1455

Statement of Dennis O'Connor,
Assistant Director, California Research Bureau

SEP 22 1999

Comments on the CalFed EIS/EIR
September 22, 1999

Senator Johannessen, Chairman of the Senate Select Committee on Cal Fed Water Program, asked that I review the latest CalFed environmental documents to determine how CalFed is using urban water demand data from the California Water Plan, (AKA Bulletin 160). My findings follow. CR10

I have reported in other forums how Bulletin 160 appears to overstate urban water demand in both the base year 1995 and into the future.[1] Subsequent research shows this is a problem not only in Southern California, but in most, but not all, of the top 25 most populous urban areas. This is particularly true for the San Francisco Bay area, but also in parts of the Sacramento-San Joaquin Valley.[2]

By overstating urban water demand, Bulletin 160 either:

- Overstates current & projected water shortages
- Or, if the current & projected water shortages are correct, it overstates the total supply of water

The CalFed EIS/EIR directly cites Bulletin 160 in nearly 100 places.[3] About half are in the Water Use Efficiency Technical Appendix – most of the rest are in the Main EIS/EIR.

The citations in the Water Use Efficiency Technical appendix can be best characterized as comparative references. Often the references show how CalFed assumptions about water conservation are different from Bulletin 160, and the over all thrust is to distance this component of the program from Bulletin 160.

The Main EIS/EIR, however, is different. Just over half of its citations of Bulletin 160 are general references. (For example, in the comment on the previous EIS/EIR, there were many references to comments about how CalFed should or should not tie to Bulletin 160 assumptions). However, the balance of citations are where CalFed explicitly states that it is tying its analysis to Bulletin 160 data.

[1] See Attachment A: Dennis O'Connor, Statement, Presented to the Senate Select Committee on Cal Fed Water Program August 5, 1998

[2] See Attachment B: Urban Water Demand in the 25 Most Populous Detailed Analysis Units

[3] See Attachment C: Bulletin 160 References in the CalFed EIS/EIR & Technical Appendicies

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CalFed is using Bulletin 160 data in four key ways:

1. 2020 Demands for Delta Exports
2. Least-Cost Planning Simulation Model (LCPSIM).
3. 1995 & 2020 Hydrology
4. Existing conditions analysis

1. 2020 Demands for Delta Exports

CalFed is using Bulletin 160's year2020 demands as the high end of the range of possible demands for delta exports.[4] As I have told CalFed staff on a couple of occasions, this approach and use of Bulletin 160 estimates seems quite rational.

2. Least-Cost Planning Simulation Model (LCPSIM). IA-7.5.12-4

This analysis "uses a system simulation framework to evaluate the value of imported water."[5] To do so, the model assumes B160 supplies and demands.[6]

If B160 overstates the shortage, then LCPSIM overstates the economic impact of a drought to urban areas. This in turn would overstate the economic value of additional supplies to urban water users, which could lead CalFed to adopt measures to export more water than is economically justifiable.

However, what if B160 overstates both demands and supplies? Given the cursory overview of the model presented in the EIS/EIR, and the lack of citations to a more detailed explanation of the model and the data, it is not possible to predict how correcting Bulletin 160 data would affect the analysis.

3. Hydrology

The hydrology and upstream depletions for all modeling scenarios are based on DWR Bulletin 160-98 land use projections. CR10

- The 1995-level hydrology is called HYD-D06E.[7]
- The 2020-level hydrology is called HYD-D09C.[8]

[4] See for example Vol. 301, pp. 1-21 & 5.2-14

[5] Vol. 301, pp. 7.5-10

[6] Vol. 301, pp. 7.5-20 & 21, and Section 7.5.15.

[7] Vol. 301, p. A-14

[8] Vol. 301, p. A-19

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According to CalFed staff, DWR has not written a description of the assumptions for either of these hydrologies.[9] Again, without a description of the assumptions and the input data, it is not possible to predict how correcting problems with Bulletin 160 would affect CalFed's analysis.

4. Existing Conditions Analysis CR10

While never explicitly stated, it appears that the existing conditions described in EIS/EIR are those described in B160 for 1995.

The problem this causes is one of comparison. If CalFed overstates demands in 1995, and "correctly" describe the demands in 2020, CalFed will understate the gap that needs to be closed. CalFed would also understate the benefits of the program would create, which among other things could cause significant problems of financing the project using a beneficiary pays system.

What Does This Mean For CalFed?

Key assumptions, in the form of input data sets and model specifications are not documented. This is particularly a problem for the hydrology, since most of CalFed's modeling relies on at least some hydrologic assumptions. Unresolved, this could lead to CEQA/NEPA compliance problems.

However, what is more important is that until the Bulletin 160 data are "correct" the modeling that relies on the data is, at best, suspect. As noted in the main EIS/EIR:

> *Project operations modeling and Delta hydrodynamic modeling rely on the formulation of reasonable assumptions to accurately reflect the consequences of present and future water management decisions. The use of different assumptions may lead to conclusions that overestimate or underestimate the impact or benefits of implementing the various Program elements.*[10]

The problems Bulletin 160 could cause LCPSIM were discussed above. Other models that are affected are those that rely on the hydrology, including:

[9] Paul Hutton, personal communication, Sept. 16, 1999

[10] Vol. 301, p. 5.1-19

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- DWRSIM[11] – which is used to used to analyze the potential effects of proposed new features, such as additional reservoir storage or Delta export conveyance, as well as any changes to criteria controlling project operations. This model is critical to the alternatives analysis.[12]
- DSM2[13] – simulates the channel flows, tidal effects, and water quality of the Bay-Delta estuary. This model is also critical to the alternatives analysis.[14]
- EWA "gaming" – which is an attempt to provide flexibility in achieving environmental benefits while reducing uncertainties associated with environmental water requirements. While not explicitly stated in the EIS/EIR, these "games" rely heavily upon assumptions about hydrology.

Finally, it is also quite likely that a benefits-based financing system would rely on some measure of expected benefits – benefits calculated from model output.

What Should CalFed Do?

1. Much more clearly document its assumptions and how they are used -- if such documentation is not readily available, then CalFed should reported it in another appendix.
2. Publicly evaluate the hydrologic assumptions as they relate to Bulletin 160. The hydrologics are so critical to CalFed's analysis they deserve special attention.
3. Resolve base year conditions. Bulletin 160's 1995 demand estimates are clearly suspect. CalFed should either work with DWR to revise the Bulletin 160 estimates, or CalFed should develop its own.
4. Deal consistently with Bulletin 160's 2020 urban demand projections. CalFed cannot use one set of demand assumptions for LCPSIM, for example, and another for DWRSIM, and expect to get comparable and consistent results.

[11] See vol. 301, p5.1-24 & Table 5.1-2

[12] Vol. 301, p. 5.1-18

[13] See vol. 301, p5.1-24 & Table 5.1-2

[14] Vol. 301, p. 5.1-18

C-116252

Attachment A: 1455

Attachment A

Statement of Dennis O'Connor, Assistant Director, California Research Bureau Presented To the Senate Select Committee on Cal Fed Water Program August 5, 1998

C-116253

Statement of Dennis O'Connor,
Assistant Director, California Research Bureau
Presented To the
Senate Select Committee on Cal Fed Water Program
August 5, 1998

Chairman Johannessen, Members, for the record I am Dennis O'Connor, Assistant Director for Environment and Natural Resources for the California Research Bureau.

Mr. Chairman, on June 9, 1998, I testified before this committee on how DWR projected urban water demand through the year 2020. I described how DWR used a two-step process. That is, first, they forecast urban per capita daily consumption. They then multiply that forecast by the Department of Finance's population forecast.

I then described how DWR forecasts per capita daily consumption. Briefly, DWR first establishes base year consumption, and then forecasts changes to per capita consumption based on projected socio-economic effects and conservation efforts.

Then I explained that DWR establishes base year consumption by examining the historical pattern of water use and adjusts for hydrologic conditions.

Finally, I showed the Committee a chart showing historic urban water demand and DWR's estimated base year consumption. I have attached a slightly reformatted version of that chart, labeled Chart 1, to my printed testimony.

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This chart shows a gap of about 60 gallons per capita daily (gpcd) between historic water consumption and DWR's 1995 estimate of average year demand.

While DWR agreed with my description of its methodology, DWR strongly disagreed with the chart. In their view, the chart made an apples-to-oranges comparison that did not properly reflect the relationship between historic urban water demand and DWR's 1995 estimate.

Since June, DWR has been very accommodating in trying to resolve this issue. We have had a numerous meetings, telephone calls, e-mails etc., and they have provided me with the necessary data sets. The result of my research is:

There is still a gap between DWR's 1995 base year estimate and historic demand, although it is not as large as I originally thought it was.

There are three reasons why the chart shown on June 9, 1998 showed such a large gap between historic urban water use and the 1995 base year demand.

1. ***DWR mis-labeled a key chart in both the current draft Bulletin 160-98 AND the previous final version of Bulletin 160-93.***

In both the draft Bulletin 160-98 and the final Bulletin 160-93, DWR included a chart labeled "Urban per Capita Water Use". In draft Bulletin 160-93, DWR labeled the vertical-axis "gallons per capita daily". However, in the final Bulletin 160-93, DWR labeled the vertical -axis "Urban Applied

Water Use (gallons per capita daily)". Moreover, the text described the chart as urban applied water use. So naturally, I used the chart from the draft Bulletin 160-98 as the source for the historic urban applied water use shown in Chart 1.

However, discussions with DWR revealed that the chart in fact did not show urban applied water use. The chart actually showed urban municipal and industrial production (also known as urban M&I production).

Urban M&I production is one of two components of urban applied water. It represents the water urban water agencies put into their system for deliveries to their customers. The other component of urban applied water is self-supplied water. This is the urban water supplied by private wells. For some regions, like southern California, self-supplied water is a rather insignificant part urban applied water. However, in places like the San Joaquin Valley where there are a number of canneries, etc., which supply their own water through private wells, self-supplied water is very important.

Consequently, Chart 1 understates historic urban water use by the amount of self-supplied water. Statewide, self-supplied water accounts for about eight gpcd. The consequence of DWR's mis-labeling of the chart in Bulletin 160, then, is that we can account for about eight of the 60 gpcd discrepancy shown in Chart 1.

C-116256

2. *DWR changed how it accounted for water in the draft Bulletin 160-98, and did not describe the change in the text.*

In the previous Bulletin 160-93, as with all previous editions of Bulletin 160, DWR used four categories of water use: Urban, Agriculture, Environment, and Other. Other included major conveyance facility losses, recreation uses, and energy production.

However, in the current draft Bulletin 160-98, DWR used three categories of water use: Urban, Agriculture, and Environment. DWR spread Other water use across the remaining three water use categories. This means that the table in draft Bulletin 160-98 labeled "Urban Applied Water" actually included urban applied water *plus* a portion of Other. However, nowhere in draft Bulletin 160-98 did DWR discuss this break with tradition.

Consequently, Chart 1 understates historic urban water use by the amount attributed to Other water. Statewide, the Other water DWR attributed to urban water use is about 16 gpcd. So, the consequence of DWR's undocumented change in accounting is that we can account for another 16 of the 60-gpcd discrepancy shown on Chart 1.

Now, in all fairness to DWR, part of the reason for releasing a draft version of a report is to help identify these kinds of blunders. Moreover, correcting for these two errors puts us back to an apples-to-apples comparison. Chart 2 shows how these two corrections account for about 24 gpcd, or about 40 percent of the gap between historic urban M&I production and DWR's 1995 base.

C-116257

3. DWR's "normalization" process overstates baseline consumption

The purpose of normalization is to remove the year to year fluctuations in demand due to annual changes in hydrologic patterns.

To do so, DWR divides the state first into major hydrologic regions. It then divides each hydrologic region into planning sub-areas and then further divides the planning sub-areas into detailed analysis units or DAUs. For illustrative purposes, I will focus on the South Coast Hydrologic Region and DAU 96 -- Orange. (See Chart 3.)

For each DAU, DWR uses production data from select "representative agencies" as the basis for its normalization. For DAU 96, the agencies are: Anaheim, Buena Park, Costa Mesa, Fullerton, Garden Grove, Huntington Beach, Orange, Laguna Beach, and Santa Ana.

To establish the normalized 1995 demand, DWR did not want to use production from the five-year drought nor the first couple of years after the drought. This is because after the 1976-77 drought, demand quickly rebounded to its pre-drought level. (See Chart 4.) So, to establish the 1995 normalized demand, DWR extrapolated the 1980 to 1988 trend in urban M&I production to 1995. They then adjusted the estimate down slightly to adjust for the beginning of the Urban BMPs (Best Management Practices) which were designed to increase the level of urban water conservation and thereby reduce demand.

C-116258

The key assumption behind this approach is that trends in people's water use habits and practices that existed in 1980-1988 would continue on to 1995 as if the drought never occurred. That is, beyond some minor changes from toilet retrofits, etc., the five-year drought experience did not induce people to permanently change how they used water.

The data suggest otherwise. Chart 5 shows actual M&I production for the Orange DAU through 1995. The chart shows that actual production appears to have stabilized at a new lower level. The difference between the "Normalized" 1995 and actual production in 1995 is 30 gpcd, or about 47,000 acre-feet.

The Orange DAU is not unique. Virtually all south coast cities show similar water use patterns. DWR does not have complete data through 1995 on urban M&I production for all representative cities in the south coast hydrologic region. So, I combined the data for those cities for which DWR does have a full data set. The cities are: Anaheim, Banning, Downey, Fullerton, Inglewood, Los Angeles, Manhattan Beach, Orange, Pasadena, Redlands, Santa Ana, and Santa Monica. These cities have a combined population of just over 5 million, or about 1/3 of the south coast hydrologic region.

As shown in Chart 6, urban M&I production in the south coast does not appear to be returning its pre-drought trend. That is, the 1987-92 drought appears to have permanently changed how people in southern California use water.

More recent data further support this observation. The City of Los Angeles, in its *Urban Water Management Plan* for fiscal year 1996-97 observes; "Water use in Los Angeles increased by about 2 percent form the previous fiscal year.... The slight jump in sales can be attributed mainly to population growth, as citywide water conservation levels remain solid at 20 percent."*

Assuming the water use patterns shown in the previous charts apply statewide, the balance of the gap can be explained by DWR's normalization process. (See Chart 7.) DWR's normalized 1995 M&I production estimates appear to be overstated by about 15 percent. That works out to approximately 1.2 million acre-feet, or 20 percent more than the reservoir holding capacity of Folsom Dam.

There are technical issues with DWR's normalization approach as well.

Perhaps the most important has to do with how DWR selects the "representative" agencies for the DAUs. DWR tries to select agencies that best represent the water use of the DAU. Sometimes, like with the Orange DAU, it is easy – there are a number of agencies able and willing to provide the necessary data.

However, it is not always easy to find representative agencies for given DAUs. Take, for example, DAU 90 – San Fernando. The City of Los

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* City of Los Angeles, *Urban Water Management Plan: Annual Update Report*, Fiscal Year 1996-97, http://www.dwp.ci.la.ca.us/water/supply/uwmplan/

Angeles provides water to most of the DAU. However, DWR attributes all of Los Angeles's water use to DAU 89 – Coastal. That means two things. First, water use patterns in the Coastal DAU are skewed (probably upwards) by water use patterns in the San Fernando Valley. Second, it means that there are not any agencies well suited to represent water use in the San Fernando Valley.

DWR's solution is to use representative agencies from outside of the DAU. For the San Fernando Valley, DWR used San Gabriel Valley cities. For both the North Riverside and South Riverside DAUs (DAUs 100 & 104), DWR used the same four cities: Banning, Corona, Hemet, and Riverside. For the Temecula DAU (DAU 110), DWR used Corona, Hemet, and Escondido.

There is a potentially serious problem with this approach. While it is possible that water use in these areas show similar *patterns*, it seems unlikely that the absolute level of per capita water demand in these areas are the same. Riverside and Corona have different micro-climates than Banning and Hemet. Different cities have different mixes of businesses and industries. Family income and other socio-economic factors differ. And most important, different water agencies sell water at different prices and under different water conservation regulations.

These differences might or might not be important. What is important is that all interested parties agree that DWR has taken the best approach to estimating baseline demand – and on this point, there is no consensus.

Why is this important?

As I testified last June, DWR forecasts 2020 demand based on projected changes to this base. If the base is too high, the 2020 demand forecast is too high.

Moreover, CalFed is using these year 2020 forecasts for their alternative's analysis. If CalFed is trying to meet an overstated demand, they will exclude otherwise viable options because they cannot meet the overstated demand.

Finally, small error can generate a lot of water. A difference of 10 gpcd is equal to 360,000 acre-feet per year, the capacity Hetch Hetchy. A difference of 1 million people (less than the revision DOF made to it's year 2000 population forecast between its official 1993 and its1997 interim forecast) is equivalent to 224,000 acre-feet – a bit more than capacity of Pardee Reservoir.

Conclusions

In conclusion, I have two recommendations and a comment.

1. ***DWR needs to describe much more explicitly the hows and whys of its urban demand estimates in Bulletin 160-98.***

To its credit, DWR recognizes that there is a problem with their draft Bulletin 160-98 and is working to correct and clarify both the text and the supporting tables and charts.

2. DWR needs to revisit its normalization methodology.

As you might imagine, my testimony last June generated a lot of interest within the water world. Hallway discussions suggest that people on all ends of the water spectrum are uncomfortable with using 1980-1988 trends to set 1995 base conditions. This is especially true since actual trends differ greatly from DWR's 1995 base.

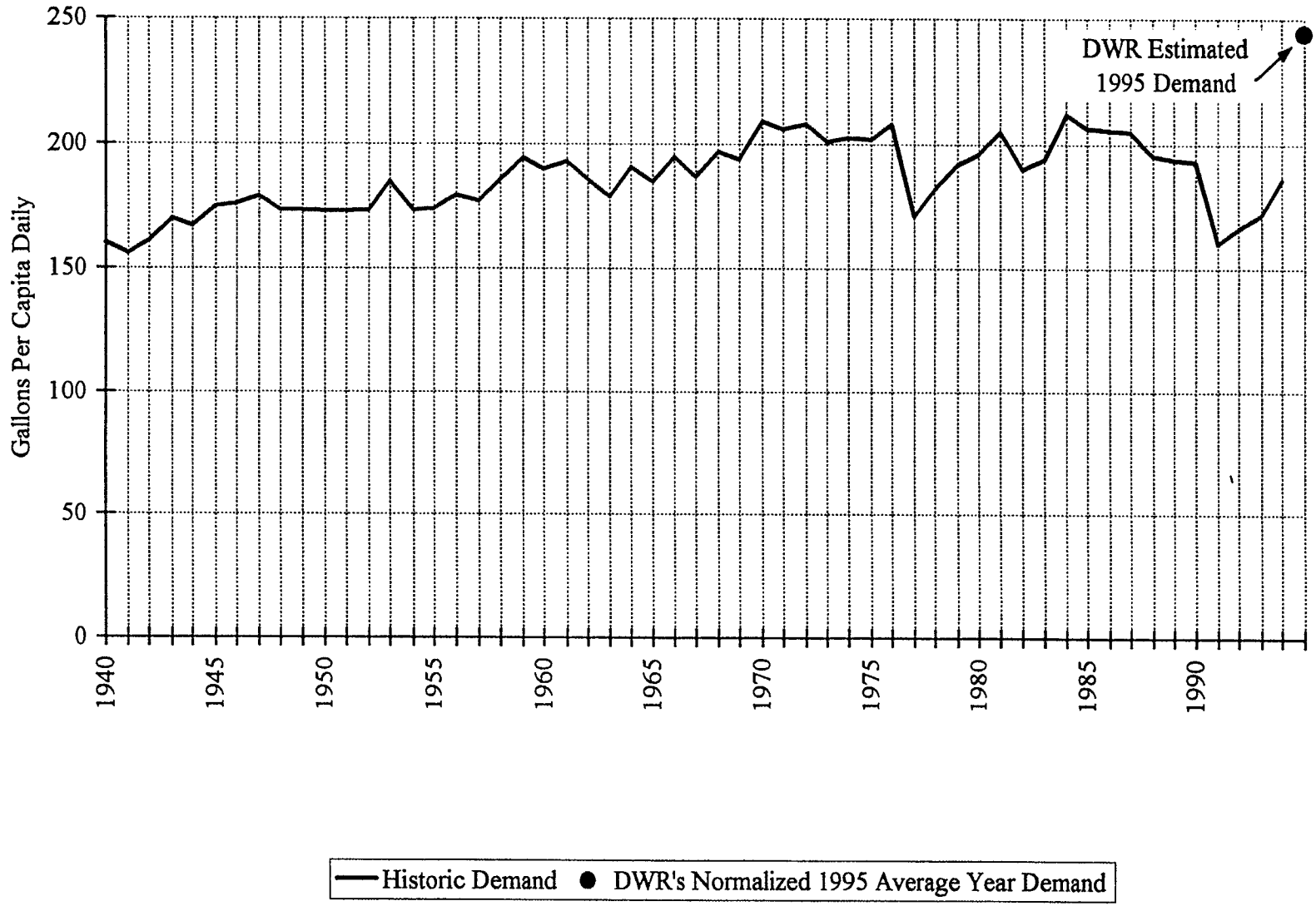
Comment

As I noted in June, if the CalFed alternative is to meet the solution principles (implementable, affordable, durable, etc.) it is important that the underlying forecasts be as accurate as possible. What I neglected to mention, is that it is just as critical that all involved in the CalFed process feel comfortable with the forecasts' accuracy as well. This is a key assurance issue. Both the accuracy and the perception of accuracy are equally important.

