City of Riverside

WASTEWATER COLLECTION AND TREATMENT FACILITIES INTEGRATED MASTER PLAN

VOLUME 2: BASIS OF PLANNING
CHAPTER 3: POPULATION AND FLOW PROJECTIONS

FINAL
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City of Riverside

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Chapter 3

POPULATION AND FLOW PROJECTIONS

3.1 PURPOSE

The purpose of this chapter is to present population projections developed by others and to use these population projections to help develop a projection of the influent wastewater flow quantities and characteristics through the year 2025 for the Riverside Regional Water Quality Control Plant (RWQCP). The flow quantities and characteristics projections will be used as a basis for the design criteria in the Integrated Master Plan. A separate set of flow projections for the collection system is presented in Volume 3, Chapter 1 - Wastewater Collection System. These flow projections are for the City of Riverside's (City) collection system and reasonably agree with the RWQCP influent flow projections that are presented in this chapter.

3.2 BACKGROUND

The Riverside RWQCP is currently providing treatment and disposal of wastewater generated within the City and from the Jurupa, Rubidoux, and Edgemont Community Services Districts (CSDs). Treatment for wastewater will also be included for the community of Highgrove, beginning in 2008.

The RWQCP wastewater flow quantities and characteristics assumed in the Integrated Master Plan are developed by examining and projecting historic population information and wastewater flows and characteristics. There are two growth scenarios for the flow projections, which are based on applying a 90-percent confidence interval to the projected RWQCP influent wastewater flows. The upper end of the 90-percent confidence interval is labeled the high-growth scenario and the lower end of the 90-percent confidence interval is labeled the low-growth scenario. At the beginning of the Integrated Master Plan process, the City decided that the high-growth scenario should be used as the design basis for all process alternative evaluations. However, after the process alternative evaluations were completed, during the rate setting process, it was determined that the slow down in the housing market would cause wastewater flows into the RWQCP to increase at a slower rate than was originally projected. Because of this slow down, the City decided that the low-growth scenario should be used for establishing the capital improvement plan (CIP), operation and maintenance (O&M) costs, and user rates and connection fees.

3.3 HISTORIC AND CURRENT POPULATION

Table 3.1 presents the historic population of Riverside from 2000 to 2006. The population of Riverside has increased at an average annual rate of 1.7 percent during the past 6 years, and it composed the majority of the population in the current RWQCP service area. The estimated year 2006 population for the CSDs is also shown in Table 3.1.

Table 3.1	Historic Population for Riverside, Edgemont, Rubidoux, and Jurupa Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside						
Area	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Riverside[1]	259,738	262,264	270,944	277,459	281,775	287,321	287,820
Edgemont[2]	-	-	-	-	-	-	6,600
Rubidoux[2]	-	-	-	-	-	-	26,000
Jurupa[2]	-	-	-	-	-	-	72,000

Notes:
(1) From the City.
(2) From CSDs. Data not available for 2000-2005.

