PROJECTIONS FOR INFLUENT HYDRAULIC FLOW TO THE SJ/SC WPCP

Neal Van Keuren
City of San Jose
Environmental Services Department
Watershed Protection Division

INTRODUCTION

The 2005 update of the California Urban Water Management Plan (UWMP) includes a "quantification of the amount of wastewater collected and treated" in five-year increments through the year 2030. The service area of the San Jose/Santa Clara Water Pollution Control Plant (Plant) includes the area served by the Santa Clara Valley Water District (District) as the water wholesaler and five water retailers who in order of size include: San Jose Water Company; City of Santa Clara; City of San Jose; City of Milpitas; and Great Oaks Water Company. The Watershed Protection Division of ESD has prepared an estimate of average annual Plant influent flow (PIF) in millions of gallons per day (mgd) to supply to these water agencies for their planning purposes. Due to the short time frame allowed this should be considered a preliminary study useful for aggregate large-scale planning purposes such as the UWMP. This memorandum documents the methodology, analysis and findings of this study.

METHODOLOGY

This analysis considered the two sources of PIF, namely point sources and non-point sources. The first was broken down into two main categories: 1) residential; and 2) non-residential. The latter is defined as Extraneous Flows (ExF) made up of rainfall inflow and groundwater infiltration. The source of demographic data up through the present for the residential fraction includes State Department of Finance (DoF) for population and California Employment Development Department (CEDD) for labor force data. The Association of Bay Area Governments (ABAG)[1] is the source for population and job sector projections in 5-year increments up to 3030.

Per capita influent flow factors (in gallons per day) are then applied to the number of people living and working in the Plant Service Area (PSA) to generate total PIF in millions of gallons per day (mgd). These per capita factors represent indoor water use (IWU) for people at home and at work and are calibrated by a combination of usage data by sector and aggregate by the water and wastewater agencies. An IWU trendline was developed by plotting the lowest monthly water use along with PIF for each year from 1987 – 2004.[2] The IWU values derived

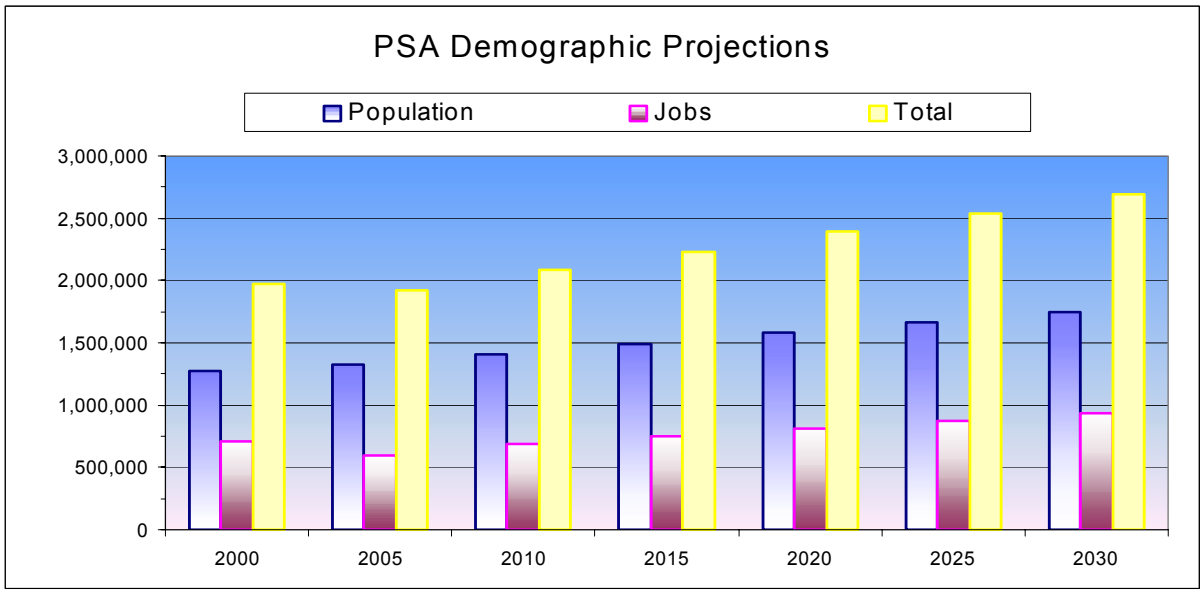
[1] ABAG is a regional planning agency that collects and analyzes demographic data by County throughout the San Francisco Bay Area. ABAG provides summaries of its analyses and projections for future resident population and employment trends by industry in semiannual reports, utilizing data from the previous two years. The projections contained herein are from the ABAG Projections 2005 report.