I will be happy to answer any question.

Chart 1

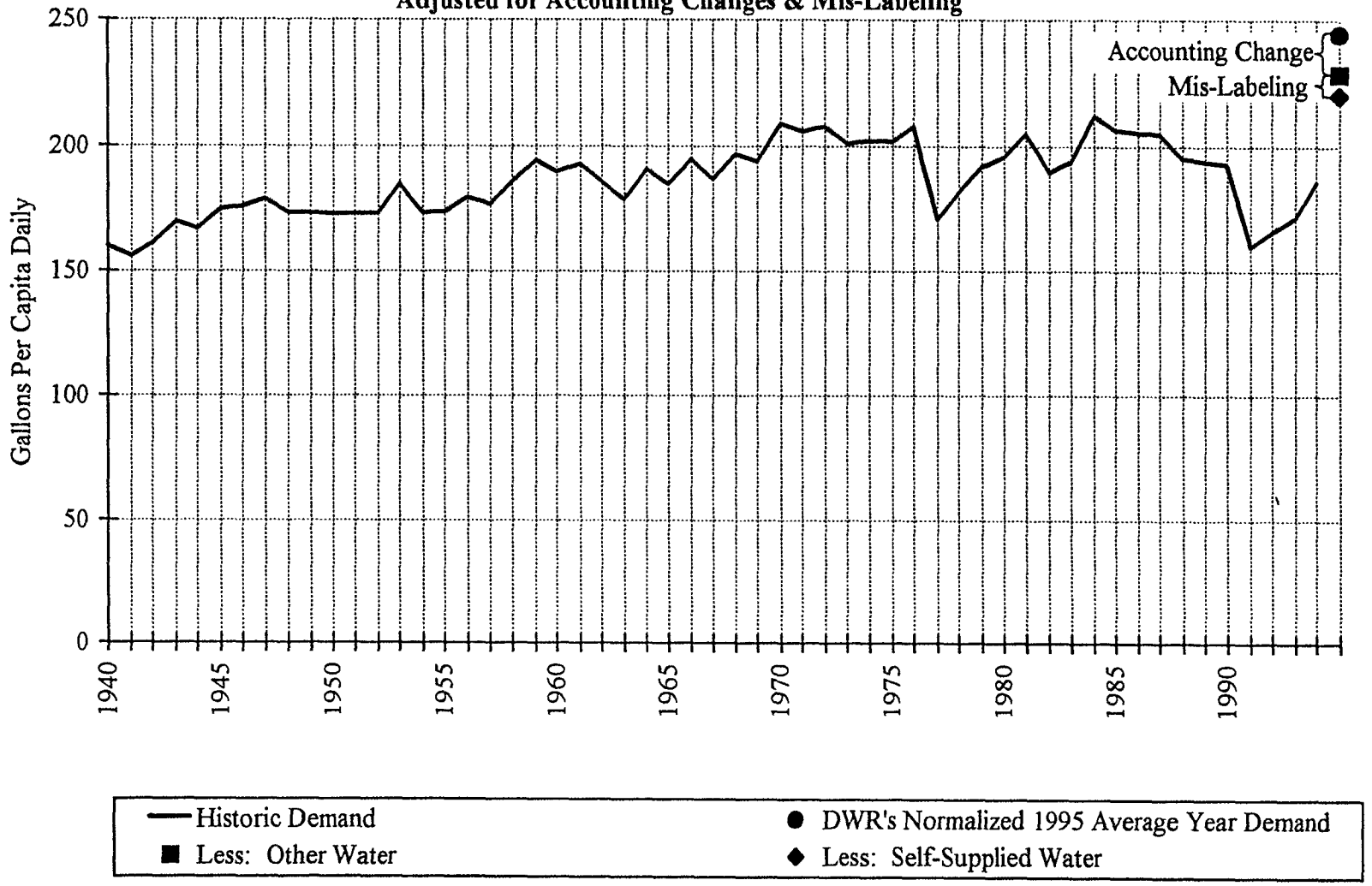
Urban Water Consumption -- Historical Demand and DWR's Estimated Base Year



Sources: DWR
Bulletin 160 Figure 4-5 and Table 4-10

California Research Bureau, California State Library

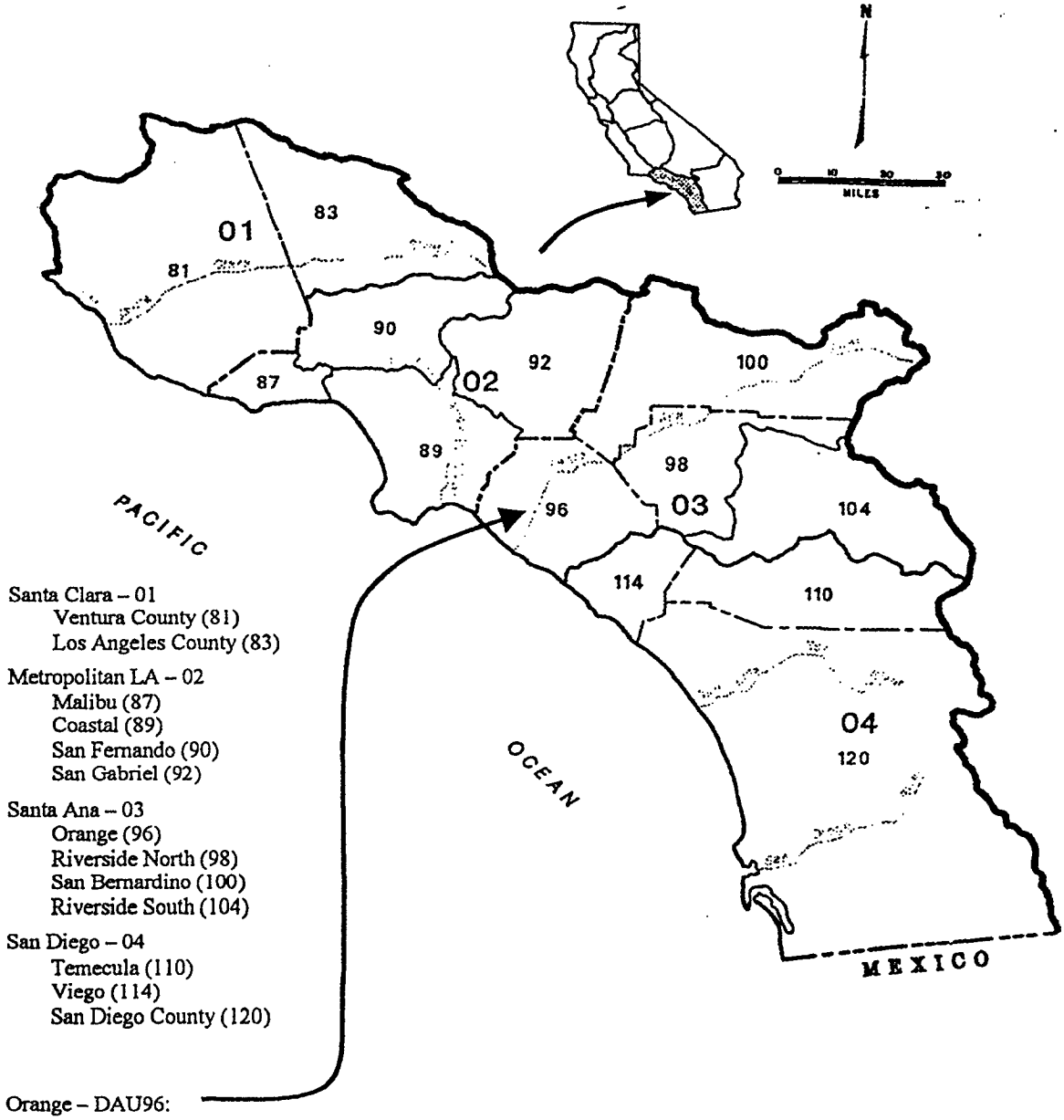
Chart 2
DWR's Normalized 1995 Average Year Demand
Adjusted for Accounting Changes & Mis-Labeling



Sources: DWR data, CRB analysis
Bulletin 160 Figure 4-5 and Table 4-10; DWR Staff

California Research Bureau, California State Library

Chart 3
South Coast Hydrologic Region
Planning Sub-Areas and Detailed Analysis Units



Santa Clara – 01
- Ventura County (81)
- Los Angeles County (83)

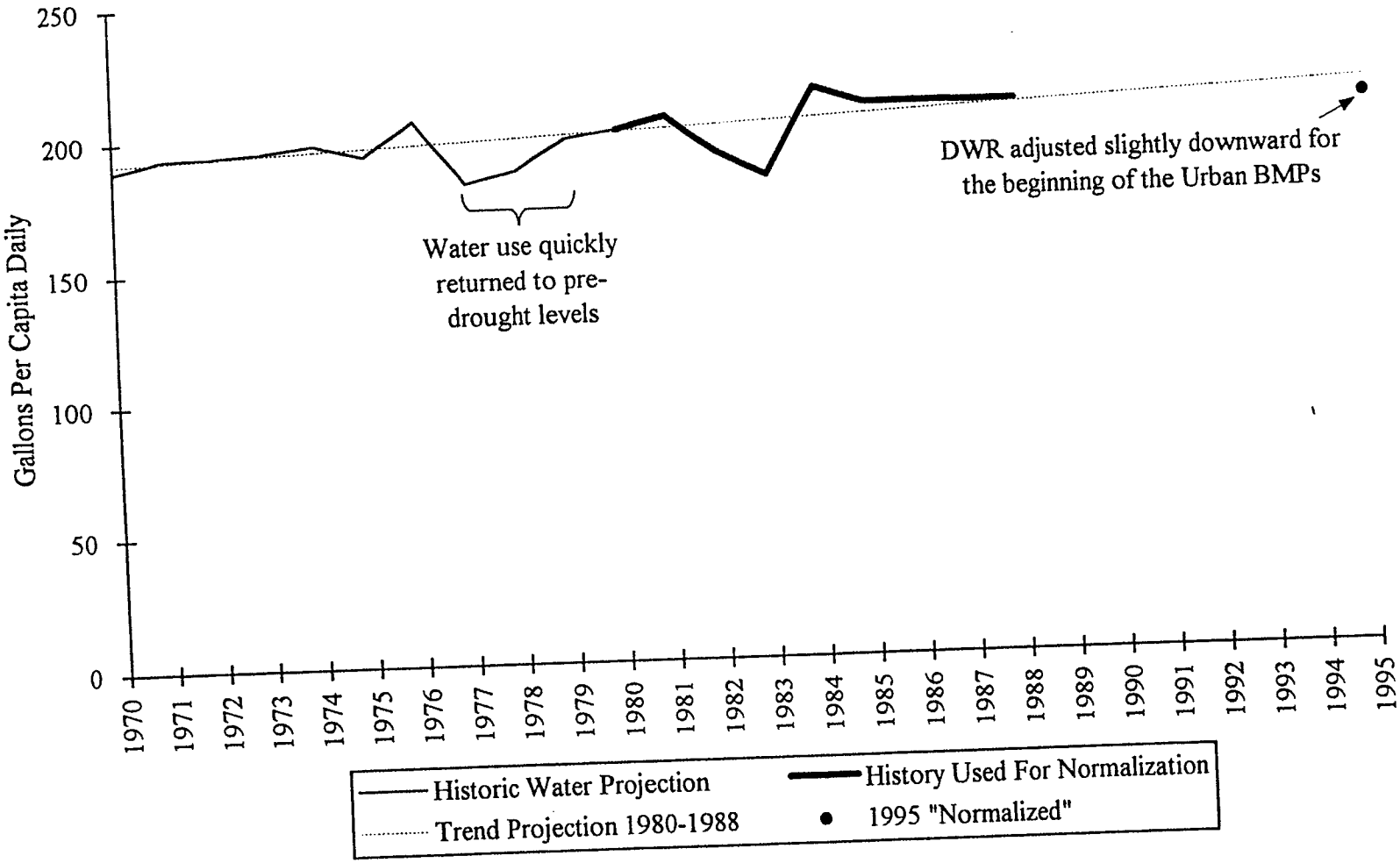
Metropolitan LA – 02
- Malibu (87)
- Coastal (89)
- San Fernando (90)
- San Gabriel (92)

Santa Ana – 03
- Orange (96)
- Riverside North (98)
- San Bernardino (100)
- Riverside South (104)

San Diego – 04
- Temecula (110)
- Viego (114)
- San Diego County (120)

Orange – DAU96:
- Anaheim
- Buena Park
- Costa Mesa
- Fullerton
- Garden Grove
- Huntington Beach
- Orange
- Laguna Beach
- Santa Ana

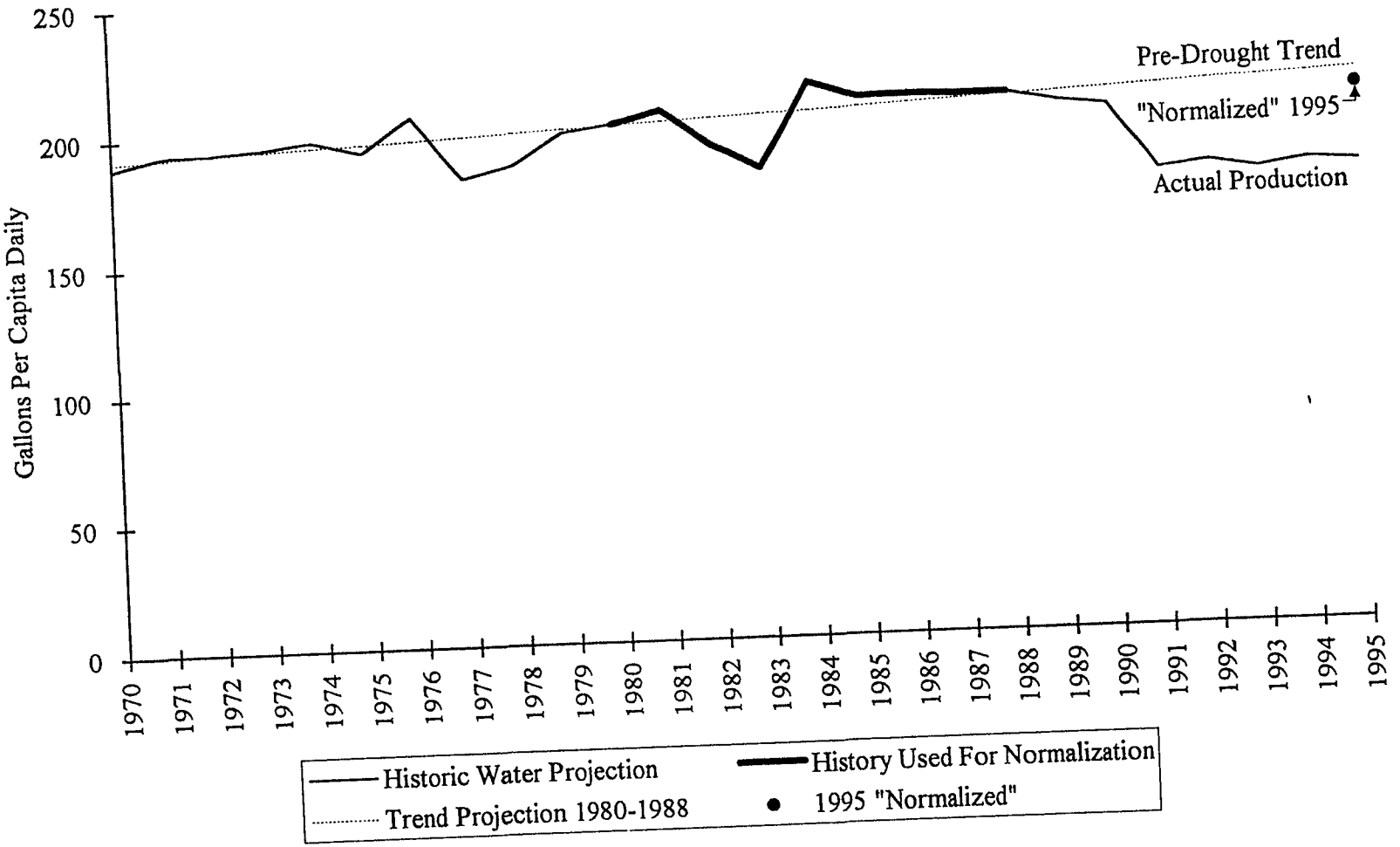
Chart 4
DWR "Normalized" 1995 Urban Water Production
Based On 1980 - 1988 Trend



Source: DWR
Urban Water Production: Orange DAU

Anaheim, Buena Park, Costa Mesa, Fullerton, Garden Grove,
Huntington Beach, Laguna Beach, Orange, Santa Ana

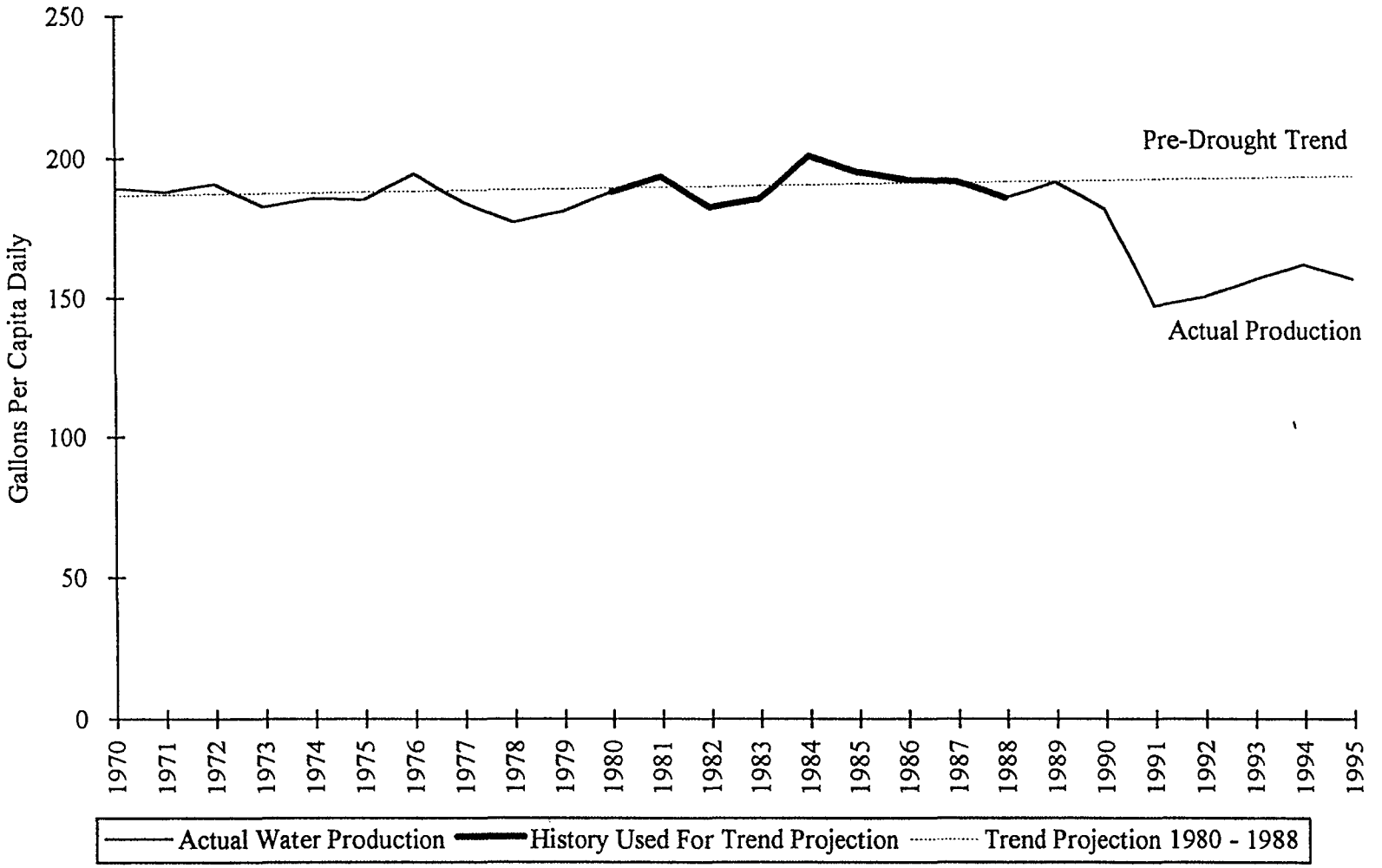
Chart 5
Urban Water Use In Orange DAU
Has Not Returned To Pre-Drought Levels