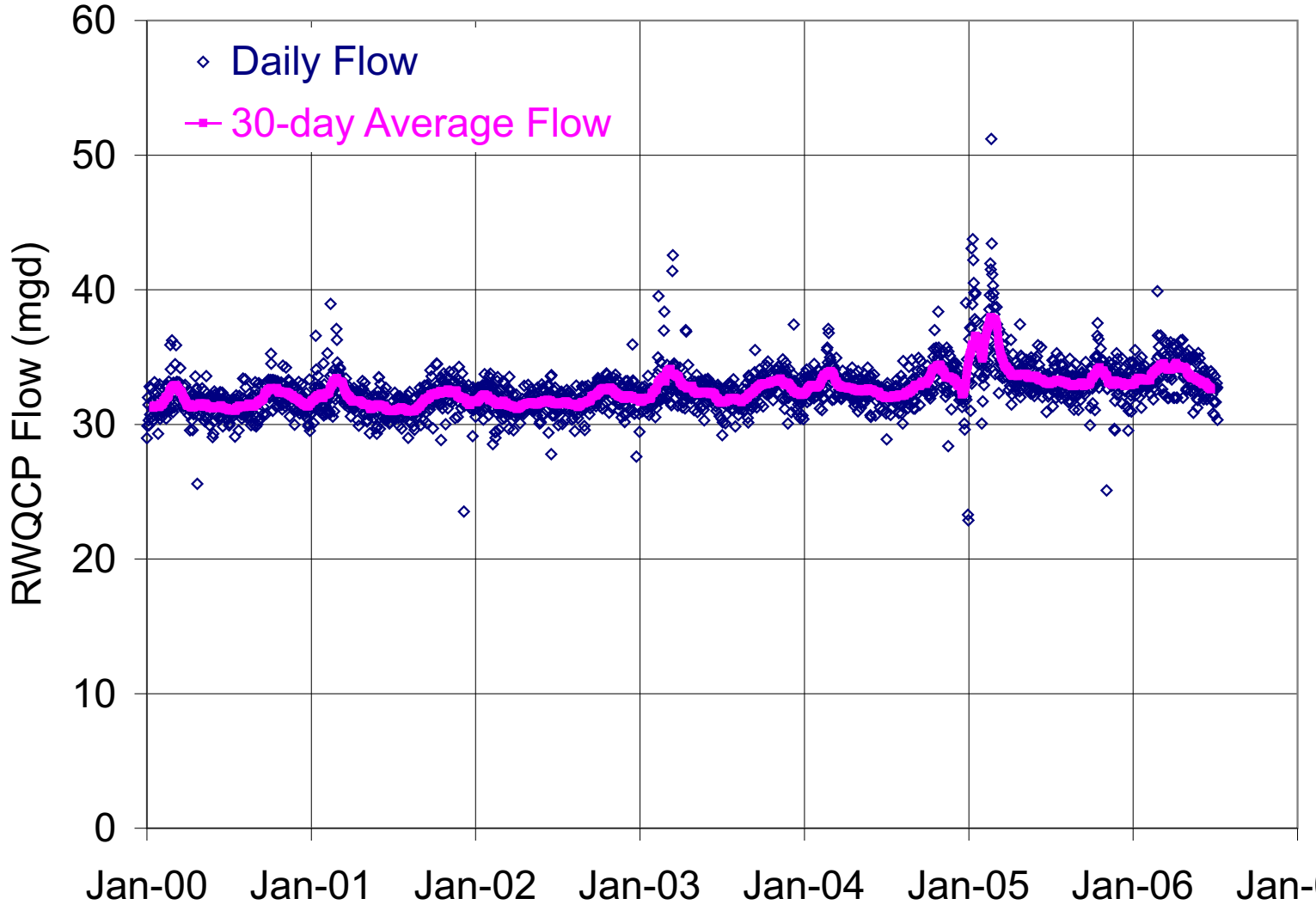
3.4 HISTORIC FLOW CHARACTERISTICS

Figure 3.1 shows the assumed average daily influent flow and the 30-day running average influent flow at RWQCP for the past 6 years. It should be noted that due to the existing influent metering configuration there is concern that the RWQCP influent flow may not be measured accurately. For this reason, the effluent meter reading, adjusted for the amount of recycled water that is pumped offsite, is used as the assumed RWQCP influent flow, and the CSD meters are used as the assumed CSD influent flows for the flow projection analysis.

The highest 30-day average flow was approximately 38 mgd in both February and March 2005. The overall average daily flow is 32.6 mgd. The flow for just the City (excluding Jurupa, Rubidoux, and Edgemont) is also presented in Table 3.2. This is calculated by subtracting the metered flows of the CSDs from the RWQCP flows.

Table 3.2	Average Daily Flow and Flow per Capita for Riverside Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside							
Parameter	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Average**
RWQCP Flow (mgd)[1]	31.7	31.9	31.8	32.6	32.9	34.0	33.5	-
Edgemont Flow (mgd)[2]	0.7	0.6	0.6	0.6	0.6	0.6	0.6	-
Jurupa Flow (mgd)[2]	3.3	3.3	3.2	3.2	3.2	3.7	3.5	-
Rubidoux Flow (mgd)[2]	2.0	2.0	2.0	2.0	2.1	2.1	2.1	-
Riverside Flow (mgd)[3]	25.7	26.0	25.9	26.7	27.0	27.6	27.4	-
Flow per Capita (Gallon/d/capita)[4]	99.1	98.9	95.5	96.2	95.7	95.9	95.1	96.6

Notes:
(1) Based on effluent flowmeter readings.
(2) From CSDs.
(3) Calculated by subtracting CSDs' flows from RWQCP flows before rounding.
(4) Calculated by dividing the Riverside Average Daily Flow by Population (City of Riverside only).



DAILY INFLUENT FLOW AND 30-DAY RUNNING AVERAGE FLOW AT RWQCP

FIGURE 3.1

Based on the historic population presented in Table 3.1, and the flow for the City during the same period, the flow per capita from 2000 to 2006 is shown in Table 3.2. The historic average flow is 96.6 gallons per capita per day.

3.5 HISTORIC WASTEWATER QUALITY CHARACTERISTICS

Figures 3.2 and 3.3 present the Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) for a daily average and a 30-day running average for the RWQCP influent for the past 6 years, respectively. Figure 3.4 shows the results of sampling for influent ammonia for the same period. There was an increase in influent BOD, TSS, and ammonia concentrations during the period. Based on the values presented in Table 3.3, a pronounced increase in influent BOD and TSS values occurred between 2003 and 2004. Although not as pronounced, a similar increase occurred in the influent ammonia. The two averages presented in Table 3.3 (one for the period 2000 to 2006 and one for the period 2004 to 2006) demonstrate this difference.