[2] The lowest water use is in the month with the highest rainfall (typically January or February), while the lowest PIF is in the driest month (typically July – September) when extraneous flows are minimal. There is a high degree of correlation of the smoothed trendline of these two values. An IWU trendline is then estimated using an assumption that 10 – 15% of all potable water use in the wettest month is used outdoors (with 85 – 90% used indoors).

from this trendline allow for a calibration of per capita factors on an annual basis when applied to historical and current demographic data. In addition, they allow for an estimation of ExF to the Plant that by definition is the difference between PIF and IWU. The potable water usage in the PSA is calculated by compiling wholesale water deliveries to the water retailers within the PSA and applying a line-loss factor of 0.94 to arrive at actual water used by customers of the Plant.[3]

PSA Demographics: Those living in the PSA currently represent 75% of the Santa Clara County population, a ratio expected to increase to 76% and 77% in 2015 and 2030 respectively. Historical and projected estimates for the number of people living and working in the PSA are provided in Figure 1 for 2000 to 2030. Total population, which increased by 58,000 (5%) over the last five years to 1,328,000 in 2005, is expected to increase by 76,000 over the next five years (6%) and 420,000 in 2030 (32%). Jobs in the PSA fell 107,000 since the economic bubble of 2000 (-15%) and are expected to rebound by 87,500 more jobs in 2010 (+15%) and 340,000 jobs (+57%) in 2030.

Figure 1: PSA Demographic Projections: 2000 – 2030



Source: State DoF, CEDD, and ABAG Projections 2005.

Per Capita Flow Factors: Per capita flow factors for the residential sector were developed using local water use data and sewage coefficients. A residential per capita flow factor of 60 gallons per day (gpd) was applied to the population in 2000.[4] This conservation benefit is expected to continue to lower residential per capita IWU and flatten the demand curve for a growing residential population. The PIF from the non-residential sector was developed by applying estimates of per capita IWU to the job sectors reported monthly by CEDD compiled into 14 job sector groups. These were then calibrated using IWU and PIF data from 1990 – 2005, along with industrial source control data and

[3] Line loss is unaccounted for water defined as the difference between water delivered at the wholesale level (e.g., metered at a treatment facility) and retail metered use. Values of 10 – 20% are considered normal when expressed as a percentage of water produced at the wholesale level. Polling of the PSA water retailers indicated a historical line loss rate of 9% dropping to 6% in recent years.