Source: DWR
Urban Water production: Orange DAU

Anaheim, Buena Park, Costa Mesa, Fullerton, Garden Grove,
Huntington Beach, Laguna Beach, Orange, Santa Ana

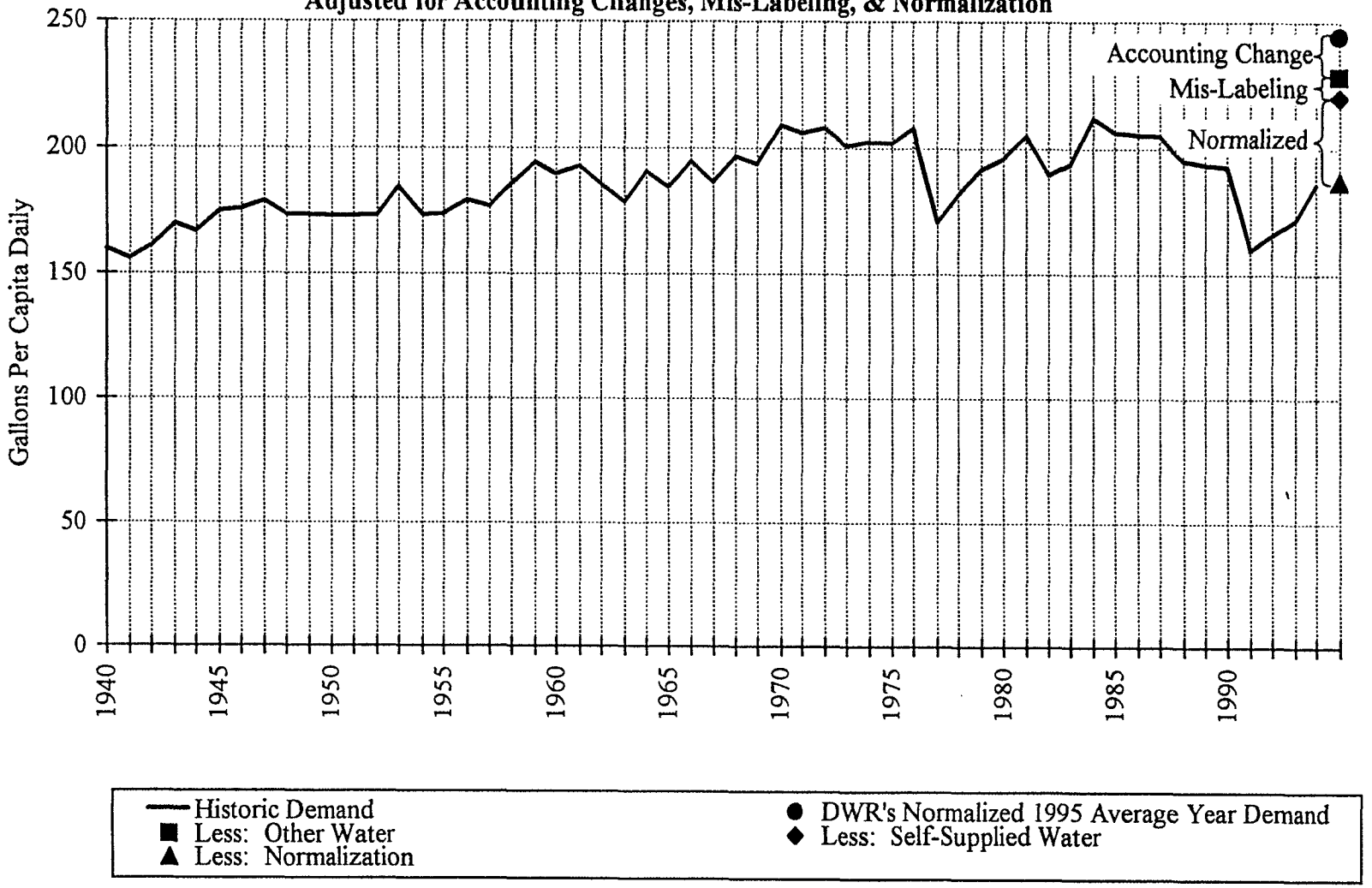
Chart 6
There Is No Evidence That Urban Water Production In the South Coast Hydrologic Region Is Returning to Pre-Drought Levels



Urban Water Production, South Coast Hydrologic Region,
Cities for which DWR has complete data, 1970 - 1995

Anaheim, Banning, Downey, Fullerton, Inglewood, Los Angeles,
Manhattan Beach, Orange, Pasadena, Redlands, Santa Ana, Santa Monica

Chart 7
DWR's Normalized 1995 Average Year Demand
Adjusted for Accounting Changes, Mis-Labeling, & Normalization



Sources: DWR data, CRB analysis
Bulletin 160 Figure 4-5 and Table 4-10; DWR Staff

Attachment B

Urban Water Demand in the 25 Most Populous Detailed Analysis Units

Source: California Department of Water Resources Charts

Note: Dashed line on charts represents 1995 "normalized" demand according to Bulletin 160-98

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Detailed Analysis Units

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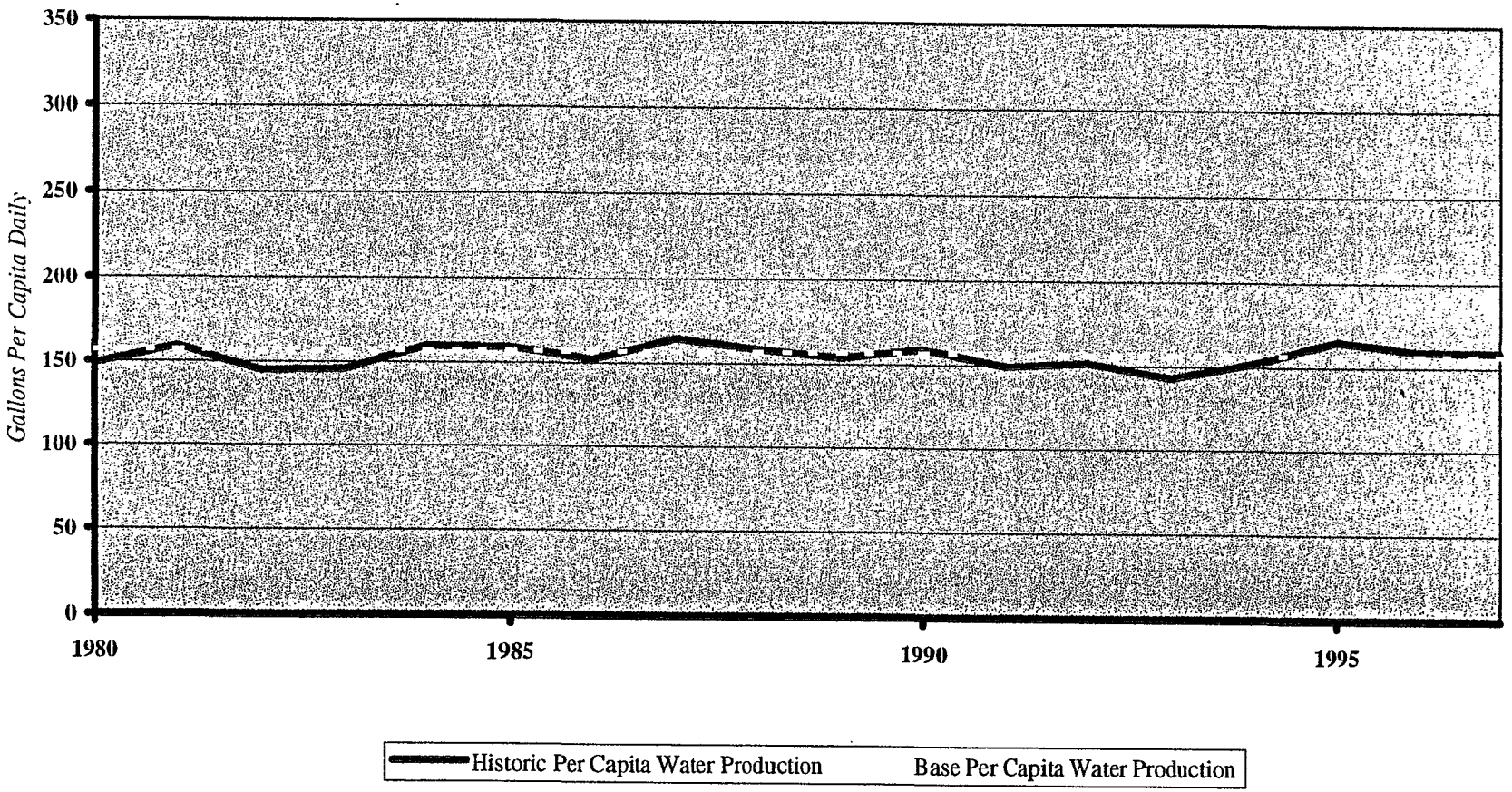
Historic and Base Per Capita Water Production [1]

