City of Folsom

Folsom Specific Plan Area SB 610 Water Supply Assessment

Folsom Specific Plan Area Water Supply Assessment

PREPARED FOR CITY OF FOLSOM

JUNE 2011

FINAL

Prepared by:

Tully & Young
Comprehensive Water Planning

TABLE OF CONTENTS

GLOSSARY OF ABBREVIATIONS IV

INTRODUCTION 1

SECTION 1 PROJECT DESCRIPTION 4
- 1.1 Project Land Uses 5
  - 1.1.1 Folsom SPA - PPA Land Uses 6

SECTION 2 FOLSOM SPA – PPA WATER DEMAND ESTIMATE 9
- 2.1 Folsom SPA Demand Projection Methodology 9
  - 2.1.1 Historic Demand Factors 9
  - 2.1.2 Regional Residential Unit Demand Factors 12
  - 2.1.3 Current and Future Mandates 13
- 2.2 Folsom SPA – PPA Demand Factors 19
  - 2.2.1 Residential 19
  - 2.2.2 Non-Residential 24
- 2.3 Folsom SPA – PPA Non-Potable Water Demand 29
- 2.4 Projected Water Demands for Folsom SPA - PPA 30

SECTION 3 FOLSOM SPA WATER SUPPLY 33
- 3.1 Explanation of the Proposed Water Supply 33
- 3.2 Surface Supply Analysis 34
  - 3.2.1 NCMWC Water Supplies 34
- 3.3 Agreements Supporting A Plan to Secure a Water Supply 38
  - 3.3.1 NCMWC – South Folsom Properties Agreement 38
  - 3.3.2 City - South Folsom Area Group Agreement 39
- 3.4 Capacity Agreement 39
- 3.5 Conveyance Alternatives 40
- 3.6 Facilities Cost and Financing 40
  - 3.6.1 Facility Costs 40
  - 3.6.2 Financing Plan 42
- 3.7 Regulatory Approvals and Permits 42
- 3.8 Proof of Appropriation 42
- 3.9 Supply Summary 43

SECTION 4 FOLSOM SPA – PPA SUPPLY SUFFICIENCY ANALYSIS 44

SECTION 5 FOLSOM SPA – RHA LAND USE PLAN 45
5.1 Land Use Plan Characteristics 45

SECTION 6 FOLSOM SPA – RHA WATER DEMAND ESTIMATE 47
6.1 Folsom SPA – RHA Demand Factors 47
6.1.1 Residential 47
6.1.2 Non-Residential Unit Demand Factors 50
6.2 Folsom SPA – RHA Non-Potable Water Demand 52
6.3 Projected Water Demands for Folsom SPA 53

SECTION 7 FOLSOM SPA – RHA WATER SUPPLY 56

SECTION 8 FOLSOM SPA – RHA WATER SUPPLY SUFFICIENCY ANALYSIS 57

APPENDICES 58

GLOSSARY OF ABBREVIATIONS

AW	Applied Water
BMP	Best Management Practices
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
CFD	Community Facilities District
EID	El Dorado Irrigation District
EIR/EIS	Environmental Impact Report/Environmental Impact Statement
ETo	Reference Evapotranpiration
FRWA	Freeport Regional Water Authority
IE	Irrigation Efficiency
LAFCO	Local Agency Formation Commission
MWELO	Model Water Efficient Landscape Ordinance
NCMWC	Natomas Central Mutual Water Company
NEPA	National Environmental Policy Act
PCWA	Placer County Water Agency
PF	Plant Factor
SBX7 7	Extraordinary Session Seven, Senate Bill 7
SCWA	Sacramento Couny Water Agency
SFP	South Folsom Properties
SPA	Specific Plan Area
SPA - RHA	Specific Plan Area - Reduce Hillside Development Alternative
SPA WSA	Specific Plan Area Water Supply Assessment
USBR	United States Bureau of Reclamation
UWMP	Urban Water Management Plan
WFA	Water Forum Agreement
WSA	Specific Plan Area - Proposed Project Alternative

INTRODUCTION

The City of Folsom and the U.S. Army Corps of Engineers are preparing an Environmental Impact Report/Environmental Impact Statement for the proposed Folsom Specific Plan Area (Folsom SPA) development south of U.S. Highway 50.[1] The Folsom SPA qualifies as a "project" under California Water Code (CWC) § 10912 because it is a proposed residential development project of more than 500 units.[2] Pursuant to CWC § 10910 (b), the City of Folsom has identified two public water systems that will serve the project – the City of Folsom and El Dorado Irrigation District (EID).[3] Both the City of Folsom and EID are public water systems under CWC § 10912 because they both operate systems for providing piped water for public consumption to more than 3,000 service connections. Procedurally, the City of Folsom, as the land-use agency responsible for the Folsom SPA, and has prepared the Folsom SPA Water Supply Assessment (Folsom SPA WSA) for approval by both the Folsom City Council and EID's Board of Directors as the respective governing body of each public water system that will provide water to the project.[4]

Because the City of Folsom and EID are public water systems that may provide water service to the Folsom SPA and neither included the Folsom SPA in their respective 2005 UWMPs, the City of Folsom and EID have prepared this Folsom SPA WSA.[5] This Folsom SPA WSA determines whether the total projected water supplies for the Folsom SPA during normal, single dry, and multiple dry water years during a 20-year time period,

[1] Section 21151.9 of the Public Resources Code requires that any proposed "project" comply with California Water Code (CWC) sections 10910, et seq. Specifically, CWC § 10910(a) provides that "Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act ... shall comply with this part." CWC § 10912(a)(1) defines a "project" as "A proposed residential development of more than 500 dwelling units."

[2] As explained in Section 1.1, there are two project alternatives analyzed in the Folsom SPA WSA – the Proposed Project Alternative (Folsom SPA – PPA) and the Reduced Hillside Development Alternative (Folsom SPA – RHA). Both exceed the 500 unit threshold and therefore both qualify as a "project" pursuant to CWC § 10912.

[3] CWC § 10910(b) provides that "The city or county, at the time that it determines whether an environmental impact report ... is required for any project subject to the California Environmental Quality Act ..., shall identify any water system that is, ..., a public water system, as defined in Section 10912, that may supply water for the project.

[4] Pursuant to CWC § 10910(g)(1) "The governing body of each public water system, or the city or county if either is required to comply with this act pursuant to subdivision [10910] (b), shall approve the assessment prepared pursuant to this section at a regular or special meeting."

[5] Both the City of Folsom and EID are public water systems that may serve the project and would therefore be responsible for preparation of a water supply assessment.

will meet the projected Folsom SPA water demand.[6] As discussed in more detail, this WSA concludes that the total projected water supplies for the Folsom SPA are sufficient to meet the SPA's projected water demand, for both the Folsom SPA Proposed Project Alternative (Folsom SPA – PPA) and the Folsom SPA Reduced Hillside Development Alternative (Folsom SPA – RHA), during normal, single dry and multiple dry water years during a 20-year time period.

Under CWC sections 10910(a) and 10912(a), the project to be analyzed in a WSA is the project that is subject to review under the California Environmental Quality Act (Public Resources Code sections 21100-21177 (CEQA)). Under CEQA, project alternatives are not equivalent to the proposed project. (See Public Resources Code § 21100(b).)[7]

The EIR/EIS that this WSA supports is subject to the National Environmental Policy Act (42 USC 4321 et seq. (NEPA)), as well as CEQA. The EIR/EIS therefore analyzes project alternatives in the level of detail required by NEPA. (See 40 CFR § 1502.14.), The Folsom SPA – RHA would involve more residential units than the Folsom SPA. Because of this fact and because the EIR/EIS analyzes that alternative in the level of detail required by NEPA, out of an abundance of caution, the City in this WSA analyzes the Folsom SPA – RHA's water demands in comparison to the City's proposed water supplies even though CWC sections 10910(a) and 10912(a) do not require the City to prepare a WSA for the Folsom SPA – RHA or for the other land-use alternatives that the EIR/EIS considers. The other land-use alternatives considered by the EIR/EIS involve an equal or lower number of residential units and greater number of acres of non-irrigated open space than the Folsom SPA – PPA and therefore do not raise the same water-supply issues as the Folsom SPA – RHA.

Section 1 provides a description of the planned land uses for the Folsom SPA - PPA. **Section 2** provides a water demand projection methodology for both the Folsom SPA – PPA and the Folsom SPA – RHA and the water demand projection for the Folsom SPA – PPA. **Section 3** analyzes the water supply proposed for the Folsom SPA, assuming the same supply will be available regardless of the ultimate land-use alternative selected.

[6] CWC § 10910(c)(4) provides that "If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, ..., the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses."

[7] Public Resources Code § 21100(b) provides, in relevant part: "The environmental impact report shall include a detailed statement setting forth all of the following . . . (4) Alternatives to the proposed project."

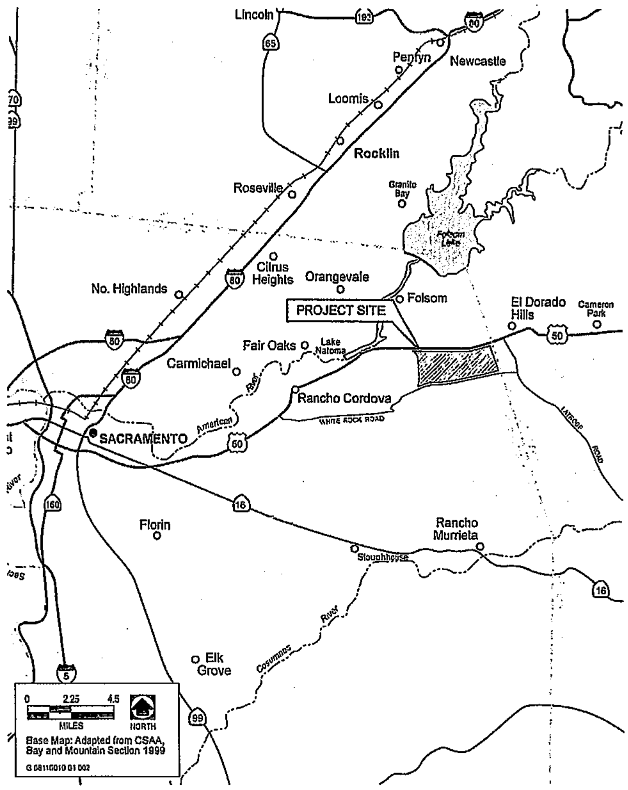
Section 4 presents a sufficiency analysis for the Folsom SPA – PPA. **Section 5** describes the Folsom SPA – RHA land-use plan. **Section 6** contains a unique water demand projection for the Folsom SPA – RHA. **Section 7** summarizes the water supply availability conclusions from **Section 3**. **Section 8** provides a sufficiency analysis for the Folsom SPA – RHA.

SECTION 1 PROJECT DESCRIPTION

As shown in **Figure 1**, the Folsom SPA is located in eastern Sacramento County south of U.S. Highway 50.[8] Currently, the land in the Folsom SPA is comprised of open non-irrigated natural grass hills with some native oak stands. Alder Creek runs through the project site along a portion of the site's northern boundary. The project site is surrounded by agricultural and rural residential land uses to the south. West of the project site is land which is owned by the Aerojet-General Corporation that the company plans to develop for residential and commercial uses. The eastern boundary is the El Dorado County line. The project site is located within the City of Folsom's sphere of influence and planning area boundary.

[8] General project land-use description as provided in Notice of Preparation of a Joint Draft Environmental Impact Report/Environmental Impact Statement for the Folsom South of U.S. Highway 50 Specific Plan Project, September 12, 2008. (Folsom SPA NOP)

Figure 1[9]
Folsom Specific Plan Area
Regional Location Map



1.1 PROJECT LAND USES

Generally, at buildout, both the Folsom SPA – PPA and Folsom SPA – RHA envision a significant mixed-use project on approximately 3,500 acres, including approximately 1,500 acres of residential land uses, 1,000 acres of non-residential development, and 1,000 acres of open space. The City of Folsom will consider applying to the Sacramento County Local Agency Formation Commission (LAFCO) to annex the Folsom SPA to the City. But as indicated in the Introduction, the Folsom SPA lies within two separate retail water service jurisdictions. Most of the total Folsom SPA is within the City of Folsom's

[9] Exhibit 1, Folsom SPA NOP.

water service area and a portion is within the El Dorado Irrigation District's (EID) water service area.[10]

1.1.1 Folsom SPA - PPA Land Uses

The Folsom SPA - PPA land uses are presented in **Table 1-1**, and the land-use areas are depicted graphically in **Appendix B**. Total project acreage will be 3,510 acres, including a maximum of 10,210 dwelling units.

Table 1-1
Folsom SPA - PPA
Land Uses[11]

Land Use ID	Area, acres	Dwelling Unit Density DU/acre	Dwelling Units
Single-Family (SF)	557.8	3.0	1,687
Single-Family; High Density (SFHD)	532.5	5.5	2,933
Multi-Family; Low Density (MFLD)	266.7	9.1	2,434
Multi-Family; Med. Density (MFMD)	67.0	18.3	1,224
Multi-Family; High Density (MFHD)	49.9	25.1	1,251
Mixed Use - Res. (MU-R)	35.5	11.5	681
Mixed Use - Non. Res. (MU-NR)	23.6	--	--
Office Park (OP)	89.2	--	--
Community Commercial (CC)	38.8	--	--
General Commercial (GC)	212.9	--	--
Regional Commercial (RC)	110.8		
Park	118.2	--	--
Local Park (LP)	3.5	--	--
School (SCH)	179.3	--	--
Open Space (OS)	1,053.1	--	--
Major Circulation (MAJ CIRC)	171.6	--	--
Total Residential	**1,509.4**		**10,210**
Total Non-Res	**2,001.0**		**0**
Total:	**3,510.4**		**10,210**

For the purpose of understanding the extent of the water that the Folsom SPA - PPA could demand from EID, **Table 1-2** provides the land use assumptions for the portion of the Folsom SPA - PPA located in the EID service area. EID's service area portion of the Folsom SPA - PPA encompasses approximately 172 acres and is projected to realize

[10] Sacramento LAFCO approved the City of Folsom Sphere of Influence Amendment Application in 2001 by adopting Resolution No. LAFC 1196. A copy of Resolution No. LAFC 1196 is attached as **Appendix A**.

[11] From MacKay and Somps, Land Use Summary, May 20, 2009. A copy of the Land Use Summary is attached as **Appendix C**. This is an update from the Specific Plan Land Uses presented in Table 1 of the Folsom SPA NOP.

construction of 530 dwelling units. For comparison, **Table 1-3** provides the land uses and associated dwelling units planned for the City of Folsom's water service area. This Folsom SPA WSA identifies a source of water and conveyance facilities that will be used to deliver water supplies to both service areas. The water supply identified for the entire project is an entirely new source for both service areas and will therefore not impact any existing water supplies in the City of Folsom or EID service areas.

Table 1-2
Folsom SPA – PPA
EID Service Area Land Uses

Land Use ID	Area (Acres)	Dwelling Unit Density DU/acre)	Dwelling Units
Single-Family (SF)	33.8	3.1	106
Single-Family; High Density (SFHD)	31.0	5.5	171
Multi-Family; Low Density (MFLD)	27.9	9.1	253
General Commercial (GC)	29.5	--	--
Open Space (OS)	43.1	--	--
Major Circulation (MAJ CIRC)	6.8	--	--
Total Residential	**92.7**		**530**
Total Non-Res	**79.4**		**0**
Total	**172.1**		**530**

Table 1-3
Folsom SPA - PPA
Folsom Water Service Area Land Uses

Land Use ID	Area (Acres)	Dwelling Unit Density (DU/acre)	Dwelling Units
Single-Family (SF)	524.0	3.0	1,581
Single-Family; High Density (SFHD)	501.5	5.5	2,762
Multi-Family; Low Density (MFLD)	238.8	9.1	2,181
Multi-Family; Med. Density (MFMD)	67.0	18.3	1,224
Multi-Family; High Density (MFHD)	49.9	25.1	1,251
Mixed Use - Res. (MU-R)	35.5	19.2	681
Mixed Use - Non. Res. (MU-NR)	23.6	--	--
Office Park (OP)	89.2	--	--
Community Commercial (CC)	38.8	--	--
General Commercial (GC)	183.4	--	--
Regional Commercial (RC)	110.8		
Park	118.2	--	--
Local Park (LP)	3.5	--	--
School (SCH)	179.3	--	--
Open Space (OS)	1,010.0	--	--
Major Circulation (MAJ CIRC)	164.8	--	--
Total Residential	**1,416.7**		**9,680**
Total Non-Res	**1,921.6**		**0**
Total:	**3,338.3**		**9,680**

As mentioned above, the planned water supply for the Folsom SPA is separate from the water supplies currently serving the City of Folsom's and EID's existing service areas. Under the Folsom SPA WSA, the City of Folsom will control the wholesale water supply for the entire Folsom SPA. It will also control the retail water supply and associated infrastructure in the City of Folsom's portion of the Folsom SPA. All water facilities and retail water supplies delivered in EID's portion of the Folsom SPA will be controlled by EID.

Water Code section 10910 requires the sufficiency of water demands to be assessed during a twenty year period. Accordingly, the Folsom SPA WSA assumes construction of the necessary water infrastructure will be completed by 2013 in time to meet water demands for the Folsom SPA – PPA. Full water demand in the Folsom SPA – PPA will be achieved by 2033 upon project completion.

SECTION 2 FOLSOM SPA – PPA WATER DEMAND ESTIMATE

2.1 FOLSOM SPA DEMAND PROJECTION METHODOLOGY

Section 2 provides a water demand projection methodology for both the Folsom SPA – PPA and Folsom SPA – RHA and the water demand projection for the Folsom SPA - PPA.[12] **Section 2.1** provides a basis for the unit demand factors for the water demand estimates by reviewing the unit water demand factors of both the City of Folsom and other water purveyors in the region, as well as additional conservation drivers. Both the historic demand factor assessment and the conservation drivers provide a foundation for the water demand projection for the Folsom SPA – PPA contained in **Section 2.2** and the Folsom SPA – RHA projection contained in **Section 6.1**. **Section 2.3** identifies potential Folsom SPA – PPA demands that could be served by a non-potable supply. Neither the City of Folsom nor EID has developed a non-potable supply to deliver to the Folsom SPA. As such, this water supply assessment does not rely on a non-potable supply to meet any portion of the water demand projected for either the Folsom SPA – PPA.[13] **Section 2.4** provides the water demand projection for the Folsom SPA – PPA used for the sufficiency analysis in **Section 4**.

2.1.1 Historic Demand Factors

The demand projections for the Folsom SPA – PPA and Folsom SPA - RHA are based upon review of historic City of Folsom meter data, evaluation of meter data in neighboring water service jurisdictions and pending conservation mandates. The City of Folsom's 2005 Urban Water Management Plan (2005 UWMP) contains the most current unit water demand factors used by the City of Folsom to project land-use water demands. The unit demand factors used in the 2005 UWMP represent historic conditions with a range of housing ages, plumbing fixtures, and irrigation systems, and therefore do not reflect demand conditions for completely new construction. Since the 2005 UWMP was adopted, the City of Folsom has completed a five-year single-family residential meter reading project that has validated the unit demand factors used in the 2005 UWMP for the City's existing service areas. Specifically, in the 2005 UWMP, the

[12] CWC § 10910(c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

[13] This does not preclude, however, an additional future non potable supply being made available to the project in the City's or EID's service area.

"Low Density Residential" land-use category was assigned a unit demand factor of 0.65 acre-feet per dwelling unit per year (af/du/yr), while the "Very Low Density Residential" category was assigned a unit demand factor of 0.59 af/du/yr.[14] The results of the 2003-2008 meter reading study support the use of 0.59 and 0.65 af/du/yr for the City's existing service area. The 2003-2008 meter-reading project entailed reading the meters of 3,909 single-family homes in August 2003 and again in July 2008 and calculating an annual average based upon the cumulative total. The average annual unit demand was 0.67 af/du/yr for all samples and 0.63 af/du/yr when the highest and lowest ten percent of samples were removed. These figures therefore support use of a historic figure between 0.60 and 0.70 af/du/yr as a basis for further refinement of the unit demand factors for both the Folsom SPA – PPA and Folsom SPA - RHA.

While the division between indoor and outdoor unit demands in the City of Folsom's meter study is not certain because dedicated irrigation meters did not exist on the accounts used for the study, it is possible to derive both indoor and outdoor unit demands using the meter data. The outdoor component calculation uses reference evapotranspiration (ETo), plant factor, and irrigation efficiency numbers that are appropriate for the City of Folsom's geography and climate.[15] In the City of Folsom, ETo is 53 inches per year, the average plant factor throughout a residential landscape is 0.7 and irrigation efficiency is about 70%.[16] Thus, total average applied water use to meet

[14] In the 2005 UWMP, the unit demand factor for the "Low Density" Residential category was comprised of an indoor factor of 0.20 af/du/yr and an outdoor factor of 0.45 af/du/yr. For the "Very Low Density" Residential category the unit demand factor was comprised of an indoor factor of 0.20 af/du/yr and an outdoor factor of 0.39 af/du/yr. These factors do not account for system losses.

[15] "Reference evapotranspiration" (ETo) is a standard measure of the environmental conditions, which affect the water use of plants. It is typically derived by measuring the evapotranspiration of cool-season grass and is expressed in inches over a specific period of time. A "plant factor" is used to determine plant water use relative to ETo. "Plant factors" are assigned to low, moderate and high water use plants. "Irrigation efficiency" (IE) is the measurement of the amount of water used by a plant divided by the amount of water applied.

[16] ETo is measured at the California Irrigation Management Information System (CIMIS) station located in Fair Oaks, California. The plant factor of 0.7 reflects the fact that the predominant landscape planting in the residential sector is cool-season grass, which has a plant factor of 0.8. A slight reduction is made to 0.7 to account for trees, shrubs, native landscapes, and non-living landscape cover. An irrigation efficiency of 70% was selected because, according to UC Cooperative Extension and the Department of Water Resources, "A representative range of efficiencies for landscape systems is proposed ... to be from 65% to 90%," and "A system which is well designed and operated can have an efficiency range of 80% to 90%." Because historic residential unit demand was estimated for homes built no later than 2003, it is unlikely the systems would be considered "well designed and operated" seven years later. Therefore, an irrigation efficiency rate on the lower end of the range was selected. *A Guide to Estimating Irrigation Water Needs from Landscape Plants in California*, University of California Cooperative Extension and California Department of Water Resources, August 2000.

outdoor demand is calculated at 4.30 acre-feet per acre (af/ac).[17] As shown in **Table 2-1**, assuming four units per acre (the mid range between the "Very Low" and "Low Density" categories), up to 35% building coverage, 15% for roads and right of ways, and about 10% for hardscapes, then landscape area would be about 40% per unit.[18] Total landscape demand per unit would be approximately 0.39 acre-feet per unit per year (af/unit/year).

Table 2-1
Outdoor Unit Demand Validation

Outdoor Unit Demand Derivation	
Parcel Area (sf)	10890
Landscape Area (sf)	3920
Landscape Area (ac)	0.09
Landscape Water Demand (af/yr)	0.39

If total annual unit demand is 0.61 af/unit/yr, the indoor demand component of total demand is approximately 0.22 af/unit/year after subtracting the outdoor demand component shown in **Table 2-1**. If there are 2.83 persons per unit per the 2005 UWMP, the indoor demand per person would be about 70 gallons/day, as shown in **Table 2-2**.

Table 2-2
Indoor Unit Demand Validation

Baseline Indoor Unit Demand	
Indoor Unit Demand (af/unit/yr)	0.22
Persons Per Unit	2.83
Indoor Per Capita Demand (gpcd)	69.4

[17] Applied Water (AW) = (ETo * Plant Factor)/IE. To convert ETo from inches to cubic feet, divide by 12. To convert cubic feet to gallons multiply by 7.481 gallons/cubic foot. To convert to gallons per acre, multiply by 43,560 ft/ac. To convert from gallons to acre-feet, divide by 325,851. (((((53/12)*7.481)*43560)/325851)*.7)/.7= 4.3 af/ac. This method does not account for "effective precipitation," (where effective precipitation is defined as the portion of annual rainfall that contributes to the outdoor demand) which may further reduce applied water. This constitutes a conservative estimate of applied water demand. For comparison, EID data provided by EID Staff indicates much lower outdoor unit demand factors (e.g. reported use of recycled water for recreational turf areas is about 2.2 acre-feet/acre). For purposes of the Folsom SBA – PPA outdoor demands, the higher outdoor factor is used as a baseline. The conservative estimate identified here is used for planning purposes.

[18] The estimate of landscaped area assumes the single-family lots in the meter study are similar to the City of Folsom's *Single Family Dwelling, Medium Lot District* category, which requires 10,000 square foot lots and maximum building coverage of 35%.

Thus, 70 gallons/day will be used as the base indoor per capita demand for the Folsom SPA – PPA and Folsom SPA – RHA, with refinements as explained in **Section 2.2.1.1** and **Section 6.1.**[19]

2.1.2 Regional Residential Unit Demand Factors

Dwelling unit demand factors for the Folsom SPA – PPA and Folsom SPA – RHA water demand estimates are also based on regional unit demand figures. Regional residential unit demand factors are presented in **Table 2-3** for comparison with unit demand factors used by the City of Folsom in its 2005 UWMP. Notably, EID, the City of Roseville and the Placer County Water Agency (PCWA) provide metered water service and Sacramento County Water Agency (SCWA) is a partially metered jurisdiction.[20] Much of the housing product mix in the El Dorado Hills portion of EID's service area, the City of Roseville, PCWA and SCWA service areas is similar to that in the City of Folsom. Overall, average unit demand for these jurisdictions are comparable to the City of Folsom's historic unit demand. Instances where demand factors are lower could be partially due to volumetrically billing in the residential sector, effective precipitation, smaller percentages of system losses, and other factors affecting demand variability. Because the City of Folsom plans to provide metered water service to single-family residential units in the Folsom SPA, unit demand factors below the unit demands factors used in the City of Folsom's 2005 UWMP are appropriate. Also, the fact that the average figures were developed based upon water use across a wide mix of housing ages and product types provides support for the case that a more modern uniform housing product with current conservation infrastructure - such as that which will exist in the Folsom SPA - should have lower unit water demand factors for each respective residential density category than the unit water demands used in the City of Folsom's 2005 UWMP.

---

[19] This indoor baseline per capita demand value is further supported by EID's historic data for "Single-Family Dual Potable" water use as reported in its annual Water Resources & Services Reliability Report (2006 through 2009, see Appendix Table A). In these annual reports, the estimated indoor use averages less than 0.20 acre-feet per dwelling unit.

[20] The PCWA service area is the geographic boundary in Placer County throughout which PCWA carries out a broad range of responsibilities including water resource planning and management, retail and wholesale supply of irrigation water and drinking water and production of hydroelectric energy. The SCWA service area includes eight zones of benefit. Each zone encompasses a unique geographic area of benefit to achieve SCWA's desired water management goals, including storm and floodwater control, diversion, storage and delivery of surface water, and regulation, production and distribution of groundwater. EID values are from Appendix Table A from recent Water Resources & Services Reliability Reports available on EID's website.

Table 2-3[21]
Regional Residential Unit Water Demand Comparison

Folsom SPA Land Use	Unit Density (units/ac)	Unit Water Demand Factors, AF/DU Roseville	PCWA	SCWA	EID	Average	2005 UWMP
Residential							
Single Family	3.9	0.84	0.64	0.68	0.74	0.73	0.65
Single Family High Density	6.9	0.59	0.55	0.68	n/a	0.61	0.65
Multi Family Low Density	11.9	0.37	0.48	0.29	0.34	0.37	0.56
Multi Family Medium Density	17.9	0.33	0.35	0.29	0.34	0.33	0.40
Multi Family High Density	25	0.21	0.21	0.15	n/a	0.19	0.30
CCD-Residential	12	0.21	0.21	0.15	n/a	0.19	0.30

2.1.3 Current and Future Mandates

External forces may drive the City of Folsom to adopt policies that ensure future residential development in the City of Folsom achieves lower unit water demands than those seen historically in the City of Folsom. **Section 2.1.3** identifies and describes the key drivers that support use of unit demand factors that are lower than historically seen in the City of Folsom and either similar to or even more aggressive than those in neighboring jurisdictions.

2.1.3.1 Water Conservation Objectives

On November 10, 2009, Governor Arnold Schwarzenegger signed SBX7 7 which now requires each urban water supplier to select one of four water conservation targets in California Water Code § 10608.20 with the statewide goal of achieving a 20-percent reduction in urban per capita water use by 2020. The City of Folsom is not yet required to state a water conservation target pursuant to SBX7 7, but will do so in its 2010 Urban Water Management Plan (2010 UWMP). Pursuant to SBX7 7, the City of Folsom's deadline for adopting its 2010 UWMP is July 1, 2011. (CWC § 10608.20(a)(1), (i)).

[21] The unit water demands are the estimated end-use unit water demands only and do not include a non-revenue water component. Non-revenue water (NRW) is generally defined as water that has been produced (treated to accepted water quality standards for drinking water) and is "lost" before it reaches the customer. Losses can be real, through leaks, or apparent, through meter inaccuracies or unknown or unbilled connections and uses (e.g. fire hydrant flushing and construction water).

As required by SBX7 7, the city's ultimate target will require reductions in per capita urban water use from past levels. To reach its ultimate target under SBX7 7, the City of Folsom probably will need to institute water conservation measures in its existing service area, and also require new service areas to use efficient indoor infrastructure and landscape features. The state's intent is to achieve a statewide 20-percent reduction in urban per capita water use by 2020. SBX7 7's mandates to the City and the City's opportunity to help achieve the state's goal by requiring that development in the Folsom SPA incorporate state-of-the-art efficiency measures all indicate that per unit water demands under the Folsom SPA – PPA (and the Folsom SPA – RHA) will be at least 10% below historic per capita unit demand factors in the City's existing service area. The reduction will be reflected in the unit demand factors identified in **Section 2.2** and **Section 6.1**.

2.1.3.2 Indoor Infrastructure Requirements

In January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (CAL Green Code) which will require the installation of water-efficient indoor infrastructure for all new projects beginning on January 1, 2011. CAL Green Code is currently in draft form and will become law on January 1, 2011 when it is incorporated into Title 24 of the California Code of Regulations.[22] The CAL Green Code will apply to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure. Because the Folsom SPA will be applying for building permits from the City of Folsom after January 1, 2011 and the project will include new "buildings and structures" under the CAL Green Code, it will need to satisfy the indoor water use infrastructure standards necessary to meet the CAL Green Code.

The CAL Green Code requires residential and nonresidential water efficiency and conservation measures for new buildings and structures that will reduce the overall potable water use in the building by 20%. The 20% water savings can be achieved in one of the following ways: (1) installation of plumbing fixtures and fittings that meet the 20% reduced flow rate specified in the CAL Green Code, or (2) by demonstrating a 20%

[22] The CAL Green Code will appear as Part 11 in Title 24 on January 1, 2011. All references in this WSA will be to the Chapter and Section numbers that appear in the Draft document which may be obtained by visiting the California Building Standards Commission web site at: http://www.documents.dgs.ca.gov/bsc/documents/2010/Draft-2010-CALGreenCode.pdf.

reduction in water use from the building "water use baseline."[23] This WSA assumes that the residential and nonresidential buildings constructed for the Folsom SPA will satisfy one of these two requirements. To be conservative, this WSA assumes that the water savings attributable to installation of the required infrastructure will provide indoor water savings of at least 10% compared to existing infrastructure standards – but not the full 20% considered above.

2.1.3.3 California Model Water Efficient Landscape Ordinance

In 2006, the California Legislature enacted, and the Governor signed, the Water Conservation in Landscaping Act (Gov. Code §§ 65591-65599), which requires the Department of Water Resources to update the Model Water Efficient Landscape Ordinance (MWELO). On September 10, 2009, the Office of Administrative Law (OAL) approved the updated MWELO, which requires that a local agency adopt the provisions of the MWELO. Because the City of Folsom is a "local agency" under the MWELO, it must require "project applicants" to prepare plans consistent with the requirements of MWELO for review and approval by the City of Folsom. The City of Folsom is in compliance with this state law.

The MWELO provisions likely to have a significant effect on the landscape design and resulting outdoor water demand include preparation of a Landscape Design Plan with a water budget that is 70% of reference evapotranspiration.[24] The provisions of the MWELO are applicable to new construction with a landscape area greater than 2,500 square feet.[25] The MWELO "highly recommends" use of a dedicated landscape meter on landscape areas smaller than 5,000 square feet, and requires weather-based irrigation controllers or soil-moisture based controllers or other self-adjusting irrigation controllers for irrigation scheduling in all irrigation systems.[26] The MWELO provides a

[23] See **Appendix D** which contains Chapter 4 and Chapter 5 from the Draft CAL Green Code. For Residential construction, Section 4.303.1 provides the residential water conservation standard and Table 4.303.2 identifies the infrastructure requirements to meet this standard. Table 4.303.1 and Worksheets WS-1 and WS-2 are to be used in calculating the baseline and the reduced water use if Option 2 is selected. For non-residential construction, Section 5.303.2 provides the water conservation standard as well as the baseline and reduced flow rate infrastructure standards. Note that Worksheets WS-1 and WS-2 incorporate both residential and non-residential fixtures, yet the water use is still to be analyzed by "building or structure" as specified in Chapter 1, Section 101.3.

[24] California Code of Regulations (CCR), Tit. 23, Div. 2, Ch. 27, Sec. 492.4. The MWELO provides the local agency discretion to calculate the landscape water budget assuming a portion of landscape demand is met by precipitation, which would further reduce the outdoor water budget. For purposes of this WSA, precipitation is not assumed to satisfy a portion of the outdoor landscape requirement because the determination of an appropriate effective precipitation factor is highly uncertain given the various landscape slopes, terrain composition, concurrent watering schedules, etc.

[25] CCR Tit. 23, Div. 2, Ch. 27, Sec. 490.1.

[26] CCR Tit. 23, Div. 2, Ch. 27, Sec. 492.7(a)(1)(A)-(B).

methodology to calculate total water use based upon a given plant factor and irrigation efficiency.[27] Finally, MWELO requires the landscape design plan to delineate hydrozones (based upon plant factor) and then assign a unique valve for each hydrozone (low, medium, high water use).[28]

It is difficult to predict the ultimate impact of the MWELO requirements on water demand. While the requirement is for development of a landscape design plan that uses plants and features that are estimated to use no more than 70% of ETo, some provision must be made for the inherent tendency to overwater even with irrigation controllers installed, piecemeal changes in landscape design, reductions in irrigation efficiency through product use, and limited resources for enforcement in the absence of dedicated irrigation meters.

For these reasons, outdoor water use is assumed to be about 85% ETo over a long-term period. 85% of ETo was selected based on a study that supports the assumption that customers tend to apply 16% more water to the landscape than it actually needs.[29] While weather-based irrigation controllers may reduce this number such that only about 2% more water is being applied than is needed, some consideration needs to be made for the factors described above that will impact water use, outside of a controlled study, even when using a weather-based irrigation controller. These factors will likely result in overuse somewhere between 2% and 16%. Given the uncertainty regarding these impacts, the "overuse" percentage of 16% was used to adjust the MWELO Landscape Plan requirement of 70% of ETo. Dividing 70% by 84% (difference between 1.0 and .16) results in an adjusted figure of approximately 85%.

2.1.3.4 Metering and Volumetric Pricing

In 2003, the California Legislature enacted, and the Governor signed, legislation that set in motion the requirement for the City of Folsom and other purveyors to install meters on all service connections to residential and nonagricultural commercial buildings constructed prior to January 1, 1992. As a result, Water Code § 526 now requires the City to charge for water based upon the actual volume of water delivered by March 1,

---

[27] In calculating Estimated Total Water Use, the MWELO requires use of at least a 71% irrigation efficiency factor. Assuming 71% irrigation efficiency, the average plant factor must be 0.50. It would be possible to stay within the water budget if the average plant factor were higher than 0.50 by designing a system with an irrigation efficiency higher than 71%. Again the relationship between a Plant Factor (PF) and Irrigation Efficiency (IE) in the Applied Water formula is: AW=(ETo*PF)/IE.

[28] CCR Tit. 23, Div. 2, Ch. 27, Secs. 492.3(a)(2)(A) and 492.7(a)(2).

[29] http://www.irwd.com/Conservation/FinalETRpt[1].pdf.

2013. Assuming construction of the Folsom SPA water infrastructure occurs in 2011, and water demand is realized in 2013, the City will be billing the Folsom SPA water users on a volumetric basis by the time water service commences, which could ultimately result in unit water demand factors less than those seen historically in the City of Folsom.

The California Urban Water Conservation Council (CUWCC) recommends assuming a 20% water savings for accounts with meter retrofits and volumetric rates.[30] Twenty percent is an appropriate level of water savings when these measures are applied to existing residential accounts. With new development such as that proposed by the Folsom SPA – PPA (and the Folsom SPA – RHA), however, metering and volumetric rates are unlikely to result in 20% reductions in demands that would otherwise occur in the affected units because those units would be built with more modern infrastructure and more efficient landscape design. Accordingly, based on the CUWCC's 20% standard and the difference between development analyzed in this WSA and existing communities to which the CUWCC's standard generally applies, this WSA conservatively assumes that per unit water demands for new units built in the Folsom SPA that are metered initially will be 10% lower than per unit demands in the existing City service area.

2.1.3.5 California Urban Water Conservation Council and Water Forum Agreement Conservation Element Best Management Practices

The City of Folsom is a signatory to the CUWCC Best Management Practices (BMP) Memorandum of Understanding (MOU). The City is also a signatory to the Water Forum Agreement (WFA), under which the City of Folsom would implement the WFA Conservation Element. Both the CUWCC MOU and the WFA Conservation Element commit the City of Folsom to implementing best management practices designed to achieve water conservation across existing demand sectors. While many of the CUWCC BMPs are focused on retrofitting existing infrastructure, some of the BMPs could be valuable for the City of Folsom as they relate to water conservation efforts in new developments such as the Folsom SPA.

In 2009, the WFA updated the WFA Conservation Element. Under that revised Element, signatories would replace their respective WFA water conservation plans with the

[30] BMP 1.3, Memorandum of Understanding Regarding Urban Water Conservation in California, California Urban Water Conservation Council, December 10, 2008.

CUWCC MOU, including the CUWCC BMPs. Thus, for this Folsom SPA WSA, it is assumed that the City of Folsom will be implementing the CUWCC BMPs exclusively.