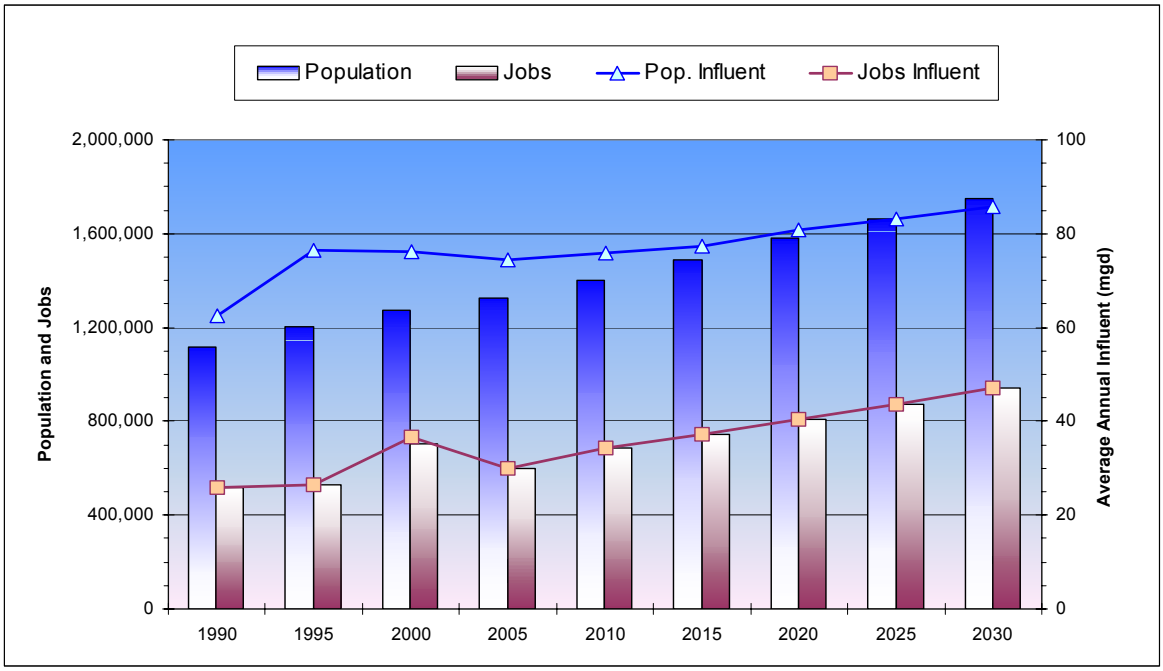
[4] The average residential IWU factor of 186 gpd per household from the *CSJ Water Use and Conservation Baseline Study, April 1999.*, with an average per household density of 3.1 persons

discussions with water retailers, resulting in an overall average of 50 gpd per job. The following PIF projections assume this value will remain static.

RESULTS

Residential per capita IWU and aggregate influent flows rebounded out of the preceding drought period, peaked in 1995, and then began declining as a result of conservation.[5] As shown in Figure 2 below, the continuing benefits of conservation will result in a residential IWU demand trend that is flatter than population growth. The ABAG projections indicate a steady population increase of 1.1% per year − adding 422,500 residents to the PSA by 2030. This analysis estimates PIF from the residential sector to increase by 15% by 2030, representing an annual increase of 0.6% per year.

Figure 2: PSA Demographic and PIF Projections: 2000 – 2030



Source: State DoF, CEDD, ABAG Projections 2005, CSJ ESD.

The expansive growth in the local economy leading up to 2000 resulted in an increase in the PSA labor force of 175,000 (+33%) and an increase in PIF of nearly 40% from 1995. The bursting of this economic bubble post-2000 has reduced the PSA labor force by 15% and PIF from the non-residential sector by 25 – 30%. The ABAG projections anticipate a steady increase in jobs in the future resulting in an increase of 340,000 (+57%) in the PSA by 2030. This analysis estimates PIF from the non-residential sector to increase at the same rate as jobs representing an increase of 17 mgd or an annual increase of 1.8% per year.