Table 3.3 Average Influent Water Quality Data at RWQCP Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside

								Average	
Parameter	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**7-Year(1)**	**3-Year(2)**
BOD (mg/L)	217	210	226	234	259	237	257	234	250
TSS (mg/L)	217	216	228	226	247	253	238	232	248
Ammonia (mg-N/L)	24.7	27.7	29.6	29.1	32.0	30.1	30.1	29.0	30.8

Notes:
(1) Average from 2000 to 2006.
(2) Average from 2004 to 2006.

3.6 PROJECTED INFLUENT FLOW QUANTITIES

Based on information supplied by the City, the population (City only) is projected to be 353,397 in the year 2025. This is an annual average increase of approximately 1.09 percent, between 2006 and 2025. Figure 3.5 presents the historic population and the population projection for the City of Riverside. A linear increase is applied to the projected population for the years between 2006 and 2025. These values are presented in Table 3.4. Based on the assumption that the future flow per capita will be the same as the historic average of 96.6 gallons per day per capita, the projected flows for the City of Riverside are calculated, as shown in Table 3.4.

Table 3.4	Projected Populations and Average Daily Flows for Riverside Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside				
Parameter	**2006**	**2010**	**2015**	**2020**	**2025**
Population[1]	287,820[3]	301,626	318,883	336,140	353,397[3]
Flow[2] (mgd)	27.4	29.2	30.8	32.5	34.2

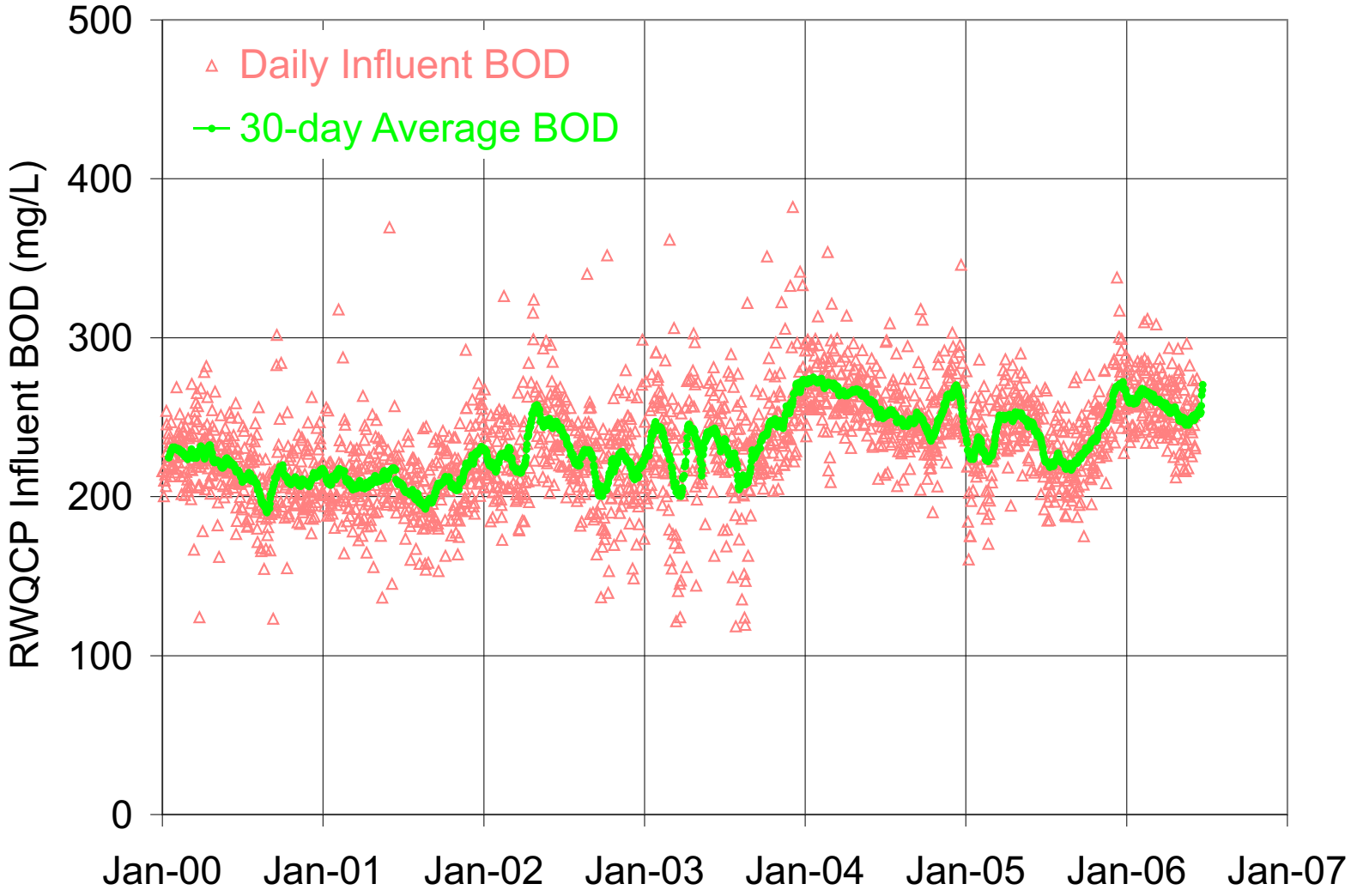
Notes:
(1) Linear increase for population projections.
(2) Future flow per capita is assumed to be 96.6 gallons per day per capita. Annual flow increase equals 1.09 percent.
(3) From the City.

