Final Revised Issue

DERWA

Report of Operations

DECEMBER 2006

Prepared by Dublin San Ramon Services District

TABLE OF CONTENTS

APPENDICES

APPENDIX A California Department of Health Services (DHS) Approval of a Design Flow Rate of 9.7 MGD (dated March 30, 2007), California Department of Health Services (DHS) Approval of an Interim Flow Rate of 8.06 MGD (dated April 28, 2006), Application to increase the permitted capacity of the DERWA

	Treatment System (dated August 31, 2006), and DHS's Approval of a Design Flow Rate of 9.7 MGD (dated March 30, 2007)
APPENDIX B	Recycled Water Customer Demands, Production, and Weather Data during Calendar Year 2006
APPENDIX C	Bid Documents related to the purchase of Sodium Hypochlorite for Disinfection
APPENDIX D	Full Scale Testing, Competitive Bidding, and Award of a Contract to supply Coagulant through June 20, 2008
APPENDIX E	Draft Preventative Maintenance Program Plan

REPORT OF OPERATIONS
DERWA RECYCLED WATER SYSTEM
December 2006

1. OVERVIEW

1.1.1 Summary

The DERWA construction phase ended on February 1, 2006, and the operations and maintenance phase began at that time. The new DERWA recycled water treatment system was placed in service on May 24, 2006, when the moving bed sand filters and ultraviolet disinfection (SF-UV) system first began producing and distributing recycled water. The microfilter and ultraviolet disinfection (MF-UV) system produced recycled water for the DERWA distribution system prior to May 24.

Between May 24 and December 31 a total of 348 million gallons of recycled water were produced by the SF-UV system. During this time full RWQCB permit compliance was maintained. DSRSD's total cost for work performed between February 1 and December 31 was $689,077. One complaint was received concerning water quality issues, and two complaints were received concerning water pressure and/or delivery issues. Process upsets at the DSRSD Treatment Facility interrupted SF-UV deliveries on several occasions, and in each case the MF-UV system was used to maintain deliveries to customers. On two occasions potable water was added to the recycled water reservoirs to maintain adequate supplies for customers. Potable water was only added to the system when the combination of SF-UV and MF-UV could not maintain sufficient reservoir levels to meet customer demands.

1.1.2 2006 Review

The treatment and distribution system is operated under a general permit (Waste Discharge Requirements, or WDR) issued by the San Francisco Bay Regional Water Quality Control Board. To address other regulatory requirements, a Title 22 Conformed Engineering Report was submitted to the California Department of Health Services (DHS). The Title 22 Engineering Report describes the proposed treatment to be provided, as well as details concerning distribution and use. On April 28, 2006, DHS granted approval for the interim flow rate of 8.06 MGD for the SF-UV system. This approval was necessary prior to initiating operation because the ultraviolet disinfection system manufactured by Wedeco had not been pre-certified for use in California. The Wedeco ultraviolet disinfection system was installed as a component of the SF-UV system, which was designed to operate with a capacity of 9.7 million gallons per day. DHS further stipulated that the determination of the final capacity beyond 8.06 MGD would be based on the results of a future flow split study. A copy of the April interim approval letter from DHS is attached in Appendix A.

A DERWA Kickoff Celebration was held at the SF-UV Treatment System at 10:00 AM on Friday June 2. The event was attended by numerous dignitaries and elected officials including representatives of EBMUD, DSRSD, DERWA, and the City of Dublin. Several speakers shared comments, and photographs were taken. The media attended, refreshments were served, and tours of the SF-UV system and the regional wastewater treatment plant were conducted.

The MF-UV system was used on a number of occasions during July and August to supplement and/or replace SF-UV effluent, primarily due to secondary process upsets. The secondary process upsets caused the turbidity of the secondary effluent to increase, which in turn impacted the ability of the SF-UV system to produce acceptable recycled water quality. In most cases, the upsets lasted for a period of 1-3 days, during which time the MF-UV system produced some or all of the recycled water that was supplied to the distribution system. On August 10 a particularly significant process upset occurred after the treatment plant lost utility power three separate times, which caused low dissolved oxygen conditions in the aeration system. The upset event was significant enough that 24 hours later even the MF-UV system was unable to produce recycled water of acceptable quality, and approximately 1.34 million gallons of potable water were added to reservoir R200 to maintain sufficient supplies to continuously meet recycled water customer demands. The primary cause of the process upsets was later determined to be ammonia shock loading to the aeration system, resulting from the return of excess cap water from the facultative sludge lagoons (FSL's). A DSRSD project is currently underway to design and install a process control system to better manage FSL cap water return, and avoid upsets due to the relatively high ammonia loads. The cost of this project will not impact DERWA.

During August-October, DSRSD participated in a pilot study to test the effectiveness of ozone to disinfect recycled water. The study was sponsored by the WateReuse Foundation, and the work was conducted by Carollo Engineers. The pilot study was also used to determine if ozone would destroy endocrine disrupters and trace pharmaceuticals in recycled water. The pilot study separately tested the effects of ozone on both SF-UV effluent and MF-UV effluent. The results of the study are expected to be released during 2007.

On August 31, Carollo Engineers submitted a letter to DHS on behalf of DERWA seeking to increase the approved capacity of the SF-UV treatment system from 8.06 MGD to the design capacity of 9.7 MGD. The letter included a copy of the split-flow analysis that was prepared by Whitley Burchett and Associates to measure the effectiveness of the ultraviolet disinfection system at higher flow rates. Wedeco modeled the results of the flow-split analysis and determined that the UV disinfection system could be rated for a maximum flow of 10.58 MGD (it should be noted that the design capacity of the installed sand filters is only 9.7 MGD). DHS submitted a response on March 30, 2007, and approved the SF-UV system for operation up to the design flow rate of 9.7 MGD. Copies of DHS's response and the August 31 submittal to DHS are attached in Appendix A.

During 2006, DERWA representatives continued to work with PG&E to try and resolve and remedy the stray voltage that occurs along the recycled water piping system where the pipeline follows the Iron Horse Trail, a former railroad alignment that is now a pedestrian trail and utility easement. PG&E's transmission lines utilize the same easement, and the presence of stray voltage has forced DERWA to require special training and procedures to avoid electrical shock injuries when working on the pipeline.

During September, several complaints were received when EBMUD field crews discovered shredded plastic material plugging recycled water strainers, recycled water meters, and irrigation fixtures. Following an investigation, it was determined that small, relatively uniform pieces of plastic were able to pass completely through the moving bed sand filters to the effluent. The plastics were pumped into the distribution system along with the finished recycled water. The plastics that pass through the moving bed sand filters typically include dime-sized fruit labels and bits of shredded cellophane. Parsons Engineering, the design engineer for the SF-UV system, was secured to study the problem and recommend solutions, and this work is expected to continue into 2007. To affect a short-term remedy to the problem, on October 12 the SF-UV system was turned off and the MF-UV system was placed in operation. The MF-UV system does not allow plastics to pass through the treatment system, because the microfiltration fibers stop all plastic debris, and the MF-UV system also has an automatic backwash strainer on the secondary effluent pumped to the microfilters. Staff also began investigating alternatives to clean the four recycled water reservoirs, including soliciting quotes to send divers into the reservoirs to inspect the interiors for a buildup of plastics, solids, and/or debris. A temporary screen for the SF-UV system was fabricated and tested in January 2007, which will be used during the 2007 irrigation season. Planning and design for a permanent solution is expected to begin during 2007 after more information has been collected regarding the daily and monthly quantities of plastics that can be expected. The reservoirs and piping were drained and flushed back to the DSRSD treatment plant in late February-early March 2007.

During October, mosquitoes were found breeding in two of the four recycled water reservoirs (R200 and R20). Both reservoirs are buried and vented to the atmosphere just above the ground surface, and it is believed that mosquitoes entered the reservoirs through the vents and were able to survive and breed in the recycled water stored inside. The Contra Costa Mosquito and Vector Control District and the Alameda County Mosquito Abatement District each provided chemicals to add to the reservoirs to prevent the larvae from surviving, which the vector control officials determined were non-toxic and safe for use in recycled water systems. DSRSD Maintenance Crews also installed mosquito screens on the vent structures on all four reservoirs to prevent insects from entering the tanks. Reservoirs R100 and R300 are not buried and do not have vents at ground level, and no mosquitoes were found in either tank. Mosquitoes were found again in R20 in March 2007, after apparently gaining access to the reservoir via the overflow piping. Following the discovery a mosquito screen was installed on the overflow pipe, and further efforts were made to identify other potential points of entry.

During November, staff began experiencing difficulty maintaining adequate chlorine residual concentrations in the recycled reservoirs. Despite repeated attempts to add sodium hypochlorite (chlorine) at the reservoirs, staff was unable to detect sufficient chlorine residuals in any of the four reservoirs. Samples were collected from the reservoirs and analyzed, and elevated levels of nitrite confirmed staff's suspicion that partial nitrification was occurring in all of the reservoirs. Nitrification occurs in aerobic conditions if there is sufficient free ammonia present. Naturally occurring bacteria convert ammonia first to nitrite, and then to nitrate. Nitrite readily consumes chlorine, which can significantly reduce or eliminate chlorine residuals and contribute to slime growths. The problem is more acute during the winter months when recycled water demands decline due to the weather, causing longer detention times to occur in the reservoirs. Staff began researching control strategies to reduce or eliminate nitrification and the corresponding presence of nitrite and biomass growths from occurring in the reservoirs and in the downstream piping.

Recycled water demands peaked on July 28 when the daily peak maximum flow of 3.795 MGD was delivered, following a period of record high summer temperatures. By mid-November recycled water demands decreased to the point where the MF-UV system was only operated on an occasional basis to provide water to the distribution system. Charts and graphs summarizing the recycled water demand, recycled water production, and ambient weather conditions are attached in Appendix B.

Coordination meetings were generally held every month to discuss the operation of the recycled water system and any issues of concern. DERWA Authority Manager Jim Bewley and representatives of DSRSD and EBMUD typically attended the meetings.