Some of the CUWCC BMPs that support using per unit demands in the Folsom SPA that are lower than such demands in the City's existing service area include Landscape Surveys (BMP 3), which could be designed for the Folsom SPA in such a way as to try to ensure the MWELO Landscape Design requirements remain in place in the field.[31] BMP 3 also requires interior surveys for Single and Multi-Family Residential customers, which could help determine whether customers are continuing to use water-efficient indoor appliances (e.g., those meeting the CAL Green Code specifications discussed in **Section 2.1.3.2**), and would also provide an opportunity for the City of Folsom to tailor its incentive programs to encourage continued use of water-efficient appliances.[32]

Also, the CUWCC recommends identifying opportunities for installation of dedicated irrigation meters, monitoring progress through billing, and then providing site-specific assistance for accounts 20% over budget. (CUWCC BMP 5) Taking the CUWCC recommendation one step further, the recently adopted CAL Green Code requires installation of separate meters or submeters in nonresidential construction landscapes that are between 1000 and 2500 square feet. Thus, irrigation submeters will be in place at many, if not all, nonresidential sites. The City of Folsom can use this meter data and provide site-specific assistance which should help maintain a level of water use consistent with its water use planning assumptions.

Also, as a signatory to the CUWCC MOU, the City of Folsom conducts public information campaigns and school education programs.[33] These educational campaigns will help reinforce water conservation oriented behavior in the Folsom SPA which can help

[31] CUWCC BMP 3 provides that MOU signatories should perform site-specific landscape water surveys that shall include checking the irrigation system and timers for maintenance and repairs; estimating landscaped area; and developing a customer irrigation schedule based on precipitation, climate and landscape conditions.

[32] CUWCC BMP 3 specifically provides that an MOU signatory should offer site-specific leak detection assistance, including a water conservation survey, water efficiency suggestions and/or an inspection, as well as providing WaterSense rated showerheads and faucet aerators.

[33] CUWCC BMP 2.1 provides that a signatory should "Implement a public information program to promote water conservation, including providing speakers to employers and at public events, providing information on customers' bills showing use for the last billing period compared to the same period the year before." This BMP also requires a messaging campaign. BMP 2.2 requires implementation of a school education program to promote water conservation, including working with schools to provide instructional assistance, educational material and classroom presentations. Both of these BMPs provide for a regional agency to undertake the educational campaigns. The City of Folsom takes advantage of this provision by supporting the Regional Water Authority's efforts on behalf of purveyors in the Sacramento County region.

minimize year-round water use indoors and moderate outdoor use during the peak irrigation season.

Two additional BMPs that will help moderate water demands in the Folsom SPA are (1) the use of a water conservation coordinator, and (2) enactment and enforcement of a water waste prohibition.[34] The City of Folsom currently has both a water conservation coordinator and an adopted water waste ordinance.[35] Both will have an impact on the Folsom SPA, because upon the SPA's annexation, the coordinator will be assigned to manage water conservation programs and city staff will be authorized to enforce the ordinance.

The CUWCC BMPs should have a long-term impact on the City of Folsom's ability to manage water use throughout the Folsom SPA. Through targeted outreach the City of Folsom can encourage continued customer use of highly efficient appliances and irrigation systems, emphasize the need to retain efficient landscape plantings, and also minimize otherwise wasteful uses. The City of Folsom's commitment to implementing these agreements should help maintain water use efficiency. Implementation of the CUWCC BMPs in the Folsom SPA will ensure that the Folsom SPA maintains the lower than historic indoor and outdoor unit demand factors identified in **Section 2.2** and **Section 6.1**.

2.2 FOLSOM SPA – PPA DEMAND FACTORS

2.2.1 Residential

Unit demand factors, used to estimate demand for the Folsom SPA-PPA, are developed by first estimating per capita use to generate an indoor unit demand factor and then landscaping demands are considered to develop an outdoor unit demand factor. The indoor and outdoor components are ultimately combined into a total unit demand factor for the residential land-use categories.

[34] CUWCC BMP 1.1(A) provides that a signatory shall designate a person as the agency's responsible conservation coordinator for program management. BMP 1.1(A) also requires a signatory to enact, enforce or support ... ordinances ... that (1) prohibit water waste ... and (2) address irrigation, landscape, and industrial, commercial, and other design inefficiencies.

[35] The City of Folsom's water waste ordinance is codified in Chapter 13.26 of the Folsom Municipal Code.

2.2.1.1 Indoor

In light of the discussion of various water use drivers in **Section 2.1.3**, unit demand factors for indoor residential land-use categories are estimated accordingly.

- Single-Family and Single-Family High Density: Based upon the meter study described in **Section 2.1.1**, the historic single-family indoor unit demand factor in the City's existing service area is approximately 0.22 af/du/yr. At 2.83 persons per household, the per capita demand is about 70 gallons per person per day (gpd).[36] If the City of Folsom adopts indoor water-efficient infrastructure policies similar to those suggested in **Section 2.1.3.2** to implement its water conservation targets adopted under SBX7 7, and implements metering and volumetric billing as described in **Section 2.1.3.4**, the historic indoor per capita unit demand factor will be reduced by at least ten percent (10%). Therefore, the single-family unit demand factor of 63 gpd is used to calculate the indoor water demand for the Folsom SPA - PPA.[37]

- Multi-Family Low Density; Multi-Family Medium Density; Multi-Family High Density; Multi-Use-Residential: The same per capita indoor unit demand factor is used for the multi-family units as is used for the single-family units because each person has similar individual indoor demands regardless of the size of the unit – e.g., bathing, dishwashing, clothes washing, toilet flushing.[38] Therefore 63 gpd is used as the indoor per capita unit demand for the multi-family and multi-use categories.

For the Folsom SPA - PPA, the indoor unit demand numbers for the single and multiple-family residential classifications are provided in **Table 2-4**. Using the dwelling unit population number for the Single-Family categories of 2.9 persons/unit and 1.9 persons/unit for the Multi-Family categories in combination with the per capita per day estimate of 63 gallons, the annual indoor unit demand factor is calculated as well.[39]

---

[36] See Table 2-2. [(.22af/du/yr)*(325851 gallons/af)/(2.83 persons/unit)/(365 days/yr)] The Folsom 2005 UWMP assumed 2.83 persons per household which is the per capita value that is used as the historical dwelling unit population density.

[37] For comparative purposes, EID has recorded indoor use values associated with projects in its El Dorado Hills service area that average about 60 gallons per person per day (see Appendix Table A, 2007 through 2009 Water Resources & Service Reliability Reports).

[38] The Folsom 2005 UWMP also assumed the multi-family indoor unit demand factor is the same as the single-family indoor unit demand factor.

[39] The dwelling unit population figure was calculated by dividing the estimated persons per unit by the total number of units for each land-use category as provided in **Appendix C**.

Table 2-4
Folsom SPA - PPA
Residential Unit Demands

Land Use	Capita per Household	Indoor gallons per capita / day	Indoor Unit Demand, AF/DU
SF	2.9	63	0.21
SFHD	2.9	63	0.21
MFLD	1.9	63	0.14
MFMD	1.9	63	0.14
MFHD	1.9	63	0.14
MU - Res	1.9	63	0.14

2.2.1.2 Outdoor

Review of historic City of Folsom data indicates a wide range of planning numbers for outdoor unit demand factors. As suggested in Section 2.2.1, based upon single-family meter data, outdoor usage in the residential sector is approximately 4.3 acre-feet/acre/ per year (af/ac/yr). An evapotranspiration-based turf demand was calculated in the Folsom Recycled Water Demand Technical Memorandum (TM) as 4.5 af/ac/yr.[40] The Folsom Recycled Water Demand TM also reviewed historic outdoor metered account usage and reported the average usage from 2000-2004 was 3.9 af/ac/yr. Thus, historic usage ranges between 3.9 – 4.5 af/ac/yr. While outdoor meters were only present in the non-residential sector when the unit demands were analyzed in the Recycled Water Demand TM, the unit demand factors from the non-residential sector provide an indication of historic outdoor unit demands in the residential sector given the general similarities in landscape design – specifically an emphasis on turf landscapes with accompanying plantings. Historic outdoor water use in the non-residential sector reflects a non-conservation based demand, as none of the City's parks or landscape and lighting accounts were implementing significant demand management measures at the time the Folsom Recycled Water Demand TM or 2005 UWMP was prepared. As explained below, post-2005 developments related to outdoor water demands support using outdoor unit demand factors for the Folsom SPA - PPA that are lower than the demands reflected in those two City documents.

[40] City of Folsom Recycled Water Demands Technical Memorandum. Brown and Caldwell, November 9, 2005.

The primary driver that could significantly change both residential and non-residential outdoor water demands is the MWELO. The MWELO provides that a landscape design plan should include plantings that use no more than seventy percent (70%) of reference evapotranspiration.[41] By requiring preparation of landscape plans for the Folsom SPA – PPA that use 70% of reference evapotranspiration, the long-term unit demand is likely to be somewhat greater than 70% ETo because of variations in plant and irrigation system maintenance. Therefore, this Folsom SPA – PPA demand estimate uses a "mid-point" between 100% ETo and that required in the MWELO - 85% of evapotranspiration, which is equivalent to 3.73 af/ac/yr. To achieve an outdoor unit demand of 3.73 af/ac/yr, consumptive demand would need to be approximately 2.6 af/ac/yr, assuming a 71% irrigation efficiency rate.[42] This would require an average plant factor of 0.6. The average plant factor could be higher if the efficiency rate were higher. For example, the plant factor could be 0.7 if the irrigation efficiency rate were at least 82%.

The outdoor unit demand factor of 3.73 af/ac/yr was developed based upon single-family lot size and associated landscape area for each lot in the Folsom SPA – PPA land-use plan. In the multi-family sector landscaped area is reflected as a percentage of total area for each multi-family category. The estimate of single-family lot area was made based upon the acreage and unit figures for the single-family land use categories as well as an estimate of the area necessary for roads and right-of-ways. For the Single-Family category, the planned unit density is three units per acre (1687 units/557.8 acres). If 25% of the area in the Single Family category is for roads and rights of ways, then the lot size is approximately 11,000 square feet (sf).[43] To estimate the landscaped area on each lot, the City of Folsom Zoning Code was used as a reference. Assuming the lots are 11,000 sf, they would likely have associated building standards similar to those in the City of Folsom's *Single Family Dwelling, Medium Lot District* category, which requires minimum 10,000 sf lots and maximum building coverage of 35%.[44] If 25% of the lot is used for hardscapes, then the remainder of the lot, as landscape area, would be approximately 40%.[45] For the Single-Family High Density Category, the planned unit density is approximately 5.5 units/acre (2933 units/532.5 acres). Again, using approximately 25% road and right-of-way dedication, then the average lot size would be

[41] CCR Title 23, Div. 2, Chapter 2.7, Sec. 492.4.
[42] See Footnote 20 for formula. ((53/(12*7.481))*.6*43560)/325851 = 2.65 af/ac.
[43] 25% was selected for roads and right of ways in a single-family neighborhood based on surveys of recently constructed subdivisions in the City of Folsom.
[44] City of Folsom Zoning Code, § 17.12.060.
[45] 25% was selected for hardscape coverage in the single-family categories based on surveys of recently constructed subdivisions in the City of Folsom.

about 6,000 sf. And, if some of the hardscapes in the Single-Family High Density category will occupy an area similar to that in the Single-Family category (e.g., a standard two-car driveway), then the Folsom SPA – PPA is assigned a landscaped area that is a smaller percentage of total lot area in the Single-Family High Density category – 30%.

For the Multi-Family categories in the Folsom SPA – PPA land-use plan, total area is first reduced by 10% to account for roads and right of ways.[46] Then landscaped area is derived by assessing that the building coverage is approximately 40-50% for the Multi-Family Low and Medium Density categories to 55% for the Multi-Family High Density category.[47] Since hardscapes are about 15-25% of lot area, then landscaped areas cover between 25-30% of the lot.[48] For the Multi-Unit Residential category, the landscaped area is only 10% of lot area because the combined commercial uses (in the Multi-Unit Nonresidential category) reduce landscaped areas with more area dedicated to hardscapes connecting the residential and commercial components. All residential land-use coverage assumptions for the Folsom SPA – PPA are provided in **Table 2-5.**

Table 2-5
Folsom SPA – PPA
Residential Land Use Coverage Assumptions

Land Use Category	Building Coverage (% of area)	Hardscape Coverage (% of area)	Landscape Coverage (% of area)
SF	35-40%	20-25%	40%
SFHD	35-40%	30-35%	30%
MFLD	40-50%	15-25%	25%
MFMD	40-50%	15-25%	25%
MFHD	50-55%	15-25%	30%
MU - Res	55-60%	25-30%	10%

[46] Because multi-family units tend to be accessed by main arterial roads and have limited interior roadways, 10% was selected as a reasonable figure across the multi-family categories. This accounts for those complexes accessed entirely by arterial roads, which are already accounted for in the Folsom SPA land-use data and provides for some internal roadways in condominium type complexes.

[47] Land coverage percentages were estimated based upon comparison to existing City of Folsom Zoning Code definitions. The existing R-2, Two-Family Residence definition provides for up to 40% lot coverage and the existing R-3, Neighborhood Apartment District definition provides for coverage up to 50%. It is assumed that the Folsom SPA - PPA Multi-Family Low and Medium Density categories are similar to the existing R-2 and R-3 definitions, thus the use of the 40-50% coverage range. For the Folsom SPA - PPA Multi-Family High Density category, it is assumed that this category is more like the City of Folsom's existing R-M, Residential Multi-Family Dwelling District definition which provides for the building to cover 60% of the lot. (See City of Folsom Zoning Code §§ 17.14, 17.16 and 17.17.)

[48] Hardscape area coverage assessed through electronic surveys of various multi-family complexes in the City of Folsom.

Table 2-6 shows the lot area and landscaped area numbers used to develop the outdoor unit demand factor for the residential categories in the Folsom SPA – PPA land-use plan. Consistent with the approach described in **Section 2.1.3.3**, the unit demand factor was developed by applying provisions of the MWELO to irrigated areas in the residential land-use categories. The long-term outdoor unit demand factor for the residential categories is calculated as a percentage of evapotranspiration. Specifically, as previously discussed in this section, unit demands are 85% of ETo. The product of the landscape area and the ETo factor is the outdoor unit demand factor.

Table 2-6
Folsom SPA - PPA
Residential Outdoor Demand Factors

Land Use	Lot Area, ft²	Lot Landscape Area, ft²	Landscape Area (Total), Acres	ETo Turf Irrig. Demand, inches/yr	ETAF	Outdoor Unit Demand, AFY/DU
SF	11,000	4,400	n/a	53	85%	0.38
SFHD	6,000	1,800	n/a	53	85%	0.16
MFLD	n/a	n/a	54	53	85%	0.09
MFMD	n/a	n/a	15	53	85%	0.05
MFHD	n/a	n/a	13	53	85%	0.04
MU - Res	n/a	n/a	3	53	85%	0.02

2.2.2 Non-Residential

2.2.2.1 Non-Residential Land Use Coverage Percentages

The Non-Residential sector water demand for the Folsom SPA - PPA is evaluated on a land-area coverage basis. Each non-residential land-use is assigned an average coverage percentage for each non-residential land-use type – indoor, hardscape, and outdoor irrigation. Land-use coverage percentages were estimated based upon existing City land-use coverages as well as proposed Floor Area Ratios in the Commercial categories. First, for the Commercial categories, the Land Use Summary in **Appendix C** provides the target floor area ratios, which serve as an indicator of the "indoor" coverage percentage.[49] For this analysis, all commercial construction in the Community, General

[49] Because floor area may be comprised of building area on more than one story, the coverage percentage may be less than floor area, but without specific knowledge of the ultimate building design, the floor area serves as a reasonable approximation of the area that the building will cover.

and Regional Commercial categories is one story and the building footprint utilizes the maximum targeted floor area. For the Office Park category, some of the units have multiple stories and the indoor coverage percentage is reduced accordingly.[50]

Commercial: Generally, because the indoor coverage for the Commercial categories in the Folsom SPA - PPA is lower than the average historic figures used in the UWMP, coverage percentages for the hardscape and landscape categories are slightly higher than historic values. According to the Land Use Summary in **Appendix C**, in the Community, General and Regional Commercial categories, the floor area ratios are 25%, 25% and 28% respectively. Assuming equivalence between floor area ratio and indoor coverage, this is about 25-35% less than the indoor figures used in the 2005 UWMP. This "excess" indoor area was therefore assigned to the hardscape and landscape categories with about 15-20% to the landscape coverage and 10-15% to the hardscape coverage. While in some cases hardscape coverage is estimated to be as high as 45%, which is slightly higher than historic values, it is more consistent with recent trends towards maximizing parking and minimizing landscaping features.

For the Office Park category, **Appendix C** provides that target floor area ratio is 30%. Starting with this floor area ratio, a building coverage of 25% was estimated based on the previously stated assumption that some of the office park buildings will be more than one story. Again, because the floor area ratio is considerably less than the building coverage percentage assumed for the 2005 UWMP, the "excess" indoor area was assigned to the landscape category. Also, the hardscape coverage percentage was reduced from the 2005 UWMP value, with a percentage going to landscape coverage and also based on surveys of more modern office park complexes with a preference for significant landscape features.

Mixed Use: For the Mixed-Use Nonresidential category, the Land Use Summary in **Appendix C** indicates that the floor area ratio for the nonresidential component is 20%. Hardscape and landscape coverages are apportioned similar to Community Commercial, with slightly more landscape coverage in place of indoor coverage.

---

[50] While the City of Folsom Zoning Code (§ 17.22.050) would seem to provide for buildings in categories similar to the Commercial and Office Park categories for the Folsom SPA to have more than one story, it is not certain what type of businesses will ultimately be sited in the Office Park and Commercial categories. Therefore, the building area coverage estimate is driven primarily by windshield surveys by Tully & Young in new commercial and office park developments in the City of Folsom.

Schools: For the Schools category, Landscape coverage remains at 50%, consistent with historic values. Based upon an electronic map survey of the existing Folsom service area conducted by Tully & Young using Google Maps, indoor coverage was increased from the historic value of 10% to 25% and the hardscaped area is reduced accordingly to 25%.

Parks: For the Park and Local Park categories, minimal area is devoted to indoor uses and hardscapes. While these figures will vary depending on the location and purpose of the park space, on average, about 5% is devoted to the indoor and hardscape categories and 95% of the park space is landscaped.[51] This estimate provides a conservatively high demand total for the Park category because the landscape category has a higher unit demand factor than the indoor and hardscape categories.

Open Space and Circulation: As for the remaining two non-residential categories, natural non-irrigated landscape will comprise 100% of the Open Space category and so will create no project water demands. As for the Major Circulation category, 90% is dedicated to roads and 10% to irrigated medians and streetscapes.

All coverage percentages are provided in **Table 2-7**.

[51] Tully & Young assessed park coverage by using Google Maps to analyze parks in the City of Folsom.

Table 2-7
Folsom SPA - PPA
Non-Residential Coverage Percentages and Unit Demand Factors

Land-use Category	Acres	Use Class	Coverage %	Use Class Unit Demand (AF/AC/YR)	Land Use Unit Demand (AF/AC/YR)
Mixed Use - Non-Residential	23.6	Indoor	20%	1.66	0.33
		Hardscape	45%	0.00	0.00
		Landscape	35%	3.73	1.31
		Total	100%		1.64
Office Park	89.2	Indoor	25%	1.90	0.48
		Hardscape	35%	0.00	0.00
		Landscape	40%	3.73	1.49
		Total	100%		1.97
General Commercial	212.9	Indoor	25%	1.66	0.42
		Hardscape	45%	0.00	0.00
		Landscape	30%	3.73	1.12
		Total	100%		1.54
Community Commercial	38.8	Indoor	25%	1.66	0.42
		Hardscape	45%	0.00	0.00
		Landscape	30%	3.73	1.12
		Total	100%		1.54
Regional Commercial	110.8	Indoor	28%	1.90	0.53
		Hardscape	47%	0.00	0.00
		Landscape	25%	3.73	0.93
		Total	100%		1.47
Park	118.2	Indoor	2%	0.48	0.01
		Hardscape	3%	0.00	0.00
		Landscape	95%	3.73	3.55
		Total	100%		3.56
Local Park	3.5	Indoor	2%	0.48	0.01
		Hardscape	3%	0.00	0.00
		Landscape	95%	3.73	3.55
		Total	100%		3.56
Schools	179.3	Indoor	25%	2.85	0.71
		Hardscape	25%	0.00	0.00
		Landscape	50%	3.73	1.87
		Total	100%		2.58
Open Space	1053.1	Indoor	0%	0.00	0.00
		Hardscape	0%	0.00	0.00
		Landscape	100%	0.00	0.00
			100%		0.00
Major Circulation	171.6	Indoor	0%	0.48	0.00
		Hardscape	90%	0.00	0.00
		Landscape	10%	3.73	0.37
		Total	100%		0.37

2.2.2.2 Nonresidential Unit Water Demand Factors

Historic indoor unit water demand factors in the City's 2005 UWMP are revised, as explained in **Section 2.2.2.2**, to estimate baseline indoor unit water demands for the Folsom SPA – PPA. Working from the assumption that the City of Folsom must ultimately comply with the water conservation provisions of SBX7 7, which will require the City of Folsom to achieve 20% conservation relative to baseline use, historic non-residential indoor unit demands are conservatively reduced by 5%.[52] The Office Park and Regional Commercial Categories began with a baseline of 2 af/ac/yr, which was then reduced to 1.90 af/ac/yr. For the Community and General Commercial Categories, a common baseline of 1.75 af/ac/yr was used based upon averaging the historic Neighborhood and Regional Commercial categories in the UWMP. The baseline for the Community and General Commercial categories was also reduced by 5% to 1.66 af/ac/yr. The indoor baseline unit demand for Mixed Use – Nonresidential is assumed to be similar to Community Commercial – 1.75 af/ac/yr.

For the Schools categories, Tully & Young evaluated 2008 meter data for a mix of schools to determine whether the 2005 UWMP demand value of 3 af/ac/yr remains a reasonable average value. Based upon rough calculations of area and recent average annual water use, indoor water use was estimated to be about 2.6 af/ac/yr. Given the high degree of variability among the schools, the historic value of 3 af/ac/yr was retained as a conservative baseline. Similar to the Commercial categories, indoor unit demands were reduced by 5% to 2.85 af/ac/yr.

The landscape unit demand for all non-residential categories reflects the requirements of the MWELO as discussed in **Section 2.1.3**. Specifically unit demands are 85% of reference evapotranspiration (53 in.) Based upon review of recent meter data, reference evapotranspiration is a reasonable estimate of baseline landscape demand. Evaluation of recent park landscaping meter data indicates that average water use is about 4.3 af/ac/yr.[53] Approximately 85% of reference evapotranspiration is achieved both through the landscape design requirements in the MWELO as well as the irrigation design system requirements and recommendations for a weather-based controller and

[52] As explained in **Section 2.1.3.2.**, this WSA assumes that the nonresidential buildings and structures must comply with the water-efficient fixture requirements of the CAL Green Code. While the CAL Green Code water savings target is 20% compared to baseline use, this WSA assumes a 5% reduction in water use and adjustments to the indoor unit water demand factors are made accordingly.

[53] Tully & Young reviewed 2008 meter data for the City of Folsom's BT Collins, Cohn and Beach Hill Parks. The average 2008 unit demand was 4.2 acre-feet per acre.

dedicated irrigation meter. This is a conservative estimate appropriate for this planning stage.

A unit demand per acre is assigned for each coverage percentage as shown in **Table 2-7**.

2.3 FOLSOM SPA – PPA NON-POTABLE WATER DEMAND

Currently, the City does not have a non-potable supply to serve any portion of the Folsom SPA. If non-potable water service is ultimately available, an indication of the scope of non-potable service may be found in the State Water Resources Control Board's *General Waste Discharge Requirements for Landscape Irrigation Uses of Municipal Recycled Water* (Recycled Water General Permit).[54] Under the Recycled Water General Permit, recycled water can be used in residential front or back yards if the municipality applies for, and obtains, an individual permit with the Regional Water Quality Control Board. According to the Recycled Water General Permit, specified uses of recycled water considered "landscape irrigation" projects include any of the following:

- Parks, greenbelts, and playgrounds;
- School yards;
- Athletic fields;
- Golf courses;
- Cemeteries;
- Residential landscaping, common areas;
- Commercial landscaping, except eating areas;
- Industrial landscaping, except eating areas; and
- Freeway, highway, and street landscaping.

If the City of Folsom were to require that the Folsom SPA - PPA demand categories corresponding to those eligible for non-potable service under the Recycled Water General Permit were to use non-potable water, then the land-use categories in **Table 2-8** would likely be eligible. The corresponding acreage and potential demand values are provided in **Table 2-8** as well.

[54]http://www.swrcb.ca.gov/water_issues/programs/water_recycling_policy/docs/wqo_2009_0006_general_permit.pdf. Non-potable supplies may be available in the future but they are not considered in this analysis.

Table 2-8[55]
Folsom SPA – PPA
Potential Non-Potable Water Demands

Land-Use Category	Landscape Acreage (AC)	Demand (AF/YR)
Parks	116	431
Streetscapes	17	64
C/I/O Landscape	147	549
Schools Landscape	90	334
Total	370	1379

2.4 Projected Water Demands for Folsom SPA - PPA

Table 2-9 provides the annual water demands by land-use category for the Folsom SPA – PPA. The total estimated water demand for the Folsom SPA - PPA in a normal year is 5,422 AF, assuming a 10% non-revenue water factor.[56] In a dry-year, this total Folsom SPA - PPA demand is projected to increase to 5,577 acre-feet. The dry-year increase is a result of increasing the normal year outdoor demand for all residential and non-residential demand categories by 5% and then applying the non-revenue water factor of 10%.[57] The 5% increase is applied to the annual outdoor demand factor of 3.73 acre-feet/acre/year.

The portion of the Folsom SPA - PPA that is within the EID service area is projected to have a water demand of 255 AF in a normal year and 262 AF in a dry year, as shown in **Table 2-9**. Finally, **Table 2-9** also provides an indication of the balance between indoor and outdoor water demands for all land-use categories in both the Folsom and EID service areas.

[55] The demand estimates are based on the outdoor unit demand factor of 3.73 acre-feet/acre/year as developed in Section 2.2.1.2. This is a conservatively high value when compared to recorded demand factors documented by EID in its annual Water Resources & Services Reliability Reports, which reported unit demands to be less than 3.0 acre-feet/acre/year. This conservatively high value is further supported, using the evapotranspiration data from a local weather station and comparing high and low values over the last 12 years. Based on the data the highest yearly value (representing the hottest year) is only 5% higher than the average for the period of record.
[56] As a signatory to the CUWCC MOU, the City of Folsom is committed, pursuant to BMP 1.2(f), to following American Water Works Association standards for system water audits, leak detection and repair. It is also committed to achieving non-revenue water losses no greater than 10% of total water introduced into its system (i.e., supply entering the treatment plant). Because the demand for the Folsom SPA-PPA is calculated from the end-user perspective, reflecting a 10% non-revenue water loss of the water entering the treatment plant translates to an equivalent of 11.11% of end-user demand. Thus, 5,422 AF/YR is the result of adding 11.11% to the end-user demand estimate.
[57] Outdoor demand is increased by 5 percent in dry years because a dry winter tends to motivate customers to begin irrigation sooner in the season.

Table 2-9
Folsom SPA - PPA
Normal and Dry-Year Demand Totals

Folsom Service Area

Residential Land Use	Normal Indoor Total (AFY)	Normal Outdoor Total (AFY)	Normal Total (AFY)	Dry-Year Total (AFY)
SF	362	666	1028	1061
SFHD	632	476	1108	1132
MFLD	332	224	556	567
MFMD	186	63	249	252
MFHD	190	56	247	249
MU - Res	104	13	117	118
Residential Totals	1806	1499	3305	3380

Non-Residential Land Use	Normal Indoor Total (AFY)	Normal Outdoor Total (AFY)	Normal Total (AFY)	Dry-Year Total (AFY)
MU-Non Res.	34	9	43	44
OP	47	148	195	203
CC	18	48	66	69
GC	85	228	313	324
RC	66	115	180	186
Park	1	466	467	490
LP	0	14	14	15
SCH (PQP)	142	372	514	533
OS	0	0	0	0
MAJ CIRC	0	68	68	72
Totals	393	1468	1861	1934
Folsom Totals	2199	2967	5166	5315

El Dorado Irrigation District Service Area

Residential Land Use	Normal Indoor Total (AFY)	Normal Outdoor Total (AFY)	Normal Total (AFY)	Dry-Year Total (AFY)
SF	24	45	69	71
SFHD	39	29	69	70
MFLD	38	26	65	66
Residential Totals	102	100	202	207

Non-Residential Land Use	Normal Indoor Total (AFY)	Normal Outdoor Total (AFY)	Normal Total (AFY)	Dry-Year Total (AFY)
GC	14	37	50	52
LP	0	0	0	0
OS	0	0	0	0
MAJ CIRC	0	3	3	3
Totals	14	40	53	55
EID Totals	116	140	255	262

Folsom SPA Total	2315	3107	5422	5577

Assuming Folsom SPA residential and non-residential construction starts in 2013 and the 20-year required projection is applied, then the projected water demand shown in Table 2-10 would be realized by 2033 for the Folsom SPA - PPA.

Table 2-10
Folsom SPA – PPA
Projected Water Demand at 2033

Water Year	2033
Normal Year (AF/YR)	5421
Dry Year (AF/YR)	5577

SECTION 3 FOLSOM SPA WATER SUPPLY

3.1 EXPLANATION OF THE PROPOSED WATER SUPPLY

Section 3 provides an explanation of the water supply that the City of Folsom will use to serve the Folsom SPA.[58] The City will meet the Folsom SPA water demands by securing an assignment of a Sacramento River surface water supply from the Natomas Central Mutual Water Company (NCMWC) pursuant to NCMWC's CVP settlement contract with the United States Bureau of Reclamation (USBR).[59] The water supply to be assigned is a long-term "Project Water" supply.[60] An initial purchase and sale agreement between South Folsom Properties LLC (SFP) and NCMWC is in place and identifies the conditions which ultimately need to be satisfied by both parties to finalize the sale, which will ultimately lead to an assignment to the City.

Currently, NCWMC diverts water and conveys it to its shareholders that apply water to agricultural lands in northern Sacramento County and southern Sutter County. NCMWC's contract provides for delivery of Project Water on an agricultural schedule, with the Project Water delivered during the late irrigation season in the months of July and August. The City will seek modification of the Project Water delivery schedule from the USBR such that water may be delivered to the City on a year-round municipal and industrial (M&I) schedule.[61] The City will divert the assigned Project Water at the Freeport Regional Water Authority's Freeport diversion facility on the Sacramento River

---

[58] CWC § 10910 (d) (1) requires that "The assessment ... include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts. (2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following: (A) Written contracts or other proof of entitlement to an identified water supply. (B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system. (C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply. (D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply."

[59] Contract No. 14-06-200-885A-R-1.

[60] "Project Water" is "... all surface water diverted ... each month during the period April through October ... from the Sacramento River which is in excess of Base Supply." "Base Supply" is "... the quantity of surface water ... which may be diverted ... from the Sacramento River each month during the period April through October of each year without payment to the United States for such quantities diverted." Article 1 of the 2005 Contract Between the United States and the Natomas Central Mutual Water Company (Renewal Contract), which is included in **Appendix G**

[61] A M&I schedule is generally one with the highest daily demands during the height of the outdoor irrigation season and lower daily demands in the spring and fall and even lower daily demands throughout the winter.

in southern Sacramento County.[62] Water will be conveyed from the Freeport diversion facility to the Folsom SPA via both FRWA facilities, which are already under construction, as well as facilities that will be constructed by the City of Folsom. The water may be either treated by SCWA or the City of Folsom pending further review of various conveyance and treatment alternatives.[63]

As explained in **Section 3.4**, the City of Folsom and the Sacramento County Water Agency (SCWA) have approved the *Memorandum of Understanding Between the City of Folsom and Sacramento County Water Agency Concerning the Folsom Sphere of Influence Area and Sharing of Freeport Project Capacity* (City - SCWA MOU). The City – SCWA MOU commits each party to try to find a mutually agreeable solution to the issue of system capacity in the FRWA facilities so that the City of Folsom can use some of that capacity to deliver Sacramento River water to the Folsom SPA. The water supply that will derive from the NCMWC assignment and be delivered under an agreement following the City – SCWA MOU will be used in both Folsom's and EID's service areas within the Folsom SPA.

The use of this water supply does not impact either the City's or EID's existing water supplies or conveyance facilities. Through SFP, the City intends to acquire water from NCMWC to serve only the Folsom SPA. Water treatment will occur at either newly constructed facilities that will not be connected to the City of Folsom's or EID's existing treatment and conveyance facilities or at third parties' treatment facilities. Thus, neither the water demands associated with land uses in the City of Folsom exclusive of the Folsom SPA, nor the water supplies used to serve these areas, are analyzed in this Folsom SPA WSA.

3.2 SURFACE SUPPLY ANALYSIS

3.2.1 NCMWC Water Supplies

Surface water will be obtained from the NCWMC pursuant to a series of agreements. Initial agreements include one between SFP and NCMWC, and the second between SFP and the City of Folsom. The agreement between SFP and the NCMWC has been

[62] The Freeport Regional Water Authority (FRWA) was created by a Joint Powers Agreement between the Sacramento County Water Agency (SCWA) and East Bay Municipal Utility District (EBMUD). FRWA guides the financing, ownership, development, construction, and operation of the Freeport Regional Water Project (FRWP). The FRWA Board of Directors is made up of two representatives from SCWA, and two representatives from EBMUD. The City of Sacramento is an Associate Member of FRWA.

[63] Conveyance alternatives are analyzed in the Draft EIR/EIS.

executed.[64] The City of Folsom and SFP have executed a non-binding memorandum of understanding.[65] The City and SFP cannot sign a binding legal agreement until after the environmental review – of which this WSA is a part – is completed. The ultimate goal is to complete an assignment of a portion of NCMWC's Project Water supply to the City of Folsom.[66] NCMWC's CVP settlement contract contemplates such an assignment.

NCMWC entered into Contract No. 14-06-200-885A (Settlement Contract) with the USBR in 1964. The Settlement Contract is based on NCMWC's pre-existing licenses and permit to divert water. The Settlement Contract provides for delivery of water to NCMWC during the months of April through October. Effective on May 10, 2005, the Settlement Contract was renewed for a 40-year term (Renewal Contract).

Under the Renewal Contract, in addition to its Base Supply, NCMWC is entitled to divert up to 22,000 acre-feet of "Project Water" which is available during July and August. Distribution of NCMWC's monthly diversion entitlements for Project Water is shown in **Table 3-1**. The Renewal Contract limits NCMWC's annual diversions of water from the Sacramento River to the total quantities included in its Base and Project Supplies regardless of the entitlement pursuant to which the water is diverted.[67]

Table 3-1
Natomas Central Mutual Water Company
Project Water Supply Allocation

Month	Project Water Supply (af)
April	0
May	0
June	0
July	7,200
August	14,800
September	0
October	0
Total	**22,000**

[64] On December 17, 2007, SFP and NCMWC entered into an agreement entitled *Terms and Conditions of Purchase and Sale of Water Entitlements*. (SFP-NCMWC Agreement) A copy of the SFP-NCMWC Agreement is included as **Appendix E.**

[65] A copy of the City-SFP MOU is attached as **Appendix F**.

[66] Assignments are allowed under Article 23 of the 2005 Contract Between the United States and the Natomas Central Mutual Water Company (Renewal Contract), which is included in **Appendix G**.

[67] NCMWC's Base Supply is not a water source for the City and is not considered in this WSA.

3.2.1.1 Reliability of NCMWC Surface Water Supplies

Annual water deliveries to the NCMWC from the USBR pursuant to the Renewal Contract are determined on the basis of natural inflow to Shasta Lake (the Shasta Index). In a normal year when there is ample water in the Central Valley Project (CVP) system, NCMWC receives 100% of its Renewal Contract entitlement. The maximum reduction in NCMWC's diversions during any "Critical Year" is 25% of both Base Supplies and Project Water.[68] A "Critical Year" means any year in which either of the following conditions exist:

(1) The forecasted full natural inflow to Shasta Lake for the current Water Year (October 1 through September 30), as such forecast is made by the United States on or before February 15 and reviewed as frequently thereafter as conditions and information warrant, is equal to or less than 3.2 million acre-feet; or

(2) The total accumulated actual deficiencies below 4 million acre-feet in the immediately prior Water Year or series of successive prior Water Years each of which had inflows of less than 4 million acre-feet, together with the forecasted deficiency for the current Water Year, exceed 800,000 acre-feet.

"Critical Years" occur relatively infrequently. Over 85 years of record (1921-2006), a Shasta Index "Critical Year" would have been triggered only nine times (1924, 1931, 1932, 1933, 1934, 1977, 1991, 1992, and 1994).[69] This results in the occurrence of a "Critical Year" less than once every nine years.

Table 3-2 provides the "Critical Year" water allocation assumption for the NCMWC Project Water supply. As shown, during a "Critical Year," NCMWC receives no less than 75% of its normal year Project Water entitlement, or 16,500 acre-feet.

[68] Article 5(a), Renewal Contract. Article 5(a) is the exclusive provision governing dry-year reductions of NCMWC's water supplies under the Renewal Contract. USBR's draft *2001 M&I Shortage Policy*, if implemented, will not apply to the NCMWC water supply because NCMWC is a settlement contractor, and its Renewal Contract therefore specifically defines the maximum reductions.

[69] www.usbr.gov 8/28/09

Table 3-2
NCMWC "Critical Year" Project Water Supply

Month	Project Water Supply (af)
April	0
May	0
June	0
July	5,400
August	11,100
September	0
October	0
Total	**16,500**

NCMWC's Renewal Contract, among many other Central Valley Project contracts, was challenged in *Natural Resources Defense Council v. Kempthorne*, Case No. 05-CV-01207 (E.D. Cal). In that case, the Honorable Oliver Wanger of the U.S. District Court for the Eastern District of California, upheld NCMWC's Renewal Contract. His decision has been appealed to the federal Court of Appeals for the Ninth Circuit. In certain orders, Judge Wanger ruled that the supply of "Project Water" under NCMWC's Renewal Contract could be reduced "to meet legal obligations" of USBR. If these orders were to be read conservatively, then they would impose on USBR, at most, a contractual obligation to comply with applicable laws, which is a standard element of most contracts. (See e.g., *Edwards v. Arthur Andersen LLC* (2008) 44 Cal.4th 937, 954.) These orders therefore do not adversely affect "Project Water" supplies under NCMWC's Renewal Contract for purposes of this WSA, any more than application of standard contract-law principles would. Because Judge Wanger upheld the Renewal Contract on the basis that USBR had no discretion to reduce NCMWC's water supplies in executing the Renewal Contract, the judge's "legal obligations" rulings probably will have less effect than would be indicated by the above conservative interpretation.