The maximum expected flows from Jurupa, Rubidoux, and Edgemont are expected to be 6.9 mgd, 3.1 mgd, and 0.9 mgd, respectively, in 2025. The flows are derived by assuming that each CSD's discharge will increase linearly so that they will discharge by 2025, to the limit of their existing purchased capacity. (This applies to all CSDs except Jurupa, who is expected to increase their purchased capacity from 4.0 mgd to 6.9 mgd.) Assuming a linear increase in flows between 2006 and 2025, the intermediate year flows for Jurupa, Rubidoux, and Edgemont are presented in Table 3.5.

Table 3.5	Projected Flows for Jurupa, Rubidoux, Edgemont, and Highgrove (mgd) Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside				
Area	**2006**	**2010**	**2015**	**2020**	**2025**
Jurupa[1]	3.5	4.2	5.1	6.0	6.9
Rubidoux[1]	2.1	2.3	2.5	2.8	3.1
Edgemont[1]	0.6	0.6	0.7	0.8	0.9
Highgrove[2]	0.0	1.6	3.0	3.7	4.4

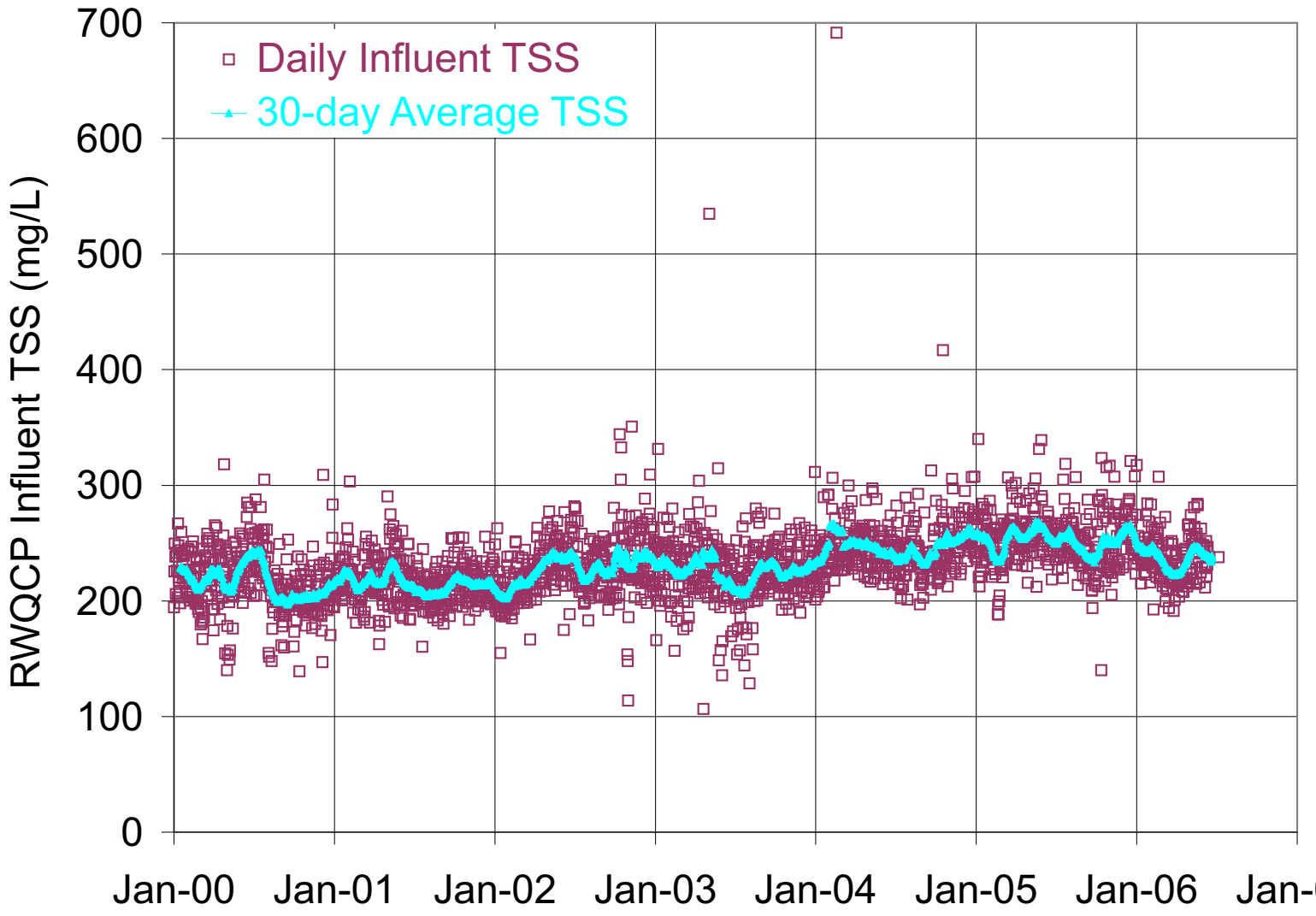
Notes:
(1) Flows for 2006 and 2025 were supplied by the City for the CSDs. Intermediate flows are calculated based on a linear increase.
(2) Flows for 2006, 2012, and 2025 are assumed to be 0.0, 2.6 and 4.4, respectively. These flows were supplied by the City. Intermediate flows are calculated based on a linear increase.