1.2 2007 Goals

During 2007 the goals for DERWA will include:

- Remove and eliminate plastics from the SF-UV effluent and the recycled water distribution system.
- Obtain DHS approval to re-rate the maximum capacity of the SF-UV system, and reprogram the Wedeco control system to accept and treat up to 9.7 MGD.
- Reduce or eliminate the occurrence of secondary treatment process upsets that limit the DERWA treatment system's ability to produce acceptable recycled water quality.
- Study and develop procedures to control the factors that could allow nitrification to occur in the reservoirs, which consumes chlorine and could allow the growth of algae, slime, and odors in the recycled water distribution system.
- Calibrate and test the DERWA treated effluent meter (PSR1) for accuracy, and reconcile water produced versus water delivered (i.e. losses).
- Continue work to optimize the SF-UV control system to increase efficiency and reliability, and reduce operating costs.
- Procure sufficient spare parts to allow staff to quickly replace mechanical and electrical equipment that fails, in order to maintain full operation of the recycled water treatment and distribution system.
- Resolve the definition of an "outage" and decide whether this term refers to a failure to produce recycled water, a failure to meet an irrigation customer's needs, or if the term applies when potable water must be added to make up for a lack of recycled water supply. The DERWA Operations Agreement

requires a key performance measure described as "unplanned recycled water supply outages", and the term has not been properly defined.

- Formalize a predictive and preventative maintenance plan.
- Compile a complete list of fixed assets.
- Develop a major reliability and replacement plan.
- Determine the proportion of the O&M cost that is variable versus fixed.
- Mitigate stray voltage along the Iron Horse Trail (DERWA's responsibility).

1.3 Key Performance Measures

Performance measures serve as a mechanism to check and evaluate the efficiency and output for a given process. The measured delivery during the water supply contract year (April 2006 through March 2007) was 1,623 acre-feet (529 million gallons), and the cost to produce and deliver recycled water averaged $507 per acre-foot, based on actual incurred costs and FYE 2007 projections. Actual recycled water deliveries were significantly lower than 2,400 acre-feet, the demand that was previously expected during the 2006 irrigation season. Unit costs for treatment and delivery are expected to decline slightly during the 2007 irrigation season to about $498 per acre-foot as recycled water deliveries increase, and therefore fixed costs are distributed over a larger demand. A significant additional customer during 2007 will be the Bridges Golf Course, which began using recycled water in December 2006. Efforts to assert better control over secondary process upsets, as well as increases in staff's experience with the SF-UV control system are expected to decrease the percentage of backwash waste from 13.4% to about 12% during 2007. Total DERWA system uptime was measured at 99.7%, easily meeting the goal of 95%. Key performance measures for the DERWA system are summarized in Table 1.

1.4.1 Secondary Effluent Supply vs. Recycled Water Demand

The City of Pleasanton agreed to allow DERWA to use up to 2.5 MGD of the wastewater that originates in Pleasanton for recycling through the year 2009. Negotiations are currently underway to extend this agreement, or perhaps replace this agreement with an agreement that doesn't expire.

Table 2 shows the total volume of secondary effluent, the City of Pleasanton's flow, the Dublin-San Ramon flow, and the volume of secondary effluent available for recycling (DSRSD flow plus 2.5 MGD from Pleasanton). Table 2 also shows the monthly average and peak daily recycled water demands during 2006, and the percentage of the supply that was utilized. The highest average monthly demand for recycled water utilized 40.5% of the available supply during 2006. The highest peak daily demand for recycled water utilized about 52% of the available supply during 2006. On the peak demand day during 2006 about 2.93 MGD of available supply remained in reserve after all of the recycled water demands were met.

Figure 1 shows a plot comparing the supply of secondary effluent available for recycling versus the 2006 *average monthly* demand for recycled water. Figure 2 shows a plot comparing the supply of secondary effluent available for recycling versus the 2006 *peak daily* demand for recycled water.

TABLE 1: KEY PERFORMANCE MEASURES

Work Element	Performance Measure	2006 Target	2006 Actual	2007 Target
Permit Compliance	• Number of RWQCB permit violations associated with DERWA Facilities	0	4	0
Customer Satisfaction	• Numbers of Verified Water Quality Complaints • Number of Verified Water Pressure Complaints • Maximum Response Time to Verified Complaints	0 0 N/A	1 2 Same day	0 0 72 hours
Treatment and Delivery Cost-Effectiveness	• Total Combined Cost per acre-foot of Recycled Water Treated and Delivered • Operations Cost per acre-foot of Recycled Water Treated and Delivered • Maintenance Cost per acre-foot of Recycled Water Treated and Delivered • Chemical Cost per acre-foot of Recycled Water Treated (excluding delivery) • Power Cost per acre-foot of Recycled Water Treated (excluding delivery)	$483 N/A N/A N/A N/A	$507 $274 $126 $39 $68	$498 $255 $122 $58 $62
Maintenance Practices	• Percent of Scheduled Preventive Maintenance Tasks Completed	N/A	62%	95%
Return Streams Handling Efficiency	• Average Filter Backwash Percent of Total Volume of Water Treated	N/A	13.44%	12.00%
System Reliability	• Number of Unplanned Recycled Water Supply Outages • Uptime percent (gallons potable added/gallons recycled produced) • Total Duration of Unplanned Recycled Water Supply Outages • Number of Reportable Recycled Water Spills	0 95% 0 hours 0	1 99.7% 23 hours 0	0 95% 0 hours 0

TABLE 2

DERWA System: Supply versus Demand

Month	Total Secondary Effluent MGD	City of Pleasanton Flow MGD	Dublin San Ramon Flow MGD	Secondary Effluent available for Recycling MGD	DERWA Recycled Water Demand MGD	DERWA Recycled Water Demand Peak MGD	Average Recycled Demand % of Supply	Daily Peak Recycled Demand % of Supply
MAY	10.49	5.93	4.56	7.06	1.97	2.58	27.93%	36.49%
JUN	9.24	5.64	3.60	6.10	2.47	3.17	40.47%	52.00%
JUL	10.64	4.93	5.71	8.21	2.91	3.80	35.46%	46.25%
AUG	11.21	5.14	6.08	8.58	2.85	3.49	33.20%	40.72%
SEP	10.76	5.37	5.40	7.90	2.39	2.86	30.29%	36.18%
OCT	9.56	5.37	4.19	6.69	1.59	2.12	23.78%	31.76%
NOV	9.72	5.07	4.65	7.15	0.49	1.48	6.84%	20.67%
AVG TOTAL	10.23	5.35	4.88	7.38	2.10		28.28%	37.72%
MIN	9.24	4.93	3.60	6.10	0.49	1.48	6.84%	20.67%
MAX	11.21	5.93	6.08	8.58	2.91	3.80	40.47%	52.00%

