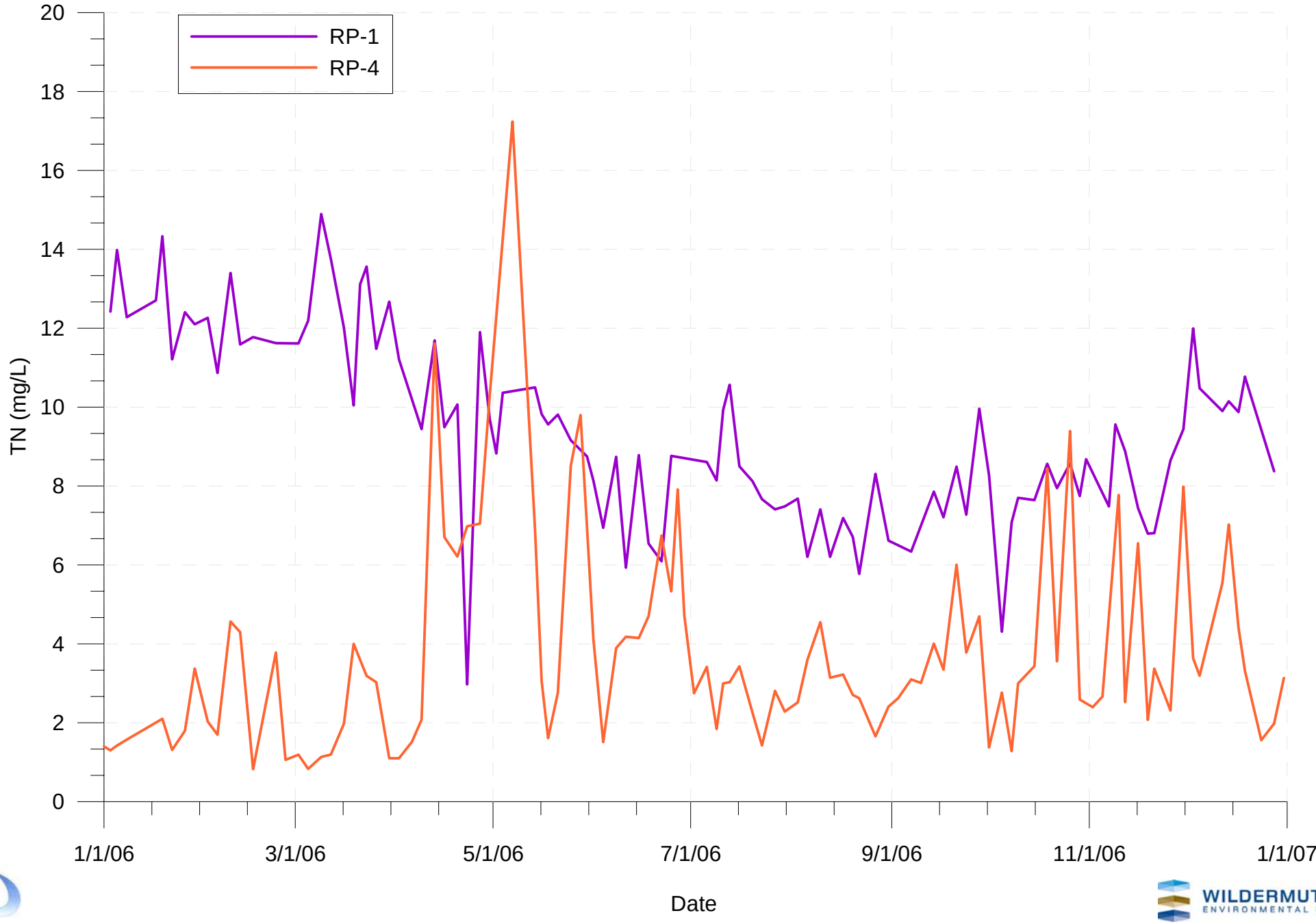

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Figure 5-1
Recycled Water Management Plan For Banana Basin