3.2.1.2 Modifications to the NCMWC Delivery Schedule

Tables 3-1 and 3-2 show the NCMWC's existing water delivery patterns in normal and critical years under its existing Renewal Contract with USBR. For the Project Water supply to serve as an effective water supply for the Folsom SPA, it will be necessary to obtain USBR approval for a modification to the delivery schedule to satisfy Folsom SPA demands on a traditional M&I pattern throughout the calendar year. According to the

Folsom SPA Notice of Preparation, "the City will work with Reclamation [USBR] or another CVP contractor to reschedule the delivery of the assigned Project Water Supply."

Table 3-3 provides an example of the delivery pattern that the City intends to seek for delivery of 5,577 AF over a twelve month period under the Folsom SPA – PPA land-use plan.[70] For planning purposes, not only does **Table 3-3** reflect the potential demand pattern, it addresses the potential capacity requirements in the FRWA and the proposed Folsom conveyance systems by providing monthly and annual average day demand, and maximum day demand. Because the maximum day demand may occur at any time throughout the year, maximum day demand is estimated by multiplying annual average day demand by 1.9.

Table 3-3
Demand Pattern for the Folsom SPA - PPA

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Pattern (% Total)	4.4%	3.9%	5.5%	6.5%	9.3%	11.5%	14.1%	13.5%	11.8%	9.1%	5.5%	4.7%	
Total (AF)	245.4	217.5	306.7	362.5	518.7	641.4	786.4	752.9	658.1	507.5	306.7	262.1	5577.0
Monthly Avg. Day (MG)	2.6	2.5	3.2	3.9	5.5	7.0	8.3	7.9	7.1	5.3	3.3	2.8	5.0
Maximum Day (Ann. Avg. Day x 1.9) (MG)													9.5

3.3 AGREEMENTS SUPPORTING A PLAN TO SECURE A WATER SUPPLY[71]

3.3.1 NCMWC – South Folsom Properties Agreement

Under the SFP-NCMWC Agreement, NCMWC agreed to permanently assign to the City, through SFP, not less than 8,000 acre-feet per year (AF/YR) of "Project Water" to which NCMWC has rights under the Renewal Contract. NCMWC did not exercise its option under Section 3.2 of the SFP-NCMWC Agreement to increase the amount of water from the initial amount of 8,000 AF/YR to be purchased by SFP, and therefore the total water supply to be assigned to the City of Folsom by NCMWC is 8,000 AF/YR. The SFP-NCMWC Agreement provides that the assigned water will be subject to a 25% reduction in a "Critical Year."(See discussion of "Critical Year" supply reductions in **Section 3.2.1.1** above.)

[70] Demand pattern obtained from analysis of the Historic Folsom Water Treatment Plan Flows prepared by the J. Crowley Group, December 2007.

[71] The agreements described in **Section 3.3** are intended to satisfy the requirement in CWC § 10910(d)(2)(A) to provide "Written contracts or other proof of entitlement to an identified water supply."

The SFP-NCMWC Agreement is effective until April 1, 2012, unless extended by SFP. Under that agreement, SFP may extend its term for up to five additional one-year periods. During the period that the SFP-NCMWC Agreement is effective, both NCMWC and SFP must satisfy specific obligations to ensure that water can ultimately be made available for use as a municipal and industrial supply in the Folsom SPA. Those obligations include, but are not limited to (1) preparation of an engineering study to ensure NCMWC may meet its future demands in the absence of the assigned supply; (2) approval from USBR to reschedule the assigned supply from an irrigation demand schedule to a municipal and industrial demand schedule; and (3) completion of all state and federal environmental review.[72]

3.3.2 City - South Folsom Area Group Agreement

On August 26, 2008, the City and SFP signed a memorandum of understanding that contemplates that SFP will assign the supply that SFP is acquiring under the SFP-NCMWC Agreement (Natomas Water) to the City for use as a new water supply for the Folsom SPA upon the completion of all legal requirements.[73] Specifically, the MOU contemplates that the City will evaluate the technical feasibility of delivering water on a year-round municipal and industrial pattern, diverting water from the Sacramento River at the FRWA facilities, and conveying water to the Folsom SPA using FRWA facilities. The MOU also contemplates that the City will identify alternatives identified in **Section 3.5** for conveying and treating Natomas Water.

3.4 Capacity Agreement

The City of Folsom and SCWA approved a City - SCWA MOU.[74] The purpose of this MOU is to establish principles and parameters to govern negotiations between the parties for City's purchase of a portion of the SCWA's capacity in the FRWA facilities in order to convey Natomas Water to supply the area encompassed by the SOI. The City – SCWA MOU indicates that the City and SCWA will cooperate during the MOU's term to develop conditions under which the City may convey the Natomas Water using SCWA's FRWA capacity, with the common goal of eventually executing a binding agreement (City-SCWA Agreement). The City – SCWA MOU therefore acknowledges that the average daily capacity in the FRWA facilities that would be available for purchase by the City is 6.5 mgd with consideration of an appropriate peaking factor.

---

[72] Specifically, SFP, in cooperation with the City, is to be responsible for obtaining all necessary approvals from USBR, including the scheduling approval and environmental review processes. Also, the City is to serve as the lead agency under CEQA and USBR will perform all duties under NEPA and the ESA. (See Sections 16 and 17 of the SFP-NCMWC Agreement.)

[73] See Appendix F.

[74] A copy is attached as **Appendix H**.

3.5 CONVEYANCE ALTERNATIVES

As for conveyance from the FRWA facilities, there are numerous routing alternatives considered in the Draft EIR/EIS:

Alternative 1 and 1A: Convey raw water from the FRWA Bifurcation to the Folsom SPA along Grant Line Road for the majority of the route with two potential approaches to the proposed Folsom Water Treatment Plant (WTP);

Alternative 2, 2A and 2B: Use the proposed SCWA Vineyard WTP to treat water and then convey to Florin Road, then north along either Excelsior or Eagles Nest Road to Douglas, then east to Grant Line Road, and north to the Folsom SPA;

Alternative 3 and 3A: Convey raw water from the FRWA Bifurcation to Florin Road, then north along either Excelsior or Eagles Nest Road to Douglas, then east to Grant Line Road, and north to the Folsom WTP at the Folsom SPA; and

Alternative 4 and 4A: Convey raw water from the FRWA Bifurcation north along either Excelsior or Eagles Nest Road to a proposed Folsom WTP on Folsom Boulevard, and ultimate conveyance to the Folsom SPA after treatment at the Folsom Boulevard location.[75]

No USACE Permit Off-site Water Facility Alternative: Convey raw water through the conveyance pipeline under Alternatives 1 and 3 above but would have no impact to waters of the United States.

The necessary easements and permits will need to be secured once an alternative is selected. Ultimately, the conveyance alternative selected will accommodate the supply secured from NCMWC.

3.6 FACILITIES COST AND FINANCING

3.6.1 Facility Costs

The Draft Project Facilities Financing Plan (PFFP) focuses on the costs of backbone infrastructure and community facilities for the Folsom SPA as well as the financing of these facilities. The Draft PFFP specifically addresses water infrastructure costs and

[75] A set of maps identifying the water conveyance alternatives is attached as **Appendix I.**

financing.[76] Because the scope of the current water infrastructure requirements and the associated cost estimates are comprehensive, the Draft PFFP provides considerable support for the City of Folsom's plan to secure a reliable water supply for the Folsom SPA. It is anticipated that the cost projections and financing strategies will be refined throughout the planning process.

Anticipated potable water improvements included in the Draft PFFP are an off-site transmission main, an on-site water treatment plant, storage tanks, booster stations, distribution mains, and laterals. Additionally, the Draft PFFP includes the cost associated with the City of Folsom acquiring conveyance capacity in the FRWA facilities. Taken together, by acquiring capacity in the FRWA system, and constructing the proposed City of Folsom conveyance, treatment and storage facilities, it will be possible to deliver the NCMWC supply to the Folsom SPA.

Complementing the potable water system, the Draft PFFP includes a recycled water system in the Project's initial design objectives and policies. To this end, the Draft PFFP includes a cost estimate for non-potable water deliveries. Yet, because the City does not have non-potable supplies available at this time, non-potable supplies are not considered to be available for purposes of estimating supply sufficiency in the WSA.

The gross cost estimate for potable and non-potable water facilities is approximately $302.1 million. However, because the cost of the water supply ($32 million) is to be funded with revenue bond proceeds and approximately 48% (based on City staff's estimate) of the water treatment plant costs relate to projects outside the plan area, the total net cost for potable and non-potable water facilities is estimated to be $245.8 million.[77]

With a net project-specific cost totaling $245.8 million, one-time burdens vary from $6,301 per central commercial mixed use unit to $38,882 per single family unit. Non-residential land use designations, meanwhile, are assigned a cost per acre ranging from $80,331 per regional commercial acre to $113,378 per office park acre.[78]

[76] The Draft PFFP assesses public facility feasibility based upon the land uses in the Folsom Plan Area Specific Plan, Administrative Review Draft, June 6, 2008. A discussion of the Draft PFFP is included in **Section 3.6** to satisfy the requirement to submit information regarding a capital outlay program to demonstrate entitlement to the identified water supply pursuant to CWC § 10910(d)(2)(B).

[77] Draft PFFP, p. 13.

[78] Draft PFFP, p. 18.

3.6.2 Financing Plan

The Draft PFFP identifies the basic components of the financing plan. Specifically, the plan includes development impact fees, utility revenue bonds, debt issued through the Mello-Roos Community Facilities Act, and developer capital.[79] If a Community Facilities District (CFD) is formed, special taxes will be collected to repay the bonds issued by the CFD. Also, an additional monthly charge included on property owners' utility bills will be collected to repay the utility revenue bonds.

Developer impact fees will fund the total net project-specific costs. A project-specific fee will ensure allocation of backbone and community facility costs among properties in the plan area.[80] The project applicant has proposed the use of revenue bonds to fund the anticipated cost to acquire rights to water supplies, and without revenue bonds, it would be necessary to increase developer impact fees. The Draft PFFP recommends establishment of a Mello-Roos CFD and issuance of tax-exempt bonds. The Draft PFFP earmarks special taxes for the public facilities to maximize available [bond] capacity. In total, $288.3 million in net CFD proceeds are expected to be generated through bonding.[81] Finally, the Draft PFFP assumes that developer capital will be required to close gaps between the time infrastructure is needed and revenues become available through the developer impact fees, utility revenue bonds and Mello-Roos CFD mechanisms.

3.7 Regulatory Approvals and Permits

Pursuant to CWC § 10910(d)(2)(C)-(D), the City shall identify, for its proposed water supply: (1) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply; and (2) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply. The anticipated federal, state and local permits are identified in the Draft EIR/EIS.[82] Based upon the ultimate quantity of water assigned, the capacity agreement with SCWA, the conveyance route selected and the treatment process chosen, the City of Folsom will obtain the appropriate approvals and permits from the suite listed in **Appendix J**.

3.8 Proof of Appropriation

CWC § 10910(e) requires that, if the water supplier has not received water from the designated source before, then the WSA has to contain "an identification" of the other

[79] Draft PFFP, p. 24.
[80] Draft PFFP, p. 24.
[81] Draft PFFP, p. 25.
[82] Draft EIR/EIS, Section 1.6.3. A copy of Section 1.6.3 is attached as **Appendix J**.

water suppliers "that receive a water supply or have existing water supply entitlements . . . or water service contracts, to the same source of water as the public water system . . . has identified as a source of water supply within its [WSA]." The City of Folsom has not previously received a water supply from either the NCMWC or the Sacramento River. The source of water from which the City will obtain its supplies is NCMWC's unique Renewal Contract, which is based on NCMWC's unique underlying water rights. The NCMWC has been entitled to divert Project Water under the Renewal Contract consistently since the contract took effect in 2005. Upon assignment, the City should be entitled to divert Project Water as well in a manner similar to that provided for under NCMWC's Renewal Contract, with an adjustment in the water delivery schedule to reflect the Folsom SPA's municipal and industrial demand pattern.

3.9 Supply Summary

Based upon the City of Folsom's plan to ultimately secure an assignment of a portion of NCMWC's Project Water supply, the normal year supply contractually available for the City of Folsom under the assignment is 8,000 AF/YR. The maximum diversion for the Folsom SPA will be 6,000 AF/YR. The existing agreement between SFP and NCMWC, and the existing non-binding memorandum of understanding between SFP and the City, provides the foundation for the City to obtain an entitlement to the water supply through an assignment approved by USBR. Consistent with the dry-year shortage provisions in the Renewal Contract, the supply ultimately assigned to the City of Folsom will be subject to a 25% reduction in "Critical Years." For purposes of the sufficiency analysis in **Section 4**, this reduction results in 6,000 AF being available in both single and multiple-dry year conditions.

In addition to the water supply agreements that have been signed, the City of Folsom is diligently pursuing conveyance and treatment options to use the supply to be assigned by NCMWC with specific focus on acquiring and using capacity in the FRWA facilities, which are already permitted and partially constructed. Moreover, the Draft PFFP provides cost estimates for the water supply and treatment infrastructure necessary to serve the Folsom SPA with the supply to be assigned by NCMWC. Given these efforts to date, the City of Folsom has a viable plan for a secure supply for the Folsom SPA.

SECTION 4 FOLSOM SPA – PPA SUPPLY SUFFICIENCY ANALYSIS

Section 4 provides analysis of the sufficiency of the designated water supply for the projected Folsom SPA – PPA water demands.[83] **Table 4-1** incorporates the demand projection in **Table 2-10**, including both normal and dry-year demand projections at 2033. It also contains the supply projections discussed in **Section 3**. Although 8,000 AF/YR is anticipated to be available to the City of Folsom under the assignment, for every normal water year between 2013 and 2033, the City will divert a maximum of 6,000 AF/YR to serve the Folsom SPA. For each single and multiple-dry year period, it is assumed that the 8,000 AF/YR base water supply is restricted pursuant to the "Shasta Critical" provisions discussed in **Section 3.2.1.1**, thereby reducing the base supply by 25% and resulting in a total supply of 6,000 AF.

Conveyance water infrastructure is expected to be complete by 2013 in time to make water deliveries to the project. Given the limited development anticipated in 2013, there will be a significant surplus of water. In a dry year at full project build out anticipated to be in 2033, supplies are still estimated to exceed demand by about 425 AF/YR because annual dry-year demand will be approximately 5,577 AF/YR and supplies will be approximately 6,000 AF/YR. Thus, based upon the information in **Table 4-1** and the supporting analyses in **Sections 1** through **3**, the Folsom SPA - PPA will have a sufficient water supply at full project buildout, even in single and multiple dry year periods.

Table 4-1
Folsom SPA – PPA
Supply/Demand Comparison

Year	Projected Baseline Water Demand (ac-ft/year)	Surface Water			Projected Surplus/ (Shortfall) (ac-ft/year)
		Hydrologic Year Type		Available Water Supply (ac-ft/year)	
2033	5,421	**Normal**		6,000	579
	5,577	**Single Dry**		6,000	423
		Multiple Dry	Year 1	6,000	423
			Year 2	6,000	423
			Year 3	6,000	423

[83] CWC § 10910 (c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

SECTION 5 FOLSOM SPA – RHA LAND USE PLAN

5.1 LAND USE PLAN CHARACTERISTICS

The Folsom SPA - RHA land uses are provided in **Table 5-1**. The land uses are depicted graphically in **Appendix K.**[84] Total project acreage will be 3,502 acres, including 11,553 dwelling units. As discussed in the Introduction, the Folsom SPA-RHA is not the proposed project to be analyzed under CWC §§ 10910(a) and 10912(a), but rather is analyzed in this WSA because the EIR/EIS analyzes the Folsom SPA-RHA at the level of detail required by NEPA and the Folsom SPA-RHA contains more residential units than the Folsom SPA-PPA.

Table 5-1
Folsom SPA - RHA
Land Uses

Land Use ID	Area, acres	Dwelling Unit Density DU/acre	Dwelling Units
Single-Family (SF)	370.7	2.7	989
Single-Family; High Density (SFHD)	331.0	4.9	1,619
Multi-Family; Low Density (MFLD)	483.2	8.0	3,866
Multi-Family; Med. Density (MFMD)	144.6	16.0	2,314
Multi-Family; High Density (MFHD)	107.1	22.2	2,380
Mixed Use - Res. (MU-R)	21.7	10.7	385
Mixed Use - Non Residential (MU-NR)	14.4		
Office Park (OP)	111.8	--	--
Community Commercial (CC)	15.4	--	--
General Commercial (GC)	210.1	--	--
Regional Commercial (RC)	133.6		
Park	158.6	--	--
School (SCH)	188.3	--	--
Open Space (OS)	1,057.6	--	--
Major Circulation (MAJ CIRC)	154.5	--	--
Total Residential	**1,458.3**		**11,553**
Total Non-Res	**2,044.3**		**0**
Total:	**3,502.6**		**11,553**

The land uses planned for the Folsom SPA – RHA in the City of Folsom and EID service areas respectively are provided in **Tables 5-2 and 5-3**.

[84] See Appendix K, Folsom SPA – RHA Land Use Diagram.

Table 5-2
Folsom SPA – RHA
Folsom Water Service Area
Land Uses

Land Use ID	Area, acres	Dwelling Unit Density DU/acre	Dwelling Units
Single-Family (SF)	331.5	2.7	884
Single-Family; High Density (SFHD)	331.0	4.9	1,619
Multi-Family; Low Density (MFLD)	456.1	8.0	3,649
Multi-Family; Med. Density (MFMD)	144.6	16.0	2,314
Multi-Family; High Density (MFHD)	107.1	22.2	2,380
Mixed Use - Res. (MU-R)	21.7	10.7	385
Mixed Use - Non Residential (MU-NR)	14.4		
Office Park (OP)	111.8	--	--
Community Commercial (CC)	15.4	--	--
General Commercial (GC)	175.7	--	--
Regional Commercial (RC)	133.6		
Park	149.7	--	--
School (SCH)	188.3	--	--
Open Space (OS)	993.9	--	--
Major Circulation (MAJ CIRC)	149.0	--	--
Total Residential	**1,392.0**		**11,231**
Total Non-Res	**1,931.8**		**0**
Total:	**3,323.8**		**11,231**

Table 5-3
Folsom SPA – RHA
EID Water Service Area
Land Uses

Land Use ID	Area, acres	Dwelling Unit Density DU/acre	Dwelling Units
Single-Family (SF)	39.2	2.7	105
Multi-Family; Low Density (MFLD)	27.1	8.0	217
General Commercial (GC)	34.4	--	--
Park	8.9	--	--
Open Space (OS)	63.7	--	--
Major Circulation (MAJ CIRC)	5.5	--	--
Total Residential	**66.3**		**322**
Total Non-Res	**112.5**		**0**
Total:	**178.8**		**322**

SECTION 6 FOLSOM SPA – RHA WATER DEMAND ESTIMATE

Section 6 provides a water demand projection for the Folsom SPA - RHA.[85] The demand projection in **Section 6** uses the bases for the unit demand factors for the Folsom SPA - PPA outlined in **Section 2.1**. Both the historic demand factor assessment and the conservation drivers provide a foundation for the water demand projection in **Section 6.1**. **Section 6.2** identifies potential demands that could be served by a non-potable supply. **Section 6.3** provides the water demand projection used for the sufficiency analysis in **Section 8**.

6.1 FOLSOM SPA – RHA DEMAND FACTORS

6.1.1 Residential

The residential unit demand factors for the Folsom SPA - RHA include both an indoor and outdoor component. The indoor unit demand factor for both the single-family and multi-family residential categories remains the same as that used for the Folsom SPA – PPA as described in **Section 2.2.1.1**. Given the difference in the proposed unit densities for the Folsom SPA - RHA, unique residential outdoor unit demand factors were developed. The indoor and outdoor components are ultimately combined into a total unit demand factor for the residential land-use categories.

6.1.1.1 Indoor

For the Folsom SPA - RHA, the indoor unit demand factors for the single and multi-family residential classifications are provided in **Table 6-1**. Assuming the housing product type and the number of persons per unit is the same as the Folsom SPA - PPA for each land use classification, the indoor unit demand factors for the Folsom SPA – RHA are the same for each residential category.

[85] CWC § 10910(c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

Table 6-1
Folsom SPA - RHA
Residential Unit Demands

Land Use	Capita per Household	Indoor gallons per capita / day	Indoor Unit Demand, AF/DU
SF	2.9	63	0.21
SFHD	2.9	63	0.21
MFLD	1.9	63	0.14
MFMD	1.9	63	0.14
MFHD	1.9	63	0.14
MU - Res	1.9	63	0.14

6.1.1.2 Outdoor

For the Folsom SPA - RHA, outdoor unit demand factors are projected to be higher than the Folsom SPA - PPA because the unit density for each residential land use category is lower. (Compare **Table 1-1** and **Table 5-1**.) Assuming each buildable acre has approximately 25% of the area devoted to roads and approximately 75% of the area for the lots, the area of the Single Family lots is assumed to increase from 11,000 square feet (sq. ft.) to 12,373 sq. ft., and the Single Family High Density lot area is assumed to increase from 6,000 sq. ft. to 6,749 sq. ft. A percentage of the difference in lot area for each category is assigned to both landscape coverage and hardscape coverage. For the Folsom SPA - RHA, 50% of the difference in lot area for the Single Family categories is assigned to landscape coverage for each category as shown in **Table 6-2**, and 50% is assigned to hardscape coverage.

By assigning 50% of the additional lot area in each Single-Family category to landscape area, unique landscape area totals were developed for each lot type as well as unique landscape area coverage percentages. Assuming the building size remains the same, then the original building coverage area remains the same and the hardscape area is adjusted accordingly to fill the remainder of the area not occupied by the building or landscape area.

Table 6-2
Folsom SPA - RHA
Building Acreage Assignment Assumptions[86]

Land Use Category	Assignment Percentages for Additional Residential Lot Area
SF	50% of difference to landscape
SFHD	50% of difference to landscape
MFLD	30% to landscape (up by 3.0%)
MFMD	30% to landscape (up by 3.0%)
MFHD	No Change
MU - Res	30% to landcape (up by 3.0%)

For the Multi-Family Low Density and Multi-Family Medium Density categories, 30% of the additional lot area is assigned to landscape area thereby increasing landscape coverage from 25% to 28%. For the Multi-Family High Density category, the layout may change most significantly with the possibility of fewer multi-level structures, thereby leading to similar building, landscape and hardscape coverages as those assumed in the Folsom SPA - PPA. For the Multi-Use Residential category, the landscape coverage is increased from 25% to 28% as well, under the assumption that more area than originally planned may be devoted to hardscapes that connect with the adjacent Multi-Use Nonresidential land uses (i.e., commercial uses). The land area coverage assumptions for the Folsom SPA – RHA are shown in **Table 6-3**.

Table 6-3
Folsom SPA - RHA
Residential Land Use Coverage

Land Use Category	Building Coverage (% of area)	Hardscape Coverage (% of area)	Landscape Coverage (% of area)
SF	36%	23%	41%
SFHD	36%	32%	32%
MFLD	47%	25%	28%
MFMD	47%	25%	28%
MFHD	55%	15%	30%
MU - Res	57%	30%	13%

[86] The remaining percentage under each land use coverage classification is assigned to hardscape, which has a demand factor of zero.

The increase in landscape coverage results in a higher outdoor unit demand factor than the Folsom SPA-PPA for each residential land classification. Consistent with the approach described in **Section 2.1.3.3**, the long-term outdoor unit demand factor for the single-family residential categories is calculated as a percentage of evapotranspiration. The landscape coverage has a demand per acre similar to that calculated for the Folsom SPA - PPA – 3.73 af/ac. The unit demand factor for each classification is provided in **Table 6-4**.

Table 6-4
Folsom SPA - RHA
Residential Outdoor Demand Factors

Land Use	Lot Area, ft^2	Lot Landscape Area, ft^2	Landscape Area (Total), Acres	ETo Turf Irrig. Demand, Inches/yr	ETAF	Outdoor Unit Demand AFY/DU
SF	12,373	5,087	n/a	53	85%	0.44
SFHD	6,749	2,175	n/a	53	85%	0.19
MFLD	n/a	n/a	122	53	85%	0.12
MFMD	n/a	n/a	36	53	85%	0.06
MFHD	n/a	n/a	29	53	85%	0.05
MU - Res	n/a	n/a	3	53	85%	0.02

6.1.2 Non-Residential Unit Demand Factors

6.1.2.1 Non-Residential Land Use Coverage Percentages

The Folsom SPA – RHA non-residential sector unit demand factors are based on land-use coverage area. With one exception, each non-residential land-use coverage area percentage is assumed to be same as that used for the Folsom SPA - PPA. (See **Section 2.2.2.1.**) For school property, 50 percent of the landscape area will include non-irrigated areas based on some of the areas that are traditionally landscaped are instead hardscaped. The non-residential landscape area coverage percentages are shown in **Table 6-5**.

Table 6-5
Folsom SPA - RHA
Non-Residential Unit Demand Factors

Land-use Category	Acres	Use Class	Coverage %	Use Class Unit Demand (AF/AC/YR)	Land Use Unit Demand (AF/AC/YR)
Mixed Use - Non-Residential	14.4	Indoor	20%	1.66	0.33
		Hardscape	45%	0.00	0.00
		Landscape	35%	3.29	1.15
		Total	100%		1.49
Office Park	111.8	Indoor	25%	1.90	0.48
		Hardscape	35%	0.00	0.00
		Landscape (Irr.)	40%	3.29	1.32
		Total	100%		1.79
General Commercial	175.7	Indoor	25%	1.66	0.42
		Hardscape	45%	0.00	0.00
		Landscape (Irr.)	30%	3.29	0.99
		Total	100%		1.40
Community Commercial	15.4	Indoor	25%	1.66	0.42
		Hardscape	45%	0.00	0.00
		Landscape (Irr.)	30%	3.29	0.99
		Total	100%		1.40
Regional Commercial	133.6	Indoor	28%	1.90	0.53
		Hardscape	47%	0.00	0.00
		Landscape (Irr.)	25%	3.29	0.82
		Total	100%		1.36
Park	149.7	Indoor	2%	0.48	0.01
		Hardscape	3%	0.00	0.00
		Landscape (Irr.)	95%	3.73	3.55
		Total	100%		3.56
Schools	188.3	Indoor	25%	2.85	0.71
		Hardscape	25%	0.00	0.00
		Landscape (Irr.)	25%	3.73	0.93
		Landscape (Non-Irr.)	25%	0.00	0.00
		Total	100%		1.65
Open Space	993.9	Indoor	0%	0.00	0.00
		Hardscape	0%	0.00	0.00
		Landscape	100%	0.00	0.00
			100%		0.00
Major Circulation	149	Indoor	0%	0.48	0.00
		Hardscape	90%	0.00	0.00
		Landscape (Irr.)	10%	3.29	0.33
		Total	100%		0.33

6.1.2.1 Nonresidential Unit Water Demand Factors

Nonresidential demand factors for the Folsom SPA - RHA were derived in a manner similar to those developed for the Folsom SPA - PPA. (See Section 2.2.2.2). All indoor unit demand factors are the same as those used for the Folsom SPA - PPA. The landscape unit demand factor for the commercial categories – Regional Commercial, Community Commercial, General Commercial, Office Park and Mixed-Use Non Residential – is 75 percent of ETo (compared to 85 percent of ETo for the Folsom SPA - PPA). The landscape unit demand for the Major Circulation category is also 75 percent of ETo. The reduction from 85 to 75 percent of ETo compared to the Folsom SPA - PPA will require the commercial categories to develop landscape plans that include more native and low-water using plantings as well as greater use of natural non-irrigated groundcover than in the Folsom SPA - PPA.[87] The landscape unit demand factor for the school and park categories remains at 85 percent of ETo because residents are most likely to demand grass covered areas in parks and in many of the non-playfield areas at schools.

The unit demand factors for each class per unit of land area for each land use category in the Folsom SPA - RHA are provided in **Table 6-5**.

6.2 Folsom SPA – RHA Non-Potable Water Demand

If the City of Folsom were to require that the Folsom SPA – RHA demand categories corresponding to those eligible for non-potable service under the Recycled Water General Permit to use non-potable water, then the Folsom SPA - RHA land-use categories in **Table 6-6** would likely be eligible. The corresponding acreage and potential demand values are provided in **Table 6-6** as well.[88]

Table 6-6
Folsom SPA - RHA
Potential Non-Potable Water Demands

Land-Use Category	Landscape Acreage (AC)	Demand (AF/YR)
Parks	142	531
Streetscapes	15	49
C/I/O Landscape	141	463
Schools Landscape	47	176
Total	345	1,219

[87] See discussion in Section 2.1.3.3. A requirement to install low water using plants and weather-based irrigation controllers, as well as the use of dedicated landscape irrigation meters could reasonably achieve a reduction in water use from 85% to 75% of ETo. Monitoring use through a dedicated meter would provide a check on the efficacy of a landscape plan and the weather-based controller.

[88] See Section 2.3 for eligible non-potable water demand categories in the Recycled Water General Permit.

6.3 PROJECTED WATER DEMANDS FOR FOLSOM SPA

Table 6-7 applies the land-use assumptions in **Table 5-2 and Table 5-3** to the unit demand values in **Tables 6-1, 6-4** and **6-5**. The total estimated water demand for the Folsom SPA RHA in a normal year is 5,395 AF, assuming a 10% non-revenue water factor.[89] In a dry-year, total Folsom SPA - RHA demand is projected to increase to 5,547 acre-feet. Similar to the Folsom SPA – PPA, the dry-year increase is a result of increasing the normal year outdoor demand for all residential and non-residential demand categories by 5% and then applying the non-revenue water factor of 10%. The portion of the Folsom SPA - RHA that is within the EID service area is projected to have a water demand of 228 AF in a normal year and 235 AF in a dry year, as shown in **Table 6-7**. Finally, **Table 6-7** also provides an indication of the balance between indoor and outdoor water demands for all land-use categories in both the Folsom and EID service areas.

[89] See footnote 43 for derivation of Non-Revenue Water factor.

Table 6-7
Folsom SPA - RHA
Normal and Dry-Year Demand Totals

Folsom Service Area				
Residential Land Use	Normal Indoor Total (AFY)	Normal Outdoor Total (AFY)	Normal Total (AFY)	Dry-Year Total (AFY)
SF	202	431	633	655
SFHD	371	337	708	724
MFLD	555	479	1,034	1,058
MFMD	352	152	504	512
MFHD	362	121	483	489
MU - Res	59	11	69	70
Residential Totals	1,901	1,530	3,431	3,508
Non Residential Land Use				
MU - Non Res.	5	19	24	25
OP	59	164	223	231
CC	7	17	24	25
GC	81	193	274	284
RC	79	122	201	207
Park	2	590	592	621
SCH	149	195	344	354
OS	0	0	0	0
MAJ CIRC	0	55	55	57
Non-Residential Totals	382	1,354	1,737	1,804
Folsom Service Area Total	2,283	2,884	5,168	5,312

El Dorado Irrigation District Service Area				
Residential Land Use	Normal Indoor Total (AFY)	Normal Outdoor Total (AFY)	Normal Total (AFY)	Dry-Year Total (AFY)
SF	24	51	75	78
MFLD	33	29	62	63
Residential Totals	57	80	137	141
Non-Residential Land Use				
GC	16	38	54	56
Park	0	35	35	37
OS	0	0	0	0
MAJ CIRC	0	2	2	2
Non-Residential Totals	16	75	91	95
EID Service Area Total	73	155	228	235
Total Demand	2,356	3,039	5,395	5,547

Assuming Folsom SPA - RHA residential and non-residential construction begins in 2013 and the 20-year required projection is applied, then the projected water demand shown in **Table 6-9** would be realized for the Folsom SPA-RHA.

Table 6-9
Folsom SPA – RHA
Projected Water Demands

Water Year	2033
Normal Year (AF/YR)	5395
Dry Year (AF/YR)	5547

SECTION 7 FOLSOM SPA – RHA WATER SUPPLY

The proposed water supply for the Folsom SPA – RHA is the same as the supply planned for the Folsom SPA – PPA that is analyzed in **Section 3**.[90] In summary, the City of Folsom plans to secure an assignment of a portion of NCMWC's Project Water supply. The existing agreement between SFP and NCMWC, and the existing non-binding memorandum of understanding between SFP and the City, provide the foundation for the City of Folsom to obtain an entitlement to the water supply through an assignment approved by the USBR. Consistent with the dry-year shortage provisions in the Renewal Contract, the supply ultimately assigned to the City of Folsom will be subject to a 25% reduction in "Critical Years." For purposes of the sufficiency analysis in **Section 8**, this reduction results in 6,000 AF being available in both single and multiple-dry year conditions. The normal year supply contractually available is projected to be 8,000 AF/YR, though the maximum diversion will be 6,000 AF/YR.

[90] The one difference that the Folsom SPA – RHA demand makes in the supply analysis is related to the demand pattern as explained in **Section 3.2.1.2**. Yet, because the dry-year demand estimate for the Folsom SPA – RHA is nearly the same (5,547 v. 5,577), 9.5 mgd is the projected maximum day demand estimate for the Folsom SPA – RHA.

SECTION 8 FOLSOM SPA – RHA WATER SUPPLY SUFFICIENCY ANALYSIS

Section 8 provides analysis of the sufficiency of the designated water supply for the projected demands for the Folsom SPA - RHA.[91] **Table 8-1** incorporates the demand projection in **Table 6-9**, including both normal and dry-year demand projections at 2033. It also contains the supply projections discussed in detail in **Section 3** and summarized in **Section 7**. Although 8,000 AF/YR is anticipated to be available through contract, for every normal water year between 2013 (start of demand) and 2033 (20-year projection), the City of Folsom will divert a maximum of 6,000 AF/YR to serve the Folsom SPA. For each single and multiple-dry year period, it is assumed that the 8,000 AF/YR base water supply is restricted pursuant to the "Shasta Critical" provisions discussed in **Section 3.2.1.1**, thereby reducing the base supply by 25% and resulting in a total supply of 6,000 AF.

Because construction of water infrastructure is expected to commence in 2011, and construction will continue for 2-3 years, water supplies will first need to be available some time in 2013. In a dry year in 2033, supplies are still estimated to exceed demand by about 450 AF/YR because annual dry-year demand will be approximately 5,547 AF/YR and supplies will be 6,000 AF/YR. Based upon the information in **Table 8-1** and the supporting analyses in **Sections 1, 5 and 6**, there will be a sufficient water supply for the Folsom SPA - RHA even in single and multiple dry year periods.

Table 8-1
Folsom SPA - RHA Supply/Demand Comparison

Year	Projected Baseline Water Demand (ac-ft/year)	Surface Water			Projected Surplus/ (Shortfall) (ac-ft/year)
		Hydrologic Year Type		Available Water Supply (ac-ft/year)	
2033	5,395	**Normal**		6,000	605
	5,547	**Single Dry**		6,000	453
		Multiple Dry	Year 1	6,000	453
			Year 2	6,000	453
			Year 3	6,000	453

[91] CWC § 10910 (c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

CITY OF FOLSOM
UTILITIES DEPARTMENT

Sphere of Influence Specific Plan Area

Water Infrastructure Plan

DRAFT
October 1, 2007

J. CROWLEY GROUP, INC.
WATER RESOURCES PLANNING AND ENGINEERING

CITY OF FOLSOM
UTILITIES DEPARTMENT

Sphere of Influence Special Plan Area

Water Infrastructure Plan

DRAFT

October 1, 2007

Prepared by:

J. CROWLEY GROUP, INC.
WATER RESOURCES PLANNING AND ENGINEERING

3095 Fair Oaks Boulevard • Sacramento, CA 95864 • 916.204.6011

Table of Contents

CHAPTER 1 INTRODUCTION 1-1

1.1 SOI BACKGROUND 1-1
1.2 STUDY AREA DESCRIPTION 1-1

CHAPTER 2 LAND USE 2-1

2.1 LAND USE DESIGNATIONS 2-1
2.2 PROPOSED LAND USE 2-2
2.3 PROJECT PHASING 2-4

CHAPTER 3 POTABLE WATER DEMAND 3-1

3.1 UNIT WATER DEMANDS 3-1
3.2 NET ACRE FACTORS 3-2
3.3 DESIGN FLOW PEAKING FACTORS 3-2
3.4 DEMAND PROJECTIONS 3-2
3.5 POTABLE WATER SUPPLY 3-4

CHAPTER 4 EXISTING WATER SYSTEM AND OTHER ADJACENT AREAS 4-1

4.1 EXISTING FOLSOM DISTRIBUTION SYSTEM 4-1
4.2 EXISTING DISTRIBUTION SYSTEM NEEDS AND PLANNED IMPROVEMENTS 4-2
4.3 GLENBOROUGH/EASTON DISTRIBUTION SYSTEM 4-3
4.4 SYSTEM WIDE PLANNING CONSIDERATIONS 4-3

CHAPTER 5 SOI DISTRIBUTION SYSTEM ANALYSIS 5-1

5.1 EID SERVICE AREA WITHIN THE SOI 5-1
5.2 SOI PRESSURE ZONES – GENERAL DESCRIPTION 5-2
5.3 DEMAND ASSIGNMENT 5-3
5.4 MODEL ASSUMPTIONS 5-5
5.5 SOI SYSTEM DEVELOPMENT 5-5
5.6 SOI STORAGE RESERVOIRS 5-7
5.7 SOI BOOSTER PUMP STATIONS 5-8
5.8 SOI WATER TREATMENT FACILITY 5-9

CHAPTER 6 INTEGRATION OF SOI AND EXISTING SYSTEM 6-1

6.1 INITIAL ANALYSIS OF INTEGRATION OF SOI AND EXISTING SYSTEM 6-1
6.2 ANALYSIS NEXT STEPS 6-2

CHAPTER 7 SOI DISTRIBUTION SYSTEM COST ESTIMATE 7-1

7.1 UNIT COSTS 7-1
7.2 CONSTRUCTION COST CONTINGENCY 7-1
7.3 CONCEPTUAL CONSTRUCTION COST 7-1

CHAPTER 8 EID SERVICE ALTERNATIVES 8-1

CHAPTER 9 NEXT STEPS 9-1

List of Tables

Table 2-1. Land Use Category Comparison....2-1
Table 2-2. Proposed Land Use....2-4
Table 3-1. Residential Unit Water Demands....3-1
Table 3-2. Non-Residential Unit Water Demands....3-1
Table 3-3. Net Acre Factors....3-2
Table 3-4. Design Flow Peaking Factors....3-2
Table 3-5. Total Water Demands....3-3
Table 3-6. Comparison of Projected Demand and Dwelling Units for Maximum and Average Dwelling Unit Density Assumptions....3-3
Table 4-1. Service Zone Elevations....4-1
Table 5-1. Comparison of EID Water Demands....5-1
Table 5-2. Demand by Pressure Zone....5-4
Table 5-3. Infrastructure Sizing and Modeling Assumptions[a]....5-5
Table 5-4. SOI Pipeline Requirements by Option....5-7
Table 5-5. SOI Storage Reservoirs....5-8
Table 5-6. SOI Booster Pump Stations Capacities by Zone....5-9
Table 7-1. Unit Cost Assumptions....7-1
Table 7-2. Summary of Conceptual Cost Estimates....7-2
Table 7-4. SOI Infrastructure Option 1a Detailed Conceptual Cost Estimate....7-3
Table 7-5. SOI Infrastructure Option 1b Detailed Conceptual Cost Estimate....7-4
Table 7-6. SOI Infrastructure Option 2 Detailed Conceptual Cost Estimate....7-5
Table 7-7. SOI Infrastructure Option 3 Detailed Conceptual Cost Estimate....7-6

List of Figures

Figure 1-1. Project Location....1-2
Figure 1-2. SOI Project Area....1-3
Figure 2-1. Proposed Land Use....2-3
Figure 5-1. Option 1a Infrastructure Layout....5-10
Figure 5-2. Option 1a Hydraulic Schematic....5-11
Figure 5-3. Option 1b Infrastructure Layout....5-12
Figure 5-4. Option 1b Hydraulic Schematic....5-13
Figure 5-5. Option 2 Infrastructure Layout....5-14
Figure 5-6. Option 2 Hydraulic Schematic....5-15
Figure 5-7. Option 3 Infrastructure Layout....5-16
Figure 5-8. Option 3 Hydraulic Schematic....5-17

List of Acronyms and Abbreviations

AF	acre-feet
AF/acre/yr	acre-feet per acre per year
AF/DU/yr	acre-feet per dwelling unit per year
BPS	booster pump station
CC	Community Commercial
CCD	Central Commercial Mixed Use
eff	efficiency
EID	El Dorado Irrigation District
EIR	Environmental Impact Report
EIS	Environmental Impact Study
EXLC RW	Excluded Right of Way
ft	feet
GC	General Commercial
GIS	geographical information system
gpd	gallons per day
gpd/acre	gallons per day per acre
gpd/DU	gallons per day per dwelling unit
gpm	gallons per minute
hp	horsepower
HWY	highway
in-dia	inch-diameter
LAFCo	Local Area Formation Commission
LP	Local Park
MAJ CIRC	Major Circulation
MG	million gallons
mgd	million gallons per day
MHD	Multi Family High Density
MLD	Multi Family Low Density
MMD	Multi Family Medium Density
OP	Office Park
OS	Open Space
OSL	Landscaped Open Space
PARK	Park
PRV	pressure reducing valve
psi	pounds per square inch
Q	flow
SCH	School
SF	Single Family
SFHD	Single Family High Density
SOI	sphere of influence
TDH	total dynamic head
UWMP	urban water management plan

CHAPTER 1 Introduction

This water infrastructure plan provides a discussion and summary of anticipated water infrastructure needs to serve the Folsom Sphere of Influence (SOI) area. The area is currently undeveloped and no public water supply or distribution system exists in the area. The City of Folsom intends to annex the area and provide water, wastewater, and recycled water services, in addition to other City services. Additional infrastructure plans are developed under separate reports for wastewater and recycled water infrastructure requirements in the SOI area. This water infrastructure plan is utilized to support the parallel environmental impact report document prepared by others and will serve as the basis for completing a detailed water infrastructure master plan.