Figure 1: 2006 Recycled Water Supply vs Average Monthly Demand

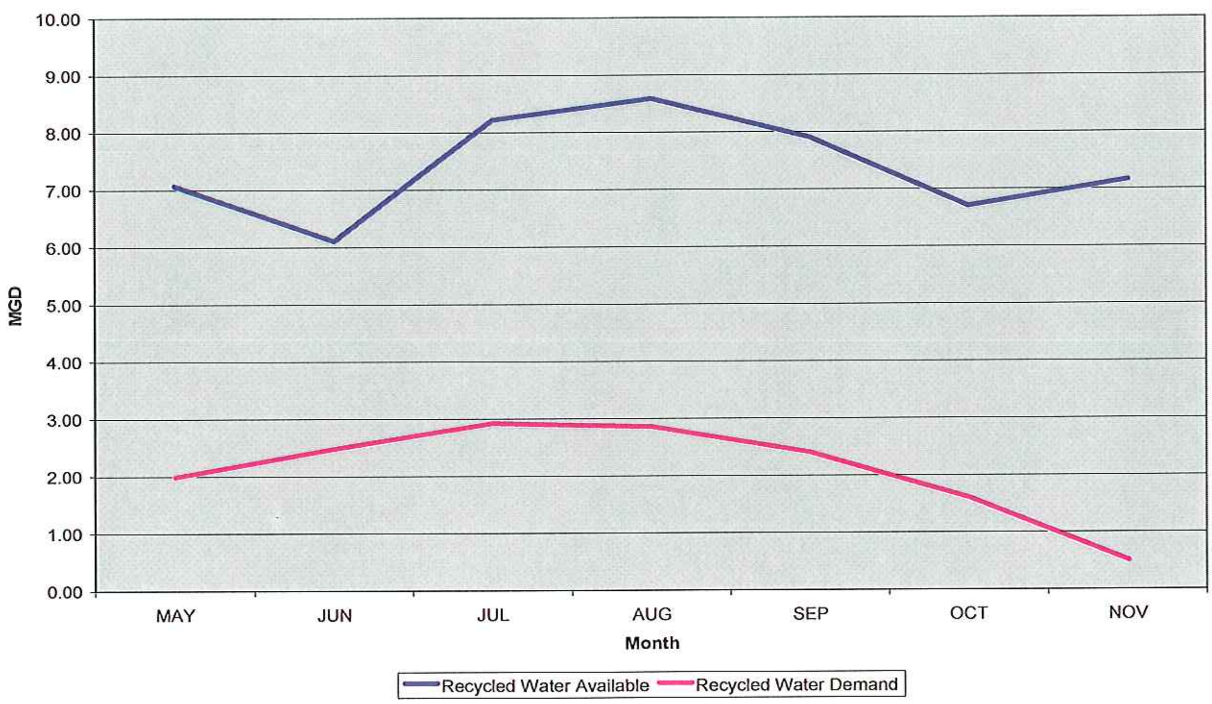


Figure 2: 2006 Recycled Water Supply vs Peak Daily Demand

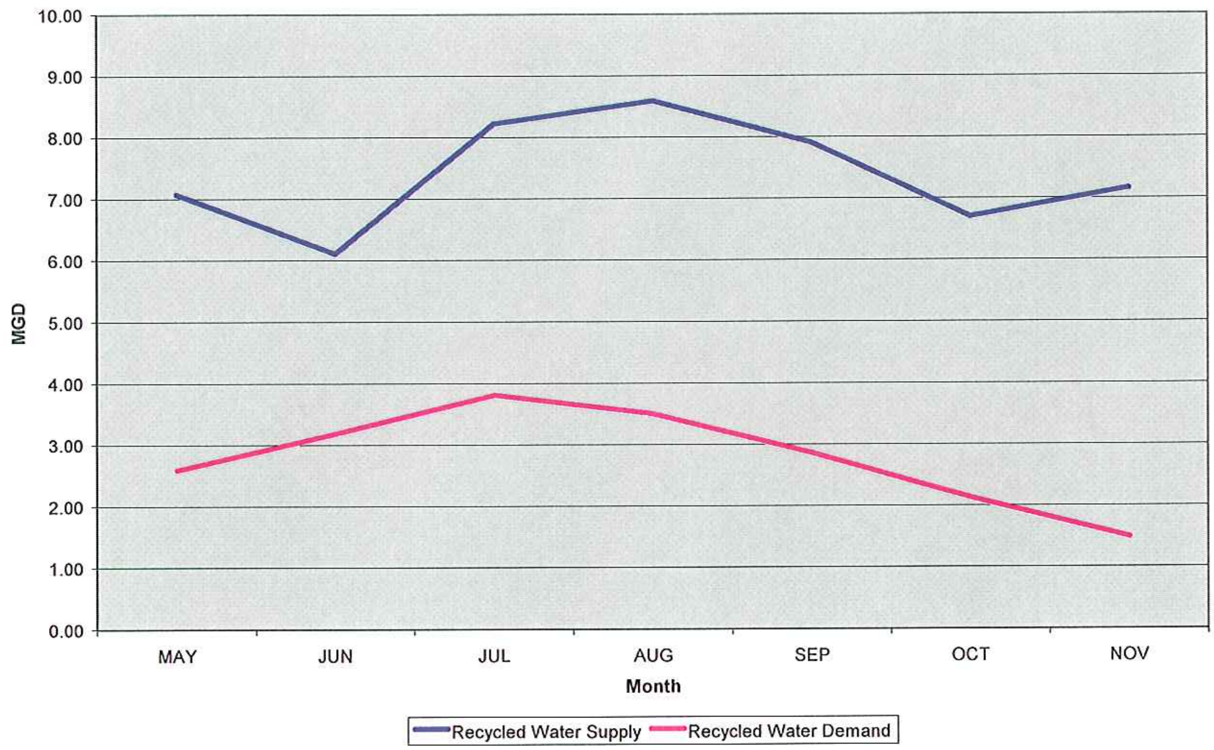


Table 3 shows the *2007 projections* for the total volume of secondary effluent, the City of Pleasanton's flow, the Dublin-San Ramon flow including growth, and the volume of secondary effluent available for recycling (DSRSD flow plus 2.5 MGD from Pleasanton). The *2007 projections* are estimates prepared by DSRSD Operations Manager Dan Gallagher based on actual recycled water deliveries measured during 2006, plus anticipated additional demands with increases of up to 1 MGD during the summer months. The addition of the Bridges Golf Course to the recycled water system in December 2006 is expected to account for a significant portion of 2007's higher demand. Table 3 also shows the monthly average and peak daily recycled water demands that are expected during 2007, and the percentage of the supply that will be utilized. The highest average monthly demand for recycled water during 2007 is expected to utilize about 50.6% of the available supply. The highest peak daily demand for recycled water during 2007 is expected to utilize about 77% of the available supply. On a peak demand day during 2007 the projections would result in about 1.76 MGD of remaining available supply in reserve after all recycled water demands are met.

TABLE 3

DERWA System: 2007 Supply and Demand Projections

Month	Total Secondary Effluent MGD	City of Pleasanton Flow MGD	Dublin San Ramon Flow MGD	Secondary Effluent available for Recycling MGD	DERWA Recycled Water Demand MGD	DERWA Recycled Water Demand Peak MGD	Average Recycled Demand % of Supply	Daily Peak Recycled Demand % of Supply
JAN	10.28	5.35	4.93	7.43	0.47	0.71	6.28%	9.57%
FEB	10.33	5.35	4.98	7.48	0.47	0.71	6.24%	9.51%
MAR	10.38	5.35	5.03	7.53	0.99	1.51	13.14%	20.03%
APR	10.43	5.35	5.08	7.58	2.34	3.57	30.89%	47.10%
MAY	10.48	5.35	5.13	7.63	2.72	4.15	35.70%	54.43%
JUN	10.53	5.35	5.18	7.68	3.47	5.29	45.18%	68.89%
JUL	10.58	5.35	5.22	7.72	3.91	5.96	50.61%	77.17%
AUG	10.62	5.35	5.27	7.77	3.85	5.87	49.50%	75.47%
SEP	10.67	5.35	5.32	7.82	3.14	4.79	40.17%	61.25%
OCT	10.72	5.35	5.37	7.87	2.09	3.19	26.57%	40.50%
NOV	10.77	5.35	5.42	7.92	0.99	1.51	12.49%	19.04%
DEC	10.82	5.35	5.47	7.97	0.47	0.71	5.85%	8.92%
AVG TOTAL	10.55	5.35	5.20	7.70	2.07	3.16	26.88%	40.99%
MIN	10.28	5.35	4.93	7.43	0.47	0.71	5.85%	8.92%
MAX	10.82	5.35	5.47	7.97	3.91	5.96	50.61%	77.17%

Figure 3 shows a plot comparing the projected 2007 supply of secondary effluent available for recycling versus the projected 2007 *average monthly* demand for recycled water. Figure 4 shows a plot comparing the projected 2007 supply of secondary effluent available for recycling versus the projected 2007 *peak daily* demand for recycled water.

The plots demonstrate that the supply of effluent was sufficient to meet recycled water demands during 2006, and the expected supply should continue to meet recycled water demands during 2007.

Figure 3: 2007 Recycled Water Supply vs Average Monthly Demand

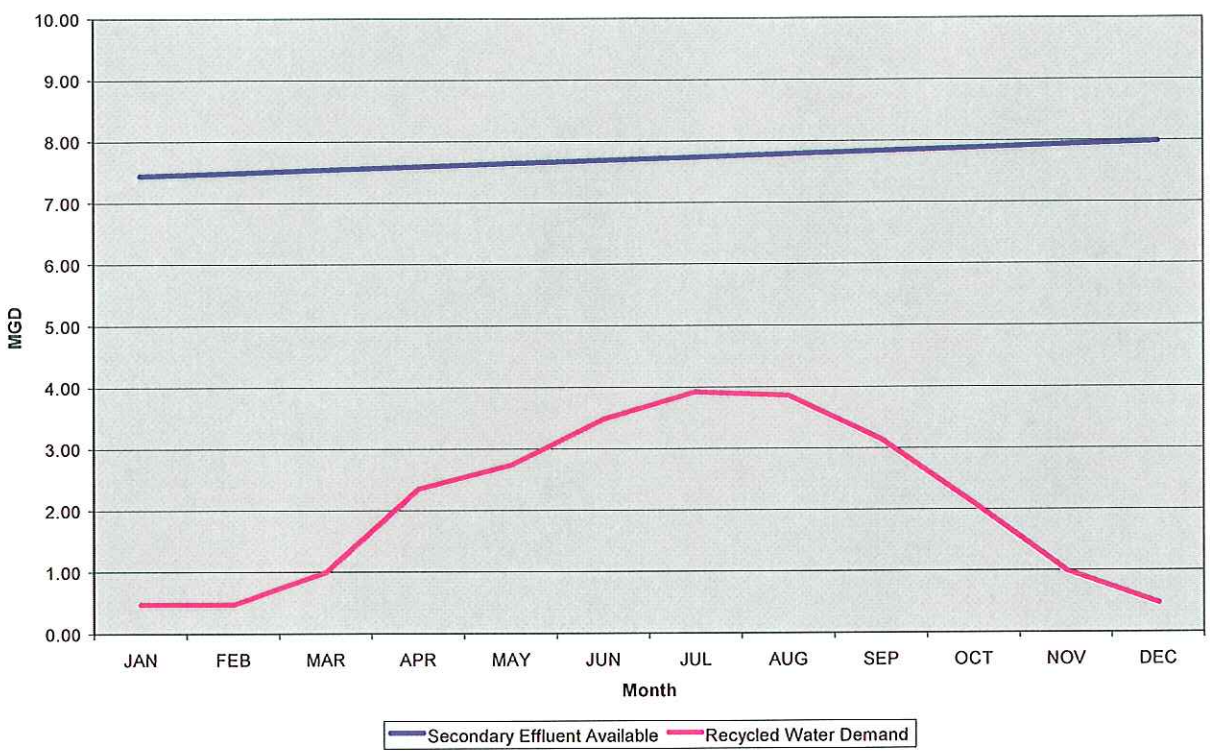
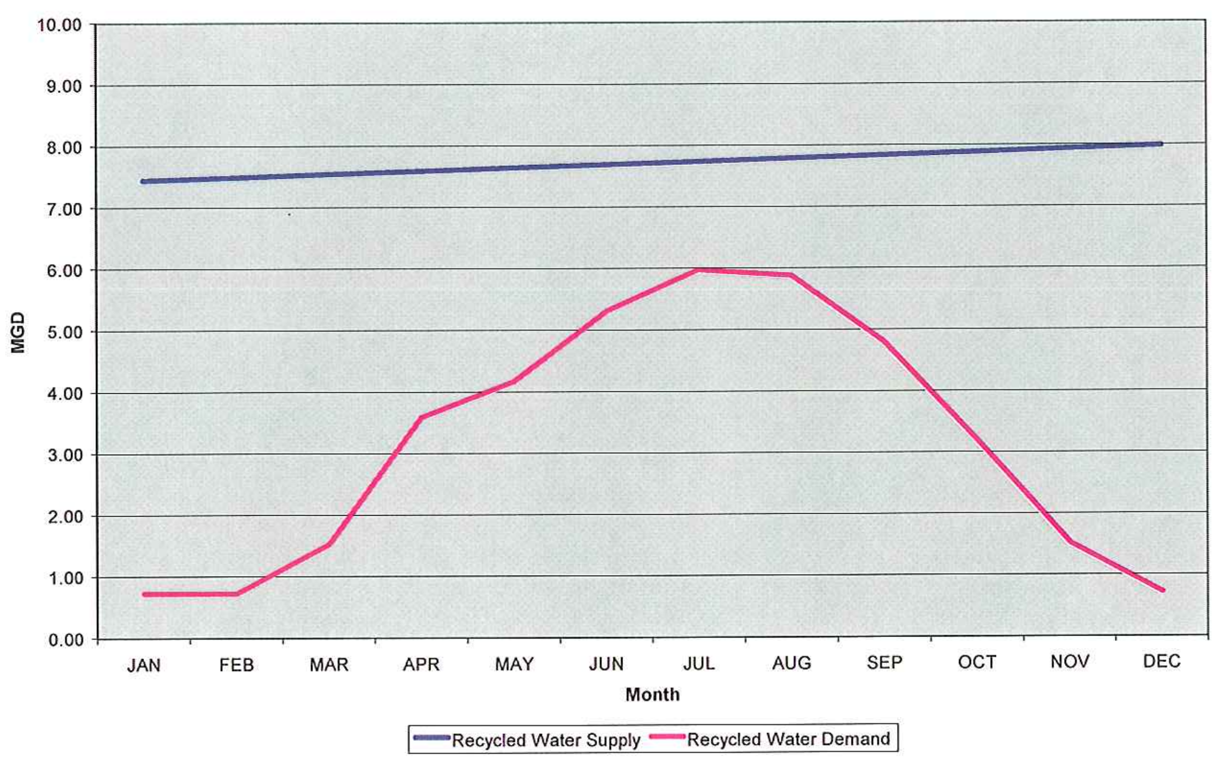