Santa Rosa DAU 36

1995 Population = 260,325

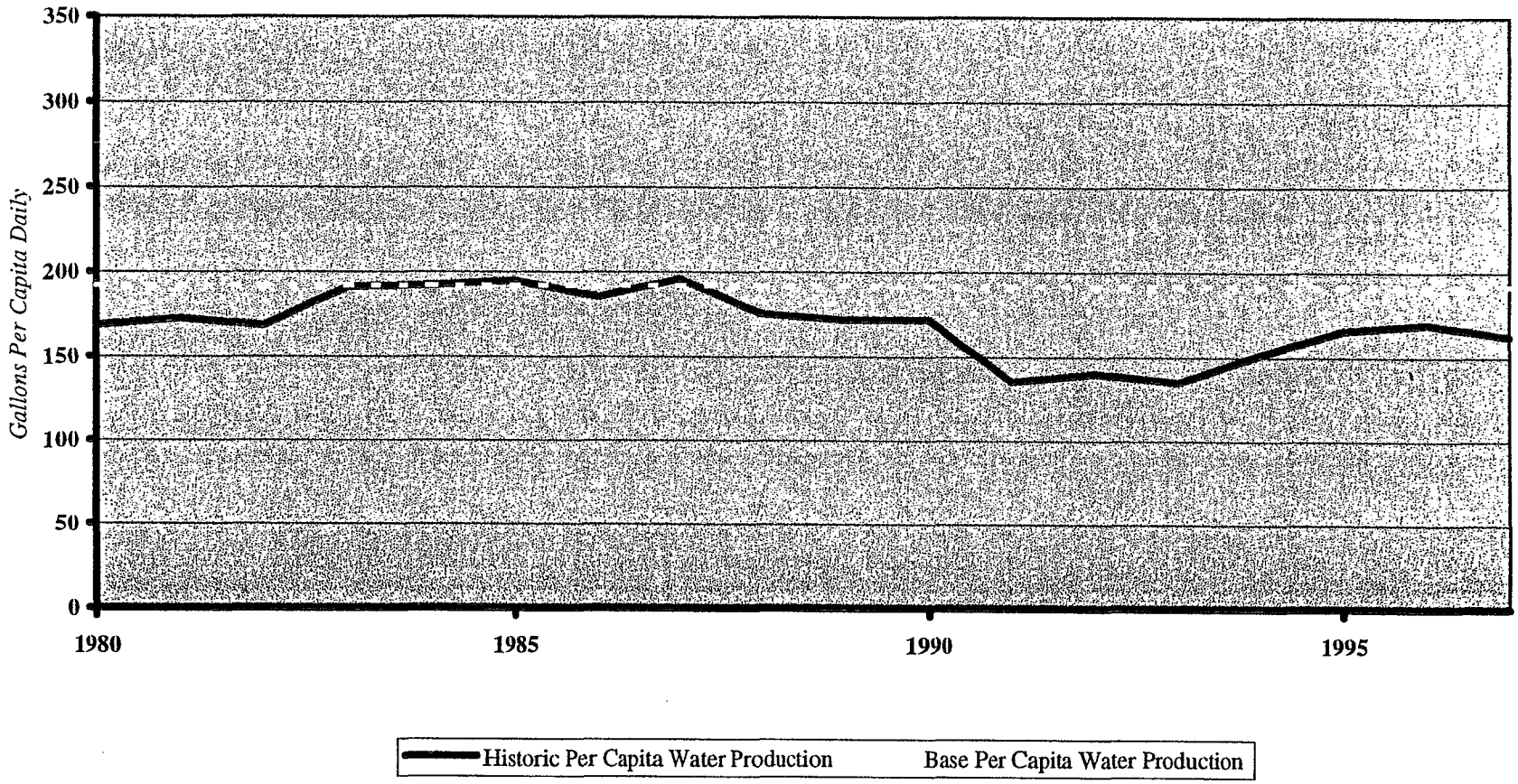


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Napa DAU 40

1995 Population = 231,375

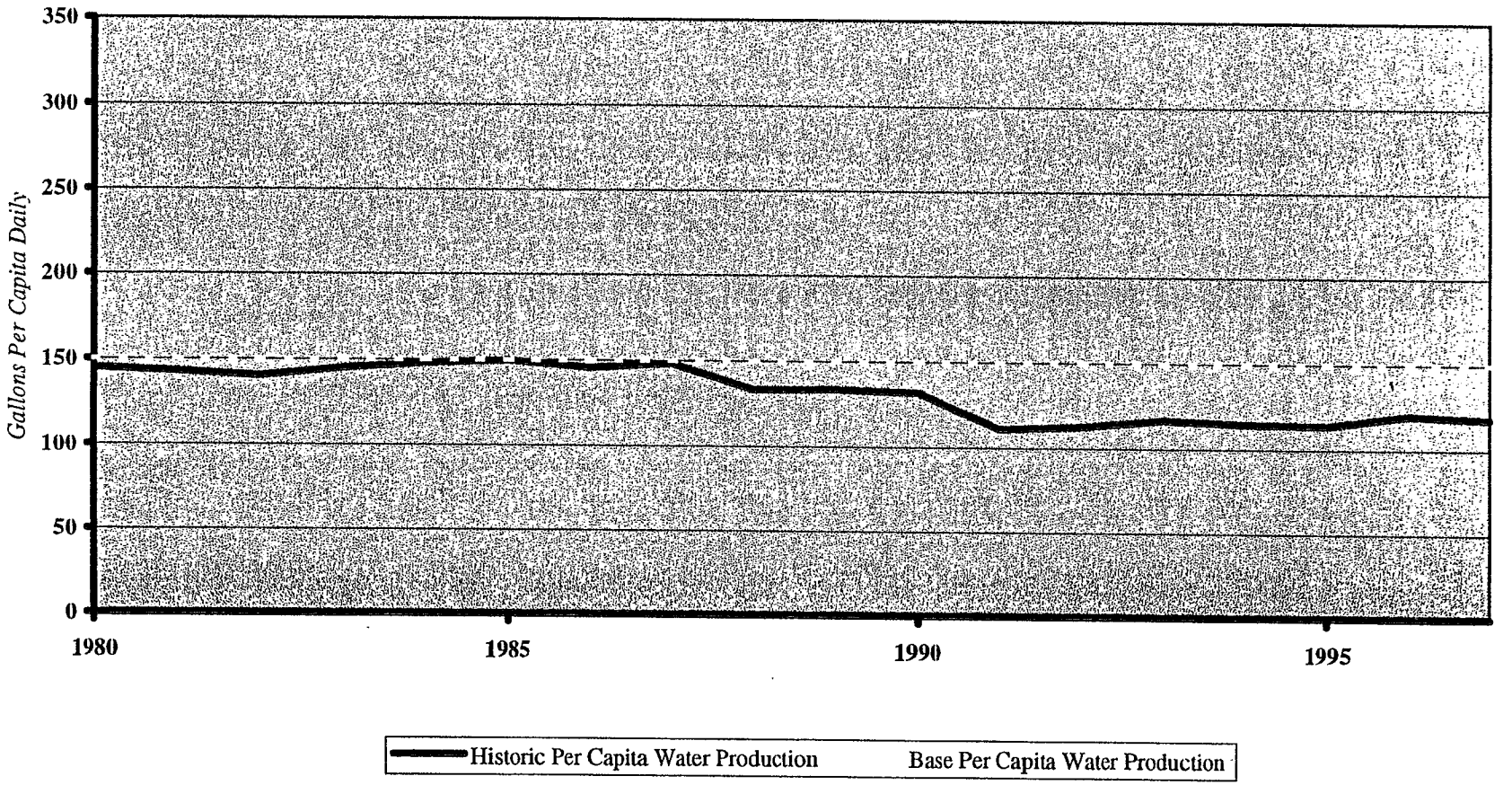


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

South Bay Peninsula DAU 43

1995 Population = 1,332,900

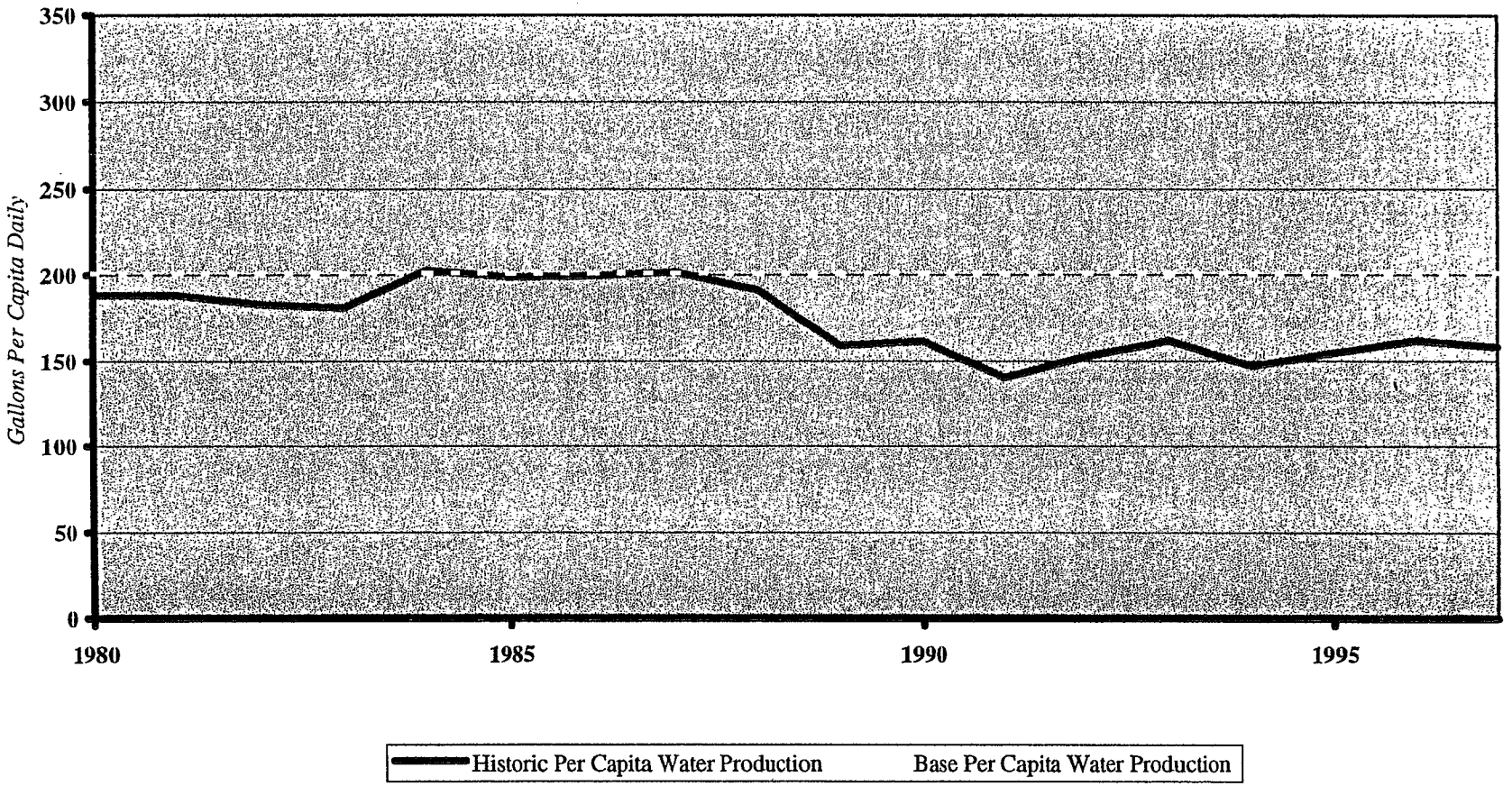


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

San Jose DAU 44

1995 Population = 1,521,925

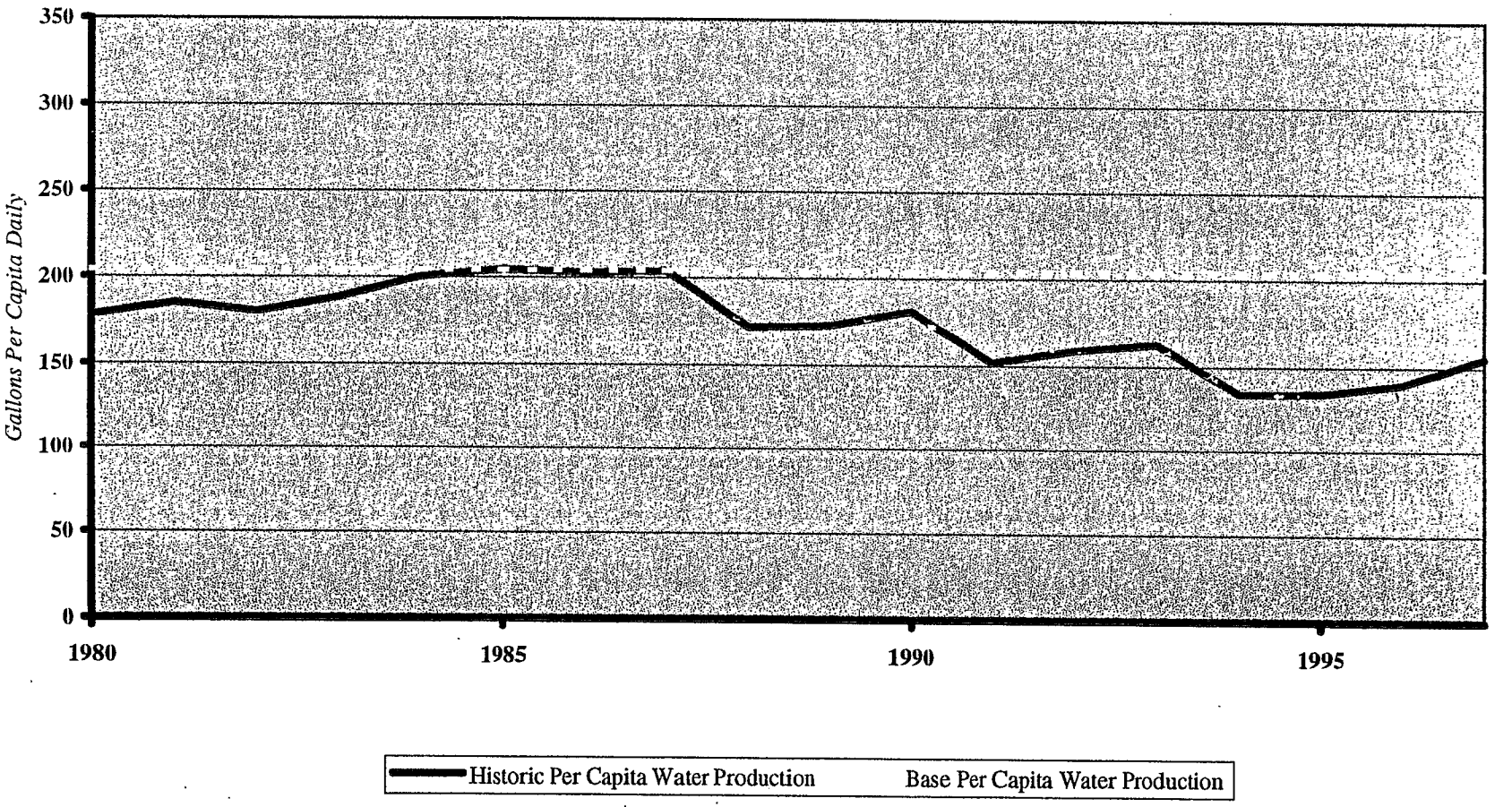


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Walnut Creek DAU 46

1995 Population = 454,300

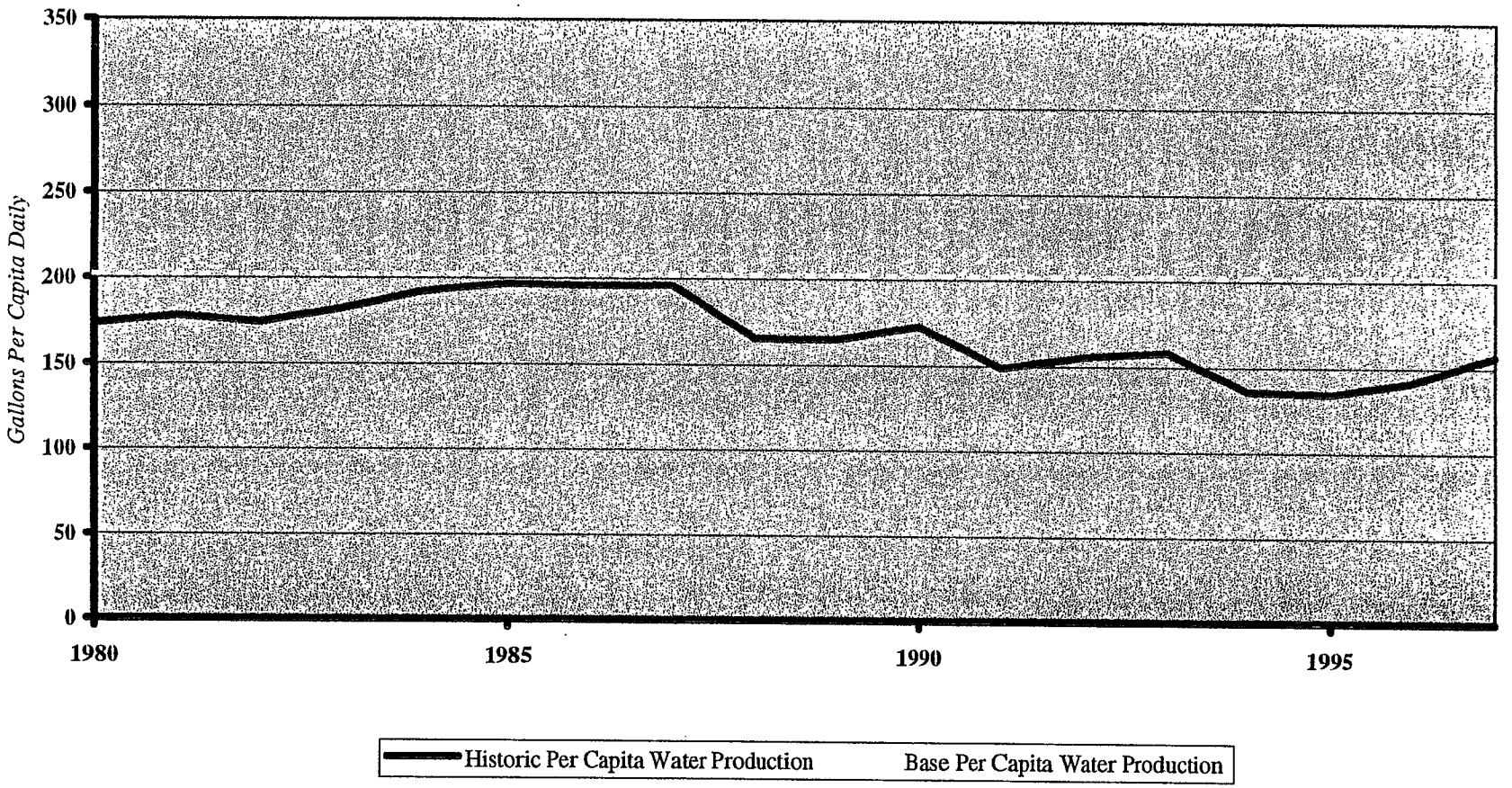


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Oakland DAU 47

1995 Population = 1,440,700

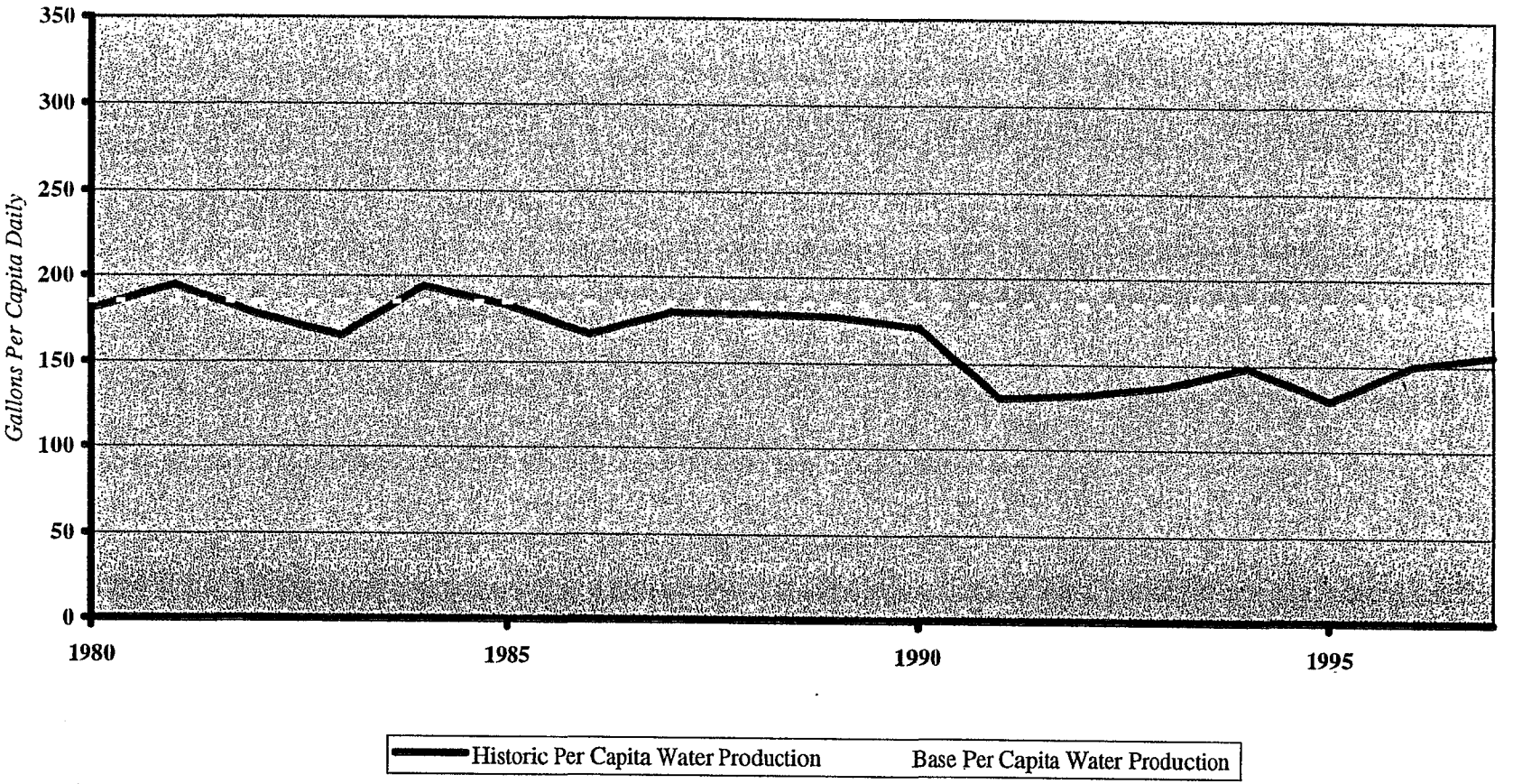


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Ventura County DAU 81