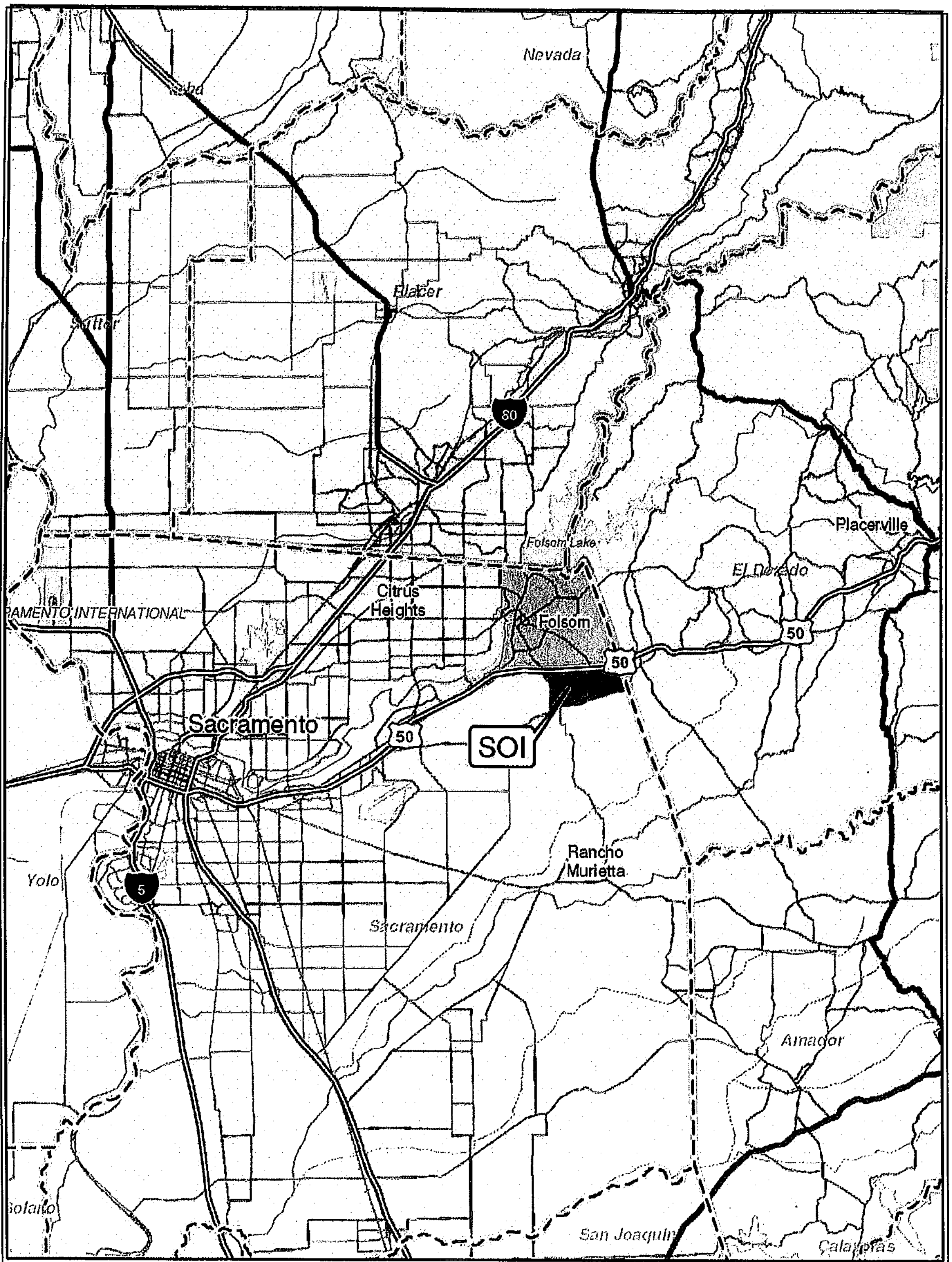
This draft report presents the analysis to date. There are many outstanding factors that will impact the water infrastructure requirements. As the development plans are refined, more detailed information is developed, and agency coordination continues, the infrastructure plan will be updated to reflect the changes.

1.1 SOI Background

The City of Folsom voters passed measure W in November 2004 to annex the SOI area. Adopted on July 27, 2004, the City has begun the process to annex the area through the Local Area Formation Commission (LAFCo), adopt a Specific Plan of the area, update the City's General Plan, and conduct an EIR/EIS process for the project. Currently seven property owners own all the land in the SOI area. The property owners have formed a group to coordinate and work with the City of Folsom and other entities to develop the project area.

1.2 Study Area Description

The SOI area consists of approximately 3,560 acres south of the existing Folsom southern boundary. The SOI area is bound by the El Dorado County Line on the east, White Rock Road on the south, Prairie City Road on the west, and Highway (HWY) 50/Folsom City limit on the north, as shown on Figure 1-1. The area is currently undeveloped and consists of rangeland and oak woodland areas. An aerial view of the project site is shown on Figure 1-2. Elevations range from 800 feet in the northeast corner, down to 300 feet in the southwest corner, and 240 feet in the northwest corner. Topography generally slopes down from east to west, although a main drainage feature runs from south to north in the eastern side of the area, discharging most of the study area drainage at the northwest corner of the project area. In addition, a ridge exists on the eastern side, such that the eastern most area is drained to the southeast corner of the project area. The eastern side consists of dry rangeland with a few stock ponds. The western side contains an oak woodland area and a few stock ponds.



City of Folsom Sphere of Influence Water Infrastructure Plan	**Figure 1-1** **Project Location**
J. CROWLEY GROUP SACRAMENTO, CA	***Figure provided by Mackay & Somps***

C:\Clients\City of Folsom\010-003 Folsom SOI\figure pdfs 092707

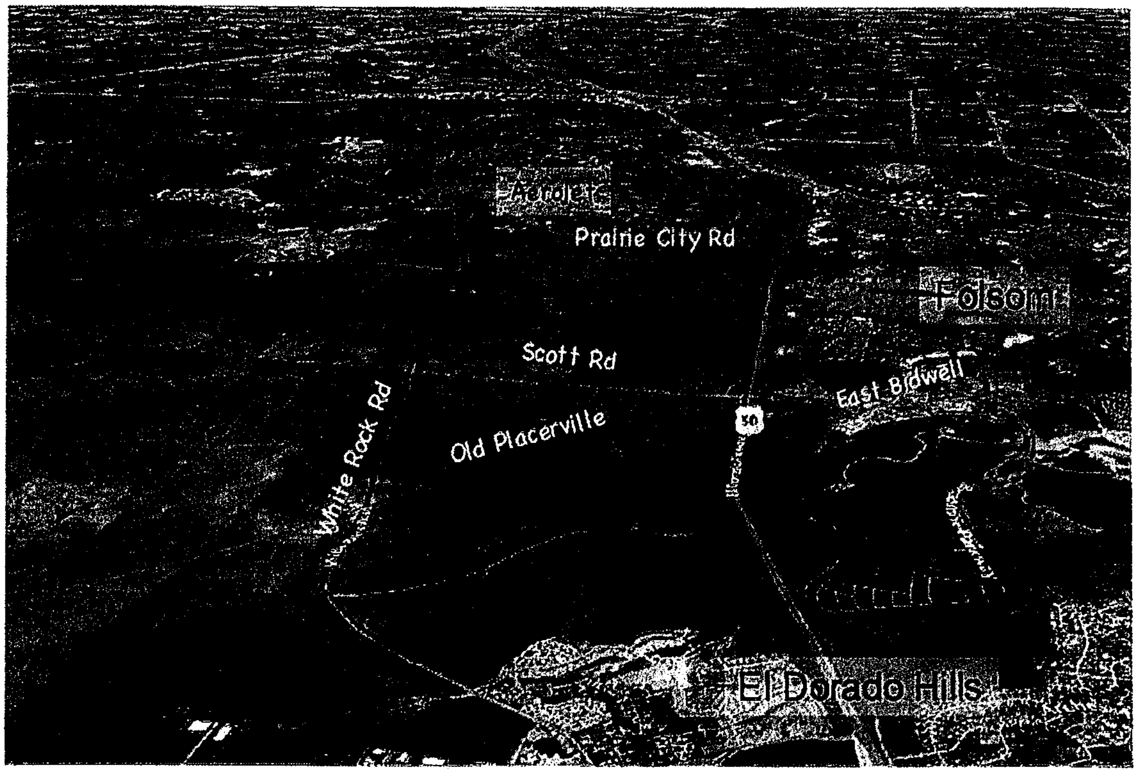


Figure 1-2. SOI Project Area

A small portion of the SOI is within the El Dorado Irrigation District (EID) service area boundary, as shown on Figure 1-1. Discussions with EID indicate they intend to maintain their service area boundary within Sacramento County. This analysis assumes that the SOI is not split into each respective service area, but remains as one system which will either be served entirely by Folsom or in part by EID. Folsom and EID will need to develop an agreement or memorandum of understanding regarding the customers whose water will be supplied and delivered by the other agency. The infrastructure needs with EID will not be completed within the time frame to submit this first version of the water plan. When the EID alternative is completed, either a revised water plan or a separate plan will be submitted.

CHAPTER 2 Land Use

Land use designations and proposed plans are provided in this chapter. The land use plan is provided by the landowners, and continues to be updated to address elements identified throughout the planning process. This document is based on the existing land use plan as of this date, but it is expected that some elements will change in the future and the resulting infrastructure requirements will require updating.

2.1 Land Use Designations

The proposed land use plan includes land uses for residential, commercial, office, public, and open space. Each land use is listed and defined below. The proposed land use categories are different than those presented in the Folsom 2005 Urban Water Management Plan (UWMP) (Tully and Young, 2006). Table 2-1 lists the proposed land use designations and the corresponding City of Folsom UWMP land use categories. This comparison is presented as the unit water demand factors from the 2005 UWMP are used to project water demands in this report.

Table 2-1. Land Use Category Comparison

SOI Land Owners Plan Land Use	Equivalent Folsom 2005 UWMP Land Use
SF – Single Family	Low Density Residential
SFHD – Single Family High Density	Medium Density Residential
MLD – Multi Family Low Density	Medium Density Residential
MMD – Multi Family Medium Density	Medium-High Density Residential
MHD – Multi Family High Density	High Density Residential
CCD – Central Commercial Mixed Use	High Density Residential
OP – Office Park	Moderate Intensity Office
CC – Community Commercial	Neighborhood Commercial/Office
GC – General Commercial	Regional Commercial/Office
PARK – Park	Park
LP – Local Park	Park
OS – Open Space	*none*
OSL – Landscaped Open Space	*none*
SCH –School	School
MAJ CIRC – Major Circulation	*none*
EXLC RW – Excluded Right of Way	*none*

SF (Single Family). Residential with dwelling unit (DU) densities of 2-3.9 DU/acre.

SFHD (Single Family High Density). Residential with densities of 4-6.9 DU/acre.

MLD (Multi Family Low Density). Multi family residential with densities of 7-11.9 DU/acre.

MMD (Multi Family Medium Density). Multi family residential with densities of 12-17.9 DU/acre.

MHD (Multi Family High Density). Multi family residential with densities of 18-25 DU/acre.

CCD (Central Commercial Mixed Use District). Residential mixed with commercial and retail usually on ground floor, located in central business district. Residential densities in range of 10-12 DU/acre.

OP (Office Park). Office parks.

CC (Community Commercial). Commercial land use with building usually only one story, located throughout area on arterial streets.

GC (General Commercial). Small commercial establishments, usually one story, located throughout development in smaller commercial areas such as intersections.

PARK (Parks). Regional and community parks, consisting of sports facilities, playgrounds, and/or turf areas.

LP (Parks – Neighborhood). A smaller park located in residential areas intended to serve immediately residential area.

OS (Open Space). Mostly void of structures and surface infrastructure, will contain greenway trails.

OSL (Landscaped Open Space). Open space land use category that is irrigated. Mostly median strips along arterial roadways.

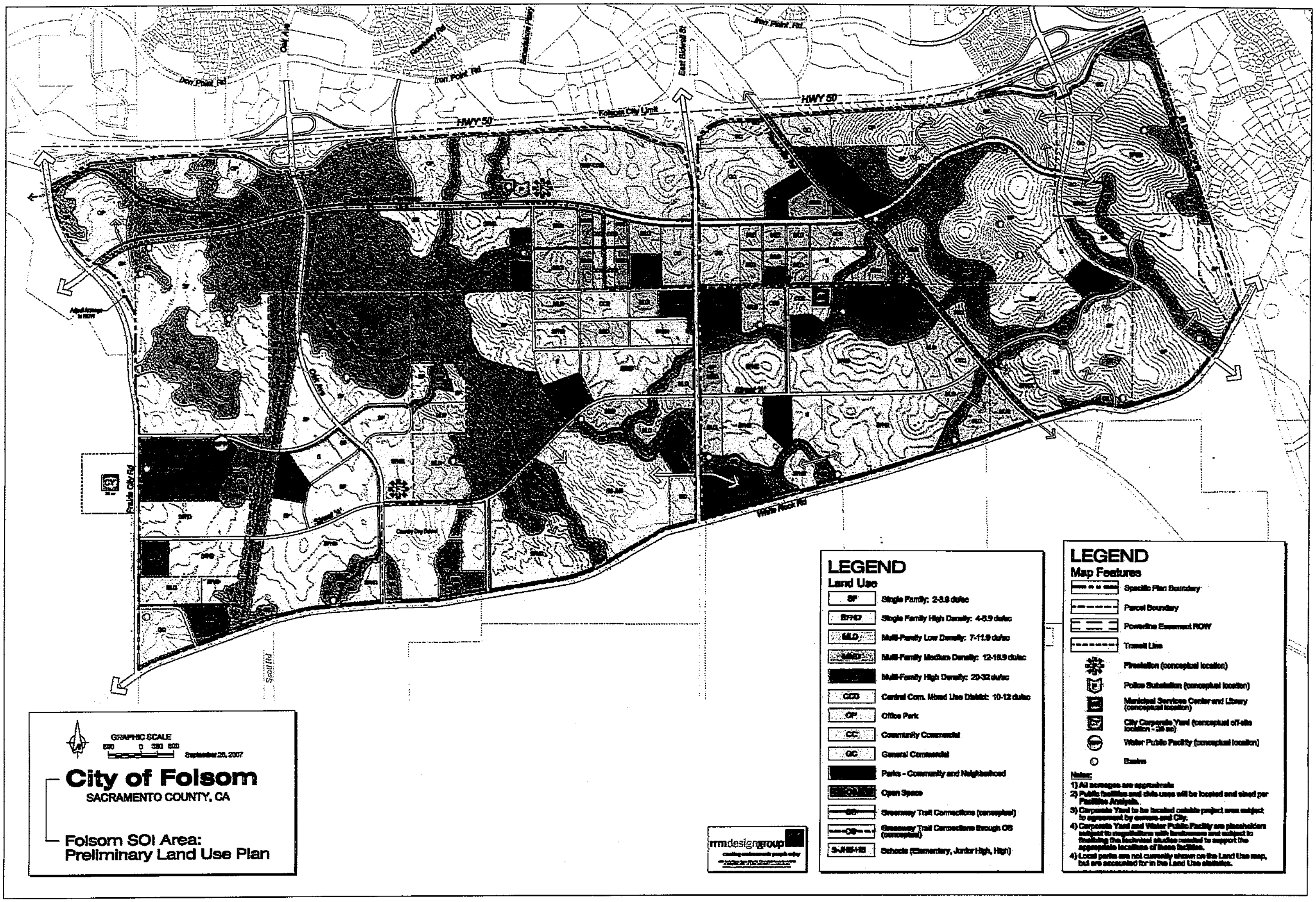
SCH (School). High schools, junior high, elementary, and Country Day School sites with associated sports facilities and open space.

MAJ CIRC (Major Circulation). Arterial and other large secondary roadways with accompanying pavement, open space, and landscaped areas.

EXCL RW (Excluded Right of Way). Area within the SOI already owned by CalTrans as part of Highway 50.

2.2 Proposed Land Use

The proposed land use is shown on Figure 2-1 and summarized in Table 2-2. The largest land use by percentage is open space that is mostly located in the western side in the oak woodland area. Single family residential land uses are the next largest land use, followed by multi family land uses, and then the various commercial categories.



City of Folsom
SACRAMENTO COUNTY, CA
Folsom SOI Area:
Preliminary Land Use Plan
GRAPHIC SCALE
September 25, 2007
HWY 50
White Rock Rd
East Bidwell St
Iron Point Rd
Prairie City Rd
Oak Ave
LEGEND
Land Use
SF Single Family: 2-3.9 du/ac
SFHD Single Family High Density: 4-6.9 du/ac
MLD Multi-Family Low Density: 7-11.9 du/ac
MMD Multi-Family Medium Density: 12-19.9 du/ac
Multi-Family High Density: 20-32 du/ac
CCD Central Com. Mixed Use District: 10-12 du/ac
OP Office Park
CC Community Commercial
GC General Commercial
Parks - Community and Neighborhood
Open Space
Greenway Trail Connections (conceptual)
Greenway Trail Connections through OS (conceptual)
Schools (Elementary, Junior High, High)
LEGEND
Map Features
Specific Plan Boundary
Parcel Boundary
Powerline Easement ROW
Transit Line
Firestation (conceptual location)
Police Substation (conceptual location)
Municipal Services Center and Library (conceptual location)
City Corporate Yard (conceptual off-site location - 20 ac)
Water Public Facility (conceptual location)
Basins
rrmdesigngroup

Table 2-2. Proposed Land Use

Land Use	Acreage	Percent of Total
SF – Single Family	560	16%
SFHD – Single Family High Density	522	15%
MLD – Multi Family Low Density	251	7%
MMD – Multi Family Medium Density	28	1%
MHD – Multi Family High Density	100	3%
CCD – Central Commercial Mixed Use	41	1%
OP – Office Park	107	3%
CC – Community Commercial	139	4%
GC – General Commercial	203	6%
PARK - Park	118	3%
LP – Local Park	47	1%
OS – Open Space	991	28%
OSL – Landscaped Open Space	55	2%
SCH - School	181	5%
MAJ CIRC – Major Circulation	143	4%
EXCL RW – Excluded Right of Way	73	2%
Total	**3,559**	**100%**

2.3 Project Phasing

The current land owners are considering developing the project area in phases. However, actual phasing plans have not been developed at this time. It is likely that each landowner will determine their own phasing plans within their areas, as is common in other large-acreage developments with multiple land owners. The infrastructure requirements in this report are developed for the ultimate buildout conditions. As development in the first phase could be scattered throughout the project area, it is assumed that the basic infrastructure requirements will be required for the first phase. This analysis also examines the potential to integrate the SOI distribution system with the existing Folsom distribution system north of Highway 50 as well as the Aerojet Glenborough/Easton development to the west of the SOI.

CHAPTER 3 Potable Water Demand

This chapter presents the projected potable water demands for the proposed land use plan. The water demands estimated in this chapter include potential recycled water demand should recycled water not be available.

3.1 Unit Water Demands

Unit water demands are presented in the City of Folsom's 2005 UWMP. These unit water demands are used by Folsom for water planning efforts within the City's boundaries and the SOI area. The land use designations are matched to the UWMP designations in Chapter 2 of this report. Corresponding unit water demand designations are presented in Table 3-1. The UWMP listed demands as acre-feet per dwelling unit per year (AF/DU/yr) or acre-feet per acre per year (AF/acre/yr). Table 3-1 also converts the unit demand to a gallon per day per dwelling unit (gpd/DU) or per acre (gpd/acre) for comparison.

Table 3-1. Residential Unit Water Demands

Land Use	Indoor, AF/DU/yr	Outdoor, AF/DU/yr	Total, AF/DU/yr	Total, gpd/DU
SF	0.20	0.45	0.65	580
SFHD	0.20	0.36	0.56	500
MLD	0.20	0.36	0.56	500
MMD	0.20	0.20	0.40	357
MHD	0.20	0.10	0.30	268
CCD[a]	0.20	0.10	0.30	268

[a]CCD water demand estimate is split between non-residential and residential water use.

Table 3-2. Non-Residential Unit Water Demands

Land Use	Indoor, AF/acre/yr	Outdoor, AF/acre/yr	Total, AF/acre/yr	Total, gpd/acre
OP	2.0	4.0	6.0	5,357
CC	1.0	4.0	5.0	4,464
CCD[a]	1.0	4.0	5.0	4,464
GC	1.0	4.0	5.0	4,464
PARK	0.5	4.0	4.5	4,018
LP	0.5	4.0	4.5	4,018
OSL	0.0	4.0	4.0	3,571
SCH	3.0	4.0	7.0	6,250

[a]CCD water demand estimate is split between non-residential and residential water use.

3.2 Net Acre Factors

Unit water demands are applied to projected land use areas to identify total annual water demands. A net acre factor is used to reduce total acreage to actual acreage with water demands. This acreage reduction accounts for non-water demand areas, such as right of ways or pavement. The net acre factors also split water demands into indoor and outdoor water demands. The indoor/outdoor net acre factors are based on the indoor/outdoor unit water demands presented in the 2005 UWMP.

Table 3-3. Net Acre Factors

Land Use	Indoor	Outdoor	Total Net Acre Factor
OP	0.40	0.10	0.50
CC	0.40	0.05	0.45
CCD	0.40	0.05	0.45
GC	0.40	0.05	0.45
PARK	0.05	0.75	0.80
LP	0.05	0.75	0.80
OSL	0.00	0.75	0.75
SCH	0.10	0.50	0.60

3.3 Design Flow Peaking Factors

Design flow peaking factors are used to convert average annual demands to design flows used for sizing infrastructure. The City of Folsom recently updated their water master plan and hydraulic model. Design flow peaking factors are developed in Technical Memorandum No. 1 for the water master plan update (West Yost and Associates, February 10, 2006.) The design flow peaking factors selected are shown in Table 3-4. The maximum day peaking factor represents the maximum day to average day demand ratio and the peak hour peaking factor represents the peak hour to maximum day demand ratio.

Table 3-4. Design Flow Peaking Factors

Demand Condition	Peaking factor
Maximum day	1.9
Peak hour	1.8

3.4 Demand Projections

Water demand projections are summarized in Table 3-5. Potential recycled water demands are included in the total water demands should recycled water supply not be available. The demand projections in Table 3-5 are based on the maximum dwelling unit density of each of the residential land use categories. It is possible that the actual dwelling unit density of each of the residential land use categories may be less than the maximum. As a

Table 3-5. Total Water Demands

Land Use ID	Area, acres	Dwelling Unit Density, DU/acre	Dwelling Units	Indoor Unit Water Demand, AF/DU or AF/ac	Outdoor Unit Water Demand, AF/DU or AF/ac	Indoor Net Acre Factor	Outdoor Net Acre Factor	Water demand		
								Avg. Annual, acre-feet	Max. Day, mgd	Peak Hour, gpm
SF	560	3.9	2,184	0.2	0.45	--	--	1,562	2.6	3,311
SFHD	522	6.9	3,604	0.2	0.45	--	--	2,577	4.4	5,464
MFLD	251	11.9	2,987	0.2	0.36	--	--	1,840	3.1	3,901
MFMD	28	17.9	499	0.2	0.2	--	--	220	0.4	466
MFHD	100	25	2,503	0.2	0.1	--	--	826	1.4	1,751
CCD-Residential		12	492	0.2	0.1	--	--			
CCD-Non residential	41			1	4	0.40	0.05	189	0.3	402
OP	107			2	4	0.40	0.10	141	0.2	298
CC	139			1.5	4	0.40	0.05	92	0.2	195
GC	203			1	4	0.40	0.05	134	0.2	284
Park	118			0.5	4	0.05	0.75	392	0.7	831
LP	47			0.5	4	0.05	0.75	157	0.3	333
OS	991			--	--	--	--	0	0.0	0
OSL	55			0	4	0	0.75	183	0.3	388
SCH	181			3	4	0.10	0.50	458	0.8	970
EXCL RW	73			--	--	--	--	--	--	--
MAJ CIRC	143			--	--	--	--	--	--	--
Total	**3,559**		**12,269**					**8,769**	**14.9**	**18,594**

result, the actual water demand may be less than the demand projected in Table 3-5. A comparison of the water demand and dwelling units projected in Table 3-5 based on maximum dwelling unit density with the water demand and dwelling units projected based on average dwelling unit density is provided in Table 3-6.

Table 3-6. Comparison of Projected Demand and Dwelling Units for Maximum and Average Dwelling Unit Density Assumptions

Dwelling Unit Density Assumption	Dwelling Units	Total SOI Demand, AF
Maximum	12,269	8,769
Average	9,924	7,331
Difference (maximum – average)	2,345	1,438

3.5 Potable Water Supply

The City of Folsom will obtain a new water source to serve the SOI area. Infrastructure requirements to deliver the supply to the SOI are currently under investigation. The projected annual demands for the land use plan area are approximately 8,769 acre-feet per year, including potential recycled water demands. As discussed in the previous section the projected annual demand in this report is based on the maximum dwelling unit density. Demands may be less if actual dwelling unit densities are less than the maximum. Demands may also be less if conservation efforts are implemented in the new development.

CHAPTER 4 Existing Water System and Other Adjacent Areas

This chapter describes the existing City of Folsom distribution system to provide a better understanding of the issues to consider when connecting the SOI system with the existing system. The pressure zones and operations are briefly discussed. A summary of the distribution system needs and planned improvements is provided. In addition, the Glenborough/Easton distribution system is discussed.

4.1 Existing Folsom Distribution System

The City of Folsom's distribution system is divided into two distinct systems. The system north of the American River is supplied by the San Juan Water District, and is not included further in this analysis. The larger water distribution system serves the largest area of the City that is located south of the American River and north of Highway 50. Water is treated at the City's water treatment plant on the north side of town. Treated water is pumped or flows by gravity into the pressure zones. There are six main pressure zones in the system, with some sub-zones. The zone elevation boundaries are summarized in Table 4-1. The SOI pressure zones are designed to mirror the service zone elevations of the existing system for ease of operations when integrating the SOI system with the existing system.

Table 4-1. Service Zone Elevations

Zone	Service Elevation Range, feet
Nimbus	Up to 180
1	Up to 280
2	280-380
3	341-466
4	466-616
5	591-716
6	716-790

Note: Reproduced from Draft TM No. 4 Water System Master Plan Update – Distribution System Analysis, West Yost & Associates, April 5, 2007.

Zone 1 serves the lower west side of Folsom. The system is mostly gravity fed from the finished water reservoirs at the treatment plant. In addition, there are five main pressure-reducing interconnections with Zone 2. The South Reservoir is filled by gravity from the Zone 1 system and provides pressure and storage needs for the zone. Zone 1 abuts the Highway 50 corridor in the southwest corner of the City.

Zone 2 is the largest of Folsom's service zones in terms of area and demand served. The Zone 2 Booster Pump Station (BPS) is located at the treatment plant site and pumps from the finished water reservoirs into the distribution system. The Tower Reservoir and the two East Reservoirs provide storage and pressure control. Zone 2 can also be fed through pressure-reducing stations from Zone 3. Zone 2 abuts the Highway 50 corridor along Iron Point Road from approximately Prairie City Road to Broadstone Parkway.

Zone 3 is a unique shape due to topography. Zone 3 covers the northeast section of Folsom to the east boundary, then wraps around in a narrow band, across East Bidwell Street to the Highway 50 corridor. The Zone 3 pumps, located at the water treatment plant, feed the system. Cimmaron Hills Reservoir provides storage and pressure control for the Zone 3 area in the northeast. Zone 3 is also fed by the East Area BPS. The East Area pumps also draw from the finished water reservoirs. The two Foothills Reservoirs provide storage and pressure control for the Zone 3 area in the southeast portion of the city.

The Zone 4 BPS is located on the east side of the City and draws from the East Area BPS fed system in Zone 3. The Broadstone Reservoir provides storage and pressure control.

The Zone 5 BPS pumps from the Zone 4 system, with Carpenter Hill Reservoir providing storage and pressure control.

The Zone 6 BPS in the southeast corner of the City draws from Zone 5, and is a hydropneumatic system due to the small service area of the zone.

4.2 Existing Distribution System Needs and Planned Improvements

The Water System Master Plan 2005 Update (West Yost and Associates, TM 1, 2, 3, and 4) evaluated future system improvements based on General Plan buildout conditions in 2009, when it is expected that residential land use will be substantially built out. Recommended improvements are discussed in Technical Memorandum No. 4 (West Yost and Associates, April 5, 2007). The recommendations call for an additional 10 million gallons (MG) of storage to meet emergency storage capacity goals, with at least 7 million gallons located at the treatment plant site, and at least 1.2 million gallons in Zone 2. Low pressure and low fire flow areas are identified with various recommendations to improve conditions through pipe replacement, relocating zone boundaries, or other localized actions.

System-wide zone issues are also addressed. Pressure-reducing valve stations are recommended to supply Zone 1 from Zone 2 during high demand periods. Zone 2 experiences storage issues due to the distance and head loss in the system that prevent utilization of stored water in the Tower Reservoir, and inhibit the ability to fill the East Reservoirs. A parallel main is recommended to reduce pumping heads and improve hydraulics, allowing the Tower Reservoir and East Reservoirs to operate as planned.

Recommendations for Zone 3 include isolating the Zone 3 Cimmaron system with pressure reducing valves (PRVs), which is expected to allow the rest of Zone 3 to operate correctly. Zones 4 through 6 do not have any high priority recommendations. However, results indicate the systems will be operated at the upper limit of flow and storage capabilities, and actual performance should be monitored and needs re-evaluated over time. Other second priority recommendations and infrastructure replacements projects consistent with normal asset management that are provided in the Water System Master Plan 2005 Update are not mentioned here.

4.3 Glenborough/Easton Distribution System

The Glenborough/Easton development will be served water supply by the City of Folsom. A parallel planning effort is underway to investigate supply connections to the existing Folsom distribution system. The development would logically connect to the City's Zone 1 and Zone 2 areas. However, the existing system may be capacity limited and not able to provide the entire development with its supply needs. The parallel analysis is investigating multiple connection points, with consideration of using the proposed SOI water treatment plant and pressures zones as a second supply source.

4.4 System Wide Planning Considerations

A summary of the existing system and infrastructure needs is discussed in this report to provide a better understanding of the issues and operations involved in integrating the SOI system with the existing system. The analysis also considers the needs of the future development, Glenborough/Easton, which will be served by the existing system for the first phases. System wide planning considerations may involve providing additional storage, treatment, and/or pumping capacity in the SOI or Glenborough/Easton developments for the purposes of improving operations for the system as a whole. Elements that support system-wide improvements will be identified and discussed.

CHAPTER 5 SOI Distribution System Analysis

This chapter develops infrastructure layout options for the water distribution system within the SOI area. The SOI distribution system is developed with consideration to demand locations, main pipe alignments, storage needs and locations, pressure zones, and pumping requirements. Integration of the new SOI system with the existing distribution system are discussed in Chapter 6 of this report.

A hydraulic model of the SOI system was developed in this analysis using MWSoft's Infowater software, the GIS-based version of H2ONet. The development of a computer hydraulic model makes it possible to analyze the expected system performance at varying demand conditions such as maximum day and peak hour. The EID service area within the SOI, SOI pressure zones, demand assignment, model assumptions, and system infrastructure design options and analysis are described in this chapter.

5.1 EID Service Area within the SOI

Approximately 150 acres on the northeast east end of the SOI area, adjacent to the Sacramento/El Dorado county line is part of the El Dorado Irrigation District service area. Folsom and EID are in the process of discussing this issue and evaluating potential service options. No service area splits have been performed for this analysis.

The EID service area is located within two of the pressure zones. Approximately one quarter of the Zone SOI 5 ground area and two-thirds of the Zone SOI 6 ground area is located within the EID service area. Approximately 430 acre-feet of demand is attributable to the EID service area. A recent EID supply analysis, "2007 Water Resources and Service Reliability Report, June 25, 2007", indicates the El Dorado Hills system contains 746 acre-feet per year of excess supply, which is equivalent to 933 new connections. The El Dorado Hills system serves all of the EID's eastern service area. Table 5-1 provides a comparison of the EID service area demand within the SOI.

Table 5-1. Comparison of EID Water Demands

Area	Average Annual Demand, AF	Dwelling units[a]	Notes
SOI EID service area	427	536	Water demand and dwelling units based on maximum dwelling unit density.
SOI total Zones SOI 5 and SOI 6	1,313	1,597	Water demand and dwelling units based on maximum dwelling unit density.

[a]Dwelling units estimated within the SOI are based on maximum dwelling unit density by residential land use category.

If EID were to serve their SOI area, a booster pump station would be required to boost water from the existing pressure zone at the El Dorado County line adjacent to the SOI. The adjacent EID service area is at a lower hydraulic grade line than what is required to serve Zones SOI 5 and SOI 6. It is assumed that only one agency will provide water service to this area; this prevents parallel construction of potable water facilities and pipelines immediately adjacent to one another. The proposed water system for the Folsom-only system is described in this chapter. The proposed system for the combined Folsom/EID service scenario is still under development with EID and will be amended to this report or submitted separately once coordination completed.

5.2 SOI Pressure Zones – General Description

The SOI pressure zones are designed to mirror the service zone elevations of the existing system for ease of operations when integrating the SOI system with the existing system. This section provides a general description of the pressure zones in the SOI as they exist in all infrastructure layout options. The infrastructure layout options are discussed later in this chapter.

Zone SOI 2 is the lowest elevated pressure zone in the SOI, and is located in western most area of the development from Prairie City Road to just west of Scott Road. It serves approximately half the total demand of the SOI. The Zone SOI 2 demand is served directly from the water treatment plant along Prairie City Road. A ground storage facility for Zone SOI 2 is located adjacent to the SOI water treatment plant. In option 1b (discussed later in this chapter), an additional Zone SOI 2 reservoir is added on the east side of Zone SOI 2. There is potential to connect Zone SOI 2 to the existing system Zone 2 by constructing a pipeline along the Prairie City Road crossing of HWY 50.

Zone SOI 3 is located in the central portion of the development from just west of Scott Road to just west of Placerville Road, and serves approximately one-fourth of the total demand of the SOI. A gravity storage facility for Zone SOI 3 is located just west of Placerville Road north of White Rock Road. There is potential to connect Zone SOI 3 to the existing system Zone 3 by constructing a pipeline along Placerville Road under HWY 50.

Zone SOI 4 is located along the Placerville Road corridor, and services approximately ten percent of the total demand of the SOI. A gravity storage facility for Zone SOI 4 is located just east of Empire Ranch Road. As discussed later in this chapter, the infrastructure is designed to maintain a system pressure between 40 and 80 pounds per square inch (psi) during maximum day demand conditions. The Zone SOI 4 is designed to mirror the existing system pressure Zone 4 ground elevations. The existing system Zone 4 ground elevation range is 466 ft to 616 ft, which is a large elevation range for a pressure zone (150ft). Because the ground elevations in Zone SOI 4 are at the bottom of the Zone 4 elevation range, the Zone SOI 4 maximum day demand pressure results in values around 100 psi in all infrastructure scenarios. This is higher than the City's typical design standards. In this analysis, it was the intent to maintain the same zone elevation range as the existing system Zone 4 for ease of existing system and SOI system integration.

Zone SOI 5 is located in the southeast area of the development, just east of Placerville Road to the Sacramento/El Dorado county line, and serves approximately 15 percent of the total demand of the SOI. A gravity storage facility for Zone SOI 5 is located just east of Empire Ranch Road, near Hwy 50. The Zone SOI 5 storage facility is also sized to serve Zone 6 peak hour demands. Approximately two thirds of the Zone SOI 5 ground area is located within the EID service area. It is assumed that only one agency will provide water service to this area; this prevents construction of two sets of potable water facilities and pipelines immediately adjacent to one another. The proposed water system for the Folsom-only system is described in this chapter. The proposed system for the combined Folsom/EID service scenario will be amended to this report or submitted separately once coordination with EID is complete. In addition, there is potential to connect Zone SOI 5 to the existing system Zone 5 by constructing a pipeline along the future Empire Ranch Road crossing of HWY 50.