Figure 4: 2007 Recycled Water Supply vs Peak Daily Demand



1.4.2 Volume of Recycled Water in Reserve

The distribution system includes four (4) recycled water reservoirs with a total combined capacity of 10.51 million gallons (MG). The reservoirs have the following design maximum usable storage capacities:

- R100 4.36 MG
- R200 4.36 MG
- R300 0.41 MG
- R20 1.38 MG

Table 4 shows the average volume stored per month, maximum storage capacity, monthly percent of storage utilized, monthly average turnover, and the monthly average demand for Reservoir R100. The average turnover in R100 was 4.5 days during 2006.

TABLE 4
DERWA System: Utilization of Storage Capacity

	Reservoir R100				
Month	Average Volume Stored MG	Maximum Storage Capacity MG	Storage Capacity Utilized %	Average Turnover DAYS	Average Demand MGD
MAY	2.79	4.36	64%	4.2	0.67
JUN	2.47	4.36	57%	3.3	0.74
JUL	2.33	4.36	53%	3.1	0.76
AUG	2.52	4.36	58%	3.4	0.74
SEP	2.51	4.36	58%	4.2	0.60
OCT	1.94	4.36	44%	4.4	0.44
NOV	1.50	4.36	34%	9.1	0.17
DEC	0.99	4.36	23%	13.6	0.07
AVG	2.29	4.36	53%	4.5	0.59
MIN	0.99	4.36	23%	3.1	0.07
MAX	2.79	4.36	64%	13.6	0.76

Figure 5 shows a plot comparing the average volume of recycled water stored each month, average turnover in days, and the average monthly demand for Reservoir R100.

Table 5 shows the average volume stored per month, maximum storage capacity, monthly percent of storage utilized, monthly average turnover, and the monthly average demand for Reservoir R200. The average turnover in R200 was 3.3 days during 2006.

Figure 6 shows a plot comparing the average volume of recycled water stored each month, average turnover in days, and the average monthly demand for Reservoir R200.

Table 6 shows the average volume stored per month, maximum storage capacity, monthly percent of storage utilized, monthly average turnover, and the monthly average demand for Reservoir R300. The average turnover in R300 was 1.8 days during 2006.

Figure 7 shows a plot comparing the average volume of recycled water stored each month, average turnover in days, and the average monthly demand for Reservoir R300.

Figure 5: 2006 Reservoir R100 Storage Utilization

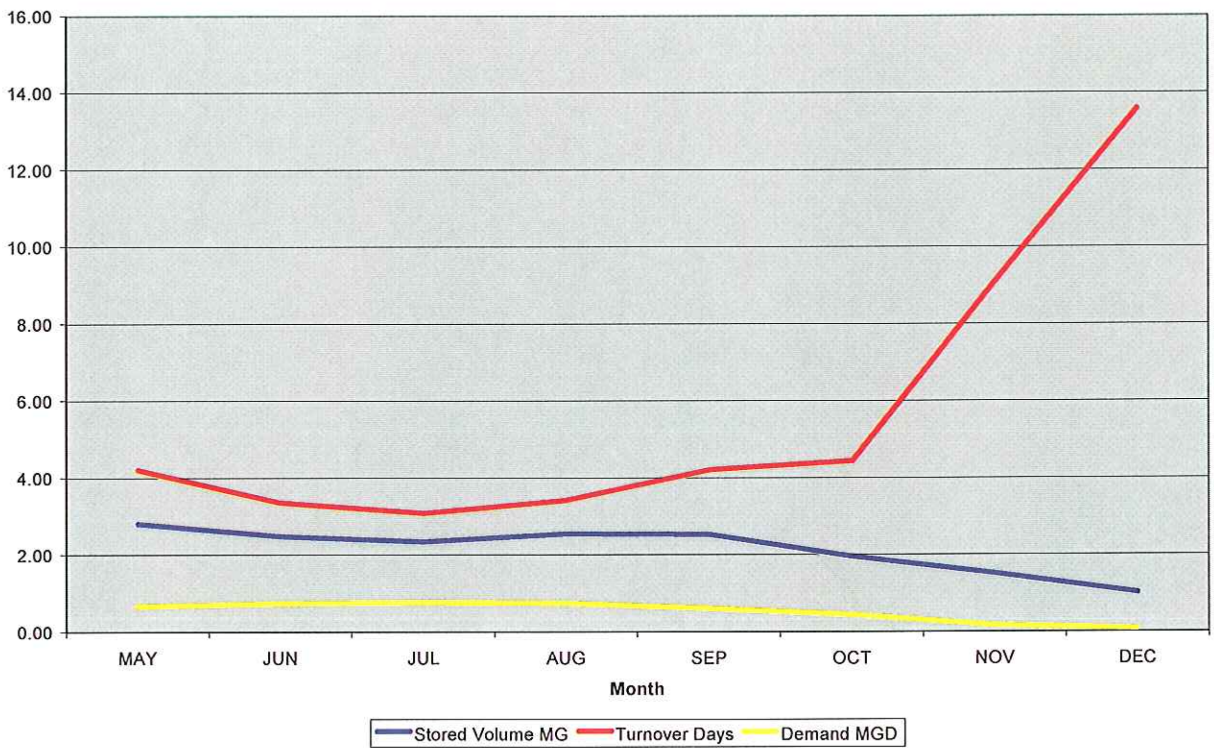


TABLE 5
DERWA System: Utilization of Storage Capacity

	Reservoir R200				
Month	Average Volume Stored MG	Maximum Storage Capacity MG	Storage Capacity Utilized %	Average Turnover DAYS	Average Demand MGD
MAY	2.67	4.36	61%	3.8	0.71
JUN	2.99	4.36	68%	3.6	0.83
JUL	2.86	4.36	66%	2.6	1.09
AUG	2.78	4.36	64%	2.3	1.21
SEP	2.55	4.36	59%	2.4	1.08
OCT	2.10	4.36	48%	2.9	0.71
NOV	1.35	4.36	31%	5.7	0.24
DEC	0.69	4.36	16%	8.7	0.08
AVG	2.47	4.36	57%	3.3	0.84
MIN	0.69	4.36	16%	2.3	0.08
MAX	2.99	4.36	68%	8.7	1.21