1995 Population = 712,460

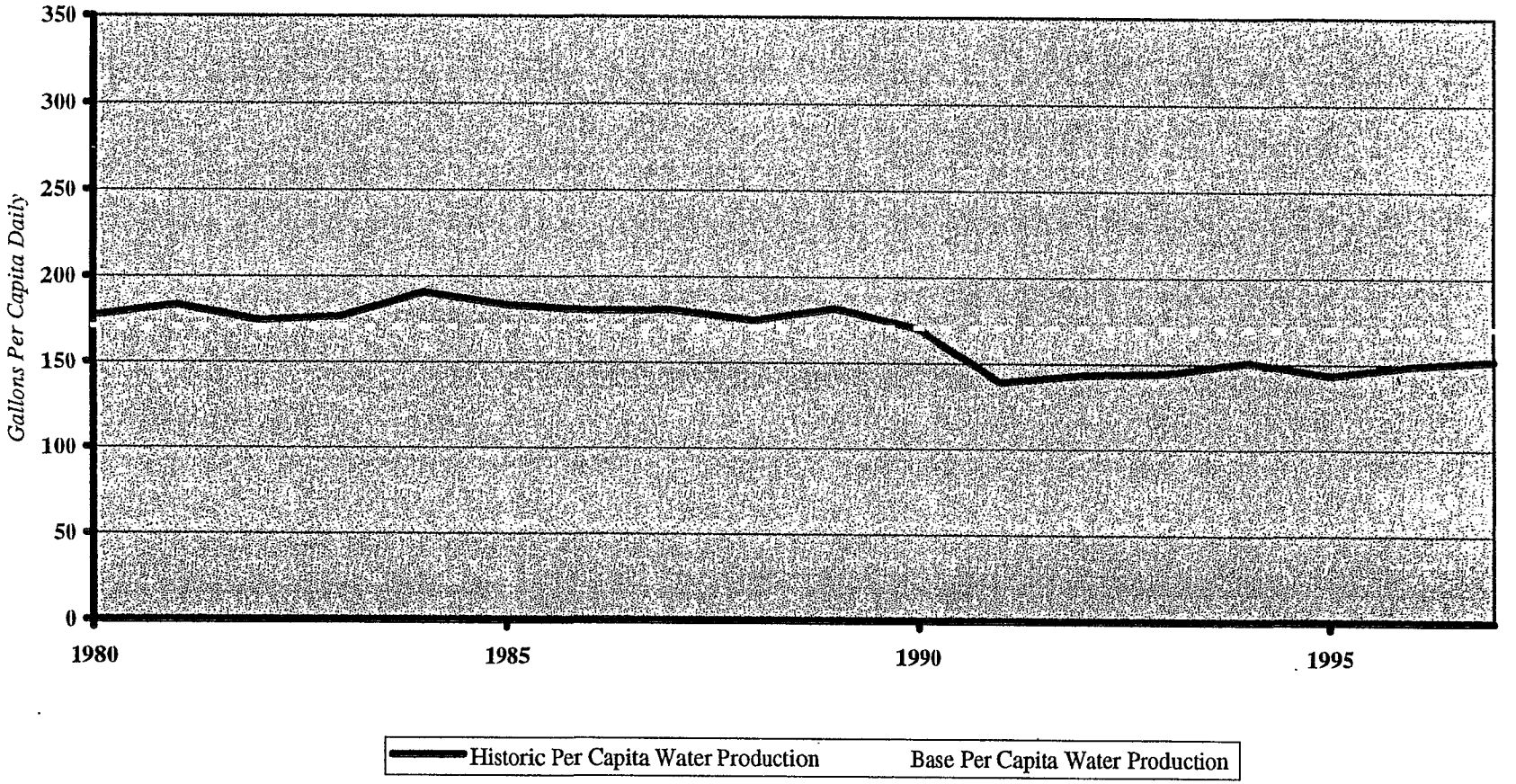


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Coastal DAU 89

1995 Population = 5,352,800

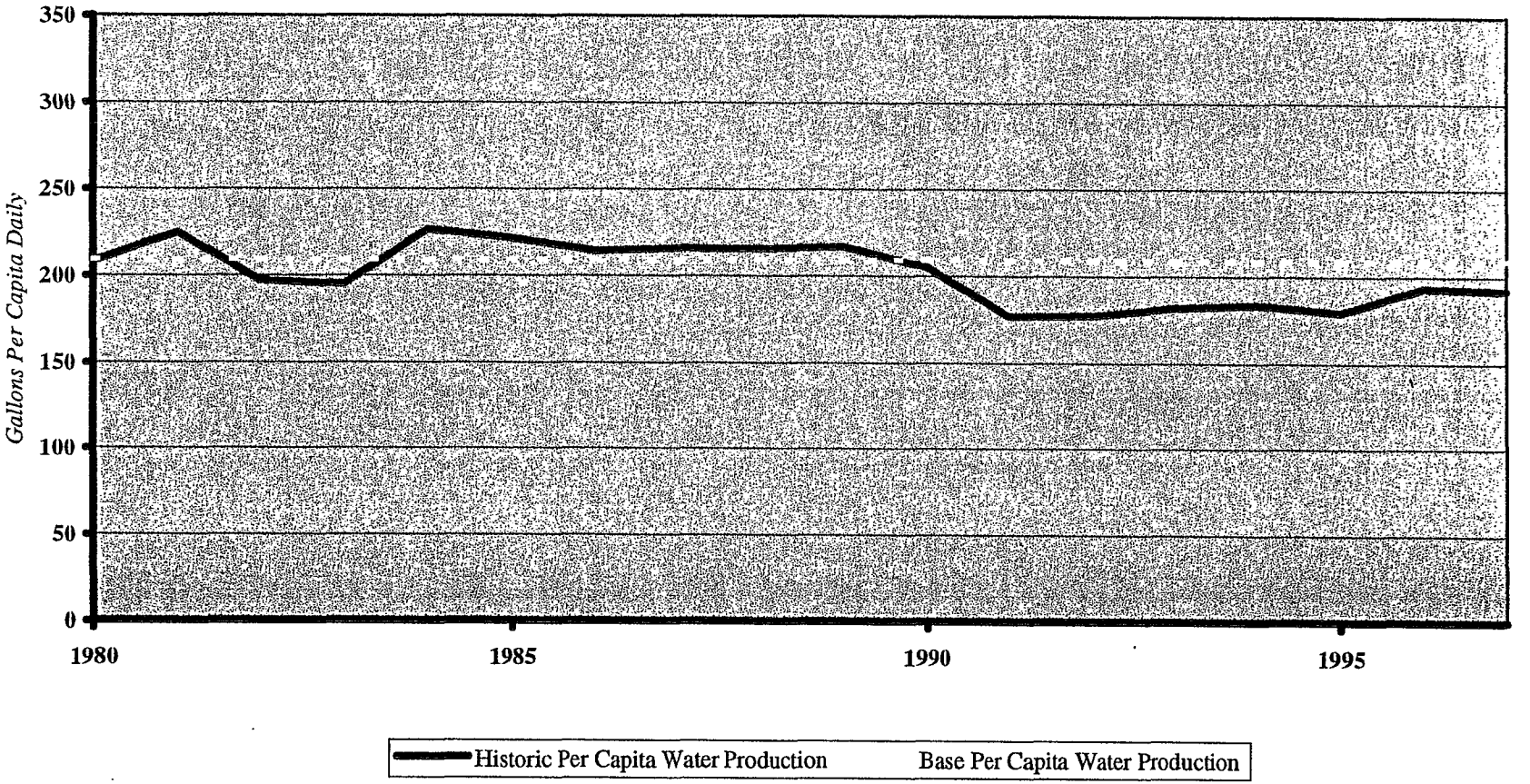


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

San Fernando DAU 90

1995 Population = 1,703,500

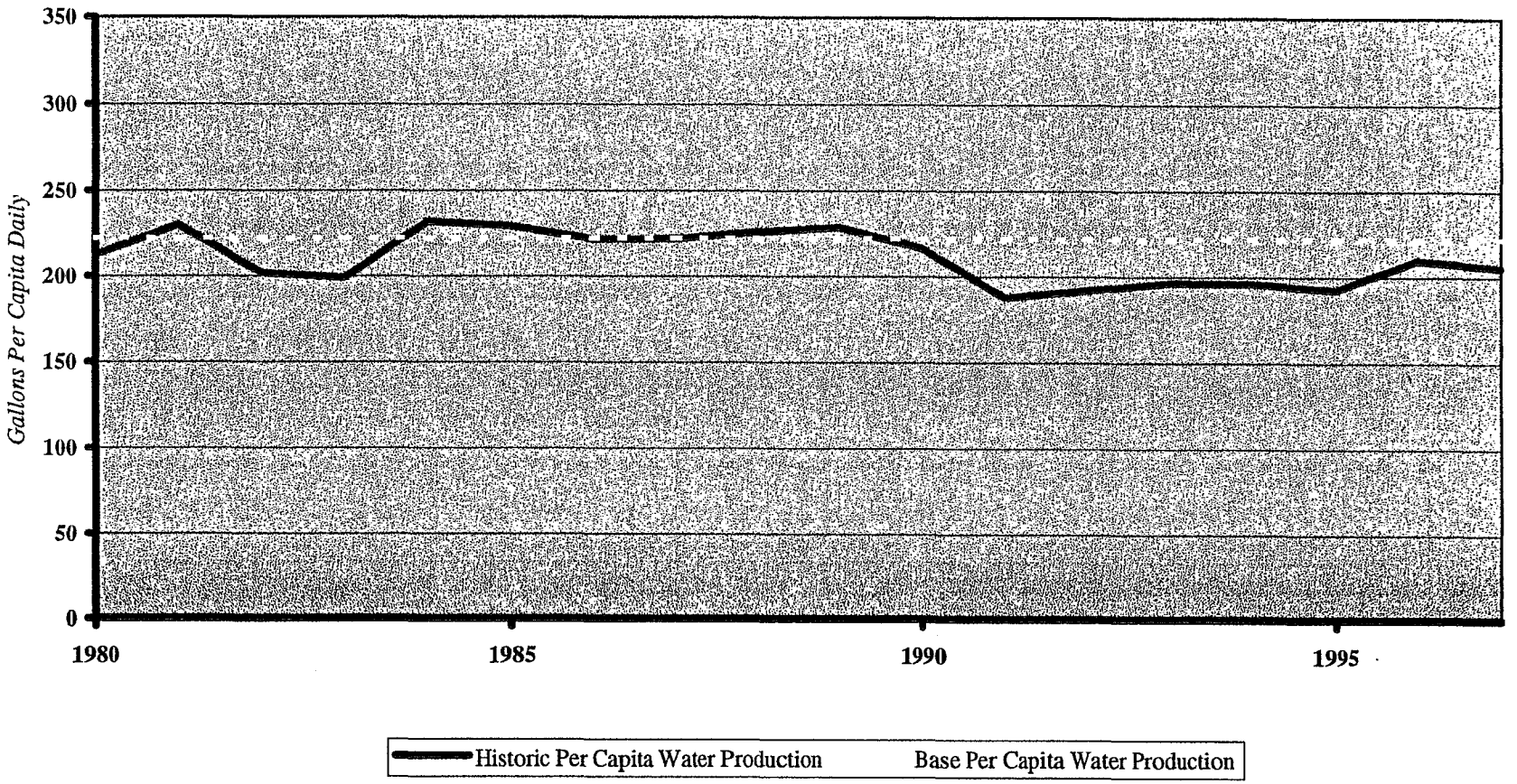


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

San Gabriel DAU 92

1995 Population = 1,714,400

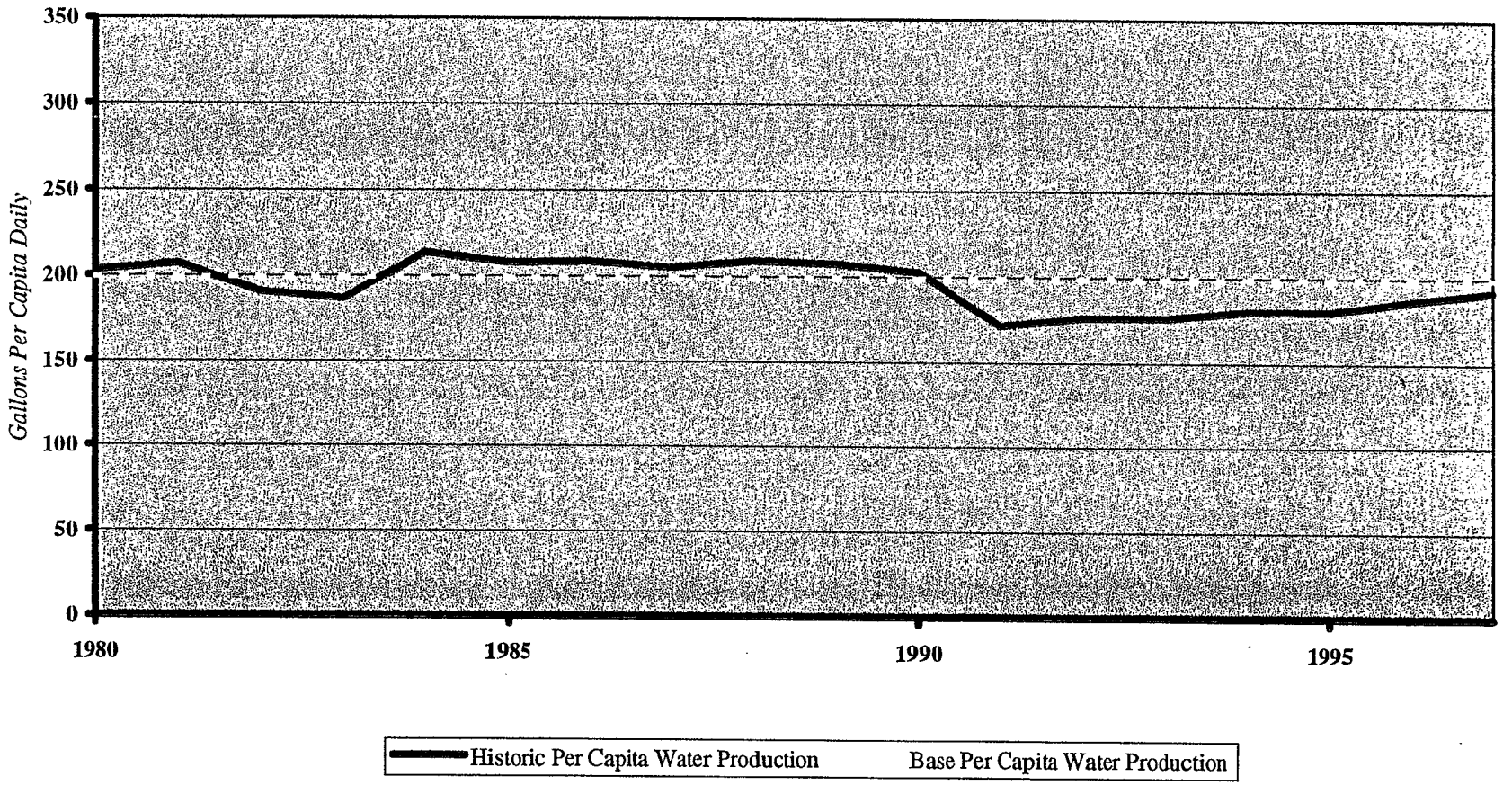


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Orange DAU 96

1995 Population = 2,219,800

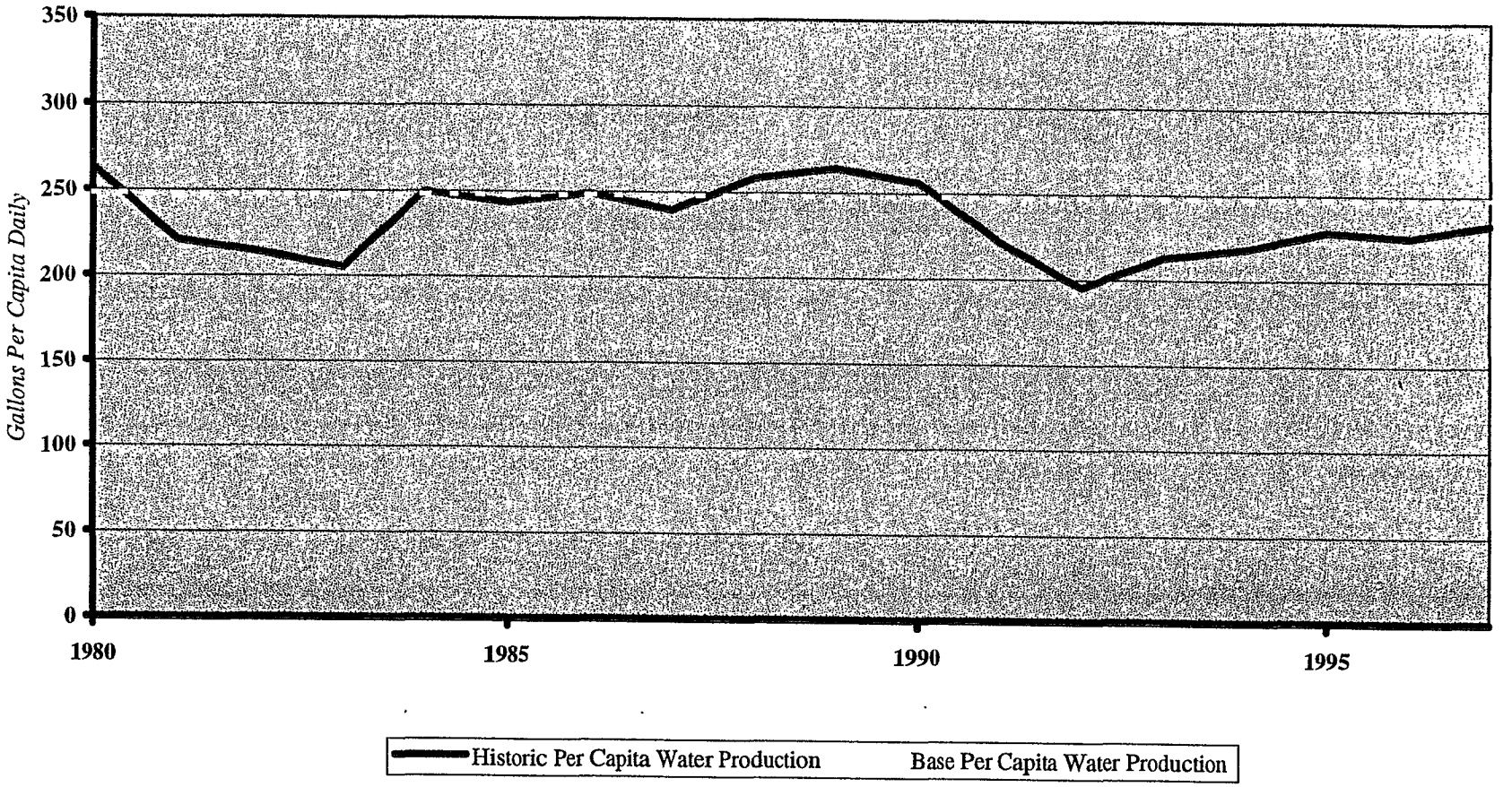


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Riverside DAU 98

1995 Population = 527,300

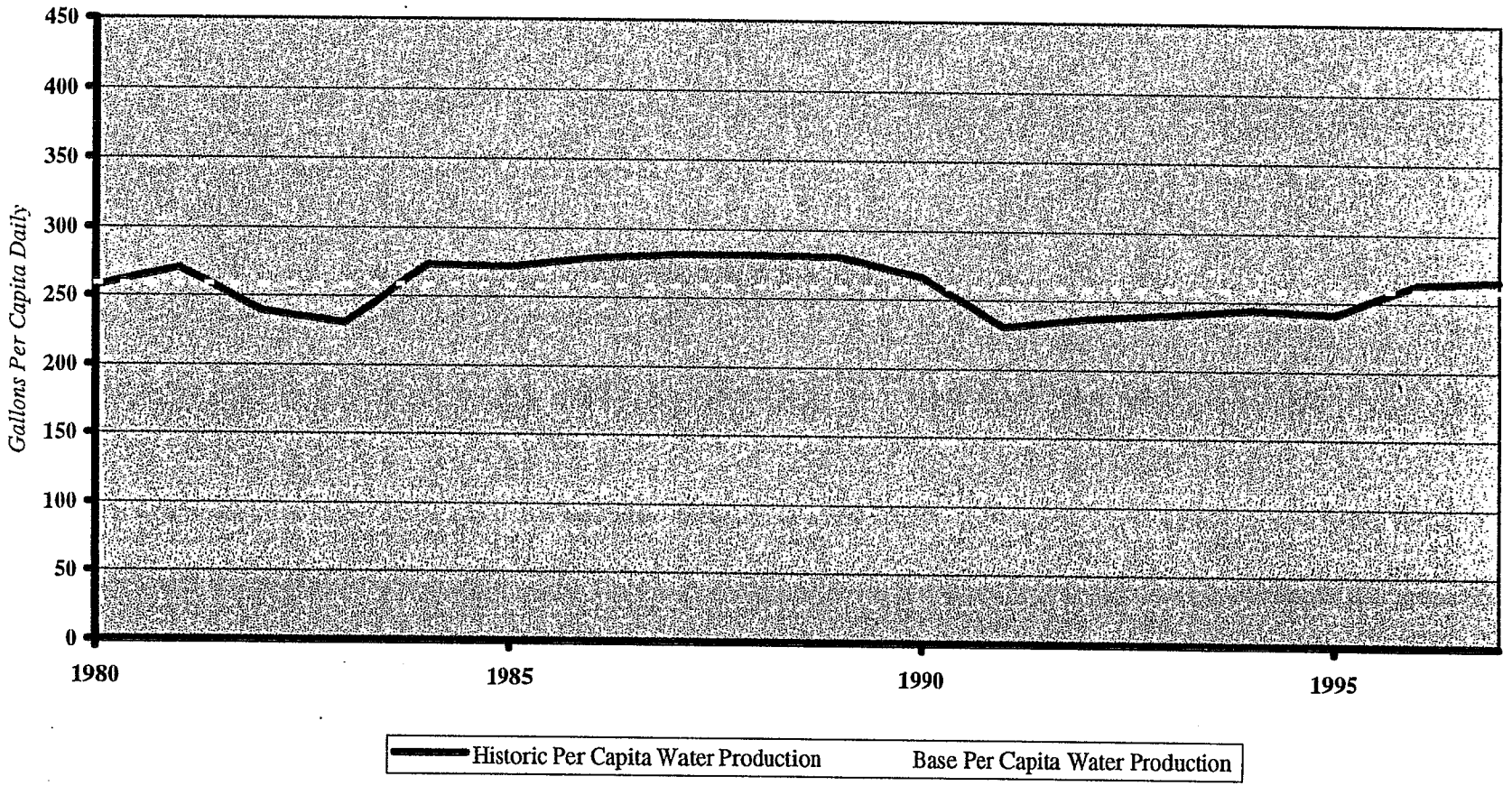


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

San Bernardino DAU 100