Zone SOI 6, the highest elevated pressure zone, is located in the northeast corner of the development between Empire Ranch Road and the Sacramento/El Dorado county line. The Zone SOI 6 is the smallest pressure zone and serves approximately one percent of the total SOI demand. All demands in Zone SOI 6 are served through a booster facility from Zone SOI5. An additional booster pump sized for fire flow demands (3,000 gpm) is required because there is no storage tank within Zone SOI 6. The Zone SOI 6 equalization, emergency, and fire flow supply is included in the Zone SOI 5 storage tank volume. Approximately two-thirds the ground area of Zone SOI 6 is located within the EID service boundary. Similar to Zone SOI 5, it is assumed that only one agency will provide water service to this area; this prevents construction of two sets of potable water facilities and pipelines immediately adjacent to one another. The proposed water system for the Folsom-only system is described in this chapter. The proposed system for the combined Folsom/EID service scenario will be amended to this report or submitted separately once coordination with EID is complete.

5.3 Demand Assignment

The demands estimated by land use parcel in Chapter 3 are grouped into demand allocation areas and assigned to the nearest nodes. The demand by pressure zone and by land use is shown in Table 5-2. Appendix B contains a system map showing the maximum day demand per node.

Table 5-2. Demand by Pressure Zone

Land Use ID	Total Area, acres	Total Annual Demand, AF	SOI Zone 2		SOI Zone 3		SOI Zone 4		SOI Zone 5		SOI Zone 6	
			Area, acres	Annual Demand, AF	Area, acres	Annual Demand, AF	Area, acres	Annual Demand, AF	Area, acres	Annual Demand, AF	Area, acres	Annual Demand, AF
SF	560	1,562	267	745			21	59	272	758		
SFHD	522	2,577	258	1,272	172	851	14	71	78	383		
MLD	251	1,840	130	952	49	359	72	529				
MMD	28	220	21	165	7	54						
MHD	100	826	33	269	47	384	21	172				
CCD	41	189	20	92	16	72	5	25				
OP	107	141	84	111			22	29				
CC	139	92	124	82	15	10						
GC	203	134	14	9	88	58	13	8	75	49	14	9
Parks	118	392	71	235	38	127			9	30		
LP	47	157	21	70	13	42	3	8	11	37		
OS	991	0	733	0	61	0	104	0	93	0		
OSL	55	183	24	80	18	59	7	23	6	20	183	
School	181	458	151	381	20	51			10	25		
EXCL RW	73	–	–	–	–	–	–	–	–	–		
MAJ CIRC	143	–	–	–	–	–	–	–	–	–		
Total	3,559	8,769	1,951	4,465	543	2,067	282	924	553	1,304	14	9
Average day demand, mgd	–	7.8	–	4.0	–	1.8	–	0.8	–	1.2	–	0.01
Maximum day demand, mgd	–	14.9	–	7.6	–	3.5	–	1.6	–	2.2	–	0.02
Maximum day demand, gpm	–	10,330	–	5,259	–	2,435	–	1,089	–	1,536	–	11
Peak hour demand, gpm	–	18,594	–	9,467	–	4,383	–	1,960	–	2,765	–	20

5.4 Model Assumptions

A distribution system consisting of storage, booster pumping stations, and transmission main pipelines was developed and input into the model. Sizing and modeling assumptions are based on factors presented in the Water System Master Plan 2005 Update Technical Memorandums No. 2 and 4 (West Yost and Associates, May 30, 2006, April 5, 2007), and are summarized in Table 5-3. A figure illustrating the ground elevation assumption at each SOI system node is presented in Appendix B.

Table 5-3. Infrastructure Sizing and Modeling Assumptions[a]

Element	Value
Storage requirement	Operational Storage at 25% maximum day demand plus Emergency storage at 75% maximum day demand plus Fire Flow based on largest fire flow requirements in zone
Pressure range	40 psi – 80 psi during normal max. day operations Minimum 30 psi during peak hour operations Minimum 20 psi in vicinity of fire
Pipeline velocity	7-8 feet per second maximum for daily operation up to 10 feet per second for fire flow operation
Pipeline roughness coefficient	130 for new pipes
Fire flows Single-Family Multi-Family Commercial/Industrial Schools	 1,500 gpm for 2 hours, 0.18 million gallons storage 2,500 gpm for 2 hours, 0.30 million gallons storage 3,000 gpm for 3 hours, 0.54 million gallons storage 4,000 gpm for 4 hours, 0.96 million gallons storage

[a]Values from Water System Master Plan 2005 Update Technical Memorandum No. 2, Draft Water System Computer Model Update May 30, 2006 and No. 4, Draft Distribution System Analysis.

5.5 SOI System Development

Four infrastructure layout options are developed. These infrastructure options assume that all demand within the SOI, including those within the EID service area, is served from the SOI water treatment plan. A second scenario investigates EID serving their service area on the east side of the SOI, and will either be amended to this document, or submitted separately, once the analysis and coordination with EID is completed.

Each of the SOI infrastructure layout options include major transmission mains, storage, and booster pumping requirements. The infrastructure layout options are listed as follows and described below:

Option 1a. All supply through Zone SOI 2
Option 1b. All supply through Zone SOI 2, Zone SOI 2 gravity storage
Option 2. Transmission main to Zone SOI 3
Option 3. Zone SOI 3 supply through Zone SOI 2, Transmission main to Zone SOI 4

Option 1a. All supply through Zone SOI 2

In this option, all SOI demand is supplied through in line boosting from one zone to the next highest zone. This option was developed to minimize the necessary transmission main pipeline by delivering water from the water treatment facility through each zone in series formation from the lowest zone (Zone 2) uphill to the highest zone (Zone 6). The Zone SOI 2 ground storage was located at the water treatment facility because this location is near the existing system and Glenborough/Easton. Additional storage volume could be added to the Zone SOI 2 ground tank to provide additional equalization, emergency, and fire flow supply and hydraulic head for the existing system Zone 2, and for the Glenborough/Easton system, adjacent to the SOI to the west. The Option 1a infrastructure layout is provided on Figure 5-1, and the hydraulic schematic is provided on Figure 5-2. Figures illustrating maximum day demand and peak hour demand pressure contours are provided in Appendix C.

Option 1b. All supply through Zone SOI 2, Zone SOI 2 gravity storage

This option is similar to Option 1a, all SOI demand is supplied through in line booster pumping to the next highest zone, with the addition of a Zone SOI 2 gravity storage tank located east of Placerville Road. In this option, the Zone SOI 2 ground tank adjacent to the water treatment facility is half the size of the other options (4.5 MG) and the gravity storage tank is 4.5 MG. This Zone SOI 2 storage variation was analyzed to examine the benefits of multiple storage locations within this large zone to provide adequate fire flow supplies and to allow for adequate system pressures during peak demand periods and fires. Ground storage at the water treatment facility, which is located close to the existing system Zone 2, could help issues in the existing system such as lack of Zone 2 storage and low pressure issues on the south side of the existing system. Further analysis of the benefits of one or multiple storage facilities in Zone SOI 2 is required when the system design has progressed to contain a more complete piping system. The Option 1b infrastructure layout is provided on Figure 5-3, and the hydraulic schematic is provided on Figure 5-4. Figures illustrating maximum day demand and peak hour demand pressure contours are provided in Appendix C.

Option 2. Transmission main to Zone SOI 3

Zone SOI 3 is fed through a dedicated transmission main from the SOI water treatment facility. Zones SOI 4, SOI 5, and SOI 6 are fed through in-line boosters from Zone SOI 3. Zone SOI 2 is not hydraulically connected to any other SOI zone and is fed directly from the SOI water treatment facility. Because Zone 2 feeds approximately half the SOI system demand, the intent of this infrastructure option was to eliminate additional dependency on Zone SOI 2 from the other zones as in Option 1a and 1b. This option increases system reliability from Option 1a and 1b because flow to Zones SOI 3, SOI 4, SOI5, and SOI 6 do not rely on Zone SOI 2 infrastructure or operations and is delivered to Zone SOI 3 directly from the water treatment facility. Additional transmission pipeline is required for this option due to the required approximately 15,000 feet of pipe of dedicated transmission main from the water treatment facility to Zone SOI 3. The Option 2 infrastructure layout is provided on Figure 5-5, and the hydraulic schematic is provided on Figure 5-6. Figures illustrating maximum day demand and peak hour demand pressure contours are provided in Appendix C.

Option 3. Zone SOI 3 supply through Zone SOI 2, Transmission main to Zone SOI 4

Zone SOI 3 is supplied through in-line boosters from Zone SOI 2. A dedicated transition main from the SOI water treatment plant delivers Zone SOI 4, Zone SOI 5, and Zone SOI 6 water to the Zone SOI 4 gravity storage facility just west of Empire Ranch Road. Zones SOI 5 and SOI 6 demand is boosted out of the Zone SOI 4 storage facility. The Zone SOI

4 demand is served from the Zone 4 gravity storage tank. Zones SOI 2 and SOI 3 are not hydraulically connected to Zones SOI 4, SOI 5, and SOI 6. Similar to Option 2, this option improves system reliability compared to Options 1a and 1b because the demand on the east side of the system is not delivered through Zones SOI 2 and SOI 3 on the west side of the system, but is delivered directly from the water treatment facility. This option requires the largest amount of transmission pipeline of all the infrastructure options due to the dedicated transmission pipeline from the water treatment plant to the Zone SOI 4 gravity storage tank. The Option 3 infrastructure layout is provided on Figure 5-7, and the hydraulic schematic is provided on Figure 5-8. Figures illustrating maximum day demand and peak hour demand pressure contours are provided in Appendix C.

Table 5-4 provides a comparison of the backbone pipeline required by infrastructure option.

Table 5-4. SOI Pipeline Requirements by Option

Pipe diameter	Option 1a	Option 1b	Option 2	Option 3
12	90,443 ft	90,443 ft	104,632 ft	90,150 ft
16	17,882 ft	17,699 ft	17,584 ft	14,523 ft
18	3,677 ft	3,677 ft	3,677 ft	3,677 ft
20	4,847 ft	4,847 ft	4,734 ft	27,527 ft
24	7,469 ft	11,798 ft	22,585 ft	6,679 ft
30	15,874 ft	15,874 ft	0 ft	15,874 ft
Total	**140,192 ft**	**144,338 ft**	**153,212 ft**	**158,430 ft**

5.6 SOI Storage Reservoirs

Table 5-5 provides the volume and base elevations of each reservoir including the pressure zone it serves. The storage tanks maintain and stabilize pressure as well as provide additional water supply during peak hour demand periods (equalization), emergencies, and fire flows. The storage reservoirs are sized based on the City's storage sizing requirements listed in Table 5-3. The SOI 5 gravity tank is sized to also provide equalization, emergency, and fire flow storage for Zone SOI 6. All reservoirs in the system are modeled as tanks.

Table 5-5. SOI Storage Reservoirs

Storage Reservoir	Pressure Zone Served	Option 1a		Option 1b		Option 2		Option 3	
		Volume, MG	Base Elevation, ft	Volume, MG	Base Elevation, ft	Volume, MG	Base Elevation, ft	Volume, MG	Base Elevation, ft
SOI 2 ground	SOI 2	9.0	320	4.5	320	9.0	320	9.0	320
SOI 2 gravity	SOI 2	--	--	4.5	472	--	--	--	--
SOI 3 gravity	SOI 3	4.5	558	4.5	558	4.5	558	4.5	558
SOI 4 gravity	SOI 4	2.5	708	2.5	708	2.5	708	3.0	708
SOI 5 gravity	SOI 5 and SOI 6	4.0	808	4.0	808	4.0	808	4.0	808

5.7 SOI Booster Pump Stations

The pressure zone served, capacity, and horsepower for each BPS are shown in Table 5-6. The booster pump stations are sized to provide maximum day demand for the zone being served as well as any additional zone drawing supply through the BPS. The zones being served by each BPS are noted for each option in Table 5-6. The Zone SOI 6 booster pump station is sized to provide maximum day and peak hour demand because there is no storage facility is Zone SOI 6. An additional booster pump is required to provide fire flow supply to Zone 6.

The horsepower (hp) required for each BPS is calculated based on the following equation:

Required horsepower=Q*TDH/(eff)*(3,960)

Where Q = required flow, gpm
TDH = total dynamic head, ft
eff = pump efficiency, assumed to be 0.75

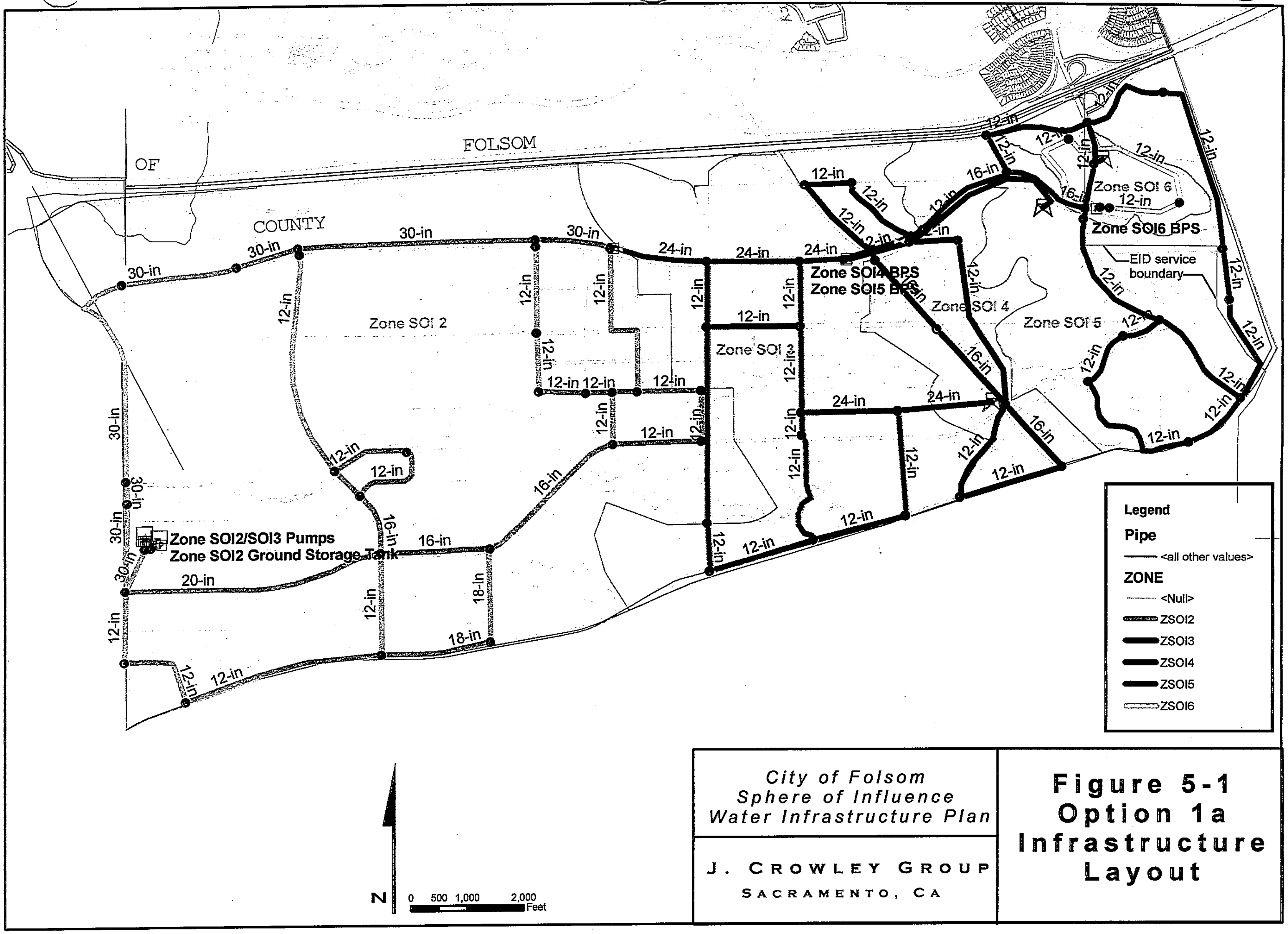
Table 5-6. SOI Booster Pump Stations Capacities by Zone

Booster Pump Station	Option 1a		Option 1b		Option 2		Option 3	
	Capacity, gpm	Power, hP	Capacity, gpm	Power, hP	Capacity, gpm	Power, hP	Capacity, gpm	Power, hP
SOI 2	10,200 gpm (serves all zones)	600 hp	10,200 gpm (serves all zones)	600 hp	5,200 gpm (serves SOI 2 only)	300 hp	7,600 gpm (serves SOI 2 and SOI 3)	400 hp
SOI 3	5,000 gpm (serves SOI 3, SOI 4, SOI 5, SOI 6)	400 hp	5,000 gpm (serves SOI 3, SOI 4, SOI 5, SOI 6)	400 hp	5,000 gpm (serves SOI 3, SOI 4, SOI 5, SOI 6)	450 hp	2,500 gpm (serves SOI 3 only)	400 hp
SOI 4	1,070 gpm (serves SOI 4 only)	100 hp	1,070 gpm (serves SOI 4 only)	100 hp	1,070 gpm (serves SOI 4 only)	100 hp	2,700 gpm (serves SOI 4, SOI 5, SOI 6)	450 hp
SOI 5	1,571 gpm (serves SOI 5 and SOI 6)	150 hp	1,571 gpm (serves SOI 5 and SOI 6)	150 hp	1,571 gpm (serves SOI 5 and SOI 6)	150 hp	1,571 gpm (serves SOI 5 and SOI 6)	150 hp
SOI 6[a]	20 gpm (serves SOI 6 only)	10 hp	20 gpm (serves SOI 6 only)	10 hp	20 gpm (serves SOI 6 only)	10 hp	20 gpm (serves SOI 6 only)	10 hp

[a]An additional fire flow booster pump of 3,000 gpm is required to supply fire flow to zone SOI 6.

5.8 SOI Water Treatment Facility

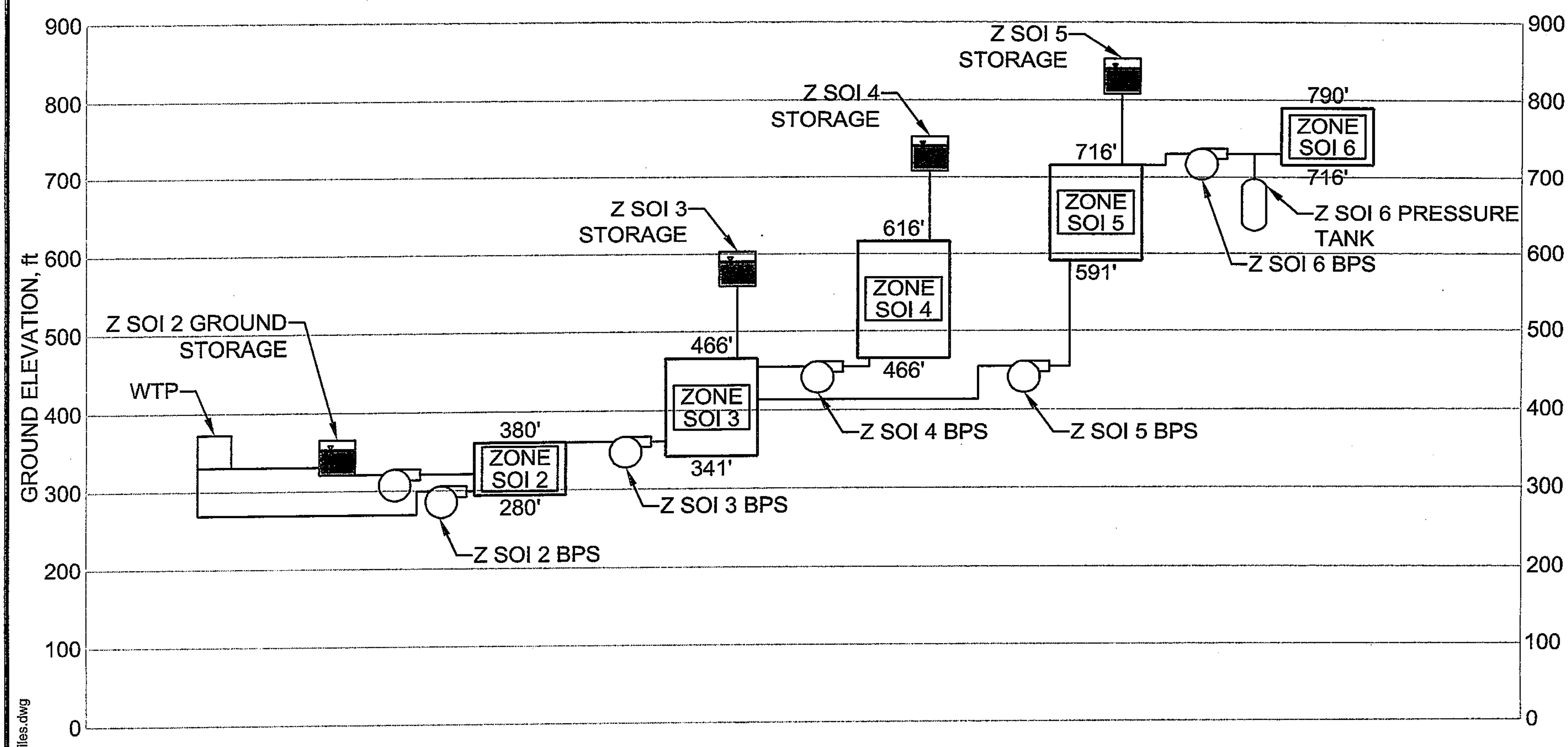
The SOI water treatment facility is to be located within the SOI area on the east side of Prairie City Road. The capacity of the treatment facility is based on the supply capacity of the Sacramento River supply source. It is estimated the treatment facility will require 20 acres based on conventional treatment including flocculation, sedimentation, and filtration, plus extra space required for on site raw water storage. The on site raw water storage element will significantly impact site area requirements. The City of Folsom may decide to increase raw water storage capabilities for system-wide reliability purposes. Total raw water storage requirements should be discussed and finalized soon so that the proper plant site area can be evaluated and identified.

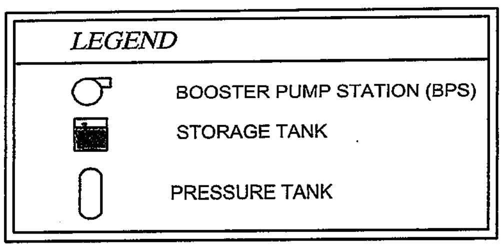


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-1 Option 1a Infrastructure Layout



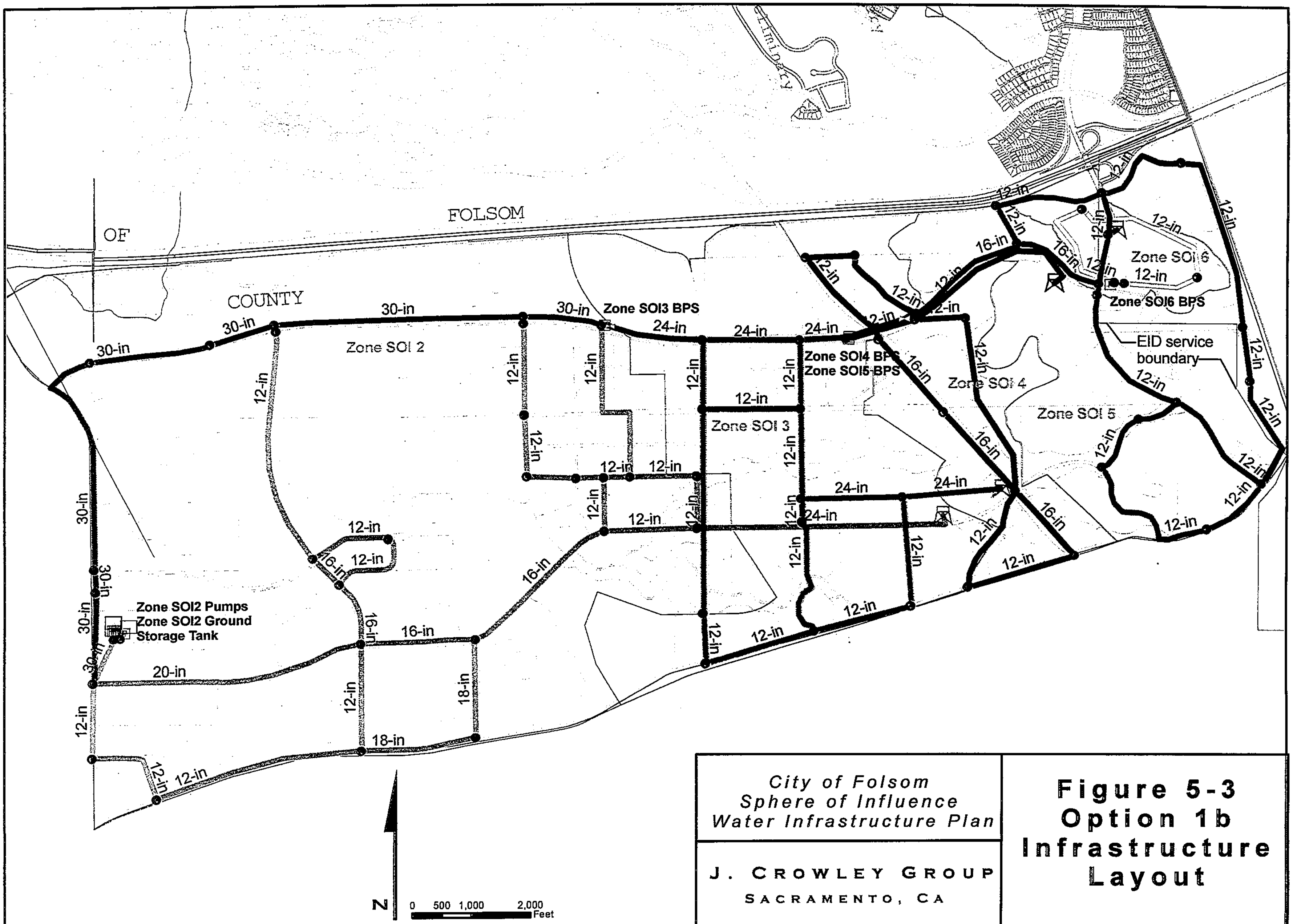


City of folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-2
Option 1a
Hydraulic
Profile

010-003 J:\2116.00\dwg\Final Sheets\Hydraulic Profiles.dwg

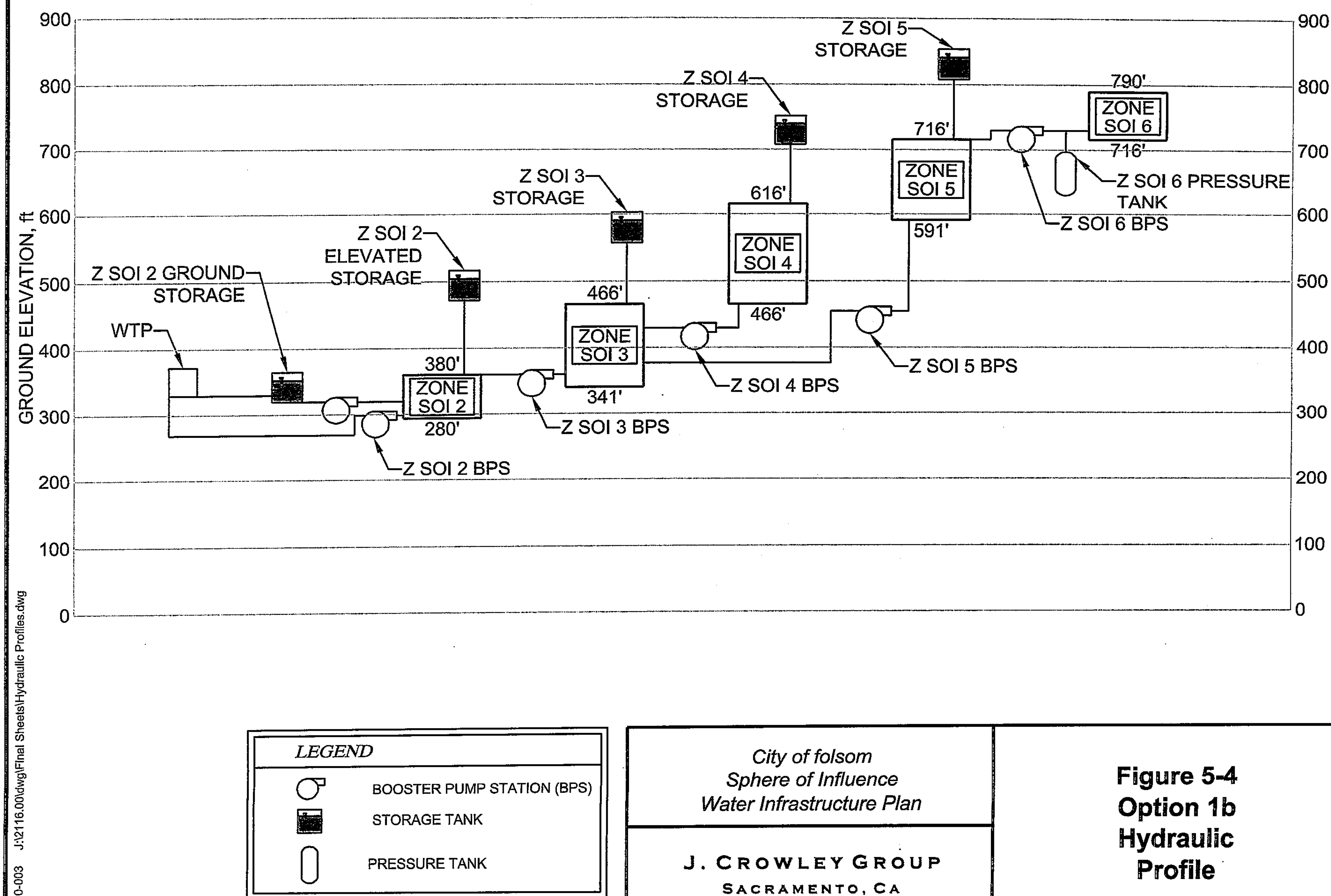


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-3
Option 1b
Infrastructure Layout

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 1b-ground &elevated tanks&Zsoi3 inline booster 4&5 inline booster091107 092507

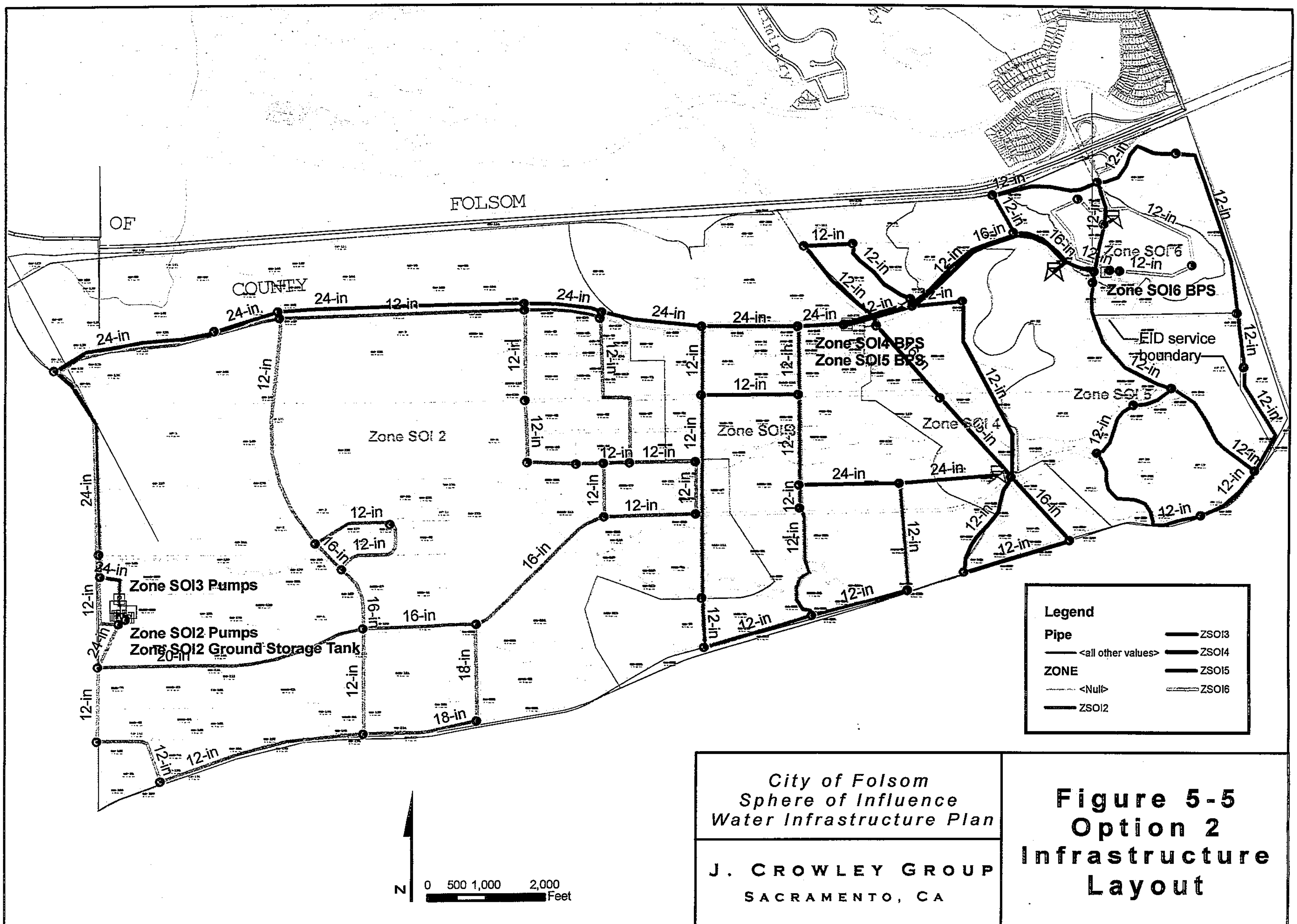


City of folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-4
Option 1b
Hydraulic
Profile

010-003 J:\2116.00\dwg\Final Sheets\Hydraulic Profiles.dwg

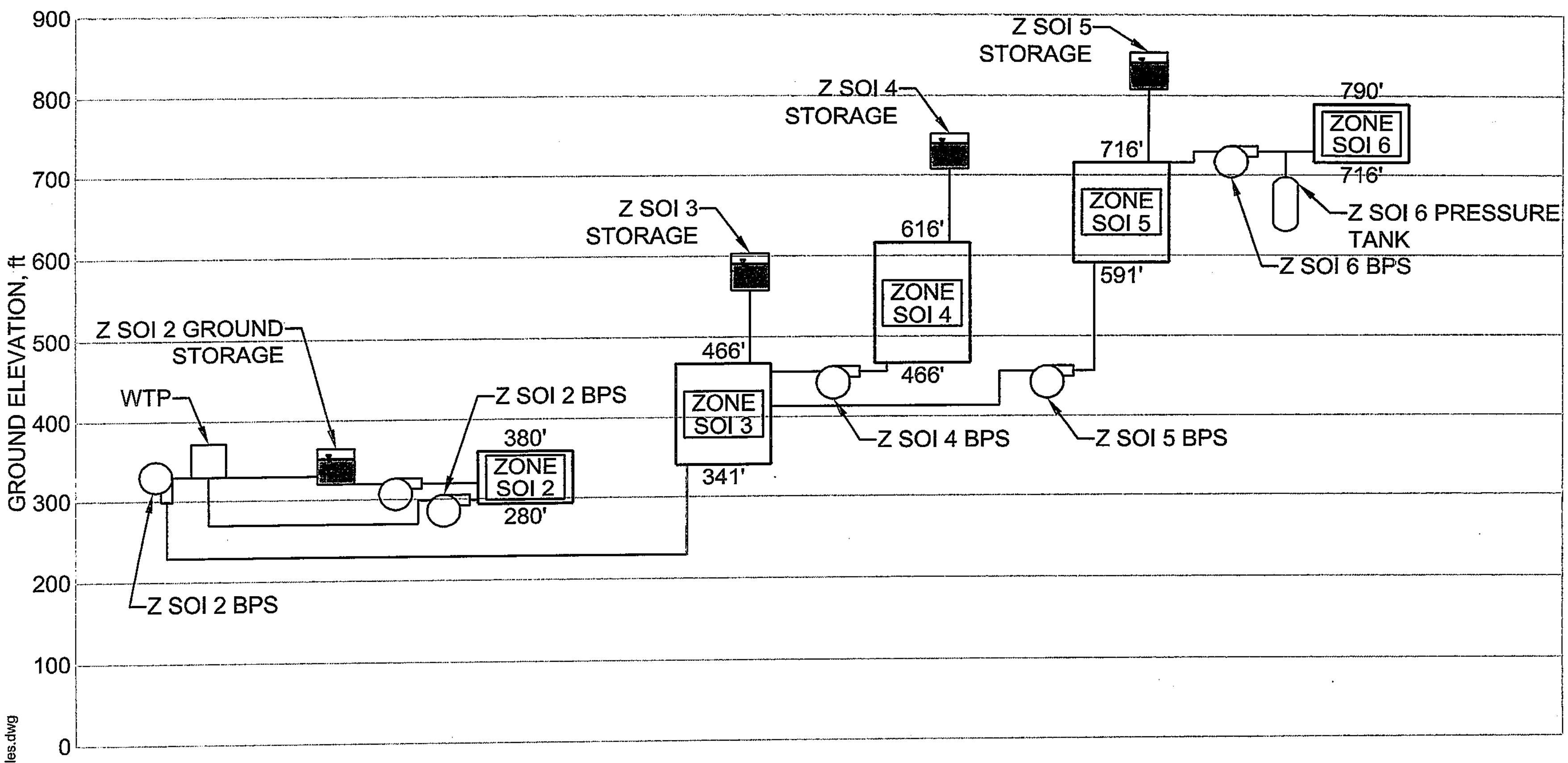


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-5
Option 2
Infrastructure Layout

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\oPTION 2-zONE 3 PARALELL_4_5 BOOSTERS 092507