Figure 6: 2006 Reservoir R200 Storage Utilization

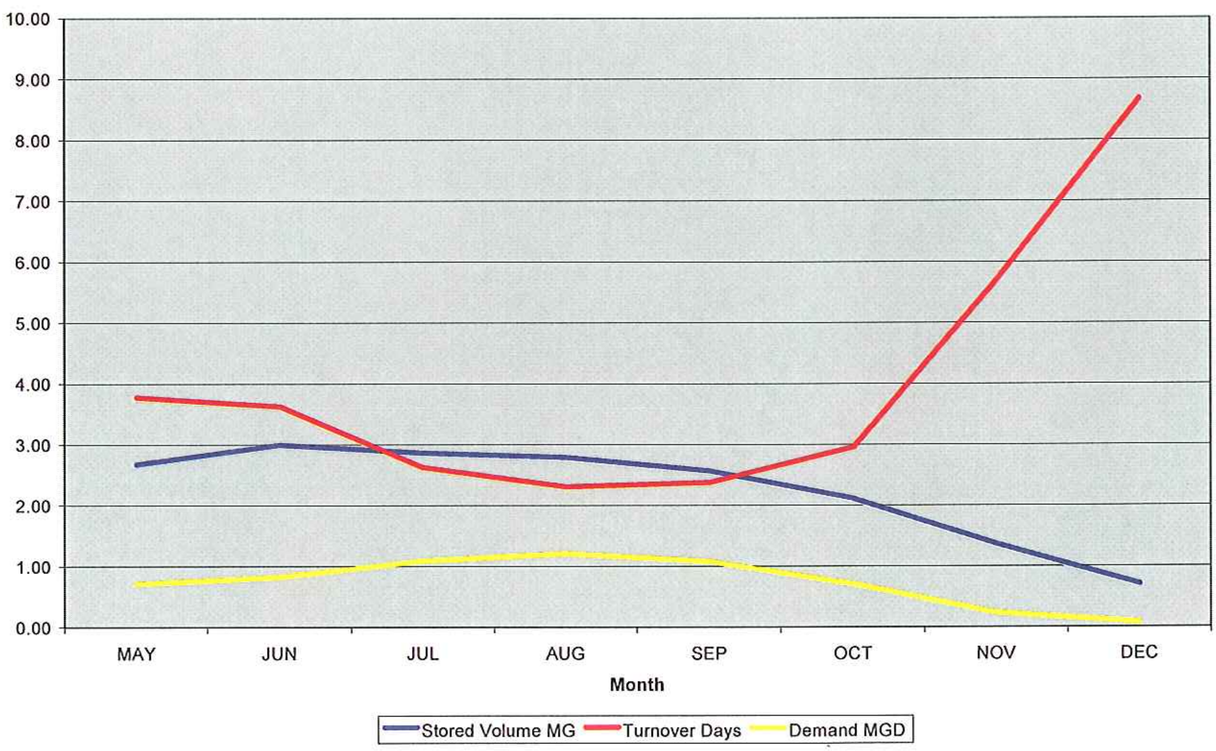


TABLE 6
DERWA System: Utilization of Storage Capacity

	Reservoir R300				
Month	Average Volume Stored MG	Maximum Storage Capacity MG	Storage Capacity Utilized %	Average Turnover DAYS	Average Demand MGD
MAY	0.33	0.41	81%	1.7	0.19
JUN	0.26	0.41	63%	1.1	0.24
JUL	0.22	0.41	54%	0.8	0.29
AUG	0.22	0.41	54%	0.8	0.26
SEP	0.26	0.41	62%	1.2	0.21
OCT	0.27	0.41	66%	1.8	0.15
NOV	0.21	0.41	50%	5.3	0.04
DEC	0.14	0.41	34%	7.3	0.02
AVG	0.25	0.41	62%	1.8	0.20
MIN	0.14	0.41	34%	0.8	0.02
MAX	0.33	0.41	81%	7.3	0.29

Figure 7: 2006 Reservoir R300 Storage Utilization

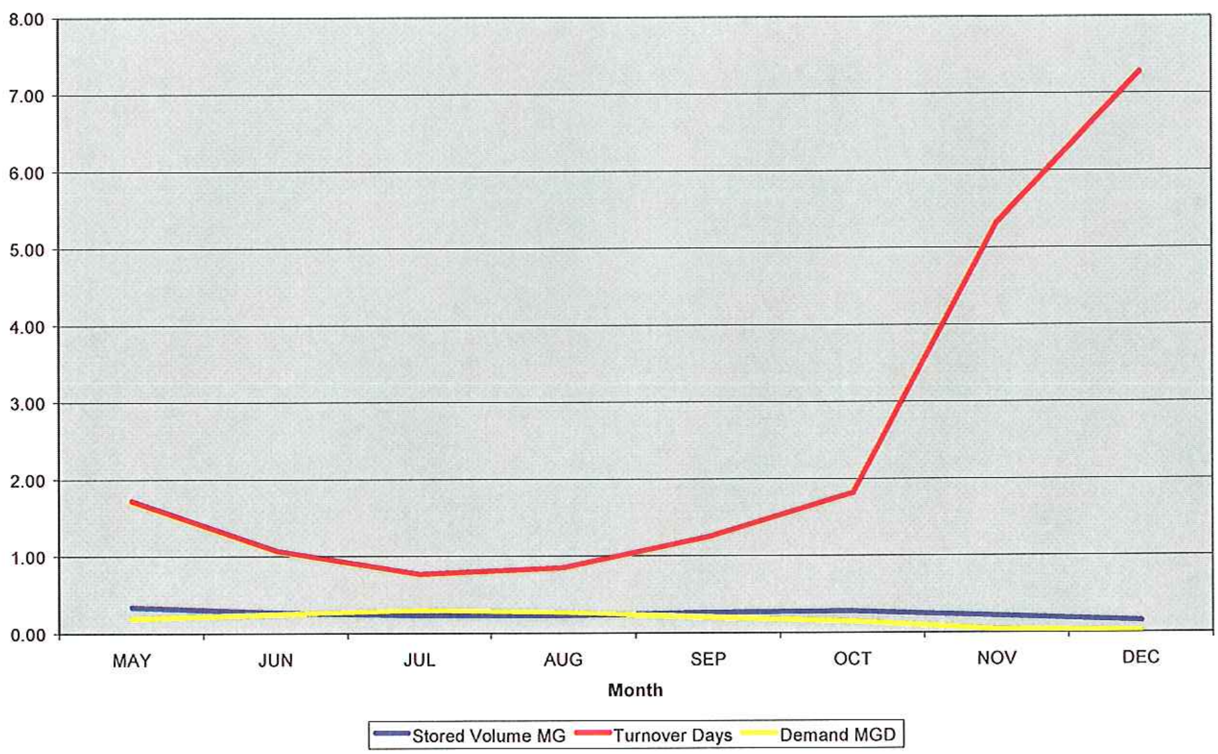


Table 7 shows the average volume stored per month, maximum storage capacity, monthly percent of storage utilized, monthly average turnover, and the monthly average demand for Reservoir R20. The average turnover in R20 was 3.5 days during 2006.

TABLE 7
DERWA System: Utilization of Storage Capacity

	Reservoir R20				
Month	Average Volume Stored MG	Maximum Storage Capacity MG	Storage Capacity Utilized %	Average Turnover DAYS	Average Demand MGD
MAY	1.17	1.38	85%	2.9	0.40
JUN	0.88	1.38	64%	1.3	0.66
JUL	0.88	1.38	64%	1.2	0.76
AUG	0.88	1.38	64%	1.4	0.63
SEP	0.85	1.38	62%	1.7	0.51
OCT	0.82	1.38	60%	2.9	0.28
NOV	0.61	1.38	44%	12.9	0.05
DEC	0.26	1.38	19%	5.3	0.05
AVG	0.87	1.38	63%	3.5	0.47
MIN	0.26	1.38	19%	1.2	0.05
MAX	1.17	1.38	85%	12.9	0.76

Figure 8 shows a plot comparing the average volume of recycled water stored each month, average turnover in days, and the average monthly demand for Reservoir R20.

Table 8 shows the average volume stored per month, maximum storage capacity, monthly percent of storage utilized, monthly average turnover, and the monthly average demand for all four of the reservoirs combined. The average turnover in the combined reservoirs was 3.4 days during 2006.

Figure 9 shows a plot comparing the average volume of recycled water stored each month, average turnover in days, and the average monthly demand for the combined reservoirs.

The tables and plots demonstrate that storage facilities are being effectively managed and are sufficient to meet peak demand requirements.

Figure 8: 2006 Reservoir R20 Storage Utilization

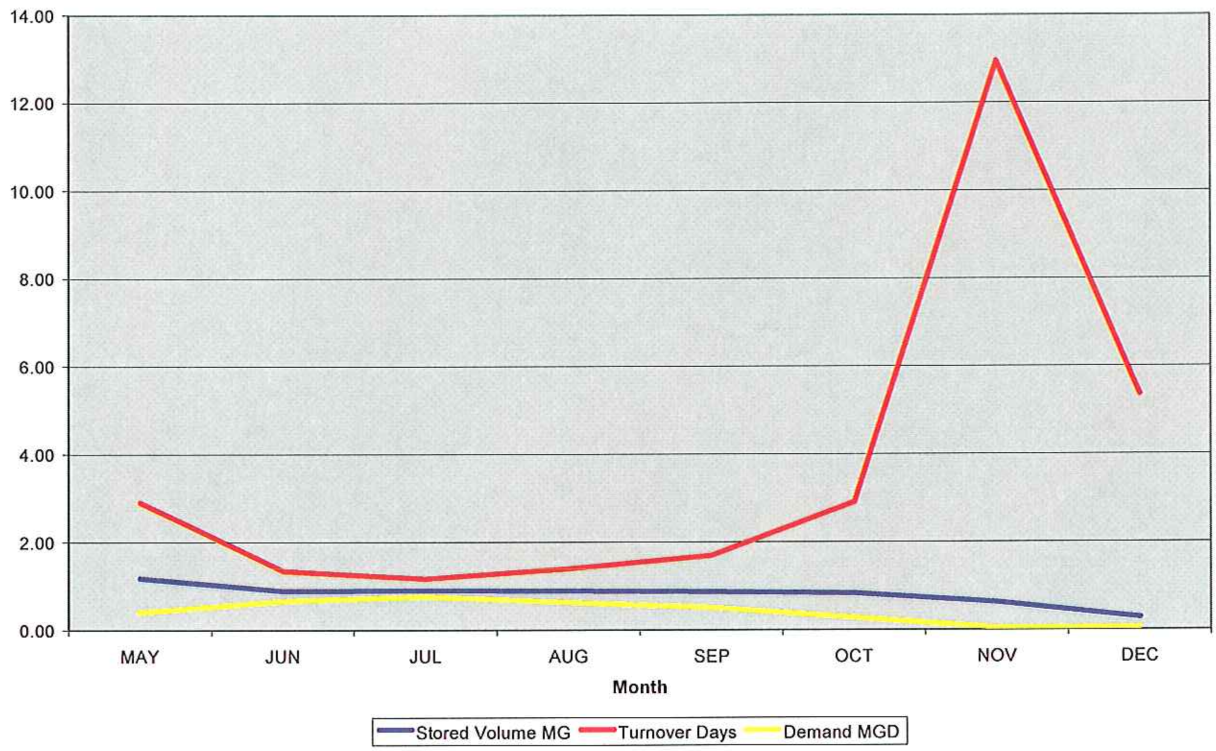
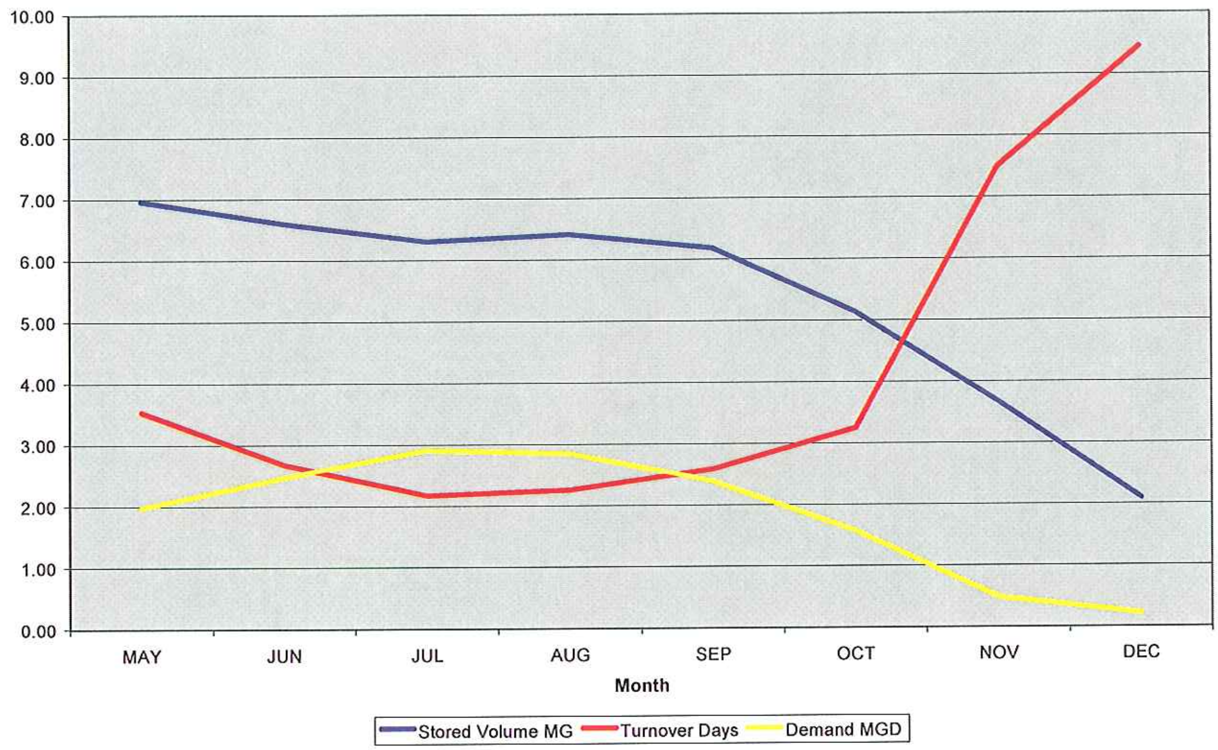