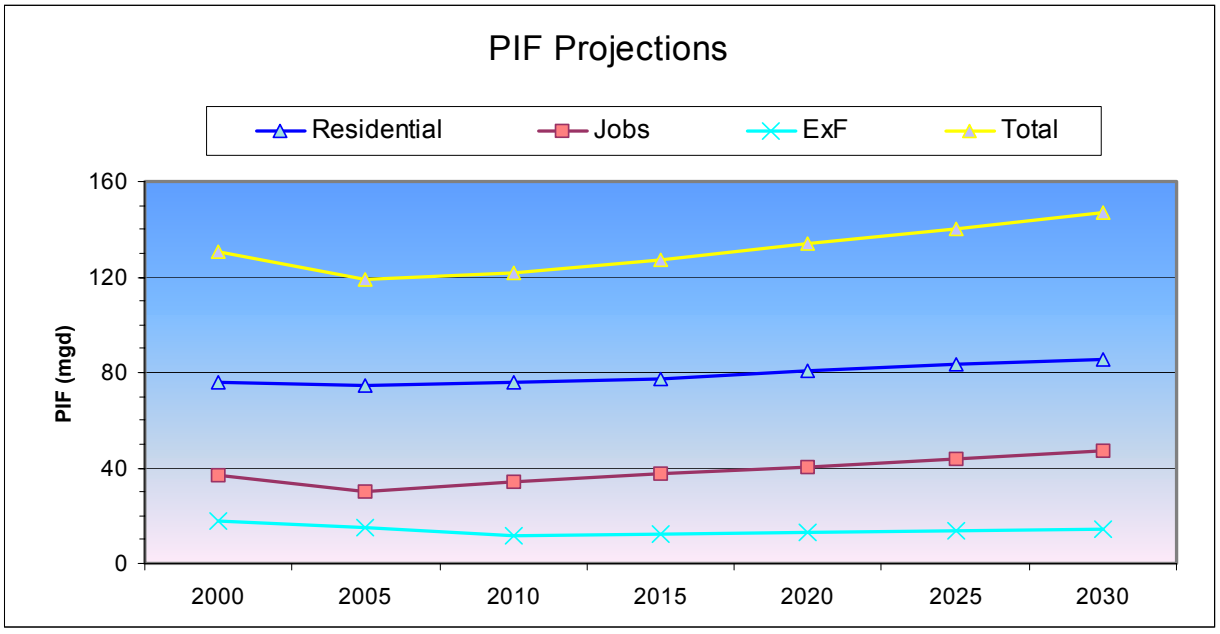
[5] Since 1992 all plumbing devices sold in California (water closets, showerheads, etc.) must be water conserving. The adoption and enforcement of local plumbing codes has required all new construction and remodels to install water-conserving plumbing devices since 1992 as well. It is assumed that as more people live in newer dwelling units and replace old or broken fixtures, residential per capita rates should continue to decline. In addition to these "hard savings", water-conserving behavior learned during the drought years of 1988 – 1991 appears to be continuing.

That portion of the PIF from non-point sources (calculated as PIF – IWU) is estimated to be 10% of total PIF during years of normal rainfall, and is used as a static ratio for the future projections in this study.[6] It should be noted that a very wet year could increase this ratio by 3 - 4%, and conversely a very dry year could have the opposite affect of reducing it 3 – 4%.

PIF Projections: The results of the analysis for average annual PIF projected to 2030 are presented in Table 1 and Figure 3 below. The increase in PIF from all sources from 114 mgd in 2004 to 147 mgd in 2030 represents a 0.8% annual increase. It is anticipated that the residential sector will make up 40% of this increase with 60% from the non-residential sector.

Table 1 and Figure 3. PIF Projections by Sector

Type	2000	2005	2010	2105	2020	2025	2030
Residential	76.2	74.4	75.8	77.4	80.7	83.1	85.8
Jobs	36.6	29.9	34.2	37.3	40.4	43.6	47.0
ExF	18.0	15.0	11.5	12.2	13.0	13.7	14.5
Total	**131**	**119**	**122**	**127**	**134**	**140**	**147**



[6] Rainfall has been recorded in San Jose since 1874, with the most recent gage of the National Weather Service located at Mission and San Pedro streets. The average or "normal" precipitation in San Jose is 14.5" per year, with the years 2002 – 2004 falling within 85% of normal – with the 10% ExF ratio the experience of 2002 – 2004. This year offers an opportunity to measure the high-end range of this ratio with rainfall for January – June at 207% of normal (15.1" vs. 7.3"), preceded by an October - December at 150% of normal (7.0" vs. 4.7"). The ExF for the first six months of 2005 has averaged +40% as compared to the previous three years, with the 2005 average annual value projected at 13% of total influent flow.