LEGEND

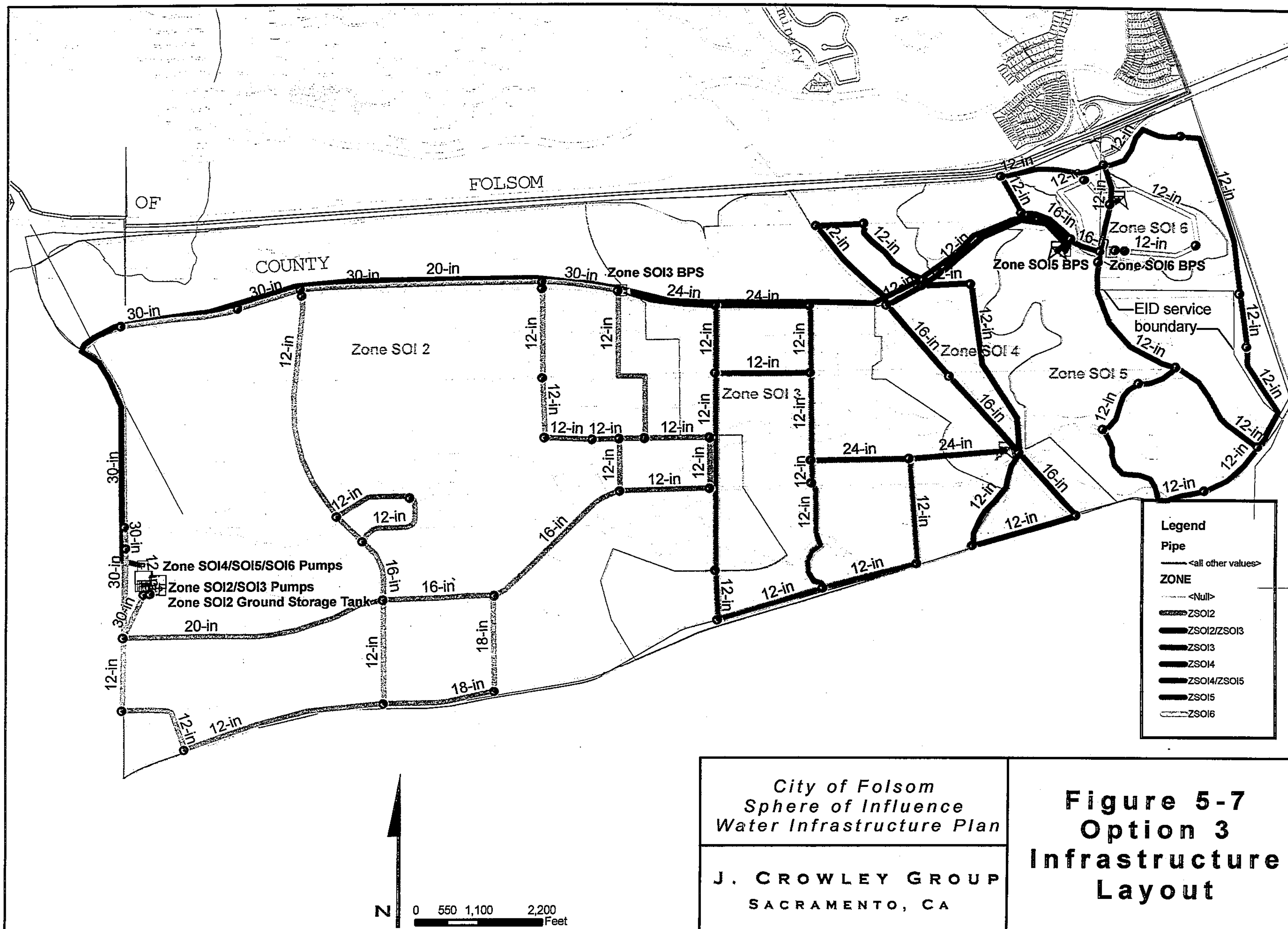
- BOOSTER PUMP STATION (BPS)
- STORAGE TANK
- PRESSURE TANK

City of folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-6
Option 2
Hydraulic
Profile

010-003 J:\2116.00\dwg\Final Sheets\Hydraulic Profiles.dwg

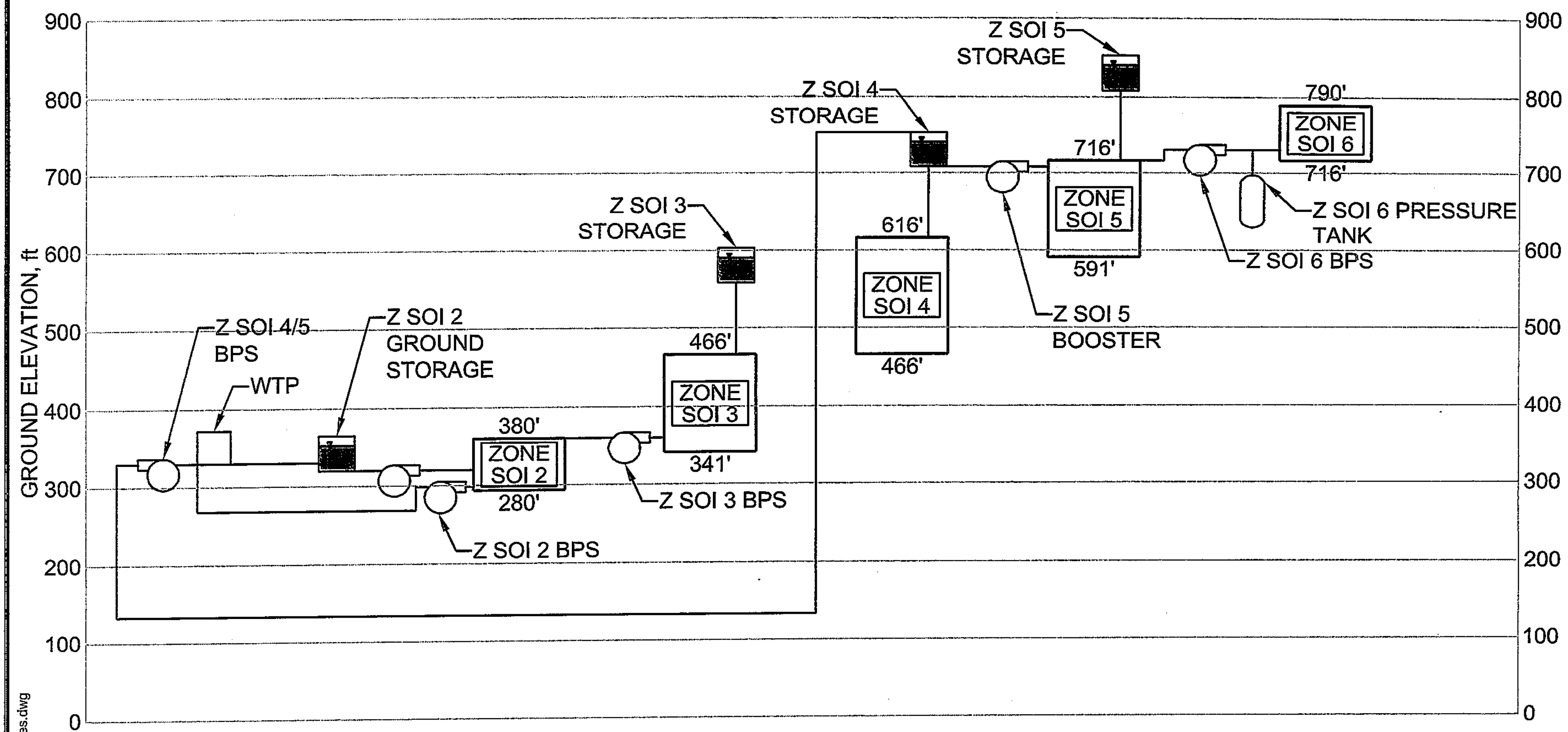


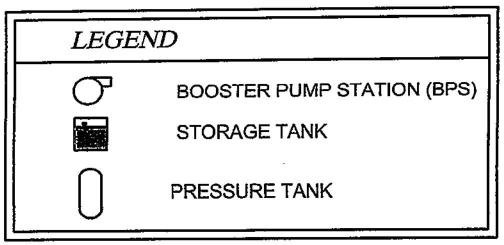
City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-7
Option 3
Infrastructure Layout

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 3-cLEARWELL TO zONE 4 AND 5 AND 6 9/26/07





City of folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5-8
Option 3
Hydraulic
Profile

010-003 J:\2116.00\dwg\Final Sheets\Hydraulic Profiles.dwg

CHAPTER 6 Integration of SOI and Existing System

This chapter describes the effort to-date regarding the integration of the SOI water system with the City's existing system. Also described are next steps required to complete the integration analysis.

6.1 Initial Analysis of Integration of SOI and Existing System

The City of Folsom's existing system H2ONet hydraulic model updated by West Yost and Associates in October 2006 was used to analyze the integration of the SOI system with the existing water system. The October 2006 model contains 2005 system demands. The City's existing system model was opened in MWSoft's Infowater, the GIS based version of H2ONet in order to integrate the existing model with the SOI system model. The SOI system was connected to the existing system at Zones 2, 3, and 5. Connecting the existing system to the SOI at these zones is the most practical due to HWY 50 crossing options and existing connecting pipe availability.

When the SOI system model was connected to the existing system 2005 demands model, the existing system typically pulled approximately 2,000 gpm from the SOI system; most of the flow passing from Zone SOI 2 to the existing Zone 2. The pressure in the south portion of the existing system Zone 2 near the SOI generally increased by 5 psi. It should be noted that based on an August 3, 2007 letter from West Yost and Associates to the City of Folsom, there may be inaccuracies in the existing system model due to the use of GIS shape files that did not incorporate several significant pipe upgrades that have been installed. The use of an updated existing system hydraulic model would enable this analysis to more accurately reflect SOI system impacts on the existing system.

Although the impacts of the future Glenborough/Easton system Phase 1 demands (2,000 gpm) have been analyzed against the existing system hydraulic model (2005 demands), the impacts of connecting the Glenborough/Easton system to the existing system at the same time as the SOI system is connected has not been analyzed. This model analysis has not been completed because this requires the use of the City of Folsom existing system hydraulic model with buildout demands as well as increased supply capacity and current infrastructure improvements. Buildout demands in the existing model are required because this reflects the demands that would be occurring in the existing system at the time of completion of the SOI and Glenborough/Easton developments. An analysis of an integrated system coordinating Glenborough/Easton, the existing system, and the SOI system would not be accurate if based on connecting to an existing system with 2005 demands and capacity. This analysis can be completed once the updated/buildout demands hydraulic model is completed.

6.2 Analysis Next Steps

In order to complete the analysis on the integration of the SOI and the City's existing system, the following next steps should be taken:

1. Update the existing system hydraulic model to reflect current infrastructure improvements that exist within the system.
2. Complete the City's hydraulic model for the existing system at buildout water demands and buildout supply and infrastructure capacity.
3. Integrate the Glenborough/Easton system demands to the existing system/SOI system integration analysis. Analyze the impacts on the existing system as a result of connecting to the Glenborough/Easton and SOI systems at buildout demand conditions. Examine the resulting pressure changes and significant hydraulic grade line impacts on the existing system.

CHAPTER 7 SOI Distribution System Cost Estimate

The estimated construction cost of the infrastructure options are developed at a conceptual level in this chapter.

7.1 Unit Costs

Table 7-1 provides a summary of the unit cost assumptions for this conceptual cost estimate. Also provided are the references and/or assumptions used to estimate the unit costs. The cost estimates are based on using construction unit costs of similar facilities when possible. When such costs are not available, construction cots are estimated from available cost curves or other assumptions.

Table 7-1. Unit Cost Assumptions

Infrastructure Component	Unit Cost	Reference/assumption
Pipeline	$18/in-dia/linear foot	Based on recent bid tabs and completed construction for projects for local water agencies, including Freeport Regional Water Authority.
Booster pump station	$250/gpm	Treated water. Based on construction costs of service water pumping stations cost curve (Robert L. Sanks, Pumping Station Design, 1989, Figure 29-6) and based on recent project costs for Sacramento area booster station projected to January 2007.
Treated water storage tank	$0.50/gallon	Based on discussions with local contractors and water agencies on recent reservoir construction with foundation and appurtenances.
Water treatment facility	$2.5/gallon	Based on letter regarding the Freeport/Folsom cost estimate provided by Brown and Caldwell on September 19, 2007.

7.2 Construction Cost Contingency

Because of limitations of costs estimates based on preliminary design, allowances must be made for variations in final length and depth of pipelines and other structures, adverse construction conditions, and other unforeseeable difficulties that may increase the final construction cost. A contingency allowance of 30 percent of the estimated construction contract cost is applied for this analysis.

7.3 Conceptual Construction Cost

The infrastructure requirements and conceptual level costs for Option 1a, 1b, 2, and 3 are provided in Table 7-2. These conceptual level cost estimates are considered to be a planning level estimate for the purposes of comparing infrastructure options. The cost of operations and maintenance for each alternative is not included in this analysis. In addition, this conceptual cost estimate does not include project costs such as engineering, construction management, and administration costs. Detailed conceptual construction cost tables by option are provided in Tables 7-3 through 7-6.

Table 7-2. Summary of Conceptual Cost Estimates

Cost Item	Cost, $ million			
	Option 1a	Option 1b	Option 2	Option 3
Water treatment plant[a]	$38	$38	$38	$38
Pipeline				
12-inch	$20	$20	$23	$19
16-inch	$5	$5	$5	$4
18-inch	$1	$1	$1	$1
20-inch	$2	$2	$2	$10
24-inch	$3	$5	$10	$3
30-inch	$9	$9	$0	$9
Pipeline subtotal	$39	$41	$40	$46
Booster pump station	$6	$5	$4	$5
Storage	$10	$11	$10	$9
Construction cost	$93	$95	$93	$97
Construction contingency (30%)	$28	$28	$28	$29
Total	**$121**	**$123**	**$120**	**$126**

[a]Costs include WTP costs based on required capacity for SOI, 15 mgd.

Table 7-4. SOI Infrastructure Option 1a Detailed Conceptual Cost Estimate

Item	Size/capacity		Unit cost, $	Option 1a. Pipe length, ft	Option 1a. Construction cost, $million
Water treatment plant	15	mgd	2.5		$38
Zone SOI 2					
Pipeline	12	inch	18	27,559	$6.0
	16	inch	18	6,914	$2.0
	18	inch	18	3,677	$1.2
	20	inch	18	4,756	$1.7
	24	inch	18		$0.0
	30	inch	18	15,874	$8.6
Booster pump station (treated water)					
Zone 2, 3, 4, 5, 6 MDD (Option 1a and 1b)	10,200	gpm	250		$2.6
Zone 2 MDD (Option 2)	5,200	gpm	250		
Zone 2 and 3 MDD (Option 3)	7,600	gpm	250		
Storage					
Ground tank (Option 1a, 2, and 3)	9	MG	0.5		$4.5
Ground tank booster (Option 1a, 2, and 3)	5,000	gpm	250		$1.3
Ground tank (Option 1b)	5	MG	0.5		
Ground tank booster (Option 1b)	2,500	gpm	250		
Elevated tank (Option 1b)	5	MG	0.5		
Zone SOI 2 subtotal				**58,780**	**$27.7**
Zone SOI 3					
Pipeline					
	12	inch	18	18,018	$3.9
	16	inch	18		$0.0
	20	inch	18	91	$0.0
	24	inch	18	7,469	$3.2
	30	inch	18		$0.0
Booster pump station (treated water)					
In-line from Zone SOI 2 (Option 1a and 1b)	5,000	gpm	250		$1.3
From WTP (Option 2)	5,000	gpm	250		
In-line from Zone SOI 2 (Option 3)	2,500	gpm	250		
Storage (elevated tank)	5	MG	0.5		$2.3
Zone SOI 3 subtotal				**25,578**	**$10.7**
Zone SOI 4					
Pipeline	12	inch	18	16,628	$3.6
	16	inch	18	4,995	$1.4
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,070	gpm	250		$0.3
Storage (elevated tank)	3	MG	0.5		$1.5
Zone SOI 4 subtotal				**21,622**	**$6.8**
Zone SOI4/SOI5 (Option 3 only)					
Pipeline	20	inch	18		
Booster pump station (treated water)					
From WTP	2,600	gpm	250		
Storage (clearwell/Zone 4 storage)	4	MG	0.5		
Zone SOI4/SOI5 subtotal					
Zone SOI 5					
Pipeline	12	inch	18	21,814	$4.7
	16	inch	18	5,973	$1.7
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,550	gpm	250		$0.4
From Zone SOI4/SOI5 Clearwell (Option 3)	1,550	gpm	250		
Storage (elevated tank)	4	MG	0.5		$2.0
Zone SOI 5 subtotal				**27,787**	**$8.8**
Zone SOI 6					
Pipeline	12	inch	18	6,425	$1.4
Booster pump station (treated water)	20	gpm	250		$0.0
Zone SOI 6 subtotal				**6,425**	**$1.4**
Total					
Water treatment plant					$38
Pipeline					
	12	inch	18	90,443	$20
	16	inch	18	17,882	$5
	18	inch	18	3,677	$1
	20	inch	18	4,847	$2
	24	inch	18	7,469	$3
	30	inch	18	15,874	$9
Total pipeline subtotal				140,192	$39
Booster pump station (treated water)					$6
Storage					$10
Construction cost subtotal					$93
Contingency (30%)					$28
Total				**140,192**	**$121**

Table 7-5. SOI Infrastructure Option 1b Detailed Conceptual Cost Estimate

Item	Size/capacity		Unit cost, $	Option 1b. Pipe length	Option 1b. Construction cost, $million
Water treatment plant	15	mgd	2.5		$37.5
Zone SOI 2					
Pipeline	12	inch	18	27,559	$6.0
	16	inch	18	6,731	$1.9
	18	inch	18	3,677	$1.2
	20	inch	18	4,766	$1.7
	24	inch	18	4,328	$1.9
	30	inch	18	15,874	$8.6
Booster pump station (treated water)					
Zone 2, 3, 4, 5, 6 MDD (Option 1a and 1b)	10,200	gpm	250		$2.6
Zone 2 MDD (Option 2)	5,200	gpm	250		
Zone 2 and 3 MDD (Option 3)	7,600	gpm	250		
Storage					
Ground tank (Option 1a, 2, and 3)	9	MG	0.5		
Ground tank booster (Option 1a, 2, and 3)	5,000	gpm	250		
Ground tank (Option 1b)	5	MG	0.5		$0.5
Ground tank booster (Option 1b)	2,500	gpm	250		$0.6
Elevated tank (Option 1b)	5	MG	0.5		$4.5
Zone SOI 2 subtotal				62,925	$29.4
Zone SOI 3					
Pipeline					
	12	inch	18	18,018	$3.9
	16	inch	18		$0.0
	20	inch	18	91	$0.0
	24	inch	18	7,469	$3.2
	30	inch	18		$0.0
Booster pump station (treated water)					
In-line from Zone SOI 2 (Option 1a and 1b)	5,000	gpm	250		$1.3
From WTP (Option 2)	5,000	gpm	250		
In-line from Zone SOI 2 (Option 3)	2,500	gpm	250		
Storage (elevated tank)	5	MG	0.5		$2.3
Zone SOI 3 subtotal				25,578	$10.7
Zone SOI 4					
Pipeline	12	inch	18	16,628	$3.6
	16	inch	18	4,995	$1.4
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,070	gpm	250		$0.3
Storage (elevated tank)	3	MG	0.5		$1.5
Zone SOI 4 subtotal				21,622	$6.8
Zone SOI4/SOI5 (Option 3 only)					
Pipeline	20	inch	18		
Booster pump station (treated water)					
From WTP	2,600	gpm	250		
Storage (clearwell/Zone 4 storage)	4	MG	0.5		
Zone SOI4/SOI5 subtotal					
Zone SOI 5					
Pipeline	12	inch	18	21,814	$4.7
	16	inch	18	5,973	$1.7
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,550	gpm	250		$0.4
From Zone SOI4/SOI5 Clearwell (Option 3)	1,550	gpm	250		
Storage (elevated tank)	4	MG	0.5		$2.0
Zone SOI 5 subtotal				27,787	$8.8
Zone SOI 6					
Pipeline	12	inch	18	6,425	$1.4
Booster pump station (treated water)	20	gpm	250		$0.0
Zone SOI 6 subtotal				6,425	$1.4
Total					
Water treatment plant					$38
Pipeline					
	12	inch	18	90,443	$20
	16	inch	18	17,699	$5
	18	inch	18	3,677	$1
	20	inch	18	4,847	$2
	24	inch	18	11,798	$5
	30	inch	18	15,874	$9
Total pipeline subtotal				144,338	$41
Booster pump station (treated water)					$5
Storage					$11
Construction cost subtotal					$95
Contingency (30%)					$28
Total				144,338	$123

Table 7-6. SOI Infrastructure Option 2 Detailed Conceptual Cost Estimate

Item	Size/capacity		Unit cost, $	Option 2. Pipe length	Option 2. Construction cost, $million
Water treatment plant	15	mgd	2.5		$37.5
Zone SOI 2					
Pipeline	12	inch	18	41,527	$9.0
	16	inch	18	6,616	$1.9
	18	inch	18	3,677	$1.2
	20	inch	18	4,643	$1.7
	24	inch	18	891	$0.4
	30	inch	18		$0.0
Booster pump station (treated water)					
Zone 2, 3, 4, 5, 6 MDD (Option 1a and 1b)	10,200	gpm	250		
Zone 2 MDD (Option 2)	5,200	gpm	250		$1.3
Zone 2 and 3 MDD (Option 3)	7,600	gpm	250		
Storage					
Ground tank (Option 1a, 2, and 3)	9	MG	0.5		$4.5
Ground tank booster (Option 1a, 2, and 3)	5,000	gpm	250		$1.3
Ground tank (Option 1b)	5	MG	0.5		
Ground tank booster (Option 1b)	2,500	gpm	250		
Elevated tank (Option 1b)	5	MG	0.5		
Zone SOI 2 subtotal				57,355	$21.2
Zone SOI 3					
Pipeline					
	12	inch	18	18,018	$3.9
	16	inch	18		$0.0
	20	inch	18	91	$0.0
	24	inch	18	21,694	$9.4
	30	inch	18		$0.0
Booster pump station (treated water)					
In-line from Zone SOI 2 (Option 1a and 1b)	5,000	gpm	250		
From WTP (Option 2)	5,000	gpm	250		$1.3
In-line from Zone SOI 2 (Option 3)	2,500	gpm	250		
Storage (elevated tank)	5	MG	0.5		$2.3
Zone SOI 3 subtotal				39,802	$16.8
Zone SOI 4					
Pipeline	12	inch	18	16,848	$3.6
	16	inch	18	4,995	$1.4
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,070	gpm	250		$0.3
Storage (elevated tank)	3	MG	0.5		$1.5
Zone SOI 4 subtotal				21,843	$6.8
Zone SOI4/SOI5 (Option 3 only)					
Pipeline	20	inch	18		
Booster pump station (treated water)					
From WTP	2,600	gpm	250		
Storage (clearwell/Zone 4 storage)	4	MG	0.5		
Zone SOI4/SOI5 subtotal					
Zone SOI 5					
Pipeline	12	inch	18	21,814	$4.7
	16	inch	18	5,973	$1.7
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,550	gpm	250		$0.4
From Zone SOI4/SOI5 Clearwell (Option 3)	1,550	gpm	250		
Storage (elevated tank)	4	MG	0.5		$2.0
Zone SOI 5 subtotal				27,787	$8.8
Zone SOI 6					
Pipeline	12	inch	18	6,426	$1.4
Booster pump station (treated water)	20	gpm	250		$0.0
Zone SOI 6 subtotal				6,426	$1.4
Total					
Water treatment plant					$38
Pipeline					
	12	inch	18	104,632	$23
	16	inch	18	17,584	$5
	18	inch	18	3,677	$1
	20	inch	18	4,734	$2
	24	inch	18	22,585	$10
	30	inch	18	0	$0
Total pipeline subtotal				153,212	$40
Booster pump station (treated water)					$4
Storage					$10
Construction cost subtotal					$93
Contingency (30%)					$28
Total				153,212	$120

Table 7-7. SOI Infrastructure Option 3 Detailed Conceptual Cost Estimate

Item	Size/capacity		Unit cost, $	Option 3	
				Pipe length	Construction cost, $million
Water treatment plant	15	mgd	2.5		$37.5
Zone SOI 2					
Pipeline	12	inch	18	27,559	$6.0
	16	inch	18	6,914	$2.0
	18	inch	18	3,677	$1.2
	20	inch	18	4,756	$1.7
	24	inch	18		$0.0
	30	inch	18	15,874	$8.6
Booster pump station (treated water)					
Zone 2, 3, 4, 5, 6 MDD (Option 1a and 1b)	10,200	gpm	250		
Zone 2 MDD (Option 2)	5,200	gpm	250		
Zone 2 and 3 MDD (Option 3)	7,600	gpm	250		$1.9
Storage					
Ground tank (Option 1a, 2, and 3)	9	MG	0.5		$4.5
Ground tank booster (Option 1a, 2, and 3)	5,000	gpm	250		$1.3
Ground tank (Option 1b)	5	MG	0.5		
Ground tank booster (Option 1b)	2,500	gpm	250		
Elevated tank (Option 1b)	5	MG	0.5		
Zone SOI 2 subtotal				58,780	$27.1
Zone SOI 3					
Pipeline					
	12	inch	18	18,018	$3.9
	16	inch	18		$0.0
	20	inch	18		$0.0
	24	inch	18	6,679	$2.9
	30	inch	18		$0.0
Booster pump station (treated water)					
In-line from Zone SOI 2 (Option 1a and 1b)	5,000	gpm	250		
From WTP (Option 2)	5,000	gpm	250		
In-line from Zone SOI 2 (Option 3)	2,500	gpm	250		$0.6
Storage (elevated tank)	5	MG	0.5		$2.3
Zone SOI 3 subtotal				24,697	$9.7
Zone SOI 4					
Pipeline	12	inch	18	16,110	$3.5
	16	inch	18	4,995	$1.4
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,070	gpm	250		
Storage (elevated tank)	3	MG	0.5		
Zone SOI 4 subtotal				21,105	$4.9
Zone SOI4/SOI5 (Option 3 only)					
Pipeline	20	inch	18	22,771	$8.2
Booster pump station (treated water)					
From WTP	2,600	gpm	250		$0.7
Storage (clearwell/Zone 4 storage)	4	MG	0.5		$2.0
Zone SOI4/SOI5 subtotal				22,771	$10.8
Zone SOI 5					
Pipeline	12	inch	18	22,039	$4.8
	16	inch	18	2,614	$0.8
Booster pump station (treated water)					
In-line from Zone 3 (Option 1a, 1b, and 2)	1,550	gpm	250		
From Zone SOI4/SOI5 Clearwell (Option 3)	1,550	gpm	250		$0.4
Storage (elevated tank)	4	MG	0.5		$2.0
Zone SOI 5 subtotal				24,653	$7.9
Zone SOI 6					
Pipeline	12	inch	18	6,425	$1.4
Booster pump station (treated water)	20	gpm	250		$0.0
Zone SOI 6 subtotal				6,425	$1.4
Total					
Water treatment plant					$38
Pipeline					
	12	inch	18	90,150	$19
	16	inch	18	14,523	$4
	18	inch	18	3,677	$1
	20	inch	18	27,527	$10
	24	inch	18	6,679	$3
	30	inch	18	15,874	$9
Total pipeline subtotal				158,430	$46
Booster pump station (treated water)					$5
Storage					$9
Construction cost subtotal					$97
Contingency (30%)					$29
Total				158,430	$126

CHAPTER 8 EID Service Alternatives

EID maintains a service area within the SOI area of approximately 150 acres. Infrastructure alternatives for EID to provide service to the east side of the SOI are under development in coordination with EID. Once completed, the alternatives will be inserted into this report.

CHAPTER 9 Next Steps

This draft report presents the analysis findings as of this date. Coordination continues with the other SOI-related projects and with neighboring agencies. The following lists items to address next as the environmental review process moves forward.

1. Continue coordination with EID to develop service scenarios for the east side of the SOI. Update analysis or prepare a separate plan once alternative is selected and agreed upon.
2. Continue coordination with EID on a parallel track to develop required policy and agreements to support the selected service scenario.
3. Coordinate review of draft report with environmental report efforts and modify analysis as necessary.
4. Continue coordination with landowners group to develop and refine infrastructure options as phasing and parcel information is updated.
5. Update SOI system demand estimates and required infrastructure based on a more detailed parcel analysis resulting in buildable dwelling unit densities.
6. Consider unit water demands, impacts on total water demand and infrastructure requirements, and potential policies that would reduce total demands.
7. Update the existing system hydraulic model to reflect current infrastructure improvements that exist within the system.
8. Complete the City's hydraulic model for the existing system at buildout water demands and buildout supply and infrastructure capacity.
9. Integrate the Glenborough/Easton system demands to the existing system/SOI system integration analysis. Analyze the impacts on the existing system as a result of connecting to the Glenborough/Easton and SOI systems at buildout demand conditions. Examine the resulting pressure changes and significant hydraulic grade line impacts on the existing system
10. Provide further analysis of the benefits of one or multiple storage facilities in Zone SOI 2 when the system design has progressed to contain a more complete pipe system.

Appendix A

References

Brown and Caldwell. Letter with subject "Freeport/Folsom Cost Estimate". August 19, 2007.

El Dorado Irrigation District. 2007 Water Resources and Service Reliability Report. June 25, 2007.

Tully and Young. Folsom 2005 Urban Water Management Plan. March 28, 2006.

West Yost & Associates. Memorandum with subject "Comments on the Water System Master Plan Analysis and the Zone 2 Transmission Main Technical Memoranda". August 3, 2007.

West Yost & Associates. Technical Memorandum No. 1 Water System Master Plan 2005 Update – Water Demand Update, West Yost, February 10, 2006.

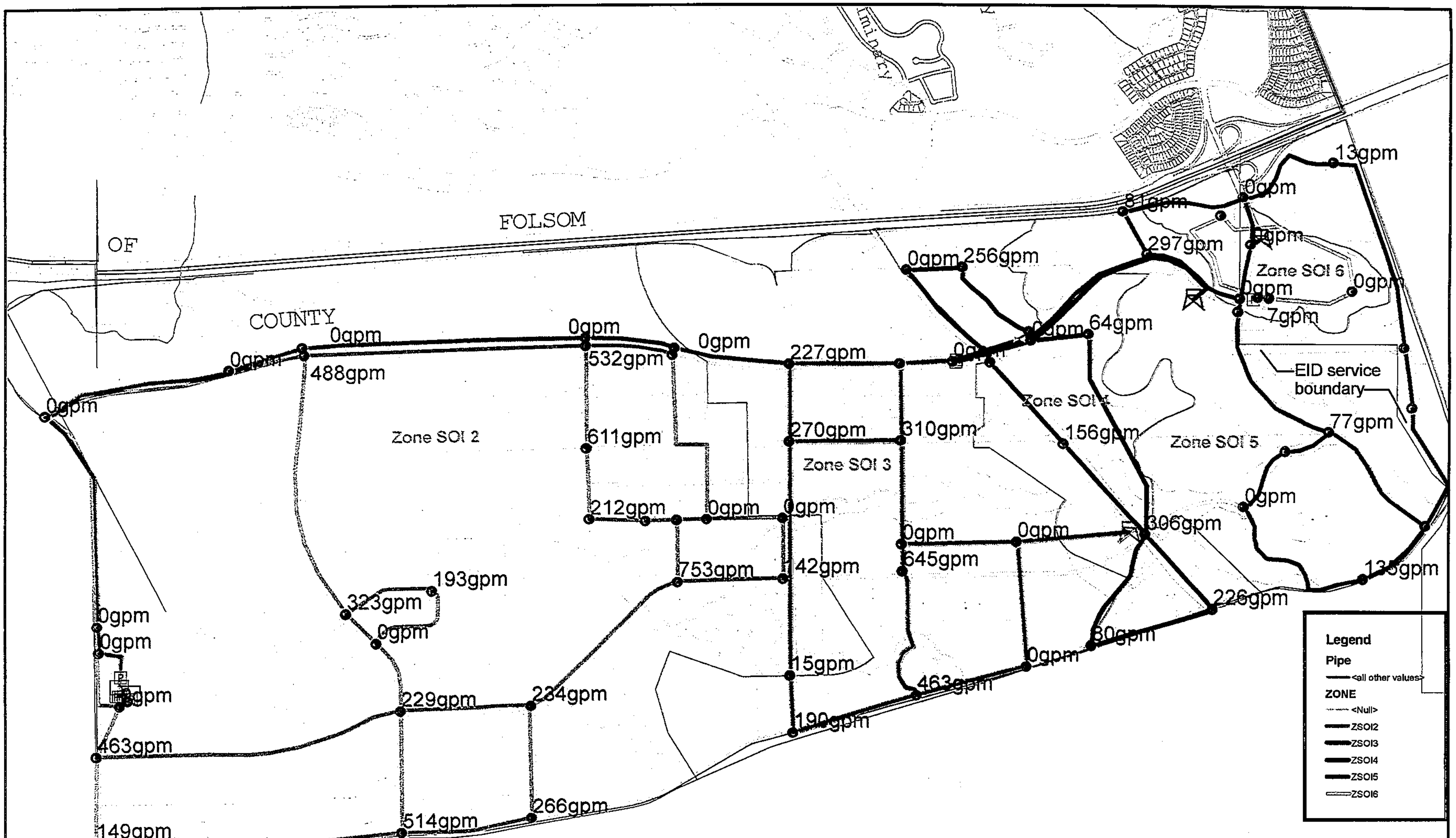
West Yost & Associates. Technical Memorandum No. 2 Water System Master Plan 2005 Update - Draft Water System Computer Model Update. May 30, 2006.

West Yost & Associates. Technical Memorandum No. 3 Water System Master Plan 2005 Update - Draft Computer Model Verification. July 28, 2006.

West Yost and Associates. Draft Technical Memorandum No. 4 Water System Master Plan 2005 Update – Distribution System Analysis. April 5, 2007.