TABLE 8

DERWA System: Utilization of Storage Capacity

	Combined Reservoirs R100, R200, R300, & R20				
Month	Average Volume Stored MG	Maximum Storage Capacity MG	Storage Capacity Utilized %	Average Turnover DAYS	Average Demand MGD
MAY	6.95	10.51	66%	3.5	1.97
JUN	6.59	10.51	63%	2.7	2.47
JUL	6.29	10.51	60%	2.2	2.91
AUG	6.40	10.51	61%	2.2	2.85
SEP	6.18	10.51	59%	2.6	2.39
OCT	5.13	10.51	49%	3.2	1.58
NOV	3.66	10.51	35%	7.5	0.49
DEC	2.09	10.51	20%	9.4	0.22
AVG	5.89	10.51	56%	3.4	2.09
MIN	2.09	10.51	20%	2.2	0.22
MAX	6.95	10.51	66%	9.4	2.91

Figure 9: 2006 Combined Reservoir Storage Utilization



1.5 Potential Budgetary Impacts

During 2007 staff expects to incur higher maintenance costs as the treatment and distribution system completes its first year of operation, and routine maintenance and repairs will become more common as the equipment wears. O&M costs may also increase due to labor and materials costs associated with additional screening that will be required to remove plastics from the treated wastewater stream.

The existing MF-UV system needs to be upgraded to use the latest version of Intellution iFIX, the software that provides the human-machine interface (HMI) on the plant's process control computers. Currently the MF-UV system has a much older version of Intellution, which is not compatible with the newer Intellution software used for the SF-UV system. This incompatibility prevents staff from integrating and combining the controls for SF-UV and MF-UV on the same computer workstation, which would streamline process control and operation of the two treatment systems.

Once DOHS approves an increase of the treatment system's capacity from 8.06 MGD to 9.7 MGD, the equipment manufacturer will revise the control system's programming to accommodate the higher output rating. The latter will be completed at no additional cost to DERWA. However, the control system is overly complex and has caused a number of unnecessary plant shutdowns when the Operators attempt to start-up the SF-UV system or change production setpoints. Additional budget may be needed to revise the control system's programming to correct these problems by modifying, eliminating, or bypassing some of the control system's extensive and complicated features.

2. OPERATIONS

2.1 Operational Strategies

Strategies that will be tested and used in 2007 include:

- Improvements in routine process monitoring and control to better manage the loading from FSL cap water return.
- Using Holding Basin No. 4 to store water to meet peak recycled water demands and reduce electrical costs for pumping. This effort will include measures to monitor and control the growth of algae in the holding basin.
- Further testing of the SF-UV system to determine what quality of secondary effluent is necessary for the SF-UV system to achieve sufficient recycled water quality. Operating experience during 2006 indicated that the SF-UV system could not achieve adequate recycled water quality if the secondary effluent exceeds a turbidity of about 6-8 NTU's. Pilot testing prior to construction indicated the moving bed sand filters should be able to meet recycled water quality standards with secondary effluent of up to 50 NTU's for brief periods of time. However, the pilot tests were conducted by adding mixed liquor to secondary effluent to increase the turbidity. Staff suspects that particle size, electrical charge, algal growths, and other properties of the constituents that create turbidity under real world conditions are different from those utilized during the sand filter pilot tests.

2.2 Filter Backwash

During 2006 consultant Whitley Burchett and Associates was directed to prepare a study of sand filter waste backwash disposal alternatives and feasibility. The study will evaluate several alternatives, including:

- Discharge of all filter backwash to the plant headworks for full treatment
- Discharge of filter backwash to the facultative sludge lagoons for cap water, with excess backwash directed to the plant headworks for full treatment
- Discharge of filter backwash to the facultative sludge lagoons for cap water, with excess backwash directed to a separate treatment system

The filter backwash study is currently under review, and will be released once it is completed.

Table 9 shows the average monthly volume of recycled water produced, the average monthly volume of backwash waste, and the percent of backwash to recycled water production for each month. The average percentage of the backwash waste to recycled water produced was 13.44% during 2006, which is also included in Table 1, Performance Measures.

Figure 10 shows a plot comparing the quantity of recycled water produced versus the quantity of the backwash waste flow in million gallons per day. Figure 11 shows the average backwash waste as a percent of the recycled water flow.

TABLE 9
DERWA System: Backwash Waste Efficiency

Month	Recycled Produced SF-UV MG	Backwash SF-UV MG	Backwash % of Recycled
MAY	17.53		
JUN	72.17	7.61	10.54%
JUL	82.57	11.14	13.49%
AUG	82.64	15.64	18.93%
SEP	71.60	9.63	13.45%
OCT	19.10	2.06	10.79%
NOV	0.00	0.00	
TOTAL	345.61		
AVG	**57.60**	**9.22**	**13.44%**
2007 GOAL:			**12.00%**