The community of Highgrove is not currently sewered, but the flows of 2.6 mgd and 4.4 mgd in the years 2012 and 2025, respectively, are expected, as the community connects to the collection system. Using a linear increase the projected flows in 5-year increments are calculated for Highgrove, as shown in Table 3.5.



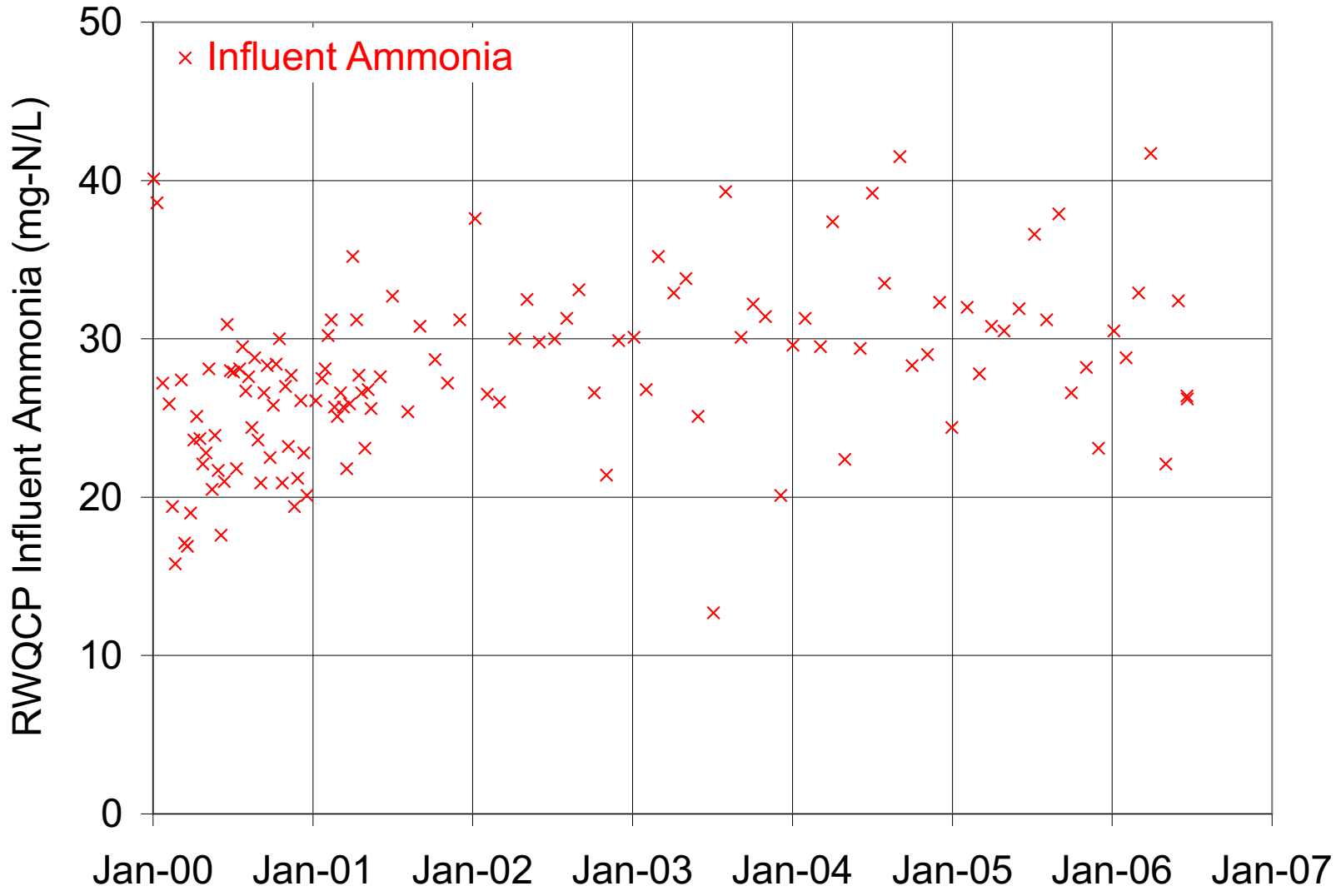
DAILY AVERAGE INFLUENT BOD AND 30-DAY RUNNING AVERAGE BOD AT RWQCP