Appendix B

SOI Distribution System Node Demands and Ground Elevations

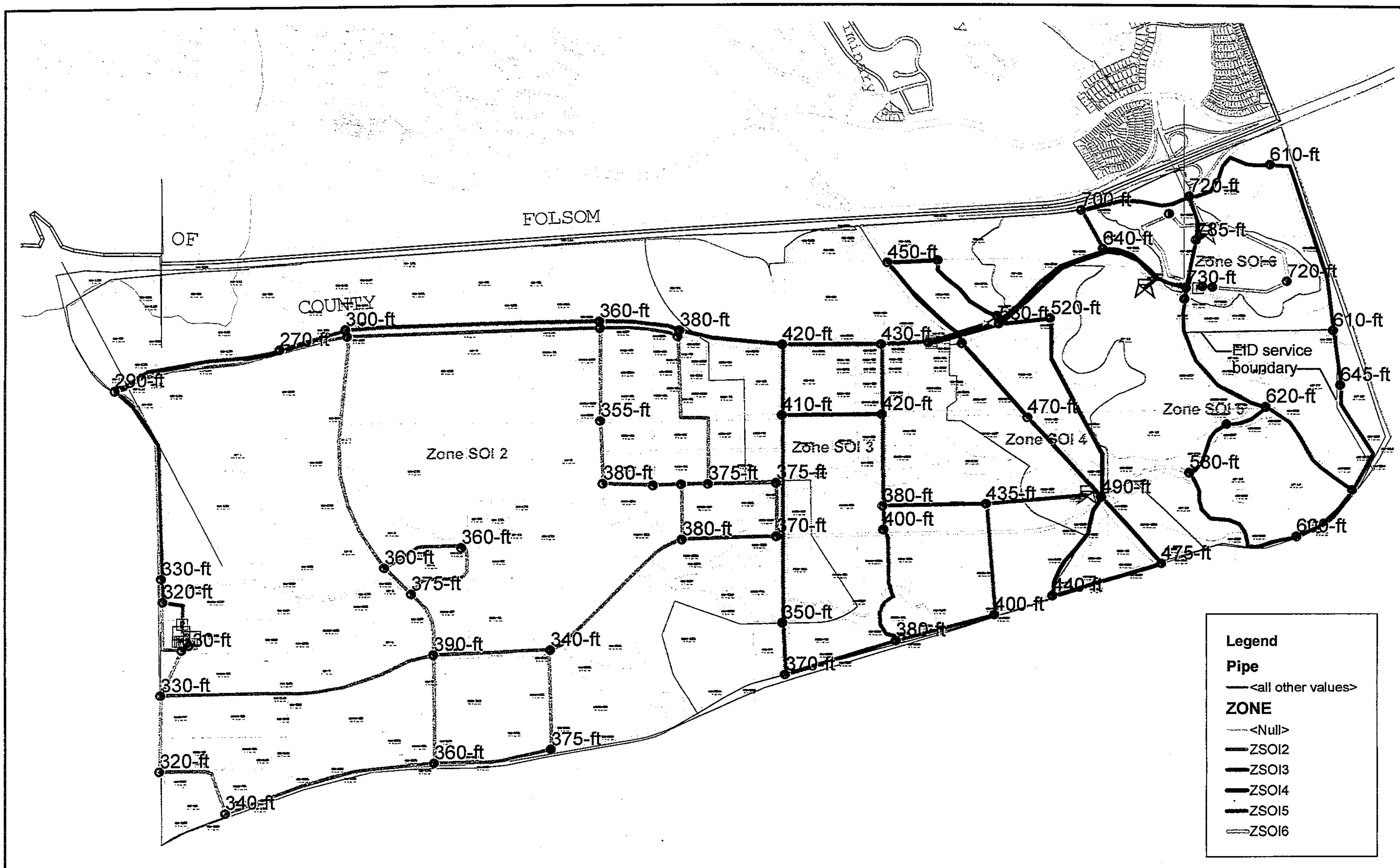


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Maximum Day Demand at Nodes

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\OPTION 2-zONE 3 PARALELL_4_5 BOOSTERS 092507



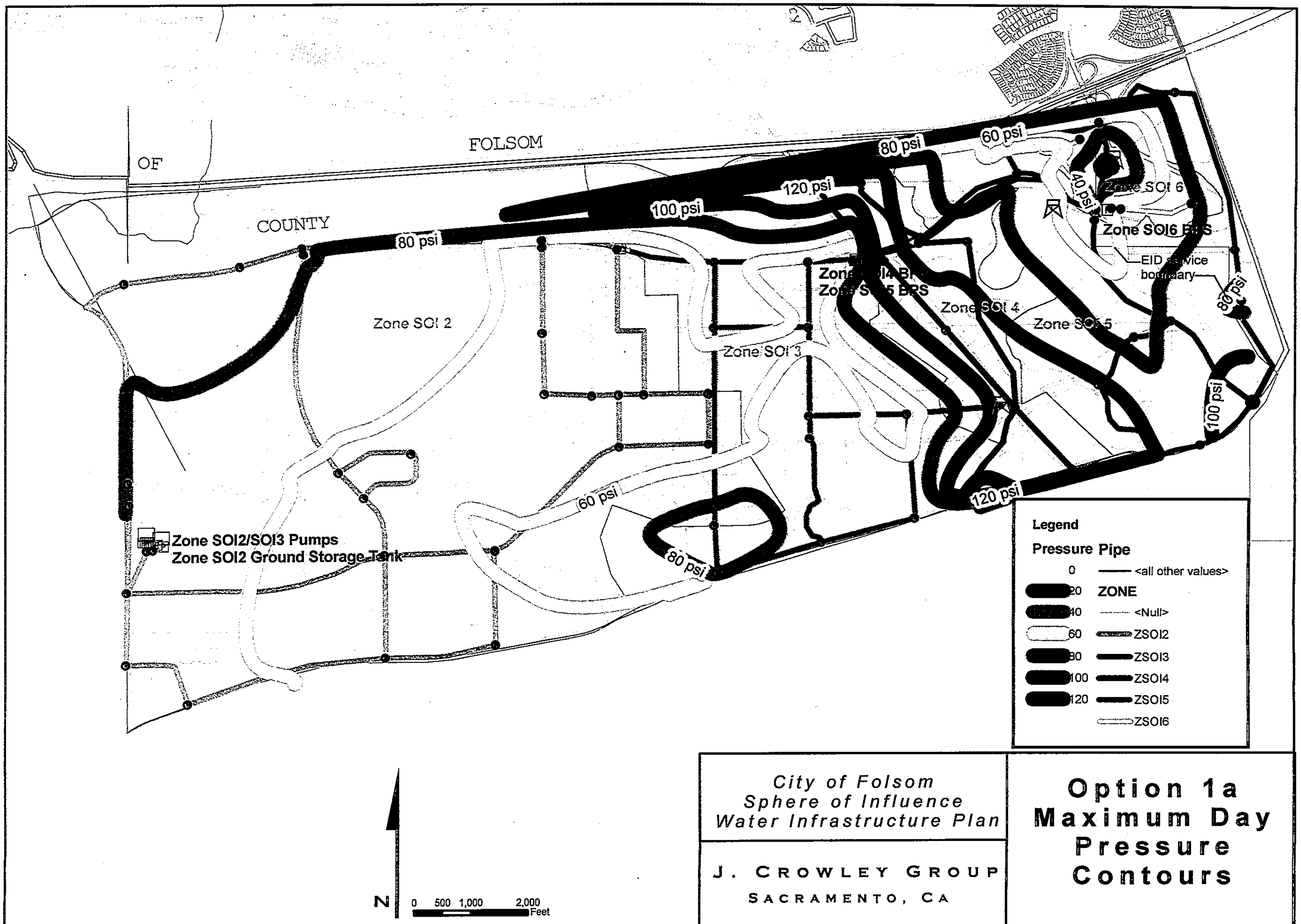
City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Ground Elevation at Nodes

Appendix C

SOI Infrastructure Options Maximum Day and Peak Hour Pressure Contours

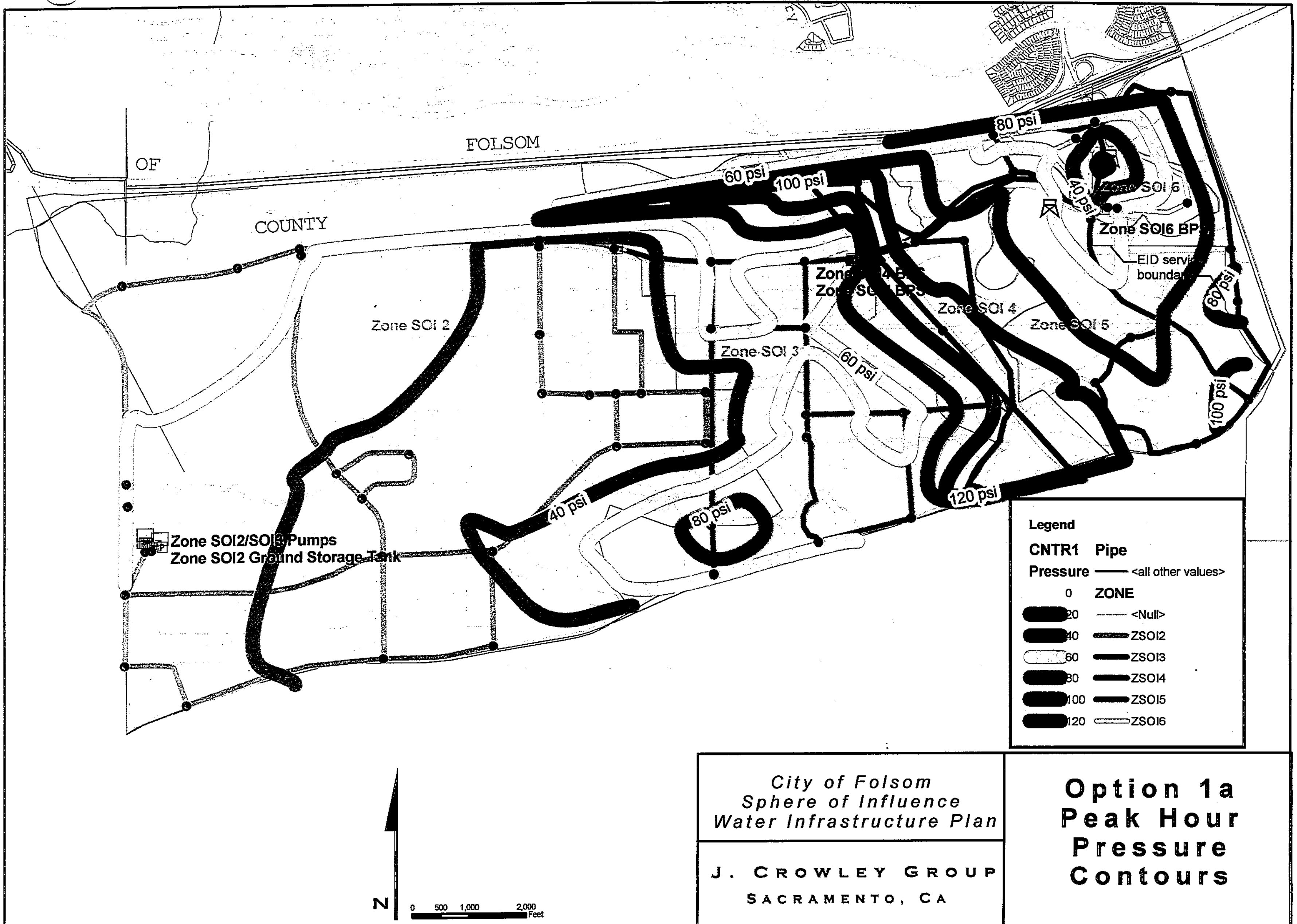


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 1a Maximum Day Pressure Contours

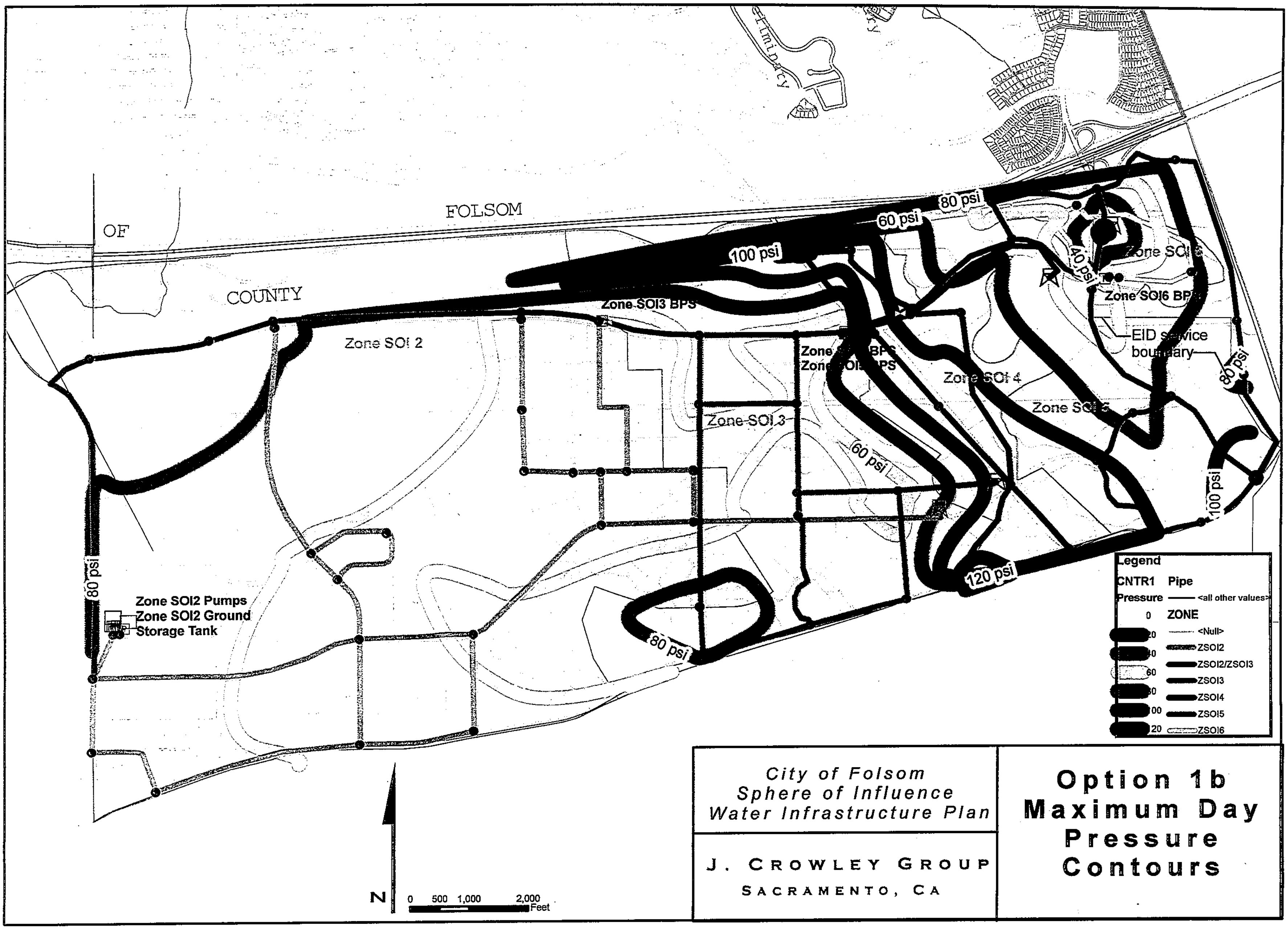
C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 1a_ground tank&Zsoi3 inline booster 4&5 inline boosters 092507



City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 1a Peak Hour Pressure Contours

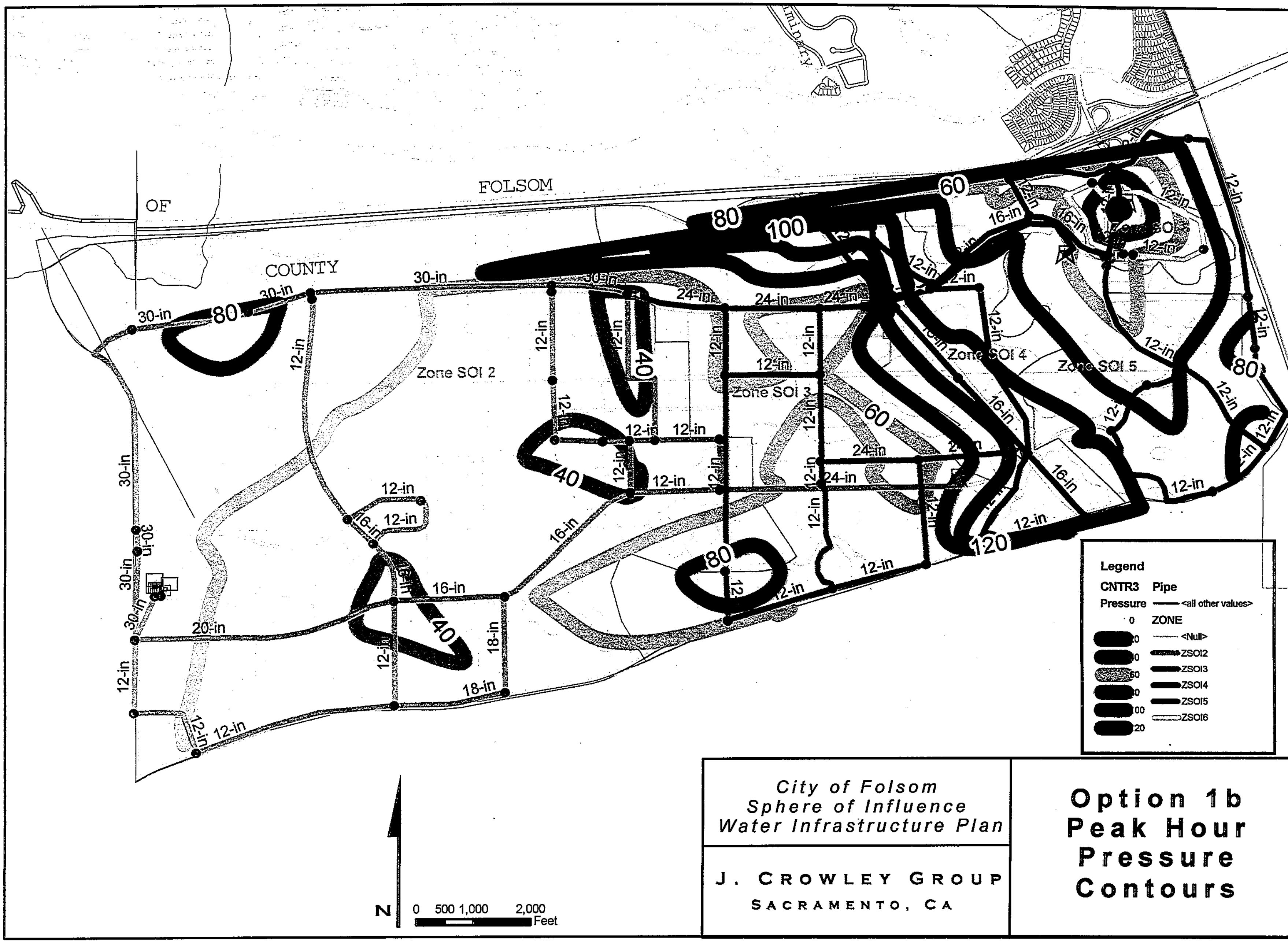


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 1b Maximum Day Pressure Contours

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 1b-ground &elevated tanks&Zsoi3 inline booster 4&5 inline booster091107 092507

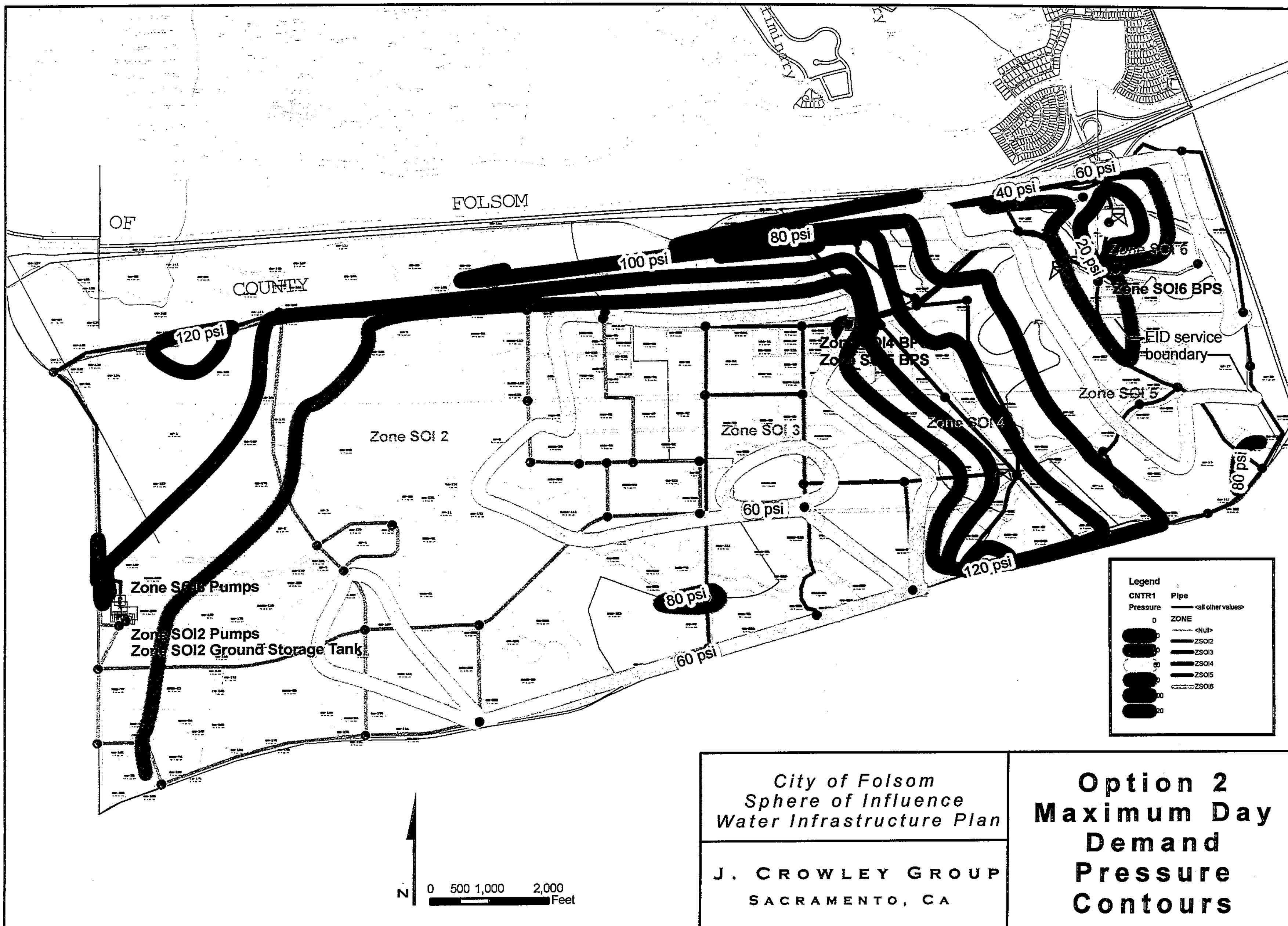


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 1b Peak Hour Pressure Contours

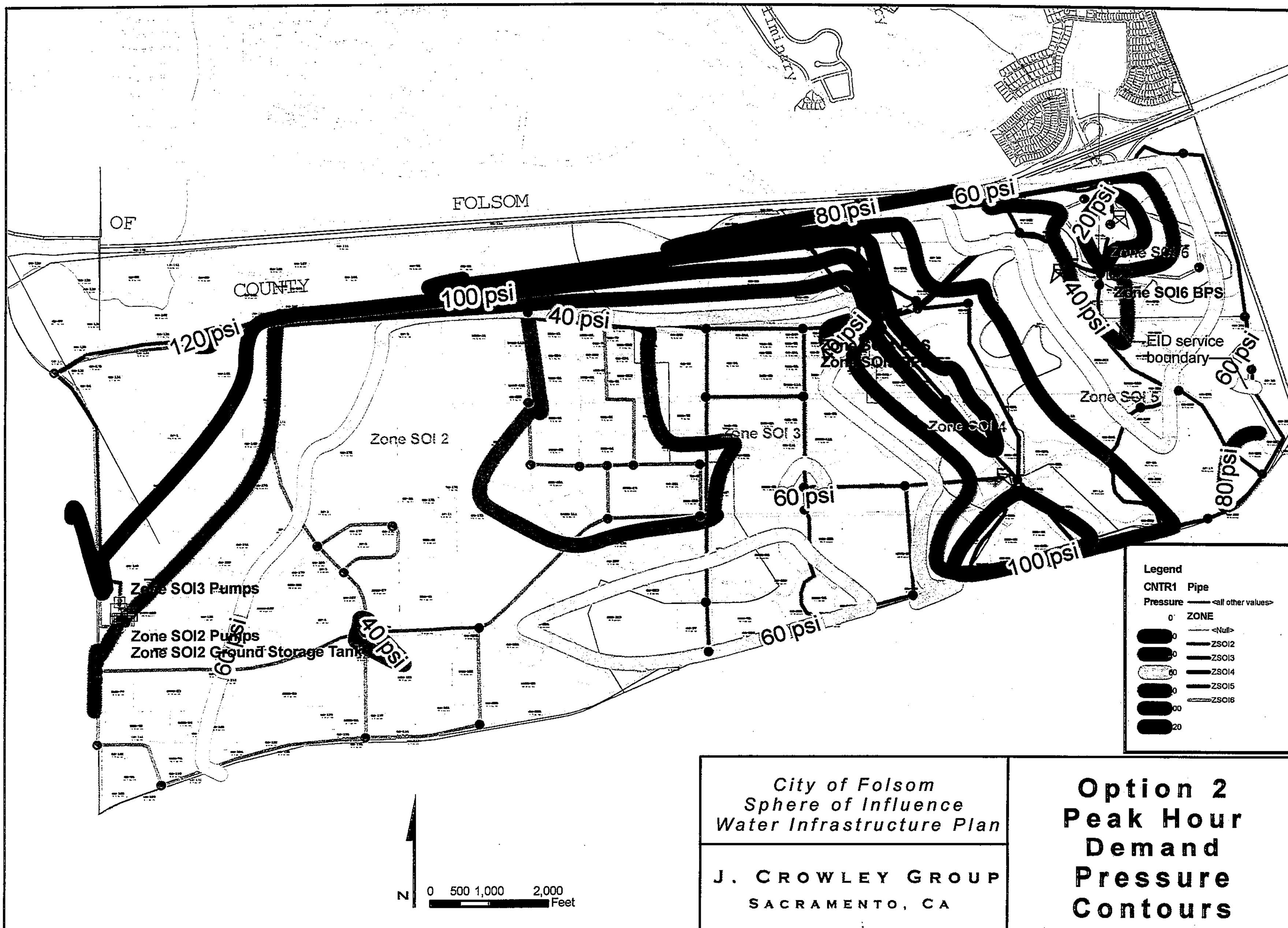
C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 1b-ground &elevated tanks&Zsoi3 inline booster 4&5 inline booster091107 092607



City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

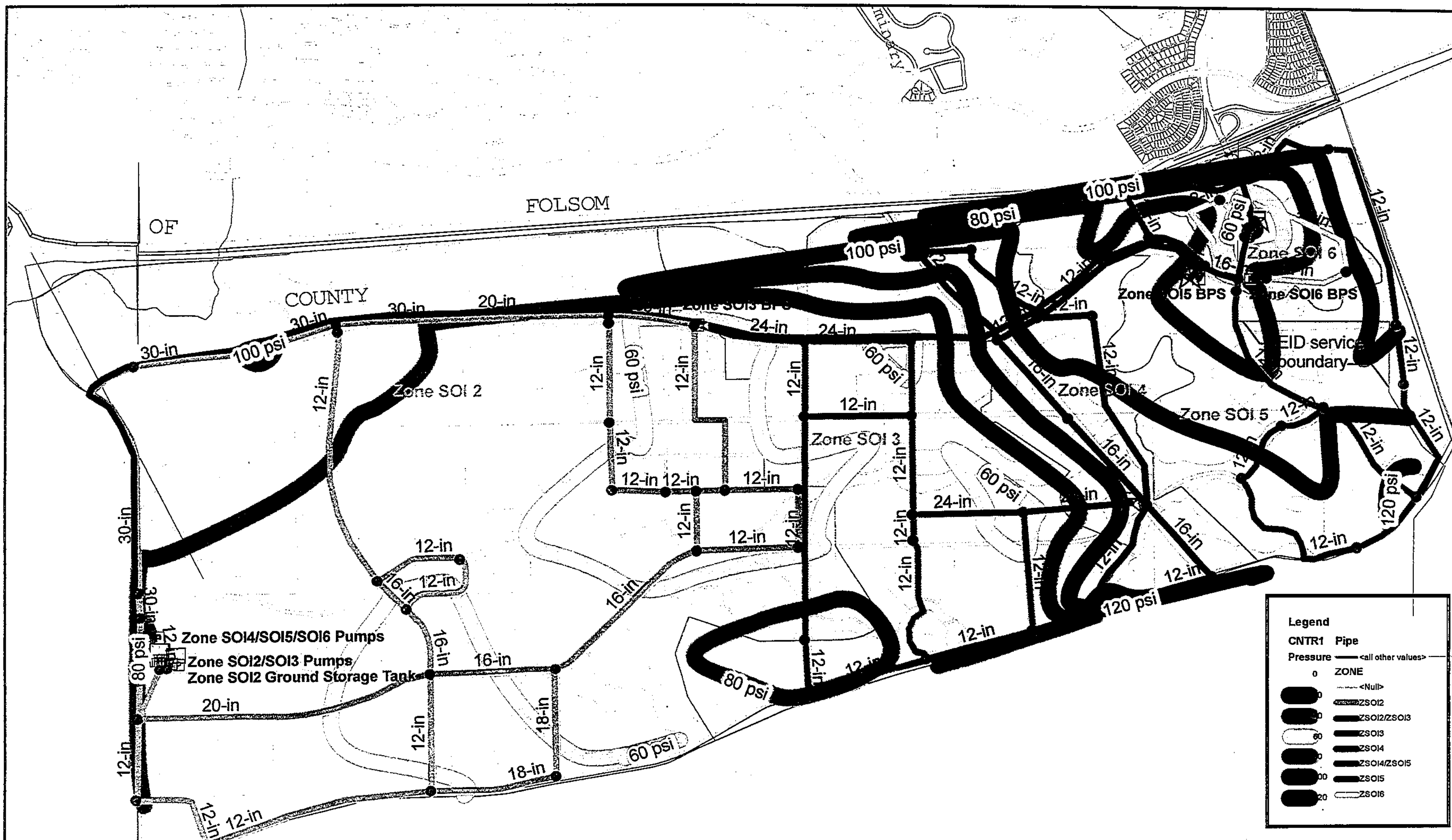
Option 2 Maximum Day Demand Pressure Contours



City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 2 Peak Hour Demand Pressure Contours

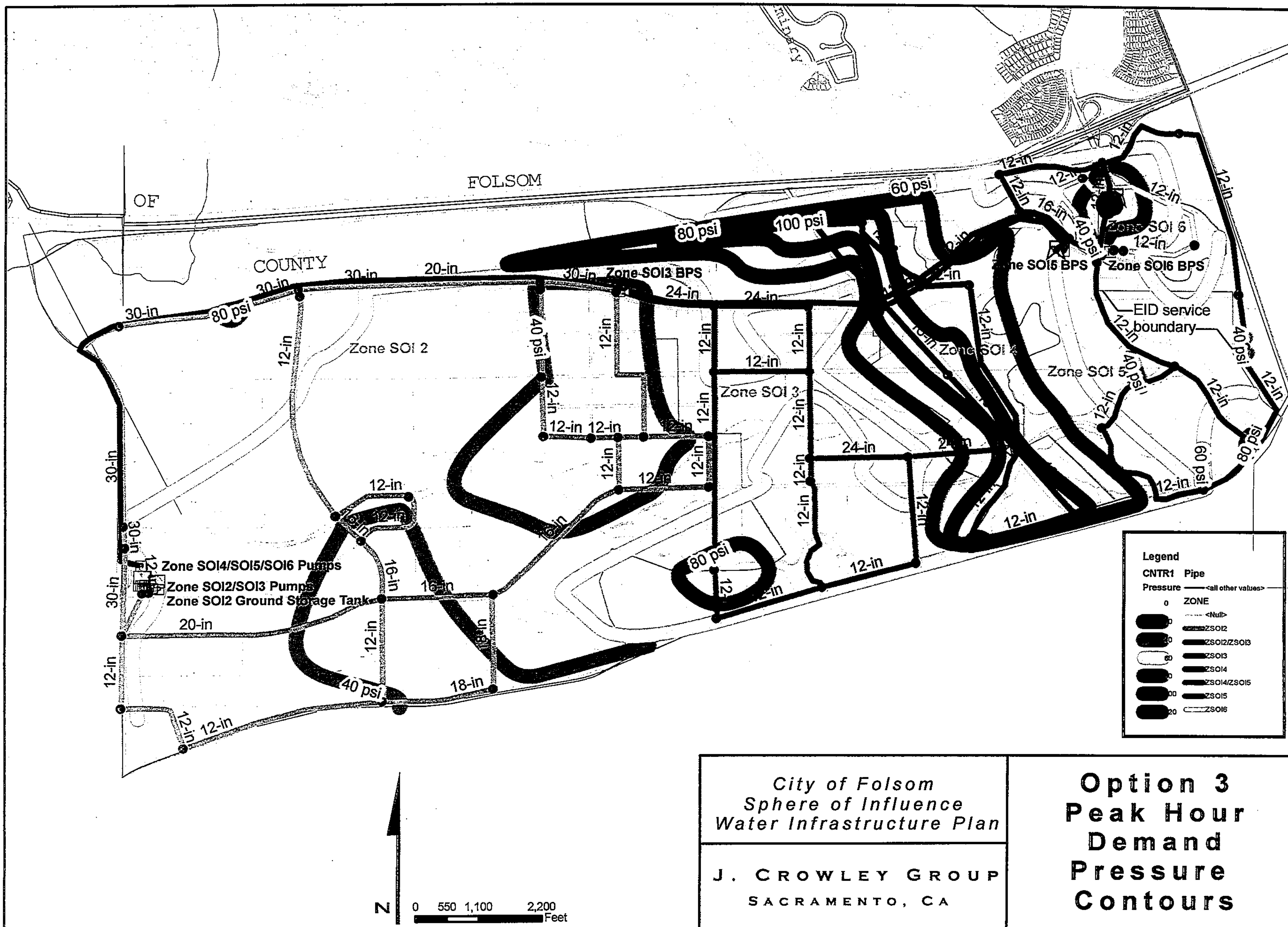


City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 3 Maximum Day Demand Pressure Contours

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 3-cLEARWELL TO zONE 4 AND 5 AND 6 9/26/07



City of Folsom
Sphere of Influence
Water Infrastructure Plan

J. CROWLEY GROUP
SACRAMENTO, CA

Option 3 Peak Hour Demand Pressure Contours

C:\Clients\City of Folsom\010-003 Folsom SOI\Model\Water Model\Infowater\Inline booster scenarios\Option 3-cLEARWELL TO zONE 4 AND 5 AND 6 9/26/07

J. CROWLEY GROUP, INC.
WATER RESOURCES PLANNING AND ENGINEERING

DRAFT

Technical Memorandum 013-003

TO: John Maguire, City of Folsom

FROM: Jim Crowley, J. Crowley Group
Melanie Holton, J. Crowley Group

DATE: December 13, 2007

SUBJECT: Draft SOI Recycled Water Analysis

Executive Summary

This recycled water infrastructure analysis provides a discussion and summary of the anticipated recycled water infrastructure needs to serve the Folsom Sphere of Influence (SOI). Potential recycled water demands in the Folsom service area and SOI area have been investigated previously by Folsom, Sacramento Regional County Sanitation District (SRCSD), and El Dorado Irrigation District (EID). This analysis estimates total potential recycled water demands assuming full residential irrigation, parks, schools, office parks, commercial, and streetscapes for comparison purposes, as shown in Table 1. Results indicate demands are projected up to 7,700 AF per year, depending on extent of recycled water use and irrigation factors assumed.

Table 1. Recycled Water Demand Comparison

Study	Projected Annual Recycled Water Demands, AF
This Analysis	
Full potential demands[a]	5,795
Targeted demands[b]	706
Draft SRCSD East County Feasibility Study[c]	
Folsom SOI C	1,947
Folsom SOI C ½	5,404
Folsom SOI D	7,708
Draft City of Folsom Water Recycling Feasibility Study[d]	
Alt 1	4,329
LO 5-4b	7,709

[a]Full potential demands include residential irrigation, parks, schools, office parks, commercial, and streetscape.
[b]Targeted demands include parks and schools in central and west side of SOI, and any irrigation of any commercial, businees, park, or streetscape adjacent to transmission mains.
[c]Draft SRCSD East County Feasibility Study data based on pdf from Jose Ramirez of the Sacramento Regional County Sanitation District via email dated August 29, 2007.
[d]Brown and Caldwell. Draft City of Folsom Water Recycling Feasibility Study, December 2005.

A targeted demand scenario is developed to plan for a system that serves most of the major non-residential recycled water demands within reasonable infrastructure requirements. The scenario assumes recycled water will be used at most parks and schools and some commercial, business park and streetscapes. Selection is based on logical grouping of sites near each other and proposed recycled water pipeline alignments. Sites selected are located in the central and west side of the SOI where most parks and schools are located. The Targeted scenario recycled water demands are compared to the total potable water demands projected in the draft Water Infrastructure Plan (J. Crowley Group, October 2007) in Table 2.

Table 2. Water Demand and Recycled Water Demand Comparison

Study	Total Water Demand, AFY	Targeted Recycled Water Demand, AFY	Adjusted Potable Water Demand, AFY
Draft Water Infrastructure Plan[a]	8,769	0.0	8,769
This Analysis	--	706	--
Total:	**8,769**	**706**	**8,063**

[a] Draft Water Infrastructure Plan (J. Crowley Group, October 2007)

This analysis does not investigate potential supply details or strategies. It is assumed supply will be provided from a satellite plant located on an interceptor sewer located west of the SOI and Folsom. Development of the necessary infrastructure assumes a booster pumping station on the west side of the SOI, a transmission main through the south portion of the SOI, and a storage tank located within the SOI near Placerville Road. Smaller distribution pipelines serve demand areas located away from the transmission mains. Sizing and design of the recycled water system requires set policies and standards that should be developed to further plan the system. The total cost for the recycled water system is estimated at $37 million dollars. This estimate includes the satellite treatment plant, but does not include the pumping station and pipeline required to deliver the flow to the SOI western boundary, as these elements could vary significantly depending on location.

This analysis quantifies the potential impact to potable water demands and the associated costs of a recycled water system. If the City would like to pursue implementing recycled water, further investigation is required to identify and develop supplies, define policy and design criteria, and coordinate with the SOI land owners, EID, and SRCSD.

Section 1 Introduction

This recycled water infrastructure analysis provides a discussion and summary of the anticipated recycled water infrastructure needs to serve the Folsom Sphere of Influence (SOI) area. The area is currently undeveloped and no public water supply or wastewater collection system exists in the area. The City of Folsom intends to annex the area and provide water, wastewater, and potentially, recycled water services, in addition to other City services, to the area. Additional infrastructure plans are developed under separate reports for water and wastewater infrastructure requirements in the SOI area. This recycled water infrastructure analysis will support discussions of recycled water use in the SOI area.

Section 2 Recycled Water Policy Assumptions

Many policy, operational, and design assumptions must be made to preliminarily size the infrastructure requirements. The following lists the assumptions made for this analysis. Should recycled water use be selected, the City will need to secure a supply and develop policy and design guidelines for the operations and design of the recycled water system.

- Supply is from a scalping plant downstream of Folsom. The analysis assumed a booster pumping station at the west side boundary of the SOI.
- Irrigation will be allowed from 9PM to 6AM to avoid potential contact with overspray or runoff.
- Flow will be pumped to a storage tank during the non-irrigation times of the day. Supply from the tank will meet daily irrigation demands.
- A portion of the SOI on the east side is in the El Dorado Irrigation District (EID) service area. EID requires all new development to include recycled water irrigation of parks, schools, streetscape, and residential. A separate analysis is underway to determine all water, recycled water, and wastewater infrastructure requirements for the EID service area.
- An earlier study (Draft City of Folsom Water Recycling Feasibility Study, Brown and Caldwell, December 2005) investigated various levels of recycled water use. Scenarios ranged from just parks and public landscapes to full residential landscape and toilet flushing in commercial and industrial land uses. This analysis assumes that recycled water will be used for irrigation at parks and schools in the central and west side of the SOI. In addition, all streetscape, commercial, and business park land uses along the recycled water pipelines will also be irrigated with recycled water. The potential demands of the full use scenario, with residential and commercial uses, are quantified for comparison purposes only.
- This analysis is based on the land use plan presented in the draft Water Infrastructure Plan (J. Crowley Group, October 2007).
- Daily storage is provided, but no seasonal storage is assumed.

Section 3 Recycled Water Demand Projections

The potential use of recycled water for outdoor irrigation for the proposed land use plan is evaluated in this section. Outdoor irrigation demands can be projected using two methodologies: Evapotranspiration (ETo)-based demands or historic data-based demands. The ETo method is based on a reference ETo and considers irrigation demand versus precipitation to determine total irrigation demand. The historic data-based demand method uses Folsom historical data and customer use analysis presented in the 2005 Urban Water Management Plan. Both methodologies are presented below and compared to select a standard basis for demand calculations.

3.1 ETo-Based Unit Demands

Landscape irrigation unit demands based on turf grass are used for projecting demands. It is assumed that most outdoor water use will irrigate turf grasses or similar water-demand plantings. ETo-based demands are calculated according to the methodology presented in *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California,* University of California Cooperative Extension and California Department of Water Resources, August 2000. Landscape water needs are estimated according to the following landscape water needs equation (modified to include precipitation):

(Equation 1) $$TWA = (ETo(k_s*k_d*k_{mc})/IE) - (P*IE)$$

where:
TWA = total water to apply.
P = precipitation.
ETo = reference evapotranspiration.
k_s = species factor (allowable range = 0.1-0.9, assumed 0.9 for turf grasses).
k_d = density factor (allowable range = 0.5-1.3, assumed 1.0 – no planting density impacts).
k_{mc} = microclimate factor (allowable range = 0.5-1.4, assumed 1.0 – no microclimate impacts).
IE = irrigation efficiency (normal range 0.65-0.90, assumed 75 percent, takes into account runoff, sprinkler efficiency, and percolation beyond root zone).

ETo data and irrigation demands are shown in Table 3. Data is presented for an average year (average precipitation) and a dry year with a return frequency of five percent. The assumptions noted for the irrigation demand equation represent a conservative (high end) estimate of water demands appropriate for this level of planning. Actual values may be less depending on type of landscape installed and irrigation system maintenance practices.

Note that ETo does not change with hydrology; it remains the same regardless of precipitation. Therefore irrigation demands in dry years represent a need to irrigate for more months compared to other years. As shown in Table 3, the dry year irrigation demand is 10 percent greater than the average year. Due to precipitation and weather patterns in the Sacramento Valley, irrigation demands during the summer months are relatively constant regardless of hydrologic year type. Only the normal year demands are carried forward throughout this analysis, as dry year demands do not influence infrastructure sizing.