Figure 10: 2006 DERWA Backwash Waste Flow vs Recycled Water Produced

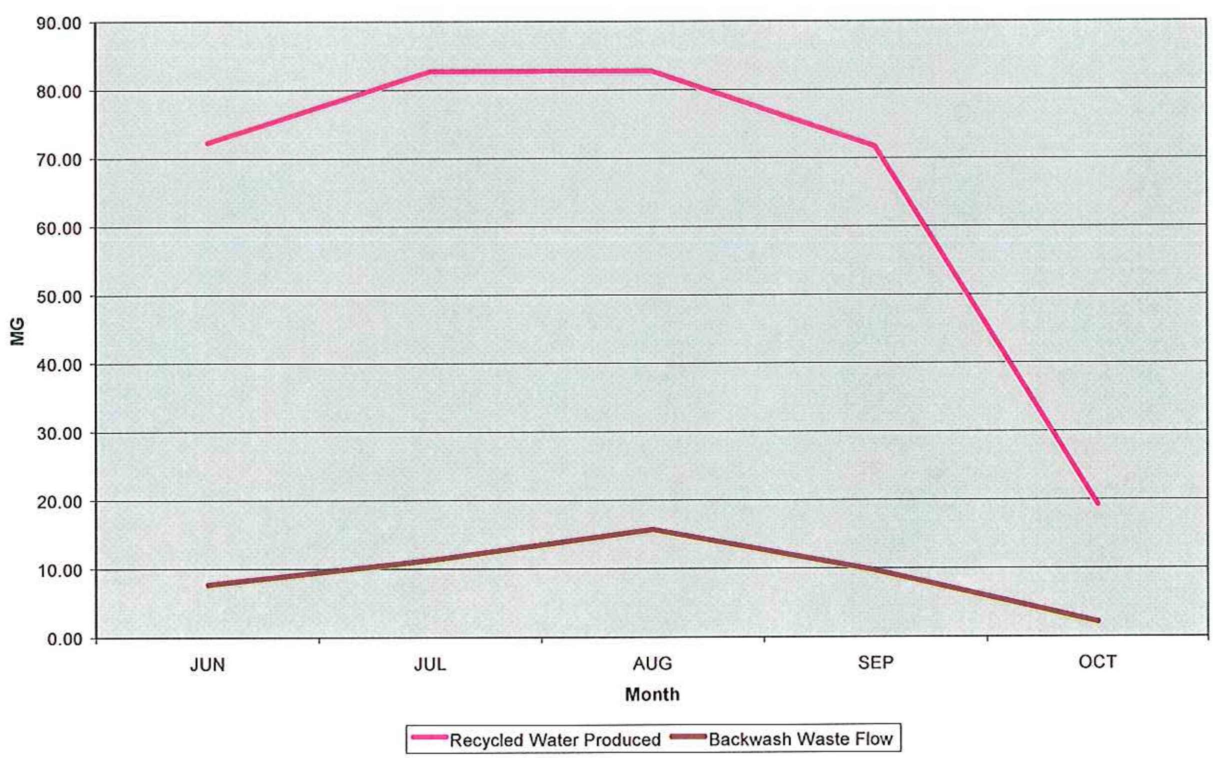
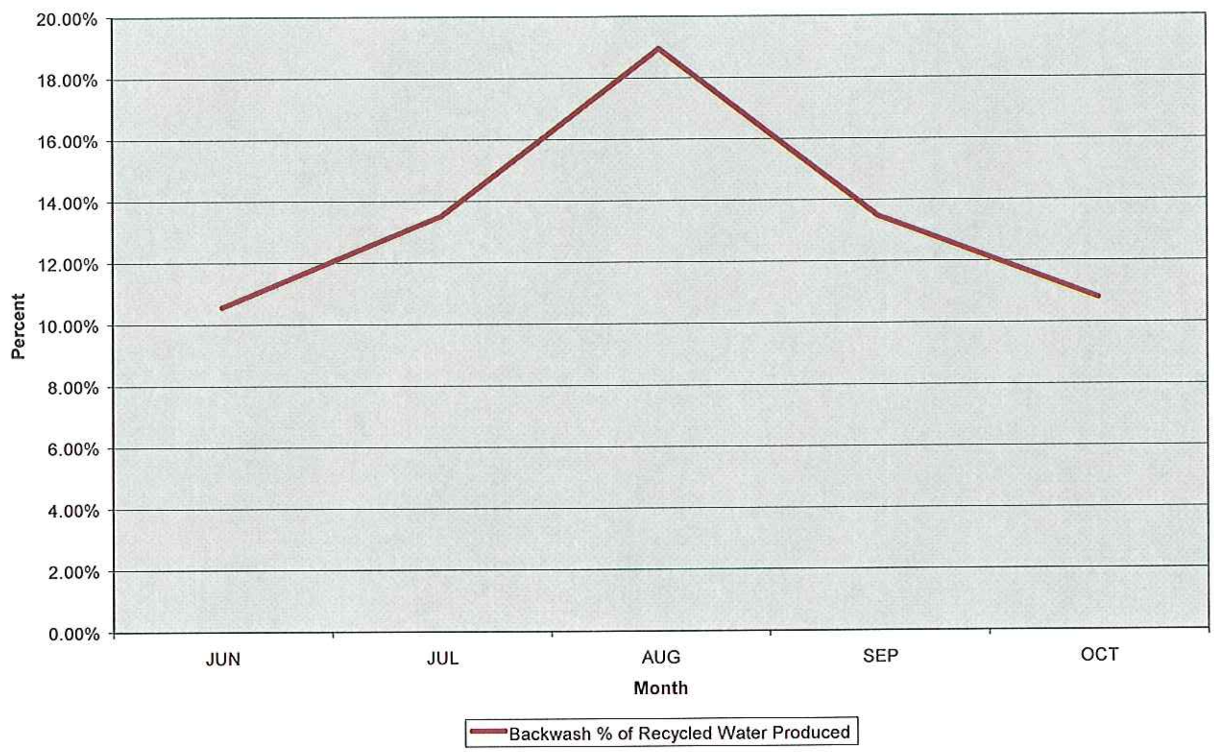


Figure 11: 2006 Backwash Waste as a Percent of Recycled Water Produced



2.3 Consumables

Power usage for DERWA includes the treatment system as well as pumping for distribution. The chemicals used in the production of recycled water for DERWA include coagulants and sodium hypochlorite for disinfection.

2.4.1 Power

Table 10 shows the electrical usage for the DERWA treatment system. Usage is separately monitored by the SCADA system using kilowatt transmitters installed on key motor control centers and recorded for:

- MF-UV: Micro Filter treatment including UV disinfection (but not including the pumps that convey secondary effluent to MF-UV, which are not separately metered)
- SF-UV: Sand filter treatment including UV disinfection and the tertiary influent pumps (TIPS)
- PSR1: Recycled water pumping from treatment into the distribution system (PSR 1)
- Total: Combined usage including MF-UV, SF-UV, and PSR 1 (but not including the pumps that convey secondary effluent to MF-UV, which are not separately metered).

TABLE 10
DERWA System: Electric Usage and Costs

Month	SFUV kWh	PSR1 kWh	MF-UV kWh	DERWA TREATMENT SYSTEM Total kWh	kWh $	Demand $	Total $
---------	---------	---------	---------	---------	---------	---------	---------
January		3,826	65,950	69,776	$5,425	$2,712	$8,137
February		10,093	63,565	73,658	$5,757	$3,582	$9,339
March		7,351	60,623	67,974	$5,302	$2,267	$7,569
April		10,927	64,349	75,275	$5,839	$2,530	$8,369
May	28,930	81,652	119,576	230,157	$19,551	$10,987	$30,538
June	96,998	96,734	45,349	239,081	$20,306	$12,560	$32,867
July	132,631	125,021	75,808	333,461	$27,535	$17,184	$44,718
August	144,637	119,089	77,680	341,406	$28,677	$14,695	$43,372
September	109,184	100,486	62,146	271,816	$21,506	$9,514	$31,020
October	38,397	65,894	76,426	180,717	$14,523	$10,742	$25,265
November	1,906	18,836	59,079	79,820	$5,853	$3,136	$8,989
December	7,168	9,613	23,493	40,274	$3,059	$3,182	$6,242
Average	69,981	54,127	66,170	166,951	$13,611	$7,758	$21,369
Total	559,852	649,521	794,043	2,003,417	$163,334	$93,091	$256,425
Minimum	1,906	3,826	23,493	40,274	$3,059	$2,267	$6,242
Maximum	144,637	125,021	119,576	341,406	$28,677	$17,184	$44,718

Notes: The effluent pump station that provides secondary effluent to MF-UV is not separately metered or included in the usage for DERWA. SF-UV includes the TIPS pumps, coagulation, flocculation, filtration, and ultraviolet disinfection used with the sand filter system. PSR1 is the pump station that conveys recycled water from SF-UV to the distribution system.

As mentioned in Section 2.1, during 2007 staff plans to continue testing the use of Holding Basin No. 4 as a means to decrease kilowatt usage, by holding more water in storage which will increase the static head available to the tertiary influent pumps (TIPS). Increasing the static head will increase the pump's efficiency, which should be reflected as reduced electrical usage for pumping. At the same time staff will observe whether increasing the volume of stored water in Holding Basin No. 4 would cause any significant amount of algae to grow in the holding basin, which could increase chemical and maintenance costs and negatively impact any costs saved from decreased electric usage.

Table 11 shows the electrical usage for the DERWA distribution system. Usage for the distribution system is measured by PG&E and recorded for:

- Recycled Water Pump Station PS R200B (100 Old Dougherty Road)
- Reservoir R100 (off Alcosta Blvd, north of Pine Valley Road)
- Reservoir R200 (off Gale Ridge Road)

TABLE 11
DERWA System: Electric Usage and Costs

	Pump Stations	Reservoirs		DERWA DISTRIBUTION SYSTEM	
Month	PSR200B kWh	R100 kWh	R200 kWh	Total kWh	Total $
---------	---------	---------	---------	---------	---------
January	2,880	42	39	2,961	$728
February	4,480	48	47	4,575	$1,030
March	4,000		76	4,076	$925
April	3,840	47	74	3,961	$878
May	8,480	43	47	8,570	$1,543
June	19,200		38	19,238	$3,312
July	25,600	45	41	25,686	$5,862
August	27,520		38	27,558	$4,606
September	2,080	43	44	2,167	$443
October	26,880	42	39	26,961	$3,975
November	2,080	48	46	2,174	$1,432
December	3,200		41	3,241	$1,087
Average	10,853	45	48	10,931	$2,152
Total	130,240	358	570	131,168	$25,820
Minimum	2,080	42	38	2,167	$443
Maximum	27,520	48	76	27,558	$5,862

2.4.2 Chemicals

Sodium hypochlorite is purchased in bulk under a bid that the District awarded in June 2006. Sodium hypochlorite is typically added to the finished recycled water prior to distribution, in order to maintain a desired level of chlorine as the recycled water is pumped into the distribution system. In addition, sodium hypochlorite can be added to one or more of the recycled water reservoirs to maintain sufficient chlorine residual in the reservoirs which feed the distribution system. Chlorine residual via sodium hypochlorite addition prevents any regrowth of pathogens, including coliform, and it also serves to prevent the growth of algae and slime in pumps, piping, and reservoirs. A copy of the sodium hypochlorite bid documents are attached in Appendix C.

To date $4,274 of sodium hypochlorite has been purchased using this bid for recycled water treatment and delivery, and of this inventory a total of $2,130 of sodium chlorite has been consumed to date for treatment. Sodium hypochlorite deliveries were accepted on the following schedule:

- March 15, 2006 900 gallons
- October 21, 2006 4,590 gallons

In addition, during 2006 approximately 500 gallons of sodium hypochlorite was purchased in small quantities from a local vendor, at a total cost of $1,866. These small quantities were used to add sodium hypochlorite directly to the recycled water reservoirs as needed to increase the residual chlorine levels. Beginning in November 2006 staff began taking sodium hypochlorite from bulk storage at the treatment plant when small quantities are needed, which will reduce the costs for using such small quantities.