FIGURE 3.2



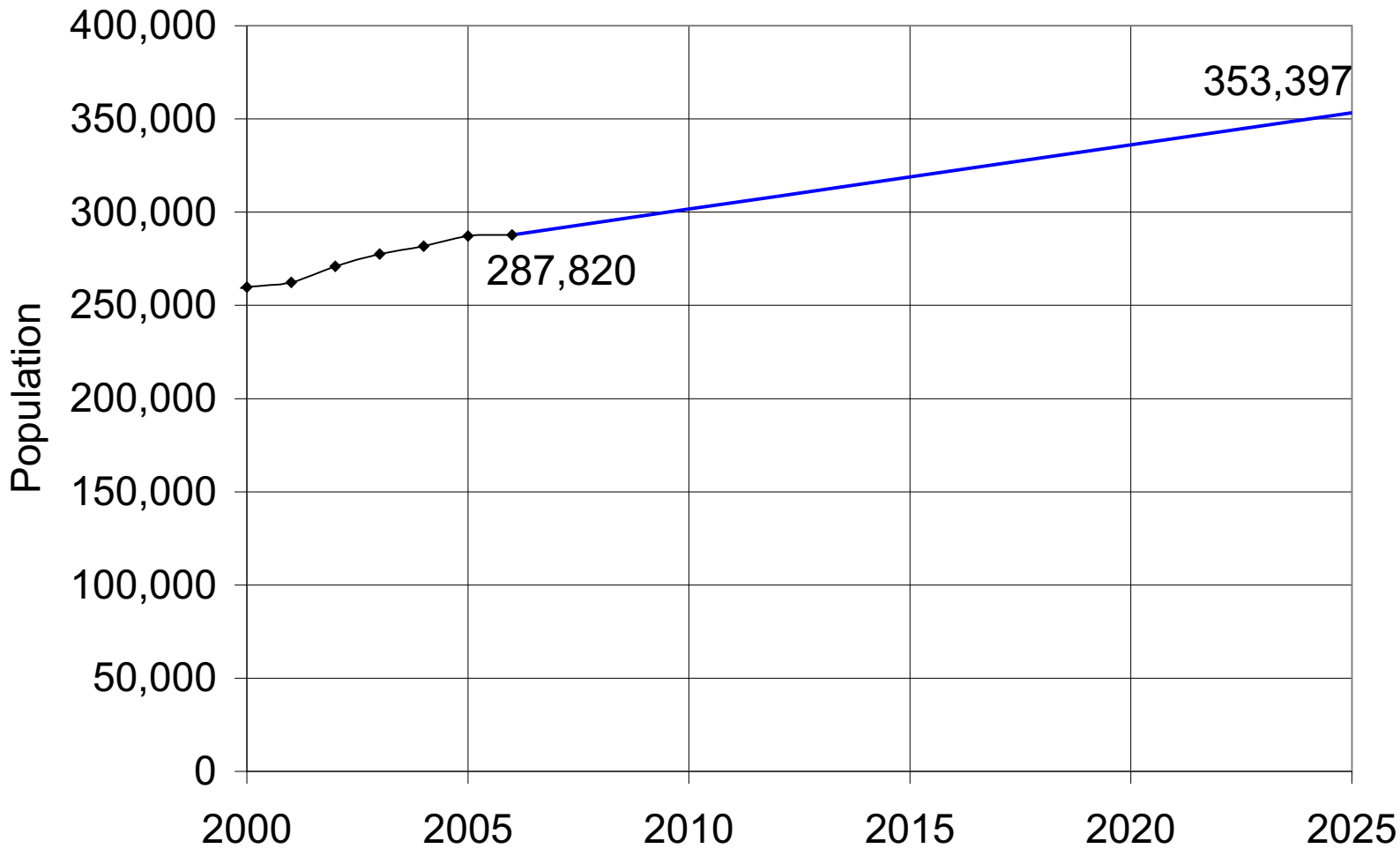
DAILY AVERAGE INFLUENT TSS AND 30-DAY RUNNING AVERAGE TSS AT RWQCP

FIGURE 3.3



INFLUENT AMMONIA AT RWQCP

FIGURE 3.4



HISTORIC AND PROJECTED POPULATION FOR THE CITY OF RIVERSIDE

FIGURE 3.5

The projected flows for Riverside, the CSDs, Highgrove, and the total flow for the planning period, 2006 to 2025, are presented in Table 3.6.