Table 3. ETo-Based Irrigation Demands

Month	Precipitation[a], inches		ETo[b], inches	Irrigation Demand[c], inches	
	Average	Dry		Average	Dry
Jan	4.4	2.2	1.59	0	0.3
Feb	3.8	2.3	2.20	0	0.9
Mar	3.9	2.2	3.66	1.5	2.7
Apr	1.9	1.0	5.08	4.7	5.4
May	0.6	0.3	6.83	7.8	8.0
Jun	0.1	0.2	7.80	9.3	9.2
Jul	0.1	0.1	8.67	10.3	10.3
Aug	0.5	0.1	7.81	9.0	9.3
Sep	0.5	0.3	5.67	6.5	6.6
Oct	1.5	0.8	4.03	3.7	4.2
Nov	3.4	1.9	2.13	0	1.1
Dec	3.5	1.9	1.59	0	0.5
Annual Totals	**24.2**	**13.3**	**57.06**	**52.6**	**58.5**

[a] Folsom Dam Station, Western Regional Climate Center, 1955-1993. Dry year represents five percent return frequency.
[b] CIMIS, Fair Oaks Station No. 131. (April 1977-2005)
[c] See Equation 3-1 for calculation assumptions.

3.2 Historic Data-Based Unit Demands

The 2005 Urban Water Management Plan (UWMP) and parallel water demand analysis investigated unit water demands for each of Folsom's land use designations, as well as indoor and outdoor use. Water production records are compared with operating conditions and a range of land use unit water demands from other agencies in the region to derive indoor and outdoor unit water demands for Folsom. Results estimate the outdoor demand unit water factor at 4.0 acre-feet per acre per year.

3.3 Unit Demand Comparison

The average year ETo-based unit water demand is 52.6 inches per year, or 4.4 acre-feet per acre per year. The dry year ETo-based unit water demand is 4.9 acre-feet per acre per year. These values are larger than the UWMP value of 4.0 acre-feet per acre per year, and larger than unit water demands experienced by other recycled water utilities in the region, such as Roseville and EID. This analysis will use the outdoor irrigation unit water demands presented in the UWMP to remain consistent with the water demand projections used for all water demands. If recycled water use is selected for the SOI, further analysis of demands and comparison with similar application sites is warranted.

3.4 Design Flow Peaking Factors

Design flow peaking factors are used to convert average annual demands to design flows used for sizing infrastructure. The peaking factors are applied to annual demands to determine maximum day and peak hour demands. The peak hour demand factor considers irrigation timing and practices to determine the peak hour flow rate. Maximum day and peak hour design flow peaking factors in Table 4 are based on factors from Sacramento Regional County Sanitation District (SRCSD) as shown in the Draft City of Folsom Water Recycling

Feasibility Study (Brown and Caldwell, December 2005). The maximum day peaking factor represents the maximum day to average day demand ratio and the peak hour peaking factor represents the peak hour to maximum day demand ratio.

Table 4. Recycled Water Design Flow Peaking Factors

Demand Condition	Peaking factor
Maximum day	2.6
Peak hour	3.0

3.5 Projected Recycled Water Demands

Unit water demands are applied to projected land use area to identify total annual water demands. A net acre factor is used to convert total acreage to actual acreage with water demands. This acreage reduction accounts for non-water demand areas, such as right of ways or pavement. Table 5 presents these factors as well as a comparison of the recycled water demands per land use for full reuse implementation for an average hydrologic year using the ETo-based unit water demands and using the historic data-based unit water demands.

A second reduced demand projection is shown in Table 6. Targeted parcels to include are developed based on review of the land use plan, site elevations, and potential pipe routes. The potential alignment was established to serve all large parks and school sites in the central and west side of the SOI. Other demands such as commercial, office park, and streetscape (OSL) were added if they were close to the main pipe alignment. This analysis assumes that most OS land use parcels will be un-irrigated, natural landscapes, and that any water demands such as parking or entrance areas, is met with potable water. Table 6 provides a summary of the targeted demands used for this analysis; selected parcels are also identified later in this analysis in Figure 3. Although the ETo based demands are not used further in this analysis, they are shown for comparison purposes only.

Table 5. Potential Recycle Water Demands for Full Implementation – Average Year

Land Use ID	Area, acres	Dwelling Unit Density, DU/acre	Dwelling Units	Outdoor Unit Water Demand		Net Acre Factor	Recycled Water demand[d]					
							Avg. Annual, acre-feet		Max day, mgd		Peak hour, gpm	
				ETo-based, AF/DU or AF/ac	Historic Data-based, AF/DU or AF/ac		ETo-based	Historic Data-based	ETo-based	Historic Data-based	ETo-based	Historic Data-based
SF	560	3.9	2,184	0.34[a]	0.45	0.30[b]	813	1,081	1.9	2.5	3,932	5,228
SFHD	522	6.9	3,604	0.26[a]	0.36	0.40[b]	1,011	1,784	2.3	4.1	4,887	8,627
MFLD	251	11.9	2,987	0.09[a]	0.2	0.25[b]	304	1,183	0.7	2.7	1,469	5,721
MFMD	28	17.9	499	0.06[a]	0.2	0.25[b]	34	110	0.1	0.3	164	532
MFHD	100	25	2,503	0.04[a]	0.2	0.25[b]	121	275	0.3	0.6	585	1,330
CCD	41			4.4	4	0.05	10	9	0.0	0.0	48	44
OP	107			4.4	4	0.10	52	47	0.1	0.1	250	227
CC	139			4.4	4	0.05	34	31	0.1	0.1	163	150
GC	203			4.4	4	0.05	49	45	0.1	0.1	238	218
Park	118[c]			4.4	4	0.75	355	322	0.8	0.7	1,717	1,557
LP	47			4.4	4	0.75	171	156	0.4	0.4	825	754
OS	991			--	--	--	--	--	--	--	--	--
OSL	55			4.4	4	0.75	200	183	0.5	0.4	966	885
SCH	181			4.4	4	0.50	438	398	1.0	0.9	2,118	1,925
EXCL RW	73			--	--	--	--	--	--	--	--	--
MAJ CIRC	143			--				--	--	--	--	--
Non-residential toilet flushing	--				--	--	172	172	0.4	0.4	832	832
Total	**3,559**		**12,269**				**3,762**	**5,795**	**8.7**	**13.5**	**18,193**	**28,029**

[a]Residential outdoor demand of 4.4 AF/acre is converted to AF/DU using the Net Acre Factor and DU density.
[b]Residential net acre factors are estimated based on draft development standards for the purpose of estimating outdoor recycled water irrigation demand using ETo-based unit water use factors.
[c]Park acreage for applied recycled water is 98 acres due to removal of Lot 108 (20.2 acres for proposed WTP site) from the recycled water application calculation.
[d]An unaccounted water use factor of 1.1 is applied to all demands.

Table 6. Recycled Water Demands – Targeted[a]

Land Use ID	Area served, acres	Recycled Water Demand[b]					
		Avg. Annual, acre-feet		Max day, mgd		Peak hour, gpm	
		ETo-based	Historic Data-based	ETo-based	Historic Data-based	ETo-based	Historic Data-based
CCD	16	4	3	0.01	0.01	18	17
Park	89	322	293	0.7	0.7	1,557	1,416
OSL	10[c]	37	34	0.1	0.1	179	163
SCH	171	414	376	1.0	0.9	2,000	1,818
Total	**286**	**776**	**706**	**1.8**	**1.6**	**3,754**	**3,413**

[a]Recycled water to parks and schools in Zones SOI 2 and SOI 3 and any adjacent commercial and landscaped open space are assumed to be served.
[b]An unaccounted water use factor of 1.1 is applied to all demands.
[c]Acreage for OSL served is approximated based on estimated length of recycled water transmission pipeline multiplied by 20 feet width of landscape along the alignment.

Table 7 provides a comparison of SOI recycled water demand estimates in this technical memorandum and in previous studies. The total potential recycled water demand in this technical memorandum falls within the median of the estimates calculated in the SRCSD and Brown and Caldwell studies. Reasons for differences in irrigated acreages and recycled water demands between the previous studies could be due to varying unit water use assumptions and the SOI land use plan status at the time of each study. The actual demands used in this analysis are significantly less, at 706 acre-feet/year, as this analysis limits reuse to some parks and schools and other parcels near the proposed pipeline alignments.

Table 7. Comparison of SOI Recycled Water Demand Estimates

Estimate Source	Gross Acreage, acres	Irrigated Acreage, acres	Recycled Water Demand	
			Avg. Annual, acre-feet	Max day, mgd
This Analysis				
Full-Use Recycled Water Demand[a]	3,559	2,331	5,795	13.5
Targeted Recycled Water Demand assumed in this analysis[a]	3,559	286	706	1.6
Draft SRCSD East County Feasibility Study[b]				
Folsom SOI C	3,584	420	1,947	6.1
Folsom SOI C ½	3,584	852	5,404	14.3
Folsom SOI D	3,584	1,140	7,708	19.8
Draft City of Folsom Water Recycling Feasibility Study[c]				
Alt 1	--	--	4,329	--
LO 5-4b	--	--	7,709	15.3

[a]Historic data-based unit water use, average year.
[b]Draft SRCSD East County Feasibility Study data based on pdf from Jose Ramirez of the Sacramento Regional County Sanitation District via email dated August 29, 2007.
[c]Brown and Caldwell. Draft City of Folsom Water Recycling Feasibility Study, December 2005.

Demand values are calculated for each month to size infrastructure on maximum demand requirements. The annual irrigation demand curve from Table 3 is applied to the selected recycle demand (706 acre-feet/year) used in this analysis in Table 8.

Table 8. Monthly Water Demand-Average Year[a]

Month	This Analysis Demand	
	Ac-ft	mgd
Jan	0.0	0.0
Feb	0.0	0.0
Mar	0.0	0.0
Apr	65	0.7
May	108	1.2
Jun	128	1.4
Jul	142	1.5
Aug	124	1.3
Sep	90	1.0
Oct	51	0.5
Nov	0.0	0.0
Dec	0.0	0.0
Annual Total	706	0.6

[a]Based on Historic data-based demand estimate.

Section 4 Recycled Water Supply

This section presents the previous efforts to identify potential recycled water supplies. Supply planning efforts by the SRCSD and (EID) are summarized with recommendations for potential supply integration strategies. The overall strategy is to obtain supply from a satellite wastewater treatment plant that scalps flow from one of the SRCWD interceptors, obtain excess supply from EID, or a combination of the two supplies. However, to size infrastructure, this analysis assumed all flow would come from a scalping plant downstream from Folsom. If reuse is selected for the SOI, a concerted effort is required to investigate and secure a supply.

4.1 Recycled Water Supply Requirements

Recycled water supply for landscape irrigation follows unique characteristics due to irrigation demand patterns over a year. Demands vary by month, with the summer months using most of the supply, and the winter months using none. However, supply needs might not directly mirror demand needs as system operation and maintenance requirements also impact supply needs. For instance, during months of minimum demand, the system still must be operated so that irrigation water is available within the design pressure and flow parameters. Also, Folsom may choose to keep the system in full operation during periods of no theoretical demands (mostly winter), as some winters may still require irrigation due to low precipitation. During these times, the system may experience water age problems, such as algae growth. The system may need additional disinfection or may need to be flushed to keep the water quality within design parameters.

Due to climate patterns in the Sacramento Valley, where there is almost no precipitation during summer months, the maximum demand is during summer months. Maximum demand usually remains constant over many days. Peak hour demands are dependent on irrigation schedules. Other recycled water systems limit irrigation to night time hours. However, it one site sets the irrigation system to meet all of its demands in a two hour period, the site will exert a greater demand on the distribution system, impacting flow conditions at other sites.

The daily issues presented mostly impact design criteria, as recycled water systems are sized to meet the maximum day and peak hour demands. Annual issues such as minimum system operations and year-round availability affect the annual supply needs presented in this document. This presents a slightly different operation than other recycled water utilities in the region, as the others do not operate satellite systems, but simply make water available from their wastewater treatment plants or raw water systems as necessary. These supply issues will need to be further defined if recycled water use is pursued.

4.2 Folsom Wastewater Flows

The City of Folsom owns and operates its own wastewater collection system. Collected flows are discharged to the SRCSD interceptor system, and are then conveyed and treated by SRCSD.

A potential source of supply is to use the City of Folsom wastewater flows in a satellite treatment facility, or scalping plant. All flows from Folsom would be available as a supply source for the SOI recycled water needs. SRCSD has investigated this alternative in their Recycled Water Opportunities Investigation, November 2006. Of main concern in the SRCSD study is to ensure there is sufficient flow to meet minimum flow requirements in the interceptor downstream of the satellite plant.

The City of Folsom projects ultimate dry weather base flows in the ongoing update to the wastewater master plan at 11.0 mgd (email from ECO:LOGIC, November 9, 2007). This converts to an annual flow volume of 12,300 acre-feet. Wastewater flow projections for the SOI area are reported in the Draft SOI Wastewater Infrastructure Analysis (J. Crowley Group, October 2007). The two flows are combined to represent total flow from Folsom that could potentially be used for recycled water supply shown in Table 9. Flow projections do not include the Aerojet development of Easton Glenborough.

Flows reported are dry weather base flow estimates. Actual flows will be larger due to some groundwater infiltration and rainfall induced infiltration and inflow. However, for recycled water supply planning purposes, the base flow is used to provide the minimum projected supply. Total Folsom flows projected in the SRCSD Recycled Water Opportunities Investigation were not available for comparison.

Table 9. Total Folsom Wastewater Production at Buildout

Area	Daily Dry Weather Base Flow, mgd	Annual Base Flow, acre-feet/year
Existing Folsom Service Area[a]	11.0	12,300
SOI[b]	5.2	5,800
Total:	**16.2**	**18,100**

[a]City of Folsom – draft wastewater master plan update project, email from ECO:LOGIC, November 9, 2007.
[b]Draft SOI Wastewater Infrastructure Plan, J Crowley Group, October 2007.

4.3 Supply to Demand Comparison

Daily supply must be able to meet maximum day demand because no seasonal storage is assumed. The maximum day demands are calculated for the range of demand scenarios from this and other studies discussed above. Annual demand is compared to supply on Figure 1. Maximum day demand is compared to daily supply on Figure 2. As indicated, when only using the wastewater generated by Folsom, there is sufficient supply on an annual basis for all of the demand scenarios listed. However, when looking at available supply on a daily basis in Figure 2, demand is much closer to supply. The supply numbers do not include the minimum pipe flow requirements suggested by SRCSD, which would result in even less supply. As the highest reuse demands occur at the lowest wastewater flow periods (summer), seasonal recycled water storage would help alleviate supply issues. Further coordination with SRCSD regarding minimum pipe flows and other supply issues is required to better define supply requirements.

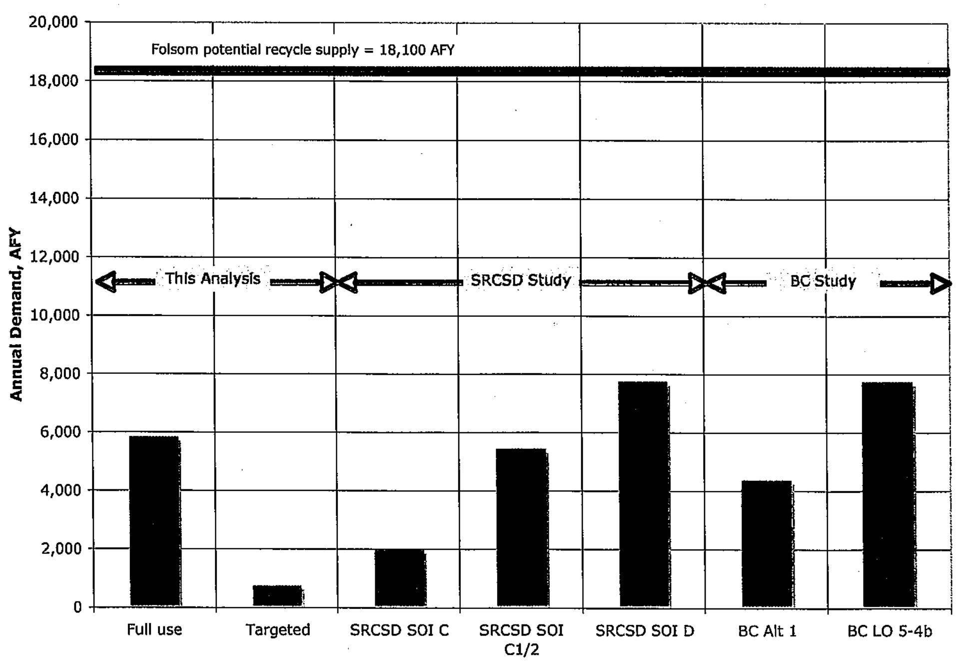
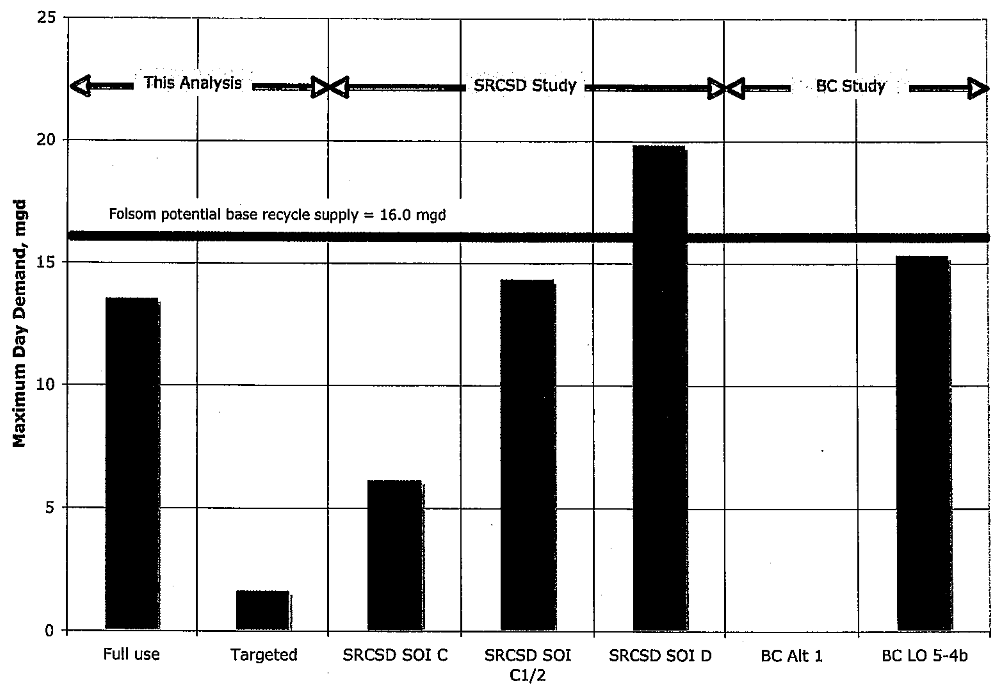


Figure 1. Annual Supply to Demand Comparison



Note: BC Alt 1 did not project maximum day demands.

Figure 2. Maximum Day Demand - Supply to Demand Comparison

4.4 SRCSD Recycled Water Planning Effort Update

SRCSD released the Water Recycling Opportunities Study in February, 2007. Since that time, SRCSD continued to update is planning projections for the Highway 50 corridor recycled water alternatives. Additional efforts by SRCSD have further defined their supply and operational issues and policies. The available supply from a satellite treatment facility per the SRCSD planning efforts is not available at this time.

4.5 EID Recycled Water Planning Efforts.

EID produced the Draft Recycled Water Master Plan in December, 2002. The document identified a potential excess recycled water supply available for use in Folsom. Since that time, EID has revised its supply and demand estimates internally, and Folsom evaluated potential supply from EID in its December 2005 Water Recycling Feasibility Study. EID staff was contacted during this planning effort to update potential supply estimates, identify interest in supply collaboration, and identify other issues that may impact recycled water planning with EID. EID staff is unable to provide comment until their internal planning and analysis is further updated.

4.6 Glenborough/Easton Development

The Glenborough/Easton development directly east of the SOI area on Aerojet property also may use recycled water for some of its landscape irrigation needs. Projected wastewater flows from its area may be available as part of the overall supply. The SRCSD planning efforts assumed that the development would use recycled water, and routed the supply main through the development.

4.7 Recycled Water Supply Summary

Recycled water supply is available to the SOI from different alternatives. A satellite treatment plant could be located within the SOI, existing City of Folsom, Glenborough development, or further west as assumed in the SRCSD studies. Supply discussions with EID are preliminary. EID is currently unable to comment on available supply until they have more information from their ongoing recycled water supply studies and projects. This analysis assumes a satellite plant would be located west of the SOI.

Section 5 SOI Recycled Water Distribution System

This section develops alternatives for the recycled water distribution system within the SOI area. The internal distribution system is first developed with consideration to demand locations, main pipe alignments, storage needs and locations, pressure zones, and pumping requirements.

An extended period simulation hydraulic model of the SOI system was developed in this analysis using MWSoft's Infowater software, the GIS-based version of H2ONet. The development of a computer hydraulic model makes it possible to analyze the expected system performance at varying demand conditions such as maximum day and peak hour. System demands are assigned to specific nodes throughout the SOI.

5.1 Demand Assignment

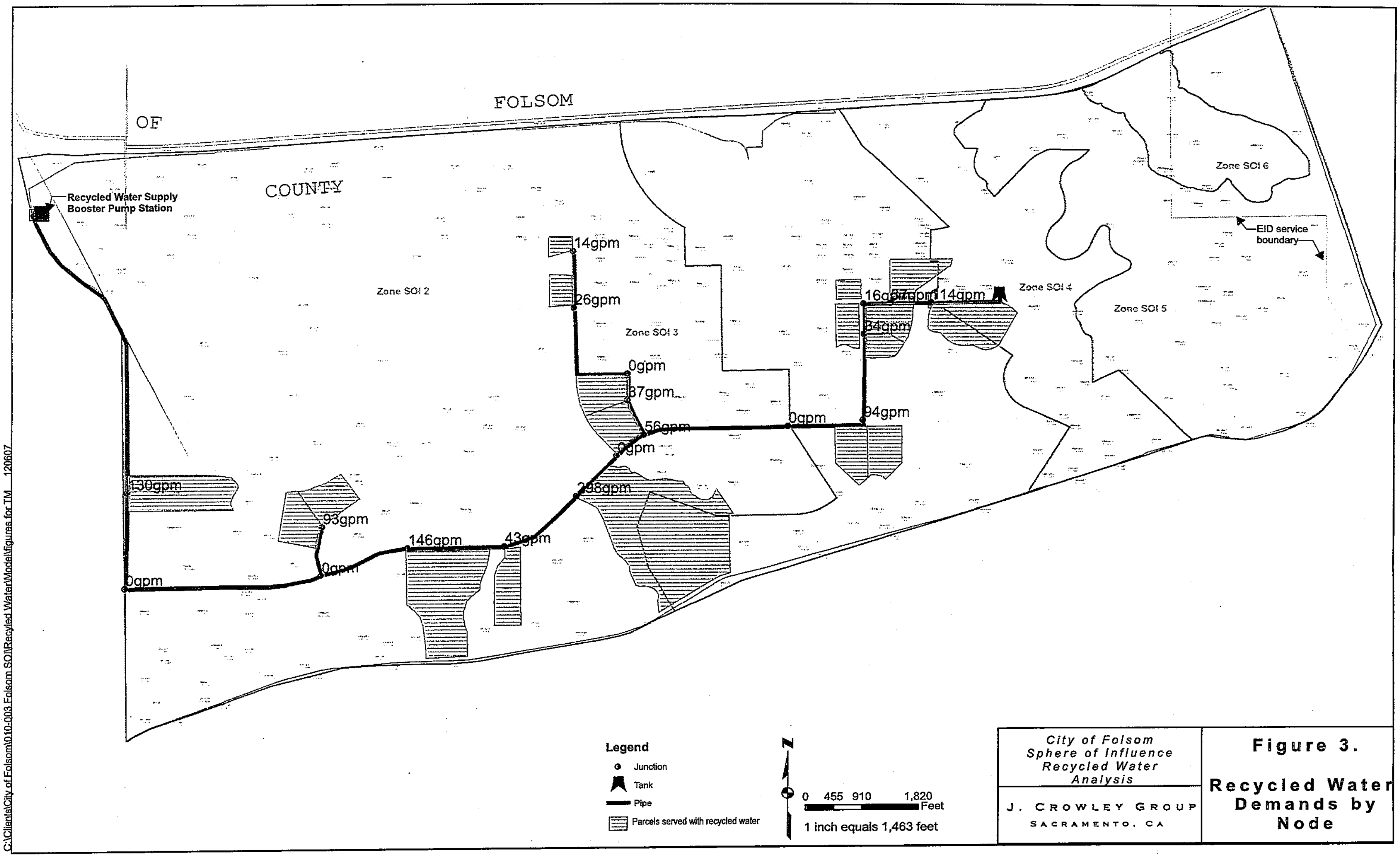
Demands developed in this technical memorandum are grouped together and assigned to node locations as shown on Figure 3. The distribution main alignment was based on serving all schools and parks within water pressure Zones SOI 2 and SOI 3. Some of the commercial and business park demands will be served if the site is located along the recycled water main alignment. The SOI land use plan is used to identify all commercial and business park demands adjacent to the proposed recycled water main. The hatched parcels on Figure 3 are the school, park, and adjacent commercial and business park parcels being served recycled water in this analysis.

5.2 Supply Location

For this analysis it is assumed that the recycled water supply booster pump station is located in the northwest corner of the SOI, as shown on Figure 3. An analysis of the supply or a portion of the supply coming from EID is not included in this report.

5.3 System Development

A distribution system consisting of storage, booster pumping, and transmission mains was developed and input into the model. Sizing and modeling assumptions used to create the system are summarized in Table 10. These design criteria should be reviewed and further developed by the City during the SOI recycled water pre-design process. A 10 psi pressure differential between potable and recycled water systems is desired so that in the case of a system leak, the potable water system is at the higher pressure.



City of Folsom
Sphere of Influence
Recycled Water
Analysis

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 3.

Recycled Water Demands by Node

C:\Clients\City of Folsom\010-003 Folsom SOI\Recycled Water\Model\figures for TM 120607

Table 10. Sizing and Modeling Assumptions

Element	Value
Diurnal Storage	Volume equal to: One maximum day demand plus 50% of maximum day demand for emergency
Pressure range	30 psi – 70 psi
Pipeline velocity	3 to 5 feet per second maximum
Pipeline roughness coefficient	130
Minimum transmission main diameter	8-in

5.4 Diurnal demand

A diurnal time pattern was established to simulate system demands over a 24-hour period. The time pattern used in this extended period analysis is illustrated on Figure 4. For this analysis it is assumed that the recycled water use will occur between 9 PM to 6 AM to reduce the chance of public exposure to recycled water spray and mist.

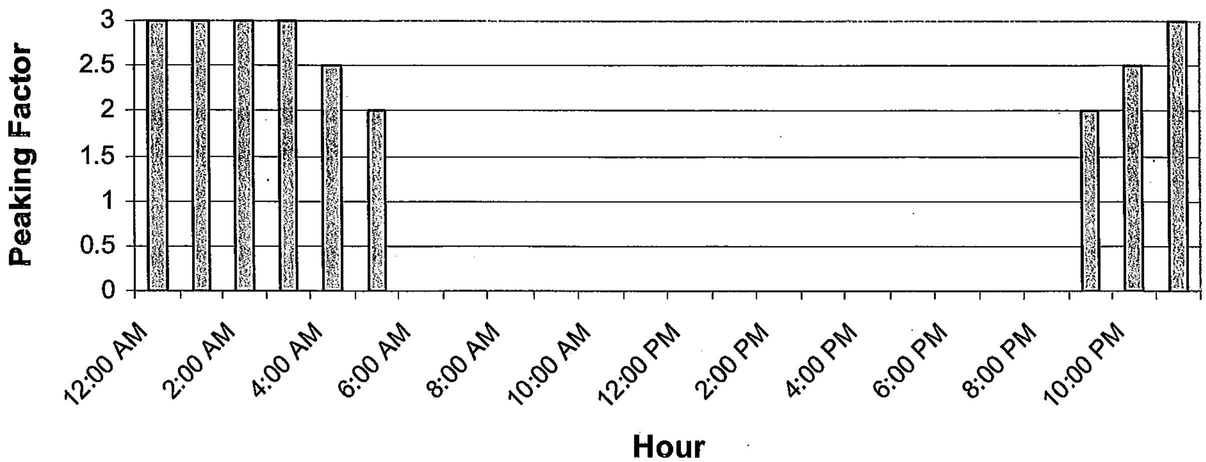


Figure 4. Diurnal Demand Curve for 24-Hour Maximum Day Period

5.5 Diurnal Storage

Diurnal storage must be provided so that the recycled water treatment facility can operate near a constant rate to maximize treatment stability. For this analysis it is assumed that the storage will be filled during non-irrigation hours (6 AM to 9 PM). The diurnal storage is sized to provide the supply for the night time demand as well as one half maximum demand day of emergency storage as shown in Table 11. Diurnal storage is typically provided in above-grade coated steel water storage tanks, designed similar to tanks used for potable water supply systems. The storage tank is located at an elevation of 500 feet in the Zone SOI 4 area.

Table 11. Storage Facility

Storage Requirement	Volume, MG
Maximum day supply	1.6
Emergency	0.8
Total	2.5

5.6 Pressure Zones

A one pressure zone recycled water system for the demand locations provides adequate pressures during the night-time demand period. During periods of no customer demand (between 6AM and 9PM) nodal pressures near the recycled water supply booster pump station are elevated as high as 170 psi. This high pressure is due to the required discharge head of the supply booster pump station necessary to pump recycled water to the diurnal storage facility. Another option is to place an in-line booster pump station and bypass valve along the alignment near the zone break between water pressure zones SOI 2 and SOI 3. This would reduce day time system pressures near the recycled water supply facility by reducing the required discharge head at the recycled water supply facility. Development of actual pressure zone boundaries and other details depend on as-yet undetermined operational policies and should be refined in the preliminary design phase.

5.7 Booster Pump Station

The booster pump station from the recycled water supply is sized to pump maximum day demands from the scalping plant to the storage tank during non-irrigation times. The capacity and horsepower for this booster pump station is provided in Table 12.

The horsepower (HP) required for this booster pump station is calculated based on the following equation:

(Equation 2) Required horsepower=Q*TDH/(eff*3,960)

Where:
Q = required flow, gpm
TDH = total dynamic head, ft
eff = pump efficiency, assumed to be 0.75

Table 12. Booster Pump Station Capacity

Booster Pump Station	Capacity	Horsepower
At supply scalping plant	2,000 gpm	250 HP

5.8 Transmission Mains

The transmission mains are sized for a pipeline velocity of 3 to 5 fps under peak hour demand conditions. Some 8-in pipelines have velocities lower than 3 fps, but for this technical memorandum a minimum pipe size of 8-in is maintained. Because this system has source supply coming from the west side of the system and the storage on the east side of the system, some of the pipelines will exhibit lower velocities during different times of the day. For example, the pipelines near the west side of the system are sized to convey supply from the scalping plant to the storage facility during the day time. When the pipelines are used to deliver supply to the irrigation sites, the velocities are much lower. The pipeline diameters and respective lengths are shown in Table 13 and illustrated on Figure 5.

Table 13. Transmission Main Diameters and Length

Diameter, in	Length, ft
8	4,754
12	14,812
16	9,227
Total (rounded)	**28,800**

5.9 SOI Recycled Water Distribution System Summary

The proposed system is shown on Figure 5. The pressures and velocities are shown for peak hour demands. High pressures occur on the west side during the non-irrigation hours when the booster pump station is pumping recycled water from the scalping plant to the storage tank. Pressure zone design depends on operational policies and will be addressed during the detailed planning and design phases.

Section 6 SOI Recycled Water Distribution System Cost Estimate

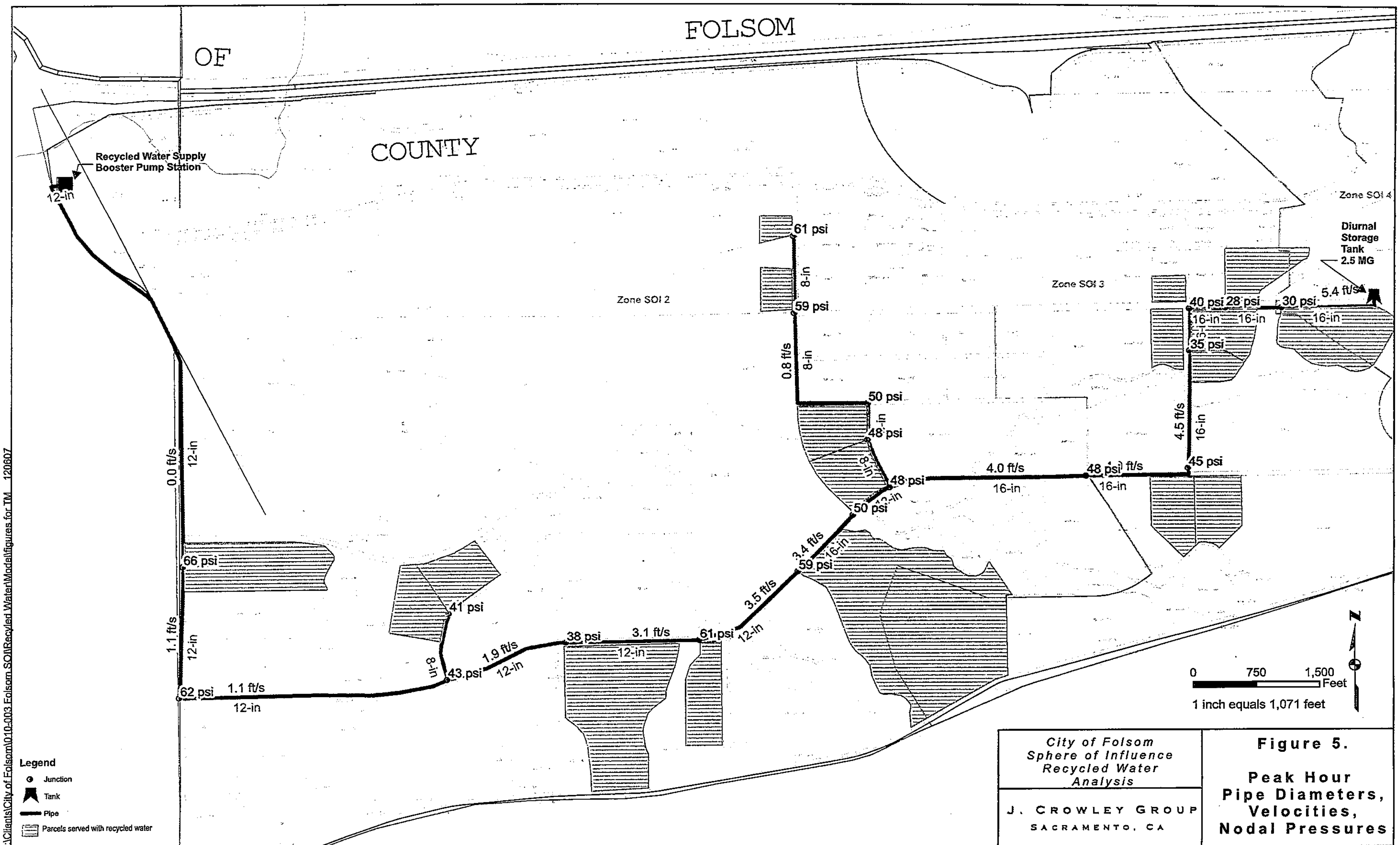
The estimated construction cost of the recycled water infrastructure is developed at a conceptual level in this section.

6.1 Unit Costs

Table 14 provides a summary of the unit cost assumptions for this conceptual cost estimate. Also provided are the references and/or assumptions used to estimate the unit costs. The cost estimates are based on using construction unit costs of similar facilities when possible. When such costs are not available, construction costs are estimated from available cost curves or other assumptions.

Table 14. Unit Cost Assumptions

Infrastructure Component	Unit Cost	Reference/assumption
Pipeline	$18/in-dia/linear foot	Based on recent bid tabs and completed construction for projects for local water agencies.
Booster pump station	$250/gpm	Treated water. Based on construction costs of service water pumping stations cost curve (Robert L. Sanks, Pumping Station Design, 1989, Figure 29-6) and based on recent project costs for Sacramento area booster station projected to January 2007.
Water storage tank	$0.50/gallon	Based on discussions with local contractors and water agencies on recent reservoir construction with foundation and appurtenances.
Recycled Water treatment facility (scalping plant)	$10/gallon	Based on high range of SRCSD estimate.



City of Folsom
Sphere of Influence
Recycled Water
Analysis

J. CROWLEY GROUP
SACRAMENTO, CA

Figure 5.

Peak Hour Pipe Diameters, Velocities, Nodal Pressures

6.2 Construction Cost Contingency

Because of limitations of planning-level costs estimates, allowances must be made for variations in final length and depth of pipelines and other structures, adverse construction conditions, and other unforeseeable difficulties that may impact the final construction cost. A contingency allowance of 30 percent of the estimated construction contract cost is applied for this analysis.

6.3 Conceptual Construction Cost

The infrastructure requirements and conceptual level costs for are provided in Table 15. These conceptual level cost estimates are considered to be a planning level estimate for the purposes of comparing infrastructure options. This estimate includes the satellite treatment plant, but does not include the pumping station and pipeline required to deliver the flow to the SOI western boundary, as these elements could vary significantly depending on location. The cost of operations and maintenance for each alternative is not included in this analysis. In addition, this conceptual cost estimate does not include project costs such as engineering, construction management, and administration costs.

Table 15. Conceptual Cost Estimate

Cost Item	Size/capacity		Unit cost, $		Pipe length, ft	Cost, $million
Recycled water scalping plant	2.0	mgd	10	gal	--	$20.0
Pipeline	8	inch	18	in-dia/lf	4,754	$0.7
	12	inch	18	in-dia/lf	14,812	$3.2
	16	inch	18	in-dia/lf	9,227	$2.7
Booster pumping station	2,000	gpm	250	gpm	--	$0.5
Diurnal storage	2.5	MG	0.5	gal	--	$1.3
					Construction cost subtotal	$28.4
					Contingency (30%)	$8.5
					Total	**$37.0**

Note: Potential costs for pumping station and pipeline from scalping plant to SOI area not included.

Section 7 Summary and Next Steps

This draft technical memorandum presents the analysis findings as of this date. Coordination continues with the other SOI-related projects and with neighboring agencies. The following lists items to address next as the environmental review process moves forward.

1. Folsom and other stakeholders to review draft technical memorandum and provide edits and comments for refining next steps.
2. Continue coordination with EID to develop service scenarios for the east side of the SOI. Update analysis or prepare a separate plan once alternative is selected and agreed upon.
3. Coordinate review of draft report with environmental report efforts and modify analysis as necessary.
4. Update recycled water supply information as SRCSD and EID continue/complete their analysis.
5. In future pre-design phase, City of Folsom should develop recycled water system operational policies and design criteria.
6. Further analyze scalping plant supply location and impacts to on-site and off-site cost.
7. Sizing criteria should be further investigated by surveying other applications supplied by satellite plants to determine operational issues and associated impacts on infrastructure sizing.