1995 Population = 1,192,900

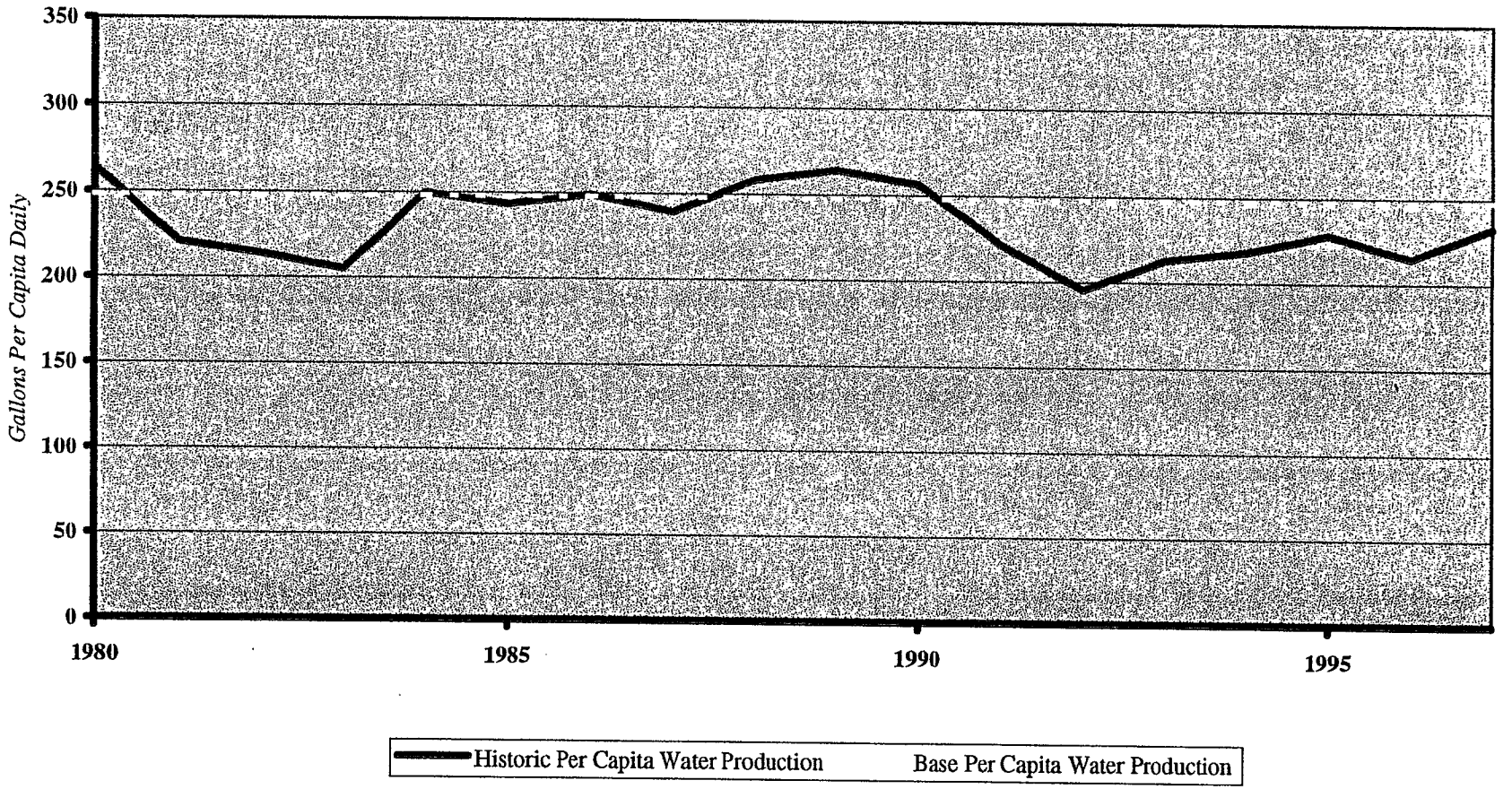


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Riverside South DAU 104

1995 Population = 409,400

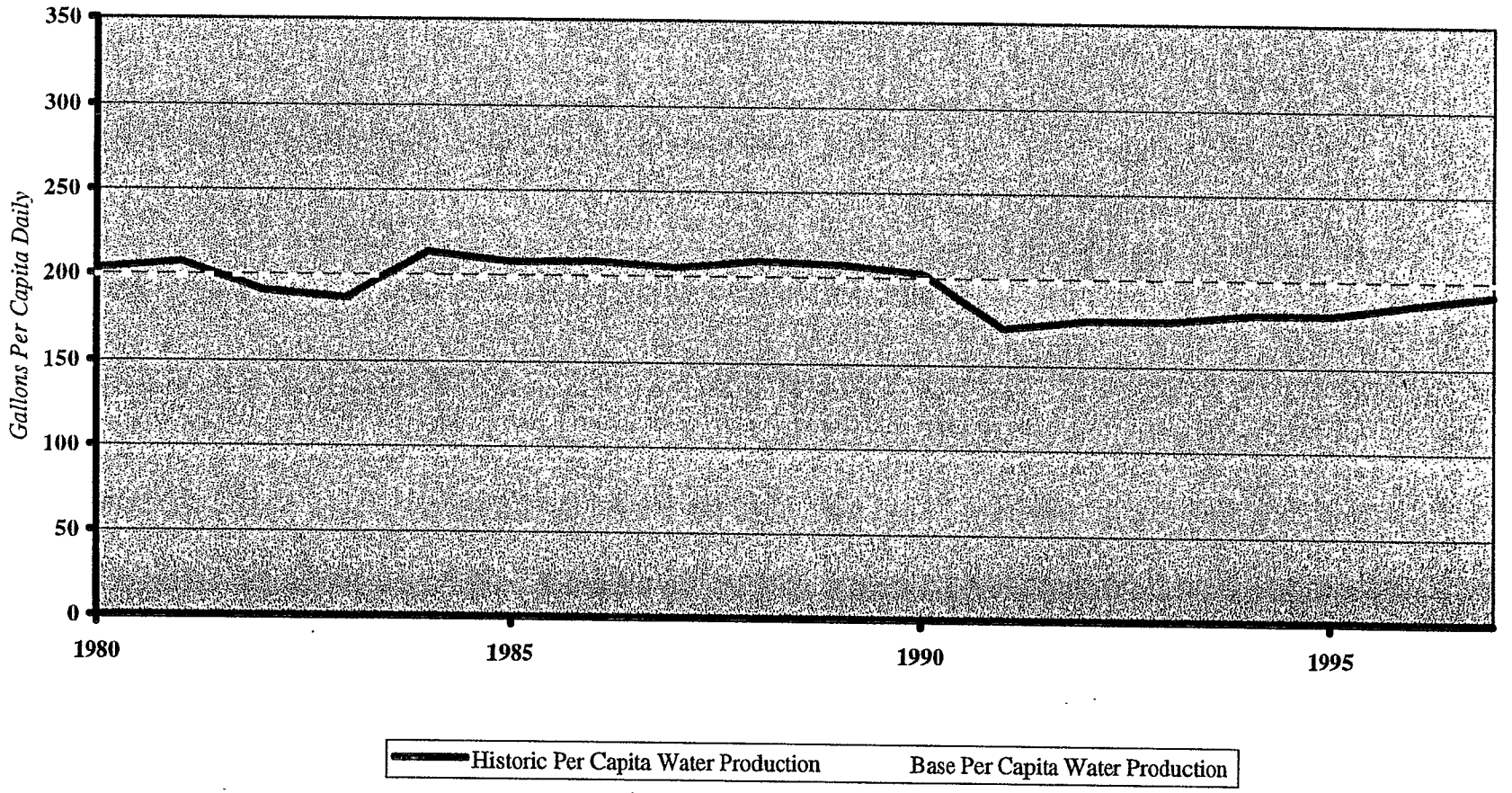


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Viejo DAU 114

1995 Population = 395,000

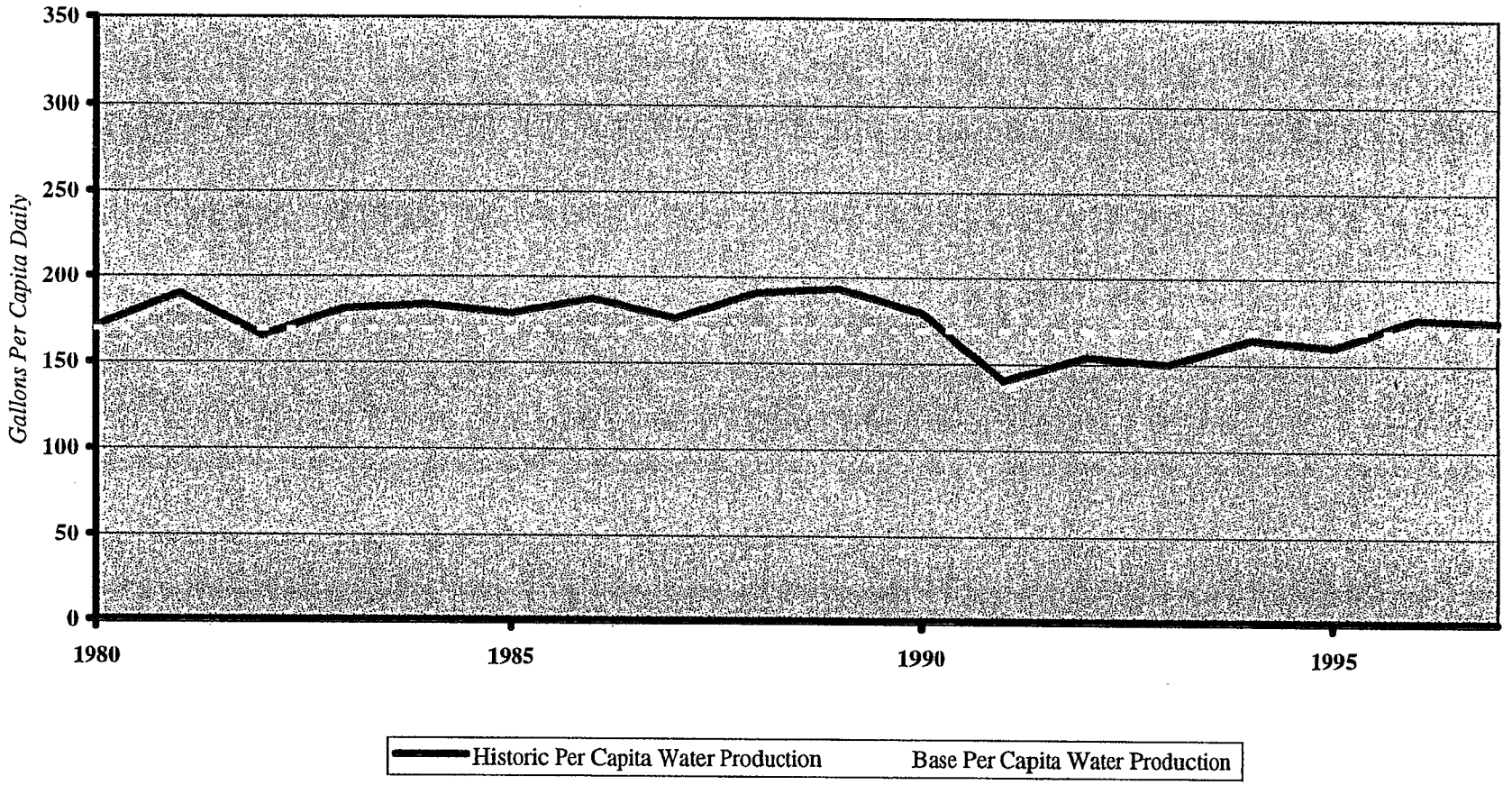


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

San Diego County DAU 120

1995 Population = 2,664,700

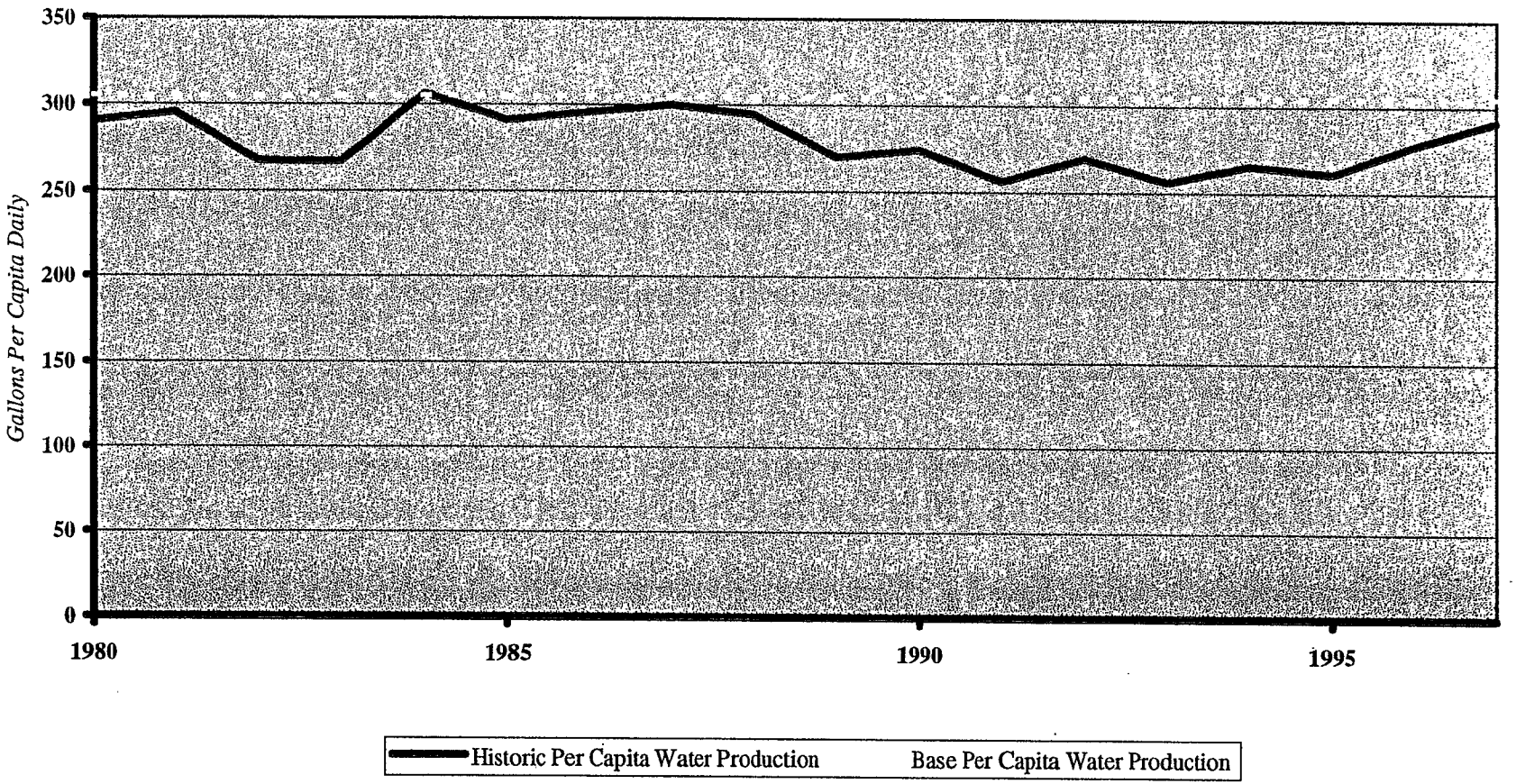


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Placer DAU 172

1995 Population = 784,425

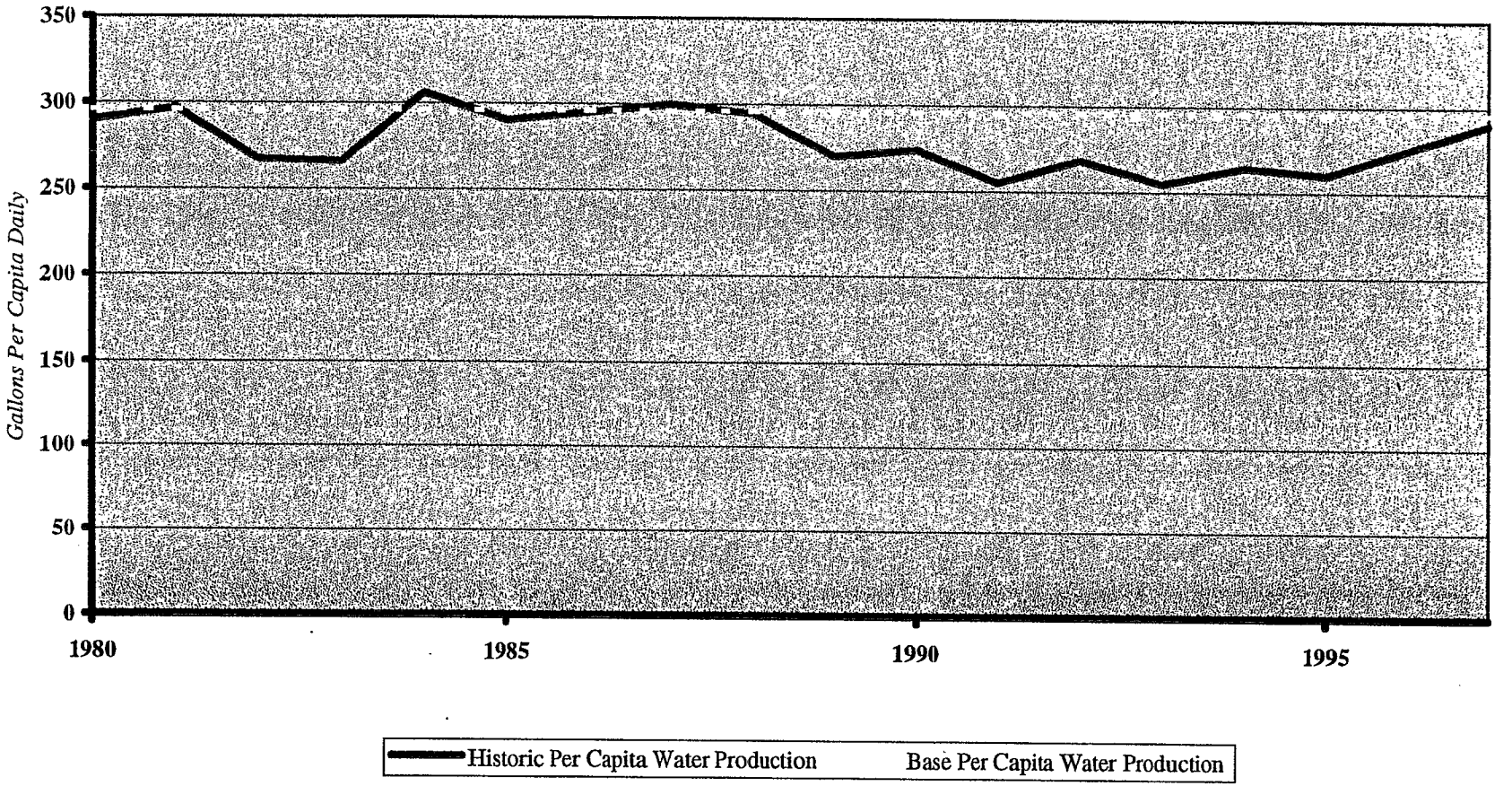


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Sacramento DAU 173

1995 Population = 389,900

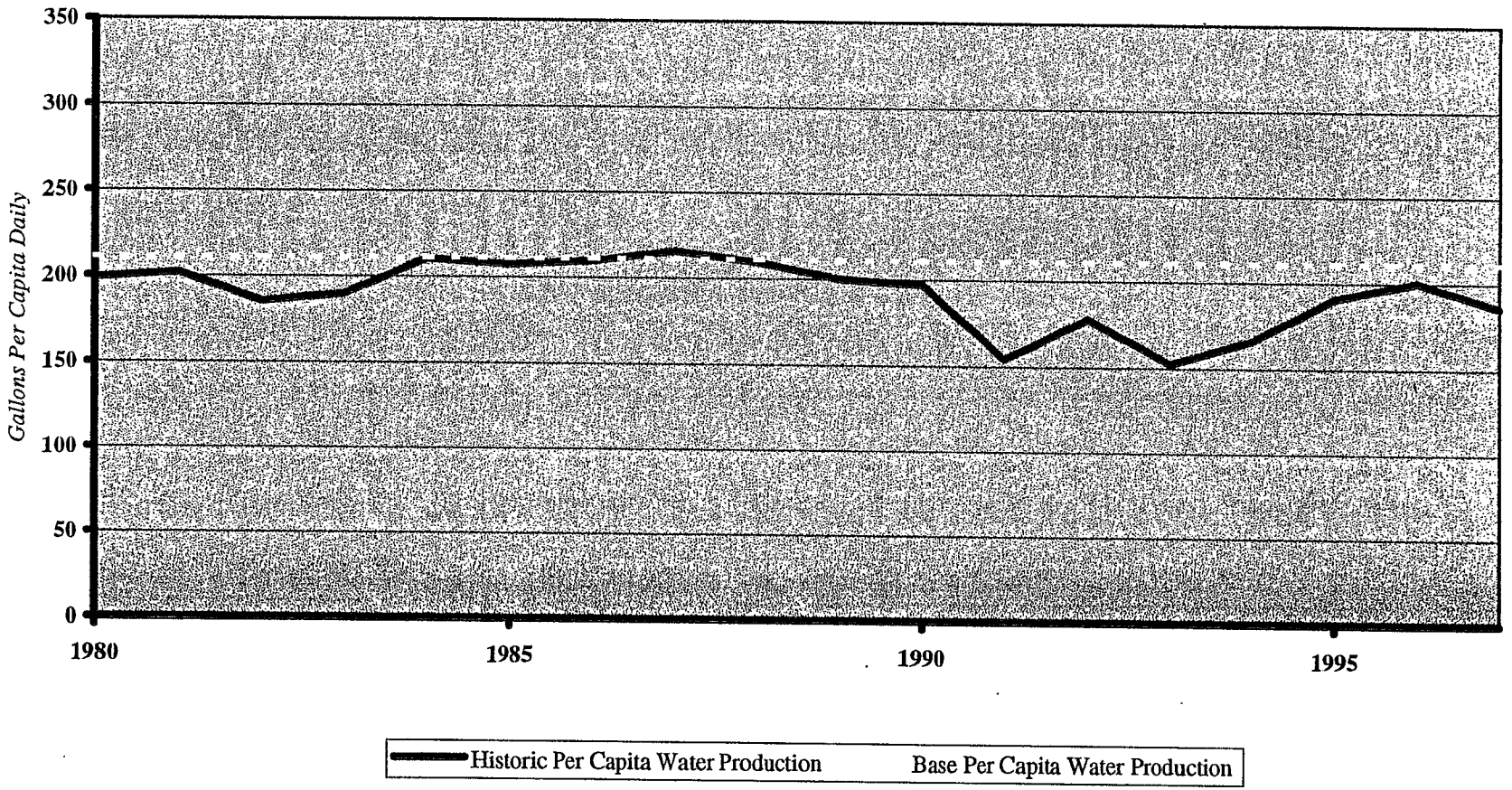


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Lodi DAU 182