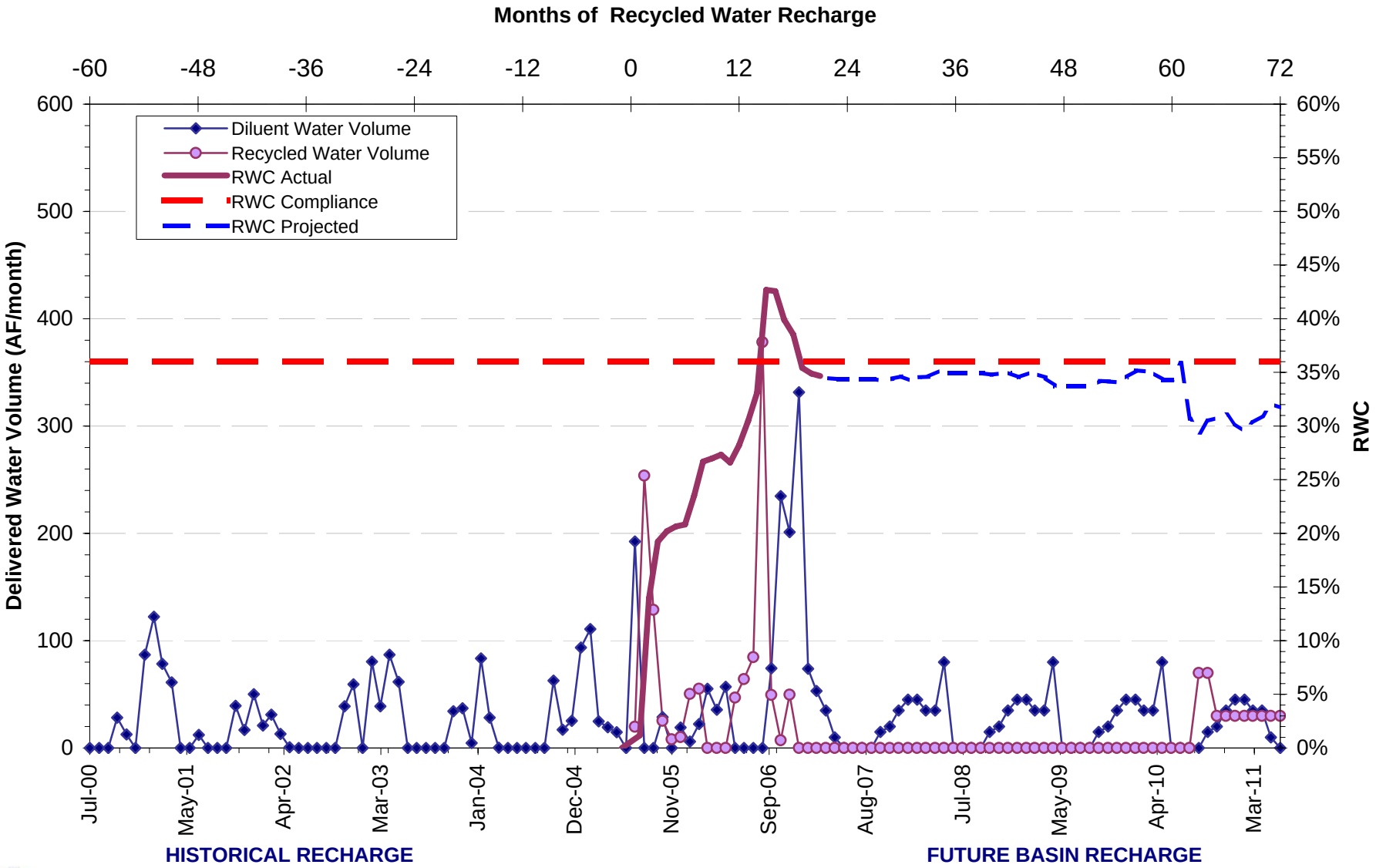
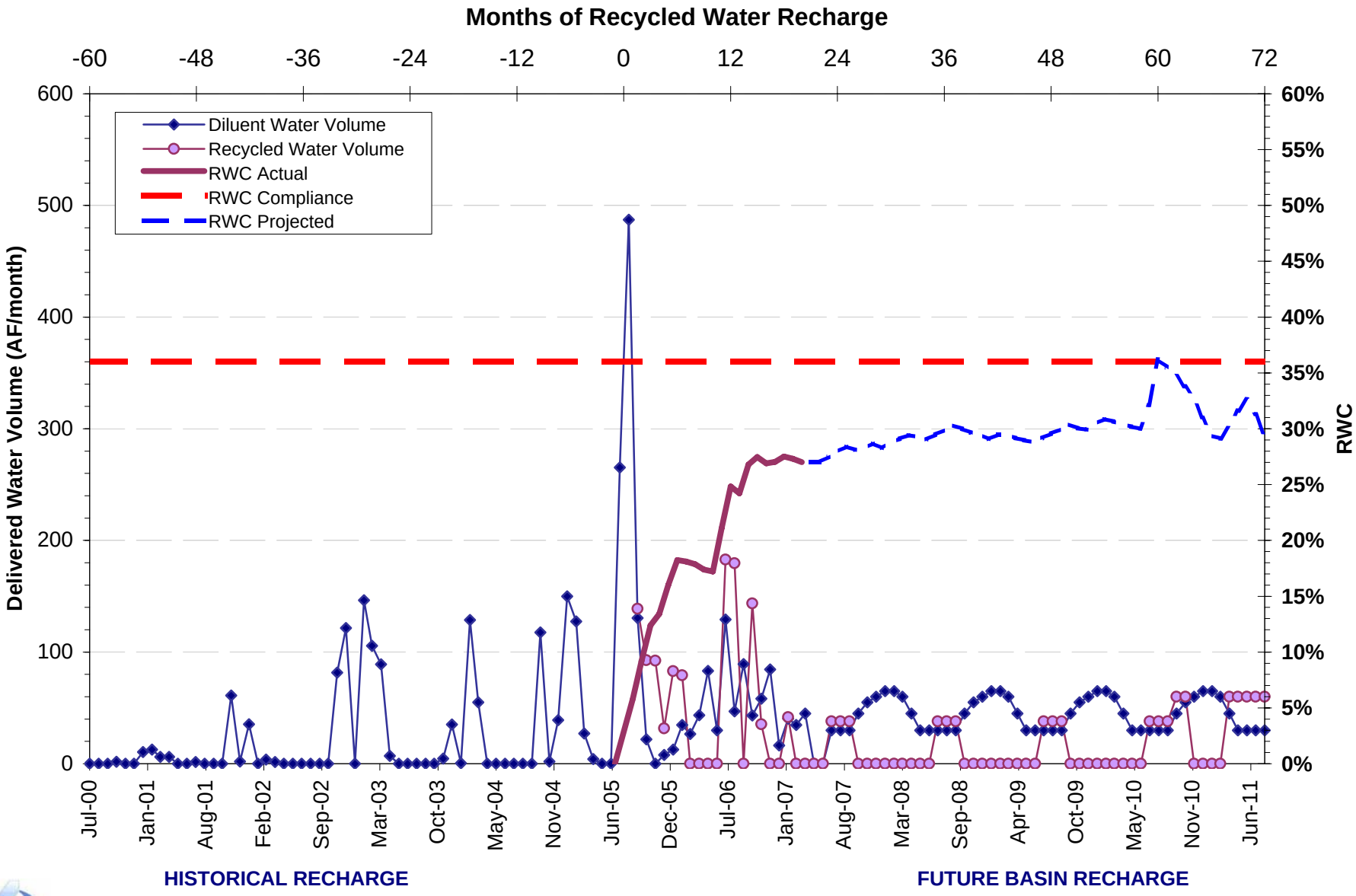