Coagulant for the SF-UV system was advertised for competitive testing and bidding on March 14, 2006. On-site testing was conducted between March 20 and April 11, 2006, and the deadline for formal proposals was April 14, 2006. Potential vendors tested different combinations of poly-aluminum chloride (PACL), some with and some without the use of a separate polymer, to test filtration efficiency using DSRSD's secondary effluent. The performance testing was very successful and proved to be an excellent method for evaluating different vendor products under actual SF-UV operating conditions. Kemiron's product produced the desired results at the lowest unit cost, so Kemiron was declared the lowest responsive bidder. Kemiron was subsequently awarded a contract to supply coagulant for DERWA through June 30, 2008. A copy of the coagulant bid documents and the results of the testing are attached in Appendix D.

To date a total of $48,462 of PACL has been purchased for use with SF-UV, and of this inventory a total of $36,291 of PACL has been consumed for treatment. PACL deliveries were accepted on the following schedule:

- May 16, 2006 4,600 gallons
- July 14, 2006 4,000 gallons
- August 14, 2006 4,000 gallons
- September 13, 2006 4,000 gallons

During 2007 staff plans to continue testing to optimize PACL chemical costs using flow pacing, turbidity, and ultraviolet transmittance values as feedback to SCADA to minimize and better control the rate of application of coagulant. In addition, during 2007 staff plans to study and implement mechanisms to prevent or control nitrification occurring in the reservoirs, which will reduce operating costs for sodium hypochlorite addition.

3. MAINTENANCE

3.1 Overhauls and Replacements

During 2006 the only significant equipment that was replaced was the ultraviolet transmittance meter, which is used by the SF-UV control system to determine if the clarity of the water will provide a sufficient coliform kill using ultraviolet (UV) disinfection. In the April 28th interim approval letter the California Department of Health Services allowed the Wedeco UV system to be operated up to 8.06 MGD as long as a minimal UV dosage of 100 mJ/cm^2 was applied at all times. The latter was based on a minimum 55% UV transmittance (UVT) and a minimum lamp intensity of 1.2 mW/cm^2. The Wedeco control system is designed to cease deliveries to the distribution system if the UVT drops below 55%. The original UVT meter manufactured by HIPPO was found to be unreliable, and the unit was replaced with a similar meter manufactured by HF Scientific. The problem occurred during the warranty period, and the cost of the replacement was born by Overaa, the construction contractor.

A number of overhauls and replacements are planned for 2007, including:

- Adding a facility to drain the flocculation basins, which were constructed without a drainage sump or drain piping.
- Replumbing washdown hoses in the SF-UV area to use recycled water instead of potable water.
- Adding piping to convey chlorinated secondary effluent to the MF-UV system, to supplement or replace the existing piping that currently conveys only undisinfected secondary effluent to the MF-UV system.
- Microfilter fiber replacement (partial) and the development of a fiber replacement schedule.
- UV lamp replacement (partial).
- Replumbing the point of addition for sodium hypochlorite to the PSR 1 wet well, to provide better mixing when MF-UV is being operated, and to allow greater Operator flexibility to control sodium hypochlorite addition.

3.2 Preventative Maintenance

A draft Preventative Maintenance Plan has been prepared as required in the Agreement, and a copy is attached in Appendix E. As specified in the Agreement, DSRSD is now ready to meet with DERWA and EBMUD to discuss the Plan and any proposed changes or additions until the document is mutually agreeable to all parties.

3.3 Reactive Maintenance

Because this was the first year of operation for the SF-UV system, the reactive maintenance that occurred was limited primarily to instrumentation failures and debugging the control system logic. Many of these problems were covered under the warranty. During 2007 staff expects to incur higher maintenance costs as the treatment and distribution system ages and routine maintenance and repairs will become more common as the equipment wears. Maintenance costs may also increase due to labor and materials associated with the additional screening that will be required to remove plastics from the treated wastewater stream.

4. <u>CUSTOMER SATISFACTION</u>

4.1 Complaints and Response

During 2006 there was one (1) complaint received for an issue related to water quality, and two (2) complaints were received for issues related to low water pressure. The complaints are described in more detail in the following paragraphs.

On October 17 the Contra Costa Mosquito and Vector Control District (CCMVCD) alerted EBMUD to mosquitoes found breeding in Reservoir R200. EBMUD staff subsequently alerted DSRSD staff. DSRSD staff worked with CCMVCD to add non-toxic chemicals to the reservoir to prevent the larvae from hatching and penetrating the water surface in the reservoir. Other chemicals were added to kill any mosquito larvae that survived in the reservoir after the first treatment.

DSRSD staff subsequently inspected Reservoirs R100, R300, and R20. Although no mosquitoes were found breeding in either R100 or R300, mosquitoes were found breeding in Reservoir R20, similar to the situation found in R200. Staff contacted the Alameda County Mosquito Abatement District for assistance in treating Reservoir R20. Both R200 and R20 are buried reservoirs, with large aperture vents located at ground level, which apparently attracted the mosquitoes. Reservoirs R100 and R300 are elevated tanks with vents located far above the ground, which apparently did not attract mosquitoes. Staff later installed mosquito screens around the vents on all four reservoirs to prevent a reoccurrence of the problem.

During summer 2006 EBMUD contacted DSRSD to report a water pressure problem at the City of San Ramon greenbelt across from the Coyote Creek Elementary School. The problem was found to be due to marking tape that was apparently left inside the recycled water pipeline following construction. The tape was removed and the problem was corrected.

In September EBMUD contacted DSRSD to report finding shredded plastic material plugging the strainers on a number of their recycled water customer connections. The problem was traced to fairly uniform, dime-sized shredded plastic material that apparently escaped through the sand filters to the finished recycled water effluent. Due to this development the SF-UV system was removed from service on October 12, and the MF-UV system was placed in service to provide recycled water for DERWA customers. Parsons Engineering was hired to study the sand filter pass-through phenomena and prepare a study with recommendations for modifications and/or improvements to remedy the problem. DSRSD began removing and cleaning the strainers and/or turbines on all 140 recycled water customer meters. This work continued into 2007.

During August one non-reportable spill of recycled water occurred at a sewer siphon operated by DSRSD for a residential development. Recycled water used to automatically flush the siphon was discovered spilling from the piping to the ground surface. The spill was estimated to be approximately 225 gallons before the automatic flushing system was removed from service for modifications. DSRSD staff later determined that increased water pressure in the DERWA system resulted in higher volumes of water that were released by the automatic flushing system, which was later adjusted and corrected.

5. EMERGENCY READINESS AND RESPONSE

5.1 Emergency Responses in 2006

There were no emergencies declared during the past year.

5.2 Emergency Contact List

The current contact list, including general information, technical issues, and emergency response, is listed below:

General Information Contact Numbers

The general contact information for each agency is as follows:

Agency	*Contact*	*Office*
DSRSD	Sue Stephenson, Community Affairs Supervisor	(925) 875-2295
DSRSD	Mary Gordon, Public Information Officer	(925) 875-2290
EBMUD	Charles Hardy, Senior Public Affairs Representative	(510) 287-0141
EBMUD	Jeff Beccera, Senior Public Information Representative	(510) 287-0143
DERWA	Jim Bewley, Authority Manager	(925) 875-2234

Technical Questions and Complaints

The general contact information for each agency is as follows:

Agency	*Contact*	*Office*
DSRSD	Bob Anderson, Field Operations Supervisor for Distribution System	(925) 570-8757
DSRSD	Levi Fuller, Operations Supervisor for Treatment Facilities	(925) 570-8775
DSRSD	Dan Gallagher, Operations Manager	(925) 570-8759
DSRSD	Stefanie Olson, Clean Water Program Coordinator	(925) 570-9756
EBMUD	Debra Skeaton, Water Distribution Supervisor	(925) 287-1071

Emergency Contact Numbers

The emergency contact information for each agency is as follows:

Agency	*Contact*	*Office*	*Weekend/After Hours*
DSRSD	24 Hour On Call Operator		(925) 872-5890
DSRSD	Plant Operations	(925) 846-4565	(925) 519-0557
DSRSD	Bob Anderson, Field Operations Supervisor for Distribution System	(925) 570-8757	(209) 239-4816
DSRSD	Levi Fuller, Operations Supervisor For Treatment Facilities	(925) 570-8775	(707) 552-4094
DSRSD	Dan Gallagher, Operations Manager	(925) 570-8759	(925) 803-0546
DSRSD	Blake Kurz, Mechanical Supervisor	(925) 570-8292	(925) 634-9780
EBMUD	24 Hour On Duty Operator		(866) 403-2683
DERWA	Jim Bewley, Authority Manager	(925) 875-2234	(650) 465-0042

6. INVOICED COSTS

6.1 Treatment and Distribution Costs During 2006

During 2006 the total cost invoiced to DERWA for the operation and maintenance of the treatment and distribution system was $689,077. Of this amount, $582,810 was the total cost related to treatment, and $106,267 was the total cost related to distribution. However, a recent examination of past invoices revealed that some labor hours charged to DERWA for transmission during November and December were for cleaning plastics from DSRSD customer meters, which should not have been charged to DERWA. These incorrectly invoiced labor costs will be reversed via a credit on the next available DERWA invoice. Table 12 shows the treatment and distribution cost invoiced each month during 2006. Please note that the amount invoiced in April 2006 included costs for February, March, and April.

TABLE 12
DERWA System: 2006 Invoiced Costs for Treatment and Distribution

Month	Treatment Cost $	Distribution Cost $	Total Cost $
JAN			
FEB			
MAR			
APR	$18,906.43	$3,650.93	$22,557.36
MAY	$60,400.84	$2,439.32	$62,840.16
JUN	$104,981.12	$8,713.57	$113,694.69
JUL	$94,629.84	$9,018.74	$103,648.58
AUG	$116,384.17	$9,406.48	$125,790.65
SEP	$46,518.09	$3,032.17	$49,550.26
OCT	$65,789.64	$6,803.28	$72,592.92
NOV	$31,169.46	$32,413.99	$63,583.45
DEC	$44,030.64	$30,788.40	$74,819.04
AVG	$64,756.69	$11,807.43	$76,564.12
TOTAL	$582,810.23	$106,266.88	$689,077.11
MIN	$18,906.43	$2,439.32	$22,557.36
MAX	$116,384.17	$32,413.99	$125,790.65