1995 Population = 292,100

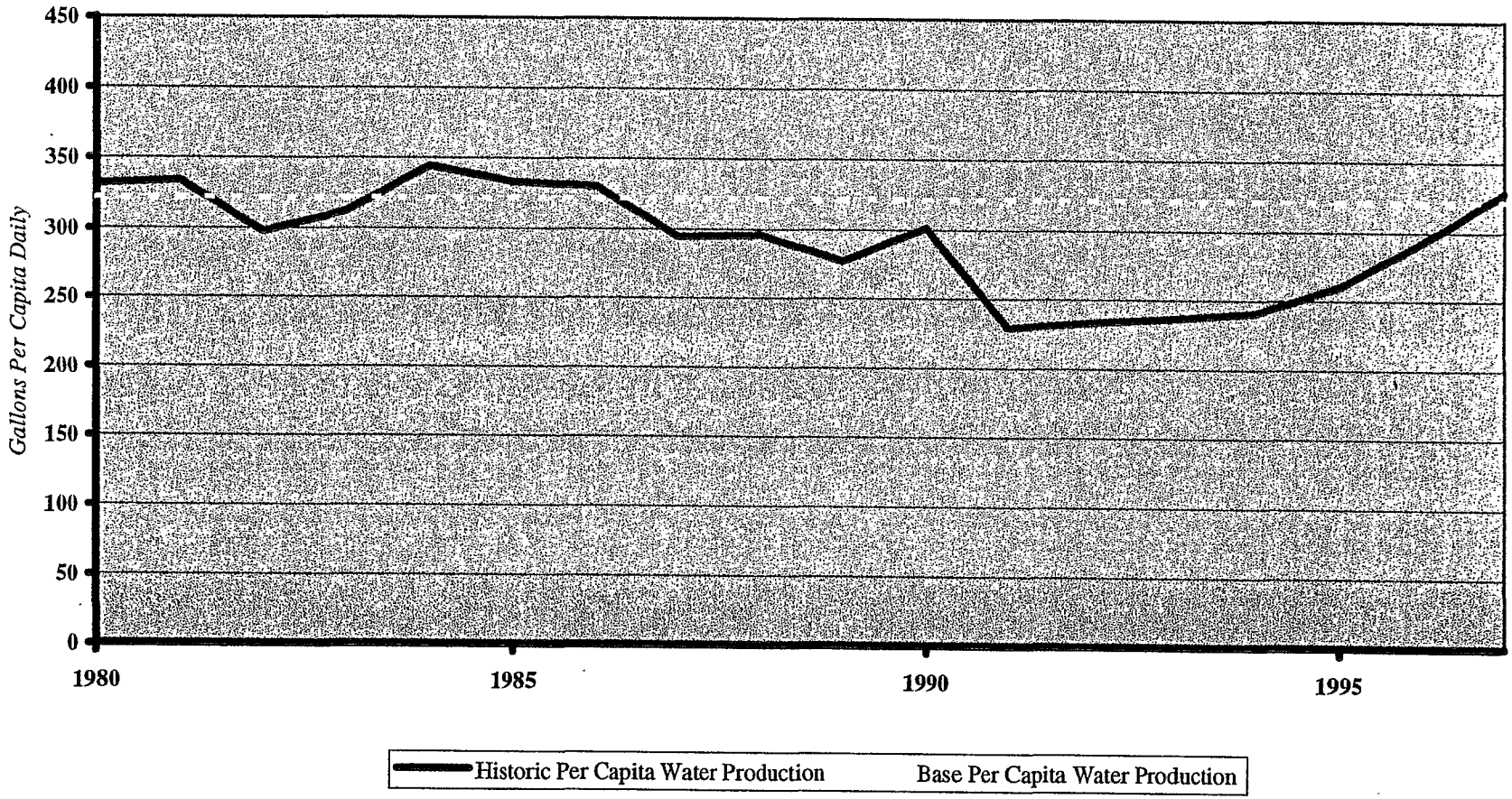


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Modesto-Oakdale DAU 206

1995 Population = 253,310

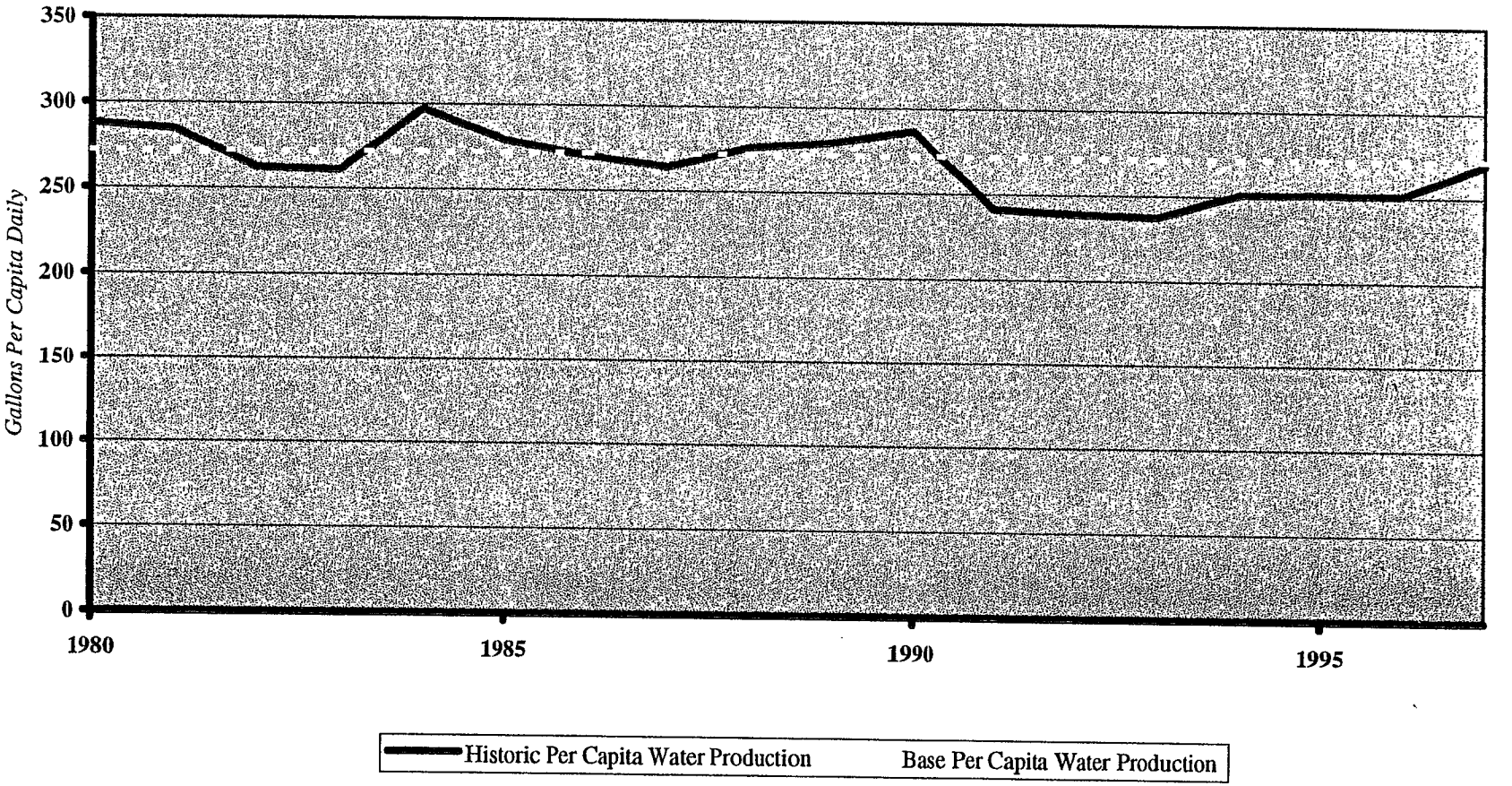


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Fresno DAU 233

1995 Population = 559,425

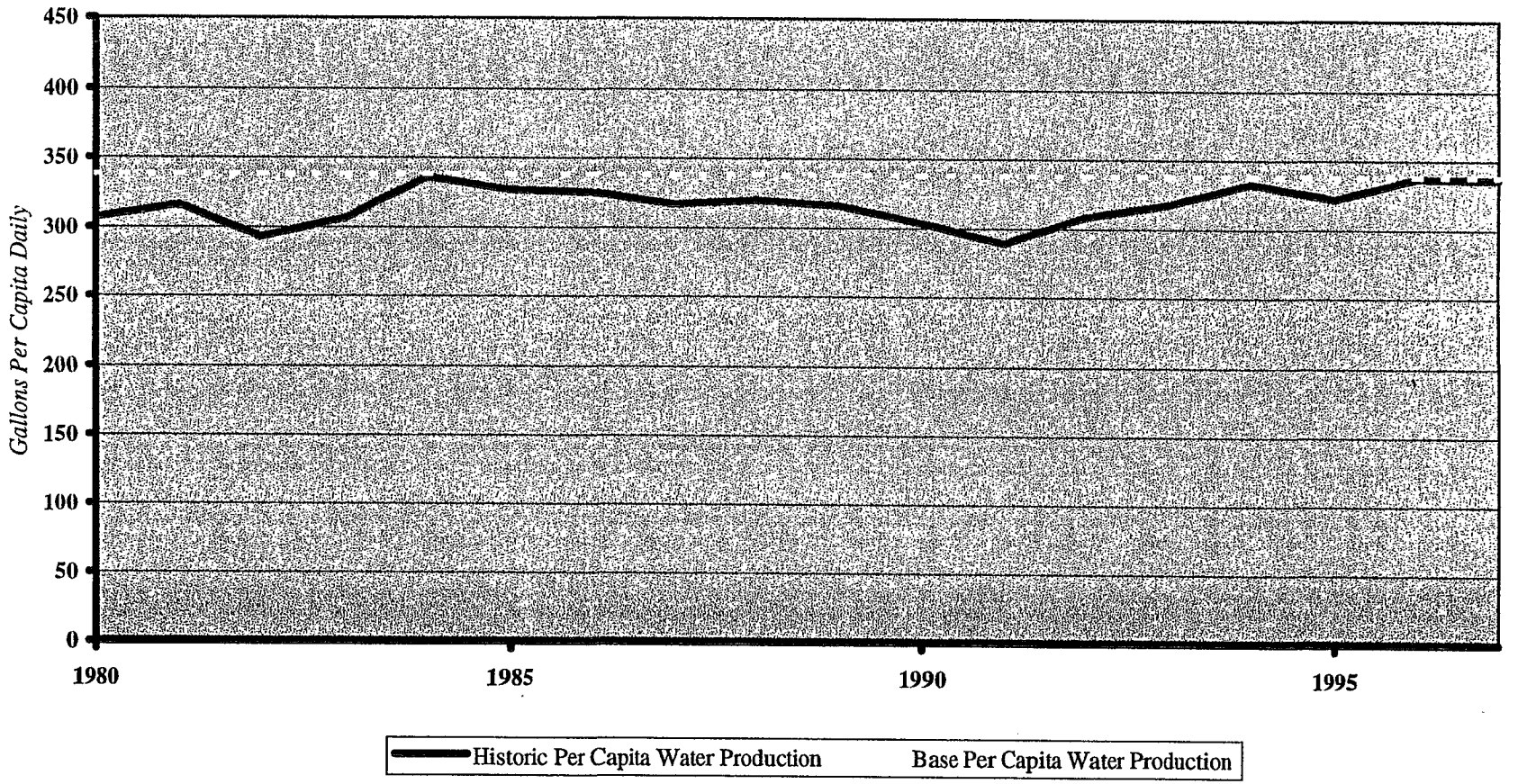


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Kern Delta DAU 254

1995 Population = 345,275

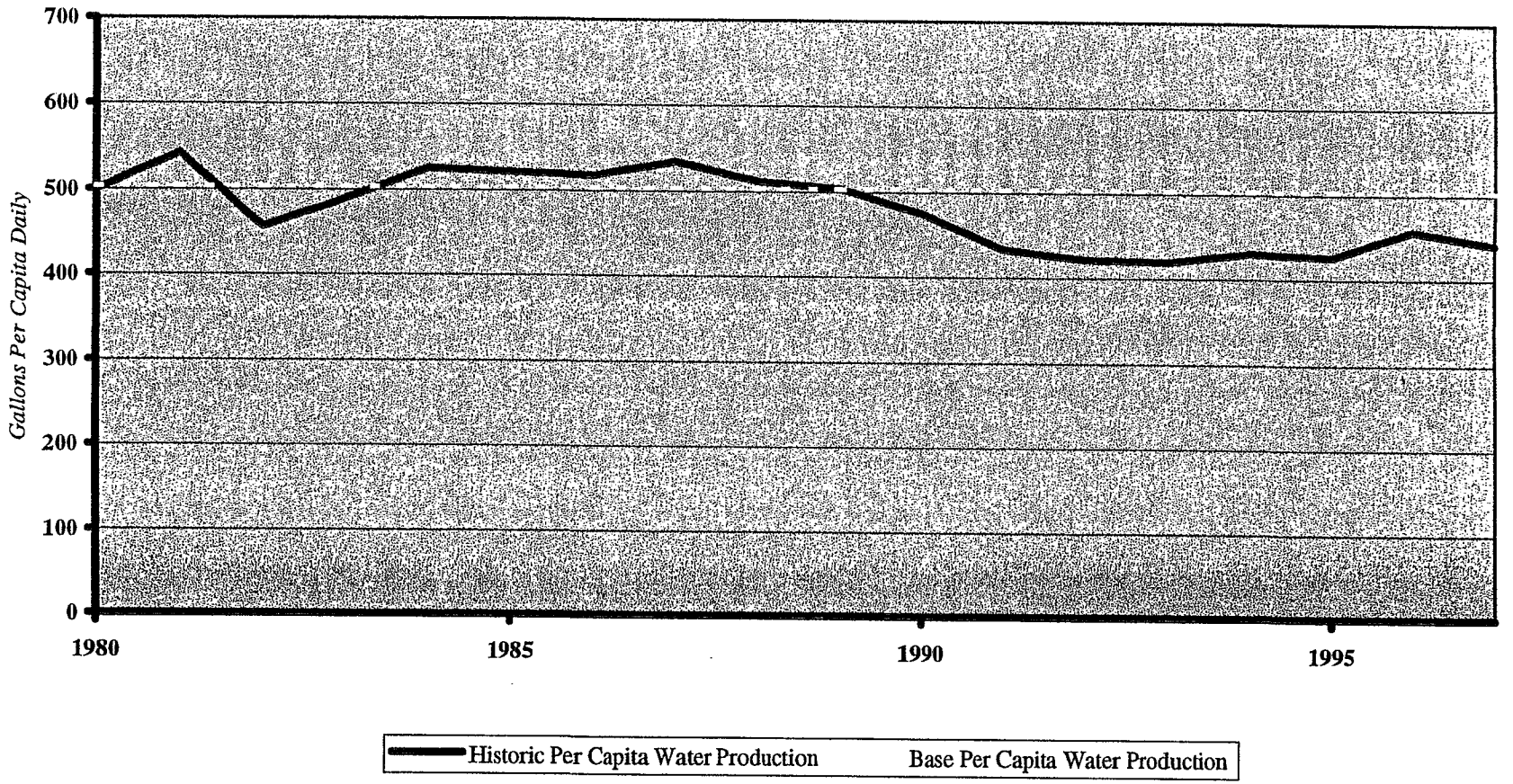


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Coachella DAU CR04

1995 Population = 289,450

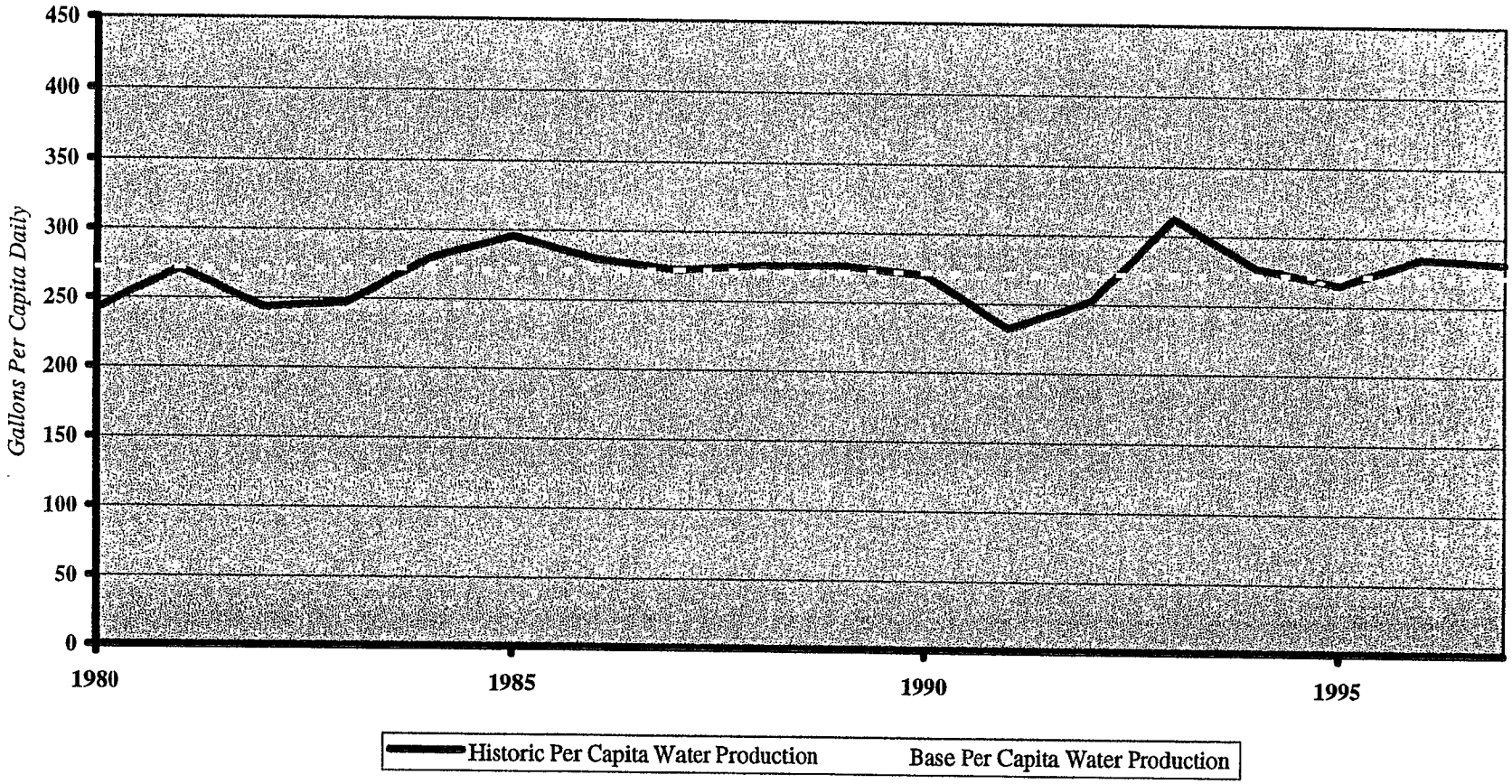


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Antelope Valley DAU SL04

1995 Population = 326,400

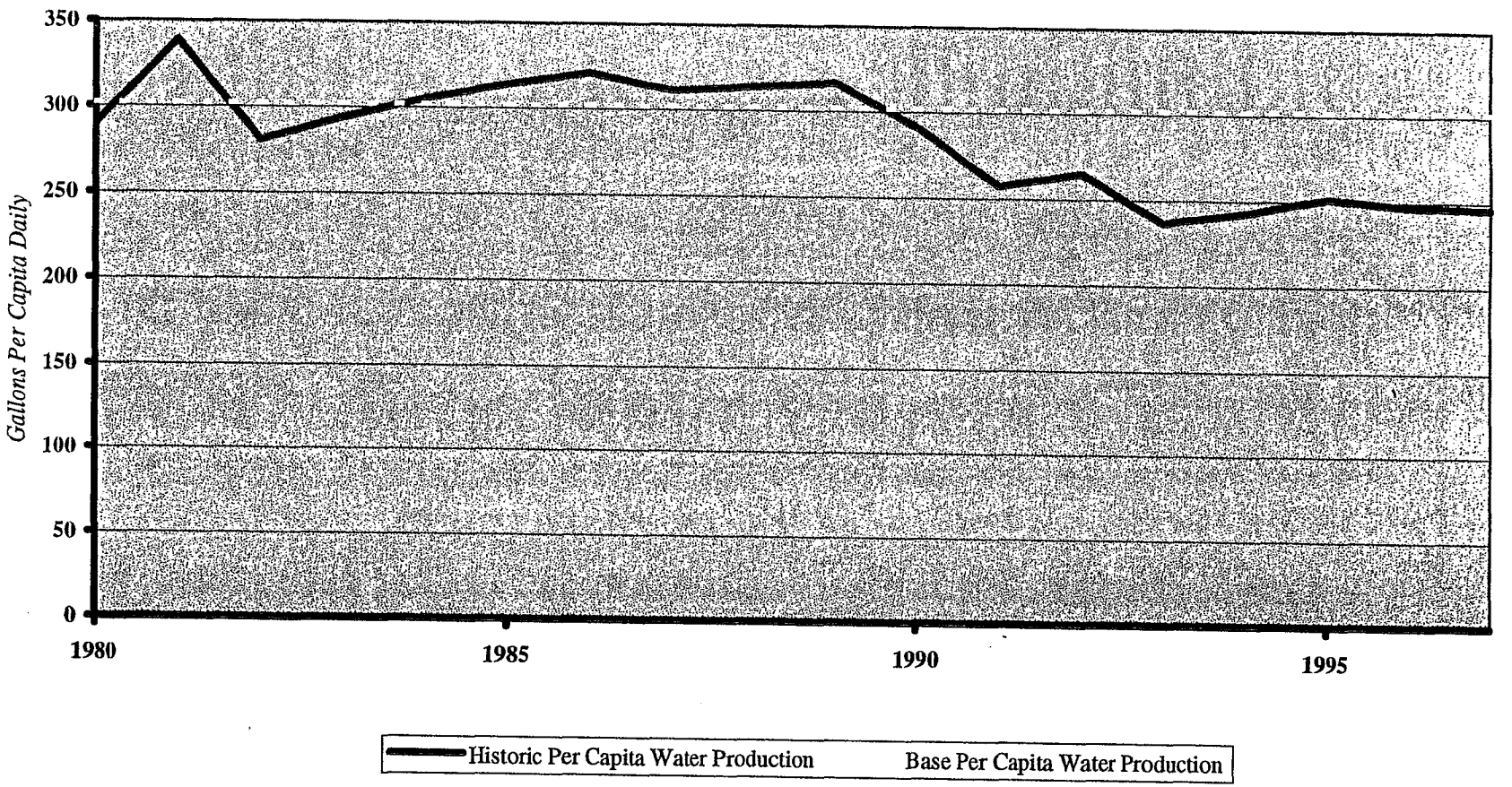


[1] Public water system production. Does not include self-produced water supplies.