Figure 5-2
Recycled Water Management Plan for Hickory Basin



Appendix A.
Groundwater Flow Map
2003 Groundwater Elevation Contour

117°40'0"W

117°20'0"W

34°0'0"N

Main Features

800 / 775 — Groundwater Elevation Contours (feet above mean sea-level)

Chino-I Desalter Well

Chino Basin Hydrologic Boundary

Geology

Water-Bearing Sediments

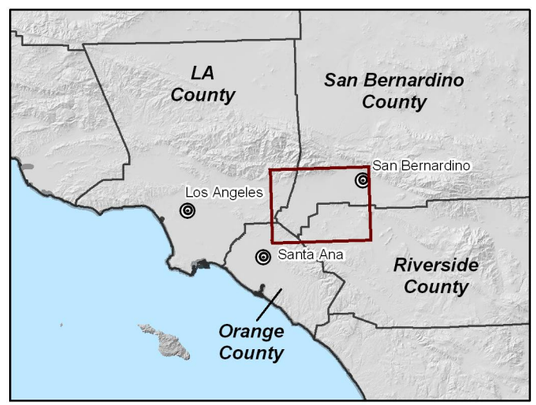
Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults & Groundwater Divides

- Location Certain
- Location Approximate
- Location Concealed
- Location Uncertain
- Groundwater Divide



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0 1 2 3 4 Miles

0 2 4 6 KM

State of the Basin Report -- 2004
Groundwater Basin Operation and Response

Groundwater Elevation Contours

Fall 2003 -- Chino Basin

Figure 3-6