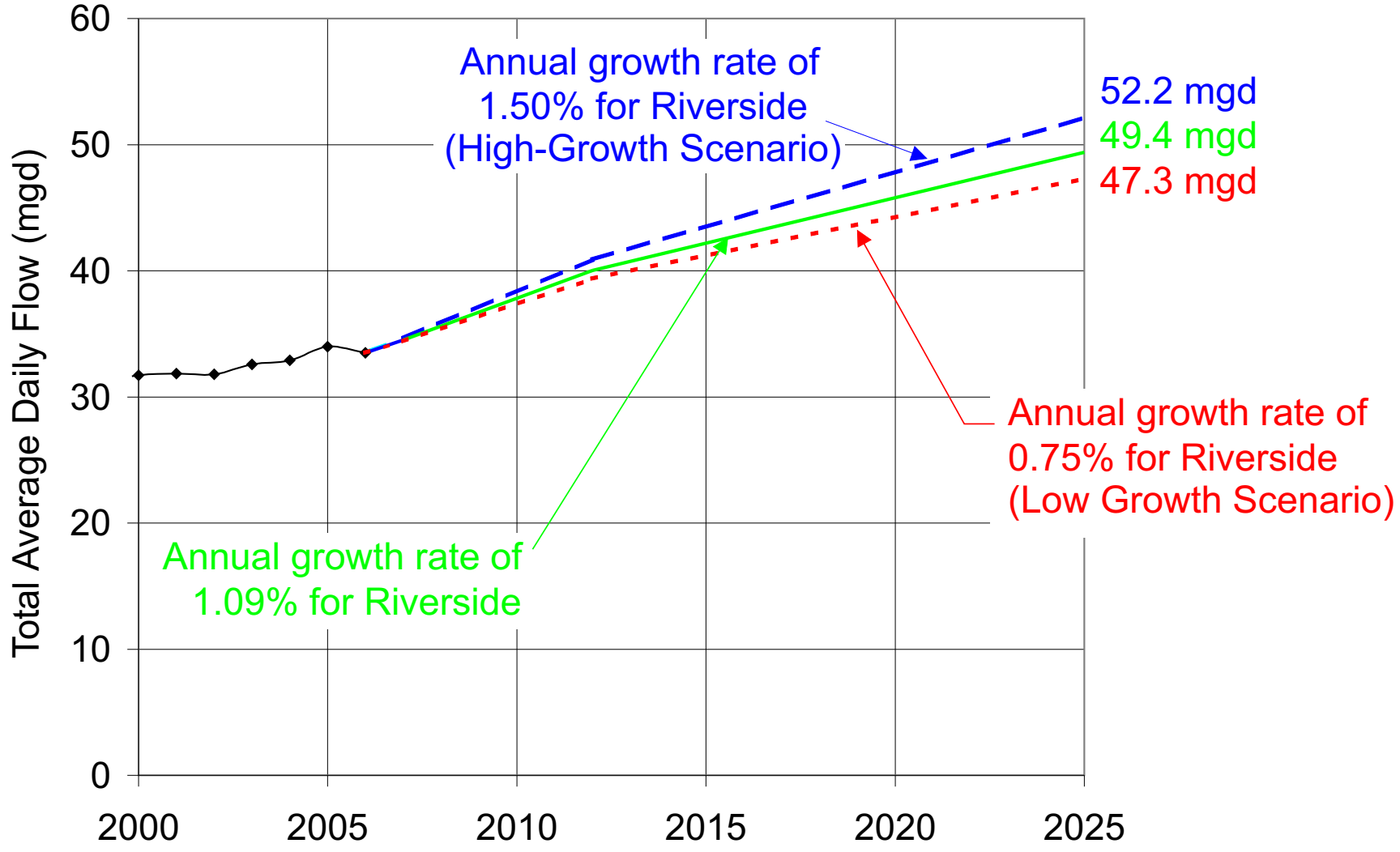
**Table 3.6 Projected Average Daily Flows for RWQCP (mgd)
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside**

Area	2006	2010	2015	2020	2025
Riverside[(1)]	27.4	29.2	30.8	32.5	34.2
Jurupa	3.5	4.2	5.1	6.0	6.9
Rubidoux	2.1	2.3	2.5	2.8	3.1
Edgemont	0.6	0.6	**0.7**	0.8	0.9
Highgrove	0.0	1.6	**3.0**	3.7	4.4
Total Average Flow[(1)]	**33.5**	**37.8**	**42.2**	**45.8**	**49.4**

Notes:
(1) Annual increase equals 1.09 percent for City.