Historic and Base Per Capita Water Production [1]

Mojave River DAU SL05

1995 Population = 306,100



[1] Public water system production. Does not include self-produced water supplies.

Attachment 3

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices		
Volume	Page	Citation:
301	1-21	Modeling for the Programmatic EIS/EIR considers a range of possible future demands for the No Action Alternative and the Program alternatives. The high end of this range is bound by the most recent demand estimates prepared for Bulletin 160-98 for 2020.
301	1-21	Bulletin 160, updated every 5 years by the Department of Water Resources (DWR), contains estimates of future water demands in the state.
301	1-21	Bulletin 160, updated every 5 years by DWR, contains estimates of future water demands in the state
301	5.2-14	DWR has formed a technical peer review panel to review the Bulletin's urban water forecasting methodologies; however, the Bay-Delta system demands included in Bulletin 160-98 serve as a reasonable upper boundary for 2020 conditions. This bookend of the No Action Alternative includes no change in Delta water management criteria from existing conditions. Criterion B results in generally higher Delta exports than existing conditions.
301	5.2-14	Under Criterion B, the Program assumes an increase in Bay-Delta system water demands of about 10% over existing conditions, as projected for 2020 in DWR's Bulletin 160-98.
301	7.1-6	AGRICULTURAL LAND AND WATER USE – Table 7.1-3. Agricultural Water Use and Water Pricing in All Program Regions, 1985 to 1990 – source: DWR 1994
301	7.2-2	Projected Crop Mix. No Action Alternative assumptions regarding future agricultural crop mix and water use will remain in dispute. This analysis relies primarily on the assumptions in DWR's Bulletin 160-98.
301	7.2-2	No Action Alternative assumptions regarding future agricultural crop mix and water use will remain in dispute. This analysis relies primarily on the assumptions in DWR's Bulletin 160-98.
301	7.5-10	URBAN WATER SUPPLY ECONOMICS – Table 7.5-Z. Per Capita per Day Water Use, Bay Region, 1968 to 1990 (gallons)source: DWR 1994
301	7.5-11	URBAN WATER SUPPLY ECONOMICS – Table 7.5-4. Characteristics of Some Bay Region Providers source: DWR 1994
301	7.5-12	URBAN WATER SUPPLY ECONOMICS –Table 7.5-5. Per Capita per Day Water Use in the Sacramento River Region, 1968 to 1990 (gallons) – source: DWR 1994
301	7.5-14	URBAN WATER SUPPLY ECONOMICS –Table 7.5-8. Per Capita per Day Water Use, San Joaquin River Region Figure 7.5-2. 1968 to 1990 (gallons) – source: DWR 1994
301	7.5-14	URBAN WATER SUPPLY ECONOMICS – Table 7.5-7. Characteristics of Some Sacramento River Region Providers – source: DWR 1994

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices
(continued)

Volume	Page	Citation:
301	7.5-18	DWR's Bulletin 160-98 estimated that the South Coast Region will experience a year 2020 supply deficit of 0.9 and 1.3 MAF in average and dry years, respectively, or enough to meet the demands of about 4.5 million persons in the average year. Most of this shortage could be eliminated with new supplies, especially reclaimed water and new yield from Colorado River, local and SWP improvements, and conservation. Nevertheless, a substantial supply deficit would remain.
301	7.5-18	DWR's Bulletin 160-98 estimated that the South Coast Region will experience a year 2020 supply deficit of 0.9 and 1.3 MAF in average and dry years, respectively, or enough to meet the demands of about 4.5 million persons in the average year.
301	7.5-20	Water demands are based on DWR's Bulletin 160-98 2020 levels.
301	7.5-21	The LCPSIM uses Bulletin 160-98 baseline information on local supplies. Given the amount of surface water available in each alternative, the LCPSIM then determines how much conservation and recycling are needed to meet demand. The amounts of conservation and recycling can then be compared to Program to Water Use Efficiency Program water savings to see if program goals were met.
301	7.5-23	The model was configured to accept data for five other potentially affected regions: the South Lahontan, CCWD, the South Bay, the San Joaquin Valley, and the Central Coast. Bulletin 160-93 data were used to develop certain data on demands and quantity of other (non-Delta) supplies. A survey of potentially affected providers was conducted; and their responses provided useful information on demands, supplies, and salinity. Results showed that economic benefits of Program alternatives depend significantly on baseline water quality levels within service areas.
301	7.5-23	This level conservation is slightly more than the amount assumed to be implemented in Bulletin 160-98.
301	7.5-25	This level of reuse is more than the amount included in Bulletin 160-98.
301	7.5-26	Table 7.15-17 shows characteristics of urban provider groups for existing conditions and the No Action Alternative. Water prices, costs, and estimates of 2020 demands were obtained from DWR's Bulletin 160-98,Program data, and information furnished by urban water providers.
301	7.5-26	Local water supplies are based on information from Bulletin 160-98 and Program data. For the analysis, water demands are reduced for additional conservation under the No Action Alternative, and water supplies have been increased to account for water recycling levels under the No Action Alternative.
301	7.5-46	Demands were based on the 2020~level values developed for DWR's Bulletin 160-98 and include the forecasted levels of adoption of BMPs for urban conservation.

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References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices (continued)		
Volume	Page	Citation:
301	7.5-46	The LCPSIM model was run for both the Bay Region and the South Coast Region. Demands were based on the 2020 level values developed for DWR's Bulletin 160-98 and include the forecasted levels of adoption of BMPs for urban conservation.
301	7.5-49	Figure 7.5-8 is the option input table used for the South Coast Region. Information from DWR Bulletin 160-98 was used to develop the data in the table. The conservation options shown in this figure (and in Figure 7.5-9) represent actions beyond those assumed to have been implemented to achieve the level of conservation already incorporated in the study demands due to the adoption of BMPs.
301	7.5-50	Figure 7.5-9 is the option input table used for the Bay Region, which also was developed from information used in Bulletin 160-98.
301	a-14	EXISTING CONDITIONS – 1995 Level Hydrology. A 1995-level hydrology, HYD-D06E, is used. The 1995~level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections.
301	a-14	The 1995~level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections.
301	a-19	CRITERION A – 2020-Level Hydrology. A 2020~level hydrology, HYD-D09C is assumed. The 2020~level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections.
301	a-19	CRITERION B – 2020-Level Hydrology. A 2020-level hydrology, HYD-D09C is assumed. The 2020.level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections (73 years: 1922-1994)
301	a-20	CRITERION B – SWP Demands – SWP demands are assumed to vary from 3.6 to 4.2 MAF. This corresponds to DWR's Bulletin 160-98 assumptions for 2020~level demand.
301	a-31	COMMENTS AND ISSUES ON WATER CONSERVATION – The Program only assumes implementation of cost-effective, feasible urban conservation measures at a level slightly greater than the options identified in DWR's November 1998 Bulletin 160-98 (Bulletin 160-98).
301	a-31	COMMENTS AND ISSUES ON WATER CONSERVATION – The No Action Alternative significantly underestimates water conservation, due in part to its reliance on Bulletin 160-98.
301	a-31	COMMENTS AND ISSUES ON WATER CONSERVATION – The Program estimates of water conservation potential were not based entirely on Bulletin 160-98.
301	a-32	COMMENTS AND ISSUES ON WATER CONSERVATION –The Program erroneously overestimates water conservation potential compared to the amounts depicted in Bulletin 160-98, the state's official water planning document.

C-116301

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices
(continued)

Volume	Page	Citation:
301	a-32	COMMENTS AND ISSUES ON WATER CONSERVATION – For comparative purposes, the urban estimates are closely related to Bulletin 160-98 assumed options.
301	a-32	COMMENTS AND ISSUES ON WATER CONSERVATION – The Bulletin 160-98 options represent measures expected to be implemented in order to help offset future supply shortages. The options are assumed by the Program to occur regardless of a Bay-Delta solution.
301	a-32	COMMENTS AND ISSUES ON WATER CONSERVATION – Furthermore, the Bulletin 160-98 2020 baseline conditions provide a conservative estimate of changes that will occur over the next 20 years.
301	a-32	COMMENTS AND ISSUES ON WATER CONSERVATION – Thus, the Program assumes a more optimistic view of conservation that expects water users and water agencies, absent a Program solution, to implement most of the Bulletin 160-98 listed options.
301	a-32	COMMENTS AND ISSUES ON WATER CONSERVATION – For comparative purposes, the urban estimates are closely related to Bulletin 160-98 assumed options.
301	a-33	COMMENTS AND ISSUES ON WATER CONSERVATION – DWR's Bulletin 160-98 Public Draft indicates that over 800 TAF of additional real water conservation can and is expected to be achieved by 2020 from simply implementing measures in the urban MOU.
301	a-4	NO ACTION ALTERNATIVE Assumes 45,000 acres retired by 2020 according to the California Department of Water Resources (DWR) Bulletin 160.93
301	a-4	EXISTING CONDITIONS – Water conservation – Assumes levels noted in DWR Bulletin 160-93
301	a-43	ACTIONS THAT MAY CONTRIBUTE TO CUMULATIVE IMPACTS – Urbanization. The growth of population in California creates a demand for land for residential, commercial, and infrastructure use. Bulletin 160-98 estimates California's 2020 population at 47.5 million, a substantial increase from the 1995 level of 32.1 million.
303	151	OPTIONS FOR DIVERSION FEES AND POTENTIAL REVENUES – To show a reasonable range of values, Table 5.5 contains an estimate of average annual water use for "'all other diverters" based on information from Bulletin 160-98.
303	152	OPTIONS FOR DIVERSION FEES AND POTENTIAL REVENUES – Information separating agricultural and M&I water uses in this category was not tabulated except for major districts. To estimate revenues, the remaining diversions were assumed to be agricultural and the $7/AF rate applied. Values are based on DWR Bulletin 160-98 estimates for 1995~level applied water.

C-116302

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices
(continued)

Volume	Page	Citation:
304 a	54	REFERENCES DWR 1994. California Department of Water Resources. California Water Plan Update: Volume 2. Bulletin 160-93, October 1994.
307	1-11	The estimates of conservation potential contained in this document are not the only estimates issued by CALFED agencies. In November 1998, DWR released the California Water Plan, Bulletin 160-98. The public review draft, published in January 1998, received substantial review. The final report reflects comments from reviewers as well as refinements made by DWR.
307	1-11	Bulletin 160 presents DWR's estimates of reductions in water demand (depletion reductions) that may occur from the implementation of various demand management measures, including urban and agricultural water conservation and urban water recycling.
307	1-11	The Bulletin 160 series is a framework document designed to assist with water resources decisions.
307	1-11	For purposes of comparison to CALFED's conservation estimates, Table l-5 presents conservation and recycling estimates published in DWR's Bulletin 160-98.
307	1-11	The Bulletin 160-98 options (right-hand set of columns) are comparable to CALFED's No Action Alternative conservation estimates.
307	1-11	As can be seen in Table 1-5, the Bulletin 160-98 depletion reduction estimates are similar to the CALFED No Action Alternative irrecoverable loss savings (under CALFED's definition, depletion reductions are the same as currently irrecoverable loss reductions).
307	1-11	For instance, anticipated agricultural conservation savings estimated by CALFED are between 132 and 324 TAF. Bulletin 160-98's option estimates this savings at 230 TAF.
307	1-11	Table l-5. Summary of DWR's Bulletin 160-98 Projected Depletion Reductions (TAF)
307	1-12	Additionally, CALFED assumes indoor residential water use to reach only 60 gallons per capita daily (gpcd) under the No Action Alternative condition, whereas Bulletin 160-98 options assumes that this amount could drop to 55 gpcd.
307	1-12	When adjusting CALFED's No Action Alternative water recycling estimate for inclusion of the portion of the "base" water recycling yet to occur, the CALFED and Bulletin 160-98 levels compare favorably.
307	1-12	The CALFED Program further anticipates conservation and recycling savings to increase beyond the estimates discussed in Bulletin 160-98 as a result of the CALFED Program.
307	4-11	The majority of water applied to fields is obtained from water districts, which obtain most of their water from surface diversions (DWR 1994).

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices
(continued)

Volume	Page	Citation:
307	4-12	Slightly over 8.5 million acres of irrigated lands are located in the CALFED Program's geographic scope (there are slightly under 9.1 million irrigated acres in the state) (DWR 1998).
307	4-21	Misuse of terminology can cause significant difficulties with understanding and interpreting the data. To help ensure consistency in using key terms, CALFED adopted the DWR definitions described below. From DWR's January 1998, public review draft of -The California Water Plan Update: Bulletin 160-98":
307	4-44	Irrigated agriculture accounts for about 95% of the water use in the region. In the future, increased urbanization and increasing costs for water could reduce the variety and acreage of crops being produced and, thus, the amount of agricultural water use (DWR 1994).
307	4-46	The San Francisco Bay Region is primarily urban with very little agricultural acreage. A 1990 land use survey shows only about 60,000 acres of agriculture in the region (DWR 1994).
307	4-5	GENERAL STATE-WIDE ASSUMPTIONS – Statewide, agricultural acreage is expected to decline as a result of Central Valley urbanization, loss of soil productivity, ecosystem restoration activities, land retirement, water transfers, and other factors (DWR Bulletin 160-93).
307	4-50	Urbanization of agricultural land is expected to be most pronounced in this region. It is projected that by 2020 irrigated crop acreage will decline to about 184,000 acres, a 42% reduction (DWR 1994).
307	4-52	Several plans to conserve water in the area while stabilizing the Sea's salinity and water levels have been developed by the Salton Sea Task Force, chaired by the State Resources Agency. However, these plans would incur substantial cost (DWR 1994).
307	4-7	As defined by DWR for the Bulletin 160 series, irrigation efficiency is defined as the volume of irrigation water beneficially used, divided by the volume of irrigation water applied.
307	5-10	DWR, in their Bulletin 160-98, estimated 2020 indoor water use to reach 65 gpcd as a result of continued implementation of BMPs by many urban water suppliers.
307	5-10	CALFED has chosen to use this same 2020 baseline value to be consistent with DWR's projections contained in Bulletin 160-98.
307	5-13	Table 5-4. Reference ET, Values Assumed for Urban Regions – These values were provided by DWR staff at the Division of Planning and Local Assistance. They are similar to values used by DWR in the Bulletin 160-98 Public Draft (DWR 1998).
307	5-17	Table 5-5. Assumed Baseline Commercial, Industrial, and Institutional Percentage of Urban Per-Capita Use – Values were obtained from DWR 1997.

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices (continued)		
Volume	Page	Citation:
307	5-18	DWR also has stated that the BMPs in the Urban MOU (see discussion earlier in this section) are projected to reduce CII water use by 12-15% by 2020 (DWR 1998).
307	5-21	Current estimates place average unaccounted water in the various regions of the state between 6 and 15% of system deliveries. However, the amount varies significantly among urban suppliers, with some experiencing losses as high as 30% and others with less than 5%. Two percent is attributed to unmetered water use (including water used for construction, fire fighting, and flushing drains and hydrants) and meter errors; therefore, distribution system losses range between 4 and 13% (DWR 1998).
307	5-23	Table 5-6. Assumed Levels of System Distribution Losses (Percent of Total Demand) – Existing percentage values are compiled from data submitted to DWR by many water agencies throughout the state. Values do not include unmetered water or meter errors, both of which are not considered distribution system losses (DWR 1997).
307	5-5	SPECIFIC STATE-WIDE ASSUMPTIONS – No Action Alternative conditions, which include implementation of urban BMPs to levels targeted in the existing Urban MOU, as well as some additional urban conservation measures that are similar to those projected in DWR's Bulletin 160-98 (DWR 1998).
307	5-7	Table 5-2. DWR's Base and Projected Regional Urban Per-Capita Water Use (gpcd) – Values are from DWR's Bulletin 160-96 Public Review Draft, January 1996. The BMPs in the Urban MOU are the expected conservation measures implemented to project 2020 demands with conservation.
307	5-8	This level of BMP implementation is anticipated by DWR to generate an estimated 870 TAF of depletion reduction (reduction in irrecoverable losses) annually statewide by 2020 (DWR 1998).
307	5-9	Current average indoor residential water use is estimated to vary from 65 to 85 gpcd and is estimated statewide to average 75 gpcd (DWR 1998).
307	6-1	Currently, the total agricultural and urban water use in the state is about 42 MAF annually. Of this, the urban sector uses about 8.7 MAF, nearly 70% of which is used in the urban coastal areas of California (DWR 1997).
307	6-1	In hotter inland areas, this percentage can increase to more than 60% (DWR 1997).
307	6-11	Greater production from existing projects as well as completion of other projects still under construction are expected to increase the base to around 6 15 TAF by 2020 (DWR 1997).
307	6-11	Table 6-2 presents the survey information as incorporated into DWR data for use in the "California Water Plan Update, Bulletin 160-98 Public Draft" (DWR 1998).
307	6-12	Table 6-2. Cumulative Estimates of Water Recycling in 2020 (TAF/Year) – Draft information developed for "California Water Plan Update, Bulletin 160-98 Public Draft" (DWR, 1998).

C-116305

References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices (continued)		
Volume	Page	Citation:
307	6-13	It should be noted that the "California Water Plan Update, Bulletin 160-98" [DWR, November 19981] includes a lower level of water recycling for the South Coast Region than indicated in Table 6-2.
307	6-13	As a result only about 30% of the planned recycling potential shown in Table 6-2 for the South Coast, in addition to the South Coast's 2020 base recycling, was assumed to be implemented as part of Bulletin 160-98.
307	6-6	Currently, just under 500 TAF of urban water recycling occurs or is under construction in the state, with more projects being completed over the next several years (DWR 1997).
307	6-8	Table 6- 1. Customers of Existing Water Recycling Projects – DWR's California Water Plan Update, Bulletin 160-98, Public Review Draft, January 1998.
307	7-1	References – California Department of Water Resources (DWR). 1994. "California Water Plan Update." Final Bulletin 160-93. Sacramento, CA.
307	7-1	References –. 1997. Unpublished supporting information for "The California Water Plan Update, Bulletin 160-98." Obtained from DWR offices. Sacramento, CA.
307	7-2	References – November 1998. "The California Water Plan Update, Bulletin 160-98." Sacramento, CA.
307	7-2	References –. . January 1998. "The California Water Plan Update, Bulletin 160-98." Public Review Draft. Sacramento, CA.
307	P-15	CHANGES IN ESTIMATED CONSERVATION POTENTIAL – Improvements to on-farm irrigation systems were referred to as changes in seasonal application efficiency (SAE) rather than irrigation efficiency (IE). This change did not affect the calculations but will help reduce some of the confusion, especially when comparing DWR's Bulletin 160-98 to CALFED estimates.
307	P-3	SUMMARY OF COMMENTS – CALFED should/should not rely on data presented in the California Department of Water Resources' (DWR's) Bulletin 160-98 for baseline computations or projected water savings estimates.
308	B-15	Water Code – §1220. Pumping groundwater from combined Sacramento and Delta Central Sierra Basins (a) No groundwater shall be pumped for export from within the combined Sacramento and Delta-Central Sierra Basins, as defined in Department of Water Resources' Bulletin 160-74, unless the pumping is in compliance with a groundwater management plan that is adopted by ordinance pursuant to subdivision (b) by the county board of supervisors, in Ml consultation with affected water districts, and that is subsequently approved by a vote in the counties or portions of counties that overlie the groundwater basin, except that water that has seeped into the underground from any reservoir, afterbay, or other facility of an export project may be returned to the water supply of the export project.

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References to Bulletin 160 in CalFed EIS/EIR & Technical Appendices (continued)		
Volume	Page	Citation:
311	115	Table 5-1. Examples of periodic and non-periodic reports from agencies and programs in the CALFED Bay-Delta solution area. – Department of Water Resources – Bulletin 160

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