Figure 3.6 shows the total projected average daily flows for the RWQCP. As stated previously, the annual flow increase percentage is approximately 1.09 percent. Based on the daily flows in the past 6 years, a 90-percent confidence interval for the flow in the year 2025 was calculated. The calculation results in an approximate flow range of between 47.3 and 52.2 mgd. These are labeled the high-growth and low-growth scenarios, respectively, in Figure 3.6. (A 90-percent confidence interval means that, based on the historical flow data, there is a 90-percent chance of the future flows falling within range of 47.3 to 52.2 mgd in the year 2025.) The 90-percent confidence interval is equal to an annual flow increase range of between 0.75 and 1.5 percent.

The City has no control over how fast the CSDs and the Highgrove area increase their flows into the RWQCP. And, based on recent activity, there is a concern that residential development may grow faster than is currently predicted. If these occur there is a good chance that RWQCP flows will tend toward the high-growth scenario. In addition, for a master planning process it is more prudent to plan based on conservative assumptions about future growth. For these reasons, the City chose to use the high-growth scenario (52.2 mgd and an annual growth rate of 1.5 percent) as the basis of the process alternative evaluations for the Integrated Master Plan. This decision was made at a meeting on August 31, 2006. Since that time, a slow down in the housing market has occurred, which caused the City to reevaluate the potential RWQCP influent flows for the master plan planning period. Based on the reevaluation, the City, at a meeting on September 20, 2007, decided that the lower end of the 90-percent confidence interval would be more appropriate as the basis for 2025 RWQCP flow projections. This results in an average daily flow of 47.3 mgd, which corresponds to an annual growth rate of 0.75 percent (low-growth scenario).



TOTAL PROJECTED AVERAGE DAILY FLOWS FOR RWQCP

FIGURE 3.6

Because the process alternative evaluations were completed before September 20, 2007, the City, at a meeting on August 24, 2007, decided not to revise the process evaluations to reflect the change from the high-growth to the low-growth scenario, but instead to revise the CIP, O&M costs, user rates and connection fees assuming the low-growth scenario.

Table 3.7 presents the projected flows for the Master Plan planning period, applying the following peaking factors to the average daily flow of 52.2 mgd:

- Peak wet weather: 2.2.
- Minimum dry weather: 0.5.
- Peak dry weather: 1.8.
- Tertiary peak: 1.5.

Table 3.7 Projected Influent Average Daily Flows for RWQCP with Seasonal Variations
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside

Parameter	2006	2010	2015	2020	2025
Annual Average Daily Flow(1)	33.5	38.4	43.5	47.8	52.2
Peak Wet Weather Flow	73.7	84.5	95.7	105.2	114.7
Minimum Dry Weather Flow	16.8	19.2	21.7	23.9	26.1
Peak Dry Weather Flow	60.3	69.1	78.3	86.1	93.9
Tertiary Peak Flow	50.3	57.6	65.2	71.7	78.2

Notes:
(1) Annual increase equals 1.50 percent for City.

3.7 TEMPORARY WASTEWATER TREATMENT FOR A PORTION OF THE CITY OF COLTON

During the preparation of this Integrated Wastewater Master Plan, the City of Colton had requested and was negotiating with the City of Riverside to provide temporary wastewater treatment for a portion of Colton's service area. The amount of wastewater to be treated will be 1,850,000 gallons per day at a maximum peak flow rate of 4.50 cubic feed per second (cfs). These flows were not included with the "Projected Influent Flow Quantities". If in the future these flows are permanently directed into the City of Riverside's wastewater collection and treatment facilities, the Integrated Wastewater Master Plan will need to be revised.

3.8 PROJECTED INFLUENT FLOW CHARACTERISTICS

Influent water quality characteristics for the RWQCP, such as concentrations of BOD, TSS, and ammonia, are assumed to be the same until 2025. Because there seemed to be an increase between the year 2003 and 2004 in the influent BOD, TSS, and ammonia concentrations, the average as presented in Table 3.3 for the years 2004 through 2006 will be used for the Integrated Master Plan evaluations. These values are as follows:

- Influent BOD: 250 mg/L.
- Influent TSS: 248 mg/L.
- Influent Ammonia: 30.8 mg/L.

It should be noted that urban runoff flows are not included in the Master Plan projected flow quantities or characteristics. Due to the present regulatory environment, it is possible that the RWQCP would have to treat dry weather urban runoff in the future. If that occurs, the Integrated Master Plan would have to be updated to account for these flows.